

# National Nuclear Security Administration's Future Modernization

Review of the National Nuclear Security Administration's (NNSA)  
Modernization and Refurbishment of the Nuclear Security Enterprise  
As Required by Section 3113 of the National Defense Authorization  
Act for Fiscal Year 2011 (P.L. 111-383)

June 2011

# Briefing Overview

- Background
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- NNSA Budget and Future Years Nuclear Security Program (FYNSP) Support for Modernization Objectives

# Background

- The congressionally-required 2010 *Nuclear Posture Review* (NPR)<sup>1</sup> identified long-term modernization and refurbishment goals and requirements for the nuclear security enterprise, including:
  - Increasing investments to rebuild and modernize the country's nuclear infrastructure;
  - Sustaining a safe, secure, and effective nuclear arsenal through the life extension of existing nuclear weapons;
  - Investing in human capital.
- NNSA has developed plans to achieve this modernization, and the Administration has pledged over \$88 billion to NNSA over the next decade for operations and modernization of the nuclear security enterprise.<sup>2</sup>

<sup>1</sup>The 2010 NPR is a legislatively-mandated review in which the Administration established the nation's nuclear weapons requirements and policy.

<sup>2</sup>The Administration's pledged \$88 billion is in constant dollars.

# Objectives

- Section 3113 of the National Defense Authorization Act for Fiscal Year 2011 (P.L. 111-383) directs GAO to conduct an annual review and assessment of NNSA's budget requests for the modernization and refurbishment of the nuclear security enterprise. In response, GAO examined:
  - (1) NNSA's plans and estimated costs for modernizing the nuclear security enterprise.
  - (2) The extent to which NNSA's current budget request and its FYNSP supports the agency's long-range modernization plans.

# Scope and Methodology

- Reviewed the 2010 *Nuclear Posture Review*, NNSA planning and budget documents, including the FY 2011 and FY 2012 *Stockpile Stewardship and Management Plans*, the congressionally required “1251” report,<sup>3</sup> and the FY 2012 budget justification and its associated FYNSP, which includes funding programmed from FY 2012-16.
- NNSA’s current budget request, associated FYNSP figures, and longer-term cost estimates are presented in constant dollars (e.g., adjusted for inflation in future years).
- Interviewed NNSA headquarters program officials responsible for managing and planning the modernization of the nuclear security enterprise.
- We conducted this performance audit from February 2011 to June 2011 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

<sup>3</sup>Report pursuant to section 1251 of the National Defense Authorization Act for Fiscal year 2010 (P.L. 111-84) which requires the President to submit to Congress a plan to enhance the safety, security, and reliability of the nuclear weapons stockpile, modernize the nuclear weapons complex, and maintain the delivery platforms for nuclear weapons.

# Summary

- NNSA's operations and modernization plans are detailed and updated in its Stockpile Stewardship and Management Plan and its "1251" Report. NNSA's annual budget justification and associated FYNSP provide additional detail on these plans.
- The agency's operations and modernization plans will take at least 2 decades to implement and include, among other things, major new facilities, refurbished nuclear weapons, and new scientific, technical, and engineering capabilities.
- NNSA estimates it will require over \$180 billion to operate and modernize the nuclear security enterprise over the next 2 decades (FY 2012-31).
- NNSA's FY 2012 budget justification and associated FYNSP generally support NNSA's long-range plans, but a number of issues may affect these plans, including:
  - Important projects currently without firm cost and schedule baselines;
  - Difficulties in improving and sustaining operations and maintenance (O&M) of existing facilities;
  - Life Extension Program (LEP) schedules driven by military requirements and infrastructure availability;
  - Poor enterprise-wide human capital knowledge and potential growth in contractors' pension costs.
- NNSA has implemented GAO recommendations that may address some of these issues.

# Plans and Estimated Costs: Defining Modernization

- NNSA's operations and modernization plans are contained in its annual *Stockpile Stewardship and Management Plan*, its 1251 Report, and its annual budget justification and associated FYNSP.
- NNSA's plans identify 4 broad objectives for modernization and improvement of the nuclear security enterprise, including:
  - Infrastructure: NNSA-owned, leased and permitted physical infrastructure and facilities required to support weapons activities.
  - Stockpile: Weapons refurbishment.
  - Science, technology, and engineering capabilities (ST&E): Capabilities that enable the annual assessment of the status of the stockpile, resolve significant finding investigations, extend nuclear weapon lifetimes and accelerate the dismantlement of retired systems.
  - Human capital: Federal employees and contractor workforce and their specialized skills needed to sustain the nuclear weapons program.

