

**THE NUCLEAR NONPROLIFERATION REGIME:  
ITS STATUS AND PROSPECTS**

by

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## **ABSTRACT**

This paper examines the status and prospects of the global, nuclear nonproliferation and disarmament regime. It finds that although the immediate crises over the North Korean and Iranian nuclear programs are serious, they are also likely manageable. Far more problematic for the regime's long-term survival is the possible deterioration of the international security environment resulting from shifts in the global balance of power, severe climate change, and nuclear weapons retentionism by the current nuclear-armed states. Additionally, the accelerating spread of nuclear technology and expertise threatens to put nuclear weapons within easier reach of more states. Overall, the prospects for the regime remain uncertain and the window for action on nuclear nonproliferation and disarmament may be beginning to close. States should act now, and with resolve, to mitigate risks and to strengthen the regime in preparation for more challenging times ahead.

**Keywords:** nuclear nonproliferation regime; nuclear weapons; nuclear nonproliferation; nuclear nonproliferation treaty; NPT; future security environment; nuclear power renaissance; nuclear disarmament; arms control.

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## INTRODUCTION

The nuclear nonproliferation regime is a framework of international institutions, agreements, and understandings aimed at preventing the further spread of nuclear weapons and at effecting their eventual elimination. It is constructed around the grand bargain of the Nuclear Non-proliferation Treaty (NPT), which stipulates that parties to the treaty not currently possessing nuclear weapons will not seek to acquire them, those that have them will work towards disarmament, and that all parties shall enjoy access to nuclear technology for peaceful purposes.

At the time of writing of this paper, the regime is slowly emerging from what has been a particularly difficult decade. North Korea's withdrawal from the NPT and subsequent nuclear weapon tests; the discovery in Iran of a clandestine uranium enrichment program and the subsequent diplomatic standoff; the regime's collective failure to address the problem of the future of the nuclear fuel cycle in the context of an expected major expansion of nuclear power worldwide; and continuing nuclear weapons retentionism by the nuclear-weapon states, all contributed to widespread talk of regime crisis, or even collapse.<sup>1</sup>

Over the past year and a half, the new Obama administration has made repairing the nonproliferation regime a priority and has re-committed the U.S. to a number of significant initiatives abandoned by its predecessor. While this change of attitude has been welcomed in diplomatic and nonproliferation circles in the U.S. and abroad, the regime continues to face a very uncertain future.

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1. Barry M. Blechman and Leo S. McKay Jr. for example, warned already in 2000 that the "complex regime intended to contain the spread of nuclear technologies is disintegrating." *Weapons of Mass Destruction: A New Paradigm for a New Century, Occasional Paper No. 40* (Washington, D.C.: Henry L. Stimson Center, 2000), 4. Much more recently, Deepti Choubey, reported that conventional wisdom held the regime to be "on the verge of collapse." Deepti Choubey, *Restoring the NPT: Essential Steps for 2010* (Washington D.C.: Carnegie Endowment for International Peace, 2009), 7.



This paper takes stock of the key issues facing the nonproliferation regime today, analyzes what they mean for its future, and offers some policy prescriptions for mitigating risks and enhancing the chances for long-term regime success. The paper begins by providing some historical context for the regime in the section immediately below. Readers familiar with this background information may wish to proceed to the main body of the paper. Each of the main three chapters of this paper is devoted to examining one of the regime's three 'pillars': the nonproliferation pillar; the peaceful uses pillar; and the disarmament pillar. The concept of the three pillars, each of which represents one of the three prongs of the NPT 'grand bargain,' is now common currency among regime watchers and, therefore, provides a convenient organizing structure for this paper.

Chapter 1 thus examines the key challenges facing the regime's nonproliferation pillar, including North Korea's recent break-out, as well as unresolved questions surrounding Iran's nuclear program. It concludes that, while these crises are serious, the worst-case outcomes of regional proliferation cascades can very likely be avoided because both crises can likely be managed and, in the longer-term, resolved. The discussion then turns to two less immediate but far graver challenges: the shifting global balance of power, and the potential geopolitical impacts of climate change. Both are capable of causing significant deterioration in the global security environment, leading to the breakdown of proliferation restraint and regime collapse. While this outcome is not a foregone conclusion, the risks are significant and countermeasures urgently required.

Chapter 2 examines the tension between the peaceful uses of nuclear energy and nonproliferation. It finds that the International Atomic Energy Agency's (IAEA) 'safeguards' system – designed to detect and deter attempts by states to cheat on their NPT commitment not to seek to acquire nuclear weapons – is inherently limited and badly overstretched. The chapter also examines the implications of the expected major, global expansion in the use of nuclear power for IAEA safeguards and the nuclear export control regime. The chapter concludes by briefly examining options for reform of the peaceful uses pillar. It

finds that drastic increases in funding for the IAEA, the rejection of a 'closed' nuclear fuel cycle dependent on plutonium reprocessing, and the multinationalization of uranium enrichment, would help address much of the concern associated with the use and spread of nuclear energy. Unfortunately, agreement on these issues will be difficult to come by.

Chapter 3 examines the nuclear disarmament pillar. It answers the sceptics who question the scope of the NPT's nuclear disarmament obligation by showing that a robust, legally-binding obligation to eliminate nuclear weapons does in fact exist. Furthermore, it argues the possibility of deterrence failures, accidental nuclear war, as well as a link between disarmament and proliferation, make nuclear disarmament highly desirable. The sole, but important caveat to the foregoing is that progress towards disarmament must not be divorced from progress on improving the broader political conditions of the international system. Even so, under the current political climate, bold, further steps towards nuclear disarmament are advisable.

The fourth and concluding chapter takes stock of the preceding discussion and offers some final thoughts about the regime's status and prospects. The picture that emerges is one of a regime besieged by serious, but perhaps not insurmountable challenges. To increase the chances of success, all states, but particularly the nuclear-armed powers, should work vigorously to enhance international security in order to reduce demand for nuclear weapons; seek a new global agreement on the nuclear fuel cycle that would multilateralize uranium enrichment and reject plutonium reprocessing; ensure that the IAEA is adequately resourced to perform its safeguards mission in the context of a nuclear power 'renaissance'; diligently pursue nuclear disarmament, and; finally, address the threat of climate change through heavy investment in geo-engineering research and development, and a rapid drawdown of greenhouse gas emissions worldwide.

The nonproliferation regime is too valuable to hazard. At quite a modest price, it provides a mechanism for collective restraint in nuclear proliferation, and

offers the best hope available for eventual nuclear disarmament while promoting responsible behaviour by the nuclear powers in the interim.<sup>2</sup> The alternatives of letting nuclear weapons spread unabated or attempting to halt their spread through *ad hoc* unilateral or 'coalition-of-the-willing'-type counter-proliferation campaigns are simply unpalatable. States would be wise to act quickly, and with resolve, to shore-up the regime in preparation for the possibility of more challenging times ahead.

## **A Short History of the Global Nuclear Nonproliferation Regime**

### **Regime Precursors (1943-1965)**

Although a truly global nonproliferation regime did not form until the NPT came into force in 1970, co-operative efforts to control the spread of nuclear weapons date back to the early years of the nuclear age when the war-time allies U.S. and U.K. swore each other to secrecy about their joint work on the atomic bomb. The Quebec Conference Agreement of August 1943 forbade both parties to "communicate any information about Tube Alloys [British code for the atomic weapon project] to third parties except by mutual consent."<sup>3</sup> Although Canada was not originally party to the agreement, it was soon brought onboard given its intimate involvement in A-bomb project.

The 'nuclear genie,' however, was already out of the bottle. While the wider world first learned of nuclear weapons following the bombings of Hiroshima and Nagasaki in August 1945, the theoretical science behind the devices was understood by physicists in Europe, North America, and Japan by the late

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2. I thank Douglas Ross for suggesting this last point.

3. Brian Buckley, *Canada's Early Nuclear Policy* (Montreal: McGill UP, 2000), 28.

1930s.<sup>4</sup> What is more, brilliant espionage efforts had kept the Soviet Union abreast of work being done by its Western allies at Los Alamos, New Mexico and Chalk River, Ontario.<sup>5</sup> By February 1943, the Soviets had set up a dedicated weapons program of their own and, once the existential threat of Nazi Germany was eliminated, the program took off under urgent orders by Stalin to produce a bomb as quickly as possible.<sup>6</sup> It would do so by 1949, using a design identical to that of the U.S. 'Fat Man' bomb dropped on Nagasaki four years prior.

With the end of WWII, and motivated by a growing understanding of the fleetingness of their nuclear oligopoly, the governments of the U.S., Britain, and Canada issued a joint call in November 1945 for the establishment of a truly multilateral nuclear control regime.<sup>7</sup> The joint declaration called on the newly created United Nations to establish a commission to develop proposals to:

- enhance exchanges of nuclear scientific information for peaceful purposes;
- control atomic energy to the extent necessary to assure its peaceful use;
- eliminate from national armaments atomic weapons and all others adaptable to mass destruction; and

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4. Thomas C. Reed and Danny B. Stillman, *The Nuclear Express: A Political History of the Bomb and Its Proliferation* (Minneapolis: Zenith Press, 2009), 26-27. Nuclear fission had been discovered in Berlin in 1938, triggering "intense global interest." Indeed, Europe had been at the forefront of nuclear science until the growth of fascism made key talent seek refuge in the United States. Even during the height of the American nuclear weapons research and development effort from 1943-1945, 55% of the "intellectual all-stars" at the Los Alamos laboratories which produced the bomb were continental Europeans (German/Austrian 21%, Hungarian 17%, other 17%). The remaining scientists were British and Canadian (25%) and lastly American (21%). Reed and Stillman, 8, 13.

5. During the first half of the 1940s, Chalk River, Ontario, Canada was the site of the second most important nuclear laboratory in the world, after Los Alamos, New Mexico, the birthplace of atomic bomb. This was largely the result of the British nuclear research effort relocating there because of the vulnerability of the United Kingdom to attack and invasion.

6. Reed and Stillman, *The Nuclear Express*, 29-32.

7. Notably, the 'Gouzenko affair' of fall 1945 brought home the fact that nuclear secrets could not be kept for very long. Gouzenko, a cipher clerk at the Soviet Embassy in Ottawa defected with documents revealing the great scope and sophistication of the Soviet espionage network aimed at infiltrating the atomic projects in Canada, Britain and the U.S.

- establish safeguards by way of inspection and other means to ensure compliance.<sup>8</sup>

The U.S. proposal to the newly established Atomic Energy Commission called for international ownership of nuclear facilities of special proliferation concern, international licensing of all other nuclear activities, a robust inspection system, and the elimination of nuclear weapons once the regime was in place.<sup>9</sup> The U.S.S.R. counter-proposal called for a system based on national, rather than international, control and demanded that the U.S. verifiably eliminate its weapons up-front, before others were required to submit to controls. In the end, the differences between the two superpowers proved irreconcilable, which should not be surprising given Soviet determination to acquire the bomb and the deepening chill beginning to permeate Soviet-American relations at that time.

By the early 1950s the U.S. was facing a very different geostrategic landscape. It was no longer the sole nuclear power. The Soviets had tested in 1949 (years earlier than expected) and the British followed in 1952.<sup>10</sup> Furthermore, a new class of nuclear weapons, called thermonuclear, and capable of generating explosive power orders of magnitude greater than that of the early A-bombs, was developed and tested first by the U.S. in 1952, and then the Soviet Union in 1953. Faced with a tightening nuclear lead, and communist consolidation in Eastern Europe, and Asia (China fell in 1949, and North Korea

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8. Buckley, *Canada's Early Nuclear Policy*, 46.

9. John Simpson, Jenny Nielsen and Moris Swinerd, comps. *NPT Briefing Book*, 2010 Ancey ed. (Southampton, U.K.: Mountbatten Centre for International Studies, 2010), 4. The U.S. plan, proposed in June 1946, was known as the 'Baruch Plan,' after Bernard Baruch the U.S. ambassador to the United Nations.

10. The British decision was likely influenced by action by the U.S. Congress in late 1946 to end American nuclear cooperation with the U.K. and Canada in light of revelations connecting some British scientists to Soviet espionage efforts. This had left the British feeling quite mistreated given their very substantial contributions to the American A-bomb project, and earlier promises of full scientific and technological co-operation. Together with what seemed like an alarmingly rapid draw-down of American forces in Western Europe, and the consolidation of Soviet power in Eastern Europe, the shut-down in scientific/technological co-operation stoked fears of renewed American isolationism and helped make the case for a British nuclear deterrent. The first British bomb was tested in October 1952 on a remote island off the coast of Western Australia. Reed and Stillman, *The Nuclear Express*, 44-49.

invaded the South following year) the Eisenhower administration renewed attempts to freeze the nuclear *status quo* through by multilateral means.

In a December 1953 speech to the U.N. General Assembly, Eisenhower proposed what came to be known as the “Atoms for Peace” program. The program called for the setting up of an international nuclear fuel bank, which the nuclear-weapon states would supply with weapons-grade fissile materials, and non-nuclear states could draw upon for use in nuclear power plants. States accepting such nuclear aid would have to foreswear nuclear weapons and accept international safeguards on the withdrawn materials. In this way, Atoms for Peace would provide a path towards nuclear disarmament and commit non-nuclear states to permanent nuclear abstention. Eisenhower also hoped that the program would prolong American nuclear superiority over the Soviet Union by forcing the latter to divert much of its weapons-grade fissile material away from use in weapons.<sup>11</sup>

Negotiations on Eisenhower’s proposal concluded in 1956 with the establishment of the International Atomic Energy Agency (IAEA) but did not give expression to the originally proposed disarmament and fuel bank schemes. The newly created IAEA had a three-fold mandate: to assist in the peaceful development of nuclear energy; to verify the peaceful nature of nuclear activities; and to sound the alarm if non-peaceful activities were detected.<sup>12</sup> States wishing to use IAEA assistance had to accept the agency’s safeguards on the material or facilities the agency helped them procure, but were not obliged to safeguard parts of their nuclear program developed without IAEA assistance. Neither were states under any obligation to seek assistance from the IAEA when developing their nuclear programs. These watered-down provisions doomed the IAEA to near irrelevance, as states such as France and China developed and tested

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11. Simpson, Nielsen, and Swinerd, *NPT Briefing Book*, 4.

12. The IAEA is discussed in more detail in Chapter 2.

nuclear weapons (in 1960, and 1964 respectively) using technology procured from outside of the IAEA system.<sup>13</sup>

Several other developments in the 1950s and early 1960s helped lay the groundwork for the current nonproliferation regime. The first of these were Soviet-American arms-control negotiations that began in the 1950s with a view to halting and ultimately reversing the arms race. These proceeded on a three-pronged track: the first, ultimately unfruitful, consisted of negotiations on general and complete disarmament (GCD) which aimed to address nuclear weapons in the broader context of the Cold War military build-up;<sup>14</sup> the second sought the negotiation of a Comprehensive Nuclear Test Ban Treaty (CTBT); while the third sought a Fissile Material Cut-off Treaty (FMCT) to limit the amount of fissile material available for use in weapons.<sup>15</sup> Negotiations on a CTBT resulted in a moratorium on testing from 1958-61, but could not deliver a permanent treaty due to differences between the superpower over the level of intrusiveness needed to verify the treaty. In the end, only a Partial Test Ban Treaty banning tests in the atmosphere was concluded in 1963 due to growing awareness of the danger of such testing to human health.<sup>16</sup> Attempts at a FMCT were abandoned in 1964, once again, over issues of verification.

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13. The French nuclear program was driven primarily by concerns of strategic abandonment by the U.S. With the development of a Soviet nuclear retaliatory capability, France was profoundly doubtful that the U.S. would risk escalating to the nuclear level in case of a Soviet conventional attack on Western Europe. The Chinese program was likely motivated by a host of factors, including an adversarial relationship with the U.S. (which had supported Chiang Kai-shek's nationalist forces against Mao Zedong's communist guerrillas during China's recent civil war); American threats on several occasions during the 1950s to use nuclear weapons against China; a deteriorating relationship with the Soviet Union; and China's image of itself as a great power. For a discussion of U.S. nuclear threats against China see Appu Kuttan Soman, *Double-Edged Sword: Nuclear Diplomacy in Unequal Conflicts - The United States & China, 1950-1958* (Westport, CT: Praeger, 2000).

14. Simpson, Nielsen, and Swinerd, *NPT Briefing Book*, 5.

15. *Ibid.*

16. Reed and Stillman, *The Nuclear Express*, 62-67. The period from 1961 to 1963 saw over 200 nuclear tests, including the largest test ever, the 58Mt 'Tsar Bomba' which was tested in the atmosphere. The 1963 Limited Test Ban Treaty banned tests in the atmosphere, in outer space, and under the sea, but not underground.

Another significant development that may have helped catalyze renewed interest in multilateral approaches to nonproliferation was the establishment in 1959 of the first ever nuclear-weapon-free zone (NWFZ) in Antarctica. This would serve as a template for similar agreements banning the stationing or transit of nuclear weapons in outer space (opened for signature in 1967), Latin America and the Caribbean (1967), the seabed (1971), South Pacific (1985), ASEAN countries (1995), Africa (1996), and Central Asia (2006).

Finally, at the U.N. General Assembly, Ireland's efforts to bring awareness to the dangers of nuclear proliferation led in 1961 to the adoption in of the "Irish Resolution" calling for the negotiation of a multilateral agreement committing nuclear weapon states not to transfer weapons or sensitive technologies to non-nuclear weapon states, and committing the latter not to seek to acquire such weapons.<sup>17</sup> This turned out to be an important catalyst of progress towards the NPT.

### **Negotiating the NPT (1965-1970)**

Although the superpowers could not agree on arms control and disarmament measures such as a CTBT, or an FMCT, they did find common ground on nonproliferation as neither wanted to see nuclear weapons spread to additional states. In a proliferated world, danger could come from adversaries and allies alike: while nuclear-armed adversaries could threaten the superpowers' interests directly, actions by nuclear-armed allies could inadvertently draw their patrons into confrontations that could well spiral out of control.<sup>18</sup>

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17. United Nations, U.N. General Assembly resolution 1665 (XVI) *Prevention of the wider dissemination of nuclear weapons*. <http://www.un.org/documents/ga/res/16/ares16.htm>.

