A World without Nuclear Weapons: End-State Issues

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I. Introduction

As of April 2009, a nuclear-free world has become a commitment, not just an aspiration, undertaken jointly by the presidents of the United States and Russia. It has become a subject to be taken seriously by policy makers and, as such, it deserves meticulous analysis and a thorough-going debate.

During his campaign, Barack Obama announced, "This is the moment to begin the work of seeking the peace of a world without nuclear weapons."[1] Shortly after his inauguration, President Obama, on the White House website, made the commitment that his administration "will set a goal of a world without nuclear weapons, and pursue it."[2] In March, President Dmitry Medvedev of the Russian Federation asserted that "Russia is fully committed to reaching the goal of a world free from these most deadly weapons."[3]

After the first meeting of the two presidents, on April 1,

1. Barack Obama, "A World That Stands as One" (As prepared for delivery, Berlin, Germany, July 24, 2008).

2. Barack Obama: Administration willing to talk to Iran 'without preconditions' (January 21, 2009). Available from: Guardian.co.uk at www.guardian.co.uk/world/2009/jan/21/barack-obama-iran-negotiations (May 1, 2009).

3. Sergei Lavrov, "Statement on behalf of President Dmitry Medvedev" (Address to the Conference on Disarmament, Geneva, Switzerland, March 6, 2009).

2009, they announced that they would immediately begin an effort to reduce nuclear weapons beyond existing agreements:

> As leaders of the two largest nuclear weapons states, we agreed to work together to fulfill our obligations under Article VI of the Treaty on Non-Proliferation of Nuclear Weapons (NPT) and demonstrate leadership in reducing the number of nuclear weapons in the world. We committed our two countries to achieving a nuclear free world, while recognizing that this long-term goal will require a new emphasis on arms control and conflict resolution measures, and their full implementation by all concerned nations. We agreed to pursue new and verifiable reductions in our strategic offensive arsenals in a step-by-step process, beginning by replacing the Strategic Arms Reduction Treaty with a new, legally binding treaty. We are instructing our negotiators to start talks immediately on this new treaty and to report on results achieved in working out the new agreement by July.[4]

President Obama followed up on this commitment with a major speech in Prague on April 5 in which he spelled out more of the details of his administration's nuclear polcies (see Appendix 3). It was fitting that he should do so for nothing less than bold and persistent leadership by the United States and Russia, the two nations that currently possess more than 90 percent of existing nuclear warheads, will be required to reach their stated goal of a world free of nuclear weapons. As global nuclear arsenals are reduced to very small numbers, policy makers will have to confront daunting new challenges. Until these are thoroughly examined and resolved by all concerned nations, they will present barriers to further progress on the

4. Presidents Barack Obama and Dmitry Medvedev, "Statement from Obama, Medvedev" (Leaders discuss global economic crisis, nuclear arms control and reductions, London, England, April 1, 2009). Senator John McCain spoke eloquently of President Reagan's "dream of a nuclear-free world" in an important speech on June 3, 2009. See Appendix 4.

journey to zero. In fact, all parties should, for the following three reasons, now begin a serious consideration of these issues. One, a genuine policy commitment to a world without nuclear weapons should be based on a good, even if incomplete, understanding of national security challenges as the numbers of weapons decline from hundreds all the way to zero, a condition we call the end state. Two, a persuasive case for national and international commitments to zero must be based on reasoned answers to questions about feasibility and risk. Three, there must be a clear and shared understanding of what zero means, particularly since it will remain true that nuclear weapons cannot be "disinvented."

This study discusses such issues within a conceptual framework rooted in analyses in *Reykjavik Revisited: Steps Toward a World Free of Nuclear Weapons*, Shultz, Andreasen, Drell, and Goodby, editors.[5] Our purpose is to stimulate further discussion and analysis, at both the conceptual and practical levels.

We will not repeat the arguments presented at two groundbreaking conferences at Stanford University's Hoover Institution and the consensus that emerged regarding the desirability of a world free of nuclear weapons. Those arguments were summarized in two *Wall Street Journal* articles in 2007 and 2008 written by George Shultz, Henry Kissinger, William Perry, and Sam Nunn. Subsequent publications expanded on these ideas. The starting point for their analysis was that

> Nuclear weapons today present tremendous dangers, but also a historic opportunity. U.S. leadership will be required to take the world to the next stage—to a solid consensus for reversing reliance on nuclear weapons globally as a vital con-

5. George P. Shultz et al., ed., *Reykjavik Revisited: Steps Toward a World Free of Nuclear Weapons: Complete Report of 2007 Hoover Institution Conference* (Stanford, Calif.: Hoover Press, 2008).

> tribution to preventing their proliferation into potentially dangerous hands, and ultimately ending them as a threat to the world.[6]

Recognizing the gravity of this danger as well as the difficulty of the challenge, the 2006 conference called for a global effort to rekindle the vision of a world without nuclear weapons that President Ronald Reagan and General Secretary Mikhail Gorbachev brought to their remarkable summit at Reykjavik in 1986. Those two statesmen understood that unparalleled diplomatic cooperation on a global scale would be required, starting with a number of specific steps to contain the nuclear danger. Taking these steps now is essential if the world is to realize the Reykjavik vision, because time may be running out. That vision must also serve as a compass if the steps toward it are to be broadly accepted as fair and urgent and if the world is to stay on course through a long and difficult journey.

For purposes of this study, we assume that the end state will be reached through successive stages of nuclear reductions that resemble the following:

1. The United States and Russia reduce to low numbers (200–500) operationally deployed warheads and bombs of *all types*; France, China, and the United Kingdom accept ceilings at less than 200; and India, Pakistan, and Israel freeze at then-current levels (assumed not to exceed approximately 100).
2. Each nuclear-armed state reduces deployed warheads to zero and non-deployed warheads to no more than 200, after which each nuclear-armed state might reduce the latter

6. "A World Free of Nuclear Weapons," *Wall Street Journal*, January 4, 2007. This article and "Toward a Nuclear Free World," *Wall Street Journal*, January 15, 2008, are included in an appendix (see Appendix 1 and 2).

category to an interim number of 50–100 apiece. A variant could have a mix of 50–100 operationally deployed or declared reserve warheads retained by each state while all other warheads are eliminated.

3. Finally, each nuclear-armed state reduces warheads to zero while retaining monitored reconstitution capabilities within agreed parameters and for a period of agreed duration.

Although those numbers are hypothetical, they provide a framework for examining key security issues that the United States and other nations will face as they approach and enter the end state.

We are not going to predict what other nations might be prepared to do to achieve a world without nuclear weapons. Although we will identify in Section III the specific steps needed to support progress toward such a world, and measures that should be in place by the time the nations enter the end state, we will not explore them in detail. They are discussed in *Reykjavik Revisited*.[7]

One point that needs to be stressed right away is that at the warhead levels being discussed in this study, no distinction can be made between so-called strategic and so-called tactical nuclear weapons. Both David Holloway and Rose Gottemoeller explain in *Reykjavik Revisited* that at some point in the reductions process, "strategic and short-range weapons should be placed in the same basket for negotiating the actual elimination process."[8] They are certainly correct.