# Plans and Estimated Costs: Defining Modernization

- Modernization funding does not cover all of NNSA's missions.
  - For example, modernization does not cover NNSA's Defense Nuclear Nonproliferation and Naval Reactors programs.
- NNSA often does not differentiate between funding for ongoing operations and modernization efforts because, according to NNSA, the program is highly integrated and interdependent.
  - For example, adequately operating and maintaining existing facilities and capabilities is not modernization in and of itself, but it may enable important future modernization efforts such as the refurbishment of weapons and the production of new weapons components.
- In addition, NNSA's 4 modernization objectives do not necessarily or consistently align with NNSA's established budget accounts within its Weapons Activities appropriation.



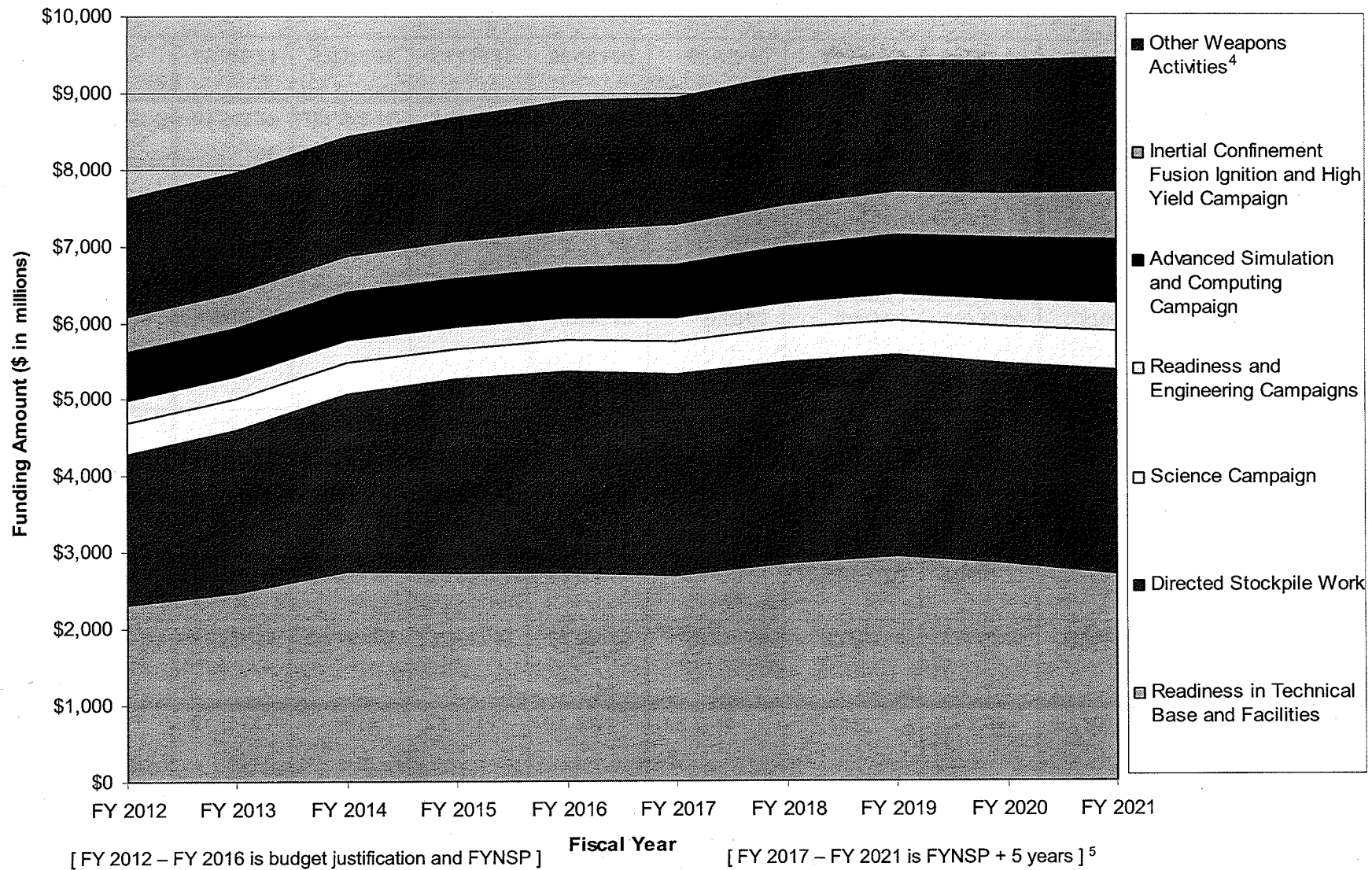
# Plans and Estimated Costs: Funding

- NNSA estimates it will require over \$180 billion over the next 2 decades to operate and modernize the nuclear security enterprise.
  - NNSA considers the \$88 billion pledged by the Administration over the next decade as its operations and modernization funding baseline. NNSA has detailed objectives, projects, and specific cost estimates for these funds, including:
    - \$41.6 billion for FY 2012-16: Funding approved by the President (“programmed”) that is detailed in the FY 2012 budget justification and associated FYNSP;
    - \$46.5 billion for FY 2017-21: Preliminary cost estimates projected by NNSA, but not yet approved by the President, for the remaining 5 years of the decade.
  - During FY 2022-31, NNSA estimates it will need over \$92 billion to operate and modernize the nuclear security enterprise. This is an initial estimate and provides a notional timeline of proposed projects and costs. NNSA’s projections are subject to change and have not been approved by the President.

# Plans and Estimated Costs: Funding

- The programs NNSA funds through its Weapons Activities appropriation will support the next decade of operations and modernization of the nuclear security enterprise, including aspects of its infrastructure, stockpile and ST&E capabilities. The 4 modernization objectives are to be met primarily by the following programs:
  - Infrastructure ~ Readiness in Technical Base and Facilities (RTBF)
