

# **THE FUTURE INTEGRITY OF THE GLOBAL NUCLEAR NON-PROLIFERATION REGIME**

ALTERNATIVE NUCLEAR WORLDS AND IMPLICATIONS FOR US NUCLEAR POLICY

**FINAL REPORT**



A STUDY FOR  
**THE DEFENSE THREAT REDUCTION AGENCY**  
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***DFI INTERNATIONAL / SPARTA, Inc.***

THE FUTURE OF THE GLOBAL NUCLEAR NON-PROLIFERATION REGIME  
Alternative Nuclear Worlds and Implications for US Nuclear Policy

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**BACKGROUND:** The Defense Threat Reduction Agency (DTRA) was founded in 1998 to integrate and focus the capabilities of the Department of Defense (DoD) that address the weapons of mass destruction (WMD) threat. To assist the agency in its primary mission, the Advanced Systems and Concepts Office (ASCO) develops and maintains an evolving analytical vision of necessary and sufficient capabilities to protect United States and Allied forces and citizens from WMD attack. ASCO is also charged by DoD and by the US Government, generally, to identify gaps in these capabilities and initiate programs to fill them. It also provides support to the Threat Reduction Advisory Committee (TRAC), and its Panels, with timely, high quality research.

**ASCO ANALYTICAL SUPPORT:** DFI International and SPARTA, Inc. have provided analytical support to DTRA since 1999 through a series of projects on nuclear, chemical, and biological issues. This work was performed for DTRA under contract DTRA01-00-D-0001.

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## EXECUTIVE SUMMARY

In April of 2000, a project team composed of analysts from DFI International and SPARTA, Inc. embarked on a twelve-month evaluation of the future integrity of the global nuclear non-proliferation regime and its potential linkages to a comprehensive test ban. A major component of this effort included forecasting likely decision behavior among 16 selected states<sup>1</sup> within varying nuclear security environments, and then assessing the possible ramifications for US nuclear policy and force structure. Specifically, what would be the implications for the United States in a world with robust non-proliferation and test-ban restrictions (i.e., a viable Non-Proliferation Treaty (NPT) with a Comprehensive Test Ban Treaty (CTBT) entry-into-force)? Conversely, what would be the implications for US nuclear policy and force structure in a world *devoid* of either one or both of these regimes? Finally, what would be the consequences of a breakdown in the testing moratoria?

The effort to project future nuclear environments, states' reactions and policy adjustments to them, and US responses to those changes including their potential cost is inevitably a challenging and highly speculative undertaking. Like any "futures" analysis, the team's projections are likely to prove to be inaccurate in an absolute sense, especially the cost data. That said, this study represents a systematic approach to thinking through some well-specified futures to gauge underlying trends and the complexity of interaction among decision factors. Indeed, this exercise has generated some valuable insights in contemplating policy choices today that are likely to have significant impact on the course of future security environments.

### *Primary Findings*

- **The issue of nuclear testing—and the current moratoria on such testing—is of greater consequence to the non-proliferation regime in the near-term than the legal status of the CTBT.** A test by one of the P-5 would likely precipitate tests by most of the other nuclear powers for military and political reasons. There has been minimal discernible negative effect of the US Senate's rejection of the CTBT ratification on either the NPT or the nuclear non-proliferation regime writ large.
  - In the longer term, however, a failure of the US to ratify CTBT would be more injurious to the non-proliferation regime than the current atmosphere would indicate. Most damaging is the resulting increased prospect that the testing moratoria would be broken.
- **In future nuclear environments, state perceptions of the global and particular regional security situations are the principal drivers of state behavior and policy choices, not international treaty arrangements.**<sup>2</sup> Treaty arrangements, such as the NPT and CTBT, typically are the manifestations of an international

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<sup>1</sup> Russia, France, United Kingdom, China, Israel, India, Pakistan, North Korea, Iran, Iraq, Argentina, Brazil, Egypt, Japan, South Korea, and South Africa.

<sup>2</sup> Thus, the project team employed several assumptions regarding global and regional strategic situations to narrow scenario conditions and focus states' reactions to particular situations or events.

security environment rather than the driver of a new one. Although the existence of arms control treaties increases the costs of state actions that are perceived to stress the existing security system or balance, treaty obligations virtually never outweigh national interests when a severe threat to national security is perceived. In a crisis, states will usually bear those costs if a policy option exists to bolster national security.

- **Current plans and policies are remarkably robust: existing nuclear states (P-5, Israel, India, and Pakistan) are unlikely to deviate their nuclear policies significantly from current positions and plans in most future nuclear environments.**<sup>3</sup> State decision-makers' confidence in traditional deterrent approaches and general satisfaction with existing or planned force structure is likely to generate relative consistency between current and future nuclear policies. For less developed nuclear states (i.e., China, India, Pakistan), however, the status quo means continuing to develop their arsenals quantitatively and qualitatively.
- **Current non-nuclear states will also likely maintain their current trends barring a major deterioration of the non-proliferation regime.** Iran, Iraq, and North Korea will aggressively pursue nuclear capabilities, barring fundamental international change, regardless of which nuclear future develops. However, since their rate of success depends heavily on foreign assistance, a breakdown of this regime will likely facilitate more imminent nuclear status for Rogue States. Such a development would require other key states in the Middle East and Asia (e.g. Egypt, Japan) to consider aggressive diplomatic and military policies, including new emphasis on nuclear programs, especially if they view US security guarantees as no longer credible. Nuclear-capable states in regions without nuclear forces (e.g. Argentina, Brazil, South Africa) are not likely to restart their programs even with the collapse of the non-proliferation regime.
- **Given these foreign reactions, US nuclear policy is likely to continue current trends in the range of alternative nuclear futures: reduced nuclear strategic offensive forces and growing ballistic missile defense.** The extent of acceptable reductions in strategic offensive forces would decline if the more threatening nuclear futures develop, but in all cases the US needs less warheads than it currently possesses. Similarly, the US will increase the capabilities and robustness of missile defense as arms treaties and the test moratoria breakdown. More fundamental deviations from current policy likely to occur in these more ominous nuclear futures would be decisions to resume nuclear testing and enhance stockpile requirements.
- **As a result of limited change in US policy between the alternative nuclear futures, US strategic expenditures are not likely to vary significantly, at least for the next twenty years.** When considering costs out to FY2020, savings from strategic offensive force reductions are modest, largely because all necessary strategic weapons systems have already been procured and O&M costs are not high. In the more hostile nuclear environments, such savings would free up

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<sup>3</sup> This assessment would not be valid if a P-5 state resumed sustained nuclear testing or the US decided to build a missile defense system capable of stopping dozens of incoming warheads.

resources for missile defenses, nuclear testing, and possibly new low-yield nuclear weapons, although not at a level sufficient to fund fully these greater requirements. Still, the cost, absent an attempt to deploy a missile defense system capable of stopping hundreds of incoming warheads, would not require steep annual budget increases.

***Projecting Alternative Nuclear Environments***

These findings result from consideration of five alternative projections of likely foreign and US behavior in alternative nuclear environments. In consultation with DTRA/ASCO, the DFI International/SPARTA Project Team derived the scenarios from three factors:

- The sustainability or collapse of the Non-Proliferation Treaty (NPT);
- The success or failure of the Comprehensive Test Ban Treaty (CTBT) entering into force; and
- The maintenance or breakage of global nuclear testing moratoria.

The resulting five scenarios, listed in Table ES-1, range from a scenario in which the existing non-proliferation regime is strengthened by entry-into-force of the CTBT to a scenario in which the non-proliferation regime collapses. Since state behavior would potentially vary depending on which nation first broke the test moratoria, the Project Team broke down Scenario C into three sub-scenarios—with the US (C-1), China (C-2), and India/Pakistan (C-3) resuming nuclear testing, respectively.

The Project Team then applied each of sixteen selected countries (see Table ES-2 below) to the scenarios in an effort to assess international reaction to each nuclear environment. Subsequently, the Project Team forecasted the US response to these reactions in each scenario, evaluating the adequacy of the US force structure to meet resulting security challenges and estimating the potential costs of changes in US strategic nuclear force requirements (projected out to 2020) under each scenario.

**Table ES-1: Alternative Nuclear Treaty Environment Scenarios**

SCENARIO	CONDITIONS
<b>A</b>	NPT intact CTBT enters into force
<b>B</b>	NPT intact CTBT fails entry-into-force Nuclear testing moratoria hold
<b>C</b>	NPT intact CTBT fails entry-into-force Nuclear testing moratoria broken
<b>D</b>	NPT breakdown CTBT fails entry-into-force Nuclear testing moratoria hold
<b>E</b>	NPT collapses CTBT fails entry-into-force Nuclear testing moratoria broken

**Table ES-2: States of Interest**

MATURE NUCLEAR STATES	DEVELOPING NUCLEAR STATES	ROGUE STATES	OTHER NUCLEAR-CAPABLE STATES OF INTEREST
Russia France United Kingdom	China Israel India Pakistan	North Korea Iraq Iran	Argentina Brazil Egypt Japan South Africa South Korea

***Scenario Analysis***

This executive summary provides brief, general characterizations of likely state behavior in each of the five scenarios. The final report expands on the analysis by laying out scenario assumptions, projecting foreign responses to the changed conditions, and evaluating US force structure and policy choices and associated costs in greater detail.

**Scenario A: NPT intact/CTBT enters into force**

The success/failure of the CTBT encompasses important perceptions regarding the international community’s commitment to nuclear arms control and the strength of the non-proliferation regime. However, a cooperative global security environment and the preservation of global testing moratoria more directly influence states’ nuclear policies than would passage of the CTBT into force. Even if the international community fails to pass the CTBT into force, ratification by the world’s nuclear powers would widely affect global perceptions regarding progress with respect to non-proliferation objectives and could, subsequently, help control both the horizontal and vertical expansion of nuclear capabilities.

**Scenario B: NPT intact/CTBT fails entry into force/test moratoria hold**

Failure to pass the CTBT into force would not impose direct or immediate threats to the global security environment nor precipitate changes in the nuclear policies of key states. However, failure by nuclear powers to ratify the CTBT would likely be perceived as a lack of commitment to disarmament goals and might heighten perceptions that the non-proliferation regime is discriminatory. This perceived lack of commitment to non-proliferation objectives could discourage international efforts to curtail nuclear proliferation, weakening the non-proliferation regime. In the long run, this strategic environment might not be stable. It permits states greater freedom to consider resuming testing without violating a formal treaty when underlying circumstances become more hostile. Consequently, the nuclear testing moratoria might not be sustainable indefinitely.

## **Scenario C: NPT intact/CTBT fails entry into force/testing moratoria broken**

### **Scenario C-1: US resumes testing**

A US decision to break its nuclear testing moratorium with sustained nuclear testing would significantly reduce the political costs of testing for other nuclear states and subsequently trigger a chain reaction that would probably result in resumed nuclear testing by at least five other states. US testing would also prompt other efforts by states of interest to bolster their nuclear positions. Resumed nuclear testing and the pursuit of more aggressive nuclear policies would undermine the non-proliferation regime, possibly making it easier for aspiring nuclear states to obtain key components and materials to develop their nuclear weapons programs. Consequently, states such as North Korea, Iraq, and Iran could enjoy accelerated success with respect to their nuclear weapons programs in this strategic environment.

### **Scenario C-2: China resumes testing**

A Chinese decision to break its nuclear testing moratorium would decrease the political costs of nuclear testing and probably would subsequently trigger a chain reaction that led to the resumption of testing by at least five other states. Given the Project Team's prediction that nuclear testing in China would provoke resumed testing in the United States, the end results in Scenario C-2 would be largely the same as those in Scenario C-1. Similarly, a Russian decision to test would likely precipitate testing by China and the United States as well as other nuclear states.

### **Scenario C-3: India/Pakistan resume testing**

Resumed nuclear testing in South Asia would not pose as significant a threat to the non-proliferation regime as would testing by a P-5 state, but such action would still heighten global and American strategic concerns by weakening the non-proliferation regime (and thus aid states seeking nuclear weapons). In particular, it would encourage US decision-makers to reorient strategic policies more toward developing nuclear states (i.e., reducing the size of US strategic offensive forces to channel resources toward strategic defenses).

### **Scenario D: NPT breaks down/CTBT fails entry into force/test moratoria hold**

This scenario represents the least likely of the future nuclear environments, as the political and strategic costs of withdrawing from the NPT would make this an unlikely option for non-nuclear-weapon states, particularly if only for the purpose of making a political statement. Nevertheless, it is feasible that these states might choose to take drastic action if they continue to perceive the non-proliferation regime as "broken" and in need of a significant jolt to spur real progress.

Withdrawal of support for the NPT by a coalition of non-nuclear-weapon states would not necessarily pose a direct security threat to the international community but could spark tensions in the strategic relationships among states of interest and ultimately lead to the breakdown of the non-proliferation regime. Consequently, this strategic environment would not be stable, potentially causing states to review their nuclear policies and to adopt more aggressive policies. In the long run, this strategic environment would likely foster vertical and horizontal proliferation of nuclear weapons.



**Scenario E: NPT breaks down/CTBT fails entry into force/test moratoria collapse**

Scenario E represents the most volatile and threatening future nuclear environment. In this environment, nearly all states of interest would adopt more aggressive nuclear policies. At least six states would likely resume testing, most with the intention of qualitatively and quantitatively enhancing their nuclear arsenals. In addition, breakdown of the non-proliferation regime could make it substantially easier for nascent and aspiring nuclear weapon states to develop their nuclear programs, almost inevitably resulting in both vertical and horizontal nuclear proliferation—particularly in Asia and the Middle East. Ultimately, this strategic environment could foster the deployment of *offensive nuclear forces in 11+ states and would result in a substantial increase in the size of many of the world’s nuclear arsenals.*

***Overview of Likely State Responses***

The matrices in Tables ES-3 and -4 lay out the projected state responses for the sixteen states in each of the alternative futures. The first matrix presents projections for states currently possessing nuclear weapons. Most of these states would be unlikely to shift significantly nuclear policy (other than testing after a state breaks the moratoria) unless the conditions of Scenario E emerge including the collapse of the non-proliferation regime.

