Annex D

FY 2011 Biennial Plan and Budget Assessment on the Modernization and Refurbishment of the Nuclear Security Complex

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United States Department of Energy
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U.S. DEPARTMENT OF ENERGY

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Introduction

1.A. Assessment

This section is in response to:

> 50 USC Sec. 2455. An assessment by the Administrator of whether both the budget for such fiscal year and the future-years nuclear security program submitted to Congress in relation to such budget under section 3253 of the NNSA Act provide for funding of the nuclear security complex at a level that is sufficient to begin the modernization and refurbishment of the nuclear security complex.

The Administrator of the NNSA assesses that the budget submitted to the Congress for fiscal year 2011 will provide funding of the nuclear weapons complex at a level that initiates the modernization and refurbishment of the complex as called for in the Nuclear Posture Review (NPR). Although not without risk, the President's budget is the best approach to modernize the physical infrastructure, mature the technology for Life Extension Programs (LEPs), and revitalize and sustain the federal and contractor workforce at a manageable pace.

1.B. Measures to Support the Nuclear Posture Review

This section is in response to:

> 50 USC Sec. 2455. A description of the modernization and refurbishment measures the Administrator determines necessary to meet the requirements of the National Security Strategy of the United States or the most recent Quadrennial Defense Review, whichever is applicable under paragraph (1)(A), and the Nuclear Posture Review.

On April 6, 2010, the 2010 NPR was submitted to Congress. To support the President's vision, the NNSA has identified a path for evolving and sustaining the nuclear deterrent. This vision encompasses all major aspects of the deterrent: the stockpile; the Science, Technology and Engineering (ST&E) base; production and laboratory infrastructure; and the federal and contractor workforce. The nuclear weapons complex proposed by the NPR will be more readily sustainable with an agile federal and contractor workforce and a modern infrastructure that is less costly to secure and operate. The NNSA ST&E capabilities will be strengthened to underwrite the deterrent. As the stockpile decreases in size, the role of ST&E within the future deterrent will increase in importance.

To achieve this vision, NNSA proposes to recapitalize its aging production infrastructure that was built to support capacities needed for the Cold War. This "capability-based" approach would provide an inherent capacity sufficient to meet future needs merely by the existence of a modernized capability. Even smaller future stockpiles or replacement component demands would not lead to a significantly smaller infrastructure.

In supporting the NPR, the path forward achieves balance between the stockpile, the underpinning ST&E base, the supporting physical infrastructure, and the skilled federal and contractor workforce. This path sustains capabilities that contribute to additional nuclear security and broader energy and security concerns. NNSA will invest in the ST&E base, extend and sustain the life of today's warheads to achieve a smaller and more agile deterrent, and recapitalize the physical infrastructure of the nuclear weapons complex. The highest physical infrastructure priorities identified in the NPR are major new nuclear facilities for plutonium and uranium. Existing Los Alamos plutonium facilities are aging and require replacement and/or upgrades for the range of acceptable future stockpile scenarios. Construction of the Chemistry Metallurgy Research Replacement-Nuclear Facility (CMRR-NF) and improvements to Plutonium Facility-4 and associated waste processing capabilities are necessary to have a sustainable infrastructure. As with plutonium, immediate investment is being made in the uranium capabilities with the operations conducted at the Y-12 Plant in Oak Ridge. Given the age and high risks of shutdown of existing facilities, a sustainable future will only be possible with a new Uranium Processing Facility (UPF).

The multi-year and steady investment in the modernization of the complex is an essential element of the NPR, allowing the United States to safely reduce the role of nuclear weapons.

1.C. Relationship of Stockpile Size and Composition to NNSA Infrastructure

NNSA's "capability-based" plan for modernization provides sustainment of essential capabilities by retaining in a state of readiness the minimum facilities, equipment and critically skilled individuals needed to design, develop, manufacture, maintain, surveil and assess the nuclear weapons stockpile. This sustainment of a "ready to use" capability requires a sufficient annual throughput to exercise the people, facilities, and processes.

Stockpile Size

With good planning, the future NNSA infrastructure will support total stockpiles up to a range of approximately 3,000 to 3,500 active, logistic spare, and reserve warheads. However, the anticipated future NNSA infrastructure is not designed to have the capacity to support a return to historical Cold War stockpiles, or rapidly respond to large production spikes.

After achieving a capability-based infrastructure, smaller total stockpiles than prescribed by post-NPR implementation strategies would not lead to a smaller, less costly infrastructure. Figure D–1 is a notional chart representing the reality that the costs to maintain capabilities necessary to support the stockpile are essentially independent of the size of the stockpile. Once the number of warheads falls below a specific level, the costs just to maintain the required capabilities dominate. This is because most facilities, operations, and critical skills must exist, be maintained, and be exercised to remain viable.

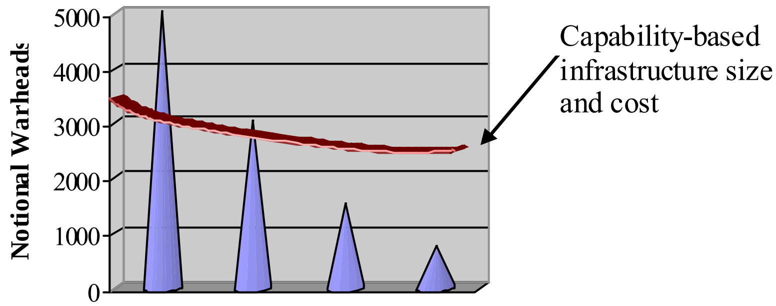

Figure D–1. Notional Warheads and NNSA Infrastructure Size and Cost

Stockpile Composition

Along with stockpile size, stockpile composition has a potential to influence the size and cost of the NNSA infrastructure. However, all weapons require that a certain set of common capabilities be retained in order to complete the functions needed to sustain the stockpile. They all have primaries, secondaries, arming, fuzing and firing, neutron generators, gas transfer systems and thousands of other essential components that require a common suite of capabilities to design, manufacture, surveil, assess and dismantle. There are differences in existing nuclear weapon components owing to the Cold War strategy of maintaining redundancy in design and manufacturing. However even if there were a reduction to only one weapon type, there still is the requirement for nuclear design, weapon engineering, plutonium operations, uranium operations, high-explosive (HE) operations, tritium operations, trusted manufacturing of non-nuclear components, dismantlement, and many other activities supported by the NNSA infrastructure. Additionally, the NPR implementation requires maintenance and surveillance of the active stockpile, and these activities drive the need for retaining a range of capabilities at NNSA laboratories and plants.

Nuclear Explosive Package Reuse

There are a number of reuse approaches under consideration for the future stockpile. Component reuse reduces the number of pits and secondary components that must be manufactured to support stockpile modernization LEPs. Reuse also enables a faster start on stockpile modernization, relieves some manufacturing stresses, and accomplishes stockpile modernization earlier than would a program requiring manufacturing of pits and secondary components. The merits of each reuse option must be considered in their ability to meet stockpile needs, provide and optimize the NNSA infrastructure capability, and assure the needed flexibility for addressing stockpile issues.

Non-nuclear Components

A full warhead system analysis that considers the tightly coupled requirements and performance of the nuclear explosive package and non-nuclear components is required to determine the appropriate scope and schedule of an LEP. It is important to recognize that issues with non-nuclear components often drive LEP requirements and schedules. However, replacement of non-nuclear components cannot be accomplished in isolation because they can impact the requirements and performance of other components in the warhead system, including the nuclear explosive package.

1.D. Capability and Capacity Objectives

Capacities by Function

Today's nuclear weapons complex already has a significantly reduced capacity from historical levels, but is still inaccurately referred to as "a Cold War Complex" in some venues. While a number of individual buildings from the Cold War era remain at the eight nuclear weapons complex sites, their inefficiency is more of an impediment than help to NNSA capacity. Some of these legacy buildings, most of which are beyond their useful life, represent a risk to weapon activity capacities. Requirements for safety, security, and administrative oversight have greatly increased over the past two decades leading to a further decrease in capacities for the remaining physical and intellectual infrastructure. Table D–1 summarizes the current and future capacities for each major NNSA function directly supporting weapons production and delivery.

The color-coding 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.

Existing capacity is not sufficient for 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 subjective and may or may not be sufficient today for future post-NPR stockpiles.

Capacity is sufficient, but existing infrastructure is economically inefficient.

Table D–1.Limiting Capacities for Weapons Activities

Function	Rate-Limiting Capability	Capacity Today	Baseline Capacity Provided by a Capability-based Infrastructure	Risk Mitigation Needed to Ensure Future Capability
Design, Certification, Testing, Surveillance and ST&E Base	Number of simultaneous LEP's supportable	1 LEP	2-3 LEPs	Support for lab ST&E capabilities and phasing of LEP activities
	Warhead certifications and assessments	Up to 8 warhead types	Up to 8 warhead types	Stable support for Nevada Test Site (NTS) and lab ST&E capabilities, and surveillance
Plutonium	Pits requiring most manufacturing process steps	10-20 pits per year	Up to 80 pits per year	Complete Plutonium Facility-4 (PF-4) upgrades, waste capability investment and CMRR-NF construction
Uranium	Canned Subassembly (CSAs) requiring reuse/inspection	40 CSA per year	Up to 80 CSAs per year	Construct UPF
	Refurbished or new CSAs.	160 CSA per year		
Tritium	Tritium quantity generated in TVA reactors	Sufficient for all scenarios	Sufficient for all scenarios	Sustain existing capabilities
	Reservoir loading/ unloading operations	Sufficient for all scenarios	Sufficient for all scenarios	Sustain existing capabilities
High Explosives (HE)	Specialty explosive manufacturing.	1000 pounds per year	Up to 2500 pounds per year	Construct HE Formulation facility
	HE component fabrication.	300 hemispheres per year	Up to 500 hemispheres per year	Construct HE Pressing and Component Fab./ Qual. facilities
Non-nuclear Components Production	Non-nuclear component production	Sufficient for Limited Life Components (LLCs) and 2 phased LEPs	Sufficient for LLCs and 2-3 phased LEPs	Implement Kansas City Responsive Infrastructure Manufacturing and Sourcing (KCRIMS) and recapitalize Microsystems and Engineering Science Applications (MESA) Complex. Stable Campaign profile to maintain capabilities
Assembly/ Disassembly	Dismantlement, disassembly and inspection, and LEP operations	350 equivalent units	Up to 600 equivalent units	Sustain existing facilities and pre-plan workforce needs.
Transportation	110 convoys	Sufficient for all scenarios	Sufficient for all scenarios	Sustain existing capabilities
Storage	Warhead and special nuclear material quantities	Not sufficient for all scenarios	Sufficient for all scenarios	Must address on enterprise level, construct CMRR, and ship surplus pits to Savannah River Site (SRS). Maintain NTS/Device Assembly Facility (DAF) for future reserve capacity

Limiting Capacities

Plutonium pit manufacturing capacity provides the most direct rate-limiting constraint on stockpile modernization scenarios in the near term. The design, certification, and test readiness capacity could be limiting without stability and adequacy of funding for the ST&E base, including experimental facilities support. Uranium and high explosive production capacities are sufficient today but in some cases are at risk because of the age and potential unreliability of existing facilities. Highly-enriched uranium (HEU) manufacturing capacity, in particular, has no backup and could go to zero if existing 60 year old facilities are shut down for any reason. Non-nuclear production capacities are estimated to be sufficient but the age and surplus square footage of existing facilities makes retention of the existing Kansas City Plant economically inefficient. Micro-electronic development and "trusted foundry" radiation-hardened fabrication capabilities require regular recapitalization to incorporate industry supported technology.

Future uranium storage capacity has been addressed through the recently completed Highly-Enriched Uranium Materials Facility (HEUMF). Plutonium storage capacities indicate a potential issue in the FY 2014 time frame. Plutonium storage capacities and options are being analyzed to develop a more holistic approach to resolving issues for the foreseeable future and provide better support for continued directed stockpile work activities.

There is also a need to clearly delineate between a baseline, or "potential" capacity and the actual number of units made. For example, Y-12 may have future baseline capacity of 80 canned subassemblies per year but the number actually produced in a given year could be far less depending on stockpile requirements. Thus, the capacities should be clearly understood as different from the number actually made in a given year. Historically, the number of actual units made is a fraction of the infrastructure capacity.

Capacities During NNSA Transitions

For most capabilities, transition from the infrastructure of today to a modernized infrastructure of tomorrow does not introduce rate-limiting concerns, because efficiencies are improving during the transition. Plutonium pit work is a concern because it is today's main rate-limiting capacity. The upgrades to PF-4 will address this capability and provide the required capability-based capacity. The new UPF is planned to be capability-based and the resulting capacity is expected to be lower than Y-12's existing old uranium production facilities. The existing Y-12 infrastructure was designed to support Cold-War stockpiles and thus it has a greater capacity than needed long-term, unless one of the existing facilities is unexpectedly shut down, resulting in a capacity of zero. Tables D–2 and D–3 show the transition of estimated plutonium and HEU capacities from today to 2024.

Table D–2.Transition Annual Plutonium Pit Capacities at Los Alamos National Laboratory (Bounding Estimates)

	Today	2016	2017	2018	2019	2020	2021	2022	2023	2024
Pits requiring most manufacturing process steps	10	10	15	20	20	40	60	80	80	80

Table D–3.Transition Annual HEU Canned Subassembly Capacities at Y-12

	Today	2016	2017	2018	2019	2020	2021	2022	2023	2024
CSAs requiring only reuse/ re-inspection (a) (b)	40	40	40	40	40	0-40	0-40	80	80	80
Refurbished or new CSAs	160	160	160	160	60-120	20-60	0-40	40-80	80	80

(a) Capacity over and above that assumed for refurbished or new CSAs; assumes UPF Program Requirements Document, Rev 4.

(b) A transition from existing facilities to UPF will occur in 2019 through 2021; the transition approach will be closely coupled to stockpile needs during that period.

1.E. Description of the Plan to Modernize the Nuclear Weapons Complex

The plan to modernize and refurbish the complex is fundamentally about maintaining a strong deterrent without relying on underground testing. While the focus of modernization and refurbishment may be on the physical infrastructure, the facilities and equipment cannot be separated from the ST&E base or the contractor workforce that make it function. To that end any plan to modernize and refurbish the physical infrastructure must be built around the ST&E base and the contractor workforce.

The Plan for the Physical Infrastructure

Over the past two decades, the nuclear weapons complex has been consolidated from 15 to 8 sites comprised of three laboratories, four production plants, and a test site. This transition has been guided by a change in philosophy from a *capacity-based* complex capable of designing and manufacturing thousands of nuclear warheads to a *capability-based* complex with a necessary set of critical skills and facilities. This smaller, safer, more secure, and more effective physical infrastructure will, when complete, ensure all essential capabilities for the ST&E and production facilities provide sufficient capacity for future needs. While the transition has successfully begun, we need to continue to recapitalize major facilities and reduce unnecessary facility square footage. NNSA recognizes that this capability based approach is not without risks – it is more vulnerable to single-point failures and less capable of responding to production spikes resulting from technical or geopolitical surprises. Managing these risks is dependent on an integrated approach to managing the stockpile, ST&E development, and implementation of a modern physical infrastructure.

The President's budget request and the NNSA's approved FY 2011 – FY 2015 Future Year Nuclear Security Program Plan (FYNSP) budget defines the projects that are approved, consistent with the 2010 NPR recommendations. Other future projects (post-FYNSP) identified are under consideration as they fall outside the NNSA's approved budget request. These post-FYNSP projects will be considered in the NNSA future budget requests.

Science, Technology, and Engineering: The nuclear security laboratories (Los Alamos, Livermore, and Sandia), test site and nuclear weapons production plants work in partnership to sustain the nuclear deterrent. Their ST&E experimental, computational, technology development, and production facilities support the nuclear stockpile lifecycle from design, development, production, certification, testing, assessment, surveillance, and maintenance through dismantlement. While much of the ST&E infrastructure was built more recently than the production complex, a number of elements still require revitalization. An immediate need is the completion of Test Capabilities Revitalization Phase 2 to support B61 LEP development and qualification against stockpile-to-target sequence requirements. In addition, a major new computer acquisition will be required to support the complex 3D analyses and Uncertainty Quantification studies essential to assuring stockpile safety, security, and reliability.

Plutonium: The ability to replace plutonium parts is impeded by the recapitalization backlog in plutonium facilities at Los Alamos; key equipment is becoming obsolete. A key near-term priority is to replace the 50-year old Chemistry and Metallurgy Research Facility, which has well-documented safety issues and supports an essential capability base, with the CMRR-NF.

Refurbishment of the PF-4 plutonium facility and associated waste processing capabilities are also required.

Uranium: While the existing uranium facilities at Y-12 have more than the needed capacity, they are 40 to 60 years old, being run to replacement, and are overly expensive to operate. A comparable key near-term priority is replacing Buildings 9212, 9204-2E, and 9215 with the UPF. The uranium operating footprint will shrink by half, and the high security zone will be reduced by 90 percent. Modern safeguards and security approaches in these new facilities will significantly reduce costs.

Tritium: NNSA works with the Tennessee Valley Authority to irradiate tritium production targets. At the SRS, NNSA manages the tritium inventory, loads gas transfer system reservoirs, and conducts related ST&E and surveillance activities. The NNSA-owned tritium infrastructure is relatively new and can support current and future mission requirements.

High Explosives and Assembly/Disassembly of Nuclear Weapons: The production of energetic components is required and the ability to assemble, disassemble, inspect, and dismantle nuclear weapons is accomplished at Pantex. The largest risks are the susceptibility to equipment failures, which represent single point failures for the entire complex. The primary, near-term need is to recapitalize High Explosive (HE) pressing capabilities.

Non-Nuclear Components: There is an enduring need for non-nuclear components (e.g., neutron generators, weapon electrical systems, radiation hardened electronics, gas transfer systems, and detonators). These are either produced within the complex or procured from commercial sources and qualified by the NNSA. Technology obsolescence is most prevalent in this arena, requiring ongoing recapitalization to keep pace with commercial industry. An immediate necessary action is the acquisition of a new Kansas City Plant to halve the operating foot print and to enable improved operational efficiencies. The recapitalization of MESA is required to support design and delivery of trusted rad-hard microelectronics for future reentry LEPs, and also reduces risk associated with B61 LEP production.

Transportation: The Secure Transportation Asset program interconnects the nuclear weapons complex with military installations and ensures that all shipments are completed safely and securely. This capability requires renewal with specific safety and security modernization.

Storage: Nuclear criticality and safety regulations limit the storage proximity of special nuclear materials (SNM). However, security costs for these materials are large, arguing for consolidation wherever possible. Uranium and tritium storage is not at present an issue, but plutonium storage at several sites has reached upper capacity limits resulting in operational constraints. Some distant sites have unused capacity, but modifications and special approvals may be necessary and the transportation logistics become complex. The Office for Nuclear Safety and Operations is studying risks and alternatives, in cooperation with other Department of Energy (DOE) offices, to provide a holistic approach for special nuclear material storage.

Test Readiness: Through preservation of the Nevada Test Site, NNSA will sustain a capability to conduct an underground nuclear test if ever directed by the President. NNSA believes that the best strategy is to invest in the elements of our intellectual and physical infrastructure expected to be exercised in dynamic plutonium experiments, and minimize traditional outdated test readiness investments. Any future test requirements can then be met with modern capabilities.

The Future of the Physical Infrastructure and Key Milestones

Key milestones on the path to the future include:

- Complete Test Capabilities Revitalization in FY 2013 to support B61 LEP design and development.
- Occupy a modern, leased non-nuclear production facility in FY 2014 as part of the Kansas City Responsive Infrastructure Manufacturing and Sourcing (KCRIMS) initiative.
- Complete recapitalization of tooling and critical process systems for MESA by FY 2016, which is necessary to support all future LEPs.
- Complete the Los Alamos Radioactive Waste projects in FY 2015.
- Complete the Pantex High-Explosives Pressing Facility project in FY 2017.
- Complete construction of the Los Alamos CMRR-NF in FY 2020 with full operations in 2022.
- Complete construction of the Y-12 UPF in FY 2020 and full operations in 2022.

