

Workshop on U.S. Nuclear Weapons Stockpile Management Summary Report

November 10, 2011



Summary Report

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Sponsored by the American Association for the Advancement of Science, the Hudson Institute Center for Political-Military Analysis and the Union of Concerned Scientists

Acknowledgments

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Introduction

On November 10, 2011, the Center for Science, Technology, and Security Policy at the American Association for the Advancement of Science (AAAS), the Hudson Institute Center for Political-Military Analysis and the Union of Concerned Scientists (UCS) hosted a workshop to discuss the future of the Department of Energy's stockpile management program.¹ The meeting was unclassified and off the record. To allow free discussion, it was carried out under the Chatham House Rule in which statements made during the meeting (such as those reported here) can be cited but not attributed to individual speakers.

In addition to those from the sponsoring organizations, workshop participants included active and retired scientists and engineers from Los Alamos National Laboratory, Lawrence Livermore National Laboratory, and Y-12 National Security Complex; representatives from the National Nuclear Security Administration (NNSA), the Department of Defense, and the Office of Science and Technology Policy; independent scientists who are members of the JASON panel that advises the government on nuclear weapons and other security issues; and experts from nongovernmental organizations and elsewhere.

While this report sometimes characterizes views as being held by groups of participants for the sake of simplicity and to avoid identifying individual speakers, participants' opinions did not fall into simple, easily separable categories.

Key Findings

1. There was wide agreement that the NNSA and the weapons labs know more about U.S. nuclear weapons and how they operate than ever before—significantly more than was known during the era of nuclear explosion testing. Overall, the stockpile stewardship and management program has been very successful. Consequently, participants agreed that there is no need to resume nuclear explosive testing to maintain the stockpile.
2. The NNSA and the weapons labs are considering significant modifications to warheads in the current Life Extension Program (LEP) process, including a proposal for a “common warhead” that would replace two existing warheads. Participants had a range of views on how desirable, achievable, and necessary the proposal was to maintaining the stockpile.
3. There was wide agreement that the NNSA and the weapons labs face a challenging environment with a budget lower than forecasted, three LEPs in different stages of completion, and plans for major new facilities up in the air. The bottom line was that not everything that NNSA wants to do will get done, and that choices will have to be made. It was noted that some of the LEPs that NNSA is proposing include additional safety and security measures that will cost more than the more basic approaches used in the past. It was suggested that NNSA could better achieve its needs with a reduced budget if it had fewer dedicated budget lines and increased flexibility to reprogram funds.

¹ This summary was prepared by Derek Updegraff (AAAS), Pierce Corden (AAAS), Gerald Epstein (AAAS), Lisbeth Gronlund (UCS) and Stephen Young (UCS).

4. There was wide agreement that NNSA and the weapons labs need to provide interesting and challenging work to recruit and retain a talented, motivated workforce, but there was significant disagreement over what that entailed. For example, some argued that NNSA's proposed "exascale" computers, a thousand times more powerful than today's fastest supercomputers, would be important for retaining capable scientists, whereas others criticized the initiative to develop such a capability as unnecessary and wasteful.
5. NNSA has not considered the implications of additional reductions in the size of the nuclear stockpile when planning for the future of the weapons complex, at least not in public documents. Some participants thought it would be useful for NNSA to do contingency planning for different future force levels. For example, under New START, the stockpile is on a path to be significantly smaller than it was when NNSA first proposed two major new weapons-related facilities—which was well before the agreement was negotiated.
6. One of the drivers motivating changes in the nuclear stockpile is the requirement to improve safety and security. Current NNSA policy is to make changes to warheads to enhance their intrinsic safety and security when such changes are "credible and executable." Some suggested that the best options for increasing safety and security did not involve changes to the warheads themselves but rather to other parts of the nuclear weapons enterprise, such as changes in delivery system characteristics, warhead basing or Department of Defense security measures. Moreover, some also argued that the terrorist threats were serious enough that the United States should make these other changes now rather than waiting the long time it would take to modify warheads.

Background

The United States has observed a moratorium on nuclear testing since 1992. In 1994, the Department of Energy established the Stockpile Stewardship and Management Program (SSMP) to maintain the safety, security, and reliability of the U.S. nuclear stockpile without a return to testing. The 2010 Nuclear Posture Review (NPR) endorsed a revitalized nuclear complex to maintain a safe, secure, and effective deterrent as long as nuclear weapons exist.² The Obama administration pledged significant increases to NNSA's budget and achieved increases in FYs 2011 and 2012 (see Figure 1), but under the new budget constraints, future increases are likely to be less than originally planned.