7. op cit.

8. Rose Gottemoeller, "Eliminating Short-Range Nuclear Weapons Designed to be Forward Deployed," and David Holloway, "Further Reductions in Nuclear Forces" in *Reykjavik Revisited*, ed. George P. Shultz, et al. (Stanford, Calif.: Hoover Press, 2008) p. 141.

II.
Virtual Deterrence

Jonathan Schell and others have contributed very valuable insights into the nature of deterrence in a post-nuclear-weapons world. Like those analysts, we believe it is possible to change the concept of nuclear deterrence as it was understood and implemented by earlier generations of political, diplomatic, and military leaders. Major changes in international conditions have taken place in recent years, including the accelerating spread of technology and the rise of suicidal terrorist organizations and national and sub-national rogue entities. As a result, we believe there is a need to reconsider the theory and practice of nuclear deterrence, and to do so in concrete terms. In particular, rather than deploying nuclear-armed missiles configured for prompt launch under procedures that allot no more than minutes for a decision, it should be possible to move to a posture in which the nations are, of necessity, months away from being able to take such a fateful action.

In his 1984 book, *The Abolition*, Schell describes a condition that we think of as the end state:

> As reductions continued, the capacity for retaliation would consist less and less of the possession of weapons and more and more of the capacity for rebuilding them, until, at the level of zero, that capacity would be all. Indeed, the more closely we look at the zero point the less of a watershed it seems to be. Examined in detail, it reveals a wide range of alternatives, in which the key issue is no longer the number of weapons in existence but the extent of the capacity and the level of readiness for building more.[9]

Although it will not be easy to make the political, technical,

9. Jonathan Schell, *The Abolition* (Stanford, Calif.: Stanford University Press, 2000).

and military changes necessary to alter the current nuclear-deterrence paradigm, we believe it is possible to make them. These changes would result in a huge improvement over the conditions under which humanity has lived for many decades. The nuclear sword of Damocles would be leashed more firmly than ever. As Schell suggested, nuclear deterrence would still exist, but it would be latent or virtual rather than made manifest through the deployment of nuclear forces ready for prompt launch. There can be no final escape from the catastrophic consequences of initiating nuclear conflict. But there could be much more time for careful consideration of the consequences and time to devise less apocalyptic alternatives. Leaders would have time to reflect on Ronald Reagan's conclusion that "a nuclear war cannot be won and must never be fought."

In his 2007 book, *The Seventh Decade: The New Shape of Nuclear Danger*, Schell revisited the concept that previously nuclear-armed nations might remain in a condition of "virtual," "latent," or "reconstitutable" deterrence.[10] That idea has also been explored in some detail in a 1997 study by the National Academy of Sciences, *The Future of U.S. Nuclear Weapons Policy*, and in essays and books written or edited by Ivo Daalder, Jan Lodal, Christopher Ford, Michael Mazarr, George Perkovich, and James Acton.[11] One critical decision involves where, in the end state, the line should be drawn between per-

10. Jonathan Schell, *The Seventh Decade: The New Shape of Nuclear Danger* (New York: Henry Holt and Company, 2007).

11. Study done by the Committee on International Security and Arms Control: Chairman, John Holdren. Ivo Daalder and Jan Lodal, "The Logic of Zero," *Foreign Affairs* 87, no. 6 (November/December 2008), Christopher Ford, "A New Paradigm: Shattering Obsolete Thinking on Arms Control and Nonproliferation," *Arms Control Today* (November 2008), at www.armscontrol.org/act/2008_11/ford, Michael Mazarr, *Nuclear Weapons in a Transformed World,* (Washington, D.C.: Palgrave MacMillan, February 2002), and George Perkovich and James Acton, *Abolishing Nuclear Weapons*, (Washington, D.C.: Carnegie Endowment Report, February 2009).

missible activities and those that would be restrained or prohibited. The amount of time required to reconstitute a limited nuclear deterrent can vary considerably. It could be as short as a number of months in the case of a former nuclear-weapons state that had dismantled and disassembled its entire nuclear force but had retained a nuclear enterprise—including the facilities, spare components, and technical expertise needed to support a shrinking nuclear stockpile during the reduction process. Or it could be a number of years for a country that had no pre-existing nuclear weapons infrastructure, or had one but had gotten rid of it.

Schell wrote that "Defining the permissible states of readiness for building the bombs and for building delivery vehicles of various sorts would be the first task of negotiations." He was right to emphasize the centrality of this issue. The nuclear genie can never be stuffed back in the bottle or its capacity for death and destruction eradicated from Earth forever. Humanity will have to live with the potential of its reappearance in the form of bombs. But minimizing the dangers is entirely possible. We will discuss this idea more fully following an analysis of practical steps that would help to establish the conditions that we believe would be a prerequisite for entering the end state.

III.
Challenges en Route to the End State

No one should have any illusions: the United States and Russia will have to engage in negotiations far broader, more difficult, and more detailed than they conducted during the Cold War years and thereafter. They, and other nations, will need to agree on several restraining measures affecting nuclear weapons and

settle on the methods for implementing them. The following discussion outlines the contours of the challenge.

A. Building the Foundations of a World without Nuclear Weapons. The structure of a nuclear arms-reduction program must be erected on a foundation strong enough to support it, one that provides evidence that its builders are serious and dedicated. Several of the building blocks were analyzed in detail in *Reykjavik Revisited* and summarized in the *Wall Street Journal*'s op-ed of January 15, 2008.

We assume that progress toward the end state will be accompanied by implementation of at least the following actions:

1. Limits on national nuclear forces imposed on all nations possessing nuclear arms; here, "forces" includes warheads and delivery systems, tactical and strategic, both in a deployed and a reserve (non-deployed) status.
2. A strengthened Nuclear Non-Proliferation Treaty, including universal adherence to the Additional Protocols.
3. Putting into effect a fissile material cut-off treaty to prevent production of more special nuclear material and requiring that existing supplies be safeguarded until rendered unusable for weapons purposes.
4. Universal acceptance of the Comprehensive Test Ban Treaty.
5. Establishing an international control regime for the complete fuel cycle for civil nuclear power.

The first of these actions would focus on limiting and reducing U.S. and Russian nuclear-weapons stockpiles, and would extend those restrictions to other nuclear-armed states. The other four measures would require initiatives on well-iden-

tified, well-understood diplomatic and technological pathways. They would be aimed at preventing the further spread of nuclear weapons capabilities while those currently possessing the weapons would be shrinking their stockpiles. All of these actions would be necessary to improve global security. All would provide useful test beds to discern whether cooperation in this sensitive area is possible. Each would require strong, patient, and visionary leadership and levels of worldwide trust and cooperation exceeding previous efforts. *The challenges these steps present, though daunting, are not fundamentally conceptual nor beyond the reach of inspired leadership.*

B. Disarmament Mechanics. A distinguished British analyst, Michael Quinlan, has aptly called the practical methods and details of arms reductions "disarmament mechanics."[12] These will become more complex once the number of U.S.- and Russian-deployed strategic warheads approaches levels closer to 1,000 than the 1,700–2,200 numbers prescribed in the 2002 Treaty of Moscow. After that, negotiations on reducing nuclear forces will have to include other nations that possess nuclear weapons capabilities. In fact, from the beginning of this renewed effort, other states will have to be involved in some way so that a world without nuclear weapons becomes truly an international enterprise, not the task of only two countries.