The Plan for the Workforce

NNSA future plans rely upon the strength of the federal and contractor workforce. The nuclear weapons that constitute the U.S. nuclear arsenal are highly specialized devices, and the suite of skills necessary to design, produce, assess, and dismantle these weapons is specialized, diverse, and highly demanding. It will not be possible for the NNSA plan to succeed without explicit focus on recruiting, training, retaining, and motivating the federal and contractor workforce that spans the nuclear security laboratories, test site, the production plants, and the NNSA.

Since the end of the Cold War, NNSA federal and contractor workforce issues have been dynamic, with positive and negative trends. The stewardship program drove staff strength in computer science, nuclear physics, computational engineering, numerous engineering disciplines, experimental sciences, laser physics, and similar high tech fields. This expanded talent pool developed the stewardship tools used to improve stockpile knowledge and to support life extensions.

However, personnel reductions totaling 20 percent have occurred over the past five years in other key areas, including stockpile stewardship, surveillance, and life extensions. As a result, we have lost both new employees and the experienced staff needed for mentoring and guidance. Success in sustaining the deterrent requires that we stabilize and, in selected areas, reverse this downward trend.

While stockpile stewardship was preserving some scientific talent, the experienced scientists and engineers responsible for the deployed stockpile design and certification were advancing in their careers, and today many have retired or are soon retiring. For example, very few experienced nuclear weapon designers remain from the underground nuclear testing era. Design competencies are fundamentally different from the skills that support stockpile assessment and analysis, and they can only be developed through programs that fully exercise each design step from conceptual design through product realization.

In recent years, opportunities to exercise the full suite of design competencies through life extensions and modernizations have been canceled or delayed. Without stability and commitment to LEPs that utilize and thereby sharpen necessary design skills, we will continue to confront difficulties in retaining and training high quality staff. The path forward recognizes the importance of strengthening our intellectual infrastructure, leading to a program that balances sustaining needed scientific expertise while developing the next generation of design talent necessary to execute life extension programs.

Contractor workforce considerations are not limited to the laboratories. There are equally important skill transformation and sustainment considerations at the production plants. We have achieved impressive improvements in neutron generator production yields and in weapon system dismantlement rates. The consolidated enterprise envisioned for Y-12, and the productivity gains that will come from Kansas City Responsive Infrastructure Manufacturing and Sourcing, will continue our progress. While productivity improvements are in part facility related, they also rely strongly on a talented and dedicated staff, and our proposed plan provides for the meaningful, challenging work that will advance the skills of our production plant workforce and continue the associated productivity gains.

From the advent of the SSP, partnerships between the science and engineering workforce and the technical personnel in academia and private industry have been key to applying cutting edge scientific research and the very latest technologies for deepening our understanding of the stockpile. Work for Others (WFO) programs, and other forms of cooperative agreements are essential to sustain our science-based approach to nuclear weapons stewardship and life extensions. These programs also provide unique NNSA capabilities to the benefit of national security challenges beyond the nuclear weapons mission.

The technically challenging work associated with a broad spectrum of national security programs helps the labs and plants attract and retain top technical talent. However, work in these other mission areas does not exercise the full suite of unique experiential competencies of the nuclear weapons mission. In terms of maintaining a competent SSP contractor workforce, WFO work is not a substitute for active nuclear weapons design and development programs.

ST&E competencies are essential not only for confident stewardship and sustainment of our stockpile, but also for closely related activities such as foreign assessments, monitoring and interpretation for nuclear testing and nuclear proliferation risks, intelligence analysis and determination of adversary countermeasures in order to ensure our stockpile supports military requirements. Certain NNSA competencies and capabilities are beneficially applied to other national and international challenges such as global climate change modeling and energy research.

The following key elements are necessary to ensure that we have the contractor workforce needed to realize the President's vision for the nuclear deterrent:

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, non-proliferation, nuclear counterterrorism, etc.;
3. Program providing the opportunity to fully exercise design and production skills; and
4. Progress against barriers that create a difficult, inefficient work environment.

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2. Physical Infrastructure – Modernizing and Improving Safety of Facilities

Functions and Infrastructure Overview

In this section, the current state of SSP functions is summarized, key facilities are identified, the future state that needs to be achieved is outlined, and plans for achieving the future state are provided.

> ***A closer look …………………………………….***
>
> The Strategic Posture Commission Report, dated May 2009, stated it best, "Physical infrastructure is unique in the long time scale involved in making changes to it. Although nuclear policy can be altered overnight and force levels can be decreased or increased (to a limited extent) in months or a few years, decisions on infrastructure can take years if not a decade or more to reach fruition."

The future complex will contain the necessary and critical knowledge base that resides in people, tools, and facilities that allow us to continue to certify or extend the life of weapons in the field, or modernize to meet the stockpile of the future. Design approaches will be used that trade commonality with design flexibility, preferred parts lists, modular architecture, and scalability. Product yields will increase, with reduced manufacturing costs, by integrating design and manufacturing, and using commercial lean manufacturing practices. Where appropriate, use of industry standards for business processes and oversight models will reduce the need to coordinate multi-site processes and tools. Transforming how we do work in the future to be more responsive must be aligned and supported with a smaller, more agile infrastructure.

The functions, capabilities, and infrastructure needed to support near through long-term execution of the program are discussed in the following functional areas. Infrastructure vulnerabilities are prominent in plutonium and uranium. Vulnerabilities also exist in sustaining the necessary ST&E competency base and high-explosives production. NNSA infrastructure modernization is required under all future stockpile scenarios and will take over a decade to be fully operational.

To obtain the resources for modernizing, the horizon for sustaining NNSA's infrastructure must be at least 30 years from today, consistent with the design, construction, and operational lifecycle of major facilities. The size and composition (e.g., number of warhead types) of the total stockpile, including hedge, have a greater impact on the NNSA infrastructure than the number of operationally deployed strategic nuclear warheads. A "capability-based" infrastructure approach is judged to provide sufficient capacity to meet the stockpile strategies of the NPR.

2.A. Science Technology and Engineering Facilities

Design, Certification, Testing, Surveillance, and Supporting ST&E

Since 1992, strong ST&E capabilities have enabled NNSA to meet the challenges of stockpile stewardship in the absence of Underground Testing (UGT). The three nuclear weapons laboratories, Nevada Test Site and nuclear weapons production sites work in partnership to design, certify, test, and assess the Nation's nuclear deterrent. Los Alamos National Laboratory (LANL) and Lawrence Livermore National Laboratory (LLNL) have primary responsibility for the nuclear design, engineering, production oversight, safety, reliability, and assessment of the nuclear explosives package in nuclear weapons. Sandia National Laboratories (SNL) has primary responsibility for: (1) design, engineering, certification of the design and production through qualification engineering releases, and assessment of non-nuclear components; (2) weapons surety (safety, security, use-control); and (3) overall weapons system engineering and integration. In performing the design agency mission, large and small scale experiments with special nuclear material have been required. The Nevada Test Site is the primary facility authorized to conduct high-hazard experiments, including expending quantities of SNM in a controlled environment.

Current State

The scientists, engineers, and capabilities needed to fulfill the Design Agency mission reside in sites across the nuclear weapons complex. The Design Agency weapon assessment and certification process gathers needed information from three resources:

- Experimental tools are key to developing validated physics-based models which are the core of our modern simulation capability. Experimental data is also key to assess anomalous conditions identified during stockpile surveillance or new manufacturing process differences encountered in the course of life extensions.
- Stockpile surveillance tools assess the current state of the aging stockpile.
- Computational tools that enable the ability to simulate weapons performance and extrapolate non-nuclear experimental data to the extremes encountered during nuclear function.

Progress in the modernization of each of these areas has enabled the complex to perform an annual assessment of the stockpile and attest to its operational effectiveness without the need to resume underground nuclear testing.

Key Facilities

Experimental Capabilities

Experimental capabilities can be categorized in two broad areas:

- Fundamental science, component, or system scale experimental capabilities needed to develop physics models and validate the predictive computational base; and
- Capabilities needed to assess weapon response to the condition of the stockpile-to-target sequence (STS) and certify the systems safety, security, and effectiveness.

Capabilities to develop and validate the predictive computational capability rely upon small-scale experiments through hydrodynamic testing. These are more fully examined in the Annex C discussion of the Science, Technology and Engineering base. Small-scale experiments lead to acquiring fundamental material properties and chemistry. Some of these tools include gas guns and pulsed power for shock impulse, and high energy density conditions using lasers or pulsed power. Intermediate-scale experimental capabilities employ coupled subsystems like high explosively driven assemblies with very complex loading conditions. Large-scale integrated performance experiments such as hydrodynamic tests use large flash radiographic capabilities. The warhead system-engineering mission is to design and deliver a certified nuclear weapon that meets requirements. These complex systems, which must be compatible with the DoD delivery platforms, require a broad set of design, analysis, fabrication, and experimental facilities. This requires an ST&E base to address a broad range of unusual materials, circuits, and mechanical systems, and to understand their compatibility and performance in extreme environments.

Capabilities for the STS assessment include environmental testing to examine delivery loading and environmental conditions, radiation effects, and system functionality. Testing is conducted in a phased manner starting with heavily instrumented smaller components and subsystems, and progressing to larger integral tests. In each instance a significant reliance on simulation is required to fully assess system response to the imposed environmental conditions. Examples of these facilities are provided below in Tables D-4 and D-5.

Table D–4.Key Facilities For Nuclear Explosive Package (NEP) Activities

Key Facilities for NEP Design Agency Design, Certification Testing, Surveillance and Supporting ST&E	
Facility Name	Facility Function
High Explosive Facilities and Firing sites: (LLNL/NTS), High Explosive Applications Facility (HEAF) and Big Explosives Experimental Facility(BEEF)	Explosive safety and detonation characterization and science.
Detonator Fabrication Facility (DFF- LANL)	Sole capability for production of detonators for the stockpile.
PF-4, CMR and Superblock	Plutonium material studies, characterization, and component fabrication.
Materials Science Laboratory and Sigma Complex (LANL)	Uranium material studies, characterization, and component fabrication.
Beryllium technology facility (BTF) (LANL)	Beryllium characterization and component fabrication.
DARHT (LANL)	Integrated hydrodynamic tests using large flash radiographic diagnostics.
Confined Firing Facility (CFF)	Integrated hydrodynamic tests using large flash radiographic diagnostics.
LANSCE (LANL)	Nuclear cross section measurements, materials characterization, and Proton Radiography—hydrodynamics data.
Omega (University of Rochester)	High Energy Density Science.
NIF (LLNL)	High Energy Density Science and fusion burn experiments – the only facility that addresses the weapon's nuclear phase.
JASPER (NTS)	Joint Actinide Shock Physics Experimental Research—Medium velocity shock impulse actinide measurements.
Large Bore Powder Gun (NTS)	Velocity and high mass impact sources that enable complex loading approaches in shock impulse material measurements.
Z Machine (SNL)	Highest level flier plate (shock) and isentropic compression (shockless) impulse material measurements (including actinides); High Energy Density Science; fusion burn experiments.
U1A (NTS)	Integrated dynamic plutonium experiments using flash radiographic, optical and interferometric diagnostics.
DAF (NTS)	Device Assembly Facility- experimental assemblies for NTS and home of criticality facilities. Also provides Broken Arrow/IND disposition and limited NEO's.
Hermes, Saturn, ACRR, IBL (SNL)	STS hostile radiation physical simulation.

Table D–5.Key Facilities For Non-Nuclear and Systems Engineering

Key Facilities for Non-Nuclear and Systems Engineering Design, Certification Testing, Surveillance and Supporting ST&E	
Facility Name	Facility Function
Thermal Test Facility (SNL)	Abnormal thermal environment response testing.
Cross-wind Test Facility (SNL)	Fire environment response testing.
Burn Site (SNL)	Propellant fire definition.
Sled tracks (SNL)	Sled tracks including diagnostics and data acquisition to examine weapon response to accident scenarios.
Aerial Cable Control Building (SNL)	Drop and pulldown tests, abnormal mechanical environments.
29-Foot Underground Centrifuge Facility (SNL)	Flight environment testing (acceleration and vibration).
Vibro-Acoustic and Mass Properties Test Facility (SNL)	Large scale vibration, acoustic and mass properties testing.
Dynamic Shock Test Facility (SNL)	Large scale mechanical shock tests.
Complex Wave Test Facility (SNL)	Large scale vibration testing.
Environmental Testing Laboratory-NM (SNL)	Component environmental testing and diagnostics: vibration, shock, temperature, humidity, load deflection, stress-strain, NDT, radiography.
Environmental Testing Laboratory-(SNL-CA)	Environmental testing: vibration, shock, temperature and humidity.
Explosive Test Facility and Mass Properties-(SNL-CA)	Mass property adjustments.
Aerothermodynamics Laboratory (SNL)	Wind tunnel testing.
Weapons Evaluation Test Lab (WETL) (Pantex)	Stockpile lab surveillance testing.
Tonopah Test Range	Flight development and surveillance testing.
Lightning Experiment (SNL)	Direct strike lightning simulator.
Strategic Defenses Facility (SNL)	RF test, electrostatic discharge, EMP.
Electro-Magnetic Environmental Simulation (SNL)	EMP and low frequency RF testing.
Radar Cross Section (RCS) Facility (SNL)	Radar Technology R&D and testing.
Gamma Irradiation Facility (GIF) (SNL)	Radiation effects sciences; certification/validation for gamma radiation.
Ion Physics Lab (SNL)	Ion irradiation to support model validation.
Simulation Technology Lab (STL) / HERMES (SNL)	Radiation effects sciences (gamma), pulsed power.
Saturn / SPHINX Facility / Labs (SNL)	Radiation effects sciences (X-Ray), pulsed power.
MESA Micro FAB (SNL)	Compound semiconductor material processing (HBT's/Optoelectronics) and advanced silicon wafer post-processing for Microsystems.
Weapons Production Primary Standards Lab (SNL)	Metrology support for nuclear weapons complex.
Explosive Components Facility (ECF) (SNL)	Energetic materials S&T; design, development, test and production.
Impact Test facility (SNL)	Ballistics, impact and explosives testing.

Future State

In the future, all essential nuclear weapons design, certification, testing, surveillance and supporting ST&E are sustained and continuously challenged with mission-related work important to U.S. national nuclear security. The national laboratories continue to be the backbone for the enduring SSP. The complex successfully engages its unique ST&E capabilities to address national challenges in a multitude of areas found beyond the immediate confines of the nuclear weapons stockpile.

We will develop the next generation of designers, engineers, and scientists trained in the ST&E skills required to steward the future nuclear weapons stockpile. These skills are critical to sustain the stockpile and underpin other non-stockpile nuclear security issues such as threat assessment, intelligence analysis and nuclear forensics. The ability and judgment to provide responsible stewardship and support such non-stockpile work is achieved only after those skills are applied to meaningful work.

> ***A closer look ………………………………….***
> The ST&E skills required to steward the nuclear weapons stockpile are critical to the nation. They also underpin non-stockpile nuclear security issues such as threat assessment, intelligence analysis and nuclear forensics. To develop the ability and judgment needed both to provide responsible stewardship and to support such non-stockpile work, designers, engineers, and scientists must be provided opportunities to apply their unique ST&E skills. A sustainable, capability-based ST&E program can provide relevant work to develop that cadre.

Modernization of the stockpile will be accomplished through life extension programs, which will include improved safety and security for all systems. LEPs require extensive design rigor relying on a solid ST&E foundation to assure that warheads meet all requirements. This process uses extensive 3-D simulation benchmarked by environmental testing, experiments, and legacy nuclear test data, exercising the suite of ST&E skill sets discussed above to assure the efficacy of improved safety and security systems and acceptable margins and uncertainties. New materials and processes will likely be needed, and a new approach to surveillance, appropriate to the future size and diversity of the stockpile will be devised and implemented.

Planned Actions

The majority of the facilities and infrastructure that are essential for design, certification, testing, surveillance and supporting ST&E are newer than the NNSA production facilities. However, the ST&E facilities will require timely corrective maintenance in order to maximize their full design life. Major actions to modernize and sustain a capability-based infrastructure for key facilities and infrastructure projects for both the nuclear explosives package and non-nuclear and systems engineering are provided below. Key ST&E facilities and infrastructure projects include the following:

The Test Capabilities Revitalization Phase 2 (TCR II) construction effort is consistent with the NNSA Record of Decision that major environmental test facility work should be consolidated at the Sandia, New Mexico site. As the Center of Excellence for Weapon Engineering and Environmental Testing, Sandia must revitalize its environmental test capabilities to meet the full spectrum of Directed Stockpile Work needs, including maintaining the enduring stockpile through LEPs and integrated stockpile evaluation program. The TCR II line item project will bring large-scale environmental test facilities to an operational capability sustainable for the foreseeable future. Facilities proposed for refurbishment under TCR II – the sled track complex, the mechanical shock and vibration facilities, the large-scale centrifuge and the Area I aero-sciences wind tunnel facility – have been "workhorse" facilities for qualification, stockpile surveillance, code validation and significant finding investigation (SFI) resolution over the past four decades. B61 LEP planning predicts heavy use of these facilities. These test facilities are also critical to experimental validation efforts supporting the Advanced Simulation and Computing and Engineering Campaigns.

Test Capabilities Revitalization (TCR) II

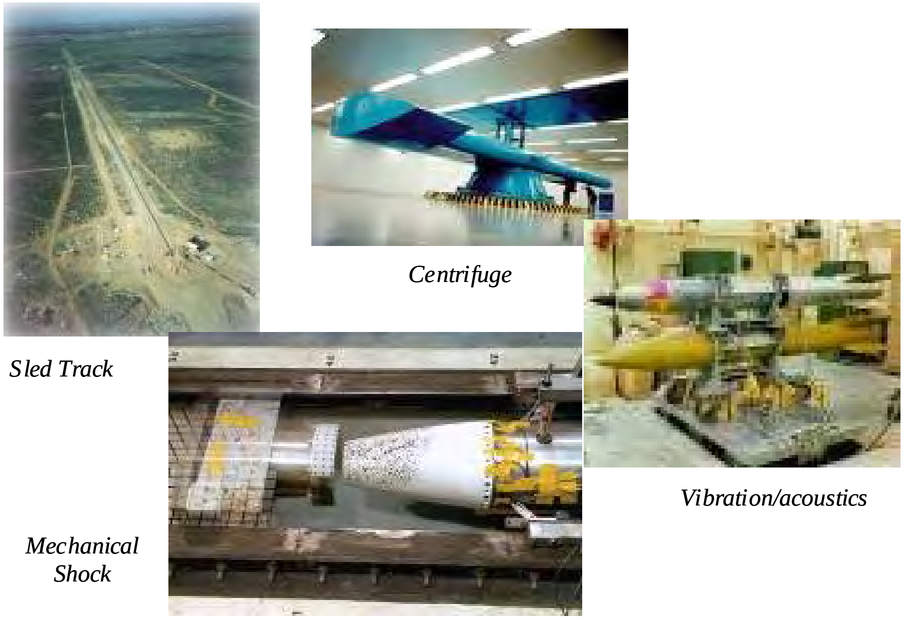


Figure D–2. Test Capabilities Revitalization II.

TCR II is critical to refurbishing large-scale test facilities in dire need of modernization and upgrade. These facilities have been in operation more than 50 years; replacement of utilities and changes to the physical structures to meet current code and Environment, Safety and Health requirements are critical to sustaining their use in support of future Directed Stockpile Work development, surveillance, and test requirements. There is only minimal capability enhancement included in TCR II, since the intent is revitalization. Without refurbishment there are continued risks of test capability failures, such as the 2006 hypersonic wind tunnel flow conditioning heater failure, the 2009 mechanical failure of a large vibration/shaker system, and some test capabilities may be at risk (or lost) during the next five years as Sandia supports the B61 LEP and ongoing stockpile surveillance. Finally, analysis of the 2009 Rocket Sled Track accident confirmed trackside instrumentation issues which were not mitigated appropriately during test set-up and resulted in sufficient energy being delivered to the rocket motor initiator to fire the motor prematurely.