Table ES-4 presents projections for the key non-nuclear states introduced above. Most of these states are likely to continue the status quo in terms of nuclear policy in a majority of the scenarios. The Rogue States are currently pursuing nuclear weapons aggressively and would likely continue to do so in any context. The nuclear-capable states would like to avoid nuclear programs and will move towards nuclear weapons development reluctantly, most likely if no other political or military policy offers adequate protection.

**Table ES-3: Summary of Likely Responses by Nuclear States**

	Scenario A	Scenario B	Scenarios C1 & C2	Scenario C3	Scenario D	Scenario E
<b>Russia</b>	Accelerate Unilateral Reductions	Undertake Unilateral Reductions	Resume Tests, Moderate Force Reductions	Proceed with Force Reductions	Status Quo	Resume Tests, Freeze Reductions
<b>France</b>	Status Quo	Status Quo	Resume Tests	Status Quo	Accelerate Modernization	Resume Tests, Moderately Expand Arsenal
<b>UK</b>	Status Quo	Status Quo	Heighten Nuclear Posture	Status Quo	Heighten Nuclear Posture	Moderately Expand Arsenal
<b>China</b>	Moderate Force Modernization	Status Quo	Resume Tests, Accelerate Force Expansion	Status Quo	Intensify Force Modernization	More Aggressive Force Posture
<b>Israel</b>	Status Quo	Status Quo	Status Quo	Status Quo	Intensify Force Modernization	Expand Force Structure
<b>India</b>	Status Quo	Status Quo	Resume Tests	Resume Tests, Deploy Greater Forces	Accelerate Nuclear Program	Aggressive Force Expansion
<b>Pakistan</b>	Pursue Minimal Deterrent	Status Quo	Resume Tests	Resume Tests, Deploy More	Accelerate Nuclear Program	Aggressive Force Expansion

**Table ES-4: Summary of Likely Responses by Non-Nuclear**

	Scenario A	Scenario B	Scenarios C1 & C2	Scenario C3	Scenario D	Scenario E
<b>North Korea</b>	Relax Nuclear Program	Status Quo	Intensify Nuclear and Diplomatic Options	Status Quo	Nuclear Opacity	Nuclear Opacity
<b>Iraq</b>	Status Quo	Status Quo	Status Quo	Status Quo	Nuclear Opacity	Accelerate N- Program
<b>Iran</b>	Status Quo	Status Quo	Status Quo	Status Quo	Nuclear Opacity	Accelerate N-Program
<b>Argentina</b>	Status Quo	Status Quo	Status Quo	Status Quo	Withdraw from NPT	Diplomatic Options
<b>Brazil</b>	Status Quo	Status Quo	Status Quo	Status Quo	Withdraw from NPT	Diplomatic Options
<b>Egypt</b>	Status Quo	Status Quo	Status Quo	Status Quo	Withdraw from NPT	Expand CBW, Explore Nuclear Option
<b>Japan</b>	Status Quo	Status Quo	Status Quo	Status Quo	Diplomatic Emphasis	Enhance BMD, US ties
<b>South Africa</b>	Status Quo	Status Quo	Status Quo	Status Quo	Withdraw from NPT	Pursue Diplomacy
<b>South Korea</b>	Status Quo	Status Quo	Status Quo	Status Quo	Enhance Defenses, Build Alliances	Enhance Defenses, Build Alliances

***The US Response***

The Project Team predicts the core elements of the US nuclear policy will be similar in each of the scenarios, reflecting the diversity and flexibility of existing US capabilities and development efforts.<sup>4</sup> Every projected nuclear future but Scenario E results in a considerable reduction in arsenal size (at least 50%) compared to today’s force results. Even in Scenario E, the US probably would reduce its force structure. In almost all scenarios, the US engages in a major effort to develop and deploy missile defenses with the difference among the scenarios being the pace and extent of this activity. Similarly, monitoring efforts would likely be roughly equal in all the scenarios, although NTM requirements would probably become more demanding in Scenario E.

The most fundamental difference in US responses to the various futures occurs in the area of stockpile requirements. US decision-makers are likely to reach conflicting answers to key questions depending on the nuclear future in play: Does the US need to test or not? Does the US need new types of warheads? Does the US need to be able to resume testing rapidly or not? The answers to these questions not only have critical political and strategic implications, but also significant budgetary consequences as well. For example, see the difference between Scenario B and Scenario C-1/C-2.<sup>5</sup> The matrix below in Table ES-5 shows the projected US strategy in each scenario.

<sup>4</sup> The Project Team considered requirements in terms of warheads, delivery systems, stockpile maintenance, and missile defenses in each scenario.

<sup>5</sup> The difference in costs between Scenario B and Scenario C – identified by the Project Team as the two most likely future nuclear worlds – totals as much as \$21.1 billion over a fifteen year period, depending on whether or not the US resumed nuclear testing and developed new replacement warheads under Scenario C conditions. However, the cost of resumed nuclear testing and development of new replacement warheads could be decreased if resumption of

Overall, aggregate budget estimates (for FY2006-2020) for the alternative nuclear futures range from approximately \$178.3 (Scenario A) to 225.9 billion (Scenario E), with the difference largely driven by the size of the force structure maintained, the robustness and scale of deployed missile defense systems and, most importantly, stockpile stewardship requirements—including the question of resuming testing. Even though the size of the force structure does change the budget somewhat, it is clear that

**Table ES-5: Projected US Strategy for Each Scenario**

SCENARIO	KEY EVENT(S)	LIKELY RESPONSE DECISION	APPROXIMATE # WARHEADS
A	CTBT enters into force	<b>ACCELERATE FORCE REDUCTIONS</b> <i>Unilaterally cut strategic offensive forces, maintain testing moratorium, and lower the priority of NMD</i>	2250
B	Nuclear testing moratoria hold	<b>TRANSITION TO STRATEGIC DEFENSES</b> <i>Unilaterally cut strategic offensive forces, maintain testing moratorium, and increase emphasis on ballistic missile defenses</i>	3000
C-1	US resumes nuclear testing	<b>REDUCE FORCE LEVEL AND RESUME TESTING</b> <i>Reduce strategic offensive forces, resume nuclear testing, and raise the priority of ballistic missile defenses</i>	3500
C-2	China resumes nuclear testing	<b>REDUCE FORCE LEVEL AND RESUME TESTING</b> <i>Reduce strategic offensive forces, resume nuclear testing, and raise the priority of ballistic missile defenses</i>	3500
C-3	Nuclear testing resumed in South Asia	<b>TRANSITION TO STRATEGIC DEFENSES</b> <i>Unilaterally cut strategic offensive forces, maintain testing moratorium, and increase emphasis on ballistic missile defenses</i>	3000
D	Defections from the NPT	<b>REORIENT TO STATES OF CONCERN</b> <i>Unilaterally cut offensive forces, maintain testing moratorium, develop new low-yield nuclear weapons, deploy TMD on expanded basis, and deploy single-layer NMD as soon as technologically feasible</i>	2900
E	Collapse of the non-proliferation regime	<b>STRATEGIC PREDOMINANCE</b> <i>Continue dismantlement under START I with some additional unilateral reductions but maintain hold on START II, resume nuclear testing, develop low-yield warheads, and deploy multilayer NMD as soon as feasible</i>	4800

reductions even to less than a third of the existing force (Scenario A) do not generate enormous savings given the modest operations and maintenance (O&M) costs and the absence of a need for new strategic systems in the next few decades.

### ***Final Thoughts***

After the Project Team considered all of the scenarios, it concluded that the most likely future nuclear environment will be one in which the NPT remains intact but the CTBT fails entry-into-force (Scenarios B and C). The key question will be whether or not the global nuclear testing moratoria hold under these conditions (yes in Scenario B and no in Scenario C). The Project Team predicts that the resumption of nuclear testing at some point in the near future is likely given international, regional, and domestic pressures on global decision-makers.

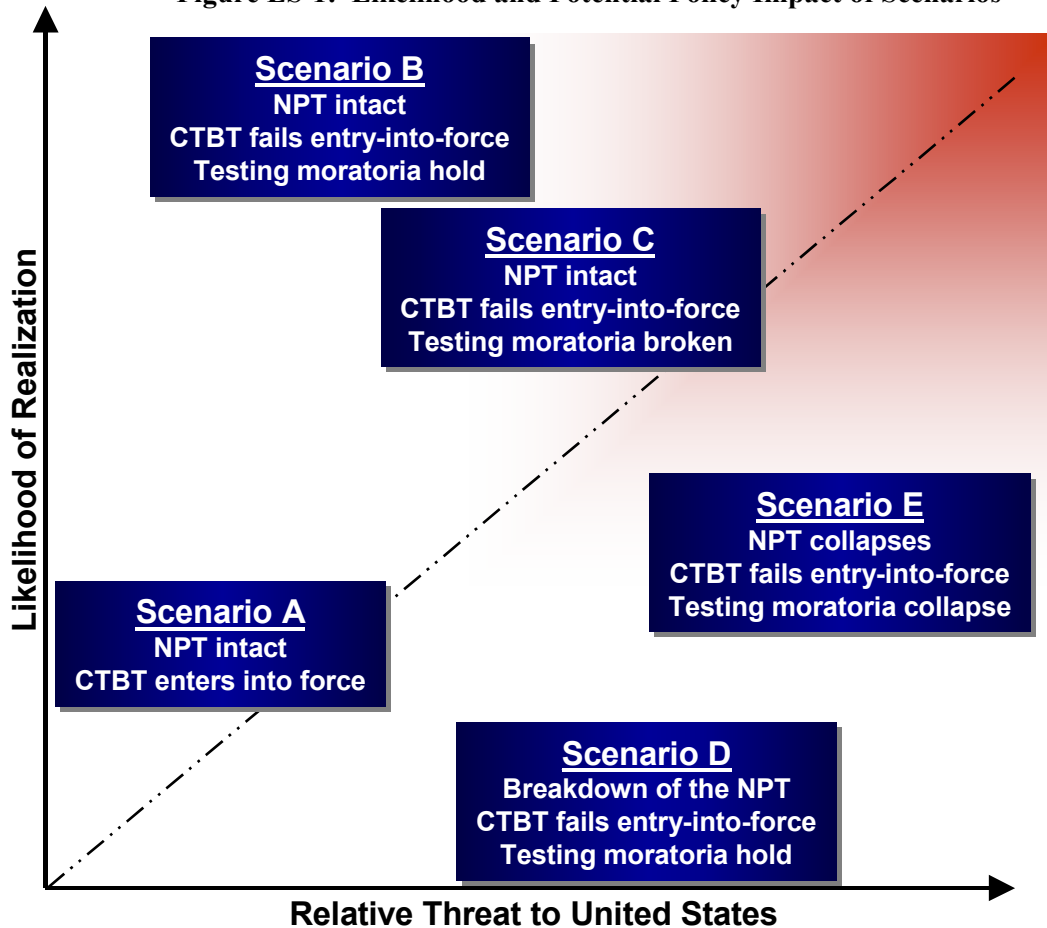
Moreover, the political costs of breaking out of a moratorium are lower than the costs of violating a treaty, increasing the likelihood that some state will eventually resume testing in the absence of the Comprehensive Test Ban Treaty. Figure 1 compares each scenario with respect to likelihood and potential impact on US nuclear policy.

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US testing translated into a far smaller budget for some Stockpile Stewardship programs, such as computer-based simulations, currently used to ensure the safety and effectiveness of the US arsenal in the absence of testing. These potential cost savings were not considered in the budget estimates as the Project Team assumed that political momentum could make it difficult to reduce the funds that flow into such programs.

The ramifications of resumed nuclear testing would vary significantly depending on whether the state breaking the testing moratoria is a nuclear power or a nascent or new nuclear state. For the US, testing by a nuclear power (in particular, China or Russia) would likely prompt more aggressive nuclear policies, including the resumption of US

**Figure ES-1: Likelihood and Potential Policy Impact of Scenarios**



testing and a moderation in strategic offensive force reductions. Testing by a nascent or new nuclear state would not necessarily result in resumed US testing or a moderation in force reductions, but would further shift the focus of US strategic concerns to developing states and provide greater justification for advocates of NMD.

In actuality, the future nuclear environment is likely to vary among these alternative scenarios (and others) over time. Thus, it is important to understand the linkages between the various futures and how a transition will occur from one to the other. The extreme scenarios (A & E) probably are the most stable in terms of continuity because of their clarity in the direction of the nuclear future and correspondingly, the appropriate type of strategy for states. The in-between scenarios, two of which are the most likely futures (B & C), provide less clear guidance since both positive and negative indicators of threat and vulnerability would likely buffet decision-makers. These environments are thus less likely to yield a consensus on policy choice.

Although a great deal of time and energy is spent focusing on the bilateral (US, Russia) nuclear arsenals and force reductions, the more fundamental question for US policy-makers in the future will focus on the related areas of fissile material/stockpile requirements and missile defenses. These questions are multilateral in nature and reinforce the shift from bilateral to multilateral influences when selecting national policy to accomplish US goals of security and stability. The relationships among key nuclear actors tend to be highly dynamic, recommending analysts and decision-makers give careful and thoughtful consideration to trade-offs and interaction effects when considering policy choices. This study represents one attempt to address the demanding problem. It clearly does not offer all the answers, but helps provide a way to think about the challenge.