From the outset of U.S.–Russian efforts to reduce their nuclear forces, other nations should be heavily engaged in negotiating and implementing a range of clearly identified nuclear restraints that lie on the path to the end state. Among those: a comprehensive test ban treaty, a fissile material cut-off treaty, and international control of the nuclear fuel cycle.

12. Michael Quinlan, "Abolishing Nuclear Armories: Policy or Pipedream?" *Survival* 49, no. 4 (Winter 2007–08): 7–16.

As the number of nuclear weapons decreases, more demanding requirements for verifying compliance with limitations on deployed nuclear warheads and delivery systems will become necessary in order to instill confidence that errors and uncertainties in the numbers of weapons also are decreasing—preferably even more rapidly. There will be similar requirements for non-deployed (reserve) nuclear forces, as well as for dismantled and disassembled components, and for such dual-use delivery systems as missiles and aircraft.

More transparency will be required than is now considered possible, including, for example, direct access to nuclear test sites and information exchanges on R&D programs, experiments, and other such nuclear weapons activities as fissile material production and the stockpiling of fissile materials. As experience shows, a very effective way to increase transparency and mutual trust is to organize programs involving scientific collaboration in inter-laboratory exchanges. In the past, this has provided a way to promote understanding between the nuclear communities of the United States, Russia, and China to a greater degree than short inspection visits could achieve.

The United States, Russia, and other interested parties have already started to discuss some of the more ambitious measures. For example, in preliminary talks during the 1990s, those two great powers discussed transparency and irreversibility of warhead dismantlement. Although the talks did not produce agreed solutions, they did lay the basis for constructive, ongoing work should the issue be re-engaged.[13] Also on the positive side, there has been a signal success in the conversion of Russia's highly enriched uranium (HEU) from its dismantled nuclear warheads into low-enriched uranium for use in civil

13. Harold A. Feiveson, ed., *The Nuclear Turning Point: A Blueprint for Deep Cuts and De-Alerting of Nuclear Weapons* (Washington, D.C.: Brookings Institution, 1999)

nuclear-power reactors. And the United States has worked with Russia, using the Nunn-Lugar program, on the construction of facilities for the secure and monitored storage of dismantled nuclear warheads.[14]

IV.
The End State:
New Conceptual Issues

Once the end state is entered, policy makers will face new conceptual issues that lie beyond the realm of disarmament mechanics. We list here three new challenges that will have to be addressed en route to achieving the vision of a world free of nuclear weapons:

1. Valid reasons will remain for a number of nations or alliances to maintain active programs in nuclear science and technology, as well as an infrastructure to support them. The programs include civilian nuclear power and industrial and medical applications. They also include increasingly broad national-security challenges, such as verification of compliance with restrictions on nuclear activities and counter-proliferation programs. Inherent in these activities will be the potential to surreptitiously fabricate or rebuild nuclear forces. The basic starting point for a reconstituted nuclear-weapons program in a former nuclear-weapons state will be far more advanced than it was at the dawn of the nuclear age, when the intense program at Los Alamos took only two and a half years to build and test an atomic bomb.

14. See Matthew Bunn, "Securing Nuclear Stockpiles Worldwide" in *Reykjavik Revisited*, ed. George P. Shultz, et al. (Stanford, Calif.: Hoover Press, 2008).

The existence of such a program with a supporting infrastructure constitutes a virtual or latent nuclear-weapons capability. *Establishing conditions of strategic stability in a world free of nuclear weapons will require defining and agreeing on parameters for limiting a virtual or latent nuclear weapons capability that will be acceptable to both the most and least advanced nuclear nations.* These parameters entail potential prohibitions and limits on the scale of nuclear activities and the supporting infrastructure, and their impact on the length of time that would be required to reconstitute or create a small nuclear-weapons force. Difficult judgments will have to be made about these parameters, but relevant experience will be gained as the end state is approached. The nations involved will be required to make detailed analyses and negotiate precise, verifiable agreements.

2. As the numerical levels of permitted nuclear weapons—deployed, reserve, or in the process of disassembly—approach zero, they will no longer pose the threat of destroying entire societies in short order. But the terror and devastation even limited numbers could cause will still be far beyond the destructive potential of any other type of weapon, save perhaps some relying on biological agents. *Under such conditions, the nations should pursue cooperative efforts to provide protection against cheating during the final stages of draw-down. Those efforts could include research on systems for detecting and tracking nuclear components, as well as cooperatively deployed early-warning systems and defenses against all forms of nuclear attack.* Until now, cooperation on those two elements has proved impossible to achieve in any serious way. That must change. In guiding deployment decisions regarding defensive systems, there

must be a clear understanding that the purpose is to enhance a stable passage through the final stages of the offensive nuclear weapons draw-down and to guard against breakout after zero is reached.

3. Nuclear disarmament would not imply the end of international disputes and military conflict, and a latent or reconstitutable nuclear force would still remain as a formidable deterrent. But there is a concern that by significantly extending the time for nuclear responses to serious hostile non-nuclear military actions or threats, one restraint against the initiation of large-scale conventional wars might be removed. Therefore, *intense diplomatic efforts to resolve regional crises and to establish norms for limiting and balancing conventional force levels will be required as part of the process of achieving a world free of nuclear weapons.* This will have to be accomplished at the regional level with the support of the international community in all parts of the world. That has already occurred in Europe, and to a greater or lesser degree, discussions have begun elsewhere. Nuclear weapons and conventional force levels in Korea have been the subject of serious talks; confidence-building measures have been discussed in the Middle East; and India and Pakistan already have put such measures in place regarding each side's nuclear posture.

Nobody should expect that all the world's problems will be solved before eliminating all nuclear weapons. Nor do nations need to wait until then to proceed with deep reductions. The challenge will be to contain the remaining disputes while continuing to work to resolve them. We will have more to say about this later in this study.

V.
Verification during the End State

As postulated above, the path to the end state, as we envisage it, passes through stages during which all operationally deployed nuclear warheads have been reduced to several hundred globally and all nuclear-armed states have begun the process of capping and reducing numbers of non-deployed nuclear warheads. Several supporting agreements, such as a ban on all nuclear-explosive testing, would already be in effect.

Getting to zero and monitoring the end state will require more comprehensive cooperation and improvements in all types of verification tools: national technical means, data exchanges, on-site inspections (both routine ones and those prompted by a challenge), perimeter and portal continuous monitoring, tags and seals, sensors and detection devices to monitor nuclear activity and the resulting effluents, remote viewing as conducted already by the International Atomic Energy Agency (IAEA), and—no less important—human intelligence (humint), or good old-fashioned spying.