The B61 is currently in the Phase 6.2/2A study, so design details on major components are not finalized. However, component organizations have already identified a need for MESA-fabricated custom Application Specific Integrated Circuits (ASICs) in the radar, interface control unit (ICU)/arming control unit (ACU) controllers, trajectory sensing signal generator (TSSG) system, firing set, and coded switch components (a minimum of 7 or 8 different custom ASICs are required). In addition, the estimate is for some 25,000 heterodyne bipolar transistor (HBT) devices including discrete transistors and small scale integrated circuits, as well as up to 3,000 micro-electrical-mechanical (MEMS) devices. Prototypes of these devices are needed and will be considered in post FYNSP requests.

MESA Refurbishment – Two Phases

Figure D–3.
Target Fabrication Consolidation.

Recapitalization of MESA is also anticipated to be required to assure radiation hardened devices for the next reentry system (W78 LEP), in addition to reducing risk to B61 LEP production.

High risk production tools have been identified using an equipment risk scorecard which assigns risk of each tool based on equipment age, availability of a backup tool, measured equipment downtime, use in baseline technologies, availability of Original Equipment Manufacture (OEM) or third party support, and availability of a qualified consumable vendor. As an example of risk, today, 31 silicon (Si) Fab tools have no OEM or third party support available, and must be fully maintained using Sandia personnel only.

Phase 1: (12 tools in this phase)

A. Facilities updates to keep 24 year old Si Fab systems operational, including:

    a. Replace acid exhaust system, make-up air handling, and process exhaust

    b. Replace HEPA filters (14 years past their 10-year lifetime) and chase ceilings.

B. High Risk Tool Replacements

    a. Reactive Ion Etch, CVD and diffusion systems, wafer inspection and metrology, Wafer bonding, and photolithography track.

Phase 2: (21 tools)

A. Migration to 200mm wafer size

    a. Upgrades to current tools

    b. Places MESA two generations behind industry (industry is moving from 300mm to 400mm)

B. Further high risk tool replacements, including implanters, scanning photolithography, chemical-mechanical polishing, diffusion, metal etch, wet bench, wafer scribe, metrology and inspection, backside etch, and wafer dryers. This replaces 18 tools in this phase.

C. Additional tooling upgrades to support evolving technologies required to ensure current and future LEP deliverables.

These phases would be staged so that the production capability of the facility would not be dramatically impacted during the prototype and war reserve production outlined above. It is of the utmost importance to coordinate facility refurbishments and capital investments with the development and delivery schedules to avoid schedule impacts on future LEPs.

National Ignition Facility (NIF)

The National Ignition Facility (NIF) at Lawrence Livermore National Laboratory is a central element of the NNSA Stockpile Stewardship Program (SSP) and will execute high energy density (HED) science experiments necessary to ensure a safe, secure, and reliable nuclear weapon stockpile without underground testing. The 192-beam, football-stadium sized NIF is operational and was completed in March 2009. With a total planned maximum ultraviolet energy on target of 1.8 million joules, NIF is approximately 50 times more energetic than any previous inertial confinement fusion (ICF) laser facility.

A major goal of NIF is the demonstration of ignition, or net energy production from thermonuclear fusion. The two primary goals of the NIC are commencement of experiments with THD (tritium/hydrogen/deuterium) ignition targets in FY 2010, and demonstration of a reliable and repeatable ignition capability with DT (deuterium/tritium) targets by the end of FY 2012. NIF ignition will provide an important new capability to address SSP scientific issues associated with thermonuclear burn.

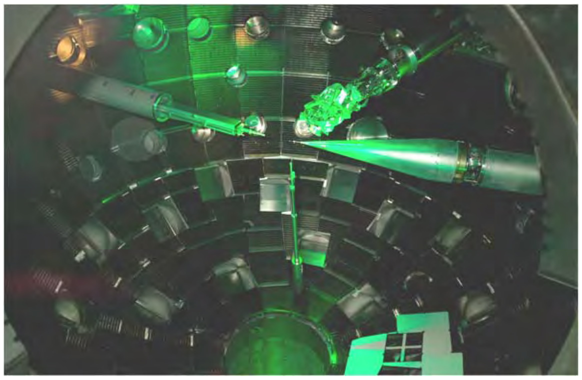


Figure D–4. Interior of NIF chamber.

The NIF will also support the SSP via execution of experiments not involving ignition in a variety of areas including radiation transport, materials science, and hydrodynamics. NIF experiments are a key component of the Predictive Capability Framework (PCF), the overall NNSA plan to improve the predictive capability of the computational tools used in stockpile stewardship.

NIF will also serve as a resource for other national security activities in areas such as the development and application of intense x-ray sources and inertial fusion energy. NIF's capabilities to generate extremes of temperature and pressure will also open new opportunities in fundamental physical science.

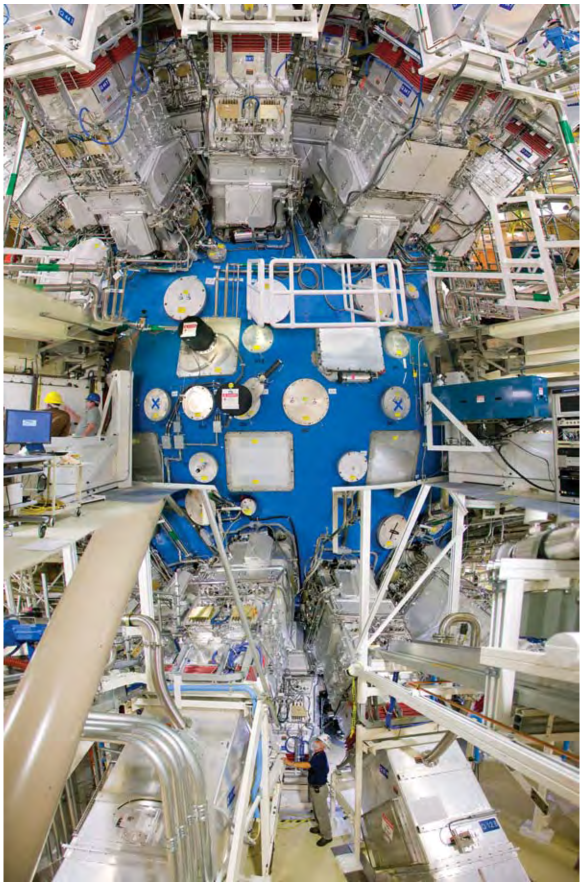


Figure D–5. NIF target chamber.

Current major investments at NIF include the installation of the baseline diagnostic suite, cryogenic, personnel, and environmental protection systems required for ignition experiments, and optics-related infrastructure in support of the large range of target irradiation conditions requested by the user community. Potential future investments at NIF include advanced diagnostics capable of detailed measurements of ignited plasmas, radiation-hardened diagnostics to allow maximum effective use of NIF's ignition capability, and installation of additional short pulse laser capability for high energy radiography and other scientific applications.

High Explosives Applications Facility (HEAF)

The High Explosives Application Facility is the cornerstone of NNSA's High Explosives R&D Center for Formulation, Processing and Characterization. HEAF was designed with transitioning the stockpile to all insensitive high explosive (IHE) weapons in mind.

HEAF is central to upcoming Lifetime Extensive Programs as articulated in the Nuclear Posture Review where safety, security and certification are critical. The HEAF staff is developing IHE boosters, surety systems, and science-based certification strategies.

Current major investments include consolidating Livermore's gas gun capabilities to HEAF where two two-stage gas guns will complement HEAF's large-bore, single-stage gun. Full activation of the gun facility is expected by the end of FY 2010. Potential future investments are expected to include diagnostic upgrades and expanded remote handling capabilities to meet the U.S. need in countering nuclear and non-nuclear threats.

2.B. Plutonium Facilities

Current State

The plutonium infrastructure can be described as a system comprised of the four key categories shown in Figure D–6. The four key plutonium categories are: nuclear facilities; personnel workforce; process capability base; and business processes. The integration of the resources in the four categories defines the plutonium capacity base and the ability of the infrastructure to respond. The plutonium infrastructure is foremost a capability-based system that could flexibly respond to one or more critical programmatic needs as directed by the President and funded by the Congress. Although the necessary skills and resources lie predominantly within the weapons activity area, they are the same skills and infrastructure needed to address other national priorities. Plutonium programs such as Pu-238 heat source production, advanced nuclear fuels development, production of parts and shapes for scientific research purposes, plutonium aging studies, technology development and demonstration related to Mixed Oxide feed for plutonium disposition, nuclear forensics support for intelligence, weapon dismantlement, plutonium characterization and monitoring; e.g., for the International Atomic Energy Agency, serve broad national purposes that are typically synergistic with Weapons Activities work. They both rely upon the skills and infrastructure historically retained by the weapons program and, through the prudent integrated management of these aligned efforts, contribute to a level of plutonium capability sustainment for work within the Weapons Activities account.

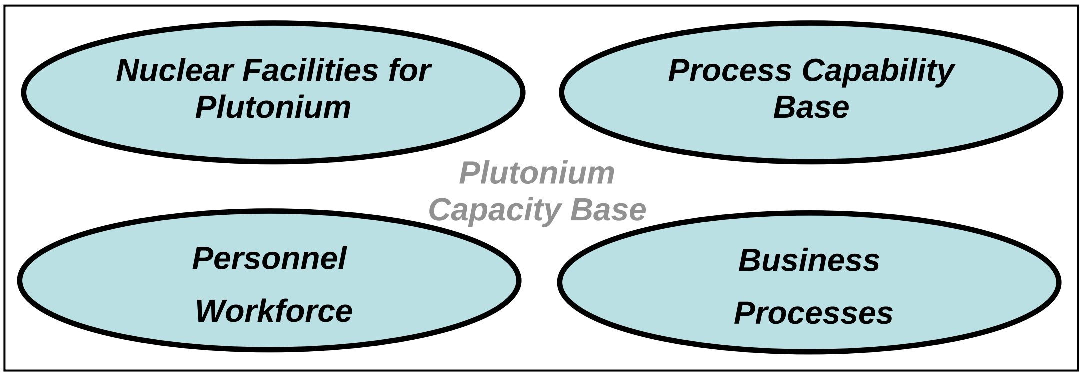


Figure D–6. Major Resource Categories for the Plutonium Infrastructure.

Of particular relevance to the NPR are the capabilities required to support life-extension options for pits into the future. The spectrum of plutonium activities supporting the stockpile is broad, including pit surveillance, pit manufacturing, plutonium research, development and technology, and dynamic material experiments. Pit manufacturing is the most rate-limiting constraint on modifications that can be made to the stockpile nuclear explosives package in the event that the pit requires modification. Plutonium processing for nuclear weapons includes all of the processing steps to convert a raw material into a finished product. No opportunity exists for out-sourcing this work or leveraging capacity from the American industrial base. All plutonium capabilities are maintained by a core team of trained and qualified plutonium handling personnel. The present plutonium technology base is adequate to satisfy today's requirements for plutonium programs. The capabilities are regularly exercised and qualified to manufacture a legacy pit type in small annual quantities.

Key Facilities

Plutonium facilities represent a key physical resource for supporting the nuclear weapon stockpile. Due to the hazards associated with plutonium these facilities are very complex, expensive, and difficult to acquire. The typical planning basis for acquiring a new plutonium facility is more than 15 years and several billion dollars. Therefore, close coordination between program planning and facility planning is necessary to ensure alignment between program requirements and the facility design. The major plutonium facilities are located at Los Alamos. The Superblock at Livermore is being transitioned to a Security Category III research and development facility. A system diagram (Figure D–7) shows the major Los Alamos facilities involving plutonium in 2009 and the interfaces to other key facilities associated with plutonium.

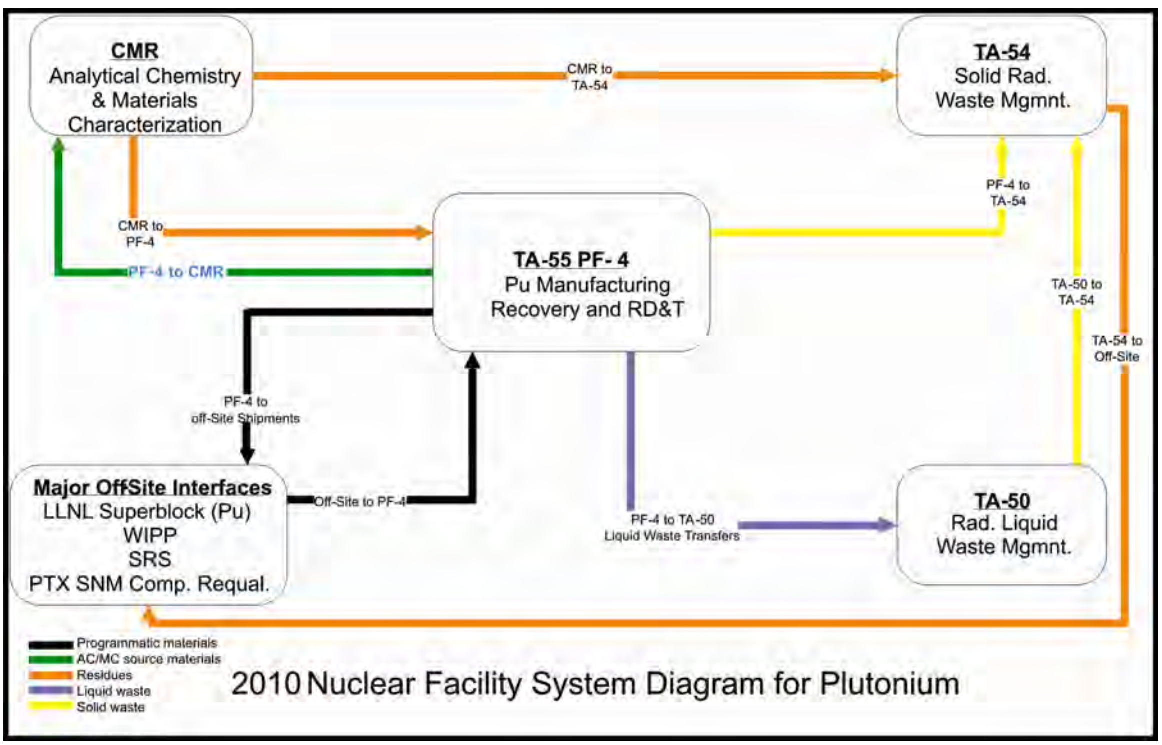


Figure D–7. Key LANL Plutonium Facilities in 2010.

The system diagram changes with time as new facilities replace older facilities, including CMRR-NF replacing CMR, Radioactive Liquid Waste Treatment Facility that will improve treatment capability at TA-50, and the TRU Project replacing TA-54. The overall system requires reliable service from each of the component facilities shown to support plutonium requirements as presented in Table D–6.

Table D–6.Key Facilities For Plutonium.

Key Facilities For Plutonium	
Facility Name	Facility Function
LANL—Plutonium processing facility (PF-4)	Plutonium Processing.
LANL—CMR	Analytical Chemistry and Materials Characterization.
LANL—Radioactive Liquid Waste Treatment	Waste Treatment and Processing.
LANL—Solid Radioactive Waste Management	Solid Waste Receipt and Staging.
LANL—Main Shops and Beryllium Technology Facility	Support facilities—Non-nuclear pit parts including beryllium.
LLNL—Superblock Plutonium Facility	Security Cat I/II Plutonium R&D until 2012. In the process of transitioning to security Cat III status by 2012.
PTX—SNM Component Requalification Facility	Pit Refurbishment.

Future State

In the near- and long-term, the facilities used to execute plutonium missions are refurbished and/or replaced to maintain a posture for the desired spectrum of weapons life extension options.

Planned Actions

Having a plutonium processing capability is essential to the NNSA mission. It takes years to bring a nuclear facility from a planned alternative to full operations capacity. The short-term action is to support plutonium analytical chemistry and material characterization with replacement of the CMR facility with the CMRR-NF project. There are well documented safety issues with the old CMR facility. This includes work to:

- Develop and execute a program to align existing plutonium capabilities to address the forecasted plutonium capacity requirements and to periodically re-invest in existing capabilities. This capability re-investment is important to ensure responsiveness because the current capability runs the risk of single point failure. Process equipment, for example, typically takes between 3 to 8 years to acquire and deploy inside an operating plutonium facility. The FY 2011 investments in deployed equipment in PF-4 are realized in the 2014-2019 time period.

- Fund and execute line item projects for plutonium-related facility upgrades and replacements for plutonium facilities.

The series of actions required to transition the plutonium infrastructure to support the long-, mid- and short-term duration are critical activities. In the short—midterm, NNSA has defined plans to ensure that the plutonium technical capability is maintained and sufficient to support the base capability and future projected capacities.

CMRR-NF

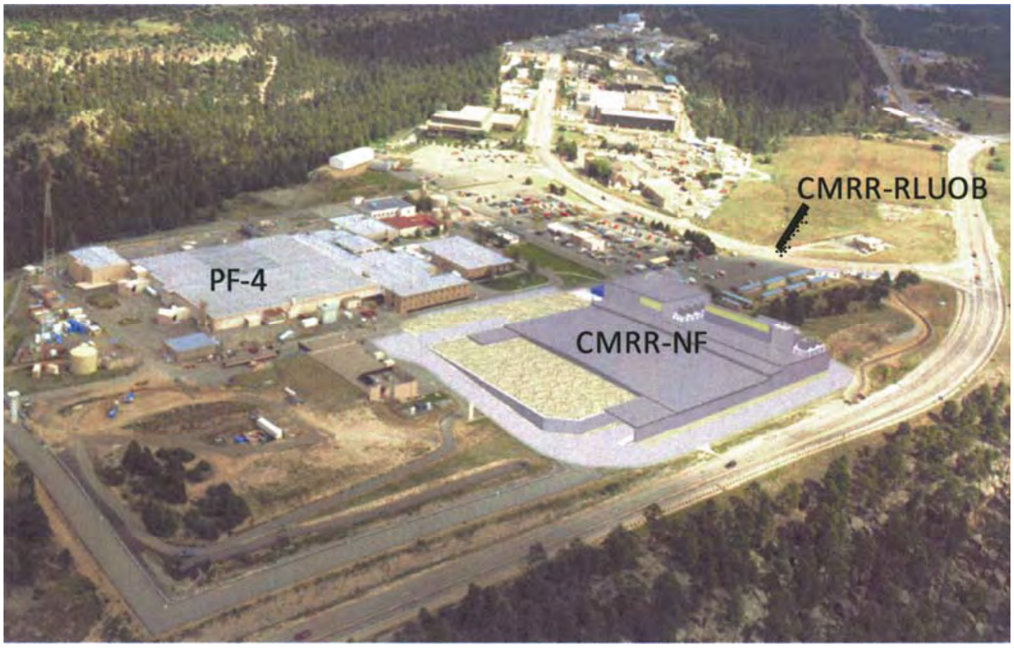


Figure D–8. The CMRR Project is comprised of two facilities, the Chemistry and Metallurgy Research Replacement-RLUOB and the CMRR-NF. Both of these facilities support the plutonium operations inside of PF-4, the main Pu processing facility at Los Alamos.

Figure D–9. Chemistry and Metallurgy Research Replacement Radiological Laboratory/ Utility/Office Building circa November 2009.

Proceeding with the construction of CMRR-NF project is consistent with the DOE Secretary of Energy's Strategic Plan and the NPR. This project provides analytical chemistry, materials characterization, and vault storage in support of any program using plutonium. There are two separate facilities that form a part of the CMRR project (the Radiological Laboratory/Utility/Office Building (RLUOB) and the CMRR-NF) that will allow complete transition of NNSA operations from the aging CMR facility. The RLUOB facility construction is complete and process equipment installation is proceeding. CMRR operations (both RLUOB and CMRR-NF) will provide direct analytical chemistry and material characterization support for PF-4 plutonium operations. In order to support program requirements, CMRR-NF construction must be complete by 2020 and it must be fully operational by 2022.

CMRR-NF provides analytical chemistry and material characterization support to PF-4 where plutonium components are evaluated, manufactured and/or re-furbished in support of the current stockpile (annual plutonium component surveillance) and/or changes to the stockpile in support of the NPR (Life extension programs) as well as R&D activities on plutonium. This new facility will replace the functions currently resident in the 1952 CMR facility.