18. Simpson, Nielsen, and Swinerd, *NPT Briefing Book*, 3. Of course not everyone saw proliferation as an unmitigated risk. Henry Kissinger, National Security Advisor to president Nixon believed that allowing allies, such as Germany or Japan, to obtain nuclear weapons would benefit U.S. interests by removing the need for a U.S. nuclear umbrella over these states. Reed and Stillman, *Nuclear Express*, 121.



By the mid-1960s, informal talks between the U.S. and the U.S.S.R. revealed that a nonproliferation treaty was within reach. In 1965, the Americans submitted their first public draft of a nonproliferation treaty to the U.N.-established Eighteen-Nation Conference on Disarmament (ENDC) in Geneva, the principal forum for disarmament negotiations.<sup>19</sup> This was soon followed by a Soviet counter-proposal. Both drafts provided for a treaty of unlimited duration and consisted of only two articles focused solely on nonproliferation. Article I obligated nuclear states not to disseminate these weapons in any way, while Article II committed non-nuclear states not to acquire such weapons. The major point of difference between these early drafts lay in their treatment of possible nuclear weapons sharing arrangements such as those being contemplated at the time within the North Atlantic Treaty Organization (NATO).<sup>20</sup>

The issue of nuclear weapons sharing had been a major stumbling block to U.S.-Soviet co-operation on nonproliferation for several years.<sup>21</sup> Facing a numerically superior adversary in the Europe, NATO's strategy relied on the threat of U.S. nuclear weapons to deter a Soviet conventional attack. However, growing Soviet capacity to target the American homeland with nuclear weapons raised doubts in European capitals as to credibility of the U.S. commitment. Would an American president really risk nuclear war to save Bonn or Brussels? The French had early on concluded in the negative, and acquired an independent deterrent by 1960. Some feared that West Germany, and possibly Italy, would follow suit.

One solution to the issue of alliance credibility was to establish a 'multilateral force' (MLF) of ships and submarines controlled by several NATO

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19. The ENDC was co-chaired by the U.S. and the U.S.S.R. Other members were U.S. allies (U.K., Canada, France, and Italy) Soviet allies (Czechoslovakia, Poland, Romania, Bulgaria) and 'non-aligned' states (Brazil, Burma, Egypt, Ethiopia, India, Mexico, Nigeria, Sweden).

20. George Bunn and Ronald Timerbaev, *Nuclear Disarmament: How much have the five nuclear powers promised in the Non-proliferation treaty* (The Lawyers Alliance for World Security, the Committee for National Security and the Washington Council on Non-Proliferation, 1994), 16.

21. George Bunn and John B. Rhinelander, "Looking Back: The Nuclear Nonproliferation Treaty Then and Now," *Arms Control Today* (July/August 2008): 2.

countries but equipped with U.S. nuclear weapons. Although likely to assuage allied fears, this option did not square with the basic concept of nonproliferation, which the Soviets were quick to point out at the Geneva negotiating table. Having paid a heavy price at the hands of Nazi Germany, the U.S.S.R. was especially opposed to the notion of even limited West German control over nuclear weapons.<sup>22</sup>

The early drafts were also challenged by a number of ENDC members who objected to the unequal distribution of rights and responsibilities in the proposed treaty. In essence, the superpowers were asking the non-nuclear states to forever foreswear the right to acquire nuclear weapons, while themselves assuming no obligation to reduce or eliminate their arsenals, which by 1965 had grown to some 38,000.<sup>23</sup> Italy submitted a counter-proposal calling for non-nuclear states to submit to limited-term, unilateral renunciations of acquisition of nuclear weapons, and to make the renewal of such renunciations contingent on progress “toward international agreements to prevent the spread of nuclear weapons, or to halt the nuclear arms race, and to reduce nuclear arsenals”.<sup>24</sup> In addition to the Italian proposal, the ‘Non-Aligned Eight’, a group eight states at the ENDC not belonging to either of the superpower blocks, submitted a joint memorandum calling for any nonproliferation treaty to be “coupled with or followed by tangible steps” to halt the arms race and eliminate nuclear weapons.<sup>25</sup> In November 1965 the U.N. General Assembly weighed in by adopting a resolution that laid out a conceptual framework for negotiations on a nonproliferation treaty. The resolution stated the treaty should:

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22. Bunn and Rhinelander, “Looking Back,” 2.

23. Norris, Robert S. and Hans M. Kristensen, “Nuclear Notebook: Global Nuclear Stockpiles: 1945-2006,” *Bulletin of the Atomic Scientists* 62, no. 4 (July/August 2006), <http://thebulletin.metapress.com/content/c4120650912x74k7/fulltext.pdf>.

24. Bunn and Timerbaev, *Nuclear Disarmament*, 16.

25. *Ibid.* The Non-Aligned Eight consisted of Brazil, Burma, Egypt, Ethiopia, India, Mexico, Nigeria, and Sweden.

- be void of any loopholes which might permit nuclear or non-nuclear weapon states to proliferate nuclear weapons in any form (a reference to the MLF proposal);
- embody an acceptable balance between the mutual responsibilities and obligations of the nuclear and non-nuclear weapon states;
- be a step towards the achievement of general and complete disarmament (GCD), and more particularly nuclear disarmament; and
- have acceptable and workable provisions to ensure its effectiveness.<sup>26</sup>

Over the next two years negotiations at the ENDC gained momentum. By late 1967 the Soviets and the Americans had resolved their key differences, including the MLF issue, on which the Americans relented,<sup>27</sup> and were able to submit identical drafts of the treaty for the ENDC's consideration.<sup>28</sup>

However, despite resolving their own differences, the superpowers were still forced to accede to demands from the remaining ENDC members on issues relating to disarmament and cooperation on the peaceful uses of nuclear energy. The non-aligned eight, particularly, made it known that they would not sign a treaty that did not include significant concessions in those areas,<sup>29</sup> but it is likely that pressure from U.S. allies had just as much to do in forcing the superpowers to compromise.<sup>30</sup> Most significantly, the eventual compromise include the addition of:

- Article IV, obliging all parties to facilitate the spread of peaceful uses of nuclear energy to the fullest extent possible;

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26. Simpson, Nielsen, and Swinerd, *NPT Briefing Book*, 5.

27. Although more limited 'nuclear sharing' arrangements were in fact adopted within the NATO alliance, allowing special U.S. units stationed on NATO bases in Europe to release nuclear weapons to NATO allies under certain contingencies.

28. Bunn and Timerbaev, *Nuclear Disarmament*, 18.

29. Dimitris Bourantonis, "The Negotiation of the Non-Proliferation Treaty, 1965-1968: A Note," *The International History Review* 19, no. 2 (May, 1997): 350-57. See also Bunn and Timerbaev, *Nuclear Disarmament*.

30. Emily Bailey et al., *Programme for Promoting Nuclear Non-Proliferation (PPNN) Briefing Book, Volume I: The Evolution of the Nuclear Non-Proliferation Regime* (Southampton, U.K.: The Mountbatten Centre for International Studies, 2000), 19.

- Article VI, committing the nuclear-weapon states to pursue good faith negotiations on arresting the nuclear arms race, effecting nuclear disarmament and GCD;
- Article VIII, providing for review conferences every 5 years to assess progress under the treaty;
- Article X, allowing for withdrawal from the treaty under “extraordinary circumstances” and limiting the treaty to an initial term of 25 years.<sup>31</sup>

The resulting document reflected what is commonly referred to as the ‘grand bargain’ of the NPT: nonproliferation in return for access to nuclear technology and eventual nuclear disarmament. Nuclear-weapon states (NWSs) defined by the treaty as those that successfully manufactured and tested a nuclear device prior to January 1, 1967 (U.S., U.S.S.R/Russia, U.K., France, and China) agreed not to disseminate nuclear weapons (Art. I), to, together with others states, facilitate the spread of nuclear technology for peaceful uses (Art. IV), and to move towards eventual nuclear, as well as general and complete, disarmament (Art. VI). For their part, the non-nuclear weapon states (NNWSs)<sup>32</sup> agreed to forego nuclear weapons (Art. II) and to accept appropriate IAEA safeguards on their nuclear programs to verify compliance (Art. III). The NPT passed a vote by the UN General Assembly in March 1968, and was opened for signature later that year. It came into effect in 1970 with nearly 100 signatories. Today, the NPT is in force in 189 states, making it one of most universally adhered to treaties of all time.<sup>33</sup>

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31. For a full text of the NPT see *Treaty on the Non-Proliferation of Nuclear Weapons*, (NPT), United Nations Office For Disarmament Affairs (UNODA), <http://www.un.org/disarmament/WMD/Nuclear/NPT.shtml>. Or see the Appendix to this paper.

32. From here on, the terms NWSs and NNWSs will be used to the nuclear-weapon states and non-nuclear weapon states as defined by the NPT. To refer to all states that possess nuclear weapons, even those outside of the NPT regime (Israel, India, Pakistan, and North Korea) I will use the broader terms ‘nuclear-armed states’, or ‘nuclear-powers.’

33. United Nations Office for Disarmament Affairs (UNODA) website, UNODA Treaties Database, <http://unhq-appspub-01.un.org/UNODA/TreatyStatus.nsf>. Only Israel, India, Pakistan, and North Korea remain outside of the treaty. North Korea withdrew from the NPT in 2003.

### **The NPT Review Conferences (1975-2010)**

Article VIII of the NPT called for an initial conference of the parties to be held five years after the treaty's coming into force, "in order to review the operation of [the] Treaty with a view to assuring that the purposes of the Preamble and the provisions of the Treaty are being realised."<sup>34</sup> The Article also provided for subsequent review conferences to be held at five year intervals at the behest of the majority of the parties. These review conferences have become institutionalized and are now an integral part of the regime. In fact, given the absence of an NPT organization or secretariat, the review conferences and their preparatory committees offer the sole venue for all the parties to jointly discuss matters pertaining to the regime.

The review conferences have tended to be somewhat conflictual as evidenced by the fact that, out of the eight conferences held thus far, only four (1975, 1985, 2000, 2010) have been able to produce a substantive final declaration. Some observers maintain that even the first two of these four did not represent true consensus as in both cases a large number of states insisted on adding their own provisos as supplements to the final 'consensus' documents.

This dynamic results from sharp differences of priorities between the NWSs and the NNWSs. From early on, the NNWSs, and particularly the over-a-hundred-strong non-aligned block within it, have tended to use the conferences to pressure the NWSs into action on stopping the arms race "at an early date" and on disarmament, as per the NPT's Article VI.<sup>35</sup> The NWSs on the other hand have tended to downplay disarmament and emphasize nonproliferation. From the NNWSs' perspective the emphasis on disarmament is natural, as the review conferences and the original 25-year life of the treaty were negotiated precisely

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34. NPT Art. VIII(3). See Appendix.

35. Simpson, Nielsen, and Swinerd, *NPT Briefing Book*, 11. Especially during the early review conferences, discussions used to focus on the need to conclude a CTBT. Although a CTBT is not explicitly mentioned by Article VI of the NPT, it has long been believed to be a key first step towards disarmament, and an implicit part of the NPT bargain. Bunn and Timerbaev, *Nuclear Disarmament*.

to provide “something akin to enforcement” of the NWSs’ Art. VI obligations.<sup>36</sup> Having fulfilled their part of the bargain by agreeing not to pursue nuclear weapons and to accept IAEA safeguards on their nuclear facilities the NNWSs eagerly demand reciprocity.

Other salient topics of discussion at the review conferences have included:

- The tension between the right to the peaceful uses of nuclear energy and attempts to limit the spread of proliferation-sensitive nuclear fuel cycle technologies.<sup>37</sup>
- The need to make membership in the regime universal.<sup>38</sup>
- And the need for more robust security assurances for the NNWSs.<sup>39</sup>

The 1995 review conference was a major test for the NPT because, falling 25 years after the treaty came into force, it was to determine whether the NPT should lapse or be extended for an additional period. While some non-aligned states lobbied for another time-limited extension in order to keep the pressure on the NWSs, most were won over by intense lobbying by Western states to extend

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36. Bunn and Timerbaev, *Nuclear Disarmament*, 19.

37. Starting in the mid-1970s, technology supplier states began to restrict the export of uranium enrichment and spent-fuel reprocessing technologies. These technologies are considered ‘sensitive’ as they enable the production of fissile materials that could be used as not only as reactor fuel but also in nuclear weapons. Supplier states justified these restrictions by invoking their Article I obligation not to “in any way [...] assist, encourage, or induce any non-nuclear-weapon State to manufacture or otherwise acquire nuclear weapons”. Many developing NNWSs, however, perceive such controls as incompatible with the Article IV obligation for all states to “undertake to facilitate [...] the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy [...] with due consideration for the needs of the developing areas of the world.” See the Appendix to this paper for the full text of the NPT.

38. This issue was particularly important to the Arab states as Israel remains outside the NPT. Israel is widely believed to have acquired nuclear weapons sometime in the latter part of the 1960s, but neither confirms nor denies this publically as part of a strategy of ‘strategic ambiguity’. India tested a nuclear device in 1974, and Pakistan begun its own weapons program around that time. NWSs France and China did not join the regime until 1992, and states of proliferation concern Argentina and Brazil not until 1995 and 1998 respectively.

39. Negative security assurances are assurances by the NWSs against nuclear attack on NNWSs. Positive assurances are assurances by NWSs to defend the NNWSs in case of nuclear attack. Non-aligned states argue that these assurances were an implicit part of the NPT bargain, a *quid pro quo* for their nuclear weapons. So far China is the only NWS that unequivocally declares its commitment not to use nuclear weapons against a NNWSs. Most other NWSs place significant caveats on their negative security assurances.

the treaty indefinitely. In return, the conference adopted a set of “principles and objectives” necessary for the full realization of the treaty. Among them were measures considered “important” to the “full realization and effective implementation of article VI.” These included the early conclusion of negotiations on the CTBT, the FMCT, and the “determined pursuit by the nuclear-weapon States of systematic and progressive efforts to reduce nuclear weapons globally, with the ultimate goals of elimination of those weapons.”<sup>40</sup> The NWSs also promised to sponsor a UN resolution calling for the establishment of a nuclear weapon-free zone in the Middle East.<sup>41</sup>

These disarmament measures were further elaborated by the 2000 review conference through a series of “practical steps for the systematic and progressive efforts to implement article VI” of the NPT. These came to be referred to as the ‘13-steps’, and included:

- An unequivocal undertaking by the NWSs to accomplish the total elimination of their nuclear arsenals leading to nuclear disarmament;
- The entry into force of the CTBT at an early date;<sup>42</sup>
- The negotiation of a verifiable Fissile Material Cut-off Treaty (FMCT);
- The need to apply the principle of irreversibility to nuclear disarmament;<sup>43</sup>

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40. Scott D. Sagan, “Good Faith and Nuclear Disarmament Negotiations,” in *Abolishing Nuclear Weapons: A Debate*, eds. George Perkovich and James A. Acton, 205-6 (Washington D.C.: Carnegie Endowment for International Peace, 2009).

41. Emily Bailey et al., *PPNN Briefing Book*, 19.

42. A CTBT had been negotiated in 1996, but could not enter into force unless ratified by a number of specifically named states, including nuclear powers like the U.S., China, North Korea, Pakistan, India, and Israel ratify it. France, the U.K. including 149 others already ratified the treaty. See [www.ctbto.org/](http://www.ctbto.org/).

43. Arms control treaties, such as the recently negotiated New START, set limits on deployed weapons. Weapons taken out of deployment are not necessarily destroyed; they can be put in reserve and re-deployed at a later time relatively easily. Actually dismantling the weapons into their components is a less-easily reversible form of disarmament. Destroying weapons components, delivery vehicles, and the infrastructure needed to make new weapons, are less easily reversible still.

- Steps by the NWSs to reduce their arsenals unilaterally, diminish the role of nuclear weapons in their security policies, and engage “as soon as appropriate” in a process leading to their total elimination; and
- A reaffirmation by the NWSs that the ultimate objective of the efforts of States in the disarmament process is GCD under effective international control.<sup>44</sup>

Unfortunately the progress represented by the 1995 “principles and objectives” and the 2000 “13 steps” was substantially undone by the George W. Bush administration. That administration brought into prominent positions a number of neo-conservative thinkers determined to use America’s privileged position as the sole remaining superpower to establish a permanent, benign American hegemony in world affairs.<sup>45</sup> This wildly ambitious strategy was based on ensuring American military superiority so vast that any potential ‘peer-competitor’ would be dissuaded from even entering the race. It also meant that the U.S. would need to keep its nuclear weapons in perpetuity (although this was never publically admitted, and the administration maintained its rhetorical commitment to nuclear disarmament at an unspecified time, beyond the visible horizon).

The U.S. thus announced that it did not consider itself bound by the 13 Steps it had previously agreed to, and that it was already in full compliance with its disarmament obligations. It also withdrew from the anti-ballistic missile (ABM) treaty with Russia to pursue a destabilizing national missile defence program, in the process scuttling the important nuclear arms reduction treaty (START II), and sought to develop new, smaller nuclear weapons for use against the types of targets previously reserved for conventional munitions. The administration also

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44. 2000 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, *Final Document, Volume 1* (New York, 2000), 14.

45. For a seminal neo-conservative formulation see Charles Krauthammer, “The Unipolar Moment”, *Foreign Affairs* 70, no. 1 America and the World (1990/91). For a discussion of the pursuit of strategic primacy by the U.S. see Douglas A. Ross and Christopher N. B. Ross, “From ‘Neo-Isolationism’ to ‘Imperial Liberalism’: ‘Grand Strategy Options’ in the American International Security Debate and the Implications for Canada,” in *The Dilemmas of American Strategic Primacy: Implications for the Future of Canadian-American Cooperation*, eds. David S. McDonough and Douglas A. Ross (Canadian-American Strategic Review Joint Workshop, 2005).



placed a stronger emphasis on counter-proliferation, or the rolling back by proliferation threats through military force. That approach was illustrated most clearly when Iraq was invaded on little more than a suspicion that it *might* in the future reconstitute its nuclear weapons program, or pursue biological weapons.