## INTRODUCTION

The Defense Threat Reduction Agency's Advanced Systems and Concepts Office (DTRA/ASCO) initiated in April 2000 a year-long study to evaluate the future viability of the global nuclear non-proliferation regime and its potential implications for US nuclear policy, giving specific attention to the possible linkages between the Non-Proliferation Treaty (NPT) and the uncertain future of the Comprehensive Test Ban Treaty (CTBT). DFI International and SPARTA, Inc., private research and analysis companies, were contracted by DTRA/ASCO to conduct this study. As such, the findings contained herein are solely those of DFI International, SPARTA, Inc., and their consultants.

The primary impetus for this study can be traced to the US Senate's October 1999 rejection of ratification of the Comprehensive Test Ban Treaty. The Senate's action, coupled with the impending 2000 Non-Proliferation Treaty Review Conference, raised serious questions about the future viability of the global nuclear non-proliferation regime. Since October 1999, the climate in the Senate has remained opposed to ratification. With the current administration also now opposed to the CTBT, US ratification seems unlikely any time soon.

Even if the US adopted the test-ban treaty, a quick evaluation of the other 43 countries whose ratification are required for CTBT to enter into force—a list that includes India, Pakistan, and North Korea—reveals that the prospects for a ratified comprehensive test ban accord are poor in at least the near future. If so, what deleterious effect might this have on both the NPT and/or the nuclear non-proliferation regime writ large?

Signed in 1968 and entered into force in 1970, the NPT has been the solid foundation upon which other strategic arms control accords have sought to build. With a membership that is nearly universal, the NPT can boast the broadest adherence of any arms control agreement, with only Cuba, India, Israel, and Pakistan remaining outside the treaty. But while the NPT was indefinitely extended in 1995, its future integrity could not be assumed. In the five years that had passed since the 1995 review, India and Pakistan had detonated nuclear devices, the US Senate had rejected the CTBT, START II remained unratified, and the Rogue States continued aggressive pursuit of nuclear weapons. Leading into the 2000 Review Conference, some observers claimed that the non-proliferation regime was “under siege.” Any crisis was averted through skillful diplomacy and cooperation at the review conference, but the basic frustration over a lack of progress on nuclear arms control remains.

Regardless of whether the regime was or is under siege or not, the question of “What would the global security environment look like in a world without the NPT?” is an interesting one. Taken further, what would the world look like without the NPT *and* the current testing moratoria? With one but not the other? With both? How might other states behave in such environments, and are these alternative nuclear futures more or less threatening than the status quo? Specifically, what would be the implications for the United States in a world with robust non-proliferation and test-ban

norms (i.e., a viable NPT with CTBT entry-into-force)? Conversely, what would be the implications for US nuclear force structure in a world *devoid* of either one or both of these regimes? What are the policy implications of these future environments for US nuclear force structure? What are the cost implications?

This study sought to answer these questions, and others. Specifically, the DFI International/SPARTA Project Team aimed to accomplish the following: 1) evaluate any current or emerging linkages between the fate of the CTBT and the future vitality of the non-proliferation regime; 2) identify and analyze prospective, alternative, global nuclear environments based on strong, weak, and non-existent nuclear non-proliferation and test ban regimes; 3) project the likely responses from various nuclear and potentially nuclear-capable states within each of these environments; and, ultimately, 4) assess the probable policy and budgetary ramifications for US nuclear force structure.

The first phase of this study, conducted from April to August 2000, pursued the initial task of evaluating linkages between the CTBT and the NPT. Toward this end, the Project Team conducted personal interviews with officials from delegations representing member states at the 2000 NPT Review Conference, analyzed official statements and documents from the Conference, and hosted a US Government interagency workshop that brought together twenty-three individuals from offices involved in nuclear non-proliferation and arms control. Phase II of the study—namely, projecting alternative nuclear environments, states' reactions within these environments, and the ramifications for US nuclear policy—was conducted from September 2000 to March 2001.

Dr. Barry M. Blechman, president of DFI International, directed this study. Project Team members included Dr. Kevin O'Prey, Dr. Brent Sterling, Matthew Travis, Jennifer Dickey, Stacey Marsh, and Josh Pollack of DFI International, and Tom Hix, David Isby, and Leslie Burchett of SPARTA, Inc. Consultants to this study included the Honorable Lawrence Scheinman of the Monterey Institute's Center for Nonproliferation Studies and Dr. Gregory van der Vink of Princeton University.

## METHODOLOGY

The Project Team defined five alternative nuclear environment scenarios and assessed the impact of each scenario on the global strategic environment. In order to predict international reaction to these scenarios, the Project Team focused on the likely reactions of sixteen nuclear capable states of interest, in addition to the US. For each state of interest, the Project Team first established a present-day baseline, compiled from an extensive literature review. The baseline analysis provided a general understanding of each state's strategic policies, threat perceptions, and economic and nuclear capabilities in order for the Project Team to predict more accurately that state's reactions to changes in its strategic environment. The Project Team then projected the policy responses of states of interest to the emergence of each nuclear treaty environment scenario. Predicted state reactions were vetted by regional experts to confirm the viability and likelihood of the Project Team's forecasts.

The Project Team subsequently assessed the implications of international reactions for US nuclear policy to determine whether or not the US's current nuclear force structure could sufficiently address changing global security conditions. For each scenario, the Project Team identified any likely changes in US nuclear policy (i.e., numbers of delivery systems, stockpile requirements, monitoring, and missile defenses) and estimated the potential costs of any adjustments.

Costing US forces in their alternative future environments required setting a date at which the transformation would start. Although some of the precipitating events could occur within the next few years, the Project Team concluded that five years represented the best overall period for the necessary conditions to produce any of the five scenarios. The Project Team estimated the costs of US nuclear policy adjustments beginning in FY06 and continuing through FY20.<sup>6</sup>

In order to estimate the cost implications stemming from alternative scenarios, the Project Team compiled baseline figures for each of four categories: Delivery Systems, Stockpile Requirements, Monitoring, and Missile Defenses. Budget numbers for these four categories were culled from public sources, including Budget Estimates from the U.S. Department of Defense as well as U.S. Department of Energy Budget Justification Documents. Baseline figures were then projected out to 2020 and used as a starting point to estimate the cost of force structure adjustments for each scenario. Predicted adjustments to US nuclear force structure and posture as well as estimated cost implications were vetted by subject matter experts to substantiate the Project Team's forecasts. The report provides greater detail on costing in each section.

### **Definition of Alternative Nuclear Treaty Environment Scenarios**

The DFI/SPARTA Project Team explored five alternative scenarios, based on three factors:

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<sup>6</sup> The scenarios could, of course, occur later with different costs due to inflation and other variables. Yet, the cost should not be significantly different for the purposes of the study. Efforts to begin further in the out years will likely be less accurate given a greater gap between the start point and current baseline numbers.



- The sustainability/collapse of the NPT;
- The success/failure of passing the CTBT into force; and
- The maintenance or breakage of global nuclear testing moratoria.

The five scenarios (labeled A-E) depict a gradual deterioration of the non-proliferation regime, ranging from a scenario in which the existing non-proliferation regime is strengthened by entry-into-force of the CTBT to a scenario in which the non-proliferation regime, including the NPT, collapses. The five alternative nuclear environment scenarios are outlined in the table below.

**Table 1: Alternative Nuclear Treaty Environment Scenarios**

SCENARIO	CONDITIONS
A	NPT intact CTBT enters into force
B	NPT intact <u>CTBT fails entry-into-force</u> Nuclear testing moratoria hold
C	NPT intact <u>CTBT fails entry-into-force</u> Nuclear testing moratoria broken
D	<u>NPT breakdown</u> <u>CTBT fails entry-into-force</u> Nuclear testing moratoria hold
E	<u>NPT collapses</u> <u>CTBT fails entry-into-force</u> <u>Nuclear testing moratoria broken</u>

For further clarification, the Project Team has defined elements of these five scenarios as follows:

- CTBT entry-into-force: the signature and ratification of 44 designated states, as outlined in Article XIV of the CTBT. While additional countries might ratify the CTBT, failure to achieve ratification by all 44 required states would constitute a failure to pass the CTBT into force.
- Maintenance of global nuclear testing moratoria: despite the absence of CTBT entry-into-force, all nuclear states refrain from testing in the spirit of the test ban.
- Nuclear testing moratoria broken: states breaking the moratoria engage in sustained nuclear testing; this behavior is considered distinct from a single testing action.
- NPT breakdown: the withdrawal of a limited number of non-nuclear-weapon states, which, while perhaps destabilizing, would not necessarily lead to a complete collapse of the non-proliferation regime.
- NPT collapse: the withdrawal by a number of member states significant enough to undermine the viability of the treaty.

## Additional Scenario Assumptions

International treaty arrangements serve to shape the global security environment within which decision-makers operate. However, states' nuclear policies are primarily shaped by global and regional political, military, and strategic conditions that affect the state's threat perceptions and security requirements. Accordingly, for each scenario, the Project Team outlined several assumptions regarding global strategic conditions that would be associated with each treaty environment. These assumptions narrow the scenario conditions and focus states' reactions to a particular situation or event. In addition, the specification of scenario assumptions facilitated a deeper understanding of states' threat perceptions in each strategic environment and guided the Project Team's assessment of likely policy responses.

Assumptions for each scenario are discussed in detail in the Scenario Analyses section.

## Identification of States of Interest

Given the extensive number of member states to the NPT and the CTBT, an analysis of all parties' reactions to scenario conditions was not a practical exercise. Moreover, given that scenario conditions would not impact the nuclear policies of most member states, analysis of all parties' reactions would provide little value. Instead, the DFI/SPARTA Project Team focused its analysis on the reactions of states in four key categories:

- Mature Nuclear States;
- Developing Nuclear States;
- Rogue States; and
- Other Nuclear-Capable States of Interest.

The Project Team included all relevant Mature and Developing Nuclear States in its analysis. Cases from the Rogue States and "Other Nuclear-Capable States of Interest" categories were selected in consultation with DTRA/ASCO on the basis of interest and importance to global and regional stability. Table 2 lists the sixteen states of interest in their respective categories.

**Table 2: States of Interest**

<b>MATURE NUCLEAR STATES</b>	<b>DEVELOPING NUCLEAR STATES</b>	<b>ROGUE STATES</b>	<b>OTHER NUCLEAR-CAPABLE STATES OF INTEREST</b>
Russia France United Kingdom	China Israel India Pakistan	North Korea Iraq Iran	Argentina Brazil Egypt Japan South Africa South Korea

Categorization of states results from their nuclear capabilities and similarities in the direction of their nuclear weapons programs. In particular, the division between Mature Nuclear States and “Developing Nuclear States” requires elaboration. In general, Mature Nuclear States have established nuclear programs and have reduced the size of their nuclear arsenals. Developing Nuclear States, on the other hand, perceive their existing nuclear arsenals as insufficient in some fashion and are currently undertaking efforts to advance their nuclear force structures, both qualitatively and quantitatively. Subsequently, despite its membership in the P-5, the Project Team classified China as a Developing Nuclear State because it is currently undertaking measures to expand its nuclear arsenal. Moreover, China’s nuclear policy trends correspond more closely to those of nascent nuclear weapon states (Israel, India, and Pakistan) than the other P-5 states.

This report summarizes the Project Team’s analysis for all five future nuclear environment scenarios. The first section of this report outlines the Project Team’s analytical methodology. This section defines the five future nuclear environment scenarios in more detail, outlines additional assumptions applied to facilitate scenario analysis, and identifies the states of interest on which the Project Team’s analysis focused. The second section delineates a baseline US strategic profile. The US baseline information serves as a starting point from which any predicted force structure adjustments can be measured. The third section presents the Project Team’s scenario analysis. For each scenario, this paper presents a discussion of how scenario conditions would affect global and regional strategic environments, highlights predicted responses of states of interest to scenario conditions, and outlines implications for US nuclear policies. Finally, the fourth section summarizes the Project Team’s overall conclusions, including a discussion of the likelihood of alternative nuclear environment scenarios.

## BASELINE ANALYSES

In order to understand how states of interest would likely respond to the alternative nuclear environment scenarios, the Project Team compiled a present-day baseline review of each state. While by no means exhaustive, the baseline analysis provided the Project Team with a general understanding of each state's current nuclear position, strategic world view, and policy drivers and constraints in order to better predict how it would respond to changes in the strategic environment. The baseline analysis incorporates the following information for each state:

- Background information
  - Economic overview
  - Domestic political situation
- Strategic world view
  - Strategic doctrine
  - Threat perceptions
  - Perceived security requirements
- Nuclear policy
  - Nuclear doctrine (if applicable)
  - Nuclear forces (if applicable)
  - Nuclear capability
  - Arms control positions

*Complete baseline information for each state of interest is included in Appendix I.*

### **US Baseline Analysis**

In addition to the baseline analysis compiled for the sixteen states of interest, the Project Team performed a baseline assessment for the United States. Given that the primary focus of this study is to analyze consequences for the US stemming from possible future nuclear environments, however, the Project Team conducted a more comprehensive baseline assessment for the US than that compiled for the other states of interest. Specifically, the US baseline incorporates additional data regarding force structure, as well as information on US stockpile stewardship, monitoring, and missile defenses.

The resulting US baseline assessment enabled the Project Team to better determine how decision-makers might alter US nuclear policy in response to changes in the strategic environment as well as to estimate the cost implications of potential US force structure adjustments.

Table 3 profiles a US baseline position with respect to strategic nuclear forces, based on open sources.