NNSA describes Stewardship and Management as follows:

"Stewardship and management are the two highly linked, principal activities of the SSMP. Stewardship provides the annual assessment and certification processes and stockpile modernization plans supported through the application and advancement of science, technology, and engineering. Management applies advanced science, technology, and engineering to oversee the specific details by which the U.S. nuclear weapons stockpile is

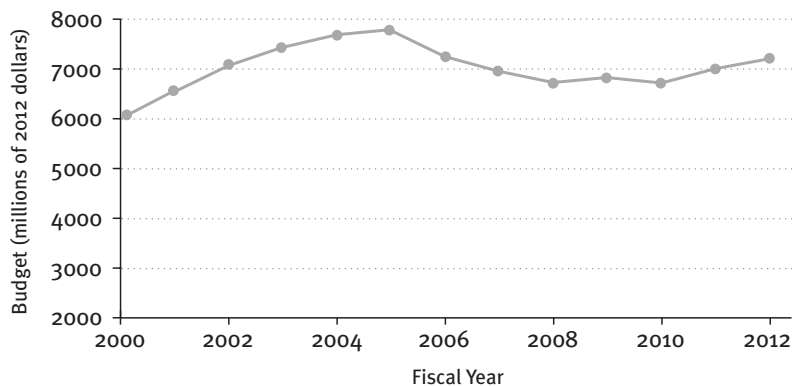
² Department of Defense, Nuclear Posture Review Report, April 2010, p. iii. Available at <http://www.defense.gov/npr/docs/2010%20nuclear%20posture%20review%20report.pdf>.

sustained and implements modernization features required for enhancements of weapon safety, security, and reliability.”³

This workshop was held to discuss the U.S. nuclear weapons stockpile and the plans to manage it.

Note: After this workshop was held, the Obama administration announced that it was delaying for at least five years construction of the Chemistry and Metallurgy Research Replacement Nuclear Facility (CMRR-NF) and accelerating the construction of the Uranium Processing Facility (UPF).

Figure 1: NNSA Weapons Activities Budgets since 2000⁴



Stockpile Stewardship

All participants agreed that the United States knows far more about the nuclear weapons stockpile than it did during the era of nuclear testing. The advanced computational and experimental capabilities that have been brought on line in the past two decades have given the labs a much better understanding of the dynamics of nuclear explosions, and give the United States increased confidence in its ability to continue to maintain the stockpile without nuclear testing.

In particular, work done at the Lawrence Livermore Lab on the “energy balance” in nuclear weapons (work that received the 2011 Lawrence Award from the Department of Energy) has eliminated the need for a “fudge factor” in the labs’ calculations—they now understand the physics. Another area that is better understood now due to work at the labs is the stability of plutonium as it ages.

Life Extension Programs

Under the SSMP, NNSA conducts Life Extension Programs (LEPs) to ensure that warheads will

³ Department of Energy, FY 2012 Stockpile Stewardship and Management Plan: Report to Congress, April 15, 2011. Available at <http://www.ucsusa.org/assets/documents/nwgs/SSMP-FY12-041511.pdf>.

⁴ Appropriations data obtained from Department of Energy Budget requests, available at <http://www.cfo.doe.gov/crorg/cf30.htm>. The 2000-2011 inflation is taken from Bureau of Labor Statistics data, 2000-2011, available at <ftp://ftp.bls.gov/pub/special.requests/cpi/cpiai.txt>. The 2012 inflation is estimated at 1.95% (<http://oregonstate.edu/cla/polisci/sahr/sahr>).

meet safety, security, and performance requirements as they age. These programs typically include replacing some components with modern equivalents for reasons of cost, reliability, and ease of manufacturing.

Currently, NNSA is working on LEPs for three warheads: the W76 missile warhead, for which the LEP is currently underway; the B61 gravity bomb, the LEP for which is soon to enter the “development engineering” phase; and the W78 missile warhead, the LEP for which is in the initial “concept study” phase. In addition, a requirement for a W88 warhead LEP is expected in the near future. (See Table 1.)