In the context of new, significant challenges to the regime – like the discovery in 2002 of Iran’s clandestine nuclear infrastructure, North Korea’s withdrawal from the NPT in 2003, and the discovery in 2004 of the full extent of Pakistani’s nuclear scientist’s A. Q. Khan’s inter-state nuclear black market network – as well as the longer standing issues of the continuing weakness of IAEA safeguards, and the need for a new approach to the nuclear fuel-cycle – the American challenge to the nonproliferation regime’s grand bargain led many observers to conclude the regime was in serious crisis, if not on the “verge of collapse”.<sup>46</sup>

Accordingly, the 2005 review conference is widely regarded to have been a fiasco. Delegates could not even agree on the agenda during the first three weeks of the month-long conference and, when they did, the differences in positions proved too great to bridge. As one observer put it, U.S. behaviour at the conference had “made it obvious that it would prefer no agreement to one that reinforced the 2000 commitments,”<sup>47</sup> and the conference ended in an atmosphere of disillusionment and acrimony.

The problems facing the regime since 2005 have not diminished. North Korea has since conducted two nuclear weapon tests and is now believed to possess an arsenal of several nuclear weapons;<sup>48</sup> Iran continues to pursue uranium enrichment in what appears to be an attempt to at least acquire the *capability* to produce nuclear weapons in short order, even if does not at the moment seek nuclear weapons themselves; Syria is believed to have been

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46. Deepti Choubey, *Restoring the NPT: Essential Steps for 2010*, 7.

47. Rebecca Johnson, “Politics and Protection: Why the 2005 NPT Review Conference Failed,” *Disarmament Diplomacy* 80 (Autumn 2005), [www.acronym.org.uk/dd/dd80/80npt.htm](http://www.acronym.org.uk/dd/dd80/80npt.htm).

48. Although both tests have been relative duds, achieving only very low nuclear yields.

building a clandestine nuclear reactor, with North Korean help, before that facility was destroyed by an Israeli air raid in 2007; and the number of states seeking access to nuclear power has risen dramatically.

Perhaps the only, though important, bright spot in recent years has been the Obama administration's resolve to reconstitute confidence in the multilateral regime. During an April 2009 speech in Prague, Obama recommitted the U.S. to the unequivocal (albeit gradual) pursuit of nuclear disarmament, and to concrete actions towards that end. Obama committed the U.S. to the prompt ratification of the CTBT, the negotiation of a verifiable FMCT, and the resumption of the START nuclear arms reductions process with Russia. This change in policy has certainly led to improved relations with other NPT members, although some scepticism remains about U.S. intentions and whether Obama can deliver on his promises.

In light of the renewed American engagement, the May 2010 NPT review conference has met with moderate success. While it did not resolve any of the significant issues facing the regime, that was never the appropriate metric. Because the conference works by consensus, outcomes tend to converge around the lowest common denominator. What the conference did accomplish, was to afford states an opportunity to recommit to the NPT's grand bargain and to make modest gains in certain areas. For example, the conference's final document for the first time included a forward-looking 'action plan' for all three pillars of the regime. While many of the actions were admittedly quite vague, the concept of the action plan was itself a useful innovation. Of note was the conference's strengthened language on the disarmament obligation. For the first time, the conference explicitly affirmed the NWSs' obligation under Article VI to "accomplish," not just to "pursue" as per the article's actual wording, "the total elimination of their nuclear arsenals." The conference also re-confirmed the "continuing validity" of the 13 Steps, and called upon the NWSs to "accelerate

concrete progress” toward them.<sup>49</sup> Parties also agreed to undertake “all necessary measures aimed at its prompt implementation” of the 1995 resolution on the establishment of a zone in the Middle East free of weapons of mass destruction. Significantly, the NWSs agreed to convene a conference of regional states on this last matter in 2012.

These positive steps have led to the general perception that after a near-decade of backsliding and atrophy, the NPT-based regime is finally “back on track.”<sup>50</sup> While this paper will show that this current ‘track’ is by no means destined for success, the earlier one was certain to end in derailment, and the switch happened just in time.

### **The Broader Regime**

Much of the preceding discussion focused on the NPT itself and at this point it is beneficial to situate that discussion in the context of the broader regime.<sup>51</sup> Many of institutions and agreements that make up the nuclear nonproliferation and disarmament regime would not have formed, or would have

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49. 2010 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, *Final Document*, Vol. 1, (New York, 2010), 19-24. Other notable achievements included: NWSs being called upon to “rapidly” move towards reducing their nuclear stockpiles, and to diminish the role of nuclear weapons in their security doctrines; an agreement for immediate discussions at the Conference on Disarmament about the possibility of providing the NNWSs with enhanced security assurances; an undertaking by all NWSs to ratify the CTBT “with all expediency”; and the urgent bringing into conclusion of a non-discriminatory and verifiable FMCT.

50. See Alison Kelly, “NPT: Back on Track,” *Arms Control Today* (July/August 2010), [http://www.armscontrol.org/act/2010\\_07-08/kelly](http://www.armscontrol.org/act/2010_07-08/kelly); and Daryl G. Kimball, “ACA Welcomes NPT Review Consensus,” Arms Control Association website, May 28 2010, <http://www.armscontrol.org/pressroom/NPTReviewConference2010>.

51. Stephen Krasner’s 1983 definition of an international regime is still the most widely used today. It holds that “Regimes can be defined as sets of implicit or explicit principles, norms, rules, and decision-making procedures around which actor expectations converge in a given area of international relations. Principles are beliefs of fact, causation, and rectitude. Norms are standards of behavior defined in terms of rights and obligations. Rules are specific prescriptions or proscriptions for action. Decision-making procedures are prevailing practices for making and implementing collective choice.” Stephen D. Krasner, “Structural Causes and Regime Consequence: Regimes as Intervening Variables,” in Stephen D. Krasner ed. *International Regimes*, Ithaca: Cornell University Press, 1983, 1. I draw upon, but modify, Krasner’s definition and define a regime as a system of institutions, agreements, and understandings that aim to govern behaviour in a specific area of international relations.

formed very differently, without the framework provided by the NPT. Other components preceded the NPT or evolved semi-independently of it.

As mentioned, the IAEA was originally created in 1957 to promote the peaceful uses of nuclear power. IAEA member states are not required to accept safeguards on portions of their nuclear programs developed without IAEA assistance, nor are they obliged to forsake nuclear weapons. In practice however, all IAEA members are also parties to the NPT, and required by Article III to accept safeguards on their nuclear activities for the purpose of verifying compliance with their non-proliferation obligations. Since 1997, the IAEA has been encouraging members to accept a voluntary 'Additional Protocol' to the standard safeguards agreements to give the Agency broader powers to detect covert nuclear activities.<sup>52</sup>

There are also two international bodies that aim to regulate nuclear trade. The first of these is the Zangger Committee, an independent group of 37 nuclear supplier states that interprets which export items trigger the requirement for IAEA safeguards under Art. III of the NPT. The second is the Nuclear Suppliers Group (NSG), which consists of 46 major nuclear supplier states and is aimed at developing common guidelines for the export of nuclear and dual-use items. The NSG was set-up in response to India's 1974 'peaceful nuclear explosion', which had been made possible in part by a research reactor gifted by Canada, and civilian nuclear assistance from other states.

The regime also consists of a number of measures aimed at the prevention of theft of nuclear materials, and the prevention of nuclear terrorism. These include:

- The Convention on the Physical Protection of Nuclear Material.
- The G-8 Global Partnership Against the Spread of Weapons and Materials of Mass Destruction.
- Security Council Resolution 1540, that aims to strengthen national nuclear export control regimes.

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52. Chapter 2 examines the IAEA's role in more detail.

- The Global Initiative to Combat Nuclear Terrorism.
- International Nuclear Material Protection and Cooperation Program.
- The Global Threat Reduction Initiative.
- The joint Communiqué of the 2010 Nuclear Security Summit.
- International Convention for the Suppression of Acts of Nuclear Terrorism.
- The Proliferation Security Initiative.

The regime also includes a number of aforementioned Nuclear Weapon-Free Zones (NWFZs), where the stationing or transit of nuclear weapons is prohibited. Finally, the regime contains arms control agreements such as the Partial Test Ban Treaty (PTBT) of 1963, which prohibits testing in the atmosphere, under water, and in outer space; the New Strategic Arms Reduction Treaty (New START); and the Intermediate-Range Nuclear Forces (INF) Treaty requiring the elimination of all intermediate range nuclear weapons. Other agreements like START I and the 2002 Moscow Treaty (SORT) have now expired or been superseded.

## CHAPTER 1: NONPROLIFERATION

Article I of the NPT commits all NWSs:

not to transfer to any recipient whatsoever nuclear weapons or other nuclear explosive devices [...] and not in any way to assist, encourage, or induce any non-nuclear-weapon State to manufacture or otherwise acquire nuclear weapons or other nuclear explosive devices.

Similarly, Article II commits the NNWSs:

not to receive the transfer from any transferor whatsoever of nuclear weapons or other nuclear explosive devices or of control over such weapons or explosive devices directly, or indirectly; not to manufacture or otherwise acquire nuclear weapons or other nuclear explosive devices; and not to seek or receive any assistance in the manufacture of nuclear weapons or other nuclear explosive devices.<sup>53</sup>

While the spread of nuclear weapons has historically been slower than many had feared, it has also been steady, holding at around one new nuclear-armed state per decade since 1970. Because proliferation by one state tends to create a new nuclear threat for others, proliferation tends to beget more proliferation.<sup>54</sup> It is not hard to see that such a dynamic cannot continue indefinitely before the regime reaches a tipping point where proliferation becomes the norm.<sup>55</sup>

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53. See Appendix.

54. George Shultz coined this expression. Quoted in Scott D. Sagan, "Why Do States Build Nuclear Weapons? Three Models in Search of a Bomb," *International Security* 21, no. 3 (Winter 1996/97): 57.

55. On nuclear tipping points see generally: Kurt Campbell, Robert Einhorn, and Mitchell Reiss, eds., *The Nuclear Tipping Point: Why States Reconsider their Nuclear Choices*, (Washington, D.C.: Brookings Institution, 2004); and James A. Russell, "A Tipping Point Realized? Nuclear Proliferation in the Persian Gulf and Middle East," *Contemporary Security Policy* 29, no. 3 (2008); Kurt M. Campbell, "Nuclear Proliferation Beyond Rogues," *Washington Quarterly* 26, no. 1 (Winter 2002/03); Joseph Nye, "Maintaining a Nonproliferation Regime," *International Organization* 35, no. 1 (Winter 1981): 36-7.

The two most immediate proliferation challenges facing the regime – North Korea’s recent entry into the nuclear club, and Iran’s continuing non-compliance with the full extent of its NPT obligations – must be seen in this light. What is most concerning is not the incremental danger posed by a North Korean, or possibly, later on, a Iranian nuclear arsenal – although that danger is real and sufficiently worrying in its own right – but the threat that proliferation in those countries will spill over to neighbouring countries. The prospects of this occurring are discussed below. Fortunately, the analysis finds some reason for cautious optimism in both cases.

While the immediate, localized crises in North Korea and Iran have received the most media and scholarly attention, there has been very little discussion about two broader, systemic threats looming on the horizon: intensified great power conflict resulting from the relative rise of Asia and Western decline, and; conflict resulting from severe climate change. Neither of these threats is certain to materialize, but both have the potential to greatly deteriorate the global security environment, thus increasing demand for nuclear weapons while reducing capacity for cooperation to halt their spread.

Before turning to these issues, however, the chapter begins by examining the theoretical debates underpinning discussions about nuclear proliferation. The two sections immediately below thus focus on the relative dangers of the spread of nuclear weapons, and on what motivates states to go nuclear. Readers already familiar with these debates may wish to go straight to the sections on North Korea, Iran, or the future security environment.

### **Does Proliferation Matter?**

There is a well established current of strategic thought that sees nuclear weapons as a *stabilizing* force in inter-state relations. Relying on rational deterrence theory<sup>56</sup> these ‘nuclear optimists’ argue that nuclear weapons’ great

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56. See a symposium on rational deterrence theory in *World Politics*, Vol. 41, no. 2. (1989), 143-247; or Patrick M. Morgan, *Deterrence Now* (Cambridge, United Kingdom: Cambridge University Press, 2003), 331.

destructive power makes deterrence easy and conflict unlikely. As Bernard Brodie, a pioneer of nuclear strategy, wrote in 1946:

If the aggressor state must fear retaliation [in kind, with atomic weapons] it will know that even if it is the victor it will suffer a degree of physical destruction incomparably greater than that suffered by any defeated nation of history [...] Under those circumstances no victory, even if guaranteed in advance—which it never is—would be worth the price.

Brodie goes on to say that given that adequate arrangements for retaliation are made in states possessing atomic weapons “the bomb cannot but prove in the net a powerful inhibition on aggression”.<sup>57</sup>

Today’s optimists agree with Brodie’s early assessment. Kenneth Waltz, the father of structural realism and an arch-optimist, writes that “it is hard not to be aware of how much damage a small number of [nuclear] warheads can do”. States will not engage in war with one another because “possible losses in war overwhelm possible gains [...] Where nuclear weapons threaten to make the cost of wars immense, who will dare start them?”<sup>58</sup> For Waltz, and many other optimists, this logic makes nuclear deterrence virtually “indestructible.”<sup>59</sup> Although Waltz stops short of explicitly advocating nuclear proliferation, he is convinced that the gradual spread of nuclear weapons “is more to be welcomed than feared.”<sup>60</sup>

The other camp in this debate, that of the ‘nuclear pessimists,’ retorts that the optimists make unsubstantiated assumptions about human rationality and

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57. Bernard Brodie and Frederick Sherwood Dunn, eds., *The Absolute Weapon: Atomic Power and World Order*, 2nd ed. (Freeport, N.Y.: Books for Libraries Press, 1972), 74-5.

58. Kenneth N. Waltz, “More May be Better” in *The Spread of Nuclear Weapons: A Debate*, eds. Scott D. Sagan and Kenneth N. Waltz (New York and London: W. W. Norton & Company, 1995), 45.

59. Sagan and Waltz, *The Spread of Nuclear Weapons: A Debate*, 30.

60. Waltz, *Spread of Nuclear Weapons*, 45. Some others go even further. Bruce Bueno de Mesquita and William Riker’s model of state interactions leads them to predict that the chance of a nuclear conflict “decreases to zero” when both actors have nuclear weapons. This makes Bueno de Mesquita and Riker argue for selective proliferation of to remedy what they perceive as destabilizing nuclear asymmetries in certain parts of the world. “An Assessment of the Merits of Selective Nuclear Proliferation,” *Journal of Conflict Resolution* 26, no. 2 (1982): 283.



that, in reality, a number of factors such as well-entrenched psychological biases, imperfect information, and faulty human institutions routinely conspire to create the possibility of deterrence failure. So far, say the pessimists, we've been lucky, but it is not reasonable to expect our good fortune to last forever.<sup>61</sup>

Psychological research reveals that built-in psychological biases make us underestimate risks, be overconfident about the prospects of success, and tend to see ambiguous or even defensive actions by perceived adversaries as unambiguously hostile, while misunderstanding how our own actions may appear to others. Militaries and other bureaucratic establishments may pursue their narrowly-defined institutional interests to the detriment of force survivability or command and control arrangements thus undermining deterrence. Finally states may choose to adopt nuclear postures, such as the launch-on-warning or 'hair-trigger' arrangement still in place in the U.S. and Russia, or pursue destabilizing doctrines like 'escalation dominance' and related nuclear war-fighting capabilities and postures.

A few examples illustrate the pessimist case. During the 1962 Cuban missile crisis, a U.S. radar operator mistakenly ran a training tape simulating an incoming missile from Cuba, fooling on-duty officers into believing the attack was genuine and into notifying NORAD. Only *after* the expected detonation had failed to occur did it become obvious that the alarm had been a false one. Furthermore, the incident had occurred while powerful voices within the U.S. military were urging the president to order preventive strikes against Cuba. No one at the time was yet aware that nuclear-tipped missiles had already been assembled on the island. Would Soviet troops have used these missiles in case of an American

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61. Some important works in the optimism/pessimism debate include the classic study by Scott D. Sagan and Kenneth N. Waltz, eds., *The Spread of Nuclear Weapons: A Debate* (New York: W. W. Norton & Company, 1995); Jeffrey W. Knopf, "Recasting the Proliferation Optimism-Pessimism Debate," *Security Studies* 12, no. 1 (2002): 41-96; Devin T. Hagerty, *The Consequences of Nuclear Proliferation: Lessons from South Asia* (Cambridge, Massachusetts: The MIT Press, 1998); David J. Karl, "Proliferation Pessimism and Emerging Nuclear Powers," *International Security* 21, no. 3 (1996); Peter D. Feaver, Scott D. Sagan and David J. Karl, "Proliferation Pessimism and Emerging Nuclear Powers," *International Security* 22, no. 2 (1997).

attack, as Fidel Castro reportedly recommended to Nikita Khrushchev?<sup>62</sup> In a fantastic show of recklessness Curtis LeMay, commander of the U.S. Strategic Air Command had reportedly ordered his nuclear-armed bombers “to fly well past their fail-safe points during the crisis in an attempt to draw (presumably nuclear-armed) air defence fire from Soviet territory so that a full-scale US “retaliatory” nuclear attack might then be launched.”<sup>63</sup> At the end of the crisis, then-Secretary of Defence Robert McNamara concluded that it was “luck,” not nuclear deterrence, that saved the world from nuclear annihilation in October 1962.<sup>64</sup>

Following the September 11<sup>th</sup> attacks, optimists were forced to re-evaluate their position in light of the newly illustrated possibility of catastrophic terrorism. Waltz now acknowledges that deterrence may not work against radical terrorist groups that embrace death (their own, as well as that of thousands of others), and have no ‘return address’ to retaliate against. He nevertheless continues to present the risks of nuclear proliferation as negligible arguing, somewhat less than convincingly, that “one can hardly believe that nuclear weapons spreading to another country or two every now and then adds much to the chances that terrorists will be able to buy or steal nuclear materials. Plentiful sources are already available [in the former Soviet Union and perhaps Pakistan].<sup>65</sup> Waltz seems to forget that both these countries were once themselves NNWSs.