  - Stockpile ~ Directed Stockpile Work (DSW)
  - ST&E ~ 5 Campaigns—technically challenging, multiyear, multifunctional efforts to develop and maintain the critical capabilities [Readiness; Engineering; Advanced Simulation and Computing; Inertial Confinement Fusion Ignition and High Yield; and Science]
  - Human capital funding for the modernization of NNSA's federal and contractor workforce is not explicitly identified and is, instead, embedded in NNSA programs.

# NNSA's Programmed Funding and Estimated Costs for Modernization



<sup>4</sup>Other Weapons Activities include Cyber Security, Defense Nuclear Security, Facilities and Infrastructure Recapitalization Program, National Security Applications, Nuclear Counterterrorism Incident Response, Secure Transportation Asset, and Site Stewardship.

<sup>5</sup>The cost estimates projected for the FYNSP+5 are not approved by the President. They are NNSA projections.

# NNSA's Programmed Funding and Estimated Costs for Modernization

(\$ in millions)	Programmed Funding (FY 2012 budget justification and associated FYNSP)					Estimated Costs (FYNSP + 5 Years) <sup>6</sup>				
	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
<b>Weapons Activities Programs</b>										
<b>Readiness in Technical Base and Facilities</b>	\$2,326.13	\$2,484.26	\$2,742.51	\$2,729.66	\$2,734.89	\$2,700.00	\$2,850.00	\$2,940.00	\$2,850.00	\$2,720.00
<b>Directed Stockpile Work</b>	\$1,963.58	\$2,111.44	\$2,327.86	\$2,529.99	\$2,630.71	\$2,630.00	\$2,630.00	\$2,630.00	\$2,610.00	\$2,670.00
<b>Science Campaign</b>	\$405.94	\$418.22	\$416.28	\$394.32	\$404.10	\$430.00	\$450.00	\$470.00	\$490.00	\$510.00
<b>Readiness and Engineering Campaigns</b>	\$285.57	\$299.17	\$296.65	\$293.16	\$294.01	\$310.00	\$330.00	\$350.00	\$360.00	\$370.00
<b>Advanced Simulation and Computing Campaign</b>	\$628.95	\$616.10	\$628.10	\$643.12	\$659.21	\$690.00	\$730.00	\$760.00	\$800.00	\$830.00
<b>Inertial Confinement Fusion Ignition and High Yield Campaign</b>	\$476.27	\$476.38	\$471.67	\$485.24	\$495.03	\$520.00	\$550.00	\$570.00	\$600.00	\$620.00
<b>Other Weapons Activities<sup>7</sup></b>	\$1,543.27	\$1,543.11	\$1,535.41	\$1,608.06	\$1,687.65	\$1,660.00	\$1,700.00	\$1,720.00	\$1,730.00	\$1,740.00
<b>Totals<sup>8</sup></b>	\$7,629.71	\$7,948.68	\$8,418.48	\$8,683.55	\$8,905.60	\$8,940.00	\$9,240.00	\$9,440.00	\$9,440.00	\$9,460.00
									<b>Grand Total</b>	\$88,106.02