There was general agreement that three simultaneous LEPs imposed a substantial workload on NNSA. These three LEPs are taking place at a time when NNSA’s budget is likely to increase less than had been planned as recently as early 2011. It was noted that despite the budget increases in FY 2012, NNSA’s 2011 budget for nuclear weapons activities was 9% lower in real terms than it was in 2005, yet it is now conducting three LEPs while only undertaking one in 2005. It was also noted that there is some tension between spending money to (1) pursue LEPs to support the current stockpile in the near term, (2) develop the infrastructure, and (3) attract the people needed to ensure stockpile safety, security and reliability in the future without nuclear testing.

Table 1: LEP status of Active U.S. weapons (as of November 2011)⁵

Type	Description	Carrier	Design Laboratories	Mission	Military	Entered Service	LEP Status
W78	Reentry Vehicle Warhead	Minuteman III ICBM	LANL/SNL	Surface to Surface	Air Force	1979	In initial study (Phase 6.1), to be completed by 2024. Production may continue to 2035 if decision is made in favor of common W78/W88 replacement.
W87	Reentry Vehicle Warhead	Minuteman III ICBM	LLNL/SNL	Surface to Surface	Air Force	1986	Planned to start in 2029
W76	Reentry Vehicle Warhead	Trident D5 SLBM/Ohio Class SSBN	LANL/SNL	Underwater to Surface	Navy	1978	Production in progress, to be completed by 2018
W88	Reentry Vehicle Warhead	Trident D5 SLBM/Ohio Class SSBN	LANL/SNL	Underwater to Surface	Navy	1989	Planned for 2016-2031
B61-3/4/10	Air-Delivered Non-Strategic Bomb	F-15E, F-16, Panavia Tornado, F-35	LANL/SNL	Air to Surface	Air Force	1979 1979 1990	Entering development engineering (Phase 6.3), program to be completed by 2021. The B61 mods 3, 4, 7, and 10 are to be merged into a single class, known as the mod 12.
B61-7	Air-Delivered Strategic Bomb	B-52, B-2	LANL/SNL	Air to Surface	Air Force	1985	
B61-11	Air-Delivered Strategic Bomb	B-52	LANL/SNL	Air to Surface	Air Force	1997	No LEP planned before 2035
B83	Air-Delivered Strategic Bomb	B-52, B-2	LLNL/SNL	Air to Surface	Air Force	1983	
W80	ALCM Warhead	B-52/AGM-86 ALCM	LLNL/SNL	Air to Surface	Air Force	1982	Planned to start in 2021 contingent on study of replacement cruise missile

⁵ Adapted from Donald Cook, Nuclear Weapon Stockpile Management, November 10, 2011. Available at http://www.lasg.org/CMRR/Nuc_weapon_SM_Cook_10Nov2011.pdf.

W78 and W88 LEPs

NNSA is considering developing a “common warhead” in the W78 and W88 LEPs that would use a common physics package for each, but different reentry vehicles appropriate for the land-based W78 and the sea-based W88. Current practice is to maintain two warhead types for each leg of the triad, so that each leg could be preserved even in the unlikely event of the failure of one type of warhead. (In principle, if one weapon type fails, the reserve forces for the other weapon type could be used to replace the failed weapon, thereby maintaining the same number of deployed weapons. However, there are no W88 reserve weapons, so the number of weapons deployed on submarines would decrease if there was a problem with the W76.)

NNSA argues that the common warhead could simultaneously provide a backup for both the sea-based W76 and the land-based W87 since it is extremely unlikely that both of those warheads would fail, reducing the requirement for reserve warheads while simplifying maintenance. It was noted that since there are no W88s in reserve to back up the W76, providing a reserve backup for the W76 might be another impetus for the common warhead. Merging the two LEPs would also save the cost of conducting two separate programs with separate design, engineering and production phases.

It was noted that the W88 was designed with a very tight yield-to-weight ratio and that it is relatively close to some of the “performance cliffs” that NNSA worries about. (The edge of a “cliff” is where the performance of a given component is no longer sufficient to trigger the next phase of the detonation sequence. Among the most salient of the cliffs is whether the primary—the fission-based first stage of a modern, two-stage nuclear weapon—will detonate with sufficient yield to trigger the secondary—the fusion-based second stage.) Replacing the W88 with a common warhead is one possible way to address this concern.