Nuclear pessimists further point out a number of reasons why new nuclear weapons states might be, at least initially at higher risk of nuclear weapon use. These factors include limited resources; limited experience; ideology; and inauspicious geopolitical circumstances. A common worry of proliferation

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62. Remarks made by Robert McNamara in *The Fog of War: Eleven Lessons From the Life of Robert S. McNamara*, directed by Errol Morris, (Sony Pictures Classics, 2003).

63. Remarks by former US Ambassador Thomas Graham, University of British Columbia, 20 April 2005, reproduced in Douglas A. Ross, “Nuclear Weapons and American Grand Strategy: Essential Pillar or Terminal Liability?” *International Journal* (Autumn 2008): 858.

64. Remarks by Robert McNamara in *The Fog of War* (2003).

65. Kenneth N. Waltz, “Waltz Responds to Sagan,” in *The Spread of Nuclear Weapons: A Debate Renewed*, eds. Scott D. Sagan and Kenneth N. Waltz, 130 (New York and London: W. W. Norton & Company, 2003).

pessimists is that new nuclear states will be too poor and technologically backward to produce nuclear forces that are safe, secure, and survivable. A striking illustration of this potential problem comes from a IAEA weapons inspector who commented that an Iraqi bomb design uncovered in that country during the 1990s would have produced a weapon so unstable that it would have continually been “on the verge of going off.” An IAEA inspector familiar with the design commented, perhaps only half tongue-in-cheek, that he “wouldn’t want to be around if [the device] fell off the edge of this desk”.<sup>66</sup>

Material incapacity of post-Soviet Russia was also the key factor driving concerns over ‘loose nukes’ in the 1990s and, to a lesser extent, still today. Bruce Blair recalls the “state of the Russian nuclear establishment during the bleak decade of the 1990s”:

Nuclear safeguards were malfunctioning for want of spare parts and maintenance. The military was disintegrating, and nuclear scientists were struggling to feed their families. Nuclear security guards were desperately underpaid. At one point, about 80 percent of the families of the Russian strategic rocket troops were living below the official poverty line. For several years, everyone I met in the nuclear forces in Moscow was moonlighting driving a taxi or performing some menial job on one shift, and on the next shift standing nuclear duties or manning early warning sites all blinky-eyed from lack of sleep.

Russia had just undergone a political and economic collapse, but retained thousands of weapons, and a sprawling nuclear weapons complex. Its experience will always be unique because of the sheer size of the problem, but it is not hard to imagine similar concerns arising in developing countries (Pakistan comes to mind) where poverty, corruption, and instability are endemic.

Less affluent states may also be unable to afford or develop advanced security features such as permissive action links and other control features that

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66. Sagan and Waltz, *The Spread of Nuclear Weapons*, 81.

would make weapons inoperable in the wrong hands.<sup>67</sup> Furthermore, scholars have raised concerns about the ability of materially challenged proliferators to construct survivable nuclear forces and the negative effects this might have on deterrence stability.<sup>68</sup> Peter Feaver, for example, points out that financial constraints may force nuclear states to adopt risky command and control postures:

one robust and multi-tiered solution to the threat of decapitation is to have highly survivable nuclear delivery systems, hardened, redundant communications between the national leaders and the nuclear arsenal [...] and reliable plans to preserve the national leadership in even the most dire crisis. Such a solution, however, is very expensive [...] A new proliferator, hard pressed by regional enemies who pose a credible threat of decapitation, would be likely to adopt a cheaper command and control solution: dispersal and delegation of the authority and ability to use nuclear weapons. But this solution increases the likelihood of an unwanted nuclear use; in a crisis, the official lines of authority could blur and an aggressive junior commander could act precipitously.<sup>69</sup>

Ideology, or a set of beliefs about the world and appropriate behaviour, is sometimes also mentioned as a special risk factor for nuclear weapon use. If, as some pessimists argue, our beliefs are often a source of bias, than ideologies should be seen as very relevant when considering proliferation risk. An assessment of ideologies in terms of nuclear risks is beyond the scope of this paper,<sup>70</sup> in broad terms, however, ideologies may threaten the peace by influencing what one values, and what actions one believes are appropriate to take to preserve such values. At the extreme, ideologies can make nuclear

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67. Hugh Gusterson, "Understanding the Reliable Replacement Warhead," March 25, 2007, Bulletin of the Atomic Scientists, web edition, <http://www.thebulletin.org/web-edition/columnists/hugh-gusterson/>.

68. Karl Kaiser, "Non-Proliferation and Nuclear Deterrence," *Survival* 31, no. 2 (1989): 126-27; and Lewis A. Dunn, *Controlling the Bomb: Nuclear Proliferation in the 1980s* (New Haven, Conn.: Yale University Press, 1982), 71-75.

69. Peter D. Feaver, "Command and Control in Emerging Nuclear Nations," *International Security* 17, no. 3 (1992): 167.

70. For a good attempt see Robin M. Frost, "Nuclear Terrorism After 9/11," *Adelphi Papers* no. 387 (December 2005): 41-62.

Armageddon,<sup>71</sup> or dying and killing for an imagined community like the nation,<sup>72</sup> or the Islamic Umma, seem appealing. It is difficult not to see the implications of this fact for the practice of nuclear deterrence and the dangers of nuclear proliferation more broadly. The only consolation is that such ideological extremes are very rare in general and even more so at the level of national leadership.

Geography can also play a role. During the Cold War, the U.S. and the U.S.S.R. were relatively lucky in that they enjoyed dominance in their respective regions, they were internally stable, and their territories were separated by thousands of kilometres. However, not all nuclear states, current or future, can expect to be similarly blessed. Steve Fetter notes that states “such as India and Pakistan, North and South Korea, and Israel and various Arab states, have deep religious, ideological, or cultural animosities, often combined with active border disputes that weaken deterrence.”<sup>73</sup> States like these can face short warning times and, as a consequence, are likely to experience heightened pre-emptive pressures during crises out of fear of being caught off guard by the adversary’s surprise attack. While these pressures may lessen over time as the arsenals become larger and better protected, many new proliferators will likely be unable to take these steps quickly due to material constraints.

In addition to external threats, some new proliferators are likely to find themselves facing internal security threats in the form of insurrections or civil unrest. While nuclear weapons are unlikely to be used deliberately in internal power struggles, their security may be jeopardized in the turmoil. One can

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71. The 1990s Japanese cult Aum Shinrikyo pursued WMD capabilities in the belief that their use would hasten a total nuclear war. Aum members believed that they, and their leader, Shoko Asahara would be elevated to a higher state of being by the experience, and emerge from it to rebuild a new and better world. Shawn Choy, "In the Spotlight: Aum Shinrikyo," Center for Defense Information.

72. Frost examines the issue of the potential for violent nationalist or secessionist movements to use nuclear weapons to force the withdrawal of a perceived occupier from the national homeland and seems reassured that the fear of retaliation in kind would foreclose this as an option. Frost, "Nuclear Terrorism After 9/11," 47-49. It is important to note, however, that not all potential targets of such nuclear blackmail would have the capability to retaliate with nuclear weapons.

73. Steve Fetter, "Ballistic Missiles and Weapons of Mass Destruction: What is the Threat? What Should Be Done?" *International Security* 16, no. 1 (Summer 1991): 30.

imagine firefights erupting between contesting military factions on military bases housing nuclear weapons, as well as the dangers associated with impromptu transportation of weapons to prevent them from falling into rebel hands.

A further argument against the spread of nuclear weapons is based on the commonsense proposition that unless the chances of an event occurring are zero they are in some important sense cumulative. In terms of nuclear proliferation, this means that an increase in the number of nuclear powers will raise, rather than diminish or leave unchanged, the chances of nuclear war. More nuclear weapons, and more independent centres of control over those weapons, mean more opportunities for nuclear use through deliberate action, accident, or authorized use. Hans Blix, for example, makes use of such a general argument when he describes the effects of proliferation as “more fingers on more triggers and, probably, a greater risk that a trigger might be pulled.”<sup>74</sup> Similarly, in analyzing the effect of nuclear weapons on international stability, George Quester finds that one of the strongest arguments against their spread is a general quantitative argument: “If  $n$  countries possess nuclear weapons, nuclear peace thus comes to depend on the emotional stability or rationality of all of them, and it is threatened by the weakest link in the chain. As the chain gets longer, the threat [...] becomes greater.”<sup>75</sup>

Finally, much has been made, especially over the past fifteen years, about the threat of the so-called ‘rogue states.’ These states, ruled by dictators and generally believed not to play by the rules of the international order, are assumed to be too aggressive, reckless, or irrational to be trusted with nuclear weapons. This particular argument however may be something of a red herring. As Ashok Kapur points out, whether one is called a rogue or not depends more on the nature of one’s relationship to the United States than on any objective criteria:

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74. Hagerty, *The Consequences of Nuclear Proliferation*, 16.

75. George C. Quester, “Nuclear Proliferation and Stability,” in *Strategies for Managing Nuclear Proliferation: Economic and Political Issues*, eds. Dagobert L. Brito, Michael D. Intriligator, and Adele E. Wick, (Lexington, Massachusetts: Lexington Books, 1983), 112 .

Iraq was not a rogue when it fought Iran in the 1980s. During this period, governments connived with many Western firms to supply the equipment and materials which allowed Iraqi [sic.] to develop nuclear and other forms of mass destruction capabilities [....] Pakistan was a rogue in the mid-1970s because President Z.A. Bhutto was committed to developing a Pakistani bomb. But when the Soviet Union invaded Afghanistan, Pakistan became a frontline state and the nuclear issue was put on the back burner. When the Soviet forces left Afghanistan and Pakistan's value in American strategy declined with the end of the Cold War, Pakistan's rogue status was restored.<sup>76</sup>

In the last few years, the war on terrorism has again necessitated the re-labelling of Pakistan which has since been receiving very substantial material and political aid from the United States.

Still, even if one accepts Kapur's view that, in practice, the *status quo* powers are often biased in how they apply the 'rogue' label, one could nonetheless maintain that the term can be used objectively to describe a group of states that pose a significantly higher than normal risk of nuclear use. Those who fear rogue states usually point to the ruthlessness of their leaders, their record of international aggression, or support of terrorist groups as indications of innate aggressiveness and irrationality, and argue that this makes rogues likely to be especially irresponsible with nuclear weapons.

The significance of these characteristics for nuclear stability however is often exaggerated. Ruthlessness against one's ethnic minorities does not neatly translate into aggressiveness towards one's neighbours. Examples include Turkey's assimilation and ethnic cleansing campaigns against the Kurds, Russia's brutal campaign in Chechnya, China's suppression of the Uyghurs, or South Africa's apartheid. Violent repression of ethnic minorities is a widespread phenomenon in the developing world and probably more a manifestation of the challenges of establishing a strong state in the absence of a broad-based national identity than of a ruler's innate aggressiveness.

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76. Ashok Kapur, "Rogue States and the International Nuclear Order," *International Journal* 51, no. 3 (June 1996): 431.

Neither is a record of international aggression an automatic indication that a state is unusually reckless or irrational. The United States, for example, has been involved in a number of illegal armed conflicts in the past half century such as the Bay of Pigs invasion (1961), the invasion of Grenada (1983), the invasion of Panama (1989), and, most recently, the illegal invasion of Iraq (2003). This record is lengthier than that of Iraq, Iran, North Korea or Syria.

Neither is it possible to make a successful case that while non-rogue aggression is based on rational calculations of risk rogues behave aggressively because they are irrational or inherently aggressive. Mearsheimer and Walt convincingly show that Iraq's allegedly reckless behaviour in starting wars with Iran and Kuwait was in reality the outcome of entirely rational, though ultimately flawed, calculations. 'Rogues' do sometimes make mistakes, but so do all states.

Some fear that the tendency of some rogues to support terrorism means they may share nuclear weapons with their terrorist allies. While troubling in other ways, state sponsorship of terrorist activities is very unlikely to indicate a willingness to equip terrorists with nuclear weapons. States like Iran, Iraq before the 2003 invasion, Syria, and others who sponsor terrorist activities do so because it is cheap way of harassing a militarily-superior enemy and, in the Middle East at least, makes for good public relations. Facilitating nuclear terrorism would certainly prove to be none of the above. Gratuitously equipping terrorists with nuclear weapons would involve taking enormous risks for little visible benefit. There are certain scenarios when a rogue might have an incentive to transfer one or more nuclear weapons to terrorists, but these are the type of extreme circumstances that could incentivize any other state to undertake similarly risky behaviour.<sup>77</sup>

What are we to make of the nuclear optimism/pessimism debate? The conclusion to be drawn from the preceding discussions is not that nuclear

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77. The "most likely and most dangerous scenario for the transfer of nuclear weapons arises when a regime with strong ties to terrorists finds its survival in jeopardy" for example, when facing serious U.S. threats of 'regime change'. See Jasen J. Castillo, "Nuclear Terrorism: Why Deterrence Still Matters," *Current History* no. 659 (December 2003).



deterrence never works. Quite likely, it works very well most of the time. But cases of deterrence failure are not implausible, and it is those cases that we must worry about.<sup>78</sup> Because deterrence is not as “indestructible” as the optimists assert, and because risks rise exponentially as the number of nuclear armed states grows, proliferation continues at our peril.

## Theories of Nuclear Nonproliferation

Why do states seek nuclear weapons? In one influential account, Scott Sagan postulates the existence of three theoretical models of nuclear proliferation: the ‘security model’ which sees states as seeking nuclear weapons to alleviate serious security concerns; the ‘domestic politics model’ which explains proliferation as the pursuit of political or bureaucratic interests at the domestic level; and the ‘norms model’ according to which states desire nuclear weapons as symbols of identity and prestige.<sup>79</sup>

At the time of writing, in the mid-1990s, Sagan was able to report a “near-consensus” among policy makers and international relations scholars in favour of the ‘security’ model.<sup>80</sup> While this consensus may have weakened somewhat in recent years as explanations focusing on purportedly irrational, aggressive state actors (i.e. rogue states) have gained in popularity, the security model remains dominant. This is undoubtedly due to its deep roots in the realist tradition. Realist theory sees states as security-seeking, rational actors, inhabiting an anarchical international system and, hence, forced to provide for their own security.

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78. For disturbing, recent evidence about the risks to human civilization posed by nuclear weapons (including mass starvation, ozone layer destruction, and nuclear winter) see John Loretz, *Zero is the Only Option: Four Medical and Environmental Cases for Eradicating Nuclear Weapons* (International Physicians for the Prevention of Nuclear War, 2010), <http://www.psr.org/assets/pdfs/zero-is-the-only-option.pdf>.

79. Scott D. Sagan, “Why Do States Build Nuclear Weapons? Three Models in Search of a Bomb,” *International Security* 21, no. 3 (Winter 1996/97): 55. See Tanya Ogilvie-White, “Is There a Theory of Nuclear Proliferation: An Analysis of the Contemporary Debate,” *The Nonproliferation Review* 4, no. 1 (Fall 1996).

80. Sagan, “Why Do States Build Nuclear Weapons?” 1. See also T.V. Paul, *Power versus Prudence: Why Nations Forgo Nuclear Weapons* (Montreal: McGill-Queen’s University Press, 2000), 6-9.

Because even a small relative disadvantage vis-à-vis a potential adversary could prove decisive in a confrontation, states are acutely sensitive to the relative balance of power between themselves and other states. When an imbalance arises, states have two options to redress it: seeking to increase their own military power, or seeking alliances with others.<sup>81</sup> Therefore, realist theory would lead one to predict that a state that can't address its security concerns through either a conventional military build-up or through alliances would turn towards a nuclear deterrent.

Richard Betts, developed a useful heuristic for thinking about the types of states likely to be driven by insecurity to seek nuclear weapons: the “three P’s”, or paranoids, pygmies, and pariahs. Paranoid states are those that tend to have exaggerated threat perceptions. Betts points to South Korea’s somewhat irrational fear of the inferior North Korean military during the 1970s as an example. This inflated threat perception led the South Koreans to consider acquiring nuclear weapons. Exaggerated threat perceptions also played a key role in the U.S. invasion of Iraq, a vastly inferior and easily deterrable adversary. Pygmy states are those surrounded by much larger, unfriendly neighbours, for example Pakistan in relation to India, Taiwan to China, Cuba to the U.S. Finally, the pariahs are isolated states, with few or no allies, but numerous enemies. Examples include South Africa, which developed, but later dismantled, nuclear weapons during apartheid; present-day North Korea; and perhaps, increasingly Iran.<sup>82</sup> Israel’s decision to acquire the bomb was also clearly driven by its pariah status with regard to its Arab neighbours.

In sharp contrast to realist explanations that focus on systemic security conditions, the domestic politics model aims to explain proliferation in terms of an array of influences internal to the state. These can restrain proliferation when public opinion, or key elites, are firmly against weapons acquisition, but they can

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81. For the seminal neo-realist work see Kenneth Waltz, *Theory of International Politics* (New York: Random House, 1979).