Source: NNSA

<sup>6</sup>The cost estimates projected for the FYNSP+5 are not approved by the President. They are NNSA projections.

<sup>7</sup>Other Weapons Activities accounts include Cyber Security, Defense Nuclear Security, Facilities and Infrastructure Recapitalization Program, National Security Applications, Nuclear Counterterrorism Incident Response, Secure Transportation Asset, and Site Stewardship.

<sup>8</sup>Totals may not add due to rounding.

# RTBF: Infrastructure Plans and Estimated Costs

- A significant portion—\$27.1 billion from the RTBF program, or about 31% of the Administration’s \$88 billion pledged over the next decade—would go to NNSA infrastructure operations and modernization. This will fund:
  - On-going and new line item construction projects, such as major new facilities;
  - Operations and maintenance (O&M) to sustain existing physical weapons infrastructure and “footprint” reduction, including the disposition of facilities and reduction in deferred maintenance.
- Other NNSA programs (DSW, Campaigns) also provide some infrastructure funding.
  - Examples include capital equipment replacement, such as weapons facilities tooling and machinery.
  - The level of this funding is not explicitly identified in NNSA’s modernization plans or budget justification.

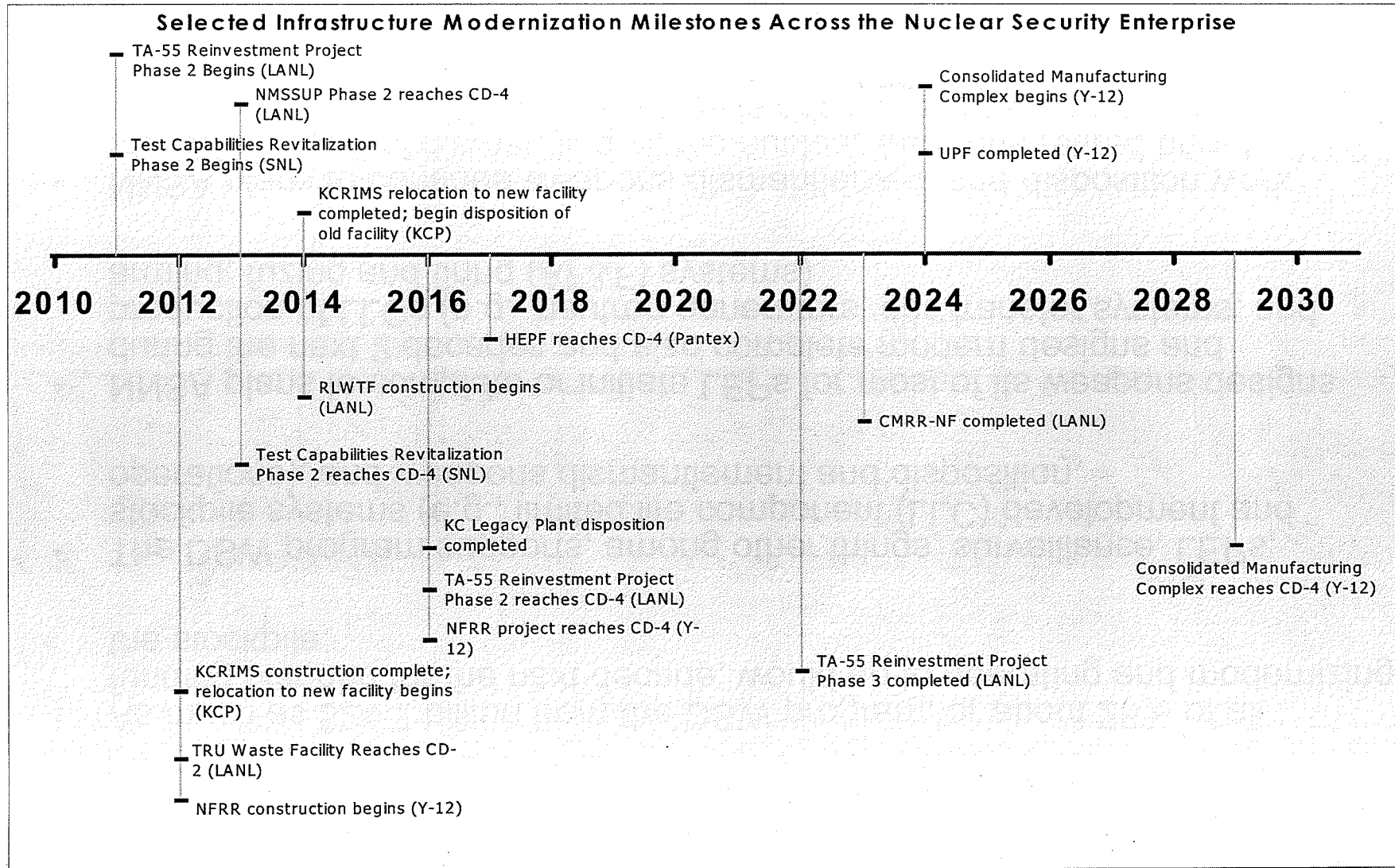
# RTBF: Infrastructure Plans and Estimated Costs