*Further US baseline information, including summaries of political and economic conditions, threat perceptions and security requirements, nuclear doctrine, and positions on arms control issues, are included in Appendix I.*

**Table 3: Year 2001 US Strategic Profile**

<b>WARHEADS</b>	<b>DELIVERY SYSTEMS</b>	<b>STOCKPILE REQUIREMENTS</b>	<b>MONITORING</b>	<b>MISSILE DEFENSES</b>
<ul style="list-style-type: none"> <li>• 7206 warheads associated with delivery systems</li> <li>• Additional warhead reserve</li> </ul>	<ul style="list-style-type: none"> <li>• ICBMs: 550 (2000 warheads)</li> <li>• SSBNs: 18 (408 SLBMs, 3456 warheads)</li> <li>• Bombers: 97 (72 active duty bombers, 25 reserves and trainers, 1750 warheads)</li> </ul>	<ul style="list-style-type: none"> <li>• Annually certified stockpile stewardship</li> <li>• Sub-critical testing</li> <li>• Ability to resume testing within 2-3 years of presidential command</li> </ul>	<ul style="list-style-type: none"> <li>• US Atomic Energy Detection System and National Data Center</li> <li>• National technical means</li> <li>• Prototype International Monitoring System (IMS) and Data Center</li> </ul>	<ul style="list-style-type: none"> <li>• Theater missile defense (TMD) systems being developed and deployed (PAC-3, THAAD, NTW, NAD)</li> <li>• NMD being developed and tested</li> </ul>

Sources: National Resources Defense Council, "Nuclear Notebook: US Nuclear Forces 2000," *Bulletin of the Atomic Scientists* (May/June 2000): 69.

### **Baseline Costing Data for US**

In order to estimate the cost implications of alternative scenarios, the Project Team calculated figures for the existing force and related requirements. This baseline budget represents the estimated cost of maintaining the current US nuclear forces through 2020.

To derive baseline cost figures, the Project Team compiled estimated budget data for four categories: delivery systems, stockpile requirements (including warheads), monitoring, and missile defenses. Budget estimates were compiled primarily from Department of Defense and Department of Energy budget justification documents provided to Congress in support of the FY2001 President's Budget Submission. In general, Department of Defense budget estimates are available for FY1999-2005, while the Department of Energy provides budget estimates for FY1999-2001. The Project Team then projected these figures out to FY2020, based on future trends outlined in the budget justification documents or on assumed growth rates where clear budget trends were not available. Finally, the Project Team aggregated budget figures for FY2006-2020 to depict the total estimated cost, for a 15-year period, of maintaining the current strategic nuclear force structure. This aggregate number facilitates relative cost comparisons of the alternative future nuclear environment scenarios. The box below summarizes the aggregate projected totals for FY2006-2020:

<b>Total (aggregate for FY2006-2020, in then-year millions)</b>	<b>\$183,729</b>
Delivery Systems	40,192
Stockpile Requirements	77,346
Monitoring	29,381
Missile Defenses	36,811

*More detailed US baseline costing data is available in Appendix VIII.*

## Assumptions Underlying US Analysis

In order to forecast and cost likely adjustments to the US force structure out to 2020, the Project Team adopted a number of assumptions regarding US strategic behavior and cost implications. These assumptions apply across all scenarios in addition to some scenario-specific assumptions. Key assumptions include:

- For each possible future world, the Project Team assumed that underlying conditions would unfold over the next five years, thus budget figures are approximately the same across scenarios for FY1999 through FY2005. Predicted changes in the US nuclear force structure and designated related areas apply to budget estimates for FY2006 and beyond.
- Projected budget data used "then year" dollars and assume a three percent inflation rate.
- Project assumed no buildup or radical restructuring of US strategic offensive forces: that the nuclear triad will be retained, with 10 – 18 SSBNs, 300 – 550 ICBMs, and 21 – 81 heavy bombers; that no new types of delivery systems will be developed and deployed by 2020; and that a minimum of approximately 2000 nuclear warheads will be deployed.
- Strategic arms reduction efforts will follow presently established START guidelines but could be supplemented or supplanted by unilateral reductions.
- No a priori preference for the type of NMD system that might be deployed.
- Resumed, sustained nuclear testing would lead to the design and deployment of replacement warhead types.
- Specialized, low-yield nuclear warheads could be built according to earliest weapons-design principles and would not require nuclear testing.

## SCENARIO ANALYSES

### Scenario A

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#### NPT INTACT CTBT ENTERS INTO FORCE

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Scenario A depicts the entry-into-force of the CTBT, creating a non-proliferation regime stronger than that which exists today. In order for the CTBT to enter into force, the treaty must be ratified by 44 designated states, in accordance with Article XIV of the CTBT. To date, approximately half of the designated states have ratified the treaty; however, important exceptions among signatories include the United States, China, Israel, and Iran. Three of the designated states—North Korea, India, and Pakistan—have, to date, refused even to sign the test ban treaty.

In order for the remaining required states to sign and/or ratify the test ban treaty, a number of outstanding security concerns must be addressed. Therefore, the DFI/SPARTA Project Team has assumed the following as likely precursors to CTBT entry-into-force:

- Confidence that the stockpile stewardship programs of nuclear states are sufficient to maintain existing nuclear arsenals;
- Increased confidence-building measures between the US and adversarial states (e.g. Russia, China);
- Progress on strategic arms control issues;
- A US decision to defer deployment of NMD or international tolerance of US NMD; and
- Progress on regional security issues, including:
  - Significant progress in the Middle East peace process;
  - Further improvement of North-South Korean relations; and
  - Stabilization of the Kashmir dispute in South Asia.

*Note that changing any of these assumptions could significantly alter states' predicted responses to the scenarios.*

#### ***Scenario A: Effects on States of Interest***

In general, Scenario A conditions would lower the threat perceptions of states of interest. First, ratification of the test ban treaty would reaffirm the dedication of the US and other nuclear powers to the goals of non-proliferation – a commitment that, under present-day conditions, is being questioned. International commitment to the nuclear test ban could help invigorate the non-proliferation regime. In addition, passage of the CTBT into force would raise the political costs of nuclear testing and thereby lower the risk of resumed testing – both by existing and aspiring nuclear weapon states. Moreover, implementation of the International Monitoring System (IMS) and Data

Center under the CTBT would establish a more robust monitoring system, making covert tests in violation of the CTBT more difficult.

With respect to nuclear capabilities, stringent restrictions on nuclear testing would make it more difficult for Developing Nuclear States to update their nuclear arsenals and weapon delivery systems, particularly if a reinvigorated non-proliferation regime translated into tighter export controls of nuclear-related equipment and technologies. For example, this strategic environment could impair the efforts of China, India, and Pakistan to achieve a MIRVed ballistic missile force. A stronger non-proliferation regime could also make it more difficult for Rogue States to obtain nuclear arsenals if it undermined their ability to acquire necessary equipment and technologies.

### ***Summary of State Responses to Scenario A***

State reactions to Scenario A would be based to a greater degree on the international security environment implied by entry-into-force of the CTBT than on passage of the treaty itself. Still, even though Scenario A conditions would positively influence states' perceptions of their strategic environment and of the strength of the non-proliferation regime, altered perceptions would not necessarily motivate states of interest to curb their nuclear programs or moderate nuclear policies.

In fact, under Scenario A conditions, Russia would probably represent the only nuclear state of interest to considerably reduce the size of its arsenal. This represents a policy that Russia has already announced the intention to pursue given economic imperatives. Russia, however, might be willing to pursue deeper force reductions in this more benign strategic environment and could reduce the size of its force structure to as low as 1000-1500 warheads.

China would probably continue to modernize its nuclear force structure in this scenario; albeit at a likely moderated pace. In addition, North Korea might relax its pursuit of nuclear weapons. Again, however, North Korea's possible willingness to curb its nuclear weapons program would stem not from the passage of the test ban treaty but from improvements in its perceived strategic environment that would have to be achieved in order for North Korea to join the CTBT, i.e., progress toward developing stronger ties with South Korea and more amiable relations with the United States.

The majority of the states of interest, though, would likely maintain their status quo strategic positions despite the improved security environment. For example, in South Asia, ratification of the CTBT by India and Pakistan implies progress toward stabilization of the Kashmir dispute and Indo-Pak relations. Despite improved regional relations, India would continue efforts to deploy a minimum nuclear deterrent as long as: (1) it perceives China as a threat to its national security; (2) nuclear powers continue to maintain their own arsenals; and (3) the perception that the possession of nuclear weapons contributes to global prestige persists. Pakistan's nuclear policies would likely echo India's but, given improved Indo-Pak relations, Pakistan might be motivated to seek bilateral arms control negotiations with India – largely because economic constraints make it difficult for Pakistan to continue an aggressive development and deployment schedule.



In the Middle East, states' perceived strategic environments could prevent the moderation of nuclear positions despite a strengthened non-proliferation regime. While ratification of the CTBT implies progress regarding regional security issues, Scenario A conditions would not dissolve underlying historical tensions and deep suspicions. Moreover, the maintenance of regional non-nuclear WMD arsenals would sustain perceived threats and vulnerabilities of regional actors. Consequently, Israel's perceived need to maintain regional military superiority would persist, and Israel would likely continue efforts to modernize its force structure. In addition, Iraq and Iran would continue their pursuit of nuclear weapons capability; however, a strengthened non-proliferation regime would make it more difficult for these states to develop their nuclear programs.

*A summary of projected reactions to Scenario A for each state of interest is outlined in the full report. More detailed analysis, including an overview of the scenario's impact on the state's threat perceptions, an outline of possible response options, and a discussion on the state's policymaking criteria, is provided in Appendix II.*

### ***US Response to Scenario A***

Given the relatively benign strategic environment in Scenario A, the US would likely move toward a significantly smaller strategic offensive force structure. In particular, Russia's decision to accelerate unilateral force reductions far below START II levels and China's decision to moderate the pace of its force modernization could accelerate the emerging consensus on moving to lower numbers. This reduced force would be regarded as providing a satisfactory deterrent at reduced cost.

The US would likely reduce warhead levels to approximately 2250, with concomitant reductions in reserve warhead levels. ICBMs and SSBNs would be cut back to minimal acceptable levels, with reductions in MIRV loadings. Commitment to the test ban treaty, combined with reduced warhead levels, would raise the priority of annual stockpile certification, and the US would likely take increased steps to facilitate the Stockpile Stewardship Program. Sub-critical testing at the Nevada Test Site would almost certainly continue.

The US would continue to perceive the nuclear ambitions of Iran and Iraq as potentially threatening, despite Iran's ratification of the CTBT. However, a strengthened non-proliferation regime could place new obstacles in the path of Iranian and Iraqi nuclear programs. These developments could subsequently lower the priority of NMD plans. Reduced emphasis on North Korea's nuclear program would further moderate pressures to deploy an NMD system. The US would likely continue the development and deployment of TMD systems, however.

Finally, entry-into-force of the CTBT would boost international monitoring capabilities, assuming implementation of the full-scale IMS and Data Center. However, the US would maintain national technical means to monitor possible violations of the test ban treaty.

The table below summarizes the predicted changes in US force requirements stemming from Scenario A conditions. Elements in *italics* represent changes from the present-day baseline (see Table 3).

**Table 4: Modified US Strategic Profile – Scenario A**

<b>WARHEADS</b>	<b>DELIVERY SYSTEMS</b>	<b>STOCKPILE REQUIREMENTS</b>	<b>MONITORING</b>	<b>MISSILE DEFENSES</b>
<ul style="list-style-type: none"> <li>• <i>About 2250 warheads associated with delivery systems</i></li> <li>• <i>Reduced warhead reserve</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>ICBMs: 300-400 (300-400 warheads)</i></li> <li>• <i>SSBNs: 10-12 (240-288 SLBMs, 1200-1440 warheads)</i></li> <li>• <i>Bombers: 21-45+ (16-36 active duty bombers, 336-816 warheads)</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Annual certification of stockpile becomes a raised priority</i></li> <li>• Sub-critical testing</li> <li>• Ability to resume testing within 2-3 years of presidential command</li> </ul>	<ul style="list-style-type: none"> <li>• US Atomic Energy Detection System and National Data Center</li> <li>• National technical means</li> <li>• <i>Full-scale IMS and Data Center</i></li> </ul>	<ul style="list-style-type: none"> <li>• TMD being developed and deployed (PAC-3, THAAD, NTW, NAD)</li> <li>• <i>NMD becomes lower priority</i></li> </ul>

**Cost Implications of Scenario A**

Substantial savings stemming from the reduction of warheads and delivery systems as well as the lowered priority of missile defense systems would be somewhat offset by an increase in stockpile stewardship and monitoring costs in Scenario A. Total estimated savings relative to baseline costs would be approximately \$5.5 billion over the fifteen-year period.

The box below summarizes the aggregate totals for the fifteen-year period (FY06-FY20) for Scenario A.

<b>Total (aggregate for FY2006-2020, in then-year millions)</b>	<b>\$178,259</b>
Delivery Systems	33,880
Stockpile Requirements	78,370
Monitoring	30,686
Missile Defenses	35,323

*More detailed costing data for Scenario A is available in Appendix VIII.*

**Scenario A Conclusions**

*The success/failure of the CTBT encompasses important perceptions regarding the international community's commitment to nuclear arms control and the strength of the non-proliferation regime. However, a cooperative global security environment and the preservation of global testing moratoria more directly influence states' nuclear policies than would passage of the CTBT into force. Even if the international community fails to pass the CTBT into force, ratification by the world's nuclear powers would widely affect global perceptions regarding progress with respect to non-proliferation objectives and could, subsequently, help control both the horizontal and vertical expansion of nuclear capabilities.*

## Scenario B

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### NPT INTACT

### CTBT FAILS ENTRY-INTO-FORCE

### NUCLEAR TESTING MORATORIA HOLD

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Scenario B depicts a non-proliferation environment similar to that which exists today. In this scenario, additional countries might ratify the CTBT, but ratification by all 44 states necessary for the treaty to enter into force is not achieved. Nevertheless, global nuclear testing moratoria hold, preserving the spirit of the test ban treaty.