82. Richard Betts, “Paranoids, Pygmies, Pariahs & Nonproliferation,” *Foreign Policy* no. 26 (Spring 1977).

also drive it when doing so serves the bureaucratic or political interests of influential domestic actors.<sup>83</sup> Sagan suggests that “Whether or not the acquisition of nuclear weapons serves the national interests of a state, it is likely to serve the parochial bureaucratic or political interests of at least some individual actors within the state.”<sup>84</sup> These parochial interests are likely to include the state’s nuclear energy establishment (state-run laboratories and the civilian nuclear industry), important military units – often within the air force or the navy – and politicians or political parties in states where public opinion is supportive of nuclear weapon acquisition:

The initial ideas for individual weapons innovations are often developed inside state laboratories, where scientists favor military innovation simply because it is technically exciting and keeps money and prestige flowing to their laboratories. Such scientists are then able to find, or even create, sponsors in the professional military whose bureaucratic interests and specific military responsibilities lead them also to favor the particular weapons system. Finally, such a coalition builds broader political support within the executive or legislative branches by shaping perceptions about the costs and benefits of weapons programs.<sup>85</sup>

Sagan argues that India’s decision to get the bomb provides some support for the domestic politics model. Indian elites were divided over whether or not to pursue nuclear weapons in response to China’s 1964 test and the decision itself was the result of a prolonged bureaucratic battle that ebbed and flowed according to the rise of political personalities and significant domestic events. Although it is impossible to know for certain what motivated Prime Minister Indira Gandhi’s final decision to proceed with the development of the ‘peaceful explosive device,’ the fact that Gandhi’s advisors in this case were nuclear scientists and not the military (the latter was not even informed of the decision until ten days prior to the actual test) indicates that it may well have been

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83. Tanya Ogilvie-White, “Is There a Theory of Nuclear Proliferation?” 48.

84. Sagan, “Why Do States Build Nuclear Weapons?” 63.

85. Sagan, 63-4.

domestic pressure, rather than external security concerns, that played the key part.<sup>86</sup>

There is other evidence in favour of the domestic model as well. For example, Leonard Spector finds that president De Gaulle's efforts to slow French nuclear weapons assistance to Israel were "thwarted by senior French bureaucrats sympathetic to Israel".<sup>87</sup> Mitchell Reiss, finds evidence that domestic politics were at least a contributing factor to the decisions of Argentina, Brazil, and South Africa first to start their nuclear weapons programs and later to abandon them.<sup>88</sup> George Perkovich relates that while:

Israel, Pakistan, China, the Soviet Union, and the United States clearly acquired nuclear-weapons capabilities to redress objective threats to their existence [... In other countries like] France, India, South Africa, and the United Kingdom, factors beyond security drove the acquisition of nuclear weapons: the quest for national grandeur, prestige, and independence; the ambition and persuasiveness of leading scientists attracted by the technological challenge and the desire to display personal and national prowess; domestic political jockeying [...] French security experts believe that a core purpose of their nuclear arsenal is to preserve France's permanent seat on the Security Council. Irrelevance is the only "clear and present danger" against which France's nuclear weapons defend.<sup>89</sup>

The 'norms model' is Sagan's third. It posits that proliferation is influenced by perceptions of legitimacy.<sup>90</sup> Drawing on insights from the field of sociology, Sagan speculates that states may, for example, come to see the development

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86. Sagan, 67-8.

87. Leonard S. Spector, *Nuclear Ambitions: The Spread of Nuclear Weapons, 1989-1990* (Boulder: Westview Press, 1990), 152.

88. Mitchell Reiss, *Bridled Ambition: Why Countries Constrain Their Nuclear Capabilities* (Washington, D.C.: Woodrow Wilson Center Press, 1995), 29-30, 66-70.

89. George Perkovich, "Nuclear Proliferation," *Foreign Policy* no. 112 (Autumn 1998): 16.

90. Sagan, "Why Do States Build Nuclear Weapons?" 73. See also Eric Arnett, "Norms and Nuclear Proliferation: Sweden's Lessons for Assessing Iran" *The Nonproliferation Review* (Winter 1998).

and possession of nuclear weapons as necessary attributes of modern statehood:

military organizations and their weapons can [...] be envisioned as serving functions similar to those of flags, airlines, and Olympic teams: they are part of what modern states believe they have to possess to be legitimate, modern states. Air Malawi, Royal Nepal Airlines, and Air Myanmar were not created because they are cost-effective means of transport nor because domestic pressure groups pushed for their development, but rather because government leaders believed that a national airline is something that modern states have to have to be modern states.<sup>91</sup>

If respectable, powerful states continue to rely on nuclear weapons in their national defence strategies, then nuclear weapons will appear to others as legitimate instruments of modern statecraft, and this behaviour will be emulated.

There is also a fourth model, one that is not mentioned by Sagan but one for which there is scattered support within the literature. It could be called the 'dominance model' of nuclear proliferation, and it posits that states acquire nuclear weapons at least in part to use them as tools of coercion. Although dominance-based explanations have fallen out of favour with the emergence of neo-realism, which merely requires the assumption that states are security-seeking, this model has deep roots in the classical realist view of international politics.

Hans Morgenthau, one of the fathers of modern realism, believed that human actions are motivated in part by an innate drive for power, an *animus dominandi*. Criticisms of the notion of *animus dominandi* as too unscientific to be support a rigorous theory of international relations were helped fuel the neo-realist reaction, but evidence from evolutionary psychology that humans possess a built-in tendency to form dominance hierarchies, and are also deeply egoistic,

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91. Sagan, "Why Do States Build Nuclear Weapons?" 19.

lends some support to this classical realist concept.<sup>92</sup>

While it is hard to find examples of states pursuing nuclear weapons for primarily offensive/coercive purposes (the Nazi nuclear program may be one) examples of nuclear weapon states attempting to use their nuclear weapons in ways that go beyond security seeking are much easier to find. Burr and Kimball argue that “From time to time during the Cold War and after, American officials tried to find ways of making nuclear weapons usable, not only for deterrence against Soviet attack but as “tactical” weapons in local conflicts or as a key element in a coercive strategy of threat-making by means of “atomic diplomacy.”” According to Burr and Kimball, the Dwight D. Eisenhower, John F. Kennedy, Nixon, Lyndon B. Johnson, and most recently the George W. Bush administrations have all contemplated the use of atomic weapons in support of foreign policy objectives.<sup>93</sup> Soman similarly claims that: “it was precisely because nuclear weapons gave American presidents the power to force adversaries to sue for peace, without having to resort to any actual use of force with all of the attendant risks and problems, that these weapons played some, often critical, role in every postwar US administration.”<sup>94</sup> This U.S. inclination towards coercive nuclear strategies that emphasize deterrence through denial rather than through

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92. Bradley Thayer, "Bringing in Darwin: Evolutionary Theory, Realism, and International Politics," *International Security* 25, no. 2 (Fall 2000): 125, 134, 138. As Thayer explains, "A species that lives communally has two choices: either it accepts organization with some centralization of power, or it engages in perpetual conflict over scarce resources, which may result in serious injury and thus deprive the group of the benefits of communal existence."

93. William Burr and Jeffrey Kimball, eds. "Nixon White House Considered Nuclear Options Against North Vietnam, Declassified Documents Reveal: Nuclear Weapons, the Vietnam War, and the "Nuclear Taboo"" *National Security Archive Electronic Briefing Book 195* (July 31, 2006), [www.gwu.edu/~nsarchiv/NSAEBB/NSAEBB195](http://www.gwu.edu/~nsarchiv/NSAEBB/NSAEBB195).

94. Appu Kuttan Soman, *Double-Edged Sword: Nuclear Diplomacy in Unequal Conflicts - The United States & China, 1950-1958* (Westport, CT: Praeger, 2000), 6. On the long-standing flirtation by the U.S. with nuclear war-fighting, counter-force strategies see David S. McDonough, "Nuclear Superiority: The New Triad and the Evolution of Nuclear Strategy," *Adelphi Papers* 46, no. 383 (2006): 13-28.

mutual vulnerability, gained strength after the Cold War, and particularly under the recent Bush administration.<sup>95</sup>

Richard Betts also identifies several examples of what he calls “atomic blackmail” in the superpower relationship during the Cold War. While Betts finds that such attempts were “a tentative sort of blackmail, perhaps halfway between stark blackmail and shifty bluff...less often a bludgeon than a crutch” they were nonetheless “seldom transparently meaningless and easy to dismiss.”<sup>96</sup> He concludes that while “The nature of the evidence precludes conclusions about whether peace was maintained because of nuclear threats or in spite of them — or about how much impact the hints of blackmail had either way [...] *the incidence of such signals shows that the decisionmakers believed they had something to gain from manipulating nuclear risks.*”<sup>97</sup> This is echoed by Soman who argues that “there is a clear divergence between what armchair strategists posit about the [dis]utility of nuclear weapons and the actions of leaders who had to make real-life decisions involving nuclear weapons.”<sup>98</sup> It stands to reason that regardless of how well or how poorly attempts at nuclear coercion actually work, if decision makers tend to *believe* that they work well, they may be more likely to seek to acquire these weapons.

While the security model remains the favoured explanation of states’ motives for the pursuit of nuclear weapons, the other models add the much needed nuance to enable us to fully understand complex behaviour that is nuclear proliferation.

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95. See David S. McDonough, “Nuclear Superiority”; and Kier A. Lieber and Daryl G. Press, “The End of MAD? The Nuclear Dimension of U.S. Primacy,” *International Security* 30, no. 4 (Spring 2006).

96. Richard Betts, *Nuclear Blackmail and the Nuclear Balance* (Washington D.C.: Brookings Institution, 1987), 8-9.

97. Betts, *Nuclear Blackmail and the Nuclear Balance*, 132. Emphasis added.

98. Soman, *Double-Edged Sword*, 6. See also McGeorge Bundy, “The Unimpressive Record of Atomic Diplomacy,” in *The Choice: Nuclear Weapons Versus Security*, ed. Gwyn Prins, 54 (London: Chatto & Windus, The Hogarth Press, 1984). Richard Nixon, for example, was convinced it was Eisenhower’s atomic threat that ended the Korean war, and sought to use nuclear threats to achieve the same results in Vietnam. Sagan and Suri, “The Madman Nuclear Alert,” (2003), 162.

## North Korea and Iran: the Immediate Crises

We now turn to the ongoing proliferation crises in North Korea and Iran that have been the focus of much media reporting and scholarly debate over the past decade. The following sections examine the origins and nature of these crises, and assess their potential impact on regional and global nonproliferation efforts.

### North Korea: Missed Opportunities, But No Burned Bridges?

The Democratic People's Republic of Korea (DPRK, or North Korea) is the latest state to acquire nuclear weapons.<sup>99</sup> As such, it represents a clear failure of the regime and of the two-and-a-half decade long effort by leading states to prevent the country from going nuclear. Because of the history of conflict on the Korean peninsula, and continuing enmity between the DPRK, the Republic of Korea (South Korea) and Japan, a number of observers have raised concerns about proliferation in North Korea sparking a regional proliferation chain reaction. The North Korean crisis has a complex history, which must form the basis of any analysis of the current situation. This account begins from that historical perspective and ends with an analysis of the situation and a prescription for action.

As Michael J. Mazarr explains:

In all probability, the origins of North Korea's nuclear program lie as far back as the 1950s. During the Korean War, the United States made a number of pointed threats of nuclear use: and after the war, Washington deployed a sizeable number of tactical nuclear weapons to [South] Korea. The result of these U.S. policies was to confront North Korea with a real and growing nuclear threat. By the 1970s, South Korea was engaged in a highly public flirtation with a nuclear weapons program of its own, while Kim Il Sung confronted

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99. Although it does not yet appear to have fully mastered the technology, with its 2009 test yielding only around a quarter of the expected energy release, or up to 4 kilotons. Jeffrey Park, "The North Korean nuclear test: What the seismic data says," *Bulletin of the Atomic Scientists*, (May 26, 2009), <http://thebulletin.org/web-edition/features/the-north-korean-nuclear-test-what-the-seismic-data-says>.



repeated shifts and eddies in the stance of his patrons, the Soviet Union and China.<sup>100</sup>

Tensions on the Korean peninsula never fully abated following the Korean War, which ended not in a peace treaty but an armistice, leaving the parties officially at war to this day.

Although North Korea may have showed interest in nuclear weapons as early as the mid-1950s, its nuclear program reached its first major milestone only in 1965 when the country acquired its first, small research reactor from the Soviet Union. Around 1980 North Korea began constructing an indigenous, small 5MWe reactor at its nuclear complex in Yongbyon, some 100km north of the capital, Pyongyang. This reactor went critical in 1986. By 1984, U.S. spy satellites discovered the construction of a larger, 50MWe reactor also at Yongbyon. It was estimated that if spent fuel from that facility were to be reprocessed, it could yield enough plutonium for several nuclear weapons per year. At American urging, the Soviet Union convinced the North Koreans to join the NPT in 1985, partly by promising the DPRK four proliferation-resistant light-water nuclear reactors (LWRs), which were, however, never delivered. By 1988 U.S. intelligence had uncovered that the Koreans were constructing a large, 200MWe reactor at Taechon, and a reprocessing plant at Yongbyon. If completed, these facilities would have enabled the DPRK to produce sufficient fissile material for around thirty bombs per year. Satellite imagery also showed that the North Koreans were conducting conventional high-explosives tests near Yongbyon; a likely indication of nuclear weapons work.<sup>101</sup>

By the end of the 1980s, appreciating the urgency of the situation, the U.S. and South Korea undertook energetic diplomacy aimed at freezing and reversing the Korean nuclear program. The timing was fortunate, as pressing economic and security concerns were at the same time also driving North Korea towards

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100. Michael J. Mazarr, "Going Just a Little Nuclear: Nonproliferation Lessons from North Korea," *International Security* 20, no. 2 (Fall 1995), 93.

101. Leon V. Sigal, *Disarming Strangers: Nuclear Diplomacy with North Korea* (Princeton, N.J.: Princeton University Press, 1998), 22; Mazarr, "Going Just a Little Nuclear," 94.

dialogue and improved relations with its neighbours and the United States.<sup>102</sup> At first, diplomacy seemed to work better than most had anticipated. In 1991 North and South Korea signed two historic agreements: one on nonaggression and reconciliation, and another on the denuclearization of the Korean peninsula. Under that second pact, North Korea halted plutonium reprocessing, and foreswore both reprocessing and uranium enrichment; commitments that went significantly beyond its NPT obligations.<sup>103</sup> In 1992 North Korea finally concluded a safeguards agreement with the IAEA as per its obligations under the NPT, and opened up its facilities to IAEA inspectors.

Soon, however, relations deteriorated. North Korea balked at the intrusive inspections being demanded by the South pursuant the bilateral denuclearization agreement, and talks stalled. At the same time, South Korea and the U.S. reinstated the 'Team Spirit' joint, annual military exercises (the largest in the world) even as North Korea warned it would suspend the peace process if the exercises went ahead.<sup>104</sup> The situation became critical in the fall of 1992, when IAEA inspections revealed that North Korea had misrepresented its reprocessing activities to the agency, and that it may already have extracted an unknown amount of plutonium, possibly as much as 8-15kgs, enough for one or, less likely, two bombs, from its 5MWe Yongbyon reactor.<sup>105</sup> When, for the first time in the agency's history, the IAEA in early 1993 invoked its right to carry out "special inspections" of non-declared sites, North Korea denied inspectors access and announced it was withdrawing from the NPT.<sup>106</sup> During the crisis the U.S. seriously considered air strikes against North Korea, while the latter threatened to

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102. Sigal, *Disarming Strangers*, 24-32.

103. *Ibid.*, 32.

104. *Ibid.*, 47.

105. "Yongbyon 5-MW(e) Reactor", Globalsecurity.org, <http://www.globalsecurity.org/wmd/world/dprk/yongbyon-5.htm>.

106. The American ambassador to South Korea at the time described the IAEA's inspection process as "a bunch of wild-haired proctologists running around North Korea asking the North Koreans to submit to all kinds of indignities without telling them how it was going to benefit them." Quoted in Sigal, *Disarming Strangers*, 43-4.

use its 13,000 long-range artillery pieces to turn Seoul into “a sea of fire” if attacked. Only belated flexibility on the part of the American negotiators, as well as an urgent, unofficial visit by former U.S. president Jimmy Carter in June 1994 managed to diffuse tensions, paving the way for the conclusion of the ‘Agreed Framework’ agreement later that year.<sup>107</sup>

Under the framework agreement, the DPRK agreed to immediately freeze reactor operations and plutonium reprocessing; have the IAEA monitor the freeze; ultimately dismantle sensitive facilities; revoke its withdrawal from the NPT; and to fully cooperate with the IAEA once the U.S. substantially met its reciprocal obligations. In exchange, North Korea was promised two 1000MWe light water reactors by 2003, and a supply of heavy fuel oil in the interim to offset the electricity forgone as the result of the freeze. Also, the U.S. agreed to “move toward full normalization of political and economic relations” including the easing of sanctions, and the establishment of liaison, and later Ambassadorial-level relations with the DPRK, and formal assurances to the DPRK against “the threat or use of nuclear weapons by the U.S.”<sup>108</sup>

Conventional wisdom has it that in 2002 North Korea was caught red-handed enriching uranium, breaking the spirit, though not the letter of the Agreed Framework (the framework did not prohibit enrichment) and thus precipitating the framework’s collapse.<sup>109</sup> The real story, however, is more complex. Leon Sigal of the Social Science Research Council and an expert on the North Korean nuclear negotiations explains that the U.S. bears a large part of the blame for the framework’s disintegration. Shortly after the framework was negotiated by the

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107. For a detailed description of this time period see Chapters 2 and 3 in Sigal, *Disarming Strangers*, and Mazarr “Going Just a Little Nuclear”.

108. *The Korean Peninsula Energy Development Organization, Agreed Framework Between the United States of America and the Democratic People’s Republic of Korea* (Geneva, October 1994), <http://www.kedo.org/pdfs/AgreedFramework.pdf>.

109. As Hugh Gusterson shows, the parties’ respective obligations under the Agreed Framework were routinely misrepresented in the U.S. media even before the agreement collapsed. It is thus not surprising that the reasons for the collapse were themselves reported in a highly lopsided way, laying the blame squarely on North Korea, while omitting mention of U.S. transgressions. Hugh Gusterson, “Paranoid, Potbellied Stalinist Gets Nuclear Weapons: How the U.S. Print Media Cover North Korea,” *Nonproliferation Review* (March 2008): 22-26.

