

# National Security and Nuclear Weapons in the 21<sup>st</sup> Century



September 2008




## Foreword




In July 2007, along with Secretary of State Condoleezza Rice, we issued a statement that summarized the need for maintaining a credible U.S. nuclear deterrent and urged bipartisan Congressional support for the Reliable Replacement Warhead program. This paper, *National Security and Nuclear Weapons in the 21<sup>st</sup> Century*, expands on the July 2007 statement by addressing in greater detail the considerations behind U.S. requirements for nuclear weapons. The paper also describes the relationship among strategic nuclear force structure, the stockpile of nuclear warheads, and the nuclear warhead research and production infrastructure. We believe the logic presented here provides a sound basis on which this and future administrations can consider further adjustments to U.S. nuclear weapons policy, strategy, and force structure.

Many of the policy issues and strategic capabilities discussed in this paper are based on the December 2001 Nuclear Posture Review and represent continuity with decisions made by prior administrations. For example, the Clinton Administration developed the “lead and hedge” strategy as a way to reduce the size of the deployed strategic nuclear force, while also ensuring that the United States would be able to respond to future challenges that could be more stressing than estimated at that time. Under this strategy the United States would take the “lead” in nuclear reductions, but would “hedge” through an inventory of non-deployed nuclear warheads and a force structure capable of deploying those warheads. The current administration seeks to build on that approach by relying, over time, more heavily on a responsive nuclear weapons design and manufacturing infrastructure to manage risk, and less on an inventory of non-deployed warheads.

We believe that this approach continues to have merit. In the dynamic, unpredictable security environment of the 21<sup>st</sup> century, the relationship between standing forces and infrastructure readiness will need to be adjusted to allow more effective management of various types of risk – geopolitical, technical, and operational. In this context, the Reliable Replacement Warhead (RRW) program deserves continued study and development. The RRW concept is both promising and fully consistent with U.S. Nuclear Nonproliferation Treaty commitments. Ultimately, a reliable replacement warhead will be needed to sustain nuclear force capabilities, revitalize the nuclear infrastructure, and reduce the nuclear stockpile in a manner that is consistent with U.S. security objectives, including alliance commitments.

  
Samuel W. Bodman  
Secretary of Energy

  
Robert M. Gates  
Secretary of Defense

## Table of Contents

	Page
Foreword	i
Table of Contents	iii
Executive Summary	1
Does the United States Still Need Nuclear Weapons?	3
The Emerging Security Environment	5
Responses of U.S. Allies to the New Security Environment	9
Sizing the U.S. Force: Political and Military Considerations	10
Managing Risk and the U.S. Nuclear Posture	16
Conclusions	23
Annex I – Stockpile Planning Through 2012	I

## Executive Summary<sup>1</sup>

During the Cold War, the greatest security concern of the United States was the military capabilities of the Soviet Union. Potential threats from China and regional states such as North Korea were considered to be lesser included cases that could be addressed by the capabilities deployed to counter the Soviet threat. The current global security environment is radically different. The primary national security challenge now facing the United States is the nexus of violent extremists and regional states of concern that have, or seek to attain, weapons of mass destruction (WMD). Some governments have demonstrated a willingness to transfer advanced weapons or sensitive weapon technologies to other states, or to support terrorist groups. China, a rapidly growing economic power and the only recognized nuclear weapons state under the Nuclear Nonproliferation Treaty (NPT) that is both modernizing and expanding its nuclear force, is also a potential concern. Concerns exist regarding Russia's modernization of its large nuclear force (including the world's largest non-strategic nuclear arsenal). Concerns also exist with respect to recent bellicose statements from Russian leaders directed at both the United States and its allies and friends. Against this backdrop, both the United Kingdom and France have recently initiated programs to revitalize their nuclear complexes and maintain their nuclear forces well into the 21<sup>st</sup> century.

Early in his first term, President Bush called for a fundamental reorientation of the United States' strategic force posture. In recognition of the changed security environment the President directed the Department of Defense (DoD) to develop a portfolio of strategic capabilities—including missile defenses and advanced conventional strike assets—and to size the nuclear force to meet 21<sup>st</sup> century requirements. The Nuclear Posture Review (NPR) Report to Congress of December 2001 outlined a new policy framework to adapt U.S. strategy, planning, and forces to a rapidly changing security environment. It identified the roles of, and benefits provided by, a strategic triad of capabilities that includes offensive capabilities (nuclear, non-nuclear and non-kinetic), defenses (both active and passive), and a responsive infrastructure, all supported by improvements in intelligence, planning, and command and control. Even as they are reduced in numbers, nuclear weapons remain an essential and enduring element of this new strategic triad, and underpin in a fundamental way these new capabilities.

Nuclear forces continue to represent the ultimate deterrent capability that supports U.S. national security. Extended deterrence is key to U.S. alliances, both in the North Atlantic Treaty Organization (NATO) and in Asia, assuring allies and friends of the credibility of U.S. security commitments. U.S. nuclear weapons deter potential adversaries from the threat or use of weapons of mass destruction against the United States, its deployed forces, and its allies and friends. In the absence of this “nuclear umbrella,” some non-nuclear allies might perceive a need to develop and deploy their own nuclear capability.

---

<sup>1</sup> This paper has been redacted and edited from a classified paper with the same title, dated February 2008.

While maintaining these security commitments, the United States has made significant reductions in its nuclear arsenal. The United States has reduced its operationally deployed strategic nuclear weapons (ODSNW) by about 50 percent over the past 15 years, and plans to reduce them to a level of 1,700 to 2,200 by 2012 as called for by the Moscow Treaty. This represents a cut of about 80 percent from the highest levels during the Cold War. The United States has reduced its non-strategic nuclear weapons by over 90 percent since 1991. To maintain a credible deterrent at these lower levels, the United States requires nuclear forces that can adapt to changing needs, and a responsive industrial infrastructure that can maintain existing capabilities and manufacture new or replacement components as needed.

While the service lives of existing warhead types are being extended through refurbishment, at present the United States does not have the ability to produce new nuclear weapons. Successive efforts at extending the service life of the current inventory of warheads, however, can decrease confidence in the nuclear stockpile as the warheads deviate further from baseline designs which were originally validated using nuclear test data. Furthermore, in the absence of a production capability for new warheads, the United States retains a significant stockpile of non-deployed legacy weapons as a hedge against technical failure of a warhead type and against adverse geopolitical or operational developments that could require augmentation of the force. Even so, after careful analysis, the United States has significantly reduced, and continues to reduce, its nuclear stockpile. By 2012, the nuclear stockpile will be at its lowest level since the Eisenhower era and at about one-quarter of its level at the end of the Cold War.