Whether or not it is decided to merge the W78 and W88 LEPs, NNSA would like to improve safety for both warheads by replacing the conventional high explosive (CHE) with insensitive high explosive (IHE), which has a much higher threshold for detonation resulting from an impact, explosion, or fire. This would not only increase the system’s safety, but would also ease constraints on handling the weapons. For example, at Pantex, work on weapons with CHE must be done in cells (also known as “gravel gerties”), which are relatively few in number. Work on IHE-based warheads can be done in bays, which are more numerous.

It was noted that it would not be possible to simply replace CHE with IHE because IHE has a lower energy density. Different options were raised: using more IHE with the existing pit, using the same amount of IHE as CHE but using a new pit or a new secondary, and substituting a different primary that used IHE. (The pit is the fissile core of the primary.) Some participants argued that the CHE-IHE shift would be difficult to carry out without testing, but others asserted that NNSA would follow the NPR’s directive to “use only nuclear components based on previously tested designs.”⁶

Some participants speculated that the NNSA was planning to use W87 primaries, which use IHE, for the common warhead.

⁶ Department of Defense, Nuclear Posture Review Report, April 2010, p. xiv. Available at <http://www.defense.gov/npr/docs/2010%20nuclear%20posture%20review%20report.pdf>.

B61 LEP

Even if B61 bombs are no longer deployed in Europe, the NPR states that the United States will maintain the ability to forward deploy nuclear weapons and, thus, the warhead will remain a part of the U.S. arsenal. The B61 LEP will combine the B61 mods 3, 4, 7, and 10 into one bomb—the B61 mod 12. (The fifth mod, the earth-penetrating B61-11, will not be a part of the LEP.) It was stated that the B61 is aging rapidly and, among other things, has a vacuum-tube radar that needs to be replaced. Moreover, it was stated that virtually none of the non-nuclear components could be manufactured with the same processes as were originally used. Others noted that there was no reason to duplicate these processes precisely, because non-nuclear testing would allow NNSA to be sure that the new components perform the same as the original ones.

Confidence in Reliability

Maintaining high confidence in the reliability of the stockpile without testing has been a major NNSA objective since the beginning of the Stockpile Stewardship and Management Program in 1994. (Reliability is an intrinsic property of a system, whereas confidence is a measure of how well the reliability is known.)⁷

To determine the reliability of a warhead or bomb and the associated confidence level, the non-nuclear components of the warhead or bomb are tested in statistically significant ways. Quantitative analyses are carried out for each potential failure mode of the nuclear weapons in the Stockpile-to-Target sequence.⁸ However, neither past nuclear explosive testing nor the Stockpile Evaluation Program has ever provided a statistical basis for the reliability of the so-called “nuclear explosive package,” which includes the primary and secondary. Thus, the net assessment also incorporates the judgment of technical experts in the weapons laboratories.

All participants agreed that confidence in the reliability of current weapons is high, but held differing views as to the relevance of high confidence.

Some believed that the reliability of U.S. systems, and confidence in their reliability, mattered very little, because no adversary would stake its survival on the hope of a large-scale common-mode failure of U.S. nuclear weapons. Others noted that, even if high confidence in reliability is not necessary to deter adversaries, it would help significantly in reassuring allies. Some believed that, although reliability was not relevant to deterrence, Congressional concerns that the stockpile is degrading might result in a return to testing if confidence diminished sufficiently. Others believed that having high confidence in reliability would be important to national security objectives in a situation where very small numbers of weapons were used. In any event, it was agreed that the United States will continue to place a premium on maintaining high confidence in high reliability.

Different views were expressed about the best way to sustain confidence in reliability. Some believe that maintaining design discipline to limit changes when components needed to be

⁷ Both reliability and confidence are needed to describe the expected performance of a system. A given system can be described by different pairs of reliability and confidence—if high confidence is required, then the reliability will be less than that associated with a lower confidence level.

⁸ “Stockpile-to-Target sequence” refers to the sequence of events from launch to detonation.

replaced would best maintain confidence, while others believe that simulation capabilities validated against the extensive database of past tests could in some cases enable new features to be prudently introduced while maintaining confidence.

It was noted that the “FY12 Stockpile Stewardship and Management Plan” states that “... as the stockpile continues to change due to aging and through inclusion of modernization features for enhanced safety and security, the validity of the calibrated simulations decreases, raising the uncertainty and need for predictive capability [emphasis added].”⁹ Some believed that the increased uncertainty could cause a real problem; others believed that it could be managed.