Clinton administration, Republicans gained control of the U.S. Congress and labelled the agreement as ‘appeasement.’ Not wanting to take Congress on, Clinton failed to implement key provisions of the Agreed Framework on time and did not implement some at all. For example, the U.S. did not ease sanctions on North Korea in any significant way until 2000, and the construction of the first of the two light-water reactors promised by 2003 did not even start until mid-2002, with the completion date on that first build being pushed back to 2007. While the U.S. did provide North Korea the heavy oil it promised, shipments were sometimes late. Importantly, the U.S. did not keep the promise to “move toward full normalization of political and economic relations” with the DPRK.<sup>110</sup>

North Korea did not keep good faith either. It is likely that in 1997 it acquired a uranium enrichment “starter-kit” from Pakistan, which would have included centrifuge designs, and a small number of units, although there is no public evidence that the enrichment program ever went beyond that pilot stage, until 2009 or 2010.<sup>111</sup> It now appears that the often quoted North Korean 2002 ‘confession’ of pursuing enrichment that finally brought down the Agreed Framework might have been “a translation error”. All that the North Koreans appear to have asserted during the famous, heated exchange with a U.S. representative was their right to a nuclear deterrent when faced with a hostile, nuclear state like the U.S.<sup>112</sup>

DPRK’s early dabbling in enrichment technology should be seen in the context of the U.S. reneging on its obligation to move to normalize relations and large delays in providing the promised light-water reactors. It does not necessarily confirm the popular belief that the North Koreans were intent on cheating from the get-go regardless of U.S. actions. According to Leon Sigal,

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110. Sigal, “A Rogue by Any Other Name” *Foreign Service Journal* (Oct. 2005): 39. Gusterson, “Paranoid, Potbellied Stalinist Gets Nuclear Weapons,” 24.

111. The DPRK has recently revealed it had constructed a small enrichment facility at Yongbyon. David Sanger, “North Koreans New Plant For Nuclear Use,” *New York Times*, November 20, 2010, <http://www.nytimes.com/2010/11/21/world/asia/21intel.html>.

112. Gusterson, “Paranoid, Potbellied Stalinist Gets Nuclear Weapons,” 26-9.

North Korean strategy during that period is better characterized as tit-for-tat, including a general willingness to engage the outside world in diplomatic give-and-take. By contrast, Sigal sees the U.S.'s default approach towards North Korea as one of "crime-and-punishment;" treating the DPRK as a transgressor to be brought into line through threats of sanctions or the use of force.<sup>113</sup>

This disciplinary philosophy reached a zenith during the first George W. Bush administration when North Korea was branded as part of the "axis of evil" and administration officials openly dropped hints about "regime change" in the American press.<sup>114</sup> As Hugh Gusterson posits, the North Koreans may simply have:

calculated that it was impossible to implement an agreement with the Bush administration and that their best path to security lay, instead, in securing a nuclear weapons capability with which to deter the United States from doing to North Korea what it had done to Iraq. This would explain the timing of North Korea's most provocative behavior from 2002 onward.<sup>115</sup>

So what are we to make of the North Korean nuclear program? Since the Agreed Framework broke down in 2002-2003 North Korea has withdrawn from the NPT, declared itself a nuclear power, and conducted two nuclear tests (the first, in 2006, is widely believed to have yielded under a kiloton, the second also fizzled-out prematurely, but may have managed to yield as much as 4 kilotons of TNT equivalent; about a quarter of the yield of the Hiroshima device, itself small by modern standards).<sup>116</sup> It is likely that the U.S.'s confrontational attitude has strengthened hard-liners within the North Korean regime who see America as inherently hostile and untrustworthy. However, as Selig Harrison, an expert on North Korea who's visited the country eleven times and maintains links to the

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113. Sigal, *Disarming Strangers*.

114. Gusterson, "Paranoid, Potbellied Stalinist Gets Nuclear Weapons," 33.

115. *Ibid.*, 33.

116. Jeffrey Park, "The North Korean nuclear test: What the seismic data says," *Bulletin of the Atomic Scientists*, (May 26, 2009), <http://thebulletin.org/web-edition/features/the-north-korean-nuclear-test-what-the-seismic-data-says>.

North Korean negotiating team, points out rather bluntly, North Korea may be a relatively easy proliferation problem to solve: “North Korea is a poor, struggling, pathetic country, a country to be pitied much more than to be feared, with tremendous economic problems. They've got to normalize relations with us [...] But they're afraid we're going to do them in first with a nuclear pre-emptive strike.”<sup>117</sup> Harrison believes the North Koreans still want to make a deal:

The North Koreans have a very clear offer on the table. They've had it on the table since January [2009...]. They want to go back to negotiations and work out a new set of exchanges on the basis of which they will cap their nuclear arsenal at present levels. The complete denuclearization will be later down the pike, after we have normalized relations with them, but they are ready for tradeoffs that would stop any further expansion of their nuclear program, which seems to me to be a very valuable achievement for the United States to work for.<sup>118</sup>

Sigal concurs, adding that another worthy objective should be to try to prevent North Korea from making miniaturized warheads capable of being delivered by missile. He concludes that “The only way to get North Korea to reverse course, short of war, is to reconcile with it - ending enmity through robust political, economic and cultural engagement, investment and aid, security assurances, normalization of relations, and, above all, a peace treaty ending the Korean war.”<sup>119</sup>

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117. Comments by Selig Harrison on PBS Newshour, “N. Korea Vows to Boycott Nuclear Talks After U.N. Rebuke,” April 14, 2009, [www.pbs.org/newshour/bb/asia/jan-june09/nkorea\\_04-14.html](http://www.pbs.org/newshour/bb/asia/jan-june09/nkorea_04-14.html).

118. Comments by Selig Harrison on PBS Newshour, “Kim Jong Il Pardons Journalists During Bill Clinton Visit,” August 4, 2009, [www.pbs.org/newshour/bb/asia/july-dec09/korea\\_08-04.html](http://www.pbs.org/newshour/bb/asia/july-dec09/korea_08-04.html). Indeed, in January 2010 North Korea proposed “new talks to negotiate a peace treaty with the United States that would formally conclude the 1950-53 Korean War [...] Seoul and Washington rejected the proposal, insisting that they can start such talks only after the North returns to six-nation nuclear disarmament negotiations and begins dismantling its nuclear weapons programs.” Choe Sang-Hun, “N. Korea Threatens to Halt All Talks With Seoul,” *New York Times*, January 15, 2010, <http://www.nytimes.com/2010/01/16/world/asia/16korea.html>.

119. Leon V. Sigal, “Magical Thinking on North Korea,” *The Boston Globe*, February 24, 2010, [www.boston.com/bostonglobe/editorial\\_opinion/oped/articles/2010/02/24/magical\\_thinking\\_on\\_north\\_korea/](http://www.boston.com/bostonglobe/editorial_opinion/oped/articles/2010/02/24/magical_thinking_on_north_korea/).

Sigal and Harrison acknowledge that they could, of course, be wrong – it could turn out that North Korea really has no intention of ever giving up their nuclear weapons – but they make the point that we won't know that for sure until the U.S. tries to engage the DPRK in serious, good faith negotiations. It is quite likely that North Korea may try to keep a few bombs or some fissile material in the basement as insurance against a return to Bush-era policies of regime change, or other security threats. It is likely to do this because the amount of plutonium it separated thus far is not exactly known, nuclear material or bombs are very easy to hide, and North Korea likely possesses the world's most extensive man-made cave and tunnel network. This is an unfortunate legacy of a failed diplomatic approach that allowed the North Koreans to carry out nuclear tests and resume reprocessing of their spent fuel, but it should not be an obstacle to progress.

While there are good reasons to be optimistic that North Korea's weapons arsenal can be capped at around current levels and its ability to produce more can be kept in check by the dismantling and monitoring of their facilities, high confidence about the absence of nuclear weapons in that country will only be attainable after many years, perhaps decades, of steadily improving relations with the outside world. In the meantime, the U.S. must work hard to reassure its regional allies about its commitment to their security, and do so in a way that is the least-threatening to North Korea and others.

### **Iran and the West: Irreconcilable Differences?**

Like North Korea's, Iran's nuclear program has a long history that predates the current crisis, which began in 2002 with revelations that Iran was covertly constructing a large uranium enrichment facility at Natanz. Iran's program started under the Shah in the 1970s, motivated by what one scholar describes as "the intention of acquiring hegemony in the region and the ability to play the role of a great power in world affairs, commensurate with Iran's perception of itself as an

ancient civilization and an important global actor.”<sup>120</sup> Iran had obtained its first 5MWe research reactor in 1967 from the U.S. under the Atoms for Peace program, and acceded to the NPT in 1970. By the mid-1970s it had contracted with French and German firms for four power reactors in deals that left open the option of reprocessing on Iranian soil, and was negotiating with the U.S. for eight more reactors.<sup>121</sup> By 1979 however, the Iranian revolution had swept the secular, pro-American Shah out of power and replaced him with a fiercely anti-American Islamist regime of Ayatollah Khomeini. All nuclear activities were initially suspended but they resumed on a more modest scale by the mid-1980s following Iraq’s invasion of Iran in 1980.

For a long time the outside world believed that Iran’s nuclear program extended only to a power reactor being constructed by the Russians at Busheher. But in August 2002 American media reported claims by an Iranian exile group that Iran had been constructing a large, secret uranium enrichment plant at Natanz and a heavy water production plant at Arak (it appears that U.S. intelligence services knew about these activities somewhat earlier).<sup>122</sup> These media stories forced Iran to reveal in September 2002 that it was “embarking on a long-term plan to construct nuclear power plants with a total capacity of 6000 MW within two decades” as well as the “all out planning, well in advance, in various field of nuclear technology such as [the nuclear] fuel cycle”. In February 2003, Iran finally allowed the IAEA to tour the facilities in question, which included a nearly-completed pilot enrichment plant at Natanz, in addition to the

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120. Efraim Inbar, “Iranians Like the Bomb: Some Tastes are Dangerous,” *Contemporary Security Policy* 29, no.3 (December 2008).

121. *New York Times*, “Iran Has Plans For When the Oil Runs Out,” March 9, 1975, [www.iranaffairs.com/iran\\_affairs/2006/05/blasts\\_from\\_the.html](http://www.iranaffairs.com/iran_affairs/2006/05/blasts_from_the.html). For additional historical context see William Burr, “A Brief History of U.S.-Iranian Nuclear Negotiations,” *Bulletin of the Atomic Scientists*, 65, no. 1 (January/February 2009), [www.thebulletin.org](http://www.thebulletin.org).

122. Mark Fitzpatrick, “The Iranian Nuclear Crisis: Avoiding Worst-case Outcomes,” *Adelphi Papers* 48, no. 398 (May 2008): 15.



commercial-scale plant under construction at the same location, and the heavy water plant at Arak.<sup>123</sup>

In attempting to justify having kept these facilities secret, Iran claimed that under its safeguards agreement it had no legal obligation to declare them to the IAEA until 180 days prior to the introduction of nuclear material into the facilities. While that is true, Iran did have an obligation to report changes to its inventory of nuclear materials, the uses of these materials, and facilities where they were present. In a 2004 report the IAEA's Director General Mohamed ElBaradei summed up Iran's compliance failures in this way: "it is clear that Iran has failed in a number of instances over an extended period of time to meet its obligations under its Safeguards Agreement with respect to the reporting of nuclear material, its processing and its use, as well as the declaration of facilities where such material has been processed and stored." Most significantly Iran had engaged in the undeclared import and processing of uranium; pilot-scale uranium enrichment (using both the gas centrifuge and laser enrichment methods); separation of small amounts of plutonium; and the failure to declare several facilities where these activities were taking place.<sup>124</sup>

More recently, in September 2009, the U.S. revealed that Iran had been secretly constructing an additional, small, enrichment facility near the city of Qom. Shortly following the 2002 revelations, Iran had agreed to amend its safeguards agreement to make the reporting of new nuclear facilities to the IAEA mandatory as soon as plans for construction were in place. Iran was thus legally obligated to report the Qom facility to the IAEA years before it was discovered. This discovery clearly contradicts Iran's narrative that it had long-since redressed

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123. International Atomic Energy Agency (IAEA), *Implementation of the NPT safeguards agreement in the Islamic Republic of Iran: Report by the Director General* GOV/2003/40, June 6, 2003, 1-2, [www.iaea.org/Publications/Documents/Board/2003/gov2003-40.pdf](http://www.iaea.org/Publications/Documents/Board/2003/gov2003-40.pdf). For a good concise history of Iran's nuclear program see Iran Watch, "Iran's Nuclear Program" (September 2004), [www.iranwatch.org/wmd/wmd-nucleaessay-footnotes.htm](http://www.iranwatch.org/wmd/wmd-nucleaessay-footnotes.htm).

124. The IAEA details 15 separate instances of Iran's noncompliance with its safeguards agreement. International Atomic Energy Agency (IAEA), *Implementation of the NPT safeguards agreement in the Islamic Republic of Iran: Report by the Director General*, GOV/2004/83, November 15, 2004, 19-20, [www.iaea.org/Publications/Documents/Board/2004/gov2004-83.pdf](http://www.iaea.org/Publications/Documents/Board/2004/gov2004-83.pdf).

all NPT compliance issues and that it should therefore not be constrained in exercising its right to the development of nuclear energy, including the sensitive parts of the fuel cycle like uranium enrichment.<sup>125</sup>

The U.S., a number of European states, and to a lesser degree Russia and China, further object that there are still many unanswered questions about possible links between Iran's nuclear program and its military, and that, even if those were to be satisfactorily answered, Iran's past transgressions mean it cannot be trusted to pursue sensitive activities like enrichment or reprocessing until that trust is restored (presumably through a lengthy record of compliance, and stringent monitoring).

#### **A Military Dimension?**

Iran certainly has the security motive to seek nuclear weapons. The allied invasion and occupation of a neutral Iran in 1941 is still within living memory of some,<sup>126</sup> but for many others the West's role in the 1980-1988 Iran-Iraq war may be a much more potent motivator. Nasser Hadian, a political scientist at Tehran University, argues that it was the experience of that brutal, eight-year long conflict that solidified the "perception [of Iran's] strategic loneliness" in the country's national psyche:

Iran felt alone in its war with Iraq, going from being a Western client-state to fighting an Iraq that had the political support of

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125. In its defence, Iran has been arguing that it had rescinded the 2003 amendment back in 2007. Legally however, Iran was not entitled to do so without IAEA consent. Likewise, Iran's claim that the amendment was invalid because it had not been approved by the Iranian parliament is a red herring. Such approval was never necessary. In fact, the Iranian government had not even asked its parliament to ratify the overarching Safeguards Agreement, the legality of which Iran does not dispute, so it is hard to argue that parliamentary permission was necessary to amend the Agreement.

126. There is a long history of European and American meddling in Iranian affairs in the twentieth century, including but not limited to the Anglo-American invasion of a neutral Iran in 1941, the deposition of its ruler Reza Shah and the installation of his son Mohammad Reza Shah Pahlavi, as well as a 1953 CIA-orchestrated coup removing the democratically elected government of Premier Mohammed Mossadeq from power allowing the Shah to consolidate his autocratic rule. The Shah's repression and torture of many of Iran's religious figures, and the strong backing he received from the U.S., virtually ensured that after the revolution the new Islamic regime would view the U.S. with suspicion and hostility.

important countries in the Arab world and the West, including the United States. In terms of military supplies, Russia, China, and France sold billions of dollars of arms, the Arabs provided money, and the United States provided satellite imagery, along with other kinds of support, to Iraq [...] This created an Iranian psychology that lacks trust in international institutions and alliances, which emphasizes reliance on its own resources, both mental and physical, for national protection and defence.<sup>127</sup>

Shortly after 9/11, Iran had found itself on President Bush's "axis of evil" list (together with Iraq and North Korea) and watched as the U.S. invaded two of its immediate neighbours: Afghanistan in late 2001 and Iraq in early 2003. The sentiment among the neoconservatives that dominated U.S. foreign policy at the time seemed to be one of 'boys go to Baghdad; real men go to Tehran'. The thinking underlying that sentiment was "the essence of the Bush Doctrine, according to which the removal of Saddam Hussein was seen not as a one-act play but rather as the opening scene in the total transformation of the Greater Middle East," by force where necessary.<sup>128</sup> Iran could not have helped but get the message. Although Iran's alleged nuclear weapons program pre-dates the Bush administration, Iran-U.S. interaction over the past decade undoubtedly strengthened Iran's security motive for getting at least the capability of moving relatively quickly to acquire a nuclear deterrent.

Although Iran has remedied many of its safeguards violations since 2002, the IAEA still considers a number of issues possibly linking Iran's nuclear program to the country's military to be outstanding. One of these, is the so-called 'uranium metal document' which was found in Iran during an IAEA inspection in 2005. The 15-page document reportedly shows the procedural requirements for the reduction of UF<sub>6</sub> (uranium hexafluoride) to metal in small quantities, and on

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127. Nasser Hadian, "Iran's Nuclear Program: Background and Clarification," *Contemporary Security Policy* 29, no.3 (December 2008), 573-74.