- NNSA has 12 ongoing line item construction projects, including:
  - Chemistry and Metallurgy Research Replacement-Nuclear Facility (CMRR-NF), Los Alamos National Laboratory (LANL);
  - Uranium Processing Facility (UPF), Y-12 National Security Complex (Y-12);
  - High Explosive Pressing Facility (HEPF), Pantex Plant (Pantex);
  - Test Capabilities Revitalization Phase 2,<sup>9</sup> Sandia National Laboratories (SNL);
  - TA-55 Reinvestment Project Phase 2,<sup>10</sup> LANL;
  - Transuranic (TRU) Waste Facilities, LANL.
- NNSA has 7 line item projects planned to start during the current FYNSP (by FY 2016), including:
  - Radioactive Liquid Waste Treatment Facility (RLWTF), LANL;
  - High Explosives Science Technology and Engineering Facility, Pantex;
  - High Explosives Packaging and Staging Facility, Pantex.
- NNSA proposes over 35 new line item construction and recapitalization projects to be initiated and funded after the current FYNSP and primarily in the second decade of modernization, including:
  - Weapons Manufacturing Support Facility, LANL;
  - Life Extension Program and Warhead Assessment Facility, Lawrence Livermore National Laboratory (LLNL);
  - Data Center Consolidation project, Nevada National Security Site (NNSS);
  - Weapons Engineering Facility, SNL;
  - Consolidated Manufacturing Complex, Y-12.

<sup>9</sup>Test Capabilities Revitalization Phase 2 is one phase of a multi-phase construction project that provides support for LEP production, environmental test infrastructure required for testing of the nuclear explosives package, and support for non-nuclear systems engineering.

<sup>10</sup>TA-55 Reinvestment Project Phase 2 is one phase of a multi-phase construction project that will extend the life of LANL's plutonium facility.

# RTBF: Infrastructure Plans and Estimated Costs



Source: GAO analysis of NNSA data.

Note: Critical Decision (CD) 2: Project's cost and schedule estimates are accurate and complete based on a review of the project's completed preliminary design. CD-4: Project has met its completion criteria or the facility is ready to start operations.

Legend: NMSSUP: Nuclear Materials Safeguards and Security Upgrades Project; KCRIMS: Kansas City Responsive Infrastructure Manufacturing and Sourcing; KCP: Kansas City Plant; NFRR: Nuclear Facilities Risk Reduction project; TRU: Transuranic Waste.