Maintaining a safe, secure, and reliable nuclear weapons stockpile and supporting infrastructure is of vital importance to U.S. interests. Currently, the U.S. is pursuing an alternative to the strategy of service life extensions for existing warheads. The long-term goal is to rely more on a revived infrastructure and less on the non-deployed stockpile to respond to unforeseen events. We seek replacement of existing warheads with Reliable Replacement Warheads (RRW) of comparable capability that would have advanced safety and security features, be less sensitive to manufacturing tolerances or to aging of materials, and be certifiable without nuclear testing. The desired size of a responsive nuclear infrastructure, measured in terms of the number of warheads it could produce or refurbish per year, would depend on a number of key variables, but once RRWs are deployed in significant numbers, many of the warheads now retained in the stockpile as a hedge against reliability problems could be retired. Until a truly responsive nuclear infrastructure is operational, however, the United States will need to retain an appropriate inventory of non-deployed warheads to manage geopolitical, technical and operational risks.

## **Does the United States Still Need Nuclear Weapons?**

The world has changed a great deal in the last decade and a half. The Cold War stand-off with the Soviet Union is over, and Russia is no longer an ideological adversary. The United States has made historic reductions in its operationally deployed strategic nuclear forces and plans to reduce them to a level of 1,700 to 2,200 by 2012, as called for by the Moscow Treaty. The U.S. has also greatly reduced its non-strategic nuclear forces and the total nuclear warhead stockpile. These significant nuclear reductions are fully warranted in the new security environment.

The United States continues to maintain nuclear forces for two fundamental reasons. First, the international security environment remains dangerous and unpredictable, and has grown more complicated since the dissolution of the Soviet Union. Political intentions can change overnight and technical surprises can be expected. Second, nuclear weapons continue to play unique roles in supporting U.S. national security. Although not suited for every 21<sup>st</sup> century challenge, nuclear weapons remain an essential element in modern strategy.

To meet the needs of this more complex security environment, the 2001 Nuclear Posture Review envisioned a more flexible New Triad that consists of: strike systems (nuclear, non-nuclear, and non-kinetic); defenses (both active and passive); and a responsive infrastructure; all supported by robust planning, intelligence and command and control capabilities. New strategic capabilities, including long-range, precision conventional strike and improved ballistic missile defenses, will be developed and fielded over the coming decade. These future offensive and defensive capabilities will increase the options available to national leaders to address a broader range of potential contingencies and will mitigate risks associated with significant nuclear reductions.

Within this more flexible portfolio, nuclear weapons are less prominent, but the roles they play continue to be vital. The policies of successive U.S. administrations have shown a marked continuity in the purposes assigned to nuclear forces. U.S. nuclear forces have served, and continue to serve, to: 1) deter acts of aggression involving nuclear weapons or other weapons of mass destruction; 2) help deter, in concert with general-purpose forces, major conventional attacks; and 3) support deterrence by holding at risk key targets that cannot be threatened effectively by non-nuclear weapons. Because of their immense destructive power, nuclear weapons, as recognized in the 2006 National Security Strategy, deter in a way that simply cannot be duplicated by other weapons.

From the beginning, the U.S. nuclear arsenal has defended not only the United States and its military forces, but also, and importantly, U.S. allies in Europe, Asia, and elsewhere. The role nuclear forces play in the deterrence of attack against allies remains an essential instrument of U.S. nonproliferation policy by significantly reducing the incentives of a number of allied countries to acquire nuclear weapons of their own. Nuclear forces continue to be a key element in U.S. alliances with other countries, for example, NATO allies, Japan, South Korea, and Australia. In general, U.S. nuclear forces act as a

counterbalance to the military capabilities of hostile states that endanger international order.

The United States has made great strides in developing and deploying both very advanced conventional weapon systems and missile defenses. However, nuclear weapons possess unique attributes and make unique contributions to national security. They continue to have an important deterrent effect on nations that have or that seek to acquire weapons of mass destruction to offset U.S. conventional superiority. Against many targets, U.S. nuclear weapons have a lethality that cannot be matched by non-nuclear munitions. Both advanced conventional weapons and missile defenses can enhance deterrence, but the ability to deter certain threats rests ultimately and fundamentally on the availability and continued effectiveness of U.S. nuclear forces. The United States will need to maintain a nuclear force, though smaller and less prominent than in the past, for the foreseeable future.



## The Emerging Security Environment

Although trends in the security environment are uneven, we live in a complicated, unpredictable, and dangerous world. Challenges that the United States may confront in the decades ahead include:

- **States of Concern:** States that either have or seek weapons of mass destruction and the means to deliver them and whose behavior is outside of international norms;
- **Violent Extremists and Non-State Actors:** Non-state organizations that are motivated by goals and values at odds with our values, and that resort to violent means to further their goals; some seek WMD and the means to deliver them; and
- **Major Existing Nuclear States Outside of NATO:** China and Russia are each modernizing their nuclear capabilities; the future political direction of each remains uncertain.

### States of Concern

Ongoing efforts of certain nation-states to develop weapons of mass destruction and delivery systems constitute a major threat to the United States, its deployed forces, and its allies and friends. North Korea's nuclear test of October 2006 and its declared acquisition of nuclear weapons, coupled with its development of long-range missiles, are of great concern. North Korea, Iran, and others are also of particular concern because of their past record transferring sensitive weapons technology to others.

The illicit pursuit of nuclear weapon programs by North Korea and Iran jeopardizes the global nonproliferation regime and threatens regional stability. Both North Korea and Iran have violated their nuclear safeguards obligations under the Nuclear Nonproliferation Treaty regime. Both North Korea and Iran may possess WMD capabilities other than nuclear weapons.

As a result of the Six-Party Talks, North Korea has provided a declaration of its nuclear programs and has agreed to disable them. The United States welcomes such steps, but North Korean declarations must be verified as accurate and their actions must lead to full denuclearization. The United States seeks North Korea's return to full compliance with the NPT as a non-nuclear weapons state. Iran continues to pursue nuclear enrichment capabilities in defiance of the United Nations Security Council. It appears that Iran is keeping its nuclear weapons options open while not disclosing its past weapons work to the International Atomic Energy Agency (IAEA), and not allowing IAEA inspectors to verify that those activities have stopped. Iran is also developing increasingly longer-range missiles as witnessed by the recent launch of a Space Launch Vehicle/Intermediate Range Ballistic Missile (IRBM), and procuring substantial numbers of short- and medium-range ballistic missiles. Iran's leaders have made numerous threats to destroy regional friends of the United States, have made direct threats against the United States,

and continue to pursue policies that are hostile to U.S. interests and jeopardize regional security.

Other states are assessed to possess chemical and biological weapon development programs and some have demonstrated a willingness to support terrorist groups and to transfer weapons to those groups. Deterring the transfer of WMD to violent extremists and their facilitators is one of the most demanding and highest priority goals for the United States.

The United States must also be concerned about the prospect for shifts in the alignment among states of concern. If significant changes occur, adjustments to U.S. deterrent capabilities may be warranted.