The overall strategy associated with CMRR is to provide a pathway for continuous support to plutonium programs between now and 2020. This requires a phased approach to moving existing operations out of the CMR facility and into the CMRR facilities. Presently, we rely completely on the CMR facility for support services to plutonium programs. When the RLUOB is fully equipped and operational in 2012, it will replace a portion of the existing CMR functions, thus reducing the risk exposure in the aging CMR facility. As the CMRR-NF comes on-line the remaining functions in CMR will transition to the new building and the CMR facility will be available for decommissioning.

TA-55 Reinvestment Phase I, II and III (TRP)

The PF-4 facility is a multi-purpose facility that houses a number of plutonium programs and is the only full service plutonium facility for Category I quantities of plutonium and pit manufacturing in the United States. The TA-55 Reinvestment Project (TRP) Phases I, II, and III are intended to provide selective replacement and upgrades of major facility and infrastructure systems in PF-4. The TRP Phase I, II, and III construction will extend the useful life of PF-4 and the safety systems that support its critical operations.

The TRP Phase I and II project will recapitalize facility subsystems that are nearing the end of their design life and must be replaced. These subsystems are beginning to require excessive maintenance. As a result, the facility is experiencing increased operating costs and more importantly, reduced system reliability. Compliance with safety and regulatory requirements is critical and needed for this 1978 facility. The types of subprojects in TRP Phase II include: replacement of uninterruptible power supply, refurbishment of air dryers, replacement of confinement doors, seismic upgrades for glovebox stands, criticality alarm system upgrades, and replacement of exhaust stacks. These project phases will enhance safety and enable cost effective operations that will provide reliable facility support for an additional 25 years.

A phased acquisition strategy has been developed for the TRP projects. The TRP projects are proposed for execution as three separate capital acquisitions. TRP Phase I physical construction is scheduled to be complete in FY 2011.

TA-55 Reinvestment Project III is the third line item project to upgrade more of the key systems that are nearing or have exceeded their design lifetimes. The project will focus on facility infrastructure systems (e.g., mechanical, electrical, structural); it will not encompass programmatic equipment. TRP Phase III will be considered in the post 2011 FYNSP period.

PF-4 Recapitalization

Figure D–10. A machinist operates a precision lathe inside a glovebox.

The Programmatic Environmental Impact Statement for Stockpile Stewardship and Management (SSM PEIS, DOE dated 1996) designated Los Alamos as the location for manufacturing of plutonium weapon components (pits). The existing PF-4 facility is fully capable of producing pits and will complete a War Reserve production campaign on the W88 program in 2011. However, the existing program is limited to about 10-20 pits per year. The PF-4 Recapitalization will support the process equipment and other production enhancements inside of PF-4 to achieve the NPR requirements. The strategy for doing this is to add additional equipment to augment the existing manufacturing line inside PF-4.

The PF-4 Recapitalization will deploy the required process equipment to achieve the capabilities and capacity required to support the NPR requirements for plutonium components. This process equipment will address both the breadth (capability) and the depth (capacity). In the absence of these equipment additions, the planned life extension projects will be limited to the existing capability and capacity.

The strategy for adding process equipment is to execute a phased campaign to remove old equipment, refurbish existing equipment, and add new equipment to achieve target requirements. This will begin in earnest in FY 2011 with the removal of old gloveboxes that will make available the floor space needed for new equipment. The overall strategy is to create independent manufacturing areas that can perform both complete manufacturing and rework. The installation of this equipment is sequenced along with the other nuclear facility projects in order for the entire system to reach required set of capabilities and capacity to achieve rate production in 2022.

Consolidated Waste Capability

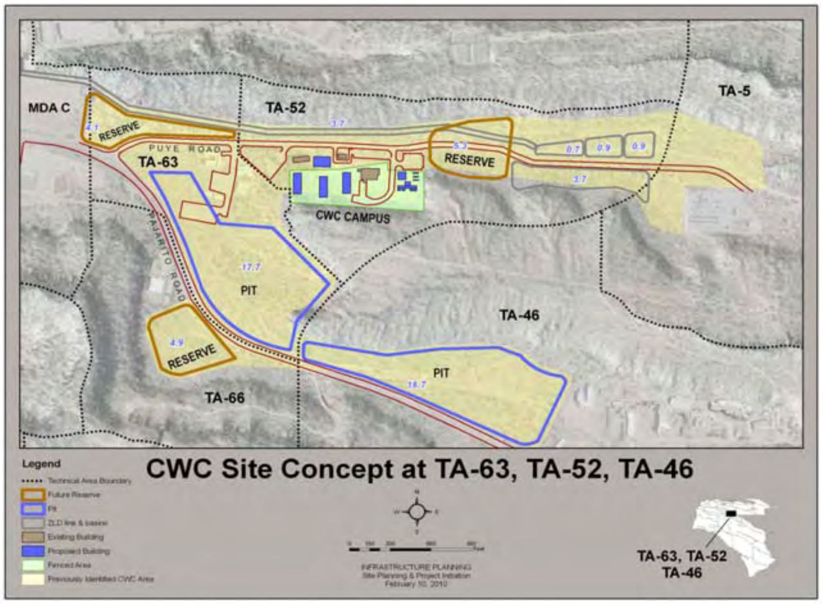


Figure D–11. Site overlay of the Consolidated Waste Capability for addressing TRU, Low Level and Mixed Low Level radioactive waste.

The waste facilities are an integral part of conducting plutonium programs in the system of nuclear facilities. The Consolidated Waste Capability includes the transuranic (TRU) Waste Facility project for solid transuranic waste and associated facilities for hazardous waste, low level waste and mixed low level waste.

The waste facilities are all a part of the larger system of nuclear facilities used to assess, surveil, manufacture, and/or refurbish plutonium components used in nuclear weapons. There is a limited ability to stage waste and therefore plutonium programmatic operations such as surveillance and manufacturing would be interrupted without the facilities required to process and dispose of waste on a timely basis.

The overall strategy is to upgrade existing facilities supporting solid and liquid waste operations until new facilities including the TRU Waste Facility and Radioactive Liquid Waste Treatment Facility (RLTWF) can be brought online. This strategy has resulted in the Consolidated Waste Capability as a master plan for addressing all forms of waste from the systems of enduring nuclear facilities at Los Alamos. The priority project among these is the TRU Waste project that provides for staging, characterization, and shipping/receiving of TRU waste bound for the Waste Isolation Pilot Plant in Carlsbad. The TRU Waste capability must be reconstituted, commissioned, and in operation at a location outside of the current location. Through the integrated nuclear planning process, these refurbishments and or replacement projects are intended to be sequenced in order to address the plutonium capability and capacity required by the life extension and refurbishment requirements set forth in the NPR.

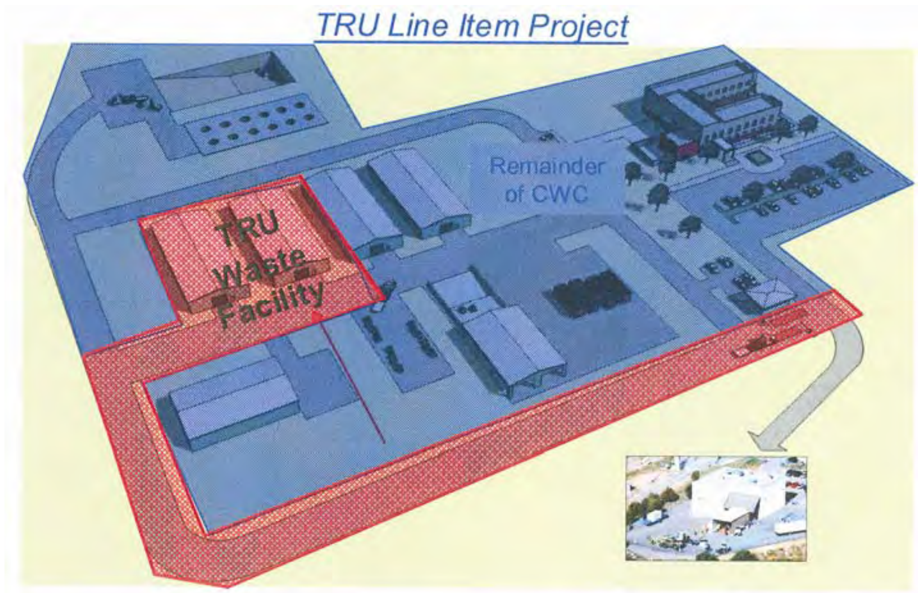


Figure D–12. Overhead view of the TRU Solid Waste Management project as a portion of the overall Consolidated Waste Capability (CWC) at Los Alamos.

2.C. Y-12 – Uranium Facilities

Current State

The uranium and weapon system secondary missions for the NNSA are performed at the Y-12 National Security Complex (NSC) in Oak Ridge, Tennessee. The NNSA missions at the Y-12 NSC include: 1) manufacturing, dismantlement, and surveillance of nuclear weapons secondaries, cases, and other weapons components; 2) safely and securely managing and storing highly enriched uranium (HEU); 3) supplying HEU used in naval reactors; and 4) promoting international nuclear safety and nonproliferation.

The Y-12 NSC was constructed in the 1940s and is located on approximately 800 acres on the DOE Oak Ridge Reservation. Many of the production and support facilities at Y-12 have now exceeded their useful life and do not comply with today's health/safety/environmental/ security standards. In addition to concerns for weapons activities, the aging facilities at Y-12 represent a risk to other important uranium missions (e.g., naval reactors, non-proliferation, etc.). Currently, Y-12 is undergoing a modernization of facilities and infrastructure that will safely, securely, and cost effectively meet future needs of the complex. NNSA has analyzed material needs and retained sufficient highly enriched uranium (HEU) for the weapons program. Thus, there are not any current plans to re-establish uranium enrichment capability within the Y-12 modernization plan. The material supply analysis also determined that there are currently decades of HEU supply available in support of naval reactors and other national security needs. In fact, NNSA is currently down blending substantial amounts of excess HEU under the fissile materials program. The denoted area in Figure D–11 reflects the outline for the 150-acre, high security area on the west end of the plant that will be reduced by 90 percent through transformation actions.

Figure D–13. Current Y-12 Site Footprint.

Key Facilities

Production and storage operations currently rely on the key facilities listed in Table D-7. One new facility, the HEUMF, was recently completed and is now operational.

In addition to these major production/storage buildings, Y-12 also operates an infrastructure that includes maintenance facilities, a technical/administrative complex, a development facility, emergency management facilities, waste operations facilities, and safeguards/security facilities. The key Canned Sub-Assembly and uranium facilities currently at Y-12 are listed in Table D–7.

Table D–7.Key Facilities for Canned Sub-assemblies and Uranium.

Key Facilities for Uranium	
Function Name	Facility Function
Enriched Uranium (EU) Production	Production/Manufacturing Building
Assembly, Dismantlement and Surveillance	Production/Manufacturing Building
EU and DU Metalworking	Production/Manufacturing Building
Lithium Operations	Production/Manufacturing Building
Special Material Operations	Production/Manufacturing Building
General Manufacturing	Production/Manufacturing Building
HEU Materials Facility	EU Storage

Future State

The future state of the Y-12 NSC will be defined by two modern nuclear production and storage facilities: the HEUMF and the Uranium Processing Facility (UPF). Construction of these nuclear facilities and the follow-on high security reduction project will transform Y-12's high security zone into one that is 90 percent smaller than today's complex. In the longer term, the site's NNSA operating footprint will encompass approximately 2.5 million square feet as opposed to today's 4.5 million square feet with the consolidation of the aging nuclear and non-nuclear production and support facilities. The future facilities and site arrangement would be designed for safeguards and security and cost effectiveness of operations.

Planned Actions

Four primary gaps are addressed in the plans to modernize the Y-12 NSC and achieve the future state shown in Figure D–14. These gaps are: 1) replacement of the aging enriched uranium (EU) production infrastructure; 2) consolidation and reduction of the high security footprint; 3) revitalization of non-HEU production facilities; and 4) revitalization of the contractor workforce. Actions to address these gaps are described below. The highest priority actions will be those associated with replacing HEU production and storage facilities and consolidating and reducing the high security footprint. In addition to these vital production initiatives, the Y-12 NSC will continue its very aggressive footprint reduction/legacy facility disposition initiatives as well as selected projects to revitalize the supporting site infrastructure. Figure D–14 denotes the post-transition Y-12 overall site footprint and the reduced high security area footprint.

Major Actions to Modernize and Sustain Capability

- Replacement of HEU Storage and Production Facilities:
  - Y-12 modernization includes the recent construction of the HEUMF that is now operational. HEU material will be moved from five existing facilities and the HEUMF will be the single Y-12 storage facility in the future. The second element is replacement of the HEU processing facilities with a UPF. This facility, now in preliminary design, will replace all HEU production capability now performed in five existing facilities with a total square footage of approximately 800,000 square feet. The UPF should become fully operational in 2022. Both facilities are designed for security and will reduce the dependence on the protective force and greatly reduce annual operating costs.
- Consolidation and Reduction of the High Security Footprint:
  - Following the completion of the UPF and the de-inventory of existing EU operating areas, a new high security perimeter will be established around HEUMF and UPF which will reduce the high security footprint by 90 percent.
- Replacement of non-HEU Production Facilites:

  In performing its mission to produce nuclear weapons secondaries, there are a number of facilities associated with non-EU material production. Modernization plans call for the replacement of these facilities with a new Consolidated Manufacturing Complex (CMC). This new complex will be designed to downsize the depleted uranium, lithium, and general manufacturing functions and locate them in a modern facility. In addition, sustaining this capability is essential to maintain the ability to manufacture and refurbish secondaries at Y-12. The current lithium facility is already experiencing structural system decay. Construction of a replacement facility for these operations should commence in 2024, in order to complete construction by 2029.
- Workforce Revitalization:
  - As with the physical infrastructure, the contractor workforce at the Y-12 NSC is also aging with a high percentage of staff becoming eligible for retirement within the next 5 years. As the site and physical infrastructure transition to the future state, the workforce must also transition to accommodate new operational facilities, advanced technologies, and new work processes. As part of its EU Transition Plan, Y-12 is developing the long range staffing plan and putting human resources systems in place to retain, recruit, and train the future workforce.

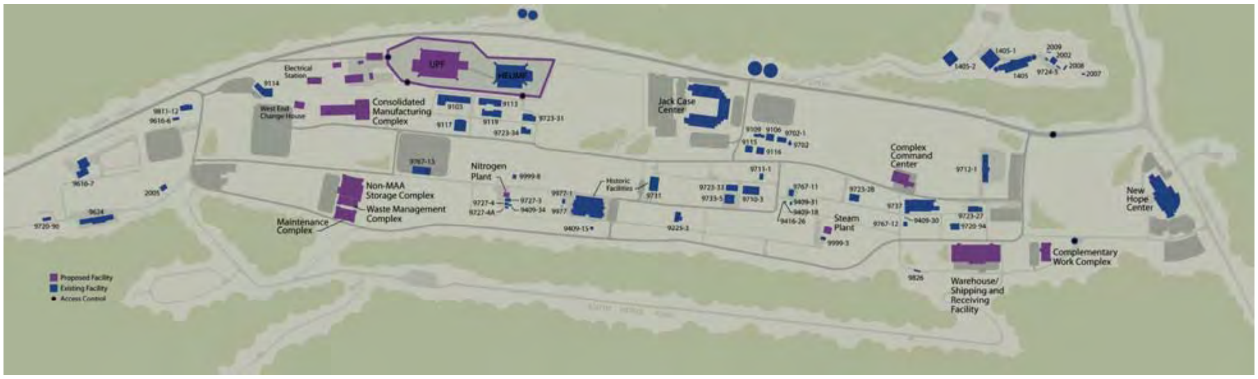


Figure D–14. Future Y-12 Site Footprint and High Security Footprint.

A summary of the one-time construction projects associated with the physical transition of the site is shown in Table D–8. These investments are in addition to costs associated with maintaining the current infrastructure and represent the major transition activities.

Table D–8.Key Facility Refurbishment/Replacement For Uranium.

Key Facility Refurbishment and Replacement For Uranium		
Category	Facility Name	Refurbishment/Replacement Project
Construction	New Uranium Processing Facility (UPF)	UPF replaces five old production buildings
	New Consolidated Manufacturing Complex (CMC)	Provides consolidation of the non-nuclear manufacturing and production activities.
	Protected Area Reduction Project	Supports 90 percent reduction in the security footprint from 150 acres to 15 acres
Security	Security Improvement Project	Support installation of ARGUS security backbone for key facilities

Transformation of the uranium function at Y-12 is driven by a specific set of needs or criteria, and is supported by a number of basic strategies and specific milestones that support achievement of the transformation goals. In addition, there are a number of major programmatic milestones that must be met during the process of transformation. The projects described below represent the major elements of future modernization and refurbishment.

Uranium Processing Facility

Figure D–14 provides an outlined area where the HEUMF (east side) has been constructed and provides a UPF rendering to the west of HEUMF.

The UPF will replace all the current, aging EU production and dismantlement facilities at Y-12. These EU production capabilities are required to produce secondaries to support the current stockpile as well as any future stockpile requirements in support of recommendations in the 2010 NPR. In addition, these capabilities are required to dismantle secondaries from retired weapons as well as provide EU feedstock for the nuclear navy.

If this facility is not constructed, the current 60-year-old facilities are at risk of failure. This would impact the ability of Y-12 to meet secondary life extension schedules, meet its dismantlement mission, perform surveillance operations, and to meet schedules for naval reactor material. In addition, a new facility is needed in order to provide improved worker safety and reduce worker exposure and will result in reduced annual operating costs.

The overall strategy is to provide a pathway for continuous support to uranium programs between now and 2022. This requires a phased approach to transition between existing Y-12 uranium processing facilities and the new UPF facility. Transition from existing facilities to UPF will occur in 2019 through 2021; the transition approach will be closely coupled to stockpile needs during that period. UPF will complete construction in 2020, start initial operations in 2021, and be fully operational in 2022.

Protected Area Reduction Project

Figure D–13 depicts the 150 acres that will be reduced to 15 acres, as shown in Figure D–14.

The highly protected area of the Y-12 NSC serves to meet the protection requirements for SNM. Today the Protected Area encompasses 150 acres and is surrounded by an aging perimeter intrusion detection and assessment system (PIDAS) that was constructed in the 1980s. Following the completion of UPF and the now operational HEUMF, the Protected Area can be reduced by 90 percent while replacing the outdated perimeter security systems.

If this project is not completed, the protected area would remain at 150 acres, perimeter security systems would have to be replaced on the existing PIDAS, non-special nuclear material operations would have to remain in the Protected Area, and the protective force could not be reduced by a significant level that would lead to an annual security cost savings of approximately $50 million. Construction of new facilities (e.g., CMC) and demolition of existing, aging facilities within the Protected Area could be prohibitively expensive.

- Conceptual design commences in 2012
- Construction complete in 2021
- Begin full operations in 2022

2.D. Assembly, Disassembly, and High Explosives Facilities

The Pantex Plant near Amarillo, Texas will serve as the center of excellence for weapons assembly/disassembly, high explosives production and Category I/II special nuclear material storage.

The weapons assembly and disassembly mission refers to the assembly, dismantlement, and reassembly of complete nuclear weapons. This activity is primarily conducted at Pantex, which is the principal facility in the complex that handles complete nuclear weapons. Facilities include heavily fortified work areas, storage facilities, administrative buildings and support laboratories. Waste management facilities are also required. Pantex also produces and machines the high explosive (HE) that surrounds the nuclear weapons components. The environmental testing of the nuclear explosive package and other functions currently performed in Buildings 334 and 834 at LLNL will be relocated to Pantex.

If justified by cost savings in business case evaluations, the NNSA would consolidate Category I/II SNM at Pantex within Zone 12, and close Zone 4.