The analysis for Scenario B rests on the following conditions, which the Project Team has assumed are the minimal conditions necessary in order to sustain the viability of the NPT and maintain nuclear testing moratoria:

- Reasonable confidence that the stockpile stewardship programs of nuclear states are sufficient to maintain existing nuclear arsenals;
- No significant deterioration of US-Russia relations;
- No significant deterioration of US-China relations;
- Continued discussions regarding strategic arms control issues;
- A US decision to defer deployment of NMD or international tolerance of US NMD; and
- Status quo regarding regional security issues (that is, underlying tensions and sporadic hostilities but no imminent war).

*Note that changing any of these assumptions could significantly alter states' predicted responses to the scenarios.*

Scenario B represents the most likely nuclear environment for the short- to medium-term, as this scenario echoes present-day conditions. Given the likelihood that states such as North Korea, Iran, Israel, or India will not ratify the CTBT, a “failed” CTBT represents a probable condition of the future nuclear environment.

### ***Scenario B: Effects on States of Interest***

In general, failure to pass the CTBT into force would not pose an immediate security threat to any state of interest, assuming that nuclear-capable states remain committed to the testing moratoria. However, failure to bring the CTBT into force could raise the risk of resumed nuclear testing – particularly in Asia and among the P-5 states – as breaking a test moratorium carries lower political costs than violations of a treaty. Lack of a full-scale IMS system could also make it more difficult to detect and punish states that break testing moratoria.

In addition, failure by nuclear powers to ratify the CTBT would increase existing perceptions of other states that the non-proliferation regime is discriminatory. Such perceptions could weaken the non-proliferation regime, particularly if states reacted by easing export restrictions and other controls over nuclear-related materials and equipment. Weakened nuclear controls would make it easier for aspiring nuclear states, especially Rogue States, to acquire the materials and technologies necessary to

develop their nuclear weapons programs. Moreover, weakened controls would make it easier for existing nuclear weapons states to advance their nuclear arsenals, both quantitatively and qualitatively.

Continued commitment by nuclear powers to testing moratoria and to progress on strategic arms control issues could help minimize consequences of a “failed” CTBT.

### ***Summary of State Responses to Scenario B***

Scenario B represents a continuation of the present-day nuclear environment. Maintenance of this strategic environment, at least in the short- to medium-term, is not likely to spark significant changes in global nuclear policies. While a perceived lack of progress on non-proliferation issues could raise frustrations among non-nuclear-weapon states and adversely affect their security interests, these concerns would likely play out through political and economic channels. It is unlikely that these concerns would translate into a change in nuclear positions. Consequently, the Project Team predicts that all states of interest, with the exception of Russia, would maintain their status quo strategic positions under Scenario B conditions. Russia currently has a hold on the implementation of START II. However, economic pressures in Russia make this policy unsustainable and, in this strategic environment, Russia would likely undertake unilateral reductions of its nuclear arsenal, assuming that the US remains committed to arms reductions and that the US and Russia reach an agreement regarding the deployment of NMD.

*A summary of projected reactions to Scenario B for each state of interest is outlined in the full report. More detailed analysis is provided in Appendix III.*

### ***US Response to Scenario B***

Given that Scenario B continues today’s nuclear environment, the US would likely continue toward reductions in strategic offensive forces, either through arms control treaties or unilateral cuts, while moving ahead with plans for missile defenses. Under Scenario B, the US would likely reduce its forces to approximately 3,000 warheads, with concomitant cuts in reserve warhead levels. Similar to Scenario A, but to a lesser degree, ICBMs and SSBNs would be decreased and missile loadings reduced.

Heightened threats to the US stemming from non-traditional sources (e.g., nuclear threats from Rogue States) would likely motivate the continued development of NMD. Deployment of an NMD system is not necessarily foreseen within the near- to mid-term, but the US would likely devote substantial resources to research and development efforts. In addition, the US would continue the development and deployment of TMD systems.

The Stockpile Stewardship Program would be seen as generally sufficient to maintain the US arsenal, but debate over stockpile stewardship would continue. The US would likely uphold its nuclear testing moratorium, while retaining the requirement that a resumption of full-scale testing can occur within two to three years of a presidential command. Monitoring requirements would not change dramatically under Scenario B conditions, and the US would likely proceed with the ongoing development of national technical means.

The table below summarizes the predicted changes in US force requirements stemming from Scenario B conditions. Elements in *italics* represent changes from the present-day baseline (see Table 3).

**Table 5: Modified US Strategic Profile – Scenario B**

<b>WARHEADS</b>	<b>DELIVERY SYSTEMS</b>	<b>STOCKPILE REQUIREMENTS</b>	<b>MONITORING</b>	<b>MISSILE DEFENSES</b>
<ul style="list-style-type: none"> <li>• <i>About 3000 warheads associated with delivery systems</i></li> <li>• <i>Reduced warhead reserve</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>ICBMs: 500 (500 warheads)</i></li> <li>• <i>SSBNs: 12-14 (288-336 SLBMs, 1440-1680 warheads)</i></li> <li>• <i>Bombers: 21-81 (16-76 active duty bombers, 336-1536 warheads)</i></li> </ul>	<ul style="list-style-type: none"> <li>• Annual certification of stockpile</li> <li>• Sub-critical testing</li> <li>• Ability to resume testing within 2-3 years of presidential command</li> </ul>	<ul style="list-style-type: none"> <li>• US Atomic Energy Detection System and National Data Center</li> <li>• National technical means</li> <li>• Prototype IMS and Data Center</li> </ul>	<ul style="list-style-type: none"> <li>• TMD being developed and deployed (PAC-3, THAAD, NTW, NAD)</li> <li>• <i>Increase emphasis on the development and deployment of NMD</i></li> </ul>

***Cost Implications of Scenario B***

Scenario B would offer moderate savings relative to baseline costs, stemming from the reduction of delivery systems and warheads. Cost savings, however, would be somewhat offset if the United States increased its emphasis on the development of missile defense systems. Given the raised priority of NMD in Scenario B, total estimated savings relative to baseline costs would be approximately \$3.5 billion over the fifteen-year period. The box below summarizes the aggregate totals for the fifteen-year period (FY06-FY20) for Scenario B.

<b>Total (aggregate for FY2006-2020, in then-year millions)</b>	<b>\$180,266</b>
Delivery Systems	35,672
Stockpile Requirements	77,346
Monitoring	29,381
Missile Defenses	37,867

*More detailed costing data for Scenario B is available in Appendix VIII.*

***Scenario B Conclusions***

*Failure to pass the CTBT into force would not impose direct or immediate threats to the global security environment nor precipitate changes in the nuclear policies of key states. However, failure by nuclear powers to ratify the CTBT would likely be perceived as a lack of commitment to disarmament goals and might heighten perceptions that the non-proliferation regime is discriminatory. This perceived lack of commitment to non-proliferation objectives could discourage international efforts to curtail nuclear proliferation, weakening the non-proliferation regime. In the long run, this strategic environment might not be stable. It permits states greater freedom to consider resuming testing without violating a formal treaty when underlying circumstances become more hostile. Consequently, the nuclear testing moratoria might not be sustainable indefinitely.*

## Scenario C

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### NPT INTACT

### CTBT FAILS ENTRY-INTO-FORCE

### NUCLEAR TESTING MORATORIA BROKEN

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Scenario C depicts a non-proliferation environment less favorable than the existing environment, representing the resumption of nuclear testing by one or more states of interest. In general, the resumption of nuclear testing seems probable at some point given global, regional, and domestic pressures on decision-makers. Moreover, the political costs of breaking out of a testing moratorium are lower than the costs of violating the CTBT, increasing the likelihood that some state will eventually resume testing in the absence of an international test ban treaty.

State reactions to resumed nuclear testing would depend heavily on which state initiated testing and the degree to which that state threatens the global security environment. Consequently, the analysis for Scenario C has been broken into three sub-scenarios:

- C-1 evaluates states' reactions to resumed nuclear testing in the US;
- C-2 evaluates states' reactions to resumed nuclear testing in China; and
- C-3 evaluates states' reactions to resumed nuclear testing in South Asia.

These sub-scenarios represent three of the most likely and meaningful events that might bring about Scenario C conditions. Note that in all sub-scenarios, a decision to resume testing means the sustained conduct of nuclear tests rather than a single action.

### *Scenario C-1*

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### US BREAKS NUCLEAR TESTING MORATORIUM

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Scenario C-1 depicts the resumption of nuclear testing by the United States. A US decision to break its nuclear testing moratorium would most likely be spurred by a belief that the Stockpile Stewardship Program could no longer ensure the safety and effectiveness of the US nuclear arsenal.

The Project Team evaluated international reactions to US testing under the following assumed conditions:

- No significant deterioration of US-Russia relations;
- No significant deterioration of US-China relations;
- Continued discussions regarding strategic arms control issues;
- A US decision to defer deployment of NMD or international tolerance of US NMD; and
- Status quo regarding regional security issues (that is, underlying tensions and sporadic hostilities but no imminent war).

Clearly US tests would strain relations with Russia and China, but a significant deterioration of relations would not be inevitable if other pressures were positive (e.g., if the US continued to reduce the size of its nuclear force structure).

*Note that changing any of these assumptions could significantly alter states' predicted responses to the scenarios.*

#### *Scenario C-1: Effects on States of Interest*

Given the presumption by foreign leaders that resumed US testing would lead to the design and development of replacement warhead types, US testing would magnify the perceived security threats of Russia and China. Consequently, US testing would trigger aggressive responses from these nuclear powers and potentially undermine further strategic arms control reductions.

In addition, a US decision to break its testing moratorium would send important signals regarding the US's strategic priorities and its commitment to the disarmament objectives of the non-proliferation regime. In particular, progress with respect to non-proliferation objectives has often been correlated with US leadership, which would be greatly hampered by US nuclear tests. Thus, US testing, particularly if combined with stalled arms control reductions, would substantially weaken the non-proliferation regime.

As discussed in Scenario B, a weakened non-proliferation regime could make it easier for both Mature and Developing Nuclear States to advance their nuclear arsenals as well as to provide nuclear assistance to Rogue States and other regimes seeking to acquire nuclear capabilities. Moreover, resumed US testing would open the opportunity for other states to resume or launch testing programs without having to pay the political costs for being the first to break the global testing moratoria.

#### *Summary of State Responses to Scenario C-1*

Resumed US testing could trigger a chain reaction that would result in resumed nuclear testing by six or more states of interest. In response to US nuclear tests, Russia would likely freeze dismantlement efforts and undertake measures to restore its decaying nuclear arsenal, although its effective nuclear arsenal would probably continue to decline in size. Russia would likely resume nuclear testing as part of these efforts. US testing would also provide China with political justification to resume its testing program, facilitating China's nuclear force structure modernization program. Resumed testing in other P-5 states would create pressures for France to conduct tests, which France would likely pursue to ensure the maintenance of an operationally-sound, minimal deterrent. In addition, resumed nuclear testing and accelerated force modernization efforts in China could lead India to resume testing, and Pakistan would almost certainly respond in kind.

This heightened nuclear posture in Asia could provoke North Korea to intensify its nuclear program. Iraq and Iran would also continue clandestine efforts to acquire a nuclear weapons option, and the weakened non-proliferation regime would probably make it easier for these states to obtain key components and materials to develop their nuclear weapons programs.

Other Nuclear-Capable States of Interest would become increasingly frustrated with the backward progress on non-proliferation issues. In response, these states would likely heighten diplomatic efforts to promote nuclear disarmament but would probably not pursue more aggressive nuclear policies.

*A summary of projected reactions to Scenario C-1 for each state of interest is outlined in the full report. More detailed analysis is provided in Appendix IV.*

### *US Response to Scenario C-1*

Under Scenario C-1, US actions precipitate the initial scenario conditions; thus, US policymakers would likely predict international reactions similar to those outlined above. Regardless, the requirement to assure stockpile viability would be deemed worth the negative repercussions. US policymakers would, however, undertake measures to mitigate aggressive international responses to resumed US testing.

Despite US efforts to control negative consequences, states of interest would likely respond strongly to US nuclear tests, triggering additional US policy adjustments. Adjustments might include a more cautious approach to force reductions and the accelerated development of an NMD system.

Because Scenario C-1 features resumed testing by as many as six states, as well as a weakening of non-proliferation norms, the US would likely assume a more cautious approach toward strategic offensive force reductions. Warhead levels would likely be reduced to approximately 3500, maintaining a far larger ICBM force than in the preceding scenarios.

Heightened security threats posed by Rogue States, along with less cooperative relations with Russia and China, would likely raise the US's commitment to the development of a robust NMD system. Deployment of NMD is not necessarily foreseen within the near- to mid-term, but the US would likely devote substantial resources to research and development efforts. In addition, the US would continue the development and deployment of TMD systems.

Stockpile stewardship would be indefinitely reoriented around a program of full-scale nuclear testing. This shift would enable the design and development of replacement warhead types for existing delivery systems, allowing for improvements in warhead yield, safety features, and other characteristics. Annual certification of existing warheads—a process requiring intensive monitoring, advanced simulations of nuclear explosions, and periodic remanufacturing of warheads—would no longer be required.

Finally, US monitoring requirements would increase under Scenario C-1 conditions, given the resumption of nuclear testing programs, the growing likelihood of nuclear proliferation, and the likely abandonment of a full-scale IMS. The US would probably expand its national technical means beyond the scope presently planned, possibly to include its own monitoring networks.

The table below summarizes the predicted changes in US force requirements stemming from Scenario C-1 conditions. Elements in *italics* represent changes from the present-day baseline (see Table 3).