128. David Hastings Dunn, "Real Men Want to Go to Tehran: Bush, Pre-emption and the Iranian Nuclear Challenge," *International Affairs* 83, no. (2007): 19. Revealingly, John Bolton, then Undersecretary of State for Arms Control and International Security, when asked what lessons Iran and North Korea should draw from the invasion of Iraq reportedly answered "take a number". Joe Cirincione "John Bolton's Nuclear Fantasy," *The Huffington Post*, July 30, 2009, [www.huffingtonpost.com/joe-cirincione/john-boltons-nuclear-fant\\_b\\_248001.html](http://www.huffingtonpost.com/joe-cirincione/john-boltons-nuclear-fant_b_248001.html).

the casting and machining of enriched, natural and depleted uranium metal into hemispherical forms, such as those that make up the core of a nuclear implosion device. While there is some support for Iran's claims that this document had been unsolicited, thrown in gratis by the Pakistanis during a 1987 sale of centrifuge designs to Iran,<sup>129</sup> the IAEA says that Iran has not yet answered all questions about the document satisfactorily, and considers the issue unresolved. Iran has stopped cooperating with the IAEA on this matter.<sup>130</sup>

A more significant set of unresolved issues involve the so-called 'alleged studies' which (allegedly) demonstrate the existence of a secret nuclear weapons program in Iran in the recent past. The majority of the documents that comprise the alleged studies were reportedly found on a lap top that was stolen and then turned over to the CIA by a walk-in defector. The documents are said to relate to: 1) undeclared activities relating to the conversion of uranium dioxide (UO<sub>2</sub>) into uranium tetrafluoride (UF<sub>4</sub>) or so-called 'green salt,' which is a step in the enrichment process; 2) alleged nuclear weapons development work including: high explosives testing, including the development and testing of high precision detonators fired simultaneously;<sup>131</sup> a schematic highly suggestive of an underground nuclear testing arrangement; alleged testing of "at least one full scale hemispherical, converging, explosively driven shock system that could be applicable to an implosion-type nuclear device"; and 3) development work to "redesign the inner cone of the Shahab-3 missile re-entry vehicle to

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129. Gareth Porter, "Nuclear 'Scare' Against Iran Exposed," *Asia Times Online*, July 10, 2008, [www.atimes.com/atimes/Middle\\_East/JG10Ak02.html](http://www.atimes.com/atimes/Middle_East/JG10Ak02.html).

130. International Atomic Energy Agency (IAEA), *Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions 1737 (2006), 1747 (2007), 1803 (2008) and 1835 (2008) in the Islamic Republic of Iran: Report by the Director General*, GOV/2010/10, February 18, 2010, 9, [www.iaea.org/Publications/Documents/Board/2010/gov2010-10.pdf](http://www.iaea.org/Publications/Documents/Board/2010/gov2010-10.pdf).

131. Significantly, Iran has admitted that it had tested two to three high precision detonators fired simultaneously, but claimed this was for civilian or conventional military uses.

accommodate a nuclear warhead.”<sup>132</sup> A summary of the key documents can be found in the May 2008 IAEA report on Iran.<sup>133</sup>

Iran claims that the documents are fake and the allegations baseless, and has stopped cooperating with IAEA’s requests for information and access to persons and locations that could shed light on the issues raised by the documents. While there is some room for genuine doubt about the documents’ authenticity<sup>134</sup> the IAEA’s overall assessment is probably sound:

The information available to the Agency in connection with these outstanding issues is extensive and has been collected from a variety of sources over time. It is also broadly consistent and credible in terms of the technical detail, the time frame in which the activities were conducted and the people and organizations involved. Altogether, this raises concerns about the possible existence in Iran of past or current undisclosed activities related to the development of a nuclear payload for a missile. These alleged activities consist of a number of projects and sub-projects, covering nuclear and missile related aspects, run by military related organizations.<sup>135</sup>

Although the IAEA is very circumspect in its public pronouncements about the nature of Iran’s program, a leaked IAEA draft document suggests that the agency believes Iran has conducted, and may still be conducting weaponization

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132. International Atomic Energy Agency (IAEA), *Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions 1737 (2006), 1747 (2007) and 1803 (2008) in the Islamic Republic of Iran: Report by the Director General*, GOV/2008/15, May 26, 2008, 4, [www.iaea.org/Publications/Documents/Board/2008/gov2008-15.pdf](http://www.iaea.org/Publications/Documents/Board/2008/gov2008-15.pdf); IAEA, *Implementation of NPT Safeguards*, February 18, 2010, 9; and Fitzpatrick, “The Iranian Nuclear Crisis,” 16.

133. IAEA, *Implementation of NPT Safeguards*, May 26, 2008, Annex A, 1, [www.iaea.org/Publications/Documents/Board/2008/gov2008-15.pdf](http://www.iaea.org/Publications/Documents/Board/2008/gov2008-15.pdf)

134. For example, at least one key document is in English rather than Farsi, and while the IAEA has been shown the documents, the CIA has not allowed the IAEA to keep copies, impeding the agency’s ability to conduct a robust, independent assessment of the document’s authenticity.

135. IAEA, GOV/2010/10, 8-9.

work.<sup>136</sup> The most recent IAEA report mentions “indications” that certain military-related activities “may have continued beyond 2004”.<sup>137</sup>

### What’s the ‘End Game’ in Iran?

Since 2003, a number of mostly Western states have been pursuing a variety of strategies aimed at retarding and rolling back Iran’s uranium enrichment program. These efforts have included technology denial through export controls, sanctions, and probably also sabotage;<sup>138</sup> the threat of force to destroy Iran’s nuclear facilities and/or remove its regime;<sup>139</sup> use of disincentives such as financial and economic sanctions and political pressure (including through four successive rounds of U.N. Security Council resolutions);<sup>140</sup> and finally, offers of economic and political incentives made through negotiation fora like the ‘EU3’ and later the ‘P5 + 1’.<sup>141</sup>

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136. Institute for Science and International Security (ISIS), “Excerpts from Internal IAEA Document on Alleged Iranian Nuclear Weaponization, ISIS Report,” (October 2, 2009), [www.isisnucleariran.org/assets/pdf/IAEA\\_info\\_3October2009.pdf](http://www.isisnucleariran.org/assets/pdf/IAEA_info_3October2009.pdf)

137. IAEA, *Report of the Director General, Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions in the Islamic Republic of Iran* GOV/2010/46, (September 6, 2010), 10. <http://www.iaea.org/Publications/Documents/Board/2010/gov2010-46.pdf>

138. See Fitzpatrick, “The Iranian Nuclear Crisis,” 29. It is also widely speculated that the recent cyber attacks by the malware Stuxnet were aimed at Iran’s nuclear program. Stuxnet was a cyber weapon of unprecedented sophistication, designed to seek and destroy a very specific industrial target. While systems in other countries have been affected as well, Iran appears to have been the epicentre. The effects of Stuxnet’s attack on the Iranian nuclear program are still unknown. The sophistication of the worm implies state involvement, and Israel and the U.S. top the list of suspects, as they possess both the motive and the capability to have carried out this attack, though other states like Russia or China cannot be discounted. Mark Clayton, “Stuxnet malware is ‘weapon’ out to destroy ... Iran’s Bushehr nuclear plant?” *Christian Science Monitor* September 21, 2010, <http://www.csmonitor.com/USA/2010/0921/Stuxnet-malware-is-weapon-out-to-destroy-Iran-s-Bushehr-nuclear-plant>.

139. Both the U.S. and Israel have repeatedly signalled the possible use of force.

140. For a good overview of the West’s strategy towards Iran, including sanctions, see Chapter 2 of Fitzpatrick’s “The Iranian Nuclear Crisis.”

141. E3 refers to Germany, France, and the U.K. which have been negotiating with Iran since 2003. The group soon transformed into the ‘EU3’ upon the addition of the Javier Solana, the EU’s foreign policy representative. The ‘P5 + 1’ refers to the permanent five members of the U.N. Security Council, plus Germany.

However, for much of the current crisis, Iran has continued to install new centrifuges, develop new, more efficient centrifuge models,<sup>142</sup> increase the overall output and stockpile of enriched uranium, as well as to raise the level of enrichment. This has made the *status quo* powers', negotiating position of 'no enrichment' less and less tenable. In its latest report, the IAEA estimated that as of August 28, 2010 the Natanz facility had produced 2803 kg of uranium enriched to around 3.5% U-235 content, and 22 kg of uranium enriched up to 20% U-235.<sup>143</sup> With further enrichment, this is already enough for three first-generation nuclear devices.<sup>144</sup>

Because by enriching even to the current level of 3.5%, Iran has done nearly 70% of the enrichment work needed to get to weapons-grade uranium (around 90% enrichment) it is capable of 'breaking-out' and producing a bomb's worth of weapons grade uranium in anywhere between a "few months" to around a year, should it choose to do so. The weaponization work of actually designing and manufacturing an explosive device and a delivery system might take another two to four years, although that is highly dependent on how much work Iran might already have done in this area.<sup>145</sup> Recently, Iran has also announced the intention to build ten new enrichment plants, although it is unclear how many of these will actually be built out or when.<sup>146</sup> So far, the construction of one new enrichment plant has been announced to start by March 2011.<sup>147</sup>

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142. Peter Crail, "Iran to Mass-Produce Improved Centrifuges," *Arms Control Today* 40 (May 2010), [www.armscontrol.org/act/2010\\_05/IranCentrifuge](http://www.armscontrol.org/act/2010_05/IranCentrifuge).

143. IAEA, *Report of the Director General, "Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions in the Islamic Republic of Iran"* September 6, 2010, <http://www.iaea.org/Publications/Documents/Board/2010/gov2010-46.pdf>

144. Iran Watch website, Iran's Nuclear Timetable, <http://www.iranwatch.org/ourpubs/articles/iranuclear timetable.html>

145. David Albright and Jacqueline Shire, "A Witches' Brew? Evaluating Iran's Uranium-Enrichment Progress," *Arms Control Today* 37 (November 2007), [www.armscontrol.org/act/2007\\_11/Albright; Crail, "Iran to Mass-Produce Improved Centrifuges."](http://www.armscontrol.org/act/2007_11/Albright; Crail, )

146. IAEA, GOV/2010/10, 10.

147. IAEA, *Report of the Director General, "Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions in the Islamic Republic of Iran"* September 6, 2010, 8, <http://www.iaea.org/Publications/Documents/Board/2010/gov2010-46.pdf>

This poor diplomatic outcome reflects the fact that the international community has no easy options for inducing Iran to change course. Although the U.S. insists that military action is still 'on the table' as a last resort to halt Iran's nuclear program, and recently there have been more hints of possible Israeli military action,<sup>148</sup> military force is not a realistic solution. Invasion and occupation, the only sure way neutralizing Iran's nuclear program for any extended period of time, is out of the question given America's bloody, humbling, expensive, and recent experience in Iraq, as well as the fact Iran, which has a much larger, more mountainous territory than Iraq, and double the latter's population, would be much more difficult to subdue.

The alternative is air strikes. These would likely need to include many hundreds, probably thousands, of sorties to have any certainty of significantly damaging Iran's extensive, dispersed, hidden, and well protected nuclear infrastructure. Natanz itself is reportedly buried under layers of earth and concrete, designed to protect against conventional bunker-buster munitions.<sup>149</sup> Even if key facilities such as Natanz, Bushehr, Arak, Isfahan, and others were to be severely damaged or destroyed, much of the key materials (including the nearly three tons of low-enriched uranium already produced) and equipment could be moved off-site, or into adjacent compartments in anticipation of attack. The nuclear program could then be reconstituted at secret, redundant facilities which Iran likely possesses (Qom is an example). Leaving aside Iran's reaction, which could involve covert or open action against tanker traffic in the strait of Hormutz, U.S. forces in Iraq, Afghanistan or even in the U.S. proper, military action would likely drive Iran further and faster towards weaponization; a fateful step that most experts believe Iran has not yet decided to take, and may never

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148. Jeffrey Goldberg, "The Point of No Return," *The Atlantic Monthly* (September 2010).

149. The George W. Bush administration reportedly even considered using tactical nuclear weapons against Natanz because military planners could not assure that conventional weapons would could destroy the facility. Seymour M. Hersh, "The Iran Plans: Would President Bush go to war to stop Tehran from getting the bomb?" *The New Yorker*, (April 17, 2006), [www.newyorker.com/archive/2006/04/17/060417fa\\_fact](http://www.newyorker.com/archive/2006/04/17/060417fa_fact).



take if left alone. For these and other reasons, military action does not appear to be favoured by the U.S. administration or military.<sup>150</sup>

To date, there have been four rounds of U.N. Security Council sanctions against Iran, as well as numerous unilateral sanctions, mostly by the U.S. and European nations. Sanctions have included freezing the assets of a number of entities involved Iran's nuclear program, a travel ban on some of their employees, a ban on Iranian arms exports as well as on imports of heavy arms and some other military and 'dual-use' items. The U.S. has also effectively banished Iranian entities from the U.S. financial system, and has been having increasing success in dissuading American, European and, lately, United Arab Emirates entities from investing in or doing business with Iran. Although other companies, particularly domestic Iranian and Chinese companies have often moved into the vacuum, and some of the sanctions are proving very difficult to enforce.<sup>151</sup>

Although sanctions and attempts to isolate Iran politically and economically do carry a real and increasing price, they are unlikely to make Iran give up enrichment, in which so much national effort and pride has been invested. This is especially the case since Iran's security situation remains tense. As George Perkovich admits, "no one is under the illusion that the sanctions are

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150. Albright and Shire, "A Witches' Brew?" Even without the U.S. support Israel may decide to strike Iran on its own. In such a scenario the damage to the Iranian program would be far less severe, but the end result of the strikes would be the same: an Iranian bomb, perhaps in a relatively short order. Not all observers are convinced that military action is unlikely. See for example Fariborz Ghadar, "Iran's Nuclear Negotiations and the West," Center for Strategic and International Studies, <http://csis.org/publication/iran%E2%80%99s-nuclear-negotiations-and-west>.

151. Fitzpatrick, "The Iranian Nuclear Crisis," 34-38. Insurance companies are becoming less willing to cover vessels stopping at Iranian ports. The vice president of the Iranian Business Council recently reported there was "something like a panic when Iran and Iranian ports (are) coming into the picture." W. G. Dunlop, "Latest Iran Sanctions 'Will Hurt UAE Trade,'" Associated Free Press, August 17, 2010. Jo Becker, "Web of Shell Companies Veils Trade by Iran's Ships," *New York Times*, June 7, 2010, [www.nytimes.com/2010/06/08/world/middleeast/08sanctions.html](http://www.nytimes.com/2010/06/08/world/middleeast/08sanctions.html). See also Thomas Erdbrink "Iran's Revolutionary Guard Corps expands role in sanctions-hit oil sector" *Washington Post*, May 5, 2010, [www.washingtonpost.com/wp-dyn/content/article/2010/05/04/AR2010050405130.html](http://www.washingtonpost.com/wp-dyn/content/article/2010/05/04/AR2010050405130.html).

going to stop Iran.”<sup>152</sup> Moreover, at present time the Iranian regime has more pressing concerns than the removal of sanctions. Firstly, it has to ensure its own political survival in the aftermath of the rigged June 2009 election and the bloody suppression of dissent that followed. Secondly, Iran’s economy is in dire straits, and fixing it is a high priority for the Iranian government. But these economic woes are largely self-inflicted, and lifting the sanctions would not do much to address their root causes. Give these realities, and the valuable insight that “complete capitulation is rare in international politics,” the most we should expect from sanctions is to soften Iran’s negotiating position.<sup>153</sup>

If no credible option exists for halting and reversing Iran’s enrichment program, and time seems to be on the Iranian side, the least-bad option may be to seek to cap Iran’s enrichment capability at near-current levels. A deal to this effect would also entail that Iran foreswear reprocessing activities,<sup>154</sup> ratify the Additional Protocol, and take additional measures to give the international community enhanced assurances of the peaceful nature of its nuclear program. In return, the sanctions should be lifted; the U.S. should unambiguously end all material support for domestic opposition groups in Iran, and end all other policies aimed at regime change; amend its negative security guarantees to include Iran; offer significant economic inducements, such sponsorship of Iran’s entry to the World Trade Organization; and close the book on possible past transgressions (visibly, the alleged studies). What is needed is a way for Iran to accept significant limits on its nuclear program without seeming to capitulate to U.S. pressure and threats.

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152. George Perkovich, “Sanctions on Iran—The Least Bad Option,” Carnegie Endowment for International Peace (June 28, 2010), <http://carnegieendowment.org/publications/index.cfm?fa=view&id=41066>.

153. William Luers, Thomas R. Pickering, Jim Walsh, “A Solution for the US–Iran Nuclear Standoff,” *The New York Review of Books* 55, no. 4 (March 20, 2008), [www.rbf.org/usr\\_doc/luers\\_article.pdf](http://www.rbf.org/usr_doc/luers_article.pdf).

154. Iran has previously stated it would agree not to pursue reprocessing if its enrichment program were to be accepted. Fitzpatrick, “The Iranian Nuclear Crisis,” 20.

Such a deal could yield an Iran with a reduced nuclear capability, a transparent nuclear program and, more importantly, one with fewer incentives to produce nuclear weapons, and thus less of a threat to its neighbours. This is not the optimal solution, but perhaps the best one available. It should also be a step in a broader strategy of normalizing relations with Iran and moving towards a nuclear-weapons-free zone in the Middle East. It may be that Iran would reject even a truly generous settlement, but we won't know that for sure until that possibility is explored. A generous offer would certainly strengthen the moderates in Iran who want improved relations with the U.S. and Europe.

Thankfully, it appears that the consensus in the West is finally beginning to recognize the that 'no enrichment' is not a winning negotiating position. According to Joseph Cirincione a prominent nonproliferation expert who reportedly speaks to the Obama administration's Iran team, what the West is "looking at now is some sort of deal which allows Iran, at least in the short run, to continue a limited operation of centrifuges under an expanded and much more intrusive international inspection regime."<sup>155</sup> New talks between the P5 + 1 and Iran could begin before the end of this year.<sup>156</sup>

It is sometimes argued that letting Iran enrich would set a bad example for others because it would show that a country can have a covert nuclear program with military dimensions, be in non-compliance with its safeguards agreement, defy Security Council resolutions and international pressure and 'get away with it'. Sanctions, under this view, should at least show international community's resolve to enforce the regime.<sup>157</sup> There is some merit to this argument, but not as much as its proponents claim. The cost of legitimising Iran's enrichment program has to be weighed against the alternative of allowing the program to expand

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155. Leslie Susser, "The Gravest Threat," *The Jerusalem Post* October 12, 2010, <http://www.jpost.com/JerusalemReport/Article.aspx?id=190701>.