By the time the end state is reached, an accurate base of information about arsenals that have been built and about material that will remain subject to restraints and elimination should be in hand. During the time it will take to negotiate and implement the steps toward the end state, we can anticipate a steady accumulation of vital information. It can be acquired in various ways. Although exchange of data is the most obvious of them, transparency also will be obtained through the necessarily close working relationships among inspectors and among technical personnel. Thus, to cite one example, the history of production of fissile materials will become better understood as time goes on. This will provide a baseline for judg-

ing the amount of material—HEU and Pu 239—available for nuclear bombs. With that information, the outer limits of warhead production can be predicted with some accuracy. But there can be no doubt that verification of non-deployed nuclear bombs and warheads will be very difficult.[15]

A. U.S.–Russian Verification Procedures. In the case of the United States and Russia, some combination of declarations, confidence-building measures, monitored warhead dismantlement, cooperative transparency, and challenge inspections will be required. Previous agreements between the two countries offer precedents. The procedure would most likely be managed by direct bilateral cooperation, rather than by the IAEA or some other international organization. International inspection would probably be brought in at a late stage of the dismantlement process, partly to add credibility for other participants in nuclear arms-reductions programs.

Verifying compliance with limitations on reserve forces, including dismantled and disassembled components, will remain a demanding challenge, and Cold War experiences provide little guidance in helping to meet it. The storage sites generally will be relatively small, dispersed, readily disguised or hidden, and relatively easily incorporated into the industrial infrastructure. However, as Edward Ifft has pointed out in his chapter in *Reykjavik Revisited*:

> Counting warheads which are *deployed*, or considered to be deployed, is straightforward and can be carried out with high confidence using techniques which have previously been agreed between the U.S. and the Russian Federation. Monitoring the numbers of *non-deployed* warheads has never been attempted in an arms control agreement. Since this was on

15. See Shultz, et al., *Reykjavik Revisited*, for an analysis of verification methodologies and issues.

> the agenda of the 1997 Helsinki Framework (START III), some work was done in the U.S. on how one might approach the task. The appropriate level of intrusiveness also became an issue in the Cooperative Threat Reduction Program. Keeping track of warheads removed from deployed status under agreed procedures should be possible, but an agreed baseline should also be established. Depending upon the degree of confidence required, rather intrusive inspections might be necessary.[16]

As the numbers of permitted weapons decrease, it will become increasingly important, in addition to monitoring and verifying the deployed and reserve weapons, to determine how many are in the queue for disassembly, and to assess the potential for their reconstitution and whether they could pose a significant breakout potential. U.S.–Russian discussions and negotiations on the subject of the irreversible dismantlement of nuclear weapons took place during the Clinton administration in 1994–95.[17] From these discussions emerged several techniques for verifiable dismantlement once the possessors of weapons declare them. The United States and Russia, in cooperation with the IAEA, made a subsequent tripartite effort.

Having such procedures in place would narrow the uncertainties inevitable in any agreement to eliminate all nuclear weapons. It would be useful to undertake talks on dismantlement of warheads and delivery systems with all nuclear countries, and in particular to resume those talks between the United States and Russia at an early date. In addition, efforts should

16. Edward Ifft, "Monitoring Nuclear Warheads," in *Reykjavik Revisited*, ed. George P. Shultz, et al. (Stanford, Calif.: Hoover Press, 2008) p. 229–230.

17. H. Feiveson, ed., *The Nuclear Turning Point* (Washington, D.C.: Brookings Institution Press, 1999) Chapter 9; also see Matthew Bunn, "Transparent and Irreversible Dismantlement of Nuclear Weapons" and Edward Ifft, "Monitoring Nuclear Warheads," in *Reykjavik Revisited*, ed. George P. Shultz, et al. (Hoover Press, 2008).

be made to exchange data regarding past production of fissile material. By enforcing tight physical security and placing dismantled warheads in secure, monitored storage, HEU and plutonium would be rendered unavailable for use in weapons during the temporary period preceding their elimination.

With the United States and Russia, it would be necessary to monitor certain types of long-range bombers and cruise and ballistic missiles. As is the case in the Strategic Arms Reductions Treaty (START), but not in the Strategic Offensive Reductions Treaty, limits on deployed strategic (long-range) delivery vehicles would be required. There are missile parts that serve as spares for testing and training or for missile space launches. Verifying and monitoring limits on such virtual or latent systems in the end state will require establishing very intrusive verification procedures as well as detailed definitional clarifications, particularly when it comes to dual-use technologies.

Strategic delivery vehicles remaining after the elimination of excess vehicles would be monitored to ensure that nuclear weapons have not been surreptitiously deployed near missile or bomber bases. The START treaty has extensive verification provisions for delivery vehicles.

The numbers of missiles eliminated under the terms of a U.S.-Russia agreement might be fairly small. Such vehicles could be used for space-launch purposes, and because of their precision and quick reaction time, there is growing interest in retaining them as launchers for conventional warheads. Such a development would probably prove contentious in future negotiations between the United States and Russia—and most likely with other nuclear weapons nations—because conventionally armed intercontinental ballistic missiles could be confused with nuclear-armed missiles and because of the breakout potential posed by large numbers of strategic delivery vehicles.

B. Implications for Verification in Enlarging the Circle of Nations Engaged in Nuclear Disarmament. The extensive record of arms control negotiations with the Soviet Union/Russia provides valuable experience for assessing the monitoring and verification of nuclear reductions. But the verification challenges will grow more demanding as the geographical scope of nuclear reductions grows to global dimensions. Special verification methods, tailored to the specific situation in each nuclear-armed state, will be required in nearly every case. These matters should be discussed with potential participants from the very beginning of any dialogue.

Among countries that have thus far not deployed or developed an advanced nuclear weapons capability but have acquired the necessary technology to do so, a number of programs have provided experience in multilateral verification; they include monitoring functions of the IAEA and the European Union's nuclear energy component, Euratom. Also relevant are the activities in Iraq of the IAEA as well as the United Nations Special Commission on Monitoring and the United Nations Monitoring, Verification, and Inspection Commission.

Where appropriate, scientist-to-scientist collaborations can be uniquely valuable in understanding the general thrust of national research and development efforts. This must have nothing in common with "spying." The objective is confident, open relationships among collaborating scientists. Each step forward in a nuclear-restraint regime will help to build a foundation of trust, transparency, and cooperation as well as to foster improved technologies that will help meet high standards of monitoring and verification.

Nuclear-free zones should be considered a viable approach to eliminating nuclear weaponry therein. Several already exist. As distinct from a global, carefully coordinated agreement, such zones have the advantage of being responsive to local con-

ditions—for example, in determining the timing of reductions, adding linkages, and creating regional verification machinery.

It should be noted that, compared to the United States and Russia, the numbers of warheads in all other countries and regions where they exist are relatively small (only a few percent); and the numbers of concealed warheads, if any, are likely to be correspondingly small. If some kind of monitored warhead-dismantlement procedure is put into effect, those numbers could be reduced to single digits. But even one or two concealed warheads would pose a major threat to some of the small nuclear-weapons states, as well as being potentially devastating for a large city anywhere. In the effort to eliminate all nuclear weapons, a much greater burden will be placed on both humint and cooperative verification (i.e., transparency and cooperation in the form of on-site inspections). Enforcement will be a make-or-break issue. Considerable successful experience with implementing agreements and very significant improvements in political relationships will be required before zero nuclear weapons can become a realistic goal everywhere in the world.