Divergent views were also expressed during the discussion about how much design discipline NNSA is practicing. Some participants believed that NNSA is being relatively rigorous in its design discipline, making only minimal changes to maintain current capabilities. They pointed to NNSA’s policy to change technology during an LEP only when a “credible and executable” opportunity to improve safety and security presents itself. Others were more skeptical, believing that many design changes were unnecessary; posed a risk to confidence in reliability even if they could be done in a way that was “credible and executable;” and might result in improved military capabilities despite the 2010 NPR’s statement that LEPs “will not support new military missions or provide for new military capabilities,”¹⁰ thereby complicating U.S. arms control policies.

Production Complex

NNSA’s planned modernization of physical infrastructure represents a large portion of its budget, and participants had divergent views on the need for and scale of some of the planned new facilities. The discussion focused on the Chemistry and Metallurgy Research Replacement-Nuclear Facility (CMRR-NF) at Los Alamos and the Uranium Processing Facility (UPF) at Y-12.

According to NNSA, CMRR-NF would allow an increase in the capacity to produce plutonium pits at Plutonium Facility 4 (PF-4) from 10-20 pits per year today to 50-80 by moving some activities in PF-4 to CMRR-NF. However, some believed that production at PF-4 can be scaled up significantly without building CMRR-NF, but argued that a capacity of 80 pits per year was excessive.

It was noted that the required pit manufacturing capacity depended on the size of the stockpile and the pit lifetime. Some argued that it was best to assume a sixty year pit lifetime, so a stockpile of 3,000 weapons would require an annual production capacity of 50 pits. Others argued that this was overly conservative in light of 2006 work done by the weapons labs (and reviewed by the independent scientific advisory “JASON” group) showing plutonium pit lifetimes of about 100 years. (According to NNSA, the weapons labs concluded that most

⁹ NNSA, 2011, “FY 2012 Stockpile Stewardship and Management Plan: Report to Congress” April 15, 2011 p. 20. Available at <http://www.ucsus.org/assets/documents/nwgs/SSMP-FY12-041511.pdf>.

¹⁰ Department of Defense, Nuclear Posture Review Report, April 2010, p. xiv. Available at <http://www.defense.gov/npr/docs/2010%20nuclear%20posture%20review%20report.pdf>.

plutonium pits have a lifetime of at least 85 years¹¹ and JASON concluded “most plutonium pit types have credible lifetimes of at least 100 years, while other pit types with less than 100 years of projected stability have mitigations either proposed or being implemented.”¹²)

A similar discussion dealt with specific issues related to the UPF, the proposed new facility with the capacity to produce 50-80 secondaries per year. Some participants suggested the number was unnecessarily large. Others argued that the cost would not be reduced proportionally with a reduction in capacity—that a facility capable of producing a single secondary per year would cost 85% as much as one capable of producing 80. Some participants were skeptical of the claim that production capacity was only loosely related to cost, particularly in light of NNSA’s expressed need for CMRR-NF to increase capacity at PF-4.

Construction of a new high explosive (HE) Pressing Facility at Pantex began in August 2011. It will provide a capability to make 300 to 500 hemispheres annually—enough for 150-250 weapons. It was stated that this exceeds the annual pit production level of 50-80 because the HE will need to be replaced more frequently than pits.

Some participants observed that future cuts in the size of the stockpile were likely and that large investments in pit and secondary production facilities could prove redundant. In that light, several participants suggested that NNSA should develop scenarios for the nature and cost of the required infrastructure to support smaller force levels. Others believed that infrastructure costs did not depend strongly on production level for any plausible stockpile size.

Some noted that the recommendations made by the Defense Nuclear Facilities Safety Board (DNFSB) are a major cost driver for the CMRR-NF. The DNFSB oversees safety standards but is not required to address cost-effectiveness; its goal is to make risks “as low as reasonably achievable,” with no reference to cost. In contrast, the goal of the comparable agency in the UK is to make risks “as low as reasonably practicable,” which takes cost into account.