**Table 6: Modified US Strategic Profile – Scenario C-1**

<b>WARHEADS</b>	<b>DELIVERY SYSTEMS</b>	<b>STOCKPILE REQUIREMENTS</b>	<b>MONITORING</b>	<b>MISSILE DEFENSES</b>
<ul style="list-style-type: none"> <li>• <i>About 3500 warheads associated with delivery systems</i></li> <li>• <i>Reduced warhead reserve</i></li> <li>• <i>New replacement warhead types</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>ICBMs: 500 (500-1500 warheads)</i></li> <li>• <i>SSBNs: 12-14 (288-336 SLBMs, 1440-1680 warheads)</i></li> <li>• <i>Bombers: 45-61+ (40-56 active duty bombers, 816-1136 warheads)</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Resumed nuclear testing program</i></li> <li>• <i>Production of replacement warhead types</i></li> </ul>	<ul style="list-style-type: none"> <li>• US Atomic Energy Detection System and National Data Center</li> <li>• <i>Expanded national technical means (NTM)</i></li> <li>• Prototype IMS and Data Center</li> </ul>	<ul style="list-style-type: none"> <li>• TMD being developed and deployed (PAC-3, THAAD, NTW, NAD)</li> <li>• <i>Development and deployment of NMD becomes raised priority</i></li> </ul>

*Cost Implications of Scenario C-1*

Modest cost savings stemming from the reduction of delivery systems and warhead totals would not provide adequate resources for testing and development of replacement warhead types, which would increase Stockpile Requirements costs by an estimated \$19.2 billion over the FY2006-2020 period. As a result, projected US costs would be in excess of \$17.6 billion above the baseline for the fifteen-year period. The box below summarizes the estimated aggregate totals for Scenario C-1.

<b>Total (aggregate for FY2006-2020, in then-year millions)</b>	<b>\$201,356</b>
Delivery Systems	35,772
Stockpile Requirements	96,505
Monitoring	31,212
Missile Defenses	37,867

*More detailed costing data for Scenario C-1 is available in Appendix VIII.*

***Scenario C-1 Conclusions***

*A US decision to break its nuclear testing moratorium would significantly reduce the political costs of testing for other nuclear states and subsequently trigger a chain reaction that would probably result in resumed nuclear testing by at least five other states. US testing would also prompt other efforts by states of interest to bolster their nuclear positions. Resumed nuclear testing and the pursuit of more aggressive nuclear policies would undermine the non-proliferation regime, possibly making it easier for aspiring nuclear states to obtain key components and materials to develop their nuclear weapons programs. Consequently, states such as North Korea, Iraq, and Iran could enjoy accelerated success with respect to their nuclear weapons programs in this strategic environment.*

## *Scenario C-2*

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### **CHINA BREAKS NUCLEAR TESTING MORATORIUM**

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Scenario C-2 depicts the resumption of nuclear testing by China.<sup>7</sup> China might resume nuclear testing to facilitate ongoing efforts to modernize its nuclear force structure and/or as a political statement in response to provocative US actions, such as the deployment of NMD or significant military assistance to Taiwan.

The Project Team evaluated international reactions to Chinese testing under the following assumed conditions:

- No significant deterioration of US-Russia relations;
- Continued discussions regarding strategic arms control issues; and
- Status quo regarding regional security issues (that is, underlying tensions and sporadic hostilities, but no imminent war).

*Note that changing any of these assumptions could significantly alter states' predicted responses to the scenarios.*

#### *Scenario C-2: Effects on States of Interest*

The resumption of a nuclear testing program in China could facilitate the advancement of China's nuclear arsenal and would signify China's pursuit of a more robust nuclear position. Consequently, Scenario C-2 would likely motivate aggressive responses from other nuclear powers, particularly the US, Russia, and India. While Chinese testing would not necessarily pose a direct threat to other states of interest, such an action could hold significant implications for non-proliferation objectives. In general, Chinese nuclear tests, particularly if they undermined ongoing arms control reduction efforts, would weaken the non-proliferation regime.

A weakened non-proliferation regime could make it easier for both Mature and Developing Nuclear States to advance their nuclear arsenals as well as to provide nuclear assistance to Rogue States and other regimes seeking to acquire nuclear capabilities. Moreover, resumed Chinese testing would open the opportunity for other states to resume or launch testing programs without having to pay the political costs for being the first to break the global testing moratoria.

#### *Summary of State Responses to Scenario C-2*

Similar to Scenario C-1, resumed Chinese testing would probably trigger a chain reaction that would result in resumed nuclear testing by six or more states of interest. In particular, Chinese nuclear tests would likely provoke the US and Russia to resume nuclear testing. The US and Russia would be motivated to resume testing by both geopolitical and security concerns.

Because both Scenarios C-1 and C-2 ultimately lead to resumed testing and more aggressive nuclear policies in the US, Russia, and China, the response decisions of all

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<sup>7</sup> A scenario in which Russia resumes testing would likely prompt similar state reactions to the C-2 Scenario in which China resumes testing.

states of interest would likely be similar in both scenarios. As the Project Team predicted for Scenario C-1, resumed testing in other P-5 states would likely prompt France to resume its own testing program. Nuclear testing and accelerated force modernization efforts in China would probably lead India to resume testing, and Pakistan would almost certainly respond in kind. This heightened nuclear posture in Asia could provoke North Korea to intensify its nuclear program, or at least provide it justification for doing so. Iraq and Iran would also continue clandestine efforts to acquire a nuclear weapons capability. In this strategic environment, these states could enjoy accelerated success with respect to their nuclear weapons programs as export controls would likely be applied with less vigilance.

Other Nuclear-Capable States of Interest would become increasingly frustrated with the lack of progress on non-proliferation issues. In response, these states would likely heighten diplomatic efforts to promote nuclear disarmament but would probably not pursue more aggressive nuclear policies.

*A summary of projected reactions to Scenario C-2 for each state of interest is outlined in the full report. More detailed analysis is provided in Appendix IV.*

#### *US Response to Scenario C-2*

Resumed Chinese testing would both raise US threat perceptions and lower the political costs of testing. Consequently, once China breaks its nuclear testing moratorium, US decision-makers would likely come under stronger domestic pressure to resume testing. In addition to resumed nuclear testing, the US would likely pursue a more cautious approach to force reductions and a more aggressive approach to building a robust NMD system.

Ultimately, the US response to Scenario C-2 would be similar to that in Scenario C-1. The US would move forward with force reductions, largely to free resources for higher priority programs such as NMD. Warhead levels would likely be reduced to approximately 3500, probably maintaining a larger ICBM force than under Scenarios A and B.

Heightened security threats would raise the US's commitment to the development of a robust NMD system. Deployment of NMD is not necessarily foreseen within the near- to mid-term, but the US would likely devote substantial resources to research and development efforts. In addition, the US would continue the development and deployment of TMD systems.

Stockpile stewardship would be indefinitely reoriented around a program of full-scale nuclear testing, and annual certification of existing warheads via the Stockpile Stewardship Program would no longer be required. Finally, US monitoring requirements would increase under Scenario C-2 conditions, and the US would probably decide to expand its national technical means beyond the scope presently planned.

The table below summarizes the predicted changes in US force requirements stemming from Scenario C-2 conditions. Elements in *italics* represent changes from the present-day baseline (see Table 3).

**Table 7: Modified US Strategic Profile – Scenario C-2**

<b>WARHEADS</b>	<b>DELIVERY SYSTEMS</b>	<b>STOCKPILE REQUIREMENTS</b>	<b>MONITORING</b>	<b>MISSILE DEFENSES</b>
<ul style="list-style-type: none"> <li>• <i>About 3500 warheads associated with delivery systems</i></li> <li>• <i>Reduced warhead reserve</i></li> <li>• <i>New replacement warhead types</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>ICBMs: 500 (500-1500 warheads)</i></li> <li>• <i>SSBNs: 12-14 (288-336 SLBMs, 1440-1680 warheads)</i></li> <li>• <i>Bombers: 45-61+ (40-56 active duty bombers, 816-1136 warheads)</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Resumed nuclear testing program</i></li> <li>• <i>Production of replacement warhead types</i></li> </ul>	<ul style="list-style-type: none"> <li>• US Atomic Energy Detection System and National Data Center</li> <li>• <i>Expanded NTM</i></li> <li>• Prototype IMS and Data Center</li> </ul>	<ul style="list-style-type: none"> <li>• TMD being developed and deployed (PAC-3, THAAD, NTW, NAD)</li> <li>• <i>Development and deployment of NMD becomes raised priority</i></li> </ul>

*Cost Implications of Scenario C-2*

Because the modified US strategic profile in Scenario C-2 echoes that of Scenario C-1, the estimated aggregate costs are the same in both scenarios. Resumed testing and development of replacement warhead types would raise Stockpile Requirements costs by an estimated \$19.2 billion and, overall, scenario conditions would result in estimated aggregate costs \$17.6 billion higher than baseline figures over the fifteen-year period. The box below summarizes the estimated aggregate totals for the fifteen-year period (FY06-FY20) for Scenario C-2.

<b>Total (aggregate for FY2006-2020, in then-year millions)</b>	<b>\$201,356</b>
Delivery Systems	35,772
Stockpile Requirements	96,505
Monitoring	31,212
Missile Defenses	37,867

*More detailed costing data for Scenario C-2 is available in Appendix VIII.*

***Scenario C-2 Conclusions***

*A Chinese decision to break its nuclear testing moratorium would decrease the political costs of nuclear testing and probably would subsequently trigger a chain reaction that led to the resumption of testing by at least five other states. Given the Project Team’s prediction that nuclear testing in China would provoke resumed testing in the United States, the end results in Scenario C-2 would be largely the same as those in Scenario C-1.*

### *Scenario C-3*

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## **NUCLEAR TESTING RESUMED IN SOUTH ASIA**

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Scenario C-3 depicts the sustained resumption of nuclear testing by India and/or Pakistan.<sup>8</sup> India or Pakistan could choose to resume testing to facilitate the development and deployment of their nuclear arsenals, in response to a significant deterioration in Indo-Pak relations, or to assuage significant domestic pressures to conduct tests. Most likely, India and/or Pakistan would decide to resume testing if all these motivations emerged in parallel.

The Project Team evaluated international reactions to resumed testing in South Asia under the following assumed conditions:

- No significant deterioration of US-Russia relations;
- No significant deterioration of US-China relations;
- Continued discussions regarding strategic arms control issues;
- A US decision to defer deployment of NMD or international tolerance of US NMD; and
- Status quo regarding regional security issues in the Middle East and on the Korean peninsula (that is, underlying tensions and sporadic hostilities but no imminent war).

*Note that changing any of these assumptions could significantly alter states' predicted responses to the scenarios.*

### *Scenario C-3: Effects on States of Interest*

Resumed testing in South Asia would pose a direct national security threat to relatively few states of interest. However, heightened nuclear tensions in South Asia would raise global strategic concerns.

Ultimately, the impact on states of interest would largely depend on the reactions of the international community to these conditions. Failure to respond swiftly and strongly to denounce resumed testing in South Asia would likely be perceived as a weak and discriminatory commitment to non-proliferation policies and could encourage the pursuit of nuclear weapons programs in other nuclear-capable states.

Resolute condemnation of South Asian nuclear tests and a strong sanction of the testing states, combined with continued progress on strategic arms control issues, could help limit the consequences of resumed testing in South Asia by reaffirming nuclear powers' commitment to non-proliferation objectives and characterizing South Asia as an outlier to global trends.

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<sup>8</sup> This scenario is based on sustained Indian/Pakistani nuclear testing. An alternative scenario would be either India or Pakistan conducting a single or single series of tests and then declaring a commitment to no further tests. Although such an even would further damage the non-proliferation regime, as did the 1998 tests, its effects would be far less than sustained nuclear testing. Thus, the project team focused on this more threatening scenario.

### *Summary of State Responses to Scenario C-3*

The Project Team predicts that if either India or Pakistan were to resume nuclear testing, the other would respond in kind for both strategic and domestic political reasons. While members of the non-proliferation regime would find resumed testing in South Asia disturbing, these conditions would not likely spark significant changes in nuclear policies. In particular, other nuclear states would not likely perceive resumed testing in South Asia as a sufficient stimulus to restart their own testing programs, all else being equal. China would be the most likely to test, especially if India tested, but Beijing would be reluctant to pay the political cost of being the first P-5 state to start testing again unless a clear, strategic military benefit would accrue from testing. Consequently, the Project Team predicts all states of interest, with the exception of India and Pakistan, would maintain their status quo strategic positions under Scenario C-3 conditions. These responses would be consistent with international reactions following the 1998 nuclear tests in South Asia.

*A summary of projected reactions to Scenario C-3 for each state of interest is outlined in the full report. More detailed analysis is provided in Appendix IV.*

### *US Response to Scenario C-3*

Resumed testing in India and/or Pakistan would not significantly alter US threat perceptions. Sustained testing in South Asia, however, would probably further shift the emphasis of US strategic concerns more from nuclear powers to nascent and emerging nuclear arsenals, providing greater justification for advocates of NMD.

Subsequently, the Project Team predicts that the US would move forward with strategic offensive force reductions, freeing resources for the development of strategic defenses. Warhead levels would be cut to approximately 3000, with concomitant reductions in reserve warheads and delivery vehicles. Most of the reductions would come from cutting ICBMs and SSBNs and downloading remaining missiles.

In response to changing circumstances, the US would aggressively develop a limited NMD system, tailored to emerging threats from developing states. The US would also place greater emphasis on TMD, deploying multiple systems on or around allied territory. Overall, the resources dedicated to missile defenses would be increased.

The Stockpile Stewardship Program would be viewed as generally sufficient to maintain the US arsenal; however, debate over stockpile stewardship would continue and proponents of US nuclear testing would try to use the resumption of testing in South Asia to drum up support for US testing. In line with existing nuclear policy, the US would uphold its testing moratorium, but would increase the speed with which it could resume full-scale testing from within two to three years of a presidential order to within one year.