The experience of the IAEA in monitoring Iraq's nuclear-capable facilities provides some relevant information. In his January 2003 report to the UN Security Council on his agency's monitoring activities in Iraq, the director general of the IAEA, Dr. Mohamed ElBaradei, described the inspection measures that had been taken and said that "no evidence that Iraq has revived its nuclear weapons program" had been found. He concluded that, if "sustained proactive cooperation by Iraq" were available, "we should be able within the next few months to provide credible assurances that Iraq has no nuclear weapons program."[18] ElBaradei was saying that proving a negative is

18. Mohammed ElBaradei, "The Status of Nuclear Inspections in Iraq," (Statement to the United Nations Security Council, New York, January 27, 2003).

possible, given the cooperation of the country being inspected. Lacking such cooperation, the problem is more difficult, but recent, practical experience can help in the search for surreptious programs.

C. Mutual Interests in Compliance. "Sustained proactive cooperation" should be the goal of all nations that commit themselves seriously to eliminating nuclear weapons. And it should be achievable even in a world where disputes and conflicts continue to exist. The contemporary international environment is characterized by the general expectation that nuclear proliferation will continue and that the current nuclear-armed states will not surrender their nuclear weapons. In such an environment, it is almost impossible to secure agreement to take action against countries like Iran and North Korea.

Joint coercive actions would be more easily accepted in such cases if the expectation were that proliferation would not proceed and that the nuclear-armed states were in the process of giving up their ready-to-use nuclear weapons or had already done so. The incentive structure would change completely. Intolerance for the infringement of global norms would replace the present laxity, simply because each of the former nuclear-armed states would have a major stake in preventing breakout and hence in cooperating with other states in quelling a threat to their mutual security. Self-interest, not idealism, would be the principal motivator.

But testing the degree of mutuality of interests will take time and experience. We do not postulate an end to war, only a self-interested realization that resorting to nuclear weapons is not compatible with any reasonable definition of national interests.

D. Conditions for the Final Push to Zero. Before eliminating all

their nuclear weapons, the nations involved would want to be confident of the following:

- permissible activities that are part of a responsive nuclear infrastructure could be monitored and verified, even after reaching zero;
- warheads scheduled for elimination could be dismantled under conditions that would assure their *actual* dismantling, with the nuclear components placed in secure and monitored storage pending final disposition;
- procedures for challenge inspections to search for concealed warheads had been established and satisfactorily exercised;
- delivery vehicles scheduled for elimination had been verifiably destroyed, and procedures were in place to confirm that dual-use systems were not armed with nuclear warheads;
- cooperative defense systems against nuclear attack had been deployed by the nations that wished to participate in joint defense;
- compliance mechanisms had been established to enforce nuclear agreements.

Nuclear warheads could not be wholly and finally eliminated until the nations involved were satisfied that sufficient progress had been made in at least those six areas. Getting to the end state would be a practice run for a world without nuclear weapons. How long a capacity to reconstitute a limited nuclear force would be needed or desirable after nuclear weapons had been eliminated would depend on judgments made during the process of arriving at the end state. That capacity should not be excluded. In fact, it cannot be excluded because the technical ability to build nuclear weapons cannot be both immediately and totally eliminated.

At some point in the process of eliminating nuclear weapons, the nations that still possessed nuclear weapons would find themselves ready to take the final steps to eliminate them. In his chapter in *Reykjavik Revisited*, David Holloway describes an "interim option" of 50–100 deployed nuclear warheads as one of the last steps before going to zero.[19] He had in mind that Britain and France might prefer to retain some deployed warheads until the very end of the elimination process. Our thinking borrows from Holloway's notion, but takes us in the direction of what we would call a "pause" in the process of eliminating nuclear weapons. Having already agreed to a program of reductions that would lead to total elimination of nuclear weapons, it would be prudent and appropriate for all the nations that had embarked on this journey to pause at some low level of nuclear weaponry to make a final assessment as to whether the conditions cited above had in fact been met. For the states identified by the NPT as possessing nuclear weapons, the relevant number might be something like Holloway's 50–100 warheads. This number could be either deployed or non-deployed, but should in either case be declared and open to inspection. Other states possessing nuclear weapons would have accepted limitations on their nuclear weapons program earlier in the process, and their numbers of deployed weapons might be zero, their non-deployed weapons already close to zero.

After the nations involved had made so much progress, nothing less than truly serious and convincing problems would stand in the way of continuing the process of elimination all the way to zero. Nevertheless, we consider it reasonable to plan for the contingency of a pause, although we do not think that

19. David Holloway, "Further Reductions in Nuclear Forces" in *Reykjavik Revisited*, ed. George P. Shultz, et al. (Stanford, Calif.: Hoover Press, 2008).

at this point it has to be specifically defined or built into a staged-reductions process. For now, all that needs to be said is that the pause would be a brief period during which the nations would assess whether the conditions cited above, and perhaps others, had been achieved.

VI.
Deterrence in the End State: Stability and Reconstitution

During the final approach to zero—say, from 50–100 to no nuclear weapons at all—the nations possessing them very likely will continue to insist on maintaining a basic nuclear infrastructure on a scale that ensures the effectiveness of their shrinking deterrent. It is also appropriate and reasonable to presume that every nation that gave up its nuclear arsenal would for some time insist on maintaining a capacity to reconstitute a nuclear strike force to hedge against changed strategic conditions.

That view has attracted criticism. Some observers who doubt that a nuclear-free world is feasible or desirable consider that what we call reasonable would invite a reconstitution race, a race that would create its own unstable and potentially dangerous strategic environment. Whether that is a correct assessment would be tested during the run-up to the end state, when responsive nuclear infrastructures would be maintained on relatively small scales and under conditions of agreed transparency. To minimize the risks of breakout from agreed constraints, the nations involved will need to agree on answers to three important questions:

(1) What are the necessary elements of an adequate nuclear infrastructure, that is, one with a capacity for limited and timely reconstitution of a deterrent? (2) What activities, facilities, or weapons-related items should be prohibited? (3) What

can be done to assure early and reliable warning of a breakout attempt?

Although the United States at that stage would no longer be in the business of calling for new weapons designed for new military missions, it would still rely on the expertise of designers for two contributions: assessing and solving potential problems with the remaining nuclear stockpile as, or if, such problems emerge over time; and introducing necessary corrections that could be implemented without relying on nuclear-explosive testing. Also required would be facilities, support, and resources necessary to retain and hone the skills of the scientists, engineers, craftsmen, and their support teams. Such an effort would include a strong, ongoing experimental R&D program that provided data to challenge and deepen their understanding of the basic science in weapons-related nuclear processes. In addition, there would be a need to maintain facilities for handling high explosives and such dangerous nuclear materials as the plutonium and highly enriched uranium that fuel the bombs.

Expert personnel with the requisite skills are the most important components of a responsive infrastructure. Given the necessary resources, the experts can be relied on to respond with confidence and at a timely pace to unanticipated problems or changes in requirements. Without such talent, no amount of resources will be adequate.