Pantex must sustain the enduring facilities critical to the mission and advance the equipment and technologies within the portfolio to safely, securely and effectively implement the tenets of the NPR. The President's FY 2011 – FY 2015 budget submission provides funding to support two Pantex projects; High Pressure Fire Loop Zone 12 South and the High Explosive Pressing Facility. Other projects that are being considered in the post FYNSP budget include: High Explosive Component Fabrication and Qualification Facility; High Explosive Formulation Facility; Weapon Surveillance Facility; Pantex Administrative Support Complex; HE Science and Engineering Facility; HE Staging Facility; Non-Destructive Evaluation Facility; Ultraviolet to Infrared Flame Detector Upgrade; and Fire Protection Building Lead-In Replacements.

Assembly/ Disassembly, and High Explosives Production

Current State

Assembly/Disassembly activities to meet currently defined stockpile demands include the following key categories of work:

- Dismantlement of retired weapons.
- Disassembly, inspection, and rebuild of weapon surveillance/evaluation units.
- Life Extension Programs.
- Limited Life Component Exchange.
- Weapon and component radiography and non-destructive evaluation.
- Non-nuclear component evaluation.
- Pit evaluation and requalification.
- Quality Evaluation Test components to other NNSA sites.

- Surveillance/evaluation/preparation of the Quality Evaluation Report.

The HE production mission is performed at Pantex and includes: 1) HE production, qualification, surveillance, testing and disposal; and 2) assembly and disassembly of nuclear weapons.

The Pantex Plant, initially constructed during World War II, is located on approximately 10,530 acres of owned and 5,800 acres of leased (detached) property. Approximately 2,500 acres of Pantex Plant proper are used for industrial operations, the burning grounds, and firing sites. Approximately 25 percent of the Plant's square footage is more than 25 years old with 19 percent of the facilities constructed during World War II. Pantex consists of 638 buildings containing 3,112,548 square feet.

Pantex performs explosive component fabrication of war reserve explosive components involving powder compaction, and extrusion and precision machining to meet production specifications. High explosives production to meet the currently defined stockpile requires a number of essential competencies/capabilities:

- Specialty chemical explosive materials manufacturing to include synthesis and formulation
- Explosive component fabrication
- Explosive component assembly
- Dimensional inspection
- Testing (Qualification/Acceptance)
- Testing (Surveillance)
- Disposal

Currently, one hydraulic press generates compacted billets for ultimate use in fabricating main charge hemispheres at a production rate of approximately 300 pressed billets per year. A second press is currently being qualified to assist in servicing future capacity demands that may add up to another 100 pressed billets per year to meet workload requirements.

Small-scale compaction of explosive powders to produce sub-components of explosive initiation trains involve small hydraulic and mechanical presses currently residing in various locations around the site. A project will be considered in the post FYNSP budget to consolidate functions to enhance production efficiencies.

Testing, inspection, qualification, acceptance, and surveillance of HE products and systems include destructive processes such as chemical, mechanical and physical testing, as well as test fire and non-destructive processes such as radiography, ultrasonic, dimensional analysis, etc. These capabilities currently occupy numerous facilities at the site.

Disposal of energetic materials and residues resulting from HE mission work requires the capability to perform open burning and/or open detonation to address the bulk of the waste quantities. Pantex currently has the capacity to address all anticipated stockpile explosives waste quantity requirements and will continue to sustain it as is, assuming open burning and/or open detonation process remain environmentally permissible in the future.

Key Facilities

Table D–9 identifies the key assembly, disassembly nuclear weapons facilities at Pantex utilized for this workload include ten nuclear-explosive cells, 37 nuclear-explosive bays, and 11 nuclear-only joint test assembly (JTA) and test bed (TB) bays. Eight special purpose bays are used to perform X-ray, mass properties measurements, leak testing, separation testing, and painting. Additional support facilities include the gas lab, container packaging and refurbishment bays, warehousing, tooling support, staging of processing material, administrative staff offices, and 7 Category I bunkers and vaults.

Table D–9.Key Facilities for Assembly, Disassembly Production.

Key Facilities for AD Production	
Facility	Facility Function
Assembly Cells	Weapon assembly and disassembly facilities
Assembly Bays/Mass Properties/ Leak Test	Assembly Bays/Mass Properties/ Leak Test
Inert Assembly and Test	Test Bed/JTA/SNM Component Requalification Facility/Pit Requalification
Assembly Bays	Container Packaging
Weapon Paint Facility	Weapon Painting
Assembly Bays	Radiography
Separation Testing Facility	Component testing and evaluation
Non-destructive Evaluation and Gas Lab	Gas Lab/NDE Facility
Component Staging and Tooling Support	Warehousing, Tooling Support

HE production and testing facilities required in order to maintain essential capabilities and support workload are shown in Table D-10.

Table D–10. Key Facilities for HE Production.

Key Facilities for HE Production	
Facility	Facility Function
Explosive Synthesis Facility	Chemical synthesis to produce HE
HE Formulation and Material Evaluation Facility	Chemical formulation to produce HE
Main Charge Pressing, Demilitarization, and Dismantlement Support Facilities	Press HE hemisphere billets Demilitarization and Dismantlement
Small Component Fabrication Facilities	Fabricate small HE components
HE Machining Facilities	Machining operations for hemispheres
HE Assembly Facilities	Cells and bays as appropriate dependent upon HE type
Destructive Testing Facilities	Burning ground and disposition of HE components
Chemical Testing Facilities	Analysis of HE for WR specifications
Non-destructive Testing Facilities	X-ray capability to evaluate HE
HE Storage	Storage

Future State

There is no plan or proposal to reduce the size of Pantex's footprint or significantly change the operating space, with the exception of some new construction that would be offset by an equal or marginally greater amount of space resulting from facility disposition. Any new construction would support replacement of existing capabilities currently housed in the old World War II era facilities.

The future state ensures sustained responsiveness for all HE mission-related work emerging over the next 3-4 decades. Production capacity will be ~500 hemispheres per year limited by HE machining rates on single shift operation.

Planned Actions

The highest priority actions will be those associated with relocating the LLNL Environmental Test Facility to the Pantex site. Other surveillance program mission gaps and non-destructive evaluation operations to support assembly/disassembly requirements are discussed below:

1. Existing Pantex facilities will be used to house the relocated LLNL Environmental Test Facility refurbished and re-certified equipment. On-going production operations will not be impacted by facility modifications and equipment installation for this mission work.

2. Several safety, security and maintenance refurbishment projects will be executed to upgrade the overall plant work environment (e.g., Ultraviolet to Infrared Detector Upgrade; Facility Installed Continuous Air Monitoring Equipment; Fire Suppression Lead-In and Fire Protection Lead-in Replacement; Security Perimeter Intrusion Detection and Assessment System; etc.).

3. Constructing a minimally-sized nuclear explosive Weapon Surveillance Facility is a possible option to resolve a potential gap in surveillance capabilities that would require the preparation of an analysis pursuant to the National Environmental Policy Act. Pantex would utilize existing facility bays to accommodate Computed Tomography and digital radiography equipment. Canned subassembly reacceptance mission work will be accomplished using the Weapon Surveillance Facility. On-going assembly/disassembly operations would not be impacted.

4. Constructing the Material Staging Facility, an underground storage facility at part of Zone 12, is also proposed as a means to close Zone 4 and eventually reduce the acreage requiring the highest levels of security. This proposed facility would only be constructed if justified by economic business cases and only after consideration of an analysis prepared pursuant to the National Environmental Policy Act.

The following areas need to be addressed to achieve a responsive infrastructure:

- The main charge press capability, based on NPR requirements will not meet future workload demands. A new HE Pressing Facility is currently in the FYNSP that offers a capacity solution that will meet the NPR recommendations.

- An HE Formulation Facility is being considered post FYNSP in tandem with the existing HE Synthesis Facility that will deliver any HE material required by the stockpile.

- An HE Component Fabrication and Qualification Facility is being considered post FYNSP that will support consolidating main charge assembly and small component fabrication activities into a suitable location to optimize the use of people and equipment.

Renovation or replacement of the following buildings may be proposed to assist NNSA to achieve efficiencies in operations and cost savings, but only after an appropriate analysis prepared pursuant to the National Environmental Policy Act. Additionally, in the case of

Building 12-17 consultations must be accomplished pursuant to the National Historic Preservation Act.

Building 12-17
Constructed in 1945

Building 12-63
Constructed in 1969

Building 12-21
Constructed in 1945

Figure D–15. Facilities at Pantex.

High Explosive Pressing Facility (HEPF)

Existing facilities supporting High Explosive (HE) Pressing operations are aged and in poor condition (see Figure D-15) requiring increased levels of maintenance. This project will allow demolition and/or shutdown of eight legacy facilities. The existing HE presses and associated equipment currently in use are experiencing downtime; in FY 2009 HE operations were down 42 percent and 48 percent in FY 2010 due to equipment failures. High Explosive fabrication, machining and pressing is required to meet mission deliverables. Failure of this capability is viewed as a single point failure for the nuclear weapons complex. Funding for this project is included in the FY 2011 FYNSP.

The strategy is to build the replacement High Explosive Pressing Facility with the following schedule:

Critical Decision -3 (CD-3) Approval	Milestone
Complete Design Verification/Issue Construction RFP	2nd Quarter FY 2011
Award Construction Contract	4th Quarter FY 2011
Critical Decision -4 (CD-4) Approval	1st Quarter FY 2017

Fire Suppression Lead-In

Figure D–16. Fire Protection Lead-In Piping Corrosion.

The Fire Suppression Lead-In project addresses replacement and modernization of the aged, unreliable, and deteriorating infrastructure to production facilities required for weapons assembly and disassembly, see Figure D-16. Installation of the new lead-in piping will significantly decrease the potential for additional piping failures in the system, which will reduce production facility down time, permit more effective maintenance, and eliminate the current deferred maintenance of the system. This project will allow Pantex production facilities to operate consistently without outages due to failure of lead-in piping. The facilities impacted by the degraded piping are a critical resource in performing the DOE/NNSA's nuclear weapons mission at Pantex.

Due to pipe aging and the existing soil conditions the lead-ins have experienced degradation from corrosion, and several failures have occurred. Twenty three failures have occurred in the total High Performance Fuel Laboratory system in the last thirteen years. Twelve of those failures have occurred on production facilities alone. The 10 inch line to one production building was only 17 years old when it failed. Each failure results in downtime for the facility.

Fire Protection Lead-in project replaces the piping for twenty-two (22) facilities and two (2) ramps in the production area.

This system upgrade to the fire protection building lead-in piping provides the required fire protection necessary to the production facilities to support transformational activities and protect the Nuclear Explosive Operations mission. Funding for this project will be considered in the post FYNSP period.

The current proposed schedule is:

Critical Decision -0 (CD-0) Approval 2nd Quarter FY 2013

Critical Decision -4 (CD-4) Approval 2nd Quarter FY 2024

2.E. Non-nuclear Components Production Facilities

Current State

The non-nuclear component production mission for the NNSA is led primarily by the Kansas City Plant (KCP) Kansas City, Missouri which supplies the majority of non-nuclear components and SNL Albuquerque, New Mexico which is responsible for neutron generator, radiation hardened integrated circuit production, and power sources. LANL produces detonators for the nuclear explosive package. In addition to directly producing non-nuclear components, KCP and SNL also provide procurement and qualification for commercial and specialty components through commercial-off-the-shelf and concurrent design and manufacturing programs. These programs include over 300 commercial suppliers qualified for war reserve production.

In addition to the production of weapons components, these facilities are key to the ongoing research and technology maturation necessary to maintain the current stockpile. Concurrent engineering is critical to developing and producing reliable weapon components in a cost effective manner. The continued support and active engagement of the technical staff at both the lab and production site is critical to maintaining the ability to respond to issues and initiatives within the complex and is a significant driver for the ST&E. As an example, the Sandia MESA facility not only produces the radiation-hardened integrated circuits for our weapons, but is integral to the scientific R&D of future technologies to support future weapon LEPs and improved surety. The SNL neutron generator facility and many KCP facilities support the ST&E base to include the development of materials, assemblies, and processes that are integral to the successful execution of the NNSA mission. Members of the production technical staff are frequently required to improve the ability to produce the component design as well as to develop and improve the processing capability of production equipment. The non-nuclear production facilities are a critical element of a healthy and responsive infrastructure.

KCP has the mission responsibility for the majority of the non-nuclear production activities, including process and production engineering and transition activities from design into production. This mission is accomplished in partnership with SNL, LANL and LLNL. To fulfill the non-nuclear development, qualification, and production engineering responsibilities, KCP provides the required manufacturing, testing, inspection, surveillance, analytical simulation tools, process development, tooling, and gauging capabilities for critical non-nuclear core products that include:

1. Electrical and Mechanical Components – KCP provides the technical and production staff to engage the labs at the conceptual and development stages to provide support for achieving manufacturable and cost effective product designs. KCP, in partnership with SNL, provides the technical support to develop and characterize the materials, testers, and production processes required to produce, inspect, and qualify approximately 35 product lines including Lightning Arrestor Connectors (LACs), Stronglinks, Radars, and Arming, Fuzing, and Firing Systems.

2. Special Materials – KCP provides the technical staff to develop and produce special materials that can no longer be produced in industry or cannot be procured in required quantities.

3. Gas Transfer Systems – KCP provides the production (empty reservoirs) and technical support for the development and characterization of processing and testing techniques to support non-nuclear component designers for the production of Gas Transfer Systems.

4. Inspection and Test – KCP provides the technical support to develop techniques to analyze, test, and validate the products KCP must produce and submit to NNSA for acceptance to the product specification requirements and quality standards. This includes a wide array of support services including the design and fabrication of tooling, gages and test equipment that are often used in conjunction with thermal, shock, and vibration environmental test equipment.

5. General Capabilities – KCP is required to maintain the critical technical skills and infrastructure to engage the three laboratories to support the development and deployment of a wide variety of products (for example, the B61 has over 5,000 parts) including collaboration with the design laboratories to characterize and produce the components more cost effectively, including qualifying, inspecting, and accepting them for war reserve use.

Kansas City Plant

KCP has served as one of the nation's national security assets for more than 60 years. The facility is situated on 136 acres of the 310-acre Bannister Federal Complex. KCP and the General Services Administration (GSA) share the 2.6 million gross square foot Main Manufacturing Building that is now 67 years old. Of that, KCP has control of, or permit to use, approximately 2 million gross square foot of that space. There are approximately 1.1 million gross square foot of additional buildings space for a total of 3.1 million gsf of NNSA space.

Within the current space, KCP maintains the capability to develop, produce, and test a wide array of products ranging from semi-conductor electronics up to and including the safety and security components used to keep the nation's arsenal safe and secure. Production processes span the broad spectrum of electrical, mechanical and engineered material technologies. Significant products include Arming, Fuzing, and Firing systems, Lightning Arrestor Connectors, Specialty Cables, Structural Components, Detonator Components, Test Assemblies, Stronglink Mechanisms, Radars, Gas Transfer System Components, Elastomers, Desiccants, Foams, and other items including the tooling, gauging, and test equipment necessary to validate component integrity. This requires the maintenance of a diverse set of equipment, processes, trained production/technical staffs that engage all three design labs. Staff must interface and integrate with the labs to define a concept, collaborate to make it manufacturable and testable, and then develop and characterize a process that will reliably deliver the product in rate production while maintaining a robust quality pedigree.

The current site layout for KCP and GSA at the Bannister Federal Complex is shown on Figure D–17. The current facility is oversized for the range of anticipated future stockpile scenarios and is very costly to maintain because of its size and age. Approximately $185 million of deferred maintenance issues have been identified in the current facility as of FY 2010. However, KCP is currently undergoing an approved transition to consolidate, modernize, and relocate operations to a new green field site eight miles south of the current location. This transition, scheduled for FY 2014 completion, will cut the weapons operations footprint by greater than 50 percent while reducing the operating costs by approximately 25 percent.

Figure D–17. Current KCP Site Layout.

KCP also effectively utilizes the commercial sector to reduce the risk and cost of nonnuclear component supply. Over 300 commercial suppliers are utilized through a rigorous and graded qualification system to supply over 2,200 war reserve quality items for both end use and next assembly operations. Suppliers are continuously evaluated and graded to determine if the supply chain is robust or needs attention. KCP's broad-based interface to the commercial sector for weapon-quality sourcing is unique among the sites and requires strict adherence to export control regulations.

Sandia National Laboratories – Non nuclear

The SNL production program designs, manufactures, and procures technically complex, high reliability products in support of the nation's nuclear deterrence strategy in a highly integrated environment in support of NNSA, SNL's systems and sub-assembly organizations, and next-assembly production agencies including KCP and Pantex. SNL has the responsibility for the required design, manufacturing, testing, inspection, surveillance, and analytical simulation tools for critical non-nuclear core products that include:

1. In-House Production

   a) Neutron Generator--Active ceramics, neutron tubes, and neutron generator assemblies for all current and future stockpile systems.
   b) Microelectronics—Trusted radiation-hardened integrated circuits and microelectronic systems, including analog and digital Application Specific Integrated Circuits (ASICs) and MEMS devices.
   c) Power Sources--Thermal batteries for all current and future stockpile systems.
   d) Systems-- Parachutes and cone ballast.

2. External Supplier Responsibility

   a) Explosives Components—Actuators, ignitors, primer plates, spin rocket motors, timers, detonators and mild detonating fuze.
   b) Power Sources—Double-layer hybrid capacitors, lithium batteries, silver-zinc batteries and thermal batteries.
   c) Microelectronics and Magnetics—Packaging of analog and digital ASICs, capacitors, clocks, coils, inductors, optoelectronic and microwave devices, resonators and transformers

In addition, SNL maintains the Weapon Production Primary Standards Laboratory for the nuclear weapons complex.

Key Facilities

Development, production and testing facilities required to sustain essential capabilities and support for the non-nuclear production workload consist of three facilities at KCP and seven facilities at SNL as shown in Table D–11.

Table D–11. Key Facilities For Non-Nuclear Production and Supporting ST&E.

Key Facilities for Non-nuclear Production and Supporting ST&E	
Facility Name	Facility Function
Manufacturing Building 1 (KCP) 2M ft^2	Houses over 90 manufacturing process capabilities including precision machining, electronic assembly and fabrication, mechanical assembly, tooling, test equipment, and secondary processing such as paint and heat treat. Also houses Kinematic Test Cells (Shock and Linear Acceleration Testing)
Polymer Building 15 (KCP) 19,000 ft^2	Polymer and Engineered Material Development and Production
Manufacturing Support Building (KCP) 143,000 ft^2	Analytical Laboratories and Thermal and Vibration Environmental Testing
MESA Micro-fabrication and Micro-electronics Development Lab (SNL)	Radiation hardened integrated circuits development and fabrication; MEMS development and fabrication
Neutron Generator Production Facility (SNL)	NG production
Neutron Generator (NG) Support Facility (SNL)	Bonded storage support for NG
Explosive Component Facility (SNL)	Support design, development, and life cycle management of all explosive components outside the nuclear package
Building 894 Production Dry Room (SNL)	Thermal battery and other component development and production
Building 860 Environmental Test Lab (SNL)	Environmental testing and diagnostics supporting development, qualification, and assessment of non-nuclear components
Weapon Production Primary Standards Laboratory (SNL)	Responsible for metrology oversight, certification of standards, and development of new standards and proficiency testing for the NNSA

Future State

In general, the future infrastructure needs for non-nuclear production are being well planned and executed for both KCP and SNL. The SNL MESA facility requires recurring recapitalization to maintain a viable trusted foundry for strategic radiation hardened microelectronics. This involves electronics tooling and unique support systems. The cost of MESA recapitalization is currently undergoing analysis. SNL's other baseline infrastructure needs are described in the Ten Year Site Plan.

KCP is executing a major project to replace the current infrastructure with a new, smaller, highly reconfigurable facility, known as the Kansas City Responsive Infrastructure, Manufacturing and Sourcing (KCRIMS). The KCRIMS project estimates a cost savings over the current model and is sized for sustainment of critical capabilities at minimal capacity. The KCRIMS driven adoption of commercial style processes, enabled by a revised NNSA oversight model, has already reduced the cost of non-nuclear production by over $160 million. Finally, because the new facility will be leased, there will be no initial capital investment and NNSA will not be burdened by costs for legacy disposition should the mission ever be discontinued. The savings and costs associated with the KCRIMS transition are fully integrated into the existing NNSA budget profile.

