Nuclear Watch Compilation of Excerpts from the *FY 2011 Stockpile Stewardship and Management Plan*

1. 1.B. International Treaty Obligations

The United States is committed to meeting its obligation to pursue nuclear disarmament under Article VI of the Nuclear Non-Proliferation Treaty and will make progress toward nuclear disarmament over the next decade. The NNSA will support these efforts by managing a safe, secure, and effective nuclear arsenal without developing new weapons, conducting underground nuclear testing, or providing any new military capabilities to existing weapon systems.

2: The NNSA will put the federal and contractor workforce first and then achieve balance between the stockpile, the underpinning ST&E base, and the supporting physical infrastructure.

2: With Congressional approval, the Department of Energy and NNSA are funded through FY 2015 to achieve the following milestones to meet the President's vision and meet key requirements identified in the NPR:

Complete the ongoing Life Extension Program (LEP) for the W76 warhead and full nuclear scope LEP study and follow-on activities for the B61 bomb to ensure first production begins in FY 2017.

Begin an LEP study in FY 2011 to explore the life extension options for the W78 system.

Complete the design and begin construction of the Chemistry and Metallurgy Research Facility Replacement Nuclear Facility at the Los Alamos National Laboratory. Plan and program to complete construction by 2020, and ramp up to full operations by 2022.

Increase pit manufacturing capacity and capability at the Plutonium Facility (PF)-4 (part of the main plutonium facility) at Los Alamos.

Complete the design and begin construction of the Uranium Processing Facility at the Y-12 National Security Complex. Plan and program to complete construction by 2020, and ramp up to full operations by 2022.

Increase warhead surveillance and essential ST&E investments to support stockpile assessment and certification in the absence of underground nuclear testing.

5. Our Nation's nuclear weapons lifespan must be extended and their performance recertified while simultaneously confronting challenges that arise from the loss of original manufacturing capabilities, processes, and specialized skills. The NNSA will complete a series of life extension activities to enhance warhead safety and security without underground nuclear tests. It is imperative to maintain the high confidence levels that underpin the Nation's deterrent capability.

7. The highest infrastructure priorities are the construction of major new nuclear facilities for plutonium and uranium. Construction of a Chemistry Metallurgy Research Replacement Nuclear Facility and improvements to Plutonium Facility-4 at Los Alamos are part of a modernized infrastructure plan. Given the risks of intermittent shutdown associated with existing facilities, immediate investments are also needed in uranium capabilities and therefore, a new Uranium Processing Facility is planned. In addition, construction of replacement high-explosive facilities will reduce age-degradation risks for the production of those essential components.

11. While the NPR expresses a policy preference for refurbishment and reuse in decisions to proceed from study to engineering development, the Laboratory Directors will be expected to provide findings associated with the full range of LEP approaches, and to make a set of recommendations based solely on their best technical assessments of the ability of each LEP approach to meet critical stockpile management goals (weapons system safety, security, and effectiveness).

11. The W78 study will include the possibility of using the resulting warhead on both ICBMs and SLBMs to reduce the number of warhead types. Other stockpile systems will require action within the next decade.

11. Cost of W76 LEP is ~$4 billion (from bar chart)

12. Cost of B61-3/4 LEP is ~$4.9 billion (from bar chart)

12. Cost of W78 LEP is ~$4.8 billion (from bar chart)

13. Ongoing Limited Life Component Exchange Activities

Many age-related changes affecting various nuclear warhead components are predictable and well understood. The Limited Life Component (LLC) Exchanges replace these components periodically throughout the lifetime of the weapon. Components such as power sources, neutron generators and tritium reservoirs deteriorate predictably and must be replaced before their deterioration adversely affects warhead function or personnel safety. The NNSA will be working with the DoD to align LLC production requirements with post-NPR stockpile size and composition.

13. For example, insensitive high explosives can replace conventional high explosives. Additionally, designs could be employed to provide greater reliability… Also, future LEP studies will consider the possibility of using the resulting warhead on multiple platforms in order to reduce the number of warhead types.

14. LEP chart and schedule

15. Dismantlement

Weapons are retired from the stockpile as a result of the stockpile evaluation program and changes in strategic requirements. Many factors affect dismantlement rates, including the logistics required to conduct assembly and disassembly activities utilizing the same technicians, equipment, and facilities. The NNSA has addressed these factors in its plans for transforming the complex, its capabilities and facilities. In the end, the NNSA is committed to meeting or exceeding its objectives in the dismantlement plan submitted to Congress. The current program of record reflects a completion date of 2022 for the inventory of weapons slated for dismantlement. The program of record will be adjusted should the new START enter into force.

17. The NNSA's strong ST&E capability has enabled a paradigm shift from a deterrence supported by underground nuclear testing (UGT), to a stockpile whose credibility is underpinned by a growing knowledge of weapons performance, allowing the laboratories to annually assess and, as required, extend the lifetimes of the warheads without UGT. Investments in experimental facilities are providing unprecedented access to realms previously reachable only through underground nuclear testing. Prior investments in ST&E are advancing high-performance computing in the physical sciences (e.g., plasma physics, materials, nuclear engineering, radiation sciences and chemistry) and are building a comprehensive basis for understanding nuclear weapon behavior. The increasing insight gained via the Stockpile Stewardship Program provides (through a modern ST&E base) the essential bridge by which existing underground nuclear test data is connected with the resolution of today's stockpile maintenance concerns. The details on the status of this effort are discussed in Annex C.