If the desired reconstitution times were measured in months rather than years, the infrastructure would require a limited, but adequate, supply of basic components that could be assembled into a weapon. The necessary parts include: safety-certified advanced fusing and firing systems with permissive action links that must receive an authorized, pre-set code in order to initiate implosion of the metal primary pits; neutron generators; the high explosives that squeeze the nuclear-explosive material to

critical densities to start the fission chain reaction; parts that control radiation flow; and gas-transfer boost systems with supplies of tritium gas that require regular replenishment.

Although a boosted primary would be adequate for a broad range of targets, geometric constraints dictated by the designs of missile re-entry vehicles might also require the retention of "on the shelf" parts for two-stage thermonuclear designs. The delivery systems would also need spare parts, including re-entry vehicles for missile delivery. If intended for dual use with conventional bombs, these parts need to be configured with compatible electrical-connection plugs for the command, control, and firing signals.

Although attracting and maintaining a high level of nuclear weapons expertise will become more challenging as the weapons are reduced to zero, an expanding array of demanding national security problems require nuclear-weapons expertise. These include an increasing need for means of assessing proliferation risks under a variety of scenarios; the need for "nuclear forensics" to help identify the origins of nuclear material, radiological dispersal devices, and nuclear explosive devices, whether obtained before or sampled after explosions; the need for a capability to disarm and disable interdicted devices; and an increasing need to be able to verify treaties and monitor nuclear weapons-related technologies.

Experimental science and collection of data will remain of great value even after the end state is reached. One example is the data gained from R&D on advanced reactor designs for civilian nuclear power. New facilities also provide important data on the behavior of material subjected to the extreme conditions of high pressure and temperatures that occur in nuclear explosives; one illustration is the recently completed National Ignition Facility studying inertial confinement fusion for basic as well as weapons science. Expertise will also be required to

train the relevant inspectors regarding compliance with treaty restraints.

In addition, there is a need for close monitoring of agreements that expressly prohibit certain activities. One example of a prohibited activity: the manufacture of new metal pits for weapons primaries to add to an existing store being retained—even if only temporarily—on the shelf.

The traditional types of adversarial verification tend to encourage cat and mouse-type games. As the nuclear-armed nations move into the end state, cooperation in nuclear-related projects should replace competition. The transparency this would afford would be the most effective way of deterring surreptitious activities. Joint research programs where appropriate, as opposed to adversarial inspections, would be the most effective way to proceed.

The above discussion indicates the important role the weapons labs will continue to play through all stages of implementing steps down to the end state and beyond. The labs will be major contributors to nonproliferation and threat-reduction efforts. To them will also fall the responsibility of ensuring that the nation's shrinking nuclear arsenal remains safe, secure, and reliable; and in the end state itself, that the nation retains the ability to reconstitute a force if necessary.

Since we do not assume that perfect peace will have been achieved or a world government will be put into place upon entering the end state, two considerations need further examination: (1) how to defend a responsive nuclear infrastructure against a first strike, possibly with non-nuclear arms, and (2) how to sustain the infrastructure in terms of competition for budgets and in terms of highly qualified personnel.

Success of a conventional, perhaps terrorist, attack on the nuclear infrastructure could give an immediate advantage to an

adversary that had concealed a few nuclear weapons.[20] Suppose, for instance, that as a result of such an attack, the United States had to undertake a time-consuming, large-scale rebuilding of its damaged nuclear infrastructure before it could reconstitute a small nuclear force. Even an adversary with very few nuclear weapons would enjoy potential advantages in blackmail and in deterring a counter-attack. One ready approach to securing the elements of the nuclear infrastructure that are critical to maintaining the capability to respond would be to distribute them in several hardened, underground structures, similar to command centers that were constructed for the U.S. nuclear deterrent during the Cold War. The government would reveal the individual locations of the chief elements of the infrastructure, but their hardening and active defenses would provide protection against attack. This is not an insoluble problem in principle.

Although sustaining a virtual or latent deterrent presents difficulties, these are almost certainly less serious for the United States than for other nations. Since 1992, the United States has maintained a safe, reliable, and secure nuclear stockpile without relying on explosive underground tests, relying instead on a science-based and well-supported stockpile-stewardship program that has been more successful than many anticipated. There are two fundamental measures of this program's success: it has discovered potential causes for serious concerns in the stockpile due to manufacturing errors, design flaws, or aging—which is precisely its role; and it has addressed and removed the concerns. Similarly, the Department of Defense is address-

20. Charles L. Glaser, "The Instability of Small Numbers Revisited: Prospects for Disarmament and Nonproliferation" (Michael May, ed., *Rebuilding the NPT Consensus*, CISAC Report, Stanford University April 2008, at iisdb.stanford.edu/pubs/22218/RebuildNPTConsensus.pdf).

ing potential problems pertinent to the maintaining of effective performance of the delivery systems.

Looking ahead through the stages of continued draw-down of the nuclear stockpile toward and in the end state, no technical grounds exist for questioning U.S. ability to maintain confidence in an effective nuclear deterrent. What will be required is preserving the essential ingredients of the current program. As emphasized previously, these include excellent personnel engaged in a vigilant search to discover and fix problems in the stockpile, and also a robust experimental program to hone their skills. Moreover, nuclear expertise will be needed to meet an increasingly broad range of new challenges. The National Nuclear Security Administration Administrator, Thomas D'Agostino, emphasized that in testimony before the Strategic Forces Subcommittee of the House Armed Services Committee in early 2008:

> In addition, our 21st century enterprise will continue to leverage the scientific underpinning of the historic nuclear weapons mission to respond to a full range of national security challenges that we have, and beyond nuclear weapons sustainment but shift those more towards nuclear counterterrorism and nuclear nonproliferation activities. And as an example, we provide technical support to the Defense Department and the FBI and emergency render-safe and post-event nuclear technical forensics activities. And a lot more needs to be done in that area and we're going to be looking to shift more towards that area.[21]

These new challenges will be a major focus of the Stockpile Stewardship Program in a post-disarmament environment. To-

21. Marvin Adams and Sidney Drell, "Technical Issues in Keeping the Nuclear Stockpile Safe, Secure, and Reliable" (paper presented at Nuclear Weapons in 21st Century U.S. National Security, Washington, D.C., April 2008) cstsp.aaas.org/content.htm.?contentid=1792 pg. 15.

gether with the critical need to retain the ability to reconstitute a force efficiently and reliably, should the need arise, they would create incentives for scientific personnel for many years to come.

Disparities in the respective capabilities of former nuclear-weapons states and between them and the non-nuclear weapon states, with respect to the lead time required for reconstitution, will remain for at least some time because of corresponding scientific, technological, and manufacturing disparities. Nuclear weapons parity, even at zero, will not be immediately established in the end state. We can expect, however, that major differences will diminish over time.