KCP is using KCRIMS to define a path forward to be able to meet NNSA transformational goals and will support scenarios derived from the 2010 NPR. The KCRIMS project has implemented a strategic sourcing and sizing plan that retains engineering and development expertise in the following technologies internal to KCP:

- Machining and Gas Transfer Systems
- Assembly and Electrical Fabrication
- Special Material (Polymer) Production
- Rubber and Plastics Manufacturing
- Paint and Heat Treat
- Refurbishment and Dismantlement
- Test Equipment, Tooling, Gauging, and Metrology
- Environmental and Analytical Laboratories

In addition, scientific and technical expertise is being retained to support commercialized technologies and a supply base of approximately 300 qualified vendors.

The continued support for production and process engineering is critical to be able to understand and support the development of manufacturable, testable, and cost effective non-nuclear components and processes in support of any future stockpile scenario. This includes specific areas such as material sciences, electro-mechanical product, microelectronics, and structural components. This knowledge and capability is essential to the ultimate understanding of the long term behavior and reliability of the weapon system.

Planned Actions

SNL MESA fabrication capabilities are previously discussed in Section 2A.

For the KCP, the NNSA will lease from GSA a new facility that provides an agile and modern manufacturing plant with greater than 50 percent reduction in weapons operating space from the current KCP facility, see Figure D-18. The new facility is expected to be operational in FY 2014. This will allow much more flexibility to meet the needs of the 2010 NPR making it almost insensitive to weapon type requirements.

Relocation will be performed over an 18-month period with no capability expected to be out of service more than 90 days. Inventory of build-aheads are being executed so that schedule deliveries and supply chain continuity are planned to be maintained throughout the relocation period. In many cases, the process capabilities will be maintained in the legacy facility until the new capability is operational at the new site. The move of product currently in production will require requalification in the new facility which is also being planned into the relocation schedule and budget.

Changes to the KCP governance model have already commenced and will be enhanced as the new facility is brought on line. Governance model changes have benefited the NNSA with a significant reduction in indirect support costs since initial implementation began in FY 2007.

Kansas City Responsive Infrastructure, Manufacturing and Sourcing (KCRIMS)

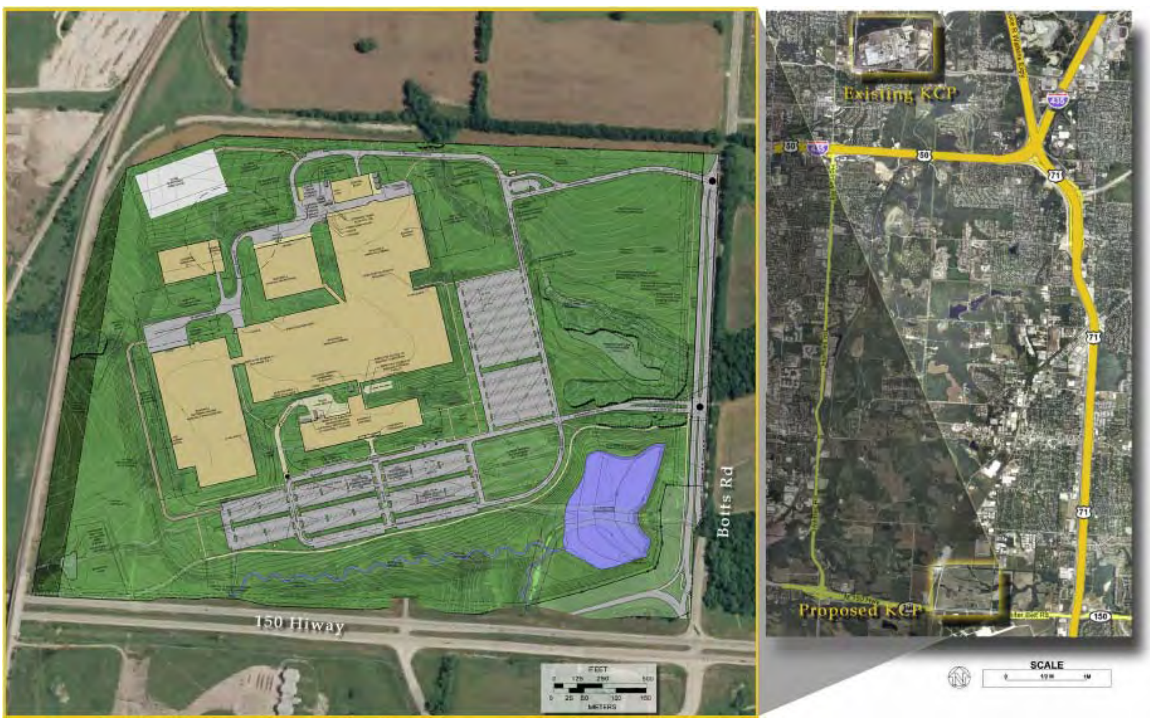


Figure D–18. KCRIMS New Facility Site Layout.

The KCRIMS transformation of nonnuclear production at the KCP utilizes strategic sourcing, business process transformation enabled by a revised governance model, and relocation to a new, smaller, flexible facility to save NNSA $100 million in annual operating costs and reduce footprint by more than half. The new facility will be LEED Gold certified and reduce carbon based energy consumption by over 50 percent. The mission critical facility supports all active weapons programs, dismantlement of legacy programs, and all major life extension programs being contemplated. It also supports on-going surveillance and flight test obligations to support the stockpile.

The current KCP facility is 67 years old and has a relatively inflexible infrastructure requiring perpetual maintenance and repair. Costs for facility readiness alone total $120 – 150 million annually and deferred maintenance of the facility is projected to be approximately $240 million when relocation occurs to the new facility in 2014. The old facility model is not sustainable and consumes resources that should be expended on direct mission endeavors. In addition, KCP has implemented a revised NNSA oversight model that recognizes third party assessments and is enabling a major business process transformation to significantly reduce the cost of indirect support functions.

Implementation of the KCRIMS transformation began in FY 2006 and has CD-0 and CD-1 approval. An innovative approach to facility acquisition, utilizing a GSA lease of a privately developed facility has been approved and is enabling construction of the $750 million campus with no capital investment by the federal government.

Major milestones and budget requirements for the KCRIMS transformation are detailed in the KCP Ten Year Site Plan that is updated on an annual basis. Significant milestones include:

- 2010: Construction start of new campus
- 2010: Completion of KCRIMS related strategic sourcing
- 2012: Construction complete, relocation activities begin
- 2014: Complete relocation and begin disposition of old facility

Readiness in Technical Base and Facilities operating funds will relocate equipment, materials and personnel and provide final hookups to the building utility and security systems. The overall project, excluding legacy facility disposition, maintains positive cash flow through 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.

2.F. Savannah River Site – Tritium Facilities

Current State

The tritium mission of managing inventories and facilities for the complex is performed at Savannah River Site (SRS) in Aiken, South Carolina. There is a well established program within NNSA to produce tritium through irradiation services provided by civilian nuclear power (currently using Tennessee Valley Authority reactors). The mission consists of tritium extraction, loading tritium and non-tritium reservoirs, conducting reservoir surveillance operations, testing gas transfer systems, and performing tritium research and development functions to support operations. The tritium extraction capability has significant capacity and can meet the anticipated tritium supply. The majority of the infrastructure supporting this mission is relatively new with a few minor exceptions.

The Savannah River Tritium Operations occupy approximately 25 acres in the northwest portion of H Area, near the center of the 300-square-mile SRS. The DOE Environmental Management Program is the landlord for this site and NNSA is a tenant.

Other NNSA facilities will include Defense Nuclear Nonproliferation Programs' lead with the Mixed Oxide Fuel Fabrication Facility, Waste Solidification Building, and the potential Plutonium Disassembly and Conversion Projects.

Key Facilities

Tritium operations currently rely on eight key facilities listed in Table D-12.

Table D–12. Key Facilities for Tritium.

Key Facilities for Tritium	
Facility Name	Facility Function
Tritium Extraction Facility (TEF)	Extraction and remote handling facility
H-Area New Manufacturing (HANM)	Reservoir loading, reservoir unloading, GTS surveillance, GTS and process R&D, and gas stripping (SRS)
H-Area Old Manufacturing Facility (HAOM)	Receipt and inspection, assembly, finishing, surveillance and R&D
New Manufacturing Building - Material Test Facility	R&D and surveillance facility
Byproduct Facility	Helium-3 recovery and purification (SRS)
Reclamation Facility	Reservoir reclamation, GTS R&D and GTS surveillance facility
Savannah River National Lab (SRNL)	GTS surveillance, reservoir R&D, and process R&D

Future State

SRS Tritium Facilities will continue to occupy the current 25-acre site footprint, but the NNSA operating footprint shrinks by approximately 44 percent, driven by demolition of approximately 140,000 square feet of building space.

Planned Actions

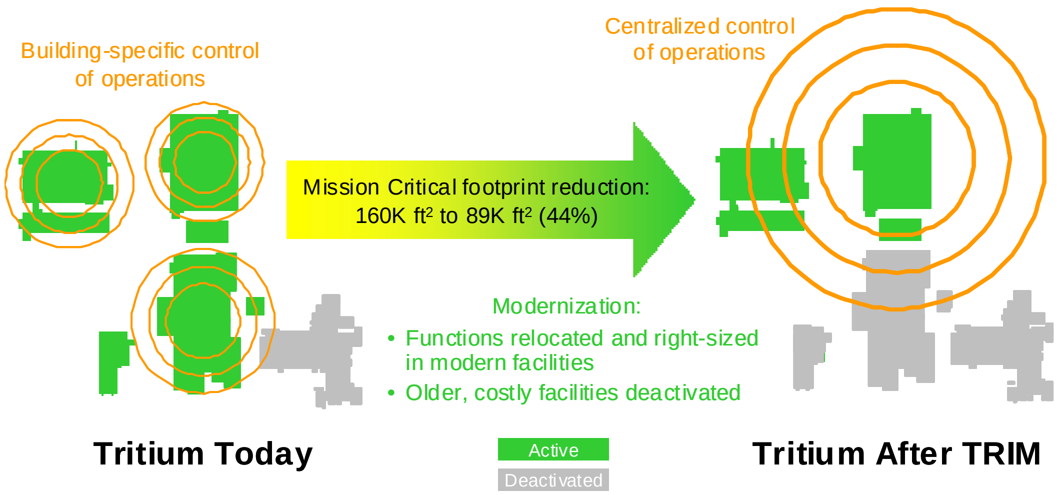
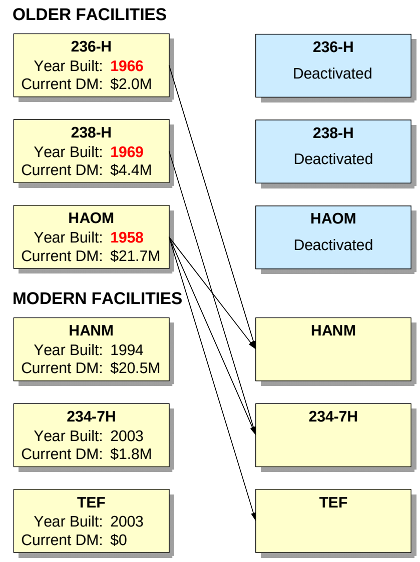


Figure D–19. Tritium Responsive Infrastructure Modifications (TRIM).

Savannah River Nuclear Solutions, LLC (SRNS) has developed a plan for its Tritium Programs, known as Tritium Responsive Infrastructure Modifications (TRIM), that is well-aligned with NNSA's current transformation objectives and any other foreseeable strategic direction in which Tritium missions endure. TRIM would provide initiatives to both strengthen the Tritium Programs business model and change the physical infrastructure. TRIM supports manufacturing of reservoir products and surveillance of gas transfer systems for all stockpile weapon systems, including LEPs. A high-level summary of the scope is provided below:

- Relocate and right-size remaining functions from the older facilities (41 to 52 years old) into the more modern facilities (7 to 16 years old)
- Cease reservoir reclamation
- Deactivate the older facilities
- Establish centralized control of operations
- Improve business processes



DM: Deferred Maintenance

HAOM: H Area Old Manufacturing facility

HANM: H Area New Manufacturing facility

TEF: Tritium Extraction Facility

Figure D–20. Relocation of Functions in Mission Critical Facilities.

TRIM would accomplish three major objectives:

1. Reduce the cost of operations	2. Reduce infrastructure vulnerabilities	3. Revitalize facilities for NNSA's enduring / new Tritium-related missions
• Consolidate capabilities • Implement newer technologies • Challenge potentially excessive requirements • Implement lean operations	• Close old, original facilities requiring excessive maintenance • Use Continuous Improvement tools to drive efficiency	• Create industrialized work flow • Modernize processes – Reservoir finishing – Byproduct purification

The project will be considered in the post FYNSP budget. The following is a summary of the benefits expected from TRIM:

- NNSA has an enduring Tritium mission. TRIM would provide suitable facilities that ensure continuous mission capability for the long term.
- TRIM is expected to provide efficiencies in annual operating costs.
- TRIM could reduce mission critical footprint up to 40 percent, and reduce the number of Hazard Category 2 and 3 facilities from 8 to 5, thereby reducing infrastructure vulnerabilities.
- Energy independence is a national priority. TRIM could reduce energy usage by up to 40 percent.

- TRIM would establish a modern working environment that instills pride and signals commitment to the business.

2.G. Nevada Test Site – Testing Facilities

Current State

The NTS provides the essential physical and operational infrastructure required to conduct high-hazard scientific, engineering, and other unique technical activities in support of national security requirements and emerging threats. Because the NTS is a unique asset, its mission is evolving to support Other Government Agencies (OGAs) in the areas of nonproliferation, treaty verification and counterterrorism while preserving its historical role within defense and nuclear weapons programs. The key facilities in Nevada currently support the following activities:

- Underground test readiness.
- Nuclear Explosive Operations (Sub-critical experiment assembly and disposition of anomalous U.S. weapon).
- Sub-critical experiments (experiments that mate HE to SNM to enhance weapon predictive performance capability and to support weapon certification), Dynamic Plutonium Experiments, and Dynamic Materials Properties Experiments (provide empirical data to support models for understanding material thermodynamic and constitutive properties).
- Treaty verification (Developing and exercising inspection/hosting team's protocols).
- Nuclear Material Staging.
- Criticality experiments (Criticality reactors moved from Los Alamos to NTS).
- Nonproliferation support to Department of Homeland Security (Detection equipment/techniques using actual nuclear materials).
- Training venues and instrumentation development for OGAs.
- First responder training (Use of radioactive nuclear testing artifacts and chemical releases).
- Counterterrorism training.
- Weapons incident response.
- Nuclear Testing Archives.

Historically, the primary mission of the NTS was to conduct nuclear weapons UGTs. Since the October 1992 testing moratorium, Presidential Directives require NNSA to retain the "readiness" or capability to conduct UGTs at NTS, if required, and to support the national laboratories nuclear weapon certification efforts under the SSP.

The NNSA mission at NTS conducts broad testing and diagnostic development programs in support of the national laboratories through underground sub-critical and dynamic material property experiments and via experiments on above-ground platforms that can generate extreme states of matter like those that exist in weapons. Some of these experiments involve combined HE and SNM, and are essential for the verification and validation of computer codes for predicting nuclear weapon performance. Execution of these experiments has the collateral benefit of helping to maintain readiness.

Key NNSA facilities in Nevada are presented in Table D-13. Support and staging for experiments at the NTS also is provided by off-site facilities at Livermore and Santa Barbara, California, and Los Alamos and Albuquerque, New Mexico.

Table D–13. Key Facilities for UGT Readiness and SSP Support.

Key Facilities for UGT Readiness and SSP Support	
Facility Name	Facility Function
Nevada Test Site	1,360 square miles of publically withdrawn land area and a unique collection of facilities meeting EIS requirements for conducting UGTs, high hazard experiments, and other activities in direct support of national security initiatives.
Device Assembly Facility (DAF)	Nuclear explosive operations in support of weapon dismantlement, treaty transparency, Broken Arrow disposition, dynamic material property experiments, SNM storage and criticality studies.
NTS U1A Complex	Tunnel complex 1000 feet underground with over 200k sq ft of space to support dynamic plutonium experiments (DPEs) critical to weapon certification. Capable of SNM staging and expansion under static security umbrella. Only U.S. facility currently authorized to expend Plutonium to the underground environment.
Joint Actinide Shock Physics Experimental Research (JASPER)	Two stage gas gun used in explosive shock physics experiments in the study of both radioactive and non-radioactive materials phase change.
High Explosives Facilities: (Baker Compound and the Big Explosives Experimental Facility (BEEF))	BEEF is an outdoor experimental facility with permanent diagnostic and recording capability capable of HE experiments of over 70,000 lbs. Baker is an HE and SNM storage and assembly facility.
North Las Vegas Facilities Complex	Houses one of a kind facilities for design, engineering, diagnostic development, testing and calibration, hazardous material machine shop, UGT training and twin tower for UGT rack assembly/testing and instrumentation installation.
Control Point Complex	Supports operations in remote experimental timing and firing, data gathering, warehousing, emergency facilities, critical communications, and command and control functions for UGTs and other experiments.
Dense Plasma Focus (DPF)	Pulsed neutron, Gamma, and X-ray source for evaluation and calibration of modern diagnostic systems and for studying High Energy Density Laboratory Plasmas.

NTS occupies approximately 1,360 square miles in southern Nevada. A large portion of the NTS (~960 square miles) is designated as non-mission critical supported by limited corrective maintenance and replacement of failed equipment if necessary. The remaining portion of the NTS (~400 square miles), which includes the key UGT Readiness and SSP experimental facilities is routinely maintained, but with reduced requirements and increasing deferred maintenance.

Future State

The Nation's ability to establish a large land withdrawal to conduct unique and high hazard experimentation programs in the future is very limited. Therefore, maintenance of the NTS and its key facilities is necessary to ensure the Nation a logical site for experimental requirements of national security laboratories and OGAs, and assures some baseline capability remains to support UGT readiness.

The DOE EM Program will maintain a presence on NTS, in perpetuity, to monitor migration of radionuclides from legacy UGTs. OGAs will continue to utilize established training venues that take advantage of remote and highly secure land and facilities.

The designated non-mission critical portion of the NTS (~960 square miles) will continue to be maintained with limited corrective maintenance and replacement only if necessary. The remaining portion of the NTS (~400 square miles), which includes the key experimental facilities will be maintained.

The NTS offers a number of unique capabilities found nowhere else in the country. It is one of the only U.S. locations where weapons-quantities of nuclear materials can be brought out into the open to test nuclear detectors for deployment at our nation's borders. It has the facilities to train national and international inspectors on critical nuclear assemblies. It is one of the few continental U.S. locations with a legacy of many surface and underground nuclear experiments. Consequently, it is a unique place where first responders can be trained in an actual radiological environment such as they might encounter following a nuclear detonation or a dirty bomb attack. It remains the only environmentally designated and secure U.S. location where SNM can be expended into the environment.

Planned Actions

Investments in NTS infrastructure maintain the viability of the NTS to support ongoing SSP program activities.

The following would retain a viable capability to perform a UGT if needed:

- Sub-critical experiments with SNM (U1A): 1-2 per year.
- Material property experiments and diagnostics experiments at U1a, BEEF and JASPER (monthly), and
- Other weapon science experiments at above-ground platforms that create and study extreme states of matter daily to weekly.

The long-range strategy and vision is to continue providing the NNSA with a safe, secure, and cost-effective environment to conduct high-hazard experiments. Additionally, the NTS must anticipate and be prepared for future use of the facility and develop long-term innovative approaches and activities that will increase its marketability to potential other governmental agency clients to offset cost.

Part of the strategy toward meeting this objective is to reduce the cost of maintenance by implementing the following actions:

- Optimize the use of time in the field (e.g., combining similar activities and taking advantage of lockout/tag out to conduct multiple activities) and simultaneously minimize operations downtime.

- Continue the current strategy of limited corrective maintenance for non-key facilities and equipment replacement only if necessary.

- Extend preventative maintenance frequencies as appropriate but limit predictive maintenance.

- Consolidate and replace smaller (older) facilities.