### **Violent Extremists and Non-State Actors**

The United States and its allies face a threat from violent extremists and other non-state actors. Some of the most serious non-state actors receive support from states that seek to use extremists and non-state actors as proxies. For example, the terrorist threat from Hezbollah is backed by Iran and Syria.<sup>2</sup> Some violent extremist groups seek WMD for use in their acts of terrorism. U.S. policy is to hold state sponsors of terrorism accountable for the actions of their proxies.

### **Major Existing Nuclear States Outside of NATO**

#### **China**

The Department of Defense (DoD) 2006 Quadrennial Defense Review (QDR) states: “U.S. policy remains focused on encouraging China to play a constructive, peaceful role in the Asia-Pacific region and to serve as a partner in addressing common security challenges, including terrorism, proliferation, narcotics, and piracy.” The QDR also notes, when looking forward, that “China has the greatest potential to compete militarily with the United States and field disruptive technologies that could, over time, offset traditional U.S. military advantages.”

China's long-term, comprehensive transformation of its military forces is improving its capabilities for force projection and anti-access/area denial operations. China's near-term focus on preparing for contingencies in the Taiwan Strait, including the possibility of U.S. intervention, is an important driver of its modernization. However, China's expanding military capabilities also affect East Asian military balances. Improvements in China's strategic capabilities have implications beyond the Asia-Pacific region.

China has had a fully functional and operating nuclear weapons infrastructure for over thirty years and is the only major nuclear power that is expanding the size of its nuclear arsenal. It is qualitatively and quantitatively modernizing its nuclear forces, developing and deploying new classes of missiles, upgrading older missile systems, and developing

---

<sup>2</sup> Testimony by the Director of National Intelligence to the Senate Armed Services Committee on February 27, 2007.

methods to counter ballistic missile defenses. Improvements in China's nuclear forces complement advances in conventional strike capabilities, including the development of advanced cruise missiles, medium-range ballistic missiles, and anti-ship ballistic missiles. China's January 2007 successful test of a direct-ascent, anti-satellite weapon suggests it seeks to expand beyond traditional concepts of anti-access/area denial in the land, air, and sea dimensions of the battlefield into space and cyber-space.

China has a variety of short-, medium- and long-range ballistic missiles deployed or in development, suggesting a level of commitment and confidence in this particular area of advanced military technology as well as an ability to deploy multiple ballistic missile systems with overlapping missions. China's nuclear-capable ballistic missiles include:

- the CSS-5 Mod 1 (DF-21) and CSS-5 Mod 2 (DF-21A) medium range ballistic missiles (MRBMs);
- the CSS-5 based JL-1 submarine-launched ballistic missiles (SLBM);
- a developmental JL-2 SLBM to be deployed aboard a new class of SSBN, the Type 094;
- the CSS-2 (DF-3A) IRBM; and
- CSS-3 (DF-4), CSS-4 Mod 2 (DF-5A), CSS-10 Mod 1 (DF-31), and CSS-10 Mod 2 (DF-31A) intercontinental ballistic missiles (ICBMs).

The United States continues to encourage China to increase openness and to be more transparent about its motivations, decision-making, key conventional and nuclear capabilities, and strategic intentions. The U.S.-China Dialogue on Nuclear Policy and Strategy and the U.S.-China Security Dialogue are important mechanisms to build greater understanding and reduce the risk of miscommunication and miscalculation.

## **Russia**

The United States is engaging Russia in important areas of common interest (e.g., counter-terrorism, nuclear security and nonproliferation), and does not consider Russia to be an adversary. However, despite diligent U.S. efforts to improve relations with Moscow, Russia's transition to a more democratic state with a less confrontational, more cooperative foreign policy has seen recent setbacks. Greatly assisted by profits from its oil and natural gas resources, Russia continues to modernize its strategic nuclear forces. Russia's current nuclear modernization includes:

- a new road-mobile and silo-based *Topol-M* (SS-27) ICBM;
- a new SS-27 derivative with a Multiple Independently-targetable Re-entry Vehicle (MIRV) payload the Russians call the RS-24,
- a new *Bulava* (SS-30) SLBM;

- a new *Borey*-class Ballistic Missile Submarine (SSBN);
- a new long-range strategic nuclear cruise missile designated the KH-102;
- modernization of *Blackjack* (Tu-160) heavy bombers;
- increased training for nuclear operations in all military branches; and
- upgraded nuclear weapons storage sites.

In addition, and quite unlike the United States, Russia maintains a fully functional nuclear weapons design, development, test and manufacturing infrastructure capable of producing significant quantities of nuclear warheads per year.

For a variety of reasons, Russia has explicitly placed increased emphasis on nuclear weapons in its national security policy and military doctrine, and has re-incorporated theater nuclear options into its military planning.

Even as the United States and its allies work to engage Russia cooperatively, and to promote greater transparency and predictability with respect to nuclear forces and other military capabilities, considerable uncertainty remains about Russia's future course. Recent statements by former President Putin have highlighted Russia's nuclear modernization program and operational readiness (e.g., the resumption of Russian long-range bomber patrols near U.S. and allied territories). Former President Putin's statements, together with Russia's across-the-board modernization of its strategic capabilities, increase concern regarding Russia's intentions. Russia has also threatened to target possible future U.S. ballistic missile defense sites in Eastern Europe. In light of these uncertainties, maintaining a nuclear force second to none, consistent with the Moscow Treaty, remains a prudent approach. For the same reasons, continuing U.S. security commitments to NATO and other allies –including the commitment of U.S. nuclear capabilities– remain vital.

## **Conclusions**

Nothing in the developments highlighted above suggest that U.S. nuclear weapons are no longer needed. Russia and China continue to attach great significance to their nuclear forces and their modernization. Regional dynamics lead other nations, such as India and Pakistan, to attach a similar significance to their nuclear forces. Nuclear programs in Iran and North Korea and further proliferation of nuclear weapons and technology remain a serious concern. Nuclear design knowledge has proliferated significantly over the last 60 years and cannot be reversed. These proliferation concerns were dramatically validated by the discovery early this decade of the wide-reaching proliferation network run by A.Q. Khan. The United States cannot afford to ignore these realities or the prospect that the future may hold similar risks. These trends clearly indicate the continuing relevance of nuclear weapons, both today and in the foreseeable future, and the need to maintain a viable U.S. nuclear capability well into the 21<sup>st</sup> century.

## Responses of U.S. Allies to the New Security Environment

Both the United Kingdom and France have each made sober assessments of the risks and uncertainties in the new security environment, and each has reached similar conclusions regarding these facts and trends. Both have made decisions to maintain their nuclear forces and infrastructure well into this century to guard against the challenges ahead.