Finally, US monitoring requirements would increase, as efforts to establish a full-scale IMS would likely be abandoned (or at least significantly delayed) with the probability of greater nuclear proliferation. The US would likely expand its national technical means beyond the scope presently planned, possibly to include its own monitoring networks.

The table below summarizes the predicted changes in US force requirements stemming from Scenario C-3 conditions. Elements in *italics* represent changes from the present-day baseline (see Table 3).

**Table 8: Modified US Strategic Profile – Scenario C-3**

<b>WARHEADS</b>	<b>DELIVERY SYSTEMS</b>	<b>STOCKPILE REQUIREMENTS</b>	<b>MONITORING</b>	<b>MISSILE DEFENSES</b>
<ul style="list-style-type: none"> <li>• <i>About 3000 warheads associated with delivery systems</i></li> <li>• <i>Reduced warhead reserve</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>ICBMs: 500 (500 warheads)</i></li> <li>• <i>SSBNs: 12-14 (288-336 SLBMs, 1440-1680 warheads)</i></li> <li>• <i>Bombers: 45-61 (40-56 active duty bombers, 816-1136 warheads)</i></li> </ul>	<ul style="list-style-type: none"> <li>• Annual certification of stockpile</li> <li>• Sub-critical testing</li> <li>• <i>Ability to resume testing within 1 year of presidential command</i></li> </ul>	<ul style="list-style-type: none"> <li>• US Atomic Energy Detection System and National Data Center</li> <li>• <i>Expanded NTM</i></li> <li>• Prototype IMS and Data Center</li> </ul>	<ul style="list-style-type: none"> <li>• <i>TMD deployed on expanded basis (PAC-3, THAAD, NTW, NAD)</i></li> <li>• <i>Single-layer NMD deployed as soon as technologically feasible</i></li> </ul>

*Cost Implications of Scenario C-3*

Under Scenario C-3 conditions, the increased costs of enhanced missile defense efforts and measures to improve nuclear test readiness would exceed savings stemming from warhead and delivery system reductions. Overall, force structure adjustments in Scenario C-3 would result in aggregate estimated costs \$4.3 billion higher than baseline costs over the fifteen-year period (FY06-FY20). The box below summarizes the estimated aggregate totals for Scenario C-3.

<b>Total (aggregate for FY2006-2020, in then-year millions)</b>	<b>\$188,057</b>
Delivery Systems	35,772
Stockpile Requirements	80,683
Monitoring	31,212
Missile Defenses	40,390

*More detailed costing data for Scenario C-3 is available in Appendix VIII.*

***Scenario C-3 Conclusions***

Resumed nuclear testing in South Asia would not pose as significant a threat to the non-proliferation regime as would testing by a P-5 state, but such action would still heighten global and American strategic concerns. In particular, it would encourage US decision-makers to reorient strategic policies more toward developing nuclear states (i.e., reducing the size of US strategic offensive forces to channel resources toward strategic defenses).

## Scenario D

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### **BREAKDOWN OF THE NPT CTBT FAILS ENTRY-INTO-FORCE NUCLEAR TESTING MORATORIA HOLD**

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Scenario D represents a situation in which a coalition of non-nuclear-weapon states withdraws its support for the NPT. Non-nuclear-weapon states—led by a group such as the New Agenda Coalition—could become frustrated with the lack of commitment to non-proliferation principles demonstrated by the P-5 and opt to withdraw from the NPT to make a political statement.<sup>9</sup> Frustration might stem from the failure of the US or other nuclear states to ratify the CTBT as well as from a lack of progress toward the disarmament commitments agreed to by the nuclear weapon states under Article VI of the NPT. While states of interest might pursue more aggressive policies in response, it is feasible that testing moratoria could hold despite such an exodus from the NPT. Although less likely than the alternative scenarios, Scenario D conditions are still plausible and, thus, worth considering.

The analysis for Scenario D rests on the following conditions, outlined to clarify how nuclear test moratoria might hold in spite of a breakdown of the NPT:

- Reasonable confidence that the stockpile stewardship programs of nuclear states are sufficient to maintain existing nuclear arsenals;
- No severe deterioration of US-Russia relations;
- No severe deterioration of US-China relations;
- Stalled progress on strategic arms reductions; and
- A US decision to defer deployment of NMD or international tolerance of US NMD.

*Note that changing any of these assumptions could significantly alter states' predicted responses to the scenarios.*

#### ***Scenario D: Effects on States of Interest***

Withdrawal from the NPT by a group of non-nuclear-weapon states would be unlikely to pose a direct national security threat to any state of interest but could ultimately usher the breakdown of the non-proliferation regime. Even if politically-motivated, withdrawal by a group of important states from the NPT would heighten the threat perceptions of those states' adversaries and neighbors and could subsequently spark regional tensions. In addition, stalled progress on arms control reductions would indicate the preservation of large nuclear arsenals and could further jeopardize support for non-proliferation policies.

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<sup>9</sup> The New Agenda Coalition is a group of seven nations—Brazil, Egypt, Ireland, Mexico, New Zealand, South Africa, and Sweden—that have called for the “speedy, final and total elimination” of nuclear weapons and have assumed a leadership role for non-nuclear-weapon states at forums such as the 2000 NPT Review Conference.



A weakened non-proliferation regime would ease international pressures to maintain the nuclear testing moratoria. Moreover, a deteriorating non-proliferation regime would probably undermine international norms regarding the export and sales of nuclear-related materials and equipment, making it significantly easier for Rogue States to develop their own nuclear weapons programs. Regional tensions combined with the increased ease of acquiring nuclear technologies could substantially raise the risk of vertical and horizontal nuclear weapons proliferation, particularly in Asia and the Middle East.

Likely disagreements between established nuclear weapon states regarding how to prevent this proliferation and how to react to its occurrence could damage the strategic relationships among nuclear powers, particularly the US, Russia, and China. Deteriorating relations among these states could subsequently lead to the adoption of more aggressive nuclear policies overall, precipitating a Scenario E-type environment.

### ***Summary of State Responses to Scenario D***

Scenario D would likely result in a nuclear environment more volatile than that which exists today. While nuclear testing moratoria would probably hold, most states of interest would likely pursue more aggressive nuclear policies, including exercising fewer restraints on the transfer of nuclear-related technologies and materials. Decision-makers' perceptions of a general negative trend might prompt more aggressive actions than initially seem likely.

Under Scenario D conditions, Russia would likely slow force reductions and undertake measures to revive its deteriorating nuclear capacity. Other nuclear weapons states would also seek to shore up the effectiveness and readiness of their arsenals. For example, France would likely accelerate efforts to modernize its weapon delivery systems, and the UK might choose to heighten its minimalist nuclear posture. Both China and Israel would likely intensify efforts to advance and expand their nuclear force structures. In response to aggressive actions by China, India would likely accelerate efforts to deploy a minimum nuclear deterrent and advance weapon delivery systems. Pakistan would likely follow suit.

Rogue States, especially Iraq and Iran, would likely perceive the strategic environment under Scenario D as an opportunity to intensify the pursuit of their clandestine nuclear weapons programs. Moreover, heightened regional tensions, assumed under Scenario D conditions, would provide further impetus to accelerate efforts to develop their nuclear capabilities. Despite the breakdown of the non-proliferation regime, these states would likely maintain a policy of opacity once they acquire nuclear capability to minimize international criticism and the prospect of military strikes to eliminate their nuclear assets.

With respect to Other Nuclear-Capable States of Interest, Brazil, Egypt, and South Africa represent likely candidates to withdraw from the NPT, as members of the New Agenda Coalition. Brazil would probably coordinate its withdrawal with Argentina in order to prevent unnecessary regional tensions. Despite their withdrawal of support from the NPT, it is unlikely that these states would seek to revive their nuclear weapons programs. However, Egypt might seek to enhance its chemical, and possibly biological, weapons capacity if Iraq and Iran acquire nuclear capability.

*A summary of projected reactions to Scenario D for each state of interest is outlined in the full report. More detailed analysis is provided in Appendix V.*

### ***US Response to Scenario D***

Similar to Scenario C-3, a breakdown of the non-proliferation regime would probably shift US nuclear policy toward developing states. A refashioned US nuclear policy under Scenario D conditions would likely have two major facets: (1) reorientation of strategic nuclear forces from a very large deterrent force to a smaller, more flexible, and potentially more “useable” arsenal; and (2) a more aggressive approach to the development of missile defenses, including an NMD system proportioned to emerging threats. In both areas, restraints would probably be observed to accommodate the concerns of Russia and China.

Given the lack of progress regarding multilateral arms control negotiations in this scenario, the Project Team predicts that the US would pursue cuts through unilateral force reductions. The number of warheads in the US arsenal would probably be reduced to approximately 3000, with concomitant reductions in reserve warheads. Most of the ICBM force would be eliminated, and significant reductions would come from downloading of ICBMs and SLBMs.

Scenario D conditions would provide greater justification for US proponents of low-yield nuclear weapons, and the US might devote additional resources to the design and development of low-yield warhead types that could be deployed on aircraft (i.e., strategic bombers and fighter-bombers). The development of new weapons would center on relatively simple, proven designs to avoid the resumption of nuclear testing, which could inspire unwelcome responses from Russia and China and further jeopardize non-proliferation efforts. Accordingly, sub-critical testing at the Nevada Test Site and annual certification of the US stockpile would continue. The US would also reduce the time required to resume nuclear testing from 2-3 years of a presidential command to within one year.

In response to changing circumstances, the US would aggressively advance a limited NMD system, tailored to emerging threats from developing states. The US would also place greater emphasis on TMD, deploying multiple systems on or around allied territory. Overall, missile defenses would be deployed on a greater scale than would otherwise have been planned.

Finally, US monitoring requirements would increase because as the finalization of the IMS could not be assured and the likelihood of nuclear proliferation would grow. The US would likely expand its national technical means beyond the scope presently planned, possibly to include its own monitoring networks.

The table below summarizes the predicted changes in US force requirements stemming from Scenario D conditions. Elements in *italics* represent changes from the present-day baseline (see Table 3).

**Table 9: Modified US Strategic Profile – Scenario D**

<b>WARHEADS</b>	<b>DELIVERY SYSTEMS</b>	<b>STOCKPILE REQUIREMENTS</b>	<b>MONITORING</b>	<b>MISSILE DEFENSES</b>
<ul style="list-style-type: none"> <li>• <i>About 3000 warheads associated with delivery systems</i></li> <li>• <i>Reduced warhead reserve</i></li> <li>• <i>New low-yield warhead types</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>ICBMs: 300-500 (300-500 warheads)</i></li> <li>• <i>SSBNs: 12-14 (288-336 SLBMs, 1440-1680 warheads)</i></li> <li>• <i>Bombers: 45-61+ (40-56 active duty bombers, 816-1136 warheads)</i></li> </ul>	<ul style="list-style-type: none"> <li>• Annual certification of stockpile</li> <li>• Sub-critical testing</li> <li>• <i>Development of new, low-yield warheads without testing</i></li> <li>• <i>Ability to resume testing within 1 year of presidential command</i></li> </ul>	<ul style="list-style-type: none"> <li>• US Atomic Energy Detection System and National Data Center</li> <li>• <i>Expanded national technical means</i></li> <li>• Prototype IMS and Data Center</li> </ul>	<ul style="list-style-type: none"> <li>• <i>TMD deployed on expanded basis (PAC-3, THAAD, NTW, NAD)</i></li> <li>• <i>Single-layer NMD deployed as soon as technologically feasible</i></li> </ul>

**Cost Implications of Scenario D**

The reorientation of US strategy under Scenario D conditions to focus more on proliferants would cost an estimated addition of \$7.3billion over the fifteen-year period relative to baseline costs. Higher costs would stem from raised stockpile requirements and missile defense efforts, which would exceed the cost savings resulting from warhead and delivery system reductions. The box below summarizes the estimated aggregate totals for Scenario D.

<b>Total (aggregate for FY2006-2020, in then-year millions)</b>	<b>\$191,047</b>
Delivery Systems	35,322
Stockpile Requirements	84,123
Monitoring	31,212
Missile Defenses	40,390

*More detailed costing data for Scenario D is available in Appendix VIII.*

**Scenario D Conclusions**

*Scenario D represents the least likely of the future nuclear environment scenarios, as the political and strategic costs of withdrawing from the NPT would make this an unlikely option for non-nuclear-weapon states, particularly if only for the purpose of making a political statement. Nevertheless, these states might choose to take drastic action if they continue to perceive the non-proliferation regime as “broken” and in need of a significant jolt to spur real progress.*

*Withdrawal of support for the NPT by a coalition of non-nuclear-weapon states would not necessarily pose a direct security threat to the international community but could spark tensions in the strategic relationships among states of interest and ultimately lead to the breakdown of the non-proliferation regime. Consequently, this strategic environment would not be stable, potentially causing states to review their nuclear policies and to adopt more aggressive policies. In the long run, this environment would likely foster vertical and horizontal proliferation of nuclear weapons.*

## Scenario E

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### **NPT COLLAPSES CTBT FAILS ENTRY-INTO-FORCE NUCLEAR TESTING MORATORIA COLLAPSE**

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Scenario E depicts a breakdown of the non-proliferation regime, including a collapse of the NPT and widespread resumption of nuclear testing. Breakdown of the non-proliferation regime could stem from some combination of the following conditions:

- Severe degradation of US-Russia relations;
- Severe degradation of US-China relations;
- Collapse of strategic arms reduction efforts;
- US deployment of a robust NMD system despite strong opposition from Russia or China; and/or
- Eruption of regional conflicts into sustained crises or war.