- Identify ways to reduce required labor; and.

- Propose specific investment projects to sustain and improve existing facility and infrastructure in order to attract new missions.

NTS will support global nuclear security initiatives as follows:

- Arms Control Treaty Verification

  - Develop, test, and train on new arms control verification technologies
  - Support an international data center for verification and confidence building
  - Expand potential for expansion to climate treaty verification technologies

- Nonproliferation / Counterterrorism Test and Training

  - Develop, test, and train on technologies to find and neutralize weapons of mass destruction
  - Demonstrate improved ways to deal with terrorist nuclear device
  - Encourage multi-agency, possible international participation

- Nuclear forensics

  - Exercise the equipment and methods to be used in a real event

The long-term objectives of NTS will be steered by broad sets of appropriate subject matter experts and interagency representatives to establish functional and operational requirements for experimental facilities and venues to support global nuclear security.

2.H. Secure Transportation Facilities

Current State

Transportation of nuclear weapons, nuclear weapon components, and other special nuclear materials of national security interest is an essential element of support for the SSP. The Secure Transportation Asset (STA) program provides this critical support by ensuring 100 percent of shipments for the weapons complex and military installations are completed safely and securely, without a compromise/loss of nuclear weapons/components or a release of radioactive materials. STA supports NNSA, DOE, and other federal agencies responsible for transportation of nuclear materials requiring the highest levels of security and safeguards.

Key Facilities

Key facilities and infrastructure include:

- Special Transportation Fleet – STA executes convoys using specialized trailers and escort vehicles. The Safeguards Transporter trailers and escort vehicles are specially engineered to protect the contents and ensure the public's safety.
- Classified Fleet Maintenance Facilities – Vehicles and trailers require "no failure" maintenance and systems testing in special facilities before each convoy mission.
- Transportation Command and Control System Infrastructure – STA utilizes satellite and relay stations to monitor and control convoys throughout the continental United States. Convoys are in constant communication with the Transportation and Emergency Control Center at Albuquerque, New Mexico.
- Aviation Fleet – STA also manages aviation assets supporting Limited Life Component Exchange, Nuclear Weapons Incident Response programs, Federal Agent transportation, and special cargo movements by air. The fleet consists of large fixed wing aircraft, one Learjet 35 and two Twin Otters.
- Training Venues – Federal Agent training requires specialized and remote facilities for emergency and tactical operations scenarios. A permanent facility is maintained at Fort Chaffee, Arkansas, with a satellite facility in Nevada.
- Support Facilities -- STA maintains separate facilities across the country to support communications, training, logistics, mission operations, and management oversight. Facilities are located in New Mexico, Texas, Tennessee, Maryland, Kansas, Idaho, South Carolina, Nevada, and Arkansas.

Key STA facilities are shown in Table D–14. (Note: In some cases, facilities addressed in this table will also appear in other organization's tables as facilities under their jurisdiction.)

Table D–14. Key Facilities and Infrastructure.

Key Facilities and Infrastructure	
Facility Name	Facility Function
STA Field HQ	Support base for all oversight and administrative functions.
Federal Agent Facilities	Support base for convoy operations along with unit training and administrative support.
Vehicle and Mobile Electronics Maintenance Facilities (VMF/MEMF)	Inspects, maintains, and prepares the mission and training fleet for convoy operations (various locations).
Relay Station Facilities	Supports the communication linkage between the TECC and convoys (various locations).
Emergency Operations Center	Support to NNSA emergency response situations.
TECC and Alternate TECC	Command and control communications with convoys.
Satellite training facility (includes barracks)	Supports large-scale collective training for convoy and firing range operations.
Permanent training facility (includes dorms)	Supports the initial 18-week training for new Agents, specialized tactical training, and the logistical base for STA.
Vehicle/Trailers production/refurbishment	Supports new production, modifications, and upgrades to the fleet.
Electronics Systems Depot	Supports storage of mission critical electronic parts and systems.
Aviation Hanger	Supports maintenance and staging for air operations.

Future State

Over the past eight years, STA has increased its Federal Agents, updated facilities, and deployed new technologies to achieve the required mission capacity of 118 convoy mission weeks. Currently, funding levels have been requested to sustain the current STA capacity, achieve a steady-state replacement life-cycle for the convoy vehicles, replace and recapitalize ageing aircraft, modernize the tactical command and control system with a state-of-the-art integrated system, and update the remaining facilities through the Future Years Nuclear Security Program.

A closer look…………………………………….

Transporting the nuclear weapons throughout the NSE is vital to support mission operations. The current fleet, expertly trained resources, and facilities can be managed to support the future workload with standard life cycle maintenance and replacements. There are plans to construct a replacement facility for the STA headquarters which will consolidate and recapitalize facilities.

Planned Actions

Table D–15 shows one-time capital investments required to achieve the future state. Investments to reduce facility deferred maintenance costs are not included in this table.

Table D–15. Key Facility and Infrastructure Refurbishment and Replacement For Transportation.

Key Facility and Infrastructure Refurbishment and Replacement For Transportation		
Category	Name	Refurbishment/Replacement Project
Facility Construction	Service Center	New Mexico HQ – Replacement of deferred maintenance facilities that are co-located with the NNSA Service Center.
Facility Construction	New Mexico Vehicle Maintenance Facility/ Mobile Electronics Maintenance Facility	Refurbishment and relocation of facilities so that they are adjacent to mission operation facilities.
Infrastructure Replacement	Aviation DC-9	Replacement of DC-9 aircraft which are at the end of their planned life cycle.
Infrastructure Replacement	Armored Tractors	Life cycle replacement of tractors with the next generation of technology enhancements.
Infrastructure Replacement	Escort Vehicles	Life cycle replacement of vehicles with light-chassis and heavy-chassis platforms.
Infrastructure Replacement	Command and Control Systems	Refurbishment/replacement of C5ISR (Command and Control, Communication, Computers, Cyber, Intelligence, Surveillance and Reconnaissance) following an approved Implementation Plan.

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3. Intellectual Infrastructure – Workforce

3.A. Current State

Maintaining the right mix of skills as the NNSA mission evolves and as the federal and contractor workforce ages is a significant human capital management challenge. As the United States moves to reduce the role and numbers of nuclear weapons, the reliability of each weapon becomes even more critical, and the facilities, programs, and personnel devoted to guaranteeing that reliability are essential. Further, this nuclear complex strengthens the ability to understand technical problems associated with verifying even deeper arms control cuts and substantially supports defense initiatives such as nuclear forensics and attribution. Expert nuclear scientists and engineers can help improve the understanding of foreign nuclear weapon activities, which is critical for managing risks.

Critical Skills and Capabilities

A critical skill is the ability to apply important or unique knowledge and abilities essential to the mission. The critical nature of the skill can be subjective, but it usually stems from a longstanding difficulty in developing and sustaining the skill with regard to challenges in training, recruitment, or retention. A critical skill requires expert and skeptical judgment trained and honed in the development, application, and assessment of nuclear weapon process tools to differentiate the reasonable use of information from unfounded conjecture or simply erroneous conclusions. This is the essential ability underpinning nuclear weapon problem solving, agility, and quality.

A critical capability is more general than a skill; it is an essential mission-related expertise. In many cases, the expertise supports a tool, a process, a component, and a material. Tangible assets, such as test facilities and advanced scientific computing platforms or intellectual capital such as nuclear weapon simulation codes, are prized NNSA possessions but cannot be considered a capability since they require knowledgeable staff to maintain and operate them. It is the integrated physical and intellectual assets combining the expertise in employing the code, or the expertise in running experiments at the test facility that establishes a capability. Physical Infrastructure is discussed elsewhere, so the NNSA intellectual infrastructure is presented here within this integrated context of capabilities.

The Critical Capability Challenge for the Nuclear Weapons Complex

NNSA produces some of the world's most complex high-reliability and high-consequence products in a high-security environment. Many technologies (such as stronglinks and gas reservoirs) and materials (e.g., plutonium and tritium) are unique to the nuclear weapon mission. Transitioning even a commercially-equivalent role (a forklift operator, for example) to perform the same tasks on nuclear weapons requires that the individual first be a U.S. citizen, be vetted in a human reliability program, and be trained adequately to mitigate the risks involved in handling these high-consequence products.

From its beginning, the NNSA attracted the best and brightest minds to its world-class laboratories and production plants. The combination of a clear and important mission, competitive pay and benefits, access to the most advanced laboratories with the finest equipment, and daily interaction with peers who routinely rank among the world's most respected in their fields served to provide the prestige, opportunity, and purpose essential to attracting and retaining the best scientists and engineers. Likewise, the nonexempt contractor workforce embraced the mission and built an infrastructure and deterrent capability that has endured for half a century. However, a number of developments over the past two decades are affecting that superior workforce. National recognition of mission importance diminished and facilities and infrastructure have declined. The attraction for hiring or remaining in the NNSA has eroded.

The Weapons Activities M&O contractor workforce today is less than a half of its 1990 size. The initial reduction was due to consolidation of sites (the elimination of Rocky Flats, Mound, and Pinellas) and the termination of plutonium and tritium production. The subsequent decade of stability 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.

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."

The Current State of Intellectual Infrastructure

Although stressed, the NNSA remains capable of surveilling, maintaining, and assessing the U.S. stockpile as a safe, secure, reliable, and effective nuclear deterrent. The concern about human capital revolves around the lack of robustness and intellectual depth of the contractor workforce: cross training opportunities have been limited due to decades of contraction in budget but not work scope, leaving little or no redundancy in the contractor workforce. An additional complication has been uncertainty over the future direction of nuclear policy, a situation that has been resolved with the publication of the NPR.

NNSA and its M&O contractors recognize these issues and are proactively encouraging the development of the next generation contractor workforce. Each entity is concerned with the loss of critical knowledge and has developed a site-specific strategy for critical skills and for the recruiting, training, and retention of 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.

3.B. Future State

The nation requires the nuclear weapons complex to maintain an enduring suite of critical skills and capabilities to assure the safety, security, reliability, and effectiveness of the nuclear stockpile, even as the nation reduces the numbers of warheads and decreases reliance on nuclear weapons. The NNSA approach to achieve this core intellectual infrastructure is to rebalance from the Cold War era "capacity-sized" approach into a "capability-based" complex.

In this new NNSA, skills, tools, and facilities will be retained and honed through performing real work in stockpile maintenance that exercises all essential capabilities of the complex. The baseline stockpile modernization program guiding this effort includes LEPs for the W76-1 submarine-launched ballistic missile warhead, the B-61 gravity bomb, and future LEPs as needed to sustain the evolving nuclear deterrent. The capacities required by the recommended future stockpiles in the NPR can all be accommodated within the planned capability suite.

The Transition Path Forward

Numerous critical skills studies have been conducted over the last decade which record the advancing age of the NNSA federal and contractor workforce and the growing concern over the ability of the complex to attract and retain qualified and skilled replacements. Increasing burdens associated with regulatory compliance, the lack of national focus for the nuclear weapon program, and the prospect of continuing reductions in benefits will make it more difficult to sustain traditional low NNSA turnover rates. Meeting these challenges, in concert with the growing concerns over the aging stockpile, places a high premium on intellectual excellence and the need to attract and retain the next generation of scientists and engineers. Our future requires:

- An emphasis on the integration of science into product;
- A commitment to product realization and quality through an expanding reliance on computation and simulation, supported by a strong experimental test basis;
- An environment where design and qualification employ new tools, new technologies, and a deep scientific understanding of our core products;
- Challenging work that enhances competency development and teamwork along with product realization;
- A sense of excitement and excellence that is self-evident to the existing, new, and pipeline federal and contractor workforce, to the Department of Defense and other nuclear security customers, to Congress, and internationally to both our allies and adversaries, serving as the foundation of the U.S. nuclear deterrent.

The ongoing pipeline and intellectual infrastructure assessment and management activities described above will continue and be expanded to transition the federal and contractor workforce from the Cold War capacity-based complex to the capability-based NNSA of the future. Workforce transitions, based on the improved understanding from these assessments and evolving implementation approaches based on impact metrics are needed. Some examples suggested to date include:

- Comprehensive critical skill enterprise modeling is needed. Its purpose is to provide a tool to respond to internal and external queries regarding the state of critical skills; evaluate and make better informed decisions on actions that impact critical skills and replace reactive skill management with a proactive, predictive approach.

- Contractor workforce supply and demand assessments for critical functions and forecast attrition of mission-critical occupations should be expanded. Reestablish the NNSA workplace incentives that declined over the past two decades with competitive salary and benefits, upgraded tools and facilities, and a demonstrated commitment to pursue world-class science, technology, engineering, and manufacturing.

- Expand the U.S. citizen population entering university science and engineering programs.

- Implement succession planning for all identified critical skills.

Approximately one third of NNSA's federal workforce is eligible to retire in the next five years. NNSA workforce analysis projects that, while not all those eligible for retirement will actually leave, one quarter of the federal workforce will depart in that period. To address this talent loss and ensure that the necessary competencies exist to meet our needs in the future, NNSA actively utilizes a couple of intern programs.

- The Future Leaders Program was developed in 2004 and each class has 30 interns. The two year entry level program is designed to develop the talent that will eventually replace retiring employees in key and mission critical positions. The recruitment into the program is based on projected vacancies. Applicants must have a Bachelor's degree or Master's degree in engineering or science or a Master's degree in business administration or security disciplines. Through a variety of training and development activities, participants develop both leadership and technical competencies.

- The Federal Government has always looked to educational institutions to find candidates who have the skills needed to meet its future employment needs both in the technical and non-technical areas. The Student Career Experience Program (SCEP) is an entry level program consisting of a pool of talented and highly qualified students that have the potential of being converted to permanent federal appointments upon completion of their education and work requirements. SCEP provides NNSA managers the opportunity to evaluate students' performance in real time work situations and to ascertain, based on the students' abilities, whether the student should be place in a permanent federal position.

Summary: Nuclear Weapons Intellectual Infrastructure

As the United States moves to reduce the role and numbers of nuclear weapons, the need for a world-class NNSA federal and contractor workforce becomes even more crucial. Maintaining the right mix of skills as the NNSA mission evolves and as the workforce ages is a significant human capital management challenge. The present state of critical skill and capability understanding, modeling, and thoughtful preparation for the future is not adequate, and requires immediate and sustained attention and support. The level of effort required is daunting, but further delays are no longer an option. As mature and experienced staff retire, a comprehensive capabilities review, coupled with subsequent implementation of a suite of actions to sustain core capabilities, are crucial to meet the demands of tomorrow.

4. Budget

This section is in response to:

> 50 USC Sec 2455(b)(2)(C). The estimated levels of annual funds the Administrator determines necessary to carry out the program, including a discussion of the criteria, evidence, and strategies on which such estimated levels of annual funds are based.

4.A. Next 5-Years – Future-Years Nuclear Security Program

Current Funding

The DOE and NNSA have the mission to strengthen the nation's security through the military application of nuclear science and to reduce the global threat of terrorism and weapons of mass destruction. The program and resulting budget structure to support this mission is shown in Figure D–21. 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.

The FY 2011 budget request represents a renewed path forward for sustaining the nation's nuclear deterrent. The FY 2011 budget request reflects a stockpile management program investment strategy consistent with the challenge of a: (a) transitioning to a smaller nuclear stockpile that remains safe, secure, and effective without underground nuclear testing; (b) strengthening the NNSA science, technology, and engineering base; (c) modernizing the physical infrastructure; and (d) streamlining NNSA's physical and operational footprint.

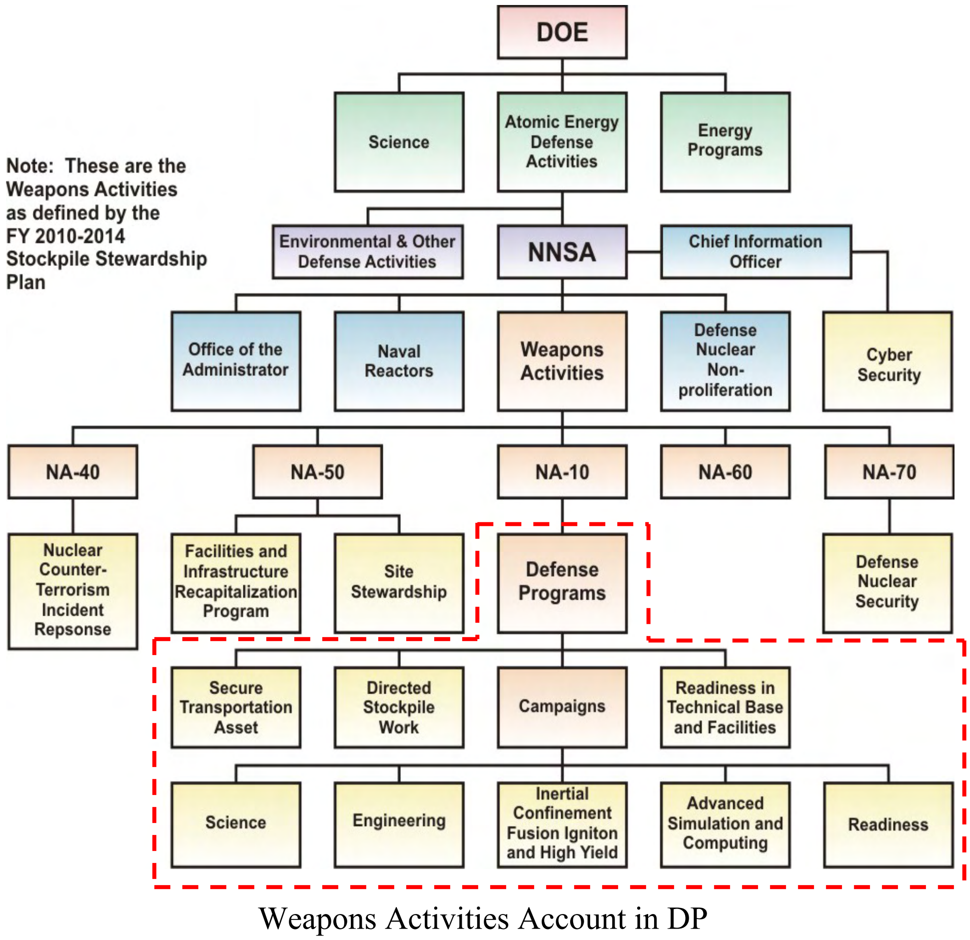

Figure D–21. Current DOE and NNSA Weapons Activities Budget Structure.

Table D–16. Organizational Responsibilities that Comprise the Stockpile Stewardship Program in the Weapons Activities Account Budget.

	Office of Defense Programs (NA-10)	Office of Emergency Operations (NA-40)	Office of Infrastructure and Environment (NA-50)	Office of Management and Administration (NA-60)	Office of Defense Nuclear Security (NA-70)
Weapons Activity Responsibilities	- Nuclear stockpile - Science, technology, and engineering base - Operation of NNSA sites - Major facility construction - Secure transportation	- Nuclear emergency response - Nuclear forensics - Nuclear counter-terrorism	- Reduction of deferred maintenance and disposition of surplus facilities. - Minor facility construction - Environmental compliance - Nuclear materials integration	- Federal staff and oversight	- Physical security for NNSA sites - Information security - Personnel security - Material control and accountability
Percentage (%) of Weapons Activities in FY 2011 Budget Request	81.7%	3.3%	2.8%	2.0%	10.2%

Within NNSA, the Office of Defense Programs (NA-10) leads the direct mission work that provides the stockpile products and sustains infrastructure functional capabilities most directly applicable to related functional objectives stated in the Nuclear Posture Review, as shown in Table D–16. As noted previously, the Weapons Activities budget elements used for program formulation and cost reporting do not directly align with infrastructure functions and capabilities. Table D–17 provides a mapping of major budget elements with infrastructure functions and capabilities that are the focus of this report.

Table D–17. Mapping of Budget Elements with Infrastructure Functions/Capabilities.