Stockpile Surveillance

It was stated that the NNSA is moving toward non-destructive surveillance and sustainment of the entire stockpile. Currently, a small number of warheads of each type are removed from the stockpile each year for disassembly and testing. As part of this testing for most warhead types, one or more warheads may be destroyed. The goal would be to inspect all stockpile warheads nondestructively every 15 years and resolve any identified problems. These “15-year touches” would also handle all the replacement of Limited Life Components (LLCs) such as tritium reservoirs, neutron generators, and radioisotope thermoelectric generators (nuclear batteries), eliminating the need to replace LLCs at other times. This, in turn, would require increasing LLC lifetimes (e.g. by increasing the fill of tritium reservoirs to counteract the tritium lost to radioactive decay during the longer time between replacements). A second reason

¹¹ National Nuclear Security Administration, 2006. “Studies Show Plutonium Degradation in U.S. Nuclear Weapons Will Not Affect Reliability Soon,” Press Release, Nov 29. Available at <http://www.nnsa.energy.gov/mediaroom/pressreleases/studies-show-plutonium-degradation-u.s.-nuclear-weapons-will-not-affect-reli>.

¹² JASON, 2007. “Pit Lifetime,” JSR-06-335, January 11. Available at <http://www.fas.org/irp/agency/dod/jason/pit.pdf>.

for increasing the fill of the tritium reservoirs is to enhance the warhead reliability. (Tritium-deuterium fusion boosts the yield of the primary, so increasing the amount of tritium provides additional margin to ensure that the primary will have the minimum yield needed to initiate the secondary explosion.)

Allowing all warhead service work to be done at Pantex would also eliminate the cost and risk of in-the-field exchanges. Pantex can handle surveillance and sustainment operations for 200 weapons annually; so all work could be consolidated there on a 15-year cycle if the total stockpile were reduced to 3000. However, it was pointed out that the consolidation of operations at Pantex would create a risk of a single point of failure at Pantex, although use of the Device Assembly Facility at the Nevada National Security Site may be able to compensate.

Safety and Security

Increasing safety and security (surety) of the stockpile is a principal objective of the SSMP. It was discussed at some length.

It was noted that the NNSA is directed by the 2003 National Security Presidential Directive 28, “United States Nuclear Weapons Command and Control, Safety, and Security,” to increase the safety and security of warheads in the stockpile. This drives most of the proposed changes to warheads in planned LEPs. (Beyond safety and security, some modifications in LEPs are performed to maintain or increase reliability.)

Some participants believed the current stockpile is sufficiently safe and secure, and that safety and security modifications are not merely unnecessary, but could undermine confidence in reliability. They argued that U.S. weapons did not pose the primary security risk in any case; foreign weapons and fissile materials are more vulnerable to theft or diversion.

Others believed that the increased risk of terrorism mandates increased security, that the benefit was sufficient to justify the expense, and that any necessary changes could be implemented without significantly reducing confidence in reliability. They noted that advances in technology offer considerable opportunities to improve safety and security.

Yet others argued that the threat of a group of suicidal terrorists (which could include insiders) exploding a nuclear weapon in place was real enough that the United States has to take steps now to address this problem rather than taking the time needed to modify weapons to add intrinsic security features to them.

Some suggested that it would be better and more cost effective to look at the entire system—rather than just the warhead—to improve safety and security. For example, there might be changes to the delivery systems or operational measures that would make sense, or perhaps it would make sense to retire a weapon system altogether. Others noted that the United States already considers ways to make transportation of weapons safer.

International Perceptions of Stockpile Management

The international perceptions of stockpile management were also a major point of discussion.

It was suggested that foreign views of stockpile management largely depended on whether the program was perceived as sustaining U.S. nuclear capabilities or increasing them. The former case would not be very troubling to international observers, while the latter could pose a barrier to further reductions and undermine nonproliferation efforts. The large budget for stockpile management could look alarming to other nuclear weapons states with much smaller nuclear weapons budgets, prompting them to think that the main goal of the program was, in fact, strengthening U.S. nuclear capabilities. Such a perception undermines the goal stated in the Nuclear Posture Review of “working to reduce the salience of nuclear weapons in international affairs.”¹³

Some believed that maintaining a hedge in the form of a responsive infrastructure capable of increased production could be seen as inconsistent with a U.S. commitment to eliminate nuclear weapons and could prove a barrier to further reductions. They also believed that the NPR’s commitment not to develop new nuclear warheads and the progress in reductions from New START have had a positive effect on international perceptions of American fulfillment of NPT commitments, and that this positive effect could be reinforced still further with ratification of the CTBT even if the U.S. maintained a responsive infrastructure.

