Declaration of Roger E. Snyder

Attachment 5

Annex D

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

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National Nuclear Security Administration
United States Department of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585

U.S. DEPARTMENT OF ENERGY

NNSA National Nuclear Security Administration

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

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.

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 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.

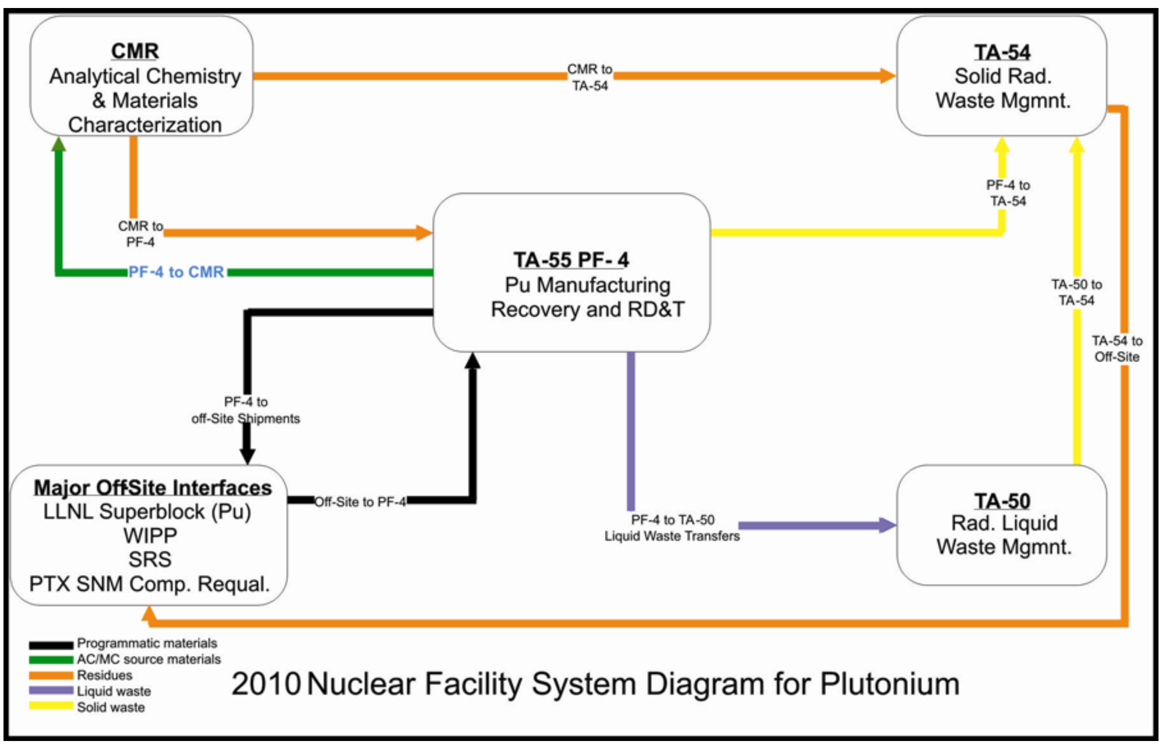

Figure D–7. Key LANL Plutonium Facilities in 2010.

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

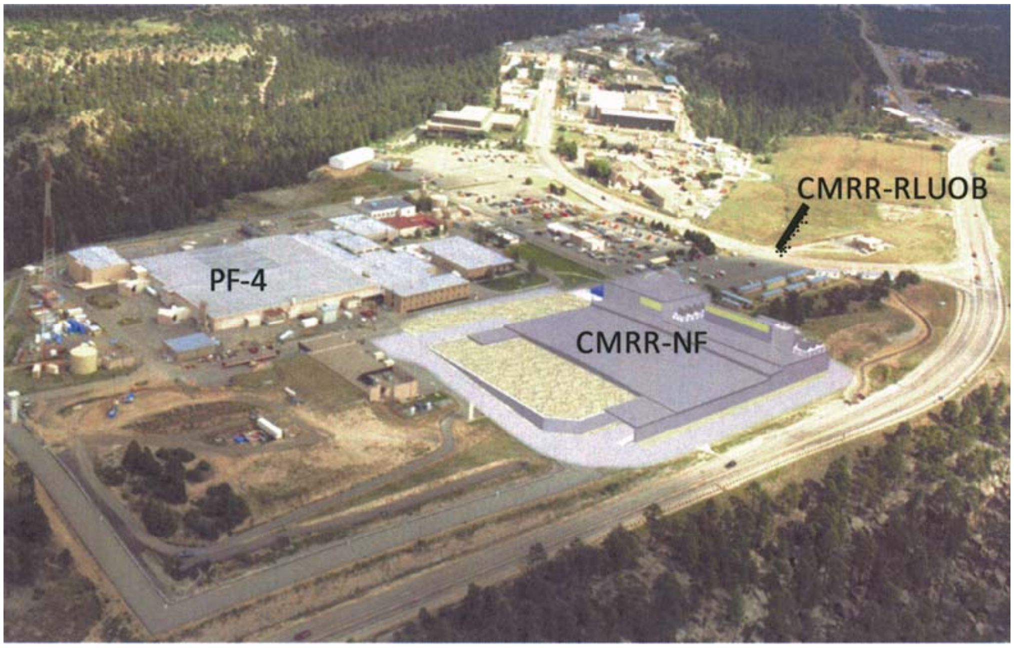

Figure D–8. The CMRR Project is comprised of two facilities, the Chemistry and Metallurgy Research Replacement-RLUOB and the CMRR-NF. Both of these facilities support the plutonium operations inside of PF-4, the main Pu processing facility at Los Alamos.

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.

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.