As noted previously, weapons in the U.S. stockpile are aging and changing in response to a number of factors that can often be monitored and controlled, but not eliminated. To maintain confidence in the weapons, a host of aging-, materials substitution-, and manufacturing process-induced changes are monitored through a combination of science-based analysis, prediction and surveillance of the stockpile. The challenge is to extend the predictive capability tools beyond underground nuclear testing-based calibration to science-based predictive capability, based on a strong ST&E foundation. The elements that comprise this predictive capability make credible the current and future stockpile, regardless of its size or composition.

18. Computational Capabilities

The computational simulation infrastructure for improving design and certification can be viewed in terms of:… 2) specific nuclear explosive design simulation tools for design engineers; … These activities have become increasingly important as the available experimental validation data from underground nuclear testing is limited to material properties and responses, rather than integrated system performance including nuclear yield.

20. Key Milestones

Key milestones on our path to a revitalized ST&E future include:
2010: Conduct a credible fusion ignition experiment.

23. The highest priorities are the major nuclear materials processing facilities for plutonium and uranium. Accordingly, the Administration is seeking Congressional

support to replace the Chemical and Metallurgy Research (CMR) facility with the CMR Replacement project at Los Alamos National Laboratory, and to build a new Uranium Processing Facility at the Y-12 Plant in Oak Ridge, Tennessee. Notable observations on the infrastructure consistent with the NPR include:

New plutonium and uranium facilities are not projected to be available until the 2020 timeframe. To realize these capabilities in this timeframe will require an extended commitment, due to the long time period for acquisition.

Existing Los Alamos plutonium facilities are not sustainable and do not provide an inherent manufacturing capacity sufficient for the range of possible future scenarios. Improvements to PF-4 and waste processing capabilities will be necessary for a sustainable infrastructure.

Given the significant risk of shutdown of existing uranium facilities at Y-12, a sustainable future will only be possible with a new Uranium Processing Facility.

Construction of replacement high-explosive facilities at Pantex will reduce age-degradation risks for facilities that currently produce that essential weapon component.

23. Path Forward
Key physical infrastructure actions and milestones for the next ten years to support our path to achieve a future transformed nuclear weapons complex, include the following:

Complete the design and begin construction of the Chemistry and Metallurgy Research Replacement Nuclear Facility at Los Alamos (a facility that conducts plutonium research and development and provides analytical chemistry and materials characterization to all plutonium programs such as surveillance, manufacturing, and plutonium disposition.) Plan and program to complete construction no later than 2020, and ramp up to full operations in 2022.

Increase pit processing capacity and capability at the adjoining PF-4 (part of the main plutonium facility) at Los Alamos to demonstrate pit reuse by 2017 and manufacturing by 2018-2020. Plan and program to ramp up to a manufacturing capability of up to 80 pits per year in 2022. Complete required investment in PF-4 infrastructure and waste processing capabilities in time to support expected plutonium capability in 2022.
Complete the design and begin construction of the Uranium Processing Facility 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 per year by 2022.

25. A key element of these principles is the requirement to advance design maturity to a sufficient level prior to establishing the performance baseline that is essential to project management success. As an example, major nuclear facility construction projects will not have cost and schedule baselines until design is nearly 90 percent complete.

27. For example, the construction baselines for UPF and CMRR-NF are not expected to

be available until FY 2013.

28. Budget chart 2011-2030 showing~170 billion

36. NNSA budget assessment whether budget assessment is sufficient.

Annex D

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

2. 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, 3. be maintained, and be exercised to remain viable.

3. Nuclear Explosive Package Reuse
There are a number of reuse approaches under consideration for the future stockpile.

5. [*Big red flag on pit production! Calls to increase to 80 pits per year, CMRR-NF and waste capabilities.]* “Plutonium pit manufacturing capacity provides the most direct rate-limiting constraint on stockpile modernization scenarios in the near term.”

6. *See pit and CSA capacities at 80 per year by 2022.*

8. 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.

9. 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.

10. 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.

10. 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.

13. 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.

14. Capabilities to develop and validate the predictive computational capability rely upon small-scale experiments through hydrodynamic testing. These are more fully examined in the [classified] Annex C discussion of the Science, Technology and Engineering base.

15. Capabilities for the STS assessment include environmental testing to examine delivery loading and environmental conditions, radiation effects, and system functionality.

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

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

16. Future State. The national laboratories continue to be the backbone for the enduring SSP.

17. 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.

17. 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... B61 LEP planning predicts heavy use of these facilities.

18. 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.

19. 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.

19. 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.

19. 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)

20. The 192-beam, football-stadium sized NIF is operational and was completed in March 2009.

21. 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.

22. **Plutonium Facilities**
Current State
… 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.

23. 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.

23. *Figure D–7. Key LANL Plutonium Facilities in 2010.* [See flow chart back and forth between PF-4 and CMRR-NF.]

24. **Planned Actions**
… forecasted plutonium capacity requirements… 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… plutonium technical capability is maintained and sufficient to support the base capability and future projected capacities.

25. *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.*

25. 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.

26. 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.

27. 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.

28. 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.

31. 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 [sic]:
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.

34. 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.

36. … assuming open burning and/or open detonation process remain environmentally permissible in the future.

37. Production capacity will be ~500 hemispheres per year limited by HE machining rates on single shift operation.

37. **Planned Actions**
The highest priority actions will be those associated with relocating the LLNL Environmental Test Facility to the Pantex site.

38. **High Explosive Pressing Facility (HEPF)**
…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.

40. **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… 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.

41… for example, the B61 has over 5,000 parts

42. **Sandia National Laboratories – Non nuclear**
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.

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

43. The SNL MESA facility requires recurring recapitalization to maintain a viable trusted foundry for strategic radiation hardened microelectronics.

44. 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.

45. 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.

46. 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.

49. Nevada Test Site … disposition of anomalous U.S. weapon

65. 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,

69. **20-Year Schedule**

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.

70. 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);