Others believed that a responsive infrastructure would make further reductions easier by allowing the United States to reduce the number of non-deployed “hedge” warheads, and that potential adversaries’ concerns could be addressed through transparency measures.

Similarly, some argued that the stockpile stewardship and management plan would serve a positive foreign policy purpose by demonstrating that the U.S. arsenal was not simply degrading in place. This would both reassure U.S. allies and strengthen deterrence. Others countered that an active stockpile plan was not as important for extended deterrence as was the credibility of U.S. security guarantees. In other words, allies’ confidence that the United States would actually come to their aid in a crisis, whether with conventional or nuclear forces, provided more reassurance than their confidence that those weapons would detonate with their intended yield.

Transparency

It was stated that the Obama administration has been seeking greater transparency regarding nuclear weapons issues, a development that participants thought would be beneficial.

Transparency regarding SSMP could help reassure the world that increases in production capacity that would hedge against a future need to ramp up production were not being used clandestinely to produce warheads. Allowing foreign observation of activities such as subcritical tests could help show that the computational and experimental enterprise is geared toward maintaining capability and enhancing safety and security, rather than developing new military capabilities. At the same time, these measures would make clear to adversaries that the U.S. nuclear arsenal was not being allowed to deteriorate, thereby strengthening deterrence. Transparency might also pave the way for reciprocal visits to foreign

¹³ Department of Defense, Nuclear Posture Review Report, April 2010, p. 7. Available at <http://www.defense.gov/npr/docs/2010%20nuclear%20posture%20review%20report.pdf>.

labs and test sites that could show that other nuclear powers, too, are not enhancing their own weapons' military characteristics or carrying out actual nuclear weapons tests.

Curatorship

“Curatorship” was discussed as an alternate approach to sustaining the nuclear stockpile. Under curatorship, weapons would be observed closely and maintained in their current state, somewhat like museum pieces. Extensive simulation and design capabilities would not be needed; stockpile management would primarily be an engineering enterprise—rigid design discipline would be enforced in the event that some components were found to be deteriorating, and components would be replaced with exact copies when necessary. No changes would be made in the military characteristics (those characteristics that would affect its military applications). Even simple component upgrades would have to undergo external review and/or be approved by a Nuclear Weapons Board tasked with weighing the potential safety and security benefits of any change against the potential negative international reactions and reduced confidence in reliability that could be associated with making changes to weapons. Participants disagreed about the extent to which this scheme differed from NNSA’s current process with respect to “design discipline.”

Some believed that such an approach would allow safety, security, and confidence in reliability of the stockpile to be maintained without the extensive cost of a large computational and experimental infrastructure, and would make clear that the United States is not seeking to develop new nuclear capabilities. It would therefore save money and devalue nuclear weapons as instruments of national policy, while still allowing for a substantial deterrent capability.

Others believed that such an approach could potentially lead to unintended consequences and would likely lead to reduced confidence in the reliability of the arsenal.

Some also argued that curatorship would impair future improvements to weapon safety and security in an era where there is substantially increased concern about the threat of a terrorist attack intended to seize and detonate nuclear weapons. Some suggested that such a static approach would also fail to attract skilled scientific personnel, which could undermine confidence in weapon reliability, and ultimately lead to nuclear explosive testing. They pointed to valuable computational work that has been done since the cessation of testing, particularly energy balance work at Livermore, and argued that it would prove very difficult to attract new personnel without an evolving computational enterprise. In response, some agreed that interesting computational work is necessary to attract good scientists but noted that curatorship is not incompatible with work on improving codes that model nuclear weapons explosions.

Another concern expressed about the curatorship approach is that allowing no changes to the military characteristics could impede reductions. For example, there could be an old military requirement driving retention of a particular capability in the stockpile that was no longer needed.

NNSA and Contingency Planning

Some pointed out that the FY12 SSMP lays out plans for the next 20 years, and assumes a U.S. force of 3,500 warheads throughout this time period. Several participants thought it would be useful for NNSA to consider different potential future force levels, and to lay out the needs under different scenarios, especially since the United States is committed to reducing its arsenal in the future. Others thought it would be important to simply acknowledge that the FY12 plans were based on currently planned force levels and to indicate which parts would be reevaluated if there were further reductions in the arsenal.