The **United Kingdom** (U.K.) is committed to retaining an independent nuclear deterrent, as former Prime Minister Tony Blair said, “as an essential part of our insurance against the uncertainties and risks of the future.”<sup>3</sup> As a result of decisions taken by the U.K. Government in late 2006, and endorsed by the U.K. Parliament in March 2007, the U.K. will develop a new generation SSBN to replace the current Vanguard-class submarine from the mid 2020s. The U.K. is also participating in the life extension program for the U.S. Navy’s Trident II D-5 SLBM, and is undertaking a review of the optimum life of its current warhead stockpile and analysis of the range of replacement options that might be available. It has a program of investment in sustaining capabilities to ensure it can maintain its existing warhead type for as long as necessary and develop a replacement should that be required. These measures will enable the U.K. to sustain a nuclear deterrent force well into the future.

**France** has also committed to maintaining a modern nuclear force. In 1996 former French President Chirac announced a portfolio of reforms for a new defense strategy. France is implementing these announced initiatives. Recently, President Sarkozy reaffirmed in the French White Paper on Defense and National Security that “nuclear deterrence remains an essential concept of national security. The sole purpose of the nuclear deterrent is to prevent any state-originating aggression against the vital interests of the nation wherever it may come from and in whatever shape or form.”<sup>4</sup> In support of this policy, France is committed to the modernization of its sea-based ballistic missile force and nuclear-capable combat aircraft. France is also committed to sustaining its nuclear infrastructure. France maintains a fully functional and active nuclear warhead design and production infrastructure that supports a nuclear force comprised of SLBMs and air-launched missiles. Currently, France is developing:

- a new *Triumphant*-class SSBN to be deployed in 2010;
- a new SLBM (M-51) to be deployed in 2010;
- a new air-to-ground missile (ASMPA) to be deployed in ~2009; and
- new warheads for both their SLBMs and air-to-ground missiles.<sup>5</sup>

---

<sup>3</sup> *The Future of the United Kingdom’s Nuclear Deterrence*, HMSO: London, 2006, page 5.

<sup>4</sup> *The French White Paper on Defense and National Security*, Presidence de la Republique: Paris, 2008, page 2.

<sup>5</sup> France designs and fields two new nuclear warhead designs approximately every decade.

## **Sizing the U.S. Force: Political and Military Considerations**

The U.S. nuclear force structure is sized in light of the current and future global security environment and by the broad policy goals U.S. nuclear forces are expected to support. Analysis of the factors described below resulted in the conclusion that a force of 1,700 to 2,200 operationally deployed strategic nuclear warheads is sufficient to meet U.S. strategic requirements. The United States currently plans on achieving such a force by 2012, consistent with U.S. obligations under the Moscow Treaty of 2002.<sup>6</sup> This represents a reduction of about 80 percent from the highest levels of ODSNW during the Cold War. The United States already has reduced its ODSNW by about 50 percent over the past 15 years. In addition, the United States has reduced its non-strategic nuclear weapons by 90 percent since 1991. Thus, while maintaining its security obligations, the United States has also been at the forefront of meeting the obligations of Article VI of the Nonproliferation Treaty.

The force sizing methodology used during the Cold War was based primarily on targeting needs associated with the prospect of a strategic conflict with the Soviet Union. Today, however, the criteria for force sizing are no longer based on the size of Russian forces and the cumulative targeting requirements for nuclear strike plans. Instead, the size of the U.S. nuclear force is now based on the ability of the operationally deployed force, the force structure, and the supporting nuclear infrastructure to meet a spectrum of political and military goals. These considerations reflect the view that the political effects of U.S. strategic forces, particularly with respect to both central strategic deterrence and extended deterrence, are key to the full range of requirements for these forces and that those broader goals are not reflected fully by military targeting requirements alone.

Furthermore, significant changes in the global security environment can occur rapidly. Today's force posture includes land- and sea-based ballistic missiles and long-range bombers to provide national leaders the means to respond in a timely manner to future, and as yet unforeseen, adverse geopolitical, operational and technical developments.

Finally, contemporary force sizing is guided by the fact that the DoD infrastructure for strategic forces and the National Nuclear Security Administration (NNSA) nuclear warhead production infrastructure, even if both are fully functional, may not be capable of responding as rapidly as needed to some kinds of unforeseen operational or technical problems, or to address adverse changes in the geopolitical environment. A responsive infrastructure and a modern stockpile are needed to provide a cushion or hedge against such contingencies.

Much of the current force sizing logic was developed during the 2001 Nuclear Posture Review (NPR), and the logic remains valid and compelling. It is also important to

---

<sup>6</sup> Periodic reviews are conducted to monitor both political and technical developments that could affect U.S. force sizing and the pace and scale of U.S. nuclear reductions. This or future administrations could adjust planned U.S. force levels.

acknowledge that the NPR, in turn, built upon earlier concepts developed in the administrations of Presidents William J. Clinton and George H.W. Bush. For example, the START II Treaty (which never entered into force) pioneered the notion of planning for a strategic nuclear force posture within a specified range (3,000 - 3,500 accountable warheads), while the START III treaty proposed during the Clinton Administration aimed at the goal of 2,000 - 2,500 warheads. In the 1994 Nuclear Posture Review, the Clinton Administration also developed the “lead and hedge” strategy as a way to reduce the size of the deployed strategic nuclear force while also ensuring that the United States would be able to respond to future challenges that could be more stressing than estimated at that time. As such, the United States would take a “lead” role in nuclear reductions, but would “hedge” against adverse trends by retaining a significant number of non-deployed nuclear warheads that could be redeployed, if warranted, and a force structure capable of uploading and employing those warheads, if needed. The strategy the United States follows today is an extension of the approach first adopted in the 1990s and a testament to the continuing strength of these ideas.

### **Assurance, Dissuasion, Deterrence, and Defeat**

U.S. nuclear forces support the defense goals of assuring allies and friends, dissuading nations from military competition with the United States, deterring adversaries from attacking the United States and its allies, and, if necessary, defeating those who attack us. The United States seeks to:

- **Assure allies** that U.S. security commitments remain valid and that the U.S. force posture is sufficient and appropriate for plausible scenarios of concern.
  - U.S. extended nuclear deterrence commitments to allies have been essential to the success of U.S. alliances. For example, the U.S. nuclear deterrent has been, and remains, the cornerstone of NATO’s collective security. Allied participation in NATO’s nuclear responsibilities and decision making have played a major role in assuring NATO members of the reality of the U.S. commitment to the common defense. In Asia, the U.S. nuclear commitment to the security of allies and friends has also played a significant role in mutual defense efforts.
  - Despite the best efforts of the U.S. and others, the proliferation of weapons of mass destruction (WMD) continues. The United States must ensure that its allies around the world continue to judge U.S. strategic capabilities to be credible and sufficient to guarantee their security. In the absence of allied confidence in U.S. capabilities and commitments, these states could feel compelled to acquire nuclear weapons of their own. Thus, maintaining continued allied confidence in the U.S. extended nuclear deterrent is an essential element of U.S. nuclear non-proliferation policy.