A careful judgment will have to be made among nations of comparable technical capabilities regarding nuclear activities that would be considered reasonable to retain in a state of latency, as opposed to those that are impermissible because they would push the world dangerously close to a reconstitution race. Compliance with agreed prohibitions could be monitored by cooperative procedures, including sensors detecting activities such as efforts to assemble high explosives with radioactive nuclear material. There will also be a need for international monitoring systems able to watch for and report promptly any signs of attempts to fabricate nuclear warheads and mate them with delivery vehicles.

Responding to this threat quickly and effectively will require a degree of international consensus that would be hard to obtain under today's circumstances. But that consensus can be expected to develop during the cooperative process of building a rigorous nuclear-restraints regime.

Deterrent measures other than reconstitution, including the possibility of military actions, are available. Admittedly, such actions would be more likely against weaker states, while a breakout by big powers would very likely trigger a compen-

satory one. Is this situation more unstable than what the world faces nowadays? Almost certainly not, since the time between a decision and the actual ability to launch an attack would be measured in months. Currently, as emphasized at the beginning of this study, that delay could be as short as minutes.

VII.
International Relationships During the End State

Ambassador Chester A. Crocker, in his study of a prospective world order that vastly scales back the role of nuclear weapons, has stressed the importance of the geopolitical context in which reductions take place.[22] He calls for "a sustained diplomatic effort to construct and sustain the favorable geopolitical context without which steps toward a nuclear weapons-free world will not flourish." The end state we have portrayed in this study would require a geopolitical context very different from that which exists today, yet not so different as some believe. World government is not a necessary precondition for eliminating nuclear weapons; nor would nuclear deterrence disappear.

Crocker presents an extended discussion of engaging key players at the beginning of the process. Our analysis will offer some thoughts about the geopolitical context at the *end* of the process. But first, we would like to stress that in our judgment, the goal of eliminating nuclear weapons can and should direct attention to neglected areas of international relations. Indeed, that is one of the most significant advantages of pursuing elimination. Schell put it well when he spoke in the *The Abolition* of

22. Chester A. Crocker, *Toward a Diplomatic Action Plan on Nuclear Issues* (Stanford, Calif.: Hoover Press, 2009).

> the objective magnitude of the task that, without our willing it or wanting it, has actually been imposed on us by nuclear weapons. This is the first requirement of realism in the nuclear age, and, I believe, it is in a spirit of realism that we should acknowledge that the abolition of nuclear weapons would be only a preliminary to getting down to the more substantial political work that lies ahead. The size of the predicament is not ours to choose; only the resolution is.

Approaching the end state, and after reaching it, the following questions arise:

- Are instabilities among the nuclear weapons states introduced at any stage? If so, what are they, and can they be corrected?
- Would nuclear reductions on this order invite aggression against one of the current nuclear weapon states by a nonnuclear weapon state (Israel being the prime example)?
- What are the implications for recourse to the use of conventional forces?
- What are the implications for biological and chemical weapons?
- What are the implications for alliances?
- What are the implications for international organizations?

We will offer our thoughts on each of these questions while acknowledging that each deserves a more thorough analysis.

A. Instabilities Among Nuclear-Weapons States. Nuclear weapons may have deterred the worst excesses of violence during the Cold War, but it is possible also to conclude that possession of such weapons had a tendency to exacerbate rivalries and animosities. Evidence gained from the U.S.-Russian experience

after the Cold War seems to support that conclusion, because both nations, despite warmer relations, have found it impossible to escape from the action-reaction cycle of the Cold War. For both, the nuclear deterrence trap still exists. Eliminating nuclear weapons would remove a divisive element in relations between the United States, Russia, and China, freeing them to work together to create a regime of cooperative security.

Problems would certainly arise if reductions were carried out too rapidly and without careful attention to the overall context of relations among the nuclear weapons states. But such speed is not likely, especially since a wide range of other restraint agreements will necessarily be in place before the end state is reached. These include verifiable treaties for a comprehensive nuclear test ban, a fissile material cutoff, and U.S.-Russian reductions in warhead levels. In addition, other verifiable agreements will probably have been negotiated or renegotiated, among them a global agreement on limiting intermediate-range nuclear forces and a European conventional-forces treaty. Cooperative arrangements in ballistic missile defense and early warning also may be in place. By the time reductions approach the end state, it is likely that all nations will have installed new leadership, and it is entirely possible that the Iranian and North Korean nuclear weapons programs will have been terminated or reduced to a latent stage.

That said, we must be mindful of current territorial disputes in Asia, such as the status of Taiwan, that could involve the United States and China. Serious instabilities might arise from the triangular relationship involving China, India, and Pakistan. Other such issues exist between Japan and Russia, and between Japan and Korea. The dispute over Kashmir between India and Pakistan is fundamental for both countries. It is unlikely that the absence of nuclear weapons would affect these disputes, but it would be necessary to find some modus vivendi

between the nations involved before reaching the end state. And that can be done: a good example was the successful Russian-Chinese effort to eliminate border disputes. In general, for nations that want improved relations, the removal of nuclear weapons as an issue between them should ease the process.

B. Aggression Against Former Nuclear Weapons States by Historically Non-Nuclear Weapons States. Israel is the only serious example of such instability. It is questionable whether aggression of this type is a realistic possibility in light of that nation's military advantages. But under present circumstances, Israel certainly believes that its nuclear deterrent induces caution on the part of its neighbors. That deterrent also serves as a lightning rod for other countries, serving to justify their own nuclear ambitions. The Israeli government's most detailed listing of conditions under which it would subscribe to a nuclear weapons-free zone in the Middle East cites a settlement with the Palestinians, and presumably with all Arab states, as a prerequisite. Today, the Israeli government would of course also require that Iran be part of such a zone and probably would insist as well on a definitive end to Iran's support for Hezbollah and Hamas. As in the case of arguments among nuclear-armed states, disputes between Israel and its neighbors would have to be greatly moderated before entering the nuclear end state.

An issue that this discussion raises is whether a nuclear weapons-free world could be achieved incrementally through regional settlements, perhaps accompanied by nuclear weapons-free zones. It would be a pity if that were not possible. The elimination of nuclear weapons in one region—say, northeast Asia or south Asia—should not be delayed until all other regions have reached a similar agreement. Of course, this asymmetric approach to a nuclear weapons-free world raises questions about extended nuclear deterrence. It also raises the issue

of the role security assurances play in advancing the prospects for a nuclear weapons-free world. In some cases, those assurances would certainly help.

One other nation should be singled out for consideration: rightly or wrongly, given its history, Russia might feel threatened by historically non-nuclear weapons states all along its borders; Russia's retention of a substantial arsenal of short-range nuclear weapons systems is evidence of that. Its membership in regional security organizations or other security assurances would be a partial remedy. Resolving any lingering disputes would be another.

C. Implications for Conventional Forces. It is already clear that at least in Europe, balanced restraints on conventional forces will be necessary if nuclear weapons are to be reduced significantly, let alone eliminated. Russia has suspended the Treaty on Conventional Armed Forces in Europe (CFE), and new terms will probably have to be negotiated. Additional limitations on missiles will also probably be necessary. In short, deep reductions leading to elimination of nuclear weapons will also require limitations on other military forces, and Europe will not be alone in requiring this. Nations in the Middle East, South Asia, and East Asia also will raise the issue of limiting missiles and conventional forces.