# DSW: Stockpile Plans and Estimated Costs

- As much as \$24.7 billion from the DSW program, or about 28% of all funding planned for the next decade, would go to operating and modernizing the stockpile.
- The DSW program supports, among other things, surveillance, LEPs, stockpile systems (e.g., limited life component (LLC) development and operations), and weapons dismantlement and disposition.
- NNSA plans to complete or initiate LEPs for most of its weapons designs during the next 2 decades and also complete modern designs and production of LLCs (e.g., neutron generators, gas transfer systems, and arming, fuzing and firing (AF&F) systems).
- NNSA plans to continue weapons dismantlement and disposition work toward the goal of dismantling all the nuclear weapons retired prior to 2009 by the end of FY 2022. NNSA projects additional weapons retirements and dismantlement work to continue through FY 2031.

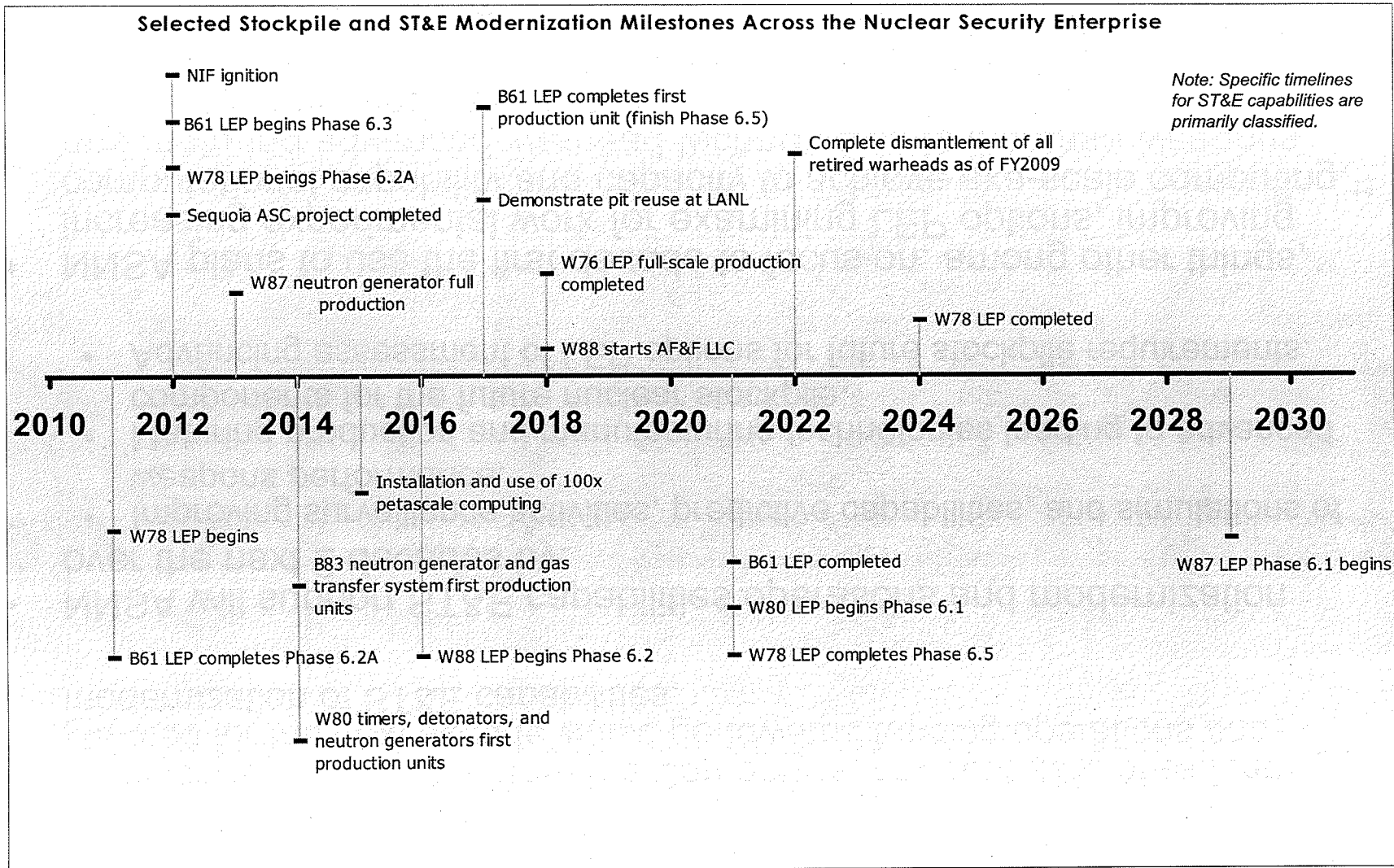


# Campaigns: ST&E Plans and Estimated Costs

- As much as \$20.4 billion from the Campaigns, or about 23% of all funding planned for the next decade would go towards funding operations and modernization of ST&E capabilities.
- NNSA will support ST&E capabilities operations and modernization over the next 2 decades by:
  - Improving surveillance activities, predictive capabilities, and simulations of weapons performance.
  - Maturing production and manufacturing technologies leading to advanced components for the future nuclear stockpile.
  - Advancing assessment of LEP options for future stockpile requirements.
- NNSA plans to use the first decade to focus on, among other things, increasing experimental work for examining LEP options, improving computational capability and capacity to achieve exa-scale computing,<sup>11</sup> and maturing advanced warhead technologies to increase weapons safety, security, and use control.
  - NNSA assumes an increase of approximately \$100 million per year for the Campaigns in its modernization cost estimates for FY 2017 through FY 2021.

<sup>11</sup>Exa-scale computing involves a million trillion calculations per second.

# DSW and Campaigns: Stockpile and ST&E Plans



Note: LEP Phase 6.1 is a concept assessment. Phases 6.2/6.2A include developing design options and studying their feasibility, selecting an option, and determining the cost of pursuing the option. Phase 6.3 includes development engineering activities. Phase 6.4 includes production engineering activities. Phase 6.5 is the first production of the refurbished weapon.

Legend: NIF: National Ignition Facility.

# Human Capital Plans and Estimated Costs

- NNSA human capital goals focus on (1) attracting and retaining skilled federal employees and contractors to maintain the weapons program and (2) keeping pension programs solvent in future years; these goals are supported by operations and modernization funding.
- NNSA plans to use operations and modernization funding to support human capital efforts, such as an apprenticeship program for skilled craft workers, mentoring programs for new hires, and operating the on-going “future leaders” internship program.