- Assurance of allies also requires that U.S. nuclear forces are not perceived as inferior or at an overall disadvantage when compared to the capabilities of other nuclear powers. The maintenance of 1,700 to 2,200 operationally deployed U.S. strategic nuclear warheads is an important part of this perception. Beyond its strategic capabilities, the United States also assures allies and friends through its effective conventional forces, missile defenses, and non-strategic nuclear forces that can be forward deployed, as appropriate.
- **Dissuade adversaries and potential adversaries** from developing threatening capabilities (including engaging in a nuclear arms competition with the United States).
  - This goal, which has endured since the 1960s, includes shaping military competition in ways favorable to the United States that also complicate military planning for potential opponents. The planned U.S. nuclear force in 2012 will support dissuasion goals by retaining a sufficient margin over countries with expanding nuclear arsenals to discourage their leaders from initiating a nuclear arms competition, while encouraging them to pursue more modest and less confrontational strategies.
- **Dissuade any potential near-peers** from military competition. Nuclear weapons are important in dissuading any potential near-peer competitor from realizing possible advantages from the acquisition of counterforce nuclear capabilities. The 1,700 to 2,200 ODSNW the United States is planning to deploy in 2012 provides a sufficient capability such that the costs of a direct nuclear competition with the United States would be very high.
  - The U.S. must also consider the potential of a robust industrial base, and growing economic power, to support the strategic objectives of a potential near-peer competitor. Maintaining 1,700 to 2,200 U.S. ODSNW also provides substantial warning and response time should any potential near-peer competitor aggressively seek to achieve nuclear parity with, or superiority over, the United States. U.S. leaders would have opportunity to respond with a combination of diplomatic and force posture initiatives should it become necessary. Finally, maintaining a credible deterrent assures U.S. allies that might otherwise develop independent nuclear arsenals in response to a near-peer's military modernization and expansion.
  - The United States seeks friendly constructive relations with all nations. However, should a potential near-peer competitor rebuff U.S. efforts to develop a constructive relationship, the United States could reverse the direction of its nuclear reductions and reconstitute elements of its nuclear forces. Reversing the reductions would take significant time, but for the mid-term, this would be significantly less costly and take much less time than building new systems and warheads.



- **Deter adversaries** from aggression, especially deterring the use or threatened use of nuclear weapons or other WMD against the United States, its deployed forces, allies and friends. The U.S. nuclear force must be of sufficient size and possess a wide range of capabilities to provide credible threat options to deter existing and future WMD-armed adversaries. Strategic capabilities—the nuclear force, along with non-nuclear offensive capabilities and defenses—need to provide a wide range of offensive and defensive options for national leaders to respond effectively and appropriately to any level of aggression directed against the United States, its allies or friends.

Estimates of the **deterrence and defeat** requirement for WMD-armed adversaries take into consideration several factors:

- The decades-old, highly integrated operational plan for strategic nuclear forces—the Single Integrated Operations Plan (SIOP) —was replaced in 2003 with a plan that provides smaller, more flexible targeting options.<sup>7</sup>
- Strategic nuclear warheads available on a day-to-day basis provide a spectrum of targeting options for consideration during rapidly developing, high-stakes contingencies. This force, much smaller than the 1,700 to 2,200 ODSNW, and routinely deployed and responsive to orders only from the President, serves immediate deterrence and defeat goals.
- However, should unexpected developments pose a more imminent threat, the projected day-to-day alert force could be increased relatively quickly (a few weeks to months) up to the baseline 1,700 to 2,200 ODSNW. This could entail bringing bombers to an alert status or placing additional strategic submarines at sea. Such actions could be needed in response to an unexpected contingency, e.g., the emergence of a new WMD-armed adversary, or severe deterioration in a U.S. near-peer relationship resulting in a return to hostile confrontation and nuclear threats.<sup>8</sup>

## **Responsive Capability**

The United States must also have the means to respond to dramatic adverse developments that can reduce the effectiveness of the U.S. nuclear arsenal. Therefore, the United States requires a responsive industrial infrastructure to maintain existing capabilities and manufacture new or replacement components, as needed. Until a truly responsive nuclear infrastructure is operational, the United States will need to retain an appropriate inventory

---

<sup>7</sup> The 2001 Nuclear Posture Review stated that “[t]he United States no longer plans, sizes or sustains its forces as though Russia presented merely a smaller version of the threat posed by the former Soviet Union [but] shifts planning for America’s strategic forces from the threat-based approach of the Cold War to a capabilities-based approach.” p. ii.

<sup>8</sup> The number and types of nuclear force capabilities needed to deter a specific adversary in a particular circumstance may differ significantly from those the President might decide to employ to defeat that adversary. However, during force sizing decisions for the NPR, DoD leaders judged the force sizing criteria for deterrence and defeat to be comparable.

of non-deployed warheads to manage geopolitical, technical and operational risks.

The United States must also retain sufficient force structure to enable the deployment of additional warheads for the most stressing, plausible challenges ahead. Such stressing challenges could include growing, resurgent or recidivist military powers. Significant increases to respond to such developments would take a few years, at a minimum.

The goal of maintaining a strategic force structure that would be flexible enough to support reconstitution to support U.S. assurance, dissuasion, deterrence, and defeat objectives, even under stressing circumstances, helped establish the basic parameters for U.S. force sizing. Even in light of the limited ability of the existing infrastructure to replace nuclear offensive capabilities, specific adjustments to the strategic nuclear force structure have been considered to be prudent:

- Some elements of the START-compliant force have been retired (e.g., all 50 Peacekeeper ICBMs and 50 Minuteman III ICBMs);
- Consistent with the increased emphasis on advanced non-nuclear strike capabilities, some force elements have been reconfigured for conventional force roles (e.g., four SSBNs were converted to guided missile submarines (SSGNs) and the entire B-1 bomber force has been dedicated exclusively to conventional missions); and
- Some elements of the nuclear force have been downloaded (i.e., deployed with fewer warheads than they have the capability to carry) to configurations that are more appropriate for our 21<sup>st</sup> century strategy.

As improvements to the infrastructure for strategic forces are realized, increased reliance will be placed on a more responsive infrastructure, and decreased reliance on maintaining a reserve of non-deployed warheads.

Prior to the 2001 Nuclear Posture Review, force sizing considerations were based on target defeat criteria with the objective of rendering a nuclear-armed adversary incapable of prosecuting conflict, and terminating any conflict on terms favorable to the United States. U.S. nuclear forces were sized to defeat all credible nuclear-armed adversary targets, and the United States retained a small reserve to ensure sufficient capability to deter further aggression in any post-exchange, post-conflict environment. Weapons were dedicated to specific targets, and the requirements for target defeat did not change dramatically year-to-year. As a result, the overall U.S. nuclear force posture accommodated incremental change in the target base, because a fully-functioning nuclear weapons infrastructure and the nuclear force structure, enabled the United States adjust to change.