Weapons Activities Budget Element	Budget Sub-element	Function/ Capability Supported by Budget Element
Directed Stockpile Work	Life Extension Programs	Specific design, certification, R&D, production, and support work that can be directly attributed to a life extension for a given warhead (e.g., costs attributed by tail number).
	Stockpile Systems	Specific design, certification, R&D, production, and support work that can be directly attributed to activities to maintain a given warhead (e.g., costs attributed by tail #).
	Weapons Dismantlement and Disposition	Specific laboratory and production work that can be directly attributed to activities to dismantle and disposition a given warhead (e.g., costs attributed by tail number).
	Stockpile Services	Specific laboratory and production work that cannot be directly attributed to a given warhead (by tail number). This includes: - Certification and safety R&D - Surveillance - Plutonium, uranium, HE, non-nuclear components, and assembly/disassembly production support base
Campaigns	Science	Design, Certification, Testing, Surveillance, and ST&E base: Science Tasks.
	Engineering	Design, Certification, Testing, Surveillance, and ST&E base: Engineering Tasks.
	Inertial Confinement Fusion	Design, Certification, Testing, Surveillance, and ST&E base: High Energy Density Physics Tasks.
	Advanced Simulation and Computing	Design, Certification, Testing, Surveillance and ST&E base: Computer Modeling and Simulation Tasks.
	Readiness	- Tritium - Production ST&E Base
Readiness in Technical Base and Facilities	Operations and Maintenance	- Operations and maintenance of facilities - Storage - Material recycle and recovery - Containers
	Construction	Major facilities and general construction (e.g., plutonium, uranium, and HE).
Secure Transportation	Operations and Equipment	Transportation.

Figure D–22 reflects the FY 2010 appropriated and President's FY 2011 requested funding for budget elements in the Weapons Activities Account.

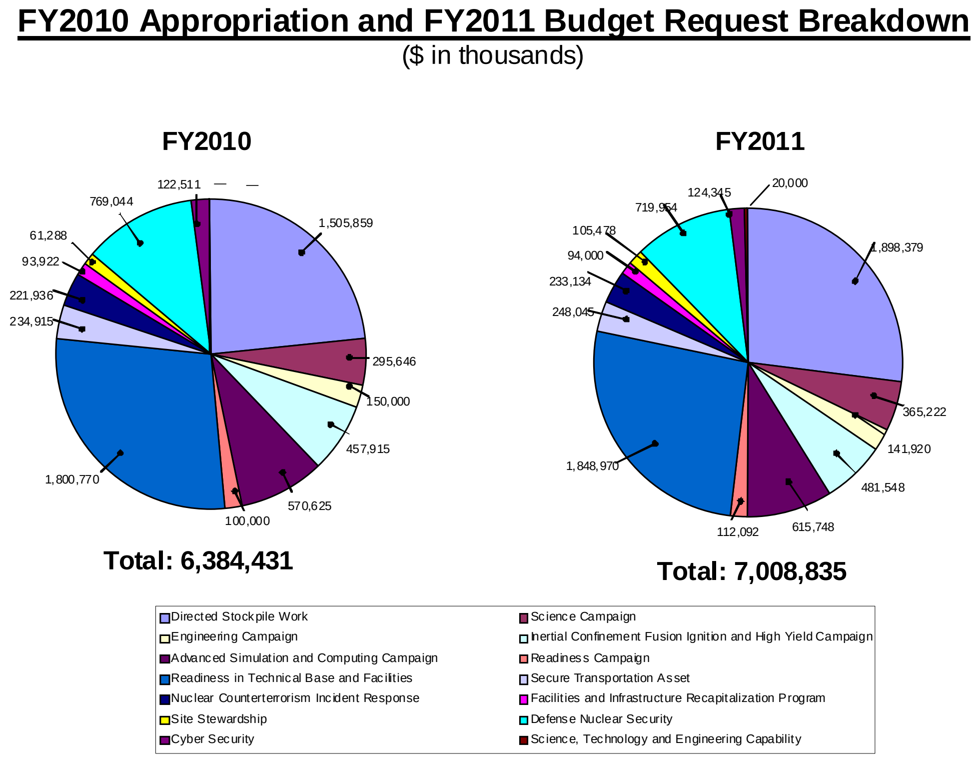

Figure D–22. FY 2010 Actual and FY 2011 Request by Budget Elements in the Weapons Activities Account.

The FY 2011 President's Budget request for Weapons Activities is based on the strategies in the 2010 NPR. The President's budget submittal sustains key Defense Programs options and initiates known elements in support of the NPR.

History and Background on NNSA Weapons Activities Costs

Over the past two decades, the U.S. nuclear weapons stockpile has significantly decreased in both size and quantity to meet post-Cold War requirements. During this time, thirteen weapon systems have been retired and total stockpile quantities have dropped to 25 percent of their 1991 total. In addition to a shrinking stockpile, the number of sites and square footage of buildings and structures within the nuclear weapons complex have been reduced by nearly 50 percent. The following summarizes historic events.

- Most of the early reduction in number of sites and square footage of facilities was achieved through stoppage of new manufacturing of SNM. Existing supplies of plutonium and HEU were deemed adequate for the smaller stockpiles of the future. The primary material manufacturing sites (e.g., Hanford, Fernald, K-25 at Oak Ridge, most of the SRS) were removed from the Weapons Activities budget and turned over to DOE, Office of Environmental Management for cleanup.

- In the 1990's, the second reduction in number of sites and square footage of facilities was achieved through consolidation of manufacturing activities and closure of additional sites (e.g., Mound Plant in Ohio and Pinellas Plant in Florida). Manufacturing of plutonium components was suspended at the Rocky Flats Plant in Colorado in 1989 for environmental reasons and restart efforts were terminated in the early 1990's because of the lack of a near-term demand for plutonium pits. By 1996, the closed manufacturing sites were removed from the Weapons Activities budget and turned over to DOE, Office of Environmental Management for cleanup.

- Starting in the 1990's, NNSA made large investments in laboratory science-based facility infrastructure to provide tools needed to meet the challenges of maintaining the nuclear weapons stockpile without underground testing.

- More recently, NNSA has requested an increase in the investment in the remaining production facilities to address safety, security, economics, and reliability, and long-term budget concerns posed by aging buildings that have served well beyond their designed and viable economic lifetimes.

It is also important to note, that while there continues to be a reduction in the size of the stockpile, the costs on a per unit basis have increased for sustaining the stockpile and maintaining its reliability and safety because of uncertainties in the effects of stockpile aging, new safety, security, and environmental requirements, and inflation. NNSA is required to:

- Sustain the safety and reliability of the stockpile without the use of underground nuclear testing. Prior to 1992, UGT was the primary tool for certification of nuclear weapons,

- Maintain the security of SNM at much higher levels of protection than were in place before September 11, 2001,

- Maintain safe operations in compliance with evolving national standards in aging facilities that were never designed with modern safety requirements and "design-for-safety" approaches in mind, and

- Respond to regulatory requirements as the nation's environmental, safety, and health sensitivity has increased and risk management practices have become more compliance-driven.

4.B. Post Future Year Nuclear Security Plan – Twenty Year Projections

The strategy laid out by the President and reflected in the NPR 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 UGT. These policy directions allow the NNSA to plan for the future nuclear security infrastructure. The most significant achievements will be the completion of the UPF and CMRR-NF, along with the steady accumulation of scientific confidence attained in the Predicative Capability Framework. NNSA does not project significant reductions or increases in the federal or contractor workforces or in workforce composition, although there should be cost savings as consolidation at some sites of the complex reduce security related expenses, such as the sizable reduction in security footprint planned at Y-12.

	FY 2011 Congressional Budget					FYNSP + 5				
Fiscal Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Directed Stockpile Work	1.898	1.901	1.999	2.240	2.346	2.4	2.5	2.5	2.4	2.5
Science Technology & Engineering Campaigns	1.737	1.732	1.716	1.717	1.731	1.9	2.0	2.1	2.2	2.3
Readiness in Technical Base and Facilities	1.849	1.873	1.841	1.927	1.998	2.5	2.7	2.7	2.4	2.2
Other Weapons Activities	1.525	1.527	1.525	1.517	1.573	1.6	1.7	1.7	1.7	1.8
(dollars in billions) Total	**7.009**	**7.033**	**7.082**	**7.401**	**7.648**	**8.4**	**8.9**	**9.0**	**8.7**	**8.8**

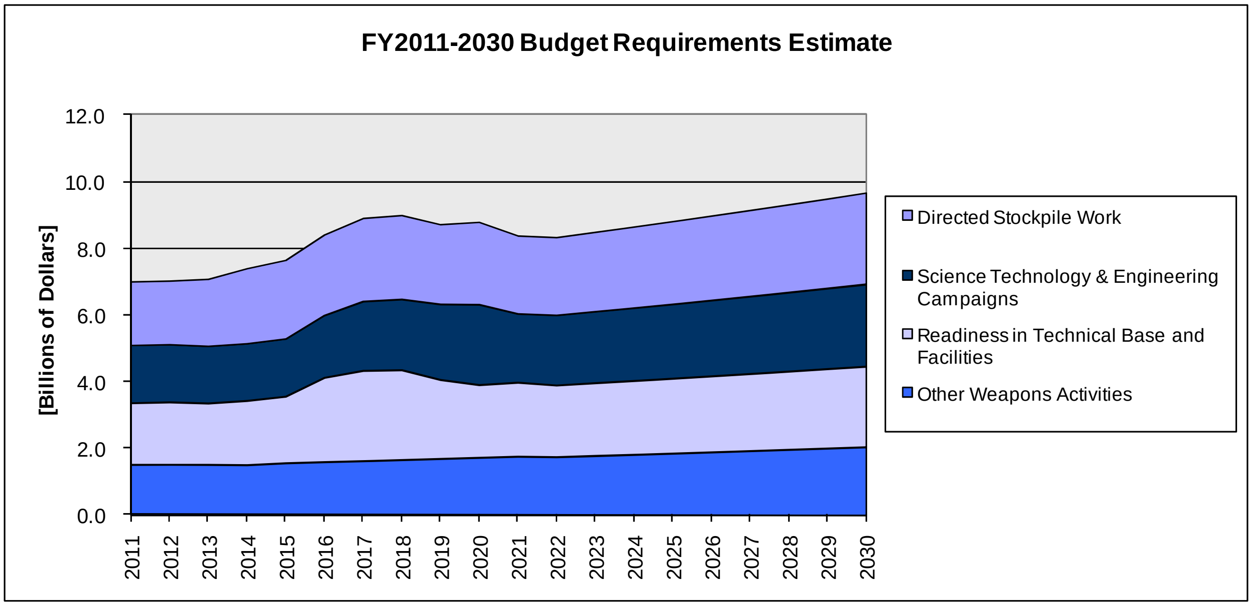

Figure D–23. An Out-Years Budget Requirements Estimate of the Weapons Activities[1] of the NNSA in then-year dollars.

Figure D-23 is based on the following assumptions:

Directed Stockpile Work

- FY 2011 through FY 2020: The ongoing and future LEP activity in the budget requirements estimates uses the data found in Chapter 3.B of this summary.
- FY 2021 through FY 2030: Planning includes the expectation of two on-going weapons LEP for the budget requirements estimate of approximately $1 billion per year during this period.

Science Technology and Engineering Campaigns

- FY 2016: Beginning in FY 2016 the budget requirements estimate is based on an increase of approximately $100 million a year for the campaigns.
- FY 2017 through 2020: Reflects approximately $1 billion spread over four years for investment in Science Technology and Engineering campaigns.

[1] FY 2011-2015 figures are from the President's FY 2011 Budget Request submitted to Congress in February 2010.

Readiness in Technical Base and Facilities

- FY 2016: Beginning in FY 2016 the budget requirements estimate is based on an increase of slightly over $200 million a year for the Readiness in Technical Base and Facilities operations and maintenance.
- FY 2016 through FY 2019: Assumes construction for other project requirements (excluding UPF and CMRR-NF) will continue after the FYNSP with a funding profile of approximately $200 million a year.
- FY 2019: Complete funding for Uranium Processing Facility and Chemical and Metallurgy Research Replacement Nuclear Facility; 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.
- FY 2020 through FY 2030: Over a half billion dollar investment per year for construction projects is used for planning.

Expected Efficiencies

- FY 2017: A reduction of $65 million in operations and maintenance costs for Kansas City Responsive Infrastructure Manufacturing and Sourcing at Kansas City Plant is expected after the new facility is occupied and the disposition of the old facility is complete.
- FY 2022: Reduction in PIDAS (Perimeter Intrusion Detection and Assessment System) security fence and other operational efficiencies at Y-12 with UPF complete results in a savings of approximately $200 million per year.

4.C. Risk Assessment

In a resource constrained environment any plan will have to manage risk. The plan described in this document presents the best compromise between resources and risks. This plan will also support the requirements in the NPR. The risks to the plan are:

- Unforeseen technical issues arising in the stockpile;
- Failure of portions of the aging infrastructure before planned modernization and refurbishment can come online; and
- Necessary regulatory advances in safety, security, and the environment could further increase costs.

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5. Schedule

This section is in response to:

> 50 USC Sec. 2455(b)(2)(B). A schedule for implementing those measures determined necessary under subparagraph (A) during the 10 years following the date of the plan.

5.A. 20-Year Schedule

The Schedule for the modernization and refurbishment of the infrastructure of the nuclear weapons complex is aggressive and continues a concerted effort to transform into a more efficient and capable organization. NNSA will begin to reap the benefits of previous consolidation efforts, such as the reduction of the Superblock Facility to Security Category III at Lawrence Livermore National Lab. Additionally, dramatic steps in science such as the Ignition Campaign are just beginning as a result of previous investments in the National Ignition Facility. Also the Highly Enriched Uranium Material Facility is now complete and receiving material. These are certainly steps in the right direction, but much remains to be done.

Key physical infrastructure actions and milestones for the next ten years to support our path to achieve a future transformed complex include the following:

- Complete the design and begin construction of the Chemistry and Metallurgy Research Replacement (CMRR) Nuclear Facility (NF) at Los Alamos – a facility that conducts plutonium research and development and provides analytical capabilities in support of pit surveillance and production. Plan and program to complete construction no later than 2020, and ramp up to full operations in 2022.

- Increase pit production capacity and capability at the adjoining Plutonium Facility (PF)-4 (part of the main plutonium facility) at Los Alamos to demonstrate pit reuse by 2017 and production by 2018-2020. Plan and program to ramp up to a production capability of up to 80 pits per year in 2022.

- Complete the design and begin construction of the Uranium Processing Facility (UPF) at Y-12 to support production and surveillance of highly-enriched uranium components. Plan and program to complete construction no later than 2020; ramp up to a production capability of up to 80 Canned Subassemblies (CSAs) per year by 2022.

It is also important to highlight that the focus of this report has been on the "major" critical single point failure types of projects. There are many other "minor" projects that are needed annually for the next two decades. Resources to fund the major projects will help the complex to support the nuclear deterrent mission. Continued focus on all projects will be required.

The most important facilities and infrastructure with key milestones for the next ten year time frame that require recapitalization include:

- Complete CD-4 for the Los Alamos CMRR-NF in FY 2020.

- Complete CD-4 for the Y-12 Uranium Processing Facility in FY 2020.

Finally, in terms of a strategic timeline, Figure D-24 depicts the NNSA major infrastructure and key milestones. There are a few important projects that have not previously been discussed that are annotated hereinafter with more detailed information provided in Annex "C." Note that some of the same important facilities projects listed above are repeated in this figure to make it more comprehensive for the full twenty year horizon. A brief summary of projects not previously discussed follows:

- Los Alamos TA-55 Reinvestment Phase 2 project - Follow-on to the Phase I project that supports seismic upgrades, refurbishes air dryers, alarms, exhaust stacks, and other ES&H repairs (approved FY 2011 FYNSP);

- Sandia Test Capability Revitalization (TCR) Phase II project - modernizes experimental and test capabilities like the: 10,000-foot Rocket Sled Track; Centrifuge; Mechanical Shock; Vibro-Acoustics; and Aerosciences (approved FY 2011 FYNSP);

- Livermore Valley Open Campus (LVOC) concept that will be considered in post FYNSP budgets. The LVOC will reconfigure part of the existing SNL-California and LLNL into a more open layout.

- Kansas City KCRIMS project – replaces old and oversized non-nuclear manufacturing facility with a GSA-leased new manufacturing plant with an approximately 50 percent reduction in NNSA's footprint (approved FY 2011 FYNSP);

- Sandia Microfab (MESA) project – provides the next generation equipment, tooling and processes to support microelectronics and systems and engineering science applications. Will be considered in post FYNSP budgets;

- Los Alamos Consolidated Waste Capability (CWC) project –upgrades or replaces both solid and liquid associated nuclear facilities. TRU Waste Facility, a subproject of the CWC, is an approved FY 2011 FYNSP project;

- Los Alamos Radioactive Liquid Waste Treatment Facility Upgrade (RLWTF) project - repairs and replaces, where needed, 65 vaults and 4 miles of piping that collect 6,000 gallons per day of radioactive liquids (approved FY 2011 FYNSP);

- Pantex HE Pressing Facility project – replaces 50-year old facilities that are badly deteriorated with a new building that will include pressing, initial machining, magazine storage, and a connecting ramp (approved FY 2011 FYNSP);

- SRS Tritium Responsive Infrastructure Modernization (TRIM) project – relocates and right-sizes remaining functions from the older facilities (41 to 52 years old) into the more modern facilities with over 40 percent reduction in footprint. Will be considered in post FYNSP budgets.

- Y-12 Consolidated Manufacturing Center (CMC) project - replaces the existing non-EU production facilities. These non-EU production capabilities are required to produce secondaries to support lithium and depleted uranium. Will be considered in post FYNSP budgets.

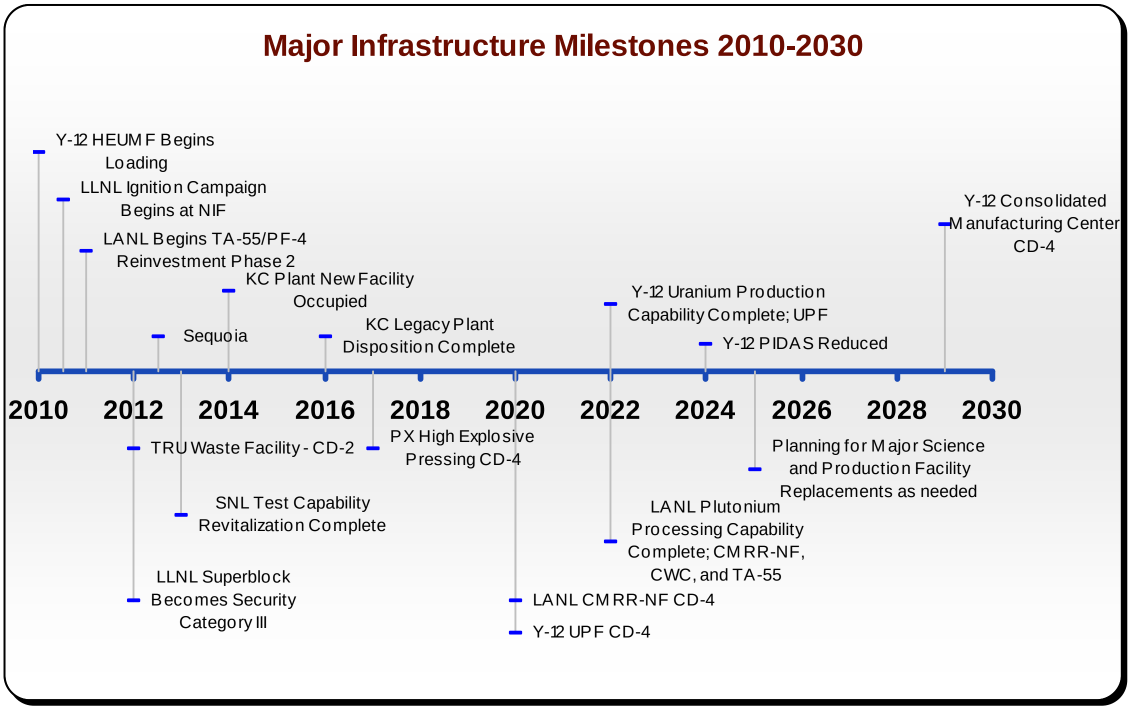

Figure D–24. NNSA Major Infrastructure and Key Milestones.