D. Implications for Biological and Chemical Weapons. It will be more important than ever to ensure that the bans on development and use of chemical and especially biological weapons remain in force and that verification measures for a ban on the latter are instituted. Biological weapons have been called the "poor nation's atom bomb" because they are cheaper and easier to produce than their nuclear counterparts. Some nations that agree to give up or forgo nuclear weapons may be tempted

to replace them with biological ones as their ultimate deterrent, and any outcome that encourages the development and proliferation of biological weapons must be avoided. For this reason, high priority should be given to negotiating a verification protocol to the Biological Weapons Convention at the earliest possible date. Verification machinery should be in place on a global basis long before nuclear-armed nations enter the end state in a nuclear-reductions program.

We note that in today's world, a capability to create biological weapons serves as a deterrent against creating them. This idea, transferred to the nuclear arena, shows how a latent capability to build nuclear weapons can serve as a deterrent against doing so.

E. Implications for Alliances. Alliances are one means of preventing nuclear proliferation. Nations that promise to come to the aid of other nations in case they are attacked make it easier for the latter to forgo nuclear weapons. This is the case with Japan, which emphasizes the American nuclear umbrella as part of its defensive policy vis-à-vis its neighbors. Arguments are made that elimination of U.S. nuclear weapons would remove one of the most important pillars of Japan's non-nuclear posture.

Generally, however, nations like Japan that live under the U.S. umbrella are well disposed toward the elimination of nuclear weapons. But two other factors figure in the case of Japan. One is that China, Russia, and Korea obviously would no longer present nuclear threats in a world without nuclear weapons. The U.S.-Japan security treaty would remain in force, and the two nations' combined air, naval, and ground forces should certainly be capable of defending the Japanese home islands and sea lines of communication against any conceivable threat. If this commitment is not credible, despite being backed by the

capabilities potentially available, the use of nuclear weapons in Japan's defense also lacks credibility. In any case, the quality of the political relationship with the United States, not the number of nuclear warheads instantly available, is the real measure of credibility.

Second, Japan has long favored nuclear disarmament and will support deeper reductions in U.S. nuclear weaponry if Russia and other nuclear-armed nations take commensurate actions. What is important to Japan is that it be consulted as reductions proceed. The end state is still years in the future, and it is safe to assume that the world—including Japan's relations with China, Russia, and North Korea—will have changed considerably by the time the end state materializes.

Although we have examined Japan, similar situations will arise in Europe and the Middle East. Similar answers to the challenges posed will then be in order, with nuances of course differentiating one case from another.

F. Implications for International Organizations. Crocker suggests that the Obama administration "has the opportunity to propose an updated version of the 1946 Acheson-Lilienthal report blended together with a reconfigured version of the grand bargain contained in the 1968 Non-Proliferation Treaty."[23] If pursued, this approach would lead to new organizational arrangements that would be in place by the time the end state, as we have defined it, is reached. Just as we assume that many, perhaps all, of the restraint agreements postulated above will be in place by then, so do we assume that new organizations will be available to deal with what Crocker calls "future nuclear governance."

Extracting nuclear weapons from the world's inventories of

23. Crocker, op cit., Section VII. "Future Nuclear Governance," pg. 33.

weapons will be a wrenching experience for a number of countries, perhaps more so for the Permanent Five of the UN Security Council than for the newer, de facto nuclear-weapons states. The P-5 did not become permanent members of the council because they possessed nuclear weapons. But the special status of these nations has become almost as much associated with their being the only recognized, *de jure* nuclear-weapons states, under the Nonproliferation Treaty, as with their permanent Council membership. Complicating this painful withdrawal from the ranks of "legitimate" nuclear-weapon states will be the expectation that, in return for surrendering its nuclear arms, India will also become a permanent member of the council. If that happens, Japan would certainly demand entry, and so probably would Brazil. Both nations, not coincidentally, have uranium enrichment facilities.

The politics of Security Council membership exemplify the ways in which a "level playing field" in nuclear arms will have a leveling effect in other areas as well. If the United States decides to take the lead in working seriously toward a world without nuclear weapons, it will also have to design policies that will compensate for the lost pride of place that causes resentment among the less powerful of the present nuclear weapons states. And that may include all of the other *de jure* nuclear weapons states, too. Russia and China, in particular, may well suspect that the United States is urging nuclear disarmament on the rest of the world in order to gain unilateral advantages—a suspicion that has already been voiced semi-officially.

The general posture of the United States, faced with these circumstances, must be either to strengthen the international institutions in which it participates or, as Crocker suggests, to create new ones.[24] He argues that "there may be no more im-

24. Crocker, op cit., pg. 36.

portant issue than identifying the mechanism and the institutional formula for addressing what one expert [Jayantha Dhanapala] has described as 'the institutional deficit in the Non-Proliferation Treaty.'" Crocker recommends "the establishment of a new, overarching framework—a place for consultation—a directorate to oversee specific functions and processes entailed in denuclearization—a forum to provide a voice and a stake in governance of the NPT."[25]

VIII.
Getting Started

This study has reviewed the range of challenges and requirements that must be met before approaching the gates to the end state—and after they've been entered. The authors mean to underscore the fact that nothing less than heroic efforts and strong global leadership will be required, starting with the United States and Russia, the two dominant nuclear powers that possess most of the nuclear weapons as well as the largest infrastructures for maintaining, modernizing, and reconstituting an arsenal. Whether or not the vision of eliminating nuclear weapons is accepted as an achievable—or even desirable—goal, the world needs unparalleled cooperation in establishing an effective verification regime if it is to succeed in reducing nuclear dangers and keeping the most deadly weapons ever invented out of dangerous hands. We believe that significant progress toward achieving this vital result will be possible only if the vision of zero nuclear weapons is accepted as a goal that can be reached.

We have heard that message loud and clear from many of the non-nuclear nations around the world, and we believe their

25. Ibid.

cooperation can be expected only if the nuclear powers convince others of their true commitment to achieving a world free of nuclear weapons. Many nations have been specific in rejecting a future that preserves today's model of a world with two tiers of nations, those with and those without nuclear weapons. We are encouraged to think that the prospects for a global consensus about this future has been greatly enhanced by the words of Presidents Obama and Medvedev quoted in the Introduction of this book, and by the strong commitment President Obama declared in Prague on April 5, 2009:

> Some argue that the spread of these weapons cannot be stopped, cannot be checked—that we are destined to live in a world where more nations and more people possess the ultimate tools of destruction. Such fatalism is a deadly adversary, for if we believe that the spread of nuclear weapons is inevitable, then in some way we are admitting to ourselves that the use of nuclear weapons is inevitable. . . .
> So today, I state clearly and with conviction America's commitment to seek the peace and security of a world without nuclear weapons. . . This goal will not be reached quickly—perhaps not in my lifetime. It will take patience and persistence. But now we, too, must ignore the voices who tell us that the world cannot change.[26]

26. President Barack Obama, "Remarks by President Barack Obama," (Hradcany Square, Prague, Czech Republic, April 5, 2009). See Appendix 3.