The Nuclear Posture Review of 2001 adopted the defense policy goals of Assurance, Dissuasion, Deterrence and Defeat articulated in the Quadrennial Defense Review of 2001, and transitioned planning from a threat-based calculus for force sizing to a capabilities-based approach. The NPR's decision to reduce the strategic nuclear force

posture to between 1,700 and 2,200 ODSNW by 2012 was based on a number of factors, including the fact that Russia no longer presented an immediate threat. To that end, the goal of a new strategic framework with Russia held significant consequences for the required size and character of U.S. nuclear forces. Achieving a more cooperative, less confrontational U.S.-Russian relationship was key to adjusting the size of the U.S. nuclear force.

In addition, the 2001 Nuclear Posture Review made distinctions among the contingencies for which the United States must be prepared. These contingencies were categorized as immediate, potential, or unexpected. The resultant force size of 1,700 to 2,200 ODSNW was judged to be sufficient to meet the requirements of assuring allies and dissuading potential competitors. These factors have proven more determinant of overall force size than the narrow, Cold War-era criterion of target defeat.

## Managing Risk and the U.S. Nuclear Posture

To help manage geopolitical, operational<sup>9</sup>, and technical risks, the United States relies on three inter-related aspects of its nuclear posture: 1) the composition of the operationally deployed nuclear delivery systems and their capacity to deliver nuclear weapons; 2) the size, yield, and mix of the nuclear stockpile that supports the operational force; and 3) the ability of the supporting infrastructure to maintain, produce, and repair nuclear weapon delivery systems and warheads. The following sections discuss how each aspect of the U.S. nuclear posture contributes to the overall management of risk.

### **Baseline: The Planned Strategic Nuclear Force for 2012**

The United States maintains a triad of strategic nuclear forces that includes land-based ICBMs, SSBNs armed with SLBMs, and long-range bombers able to deliver both stand-off cruise missiles and gravity bombs. (The United States also maintains a small non-strategic nuclear force, consisting of dual-capable aircraft deployed in NATO countries, and some non-deployed, nuclear-armed sea-launched cruise missiles.) Each leg of the triad brings unique capabilities. Together, the legs of the nuclear triad combine to provide operational flexibility and help ensure that an adversary cannot pose a threat that could potentially negate the entire force.

The planned composition of the U.S. strategic nuclear force in 2012 is:<sup>10</sup>

- 450 Minuteman III ICBMs;
- 14 Ohio class SSBNs; and
- 20 B-2 and 56 B-52 bombers

This force structure allows the deployment of 1,700 to 2,200 warheads, provides flexibility to adjust the loading of warheads among the three legs of the triad in response to technical concerns or operational needs, and provides sufficient capacity to increase the number of deployed warheads in response to adverse geopolitical developments.

On a day-to-day basis, some portion of the 1,700 to 2,200 ODSNW will be on alert and readily available. The number of U.S. strategic nuclear warheads maintained on day-to-day alert has decreased dramatically in the post-Cold War era. In 1987, the United States had many thousands of strategic nuclear warheads on alert; today's alert force is much reduced and projected to be even less in 2012.

---

<sup>9</sup> Operational risks are threats to the survivability or effectiveness of U.S. nuclear forces stemming from actions by potential adversaries.

<sup>10</sup> The Administration decided in 2001 to withdraw four SSBNs from strategic nuclear service for modification as cruise missile and special-forces-capable submarines. B-1 bombers were also removed from the nuclear role in 2001. All 50 Peacekeeper ICBMs were fully retired by September of 2006. Following the 2006 Quadrennial Defense Review, the Department of Defense announced plans to retire an additional 50 Minuteman III ICBMs, retire all Advanced Cruise Missiles (ACM), and reduce the number of Air Launched Cruise Missiles (ALCMs).

For the near-term, the planned strategic nuclear force structure provides the diversity, survivability, and flexibility to adapt to a range of plausible, but unforeseeable future needs. A pressing concern is the aging of the strategic nuclear force. The Minuteman III ICBM force is to be life-extended to 2030, and the United States needs to develop a follow-on to its current Trident SSBN, and a next generation bomber.

### **The Nuclear Warhead Stockpile**

The current stockpile of nuclear warheads includes sufficient quantities of each warhead type to support deployed nuclear forces. Additionally, because the United States does not have the ability to produce new warheads, a pool of non-deployed warheads is retained to be used in cases of reliability failures and as a hedge against adverse political developments.

In 2004, DoD and NNSA jointly conducted a study of nuclear stockpile needs to support the planned, operationally-deployed force. The study considered the need for deployed warheads (both strategic and non-strategic), spares for logistics and maintenance, warheads that would be destroyed during annual surveillance and quality assurance inspections, and a pool of non-deployed warheads that could be used as either reliability replacements or to augment the planned deployed force. The study recommended a reduction in the nuclear stockpile of over 40 percent by 2012. The President approved the findings and directed the reductions. Subsequently, the stockpile analysis has been refined and the planned 2012 stockpile size reduced further to the lowest total since the Eisenhower Administration, and a quarter of its level at the end of the Cold War.

### **Concerns with the Stockpile**

The stockpile stewardship program, initiated in the mid-1990s, has largely been successful. At present, our judgment is that the nuclear warhead stockpile remains safe, secure, and reliable.<sup>11</sup> For the near-term, the administration continues to have confidence that warhead life extension programs for W76 warheads for Trident II missiles, and for B61 gravity bombs, are needed and are wise investments to sustain existing nuclear capabilities. However, the current path for sustaining the warhead stockpile—successive refurbishments of existing Cold War warheads designed with small margins of error—may be unsustainable in the future. Specifically, the directors of the nation’s nuclear weapons laboratories have expressed concern about the ability to ensure confidence in the reliability of the legacy stockpile over the long term, without nuclear testing.

Successive efforts at extending the service life of the current inventory of warheads will drive the warhead configurations further away from the original design baseline that was validated using underground nuclear test data. Repeated refurbishments will accrue technical changes that, over time, might inadvertently undermine reliability and

---

<sup>11</sup> For example, see the written statement of Thomas P. D’Agostino, then acting Under Secretary for Nuclear Security and Administrator, NNSA, before the House Armed Services Subcommittee on Strategic Forces, March 20, 2007.

performance. The skills, materials, processes, and technologies needed to refurbish and maintain these older warhead designs are also increasingly difficult to sustain or acquire. Some of the materials employed in these older warheads are extremely hazardous. Moreover, it is difficult to incorporate modern safety and security features into Cold War-era weapon designs.