- NNSA modernization timelines and cost estimates for specific human capital projects are not identified.

# Budget and FYNSP Support for Long-Range Modernization Plans

- NNSA's current budget justification and associated FYNSP generally support its long-range operations and modernization plans, but a variety of issues may affect these plans, including:
  - Important projects currently without firm cost and schedule baselines;
  - Difficulties in improving and sustaining O&M of existing facilities;
  - LEP schedules driven by military requirements and infrastructure availability;
  - Poor enterprise-wide human capital knowledge and potential growth in contractors' pension costs.
- NNSA has implemented GAO recommendations that may address some of these issues.

# RTBF: Projects Currently Without Firm Cost and Schedule Baselines

- Previous GAO work has documented NNSA's poor record of project and contract management.
  - NNSA continues to struggle to meet cost and schedule goals on major projects. (GAO-09-406T)
  - NNSA lacks reliable information on its capital improvement projects. (GAO-10-199)
  - NNSA remains on GAO's High Risk List for project management. NNSA's cost estimating policies and procedures need improvement. (GAO-11-278)
- NNSA's two major construction projects, CMRR and UPF, comprise about 85% of construction funding included in the FYNSP but do not yet have firm cost and schedule baselines.
  - FYNSP funding requirements for these two projects reflect cost estimates made early during project design and may not represent valid total project estimates.
- While DOE and NNSA have recently taken steps—such as updating important guidance—to improve project management (GAO-11-278), project cost growth and schedule slippages will adversely affect NNSA's operations and modernization plans.

# RTBF: Difficulties Improving and Sustaining O&M of Existing Facilities

- Previous GAO work has documented NNSA's challenges in maintaining its existing infrastructure.
  - NNSA does not know the total costs of operating and maintaining its existing weapons facilities and infrastructure. (GAO-10-582)
  - NNSA lacks consistent, accurate, and complete data on the conditions of its facilities, including deferred maintenance. (GAO-11-188)
- The RTBF FYNSP primarily supports O&M of weapons facilities and infrastructure at a sustainment level. As a result, deferred maintenance will continue to accumulate through FY 2016.<sup>12</sup>
  - NNSA expects deferred maintenance to grow at about \$70 million per year throughout the FYNSP and the remainder of the first decade.
  - To stop the growth in deferred maintenance, NNSA will need to dedicate additional resources beyond the \$88 billion planned over the next decade.
- NNSA's plans to maintain its existing infrastructure, while an improvement compared to its past record, do not align with, and may negatively affect, the agency's modernization plans.