#### ***Scenario E: Effects on States of Interest***

Collapse of the NPT would imply a breakdown of the non-proliferation regime, which would create an uncertain and potentially dangerous strategic environment. Aggressive reactions to scenario conditions, such as accelerated efforts to advance nuclear arsenals and the resumption of nuclear testing, would further magnify states' threat perceptions.

Widespread nuclear testing would significantly lower the political costs of testing, facilitating the design and development of modernized nuclear arsenals. Similarly, deterioration of non-proliferation norms could virtually eliminate restrictions on the export and sales of nuclear-related materials and technologies – or at least make such materials substantially easier to acquire. Consequently, Scenario E conditions would greatly increase the difficulty of controlling the proliferation of nuclear weapons.

#### ***Summary of State Responses to Scenario E***

Scenario E would result in a volatile and aggressive nuclear environment, with limited constraints on states' nuclear policies. Scenario conditions would likely lead to resumed testing by at least six nuclear weapon states of interest, including Russia, France, China, India, and Pakistan (as well as the US). Resumed testing would facilitate Russia's development of more advanced nuclear warhead designs and enable France to ensure the effectiveness of its nuclear deterrent. China, India, and Pakistan would likely resume testing with the intention of expanding their arsenals, both quantitatively and qualitatively, and all three states would probably move beyond a minimal deterrent posture.

Collapse of the non-proliferation regime could also rapidly accelerate the development of nuclear capability in Rogue States. However, subsequent nuclear doctrine in these states would heavily depend on how regional security conditions unfolded. North Korea would likely resume the production of fissile material and engage in a clandestine nuclear weapons program with the intention of developing a small nuclear arsenal. Given the degree to which North Korea relies on its nuclear program as a

bargaining chip, it would likely maintain a policy of nuclear opacity as long as possible. Alternately, Iraq and Iran would likely assume a transparent nuclear policy in this volatile strategic environment, openly violating their non-proliferation commitments. Given likely fissile material limitations in these states, however, both would probably refrain from testing unless provoked. With respect to Other Nuclear-Capable States of Interest, Scenario E conditions would likely result in two groups or categories of states. While collapse of the non-proliferation regime would raise significant concerns for nearly all states of interest, some states would experience more direct security threats from Scenario E conditions than would others. Nuclear-Capable States of Interest that face a direct threat by regional nuclear programs – specifically Egypt, Japan, and South Korea – could find it difficult not to pursue a nuclear option to protect their security interests. Thus, these states might choose to develop their nuclear infrastructures and expand weapons research to enable the pursuit of a nuclear program under extreme conditions. Nuclear-Capable States of Interest that would not face direct security threats from a collapse of the non-proliferation regime (e.g., Argentina, Brazil, and South Africa) would likely respond with heightened diplomatic efforts to restore and/or secure key non-proliferation agreements, at least at a regional level.

*A summary of projected reactions to Scenario E for each state of interest is outlined in the full report. More detailed analysis is provided in Appendix VI.*

### ***US Response to Scenario E***

The collapse of the nonproliferation regime and the widespread resumption of nuclear testing would push the US to adopt a more robust strategic policy to address changing threats. Under Scenario E conditions, the US would likely suspend arms reduction negotiations, resume nuclear testing, and emphasize the development of new, low-yield warhead types. In addition, increased emphasis would be placed on the development and deployment of a multi-layered NMD system.

US leaders would probably not view an increase in strategic offensive forces as useful. Instead, offensive forces would be moderately reduced to free resources for other defense programs. Total warheads would likely be maintained at approximately 4800, with no reductions in reserve warheads. Cuts would primarily come from reductions and downloading of ICBMs. The bomber mix might be altered with the acquisition of additional B-2s to replace B-52s. The Project Team considered a possible buy of 20 additional B-2s under this scenario.

The Stockpile Stewardship Program would be indefinitely reoriented around a program of full-scale nuclear testing. This shift would enable the design and development of replacement warhead types for existing delivery systems, as well as the development of new, low-yield warheads. Annual certification of existing warheads via the Stockpile Stewardship Program would no longer be required.

A multi-layered NMD system would likely become a critical element of US strategy in this strategic environment, possibly linking TMD systems with boost-phase and mid-course NMD systems. TMD would likely be deployed on an expanded basis on or around allied territory.

Finally, US monitoring requirements would increase, as efforts to implement any International Monitoring System will have collapsed. The US would almost certainly

expand its national technical means beyond the scope presently planned, possibly to include its own monitoring networks.

The table below summarizes the predicted changes in US force requirements stemming from Scenario E conditions. Elements in *italics* represent changes from the present-day baseline (see Table 3).

**Table 10: Modified US Strategic Profile – Scenario E**

WARHEADS	DELIVERY SYSTEMS	STOCKPILE REQUIREMENTS	MONITORING	MISSILE DEFENSES
<ul style="list-style-type: none"> <li>• <i>4800 warheads associated with delivery systems</i></li> <li>• Maintain existing warhead reserve</li> <li>• <i>New warhead types</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>ICBMs: 500 (500-1500 warheads)</i></li> <li>• <i>SSBNs: 12-14 (288-336 SLBMs, 2304-2688 warheads)</i></li> <li>• <i>Bombers: 61-81+ (56-76 active duty bombers, 1136-1536 warheads)</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Resume nuclear testing program</i></li> <li>• <i>Production of replacement warhead types</i></li> <li>• <i>Development of new, low-yield warheads</i></li> </ul>	<ul style="list-style-type: none"> <li>• US Atomic Energy Detection System and National Data Center</li> <li>• <i>Expanded national technical means</i></li> <li>• Prototype IMS and Data Center</li> </ul>	<ul style="list-style-type: none"> <li>• <i>TMD deployed on expanded basis (PAC-3, THAAD, NTW, NAD)</i></li> <li>• <i>Multi-layer NMD deployed</i></li> </ul>

***Cost Implications of Scenario E***

Responding to the more threatening Scenario E would entail significant additional investment in strategic nuclear forces and related areas, in excess of \$42 billion over the baseline for the fifteen-year period (FY06-FY20). The stockpile and missile defense requirements contribute a large share of the costs, but the decision to include procurement of additional B-2s also fuels this budget growth. The box below shows the estimated aggregate total for the fifteen-year period for Scenario E.

<b>Total (aggregate for FY2006-2020, in then-year millions)</b>	<b>\$225,867</b>
Delivery Systems	53,409
Stockpile Requirements	96,212
Monitoring	31,212
Missile Defenses	45,034

*More detailed costing data for Scenario E is available in Appendix VIII.*

***Scenario E Conclusions***

*Scenario E is the most volatile and threatening future nuclear environment, in which nearly all states of interest would adopt more aggressive nuclear policies. At least six states would likely resume testing, most with the intention of enhancing their nuclear arsenals. Breakdown of the non-proliferation regime could make it much easier for nascent and aspiring nuclear weapon states—particularly in Asia and the Middle East—to develop their nuclear program. Ultimately, this strategic environment could foster the deployment of offensive nuclear forces in 11+ states and result in a substantial increase in the size of many of the world’s nuclear arsenals.*

## CONCLUSIONS

### **Likelihood of Alternative Nuclear Environment Scenarios**

**O**f the five scenarios reviewed, Scenarios B and C stand out as the most likely future worlds. In both scenarios, the NPT remains intact but the CTBT does not enter into force (but in B, unlike C, the testing moratoria holds). In general, the Project Team predicts that the NPT will continue to exist as a workable treaty. Nuclear weapons would not significantly enhance the security of most NPT signatories and, unless provoked by extreme circumstances, few would likely devote the resources necessary to develop a costly nuclear weapons program. Moreover, non-proliferation objectives are in the interest of most NPT signatories, and preservation of the non-proliferation regime is a key policy objective of the international community. A major Scenario D-type exodus would be unlikely to help their cause.

The Project Team also predicts that the CTBT will not enter into force. Given the likelihood that all required states – including North Korea, Iran, Israel, and India – will not ratify a test ban treaty, a “failed” CTBT represents a probable condition of the future nuclear environment.

Regardless of whether or not the CTBT enters into force, the non-proliferation regime is unlikely to come under severe strain as long as the global testing moratoria holds. This represents the key distinction between Scenarios B and C. Ultimately, however, the resumption of nuclear testing at some point in the future seems likely given international, regional, and domestic pressures on global decision-makers. Moreover, if pressures increase for a government to initiate or resume nuclear testing, the political costs of breaking out of a moratorium are lower than the costs of violating a treaty, raising the likelihood that some state will eventually resume testing in the absence of a test ban treaty.

A decision to break the testing moratoria would probably trigger resumed testing in other states, given the political incentives for rivals to retaliate and the opportunity for others to test without being the first to break the moratoria. In the end, though, the ramifications of resumed testing would vary significantly depending on whether the state breaking the testing moratoria is a P-5 member or a nascent or new nuclear state. Testing by a nascent or new nuclear state (including India and Pakistan) could create meaningful proliferation incentives among other nascent nuclear states or nuclear-capable states—at least in the region of origin—if the international community fails to strongly dissuade such activity. In contrast, resumed testing by a P-5 state would entail greater pressures among the other P-5 states to resume testing and adjust their nuclear policies. Resumed testing by a P-5 state would also signal to other states that P-5 declarations of intent to eliminate their nuclear weapons are simply rhetoric.

### **US Policy and Cost Implications**

The Project Team predicts the core elements of the US nuclear policy will be somewhat similar in each of the scenarios reflecting the diversity and flexibility of

existing US capabilities and development efforts. In every nuclear future but Scenario E, a considerable reduction in arsenal size results (at least 50%). Even in Scenario E, the US probably would reduce force structure. In almost all scenarios, the US engages in a major effort to develop and deploy missile defenses with the difference among the scenarios being the pace and degree of this activity. Similarly, monitoring efforts would likely be roughly equal in all the scenarios although NTM requirements would probably become far more demanding in Scenario E.

The most fundamental differences occur in the area of stockpile requirements. US decision-makers are likely to reach opposing answers to key questions depending on the nuclear future in play: Does the US need to test or not? Does the US need new types of warheads? Does the US need to be able to resume testing rapidly or not? The answers to these questions not only have critical political and strategic aspects, but also significant budget consequences. For example, see the difference between Scenario B and Scenario C-1/C-2.<sup>10</sup>

Overall, aggregate budget estimates (for FY2006-2020) for the alternative nuclear futures range from approximately \$178.3 to 225.9 billion, with the variances largely driven by the size of the force structure maintained, the robustness and scale of deployed missile defense systems, and most importantly, stockpile stewardship requirements, including a resumption of testing. Even though the size of the force structure does change the budget somewhat, it is clear that reductions even to less than a third of the existing force (Scenario A) do not generate enormous savings. Table 11 summarizes aggregate budget estimates for each alternative scenario.

**Table 11: Aggregate Budget Estimates for FY2006-2020, in millions (Then-Year \$)**

SCENARIO	TOTAL	DELIVERY SYSTEMS	STOCKPILE REQUIREMENTS	MONITORING	MISSILE DEFENSES
<b>Baseline</b>	<b>183,729</b>	40,192	77,346	29,381	35,811
<b>A</b>	<b>178,259</b>	33,880	78,370	30,686	35,323
<b>B</b>	<b>180,266</b>	35,672	77,346	29,381	37,867
<b>C-1</b>	<b>201,356</b>	35,772	96,505	31,212	37,867
<b>C-2</b>	<b>201,356</b>	35,772	96,505	31,212	37,867
<b>C-3</b>	<b>188,057</b>	35,772	80,683	31,212	40,390
<b>D</b>	<b>191,047</b>	35,322	84,123	31,212	40,390
<b>E</b>	<b>225,867</b>	53,409	96,212	31,212	45,034

<sup>10</sup> The difference in costs between Scenario B and Scenario C – identified by the Project Team as the two most likely future nuclear worlds – totals as much as \$21.1 billion, depending on whether or not the US resumed nuclear testing and developed new replacement warheads under Scenario C conditions. However, the cost of resumed nuclear testing and development of new replacement warheads could be decreased if resumption of US testing translated into a far smaller budget for some Stockpile Stewardship programs, such as computer-based simulations, currently used to ensure the safety and effectiveness of the US arsenal in the absence of testing. These potential cost savings were not considered in the budget estimates as the Project Team assumed that political momentum could make it difficult to reduce the funds that flow into such programs.



## Final Thoughts

The effort to project future nuclear environments, states' reactions and policy adjustments to them, and US responses to those changes including their potential cost is inevitably a challenging and highly speculative undertaking. Like any "futures" analysis, the team's projections are likely to prove to be inaccurate in an absolute sense, especially the cost data. That said, the study represents a systematic approach to thinking through some well-specified futures to gauge underlying trends and the complexity of interaction among decision factors. Indeed, this exercise has generated some valuable insights in contemplating policy choices today that are likely to have significant impact on the course of future security environments.

In actuality, the future nuclear environment is likely to vary among these alternative scenarios (and others) over time. The extreme scenarios (A & E) probably are the most stable in terms of continuity because of their clarity in the direction of the nuclear future and correspondingly, the appropriate type of strategy for states. The in-between scenarios, two of which are the most likely futures (B & C), provide less clear guidance since both positive and negative indicators of threat and vulnerability would likely buffet decision-makers. These environments are thus less likely to yield a consensus on policy choice.

Although a great deal of time and energy is spent focusing on the bilateral (US, Russia) nuclear arsenals and force reductions, the more fundamental question for US policymakers in the future will focus on the related areas of stockpile requirements and missile defenses. These questions are multilateral in nature and reinforce the shift from bilateral to multilateral influences when selecting national policy to accomplish US goals of security and stability. The relationships among key nuclear actors tend to be highly dynamic, recommending analysts and decision-makers give careful and thoughtful consideration to trade-offs and interaction effects when considering policy choices. This study represents one attempt to address the demanding problem. It clearly does not offer all the answers, but helps provide a way to think about the challenge.