As a consequence, the stockpile stewardship program is expanding its range of component and material testing and analysis, and is likely to identify more areas of concern. However, without nuclear testing, at some time in the future the United States may be unable to confirm the effect of the accumulation of changes to tested warhead configurations. As the United States continues to observe a moratorium on underground nuclear testing, certification of the safety, surety, and reliability of the existing stockpile of weapons (with their narrow performance margins) will become increasingly difficult. In the near-term, the United States has no choice but to continue to extend the life of these legacy warheads.

However, the Departments of Defense and Energy are pursuing an alternative to this strategy of indefinite life extension; namely, the gradual replacement of existing warheads with warheads of comparable capability that are less sensitive to manufacturing tolerances or to aging of materials. The generic concept is often referred to as the Reliable Replacement Warhead (RRW). The RRW concept promises other attractive benefits such as improved safety and security, production processes that are less complex, elimination of many hazardous materials in existing warheads, and production of less hazardous waste.<sup>12</sup> The directors of the nuclear weapons laboratories believe that modern scientific tools developed for the stockpile stewardship program, including advanced computer modeling and experimental facilities, will enable design and certification of the RRW without nuclear testing.

In the longer term, RRW will be key to sustaining confidence in the U.S. nuclear stockpile. Assuring allies and convincing adversaries of the safety, security, and reliability of U.S. nuclear forces will, in turn, contribute to the full range of political and military benefits of the U.S. nuclear deterrent. Allies with continued confidence in U.S. extended deterrence will have less motivation to develop nuclear weapons of their own. Moreover, once the RRW is deployed in significant numbers as replacements for low-margin-of-error legacy warheads, some or all of the reserve warheads retained in the stockpile for reliability purposes can be retired and dismantled without incurring significant risk.

---

<sup>12</sup> It has become clear that the security threat to nuclear warheads has fundamentally changed. The security features in today's stockpile are commensurate with the technologies available during the Cold War, and with the threats of that time. Modern safety and security features, mandated today, cannot be fully incorporated through retrofits to the legacy stockpile. Modern safety and security technology is best incorporated into the stockpile during the design phase, when there is flexibility in accommodating new features.

## The Nuclear Warhead Infrastructure

During the Cold War, the U.S. nuclear weapons infrastructure, comprising design and engineering laboratories, as well as testing and production facilities, played an important role in risk management. During this period the United States did not maintain a significant inventory of non-deployed warheads as reliability back-ups or for force augmentation; instead, the United States relied on a large operationally deployed force and an active nuclear weapons infrastructure to meet emerging needs in a timely manner.

When a serious technical problem did occur with a given warhead, this infrastructure had sufficient capacity to respond rapidly and implement solutions so that a reliable, certified nuclear force could be maintained. Accordingly, existing U.S. nuclear weapons were designed for a short service life of approximately 10-15 years, and the nuclear infrastructure routinely replaced warheads with new designs to meet emerging requirements.<sup>13</sup>

During the late 1980s and early 1990s, a series of events combined to change fundamentally how the United States manages the risks associated with maintaining its nuclear force. These events included the shut down and dismantlement of the nation's nuclear weapon "pit" fabrication plant at Rocky Flats, Colorado in 1989; two Presidential Nuclear Initiatives issued by President George H. W. Bush in 1991 and 1992, which halted all nuclear weapon development and production then underway; and President Clinton's announcement in 1993 of an indefinite moratorium on nuclear testing.

Consequently, the United States is now the only nuclear weapons state party to the NPT that does not have the capability to produce a new nuclear warhead. The United States has not designed a new nuclear warhead since the 1980s and has not built a new warhead since the early 1990s. As a result, the nuclear weapons infrastructure has atrophied and existing U.S. nuclear weapons — most of which were designed 20 to 30 years ago — are being maintained well beyond the service life for which they were designed. Critical personnel, with experience in the design and testing of nuclear weapons, are also aging and retiring, and in the absence of a viable nuclear infrastructure, their expertise cannot be replaced. Moreover, as new design efforts are further delayed, the ability and availability of experienced designers and engineers to mentor the next generation will decrease over time.

The hedging strategy adopted by the United States for mitigating geopolitical and technical risks by retaining a significant number of reserve warheads is a direct result of the events of the 1980s and early 1990s and the atrophy of the nuclear infrastructure. During this same period the need to manage risk was also considered in other initiatives. For example, the Stockpile Stewardship Program (initially Science-based Stockpile Stewardship) was developed to mitigate the risks associated with the moratorium on

---

<sup>13</sup> Even with active design, engineering, and production efforts in operation, however, strategic reserves of critical materials, such as tritium, plutonium, and highly enriched uranium, were maintained in case the material production portion of the infrastructure was off-line for a time.

nuclear testing, while life extension programs were developed to sustain existing nuclear forces absent a fully operational nuclear infrastructure.

In the long-term, the goal is for the United States to rely more on a revived nuclear infrastructure to respond to unforeseen events, and less on reserve warheads in the stockpile. However, until there is confidence in the infrastructure's demonstrated capability to respond to unexpected developments by producing nuclear weapon components in sufficient quantities, especially plutonium pits, the United States will need to retain more reserve warheads than otherwise would be desired as a hedge against technical problems or adverse geopolitical changes.

The RRW program will be a key enabler for a more responsive nuclear infrastructure, and will help train a new generation of U.S. experts capable of sustaining nuclear deterrent forces. Key milestones in developing the RRW and a responsive infrastructure include:

- *Completion of the RRW Phase 2/2A Design Definition and Cost Study.* Completion of this study will provide estimates of the costs to develop, produce, and deploy replacement warheads. These estimates will inform the decision whether or not to seek Congressional authorization and funding to begin RRW engineering development and to refine future plans.
- *Completion and approval by DoD/NNSA of an RRW certification plan* to achieve RRW safety and reliability goals without nuclear testing.
- *Achievement of an interim production capacity of 30-50 pits per year at TA-55*, the pit production area at Los Alamos National Laboratory.
- *Demonstration that RRW can be certified without underground nuclear testing.* Once the first RRW is produced, weapons designers and engineers will confirm, as part of the certification process, that the RRW meets the original design goals.
- *Achievement/demonstration of expanded pit production of 50-80 pits per year.* This would require the construction of a new Chemistry and Metallurgy Research-Replacement (CMRR) Nuclear Facility.

With a viable design, congressional approval, and appropriate funding, these steps could be completed in about ten years. Accomplishing these milestones would result in increased levels of confidence as the United States proceeds with stockpile and infrastructure transformation. In combination, these milestones represent a vital first step in this transformation. Sustained production of RRW and several years of experience with RRW in the stockpile will permit characterization of any inadvertent defects introduced during development and production. This will help support subsequent decisions to curtail some warhead life extension programs and move forward with a warhead replacement strategy.