<sup>12</sup>NNSA told us that the RTBF FYNSP funds will stabilize and stop the growth of deferred maintenance on its most critical weapons facilities.

# DSW: LEP Schedules Driven by Military Requirements and Infrastructure Availability

- Previous GAO work has documented that past and ongoing LEPs have experienced technical challenges that have resulted in cost increases and schedule delays. (GAO-11-387; GAO-09-385)
- According to the NPR and NNSA plans, to continue to meet military requirements almost every weapon in the stockpile will require some level of technical attention to extend its service life over the next decades.
- Until planned facilities are fully operational, these weapons will be refurbished using aged infrastructure that is capable of conducting only one LEP at a time.
- Future cost increases and schedule delays with ongoing and planned LEPs will adversely impact NNSA's modernization plans.

# Poor Enterprise-wide Human Capital Knowledge and Potential Growth in Pension Costs

- Human capital funding for the modernization of NNSA's federal and contractor workforce is not explicitly identified in the budget and FYNSP.
- Previous GAO work has demonstrated that NNSA lacks consistent, accurate, and complete data on the critical human capital skills in its contractor workforce needed to maintain the Stockpile Stewardship Program. Without an enterprise-wide human capital baseline of needed skills and levels to effectively maintain capabilities, NNSA cannot be certain that recruiting efforts are appropriately focused toward critical gaps. (GAO-11-188)
  - GAO currently has work under way to examine NNSA contractors' human capital plans and issues.
- GAO has documented that DOE (and NNSA) will likely continue to face significant challenges managing the costs of retirement benefits; in particular, DOE (and NNSA) will have to reimburse the costs of substantial pension liabilities its contractors have accumulated over decades. It is important that DOE (and NNSA) keep Congress informed on the amounts budgeted for such costs, the factors that affect these costs, and the plans for mitigating possible mission impacts if costs rise. Without this information, policymakers will not have a full understanding of how benefit reimbursement costs, such as pensions, might affect DOE's mission work, including NNSA's modernization work, in coming years. (GAO-11-378)
- NNSA operations and modernization funding during the FYNSP will cover about \$1.6 billion in pension costs.
- NNSA's operations and modernization may be eroded by future increased pension costs.



## Related GAO Products

- *Department of Energy: Progress Made Overseeing the Costs of Contractor Postretirement Benefits, but Additional Actions Could Help Address Challenges*, GAO-11-378 (April 29, 2011).
- *Nuclear Weapons: DOD and NNSA Need to Better Manage Scope of Future Refurbishments and Risks to Maintaining U.S. Commitments to NATO*, GAO-11-387 (May 2, 2011).
- *High-Risk Series: An Update*, GAO-11-278 (February 16, 2011).
- *Nuclear Weapons: NNSA Needs More Comprehensive Infrastructure and Workforce Data to Improve Enterprise Decision-making*, GAO-11-188 (February 14, 2011).
- *Nuclear Weapons: National Nuclear Security Administration's Plans for Its Uranium Processing Facility Should Better Reflect Funding Estimates and Technology Readiness*, GAO-11-103 (November 19, 2010).
- *Nuclear Weapons: Actions Needed to Identify Total Costs of Weapons Complex Infrastructure and Research and Production Capabilities*, GAO-10-582 (June 21, 2010).
- *Department of Energy: Actions Needed to Develop High-Quality Cost Estimates for Construction and Environmental Cleanup Projects*, GAO-10-199 (January 14, 2010).
- *Nuclear Weapons: National Nuclear Security Administration Needs to Better Manage Risks Associated with Modernization of Its Kansas City Plant*, GAO-10-115 (October 23, 2009).
- *Nuclear Weapons: NNSA and DOD Need to More Effectively Manage the Stockpile Life Extension Program*, GAO-09-385 (March 2, 2009).