Finally, an issue of critical importance for the 21<sup>st</sup> century is the production capacity needed for a responsive nuclear weapons infrastructure, i.e., the rate at which it can refurbish existing warheads or produce replacement warheads. The time required to replace the existing stockpile depends critically on the overall size of the stockpile, the viability of pit reuse options, and the rate at which new plutonium pits can be produced.

Currently, the United States has a very small pit production capacity (about ten pits per year) at Los Alamos. A variety of pit production alternatives have been evaluated as part of the planning for transforming the nuclear weapons complex infrastructure. The best alternative, for all potential pit production capacities, is to increase the existing production facilities at Los Alamos to its estimated maximum capacity of 50-80 pits per year.

Should a capacity greater than 50-80 pits per year be required, this could be achieved by either an upgrade to the CMRR or an addition of a new manufacturing annex at TA-55.<sup>14</sup> Several key factors must be considered when judging the desired production capacity of the nuclear weapons infrastructure:

- First, depending on warhead type, the best estimate of minimum pit life is 85-100 years. Although this exceeds previous estimates, degradation from plutonium aging still introduces uncertainty in overall system performance, particularly for systems with tighter margins. As the stockpile continues to age, the United States must plan to replace considerable numbers of pits in stockpiled weapons.
- Second, at significantly smaller stockpile levels than today, the U.S. must anticipate that an adverse change in the geopolitical threat environment, or a technical problem or development, could require manufacture of additional warheads on a relatively rapid timescale.
- Third, if a decision is made to field RRW, the U.S. will require an expanded pit production capacity to introduce sufficient numbers of these warheads into the stockpile.
- Finally, production rates correlate directly to the retirement of legacy warheads.

---

<sup>14</sup> By way of comparison, U.S. planned pit production capacity is very modest – much more than a factor of ten below Cold War levels when the U.S. was producing thousands of warheads.

This relationship, and the timelines required to replace current warheads in the stockpile, can be seen below.<sup>15</sup> In the case of a total stockpile of 3,500 warheads the replacement process would take well over half a century at a rate of 80 pits per year.

**Calendar Year (CY) in Which Stockpile Replacement Would Be Completed**

<b>Pits per Year:</b>	<b>50</b>	<b>80</b>	<b>100</b>	<b>125</b>	<b>150</b>
<b>Total Stockpile Size</b>					
4,500	CY2114	CY2080	CY2069	CY2060	CY2054
3,500	CY2092	CY2066	CY2058	CY2051	CY2047
2,500	CY2070	CY2052	CY2047	CY2042	CY2039

Such timelines suggest that a flexible infrastructure capable of higher production rates could help meet a requirement to respond in a timely way to stressing developments in the international security environment. At the same time, such an infrastructure could provide the benefits of an RRW—safety, surety, and reliability without underground testing—much earlier than would otherwise be the case, even with smaller stockpiles than currently planned. Near-term planning for 50-80 pits-per-year capacity will be executed in a way that does not preclude further expansion if desired in the future. Changes to military requirements, stockpile size, and risk factors may ultimately lead to a revised rate.

Many questions regarding the future nuclear stockpile and nuclear force cannot be answered with precision today. The answers will depend on knowledge gained by further work on programs such as RRW, by efforts to modernize the nuclear warhead infrastructure, and by closely watching emerging trends around the world.

---

<sup>15</sup> The calculations assume the following:

- Based on starting production in 2008
- Facilities do not operate at 100 percent efficiency – down time must be scheduled for training, equipment maintenance, and periodic reconfiguration;
- The existing pit manufacturing facility at Los Alamos gradually increases the production rate until its design goal is reached;
- A new facility immediately begins to operate at its design capacity (at 90 percent efficiency) in the future (when production at the existing facility would be phased out).

## **Conclusions**

The United States is making historic reductions in its deployed nuclear forces and its nuclear stockpile. The resulting nuclear force, along with a portfolio of advanced conventional offensive and defensive strategic capabilities, will support the goals of assurance, dissuasion, and deterrence, and allow the United States to respond decisively against aggression should deterrence fail.

The future security environment is characterized by a broad range of uncertainties; some current trends are not favorable. The future direction that states may take, including some established nuclear powers with robust nuclear force modernization programs, could adversely affect U.S. security and that of U.S. allies and friends. The United States seeks to assure its allies and friends that the U.S. nuclear deterrent continues to serve as the ultimate guarantor of their security, obviating any need for them to develop nuclear weapons of their own. Credible U.S. nuclear capabilities and the security commitment to allies remain an indispensable part of U.S. efforts to limit nuclear proliferation.

Maintaining a credible nuclear force for the nation will require partnership between the Executive Branch and the Congress; this partnership will be no less critical in the future than in the past. Over the next two decades, Congress and the American people will be asked to consider initiatives that will help determine how fast and how far the United States can go in transforming its strategic capabilities and nuclear infrastructure to manage the risks and challenges of the 21<sup>st</sup> century.

## Annex I

### Stockpile Planning through 2012

Although the United States would be permitted to deploy up to 2,200 ODSNW in 2012 under the Moscow Treaty, no decisions have been made about the number or mix of specific warheads to be fielded in 2012. Factors bearing on these decisions will be addressed in periodic reviews of future geopolitical trends, the health of the U.S. nuclear weapons stockpile, and progress towards fielding the New Triad and restoring a responsive nuclear weapons infrastructure.

Although the United States will reduce its ODSNW to 1,700 to 2,200, this will not reduce the total stockpile to 1,700 to 2,200 warheads. The operationally deployed force of 1,700 to 2,200 strategic warheads is *not* the total size of the nuclear stockpile. Additional warheads will be needed for routine maintenance of the stockpile including logistics spares and to replace those warheads that are eliminated during destructive surveillance testing—the so-called Quality Assurance Reliability Test (QART) units. Further, a reduced number of warheads for U.S. non-strategic nuclear forces (already reduced from Cold War levels) will be retained, among other reasons, to meet commitments to allies.

In addition, some warheads will be retained for prudent risk management to mitigate geopolitical and technical risks. Mitigating geopolitical risk will require that sufficient numbers of non-deployed warheads be retained to augment the operationally deployed force should world events require a more robust deterrence posture.

As the stockpile ages and becomes both smaller and less diverse in terms of the number of warhead types that are deployed, there is inevitably less flexibility to adjust for technical failures that could arise. Any concerns that develop about stockpile safety and reliability become even more pressing. Mitigating technical risk, therefore, will cause us in the near term to retain additional warheads, over and above the operationally deployed force, for reliability replacement, and also to seek to preserve diversity of warhead types in the overall stockpile.

The capability and credibility of the nation's deterrent is particularly sensitive to technical problems that could render a warhead unacceptable. This problem has been a primary impetus for the RRW program and highlights the urgency of getting on with the task of restoring a responsive and capable nuclear weapons infrastructure. To a certain extent, the U.S. currently hedges against potential problems by retaining a sufficiently large number of warheads in reserve.