156. Elise Labott, "U.S., allies spar with Iran over nuclear talks venue," CNN website, November 10, 2010, <http://edition.cnn.com/2010/WORLD/meast/11/09/iran.nuclear.talks/>.

157. This view is often held by even moderate, mainstream nonproliferation experts. See for example Perkovich, "Sanctions on Iran – The Least Bad Option."

unchecked in an atmosphere of hostility that risks pushing Iran closer towards a nuclear capability, and perhaps right out of the NPT. Potential proliferators have already learned from the Iranian example (as well as from those of North Korea, Libya, Syria, and Iraq) that they must be prepared to run the gauntlet of strained international relations, sanctions, and even threats or the use of military force. An additional few years of sanctions of limited effectiveness is unlikely to alter this calculus significantly.

The U.S. is also likely to have a lot more leverage on other potential proliferators than it does on Iran. Many of the states that usually make the list of states of proliferation concern (South Korea, Japan, Saudi Arabia and other Persian Gulf states, and Turkey) are U.S. allies and heavily reliant on its security guarantees. As a result, they mostly lack Iran's security incentives for seeking an independent nuclear deterrent, and will want to avoid jeopardizing their relationship with the U.S. The likelihood for spill-over effects of the North Korean and Iranian crises is examined below in more detail.

### **East Asia and the Middle East: Tipping Points Realized?**

Might proliferation in North Korea or Iran cause further proliferation in their respective regions? Are we perhaps nearing proliferation tipping points in East Asia and the Middle East? If so, what does this mean for the risk of stumbling past a global tipping point? Before attempting to answer these questions, we should examine the concepts of 'nuclear forbearance' and 'nuclear tipping point'. Because proliferation is not a binary, on-off, phenomenon, there may be more than one type of tipping point on the continuum from nuclear forbearance to the pursuit and deployment of nuclear weapons.

Maria Rost Rublee uses insights from social psychology to argue that the observed behaviour of nuclear restraint can be the result of at least two distinct mechanisms: "persuasion", where states come to genuinely believe nuclear restraint is the morally appropriate course of action, thus internalizing the nonproliferation norm; and "social conformity," where states retain private

preferences for proliferation but refrain from acting on them out of fear of punishment or expectation of reward.<sup>158</sup> The mechanism of persuasion implies the potential existence of one important type of tipping point: the point at which a significant number of states that have previously internalized the nonproliferation norm change their preferences in favour of proliferation. The mechanism of social conformity implies a number of further tipping points that can range from: the pursuit of relatively unambitious hedging strategies which may involve no more than the development of a domestic nuclear energy infrastructure and expertise to reduce the time needed to get to a weapon should that decision be made; to more aggressive hedging involving the development of sensitive fuel cycles capabilities; to a threshold weapons capability (generally understood as the ability to develop and deploy a weapon quickly, in a matter of months); and finally, to the ultimate tipping point of weapons deployment, where even the pressures for social conformity prove insufficient to prevent proliferation.<sup>159</sup>

What is the danger of any of these tipping points being crossed in the Middle East or in East Asia? Since 2006, thirteen Middle Eastern or North Africa states have rather suddenly expressed interest in nuclear power. These include Iran's Persian Gulf neighbours, Saudi Arabia, Kuwait, Bahrain, Qatar, the United Arab Emirates, and Oman, as well as Jordan, Algeria, Libya, Morocco, Egypt and Turkey. While the stated rationale for this sudden interest is always economic,<sup>160</sup> most observers believe that security considerations play an important role as well. According to Cirincione, these states are hedging: "They're starting their engines. It takes decades to build a nuclear infrastructure, and they're beginning

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158. Maria Roast Rublee, "Taking Stock of the Nuclear Nonproliferation Regime: Using Social Psychology to Understand Regime Effectiveness," *International Studies Review* 10, (2008), 423. In addition to persuasion, and social conformity, Rublee sees social identification as another mechanism driving proliferation decisions. This mechanism is likely the least important of the three and is not explored here for the sake of brevity.

159. Ariel E. Levite examines the strategy of nuclear hedging in "Never Say Never Again: Nuclear Reversal Revisited," *International Security* 27, no. 3 (Winter 2002/03), 59.

160. Often cited reasons include growing domestic and foreign energy demand, dwindling oil reserves, and rising oil prices which may make it more economical to export oil while using nuclear energy to cover domestic demand.

to do it now. They're saying, 'If there's going to be an arms race, we're going to be in it.'"<sup>161</sup>

If Cirincione is right, we've already passed one tipping point: the regional states decided they need to take out nuclear insurance against future threats. But this kind of hedging does not yet imply a decision to pursue a weapons capability, or to actually develop a weapon. Whether a more active regional nuclear arms race can be prevented depends on a host of factors including how these states perceive Iran's nuclear intentions, American willingness to reassure allies while avoiding threatening others, as well as broader security issues including progress on the Middle East peace process and Israel's nuclear arsenal. The 2010 NPT Review Conference agreed to take steps towards the achievement of a Middle East nuclear-weapons-free zone, starting with a regional conference on this subject in 2012. The Obama administration's recent attempt to revive the Israeli-Palestinian peace process should be seen in this light, although as of yet it is meeting with poor results.

Ariel Levite points out that, overall, the U.S. has a relatively strong record of intervening to prevent proliferation. Such interventions have included: extending positive and negative security guarantees; stationing of 'trip-wire' U.S. forces on foreign territories; conventional weapons sales (e.g. to NATO allies, Japan, South Korea; Australia); reassurances about the behaviour or intent of third parties (e.g. the reassurance of Egypt regarding Israel's nuclear behaviour); the promise of economic or technological assistance (Argentina, Kazakhstan, Belarus, Ukraine, South Africa; Libya); and diplomatic pressure (Taiwan in 1976 and again in 1987, and South Korea in the 1970s and more recently).<sup>162</sup> Levite

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161. Joby Warrick, "Spread of Nuclear Capability Is Feared: Global Interest in Energy May Presage A New Arms Race," *Washington Post*, May 12, 2008. An IISS dossier offers a more cautious conclusion: "The danger of a proliferation cascade in the Middle East, while real, is not imminent. Although some countries may be positioning themselves to be able eventually to produce fissile material, no country is known or seriously believed to be currently pursuing a nuclear-weapons programme as a result of Iran's activities." John Chipman, "Nuclear Programmes in the Middle East: In the shadow of Iran," IISS Strategic Dossier, Press Statement, May 20, 2008, <http://www.iiss.org/publications/strategic-dossiers/>.

162. Levite, "Never Say Never Again," 76-85.

finds that although U.S. intervention is not sufficient to induce nuclear restraint or reversal, it does have important causal effects. This bodes well for regions like the Middle East where the U.S. has deep security ties to many of the states of concern.

Like the Middle East, East Asia is also a region where tipping points may be crossed. The typical scenario for an East Asian nuclear cascade involves North Korea's nuclear weapons program leading to "Japan reconsidering its nuclear options, closely followed by South Korea reacting to the change of stance by both North Korea and Japan. The possible further upgrading by China [...] of its nuclear capabilities and doctrine, in reaction to a nuclearized Japan and Korean Peninsula, might then trigger renewed interest by Taiwan in a nuclear weapons capacity."<sup>163</sup>

South Korea certainly faces a precarious security situation and has in the past engaged in sensitive research in violation of its safeguards obligations. However, it is also securely under the U.S. nuclear umbrella, and the U.S. maintains a force of 30,000 troops in the country. Getting an independent nuclear deterrent would not resolve South Korea's security problem but rather exacerbate it as it would raise the stakes during crises and increase pre-emptive pressures on both sides of the boarder. Muted talk of an independent nuclear deterrent arises regularly in South Korea but so far only on the periphery of political discourse.

Like Korea, Japan and Taiwan face significant external threats but are also deeply dependent on their U.S. ally. As one observer notes "Japanese security policy distilled to its essence is the American nuclear umbrella."<sup>164</sup> A similar claim can be made for Taiwan. To the extent these countries trust the U.S. commitment to their security, making indigenous weapons makes little sense: "The world does not need George W. Bush in the White House to know

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163. Christopher W. Hughes, "North Korea's Nuclear Weapons: Implications for the Nuclear Ambitions of Japan, South Korea, and Japan," *Asia Policy* 3 (January 2007): 77.

164. Masaru Tamamoto, "The Emperor's New Clothes: Can Japan Live Without the Bomb?" *World Policy Journal* 26, no. 3 (Fall 2009): 63.

what the United States will do to North Korea if it decided to attack [...] Japan [...]. If, in this horrendous scenario, the United States proved insufficient to deter North Korean aggression, than it is hard to imagine how Japan could do any better.”<sup>165</sup> The U.S. commitment to Taiwan in the face of a confrontation with China is much more uncertain (which is why Taiwan had already on two occasions started, but been pressured to shut down, an indigenous nuclear weapons program). For now, however, Taiwan seems to have decided that a nuclear weapons program would only exacerbate the very problems it would have been meant to address, because it would likely alienate the country’s American protector, and raise pressures for preventive war within China.

This brief analysis suggests that while the developments in the Middle East and East Asia are troubling, the risk that significant tipping points will be crossed appears manageable.<sup>166</sup> For now, many regional states appear content to proceed cautiously, tentatively hedging their nuclear bets, to prevent precipitating a nuclear arms race.<sup>167</sup> This could give the international community time to address the issues driving the proliferation dynamics in each region. Unfortunately, this calculus could be upset if the broader, global security environment deteriorates in a significant way, and there is some evidence that it soon may.

## The Future Security Environment

Writing about the conditions necessary for the eventual abolition of nuclear weapons, Harald Müller emphasizes the importance of auspicious ‘framework conditions’ including the “overwhelming need to create and maintain cordial

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165. Masaru Tamamoto, “The Emperor’s New Clothes,” 70.

166. Russell makes this point about the Middle East, but it likely applies to East Asia as well; Russell, “A Tipping Point Realized?” 534-5.

167. T.V. Paul calls such restraint “prudential realism”. It stems out of concern for how other states might perceive and respond to one’s actions; T. V. Paul, *Power Versus Prudence*.



great-power relations.”<sup>168</sup> The requirements for sustainable nonproliferation are the same. While the post-Cold War period has been one of unusual peace and prosperity, it might also have been a brief ‘holiday from history’ that could soon come to an end, with disastrous consequences for the nonproliferation regime. There are two most likely pathways by which such a deterioration in the global security environment could occur: conflict resulting from the shifting global balance of power; and conflict arising from the consequences of severe climate change. Both these pathways are briefly considered below.

In *War and Change in World Politics*, Robert Gilpin argued that the most powerful states always shape the international order to suit their interests. Over time, as technological, economic, or social developments alter the relative balance of power, rising great powers attempt to rewrite the rules of the game in their favour. This, says Gilpin, puts them on a collision course with the declining powers, which are heavily invested in the *status quo*.<sup>169</sup> It is widely believed that we are now witnessing a power transition from the transatlantic region (North America and Europe) towards the rising economies of Asia, particularly China and India. If Gilpin is right, the risk of renewed great-power conflict could be about to rise considerably.<sup>170</sup>

The Chinese economy has been growing at around 10% a year since 1980, and in 2010 surpassed Japan’s to become the second largest in the world.

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168. Harald Müller, “The Importance of Framework Conditions,” in *Abolishing Nuclear Weapons: A Debate*, eds. George Perkovich and James M. Acton (Carnegie Endowment for International Peace, 2009), 171.

169. Robert Gilpin, *War and Change in World Politics* (Cambridge: Cambridge University Press, 1981).

170. John Lee, “The Future is Already Here,” *The Diplomat*, <http://apac2020.the-diplomat.com/feature/the-future-is-already-here/>. For a prediction of more tumultuous international relations in a world with a number of great powers see Robert Kagan, “End of Dreams, Return of History,” *Policy Review* 144 (July 2007), <http://www.hoover.org/publications/policy-review/article/6136>. The recent, global financial crisis has hastened the relative decline of U.S. influence on the world stage, perhaps striking a final blow to those optimists who believed that the international security systems could be centrally managed from Washington.

It is still only little more than a third as large as the American economy<sup>171</sup> but some analysts project it to overtake the latter as early as the 2020s or the 2030s. Although these estimates depend on the questionable assumption that China's future growth rates will match those of the past thirty years,<sup>172</sup> there is no doubt that China is a global power on the ascent, and this new power is giving China the ability to compete with the U.S. and other established powers more seriously, and in more spheres, than before.<sup>173</sup>

Thus, greater friction in international relations is likely unavoidable, but whether this friction can be contained in the politico-economic sphere where it belongs, or whether it will cross over to the security realm will depend on whether the U.S., China and the broader international community can manage the transition responsibly. As China's military power increases, it can be expected to become more assertive about its claims over Taiwan, or in the South China sea. It is imperative that these and other potential crises be resolved through measured diplomacy.

Unfortunately recent history is not altogether encouraging. Following the inauguration of the Bush administration and the 9/11 attacks, U.S. 'grand strategy' took a decidedly unilateralist, primacist direction, seeking to establish U.S. military superiority sufficient to "dissuade potential adversaries [read China, or resurgent Russia] from pursuing a military build-up in hopes of surpassing or

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171. International Monetary Fund, World Economic Outlook Database, April 2010 edition, [www.imf.org/external/pubs/ft/weo/2010/01/weodata/index.aspx](http://www.imf.org/external/pubs/ft/weo/2010/01/weodata/index.aspx).

172. Minxin Pei, "China's not a superpower" *The Diplomat*, <http://apac2020.the-diplomat.com/feature/china%E2%80%99s-not-a-superpower/3/>.

173. The current competition among major powers to lock in energy supplies is an illustration. China with an insatiable and growing thirst for energy, perceives the American invasion of Iraq to be part of an American strategy to establish military dominance in the Middle East, and give it the ability to choke off oil supplies to China in a crisis (for example, over Taiwan). China has responded by diversifying its supply to African countries. Its strategic alliance with the Sudanese government has prevented stronger action to stop massacres in Darfur. This is just one example of how divergent interest and perceptions can generate unforeseen friction in great power relations; Gwynne Dyer, *Climate Wars*, (Toronto: Vintage Canada, 2009), 103.

equalling the power of the United States”.<sup>174</sup> This sentiment has not fully dissipated with the coming of a new administration. While the Obama administration has generally demonstrated a more cooperative approach to international politics<sup>175</sup> it has also retained some worrying primacist vestiges, like the development of the ‘prompt global strike’ system that would give the U.S. the ability to hit a target anywhere in the world in under 60 minutes using conventionally-armed ICBMs and other systems.<sup>176</sup> Furthermore, as one observer notes, there remains:

a flourishing intellectual industry in the United States promoting the idea that a long military confrontation with China is inevitable. It has considerable tacit support from those branches of the U.S. Armed Forces that can only justify their large investments in high-tech military hardware by the existence of a “peer competitor”: some other country big and powerful enough to justify the maintenance of twelve aircraft-carrier task forces [...] it is not to be doubted that there are similar groups in the Chinese armed forces who use the “American threat” to justify their own requests for more and better weapons.<sup>177</sup>

Even if military conflict can be avoided, discord among the great powers could stifle much needed cooperation on managing the climate crisis. In his book *Climate Wars*, based largely on interviews with dozens of top subject-matter experts, Gwynne Dyer endeavours to understand the geopolitical effects of the accelerating climate crisis. Dyer concludes *inter alia* that: 1) we can expect the planet to be anywhere between two and twelve degrees Celsius hotter by the end

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174. United States Government, *National Security Strategy of the United States of America*, (September 2002), 30-31, quoted in Ross and Ross, “‘Grand Strategy Options’ in the American International Security Debate”, 190-197.

175. For example, it has recently reversed the Bush policy on the militarization of space, which rejected “any limitations on the fundamental right of the United States to operate in and acquire data from space”. The new U.S. space policy is open to proposals for arms control measures in space. William J. Broad and Kenneth Chang, “Obama Reverses Bush’s Space Policy,” *New York Times*, June 28, 2010.

176. Amy F. Woolf, *Conventional Prompt Global Strike and Long-Range Ballistic Missiles: Background and Issues* (Congressional Research Service, 2010), <http://www.fas.org/sgp/crs/nuke/R41464.pdf>.

177. Dyer, *Climate Wars*, 109.

this century (short of the politically-impossible feat of decarbonising the economy whole-sale by mid-century, there is just too much warming momentum built into the system to avoid this outcome and natural, positive feedback mechanisms may be already kicking-in); 2) attempts at geo-engineering a cooler world in the mid-term, while humanity brings its emissions under control, may be the only way to avoid a climate catastrophe, but geo-engineering techniques are unproven and may backfire; 3) if our efforts to prevent a temperature rise of 2-4 degrees above pre-industrial levels do not succeed, the consequences will likely include widespread drought, mass-famine, and inundation of some heavily-populated coastal areas, leading to endemic military conflict and near-total break-down of international cooperation. As Dyer explains, this would be:

a world where people are starting to starve, but it is not always the familiar scene of helpless peasant societies facing famine with numb resignation. Some of the victims now are fully developed, technologically competent countries, and their people will not watch their children starve so long as there is any recourse, however illegitimate, that might save them. So the lucky countries in the northern tier that can still feed themselves – but have little or no food to spare – must be able to turn back hordes of hungry refugees, quite probably by force. They must also be able to deal with neighbours who try to extort food by threats – and these desperate neighbours may even be armed with nuclear weapons. Appeals to reason will be pointless, as it is reasonable for nations to do anything they can to avoid mass starvation.<sup>178</sup>

Needless to say, cooperation on nuclear nonproliferation is likely to go out the window long before such severe impacts occur, as nations foresee and prepare for a dangerous future. If that should happen, how will the established nuclear powers respond? One possibility is that the demise of nonproliferation multilateralism will give rise to counter-proliferation unilateralism, or perhaps joint

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178. Dyer, *Climate Wars*, 4. See also a 2003 study for the Pentagon which hypothesises the potential effects of abrupt climate change triggered by a sudden slowing of the oceans' thermohaline conveyers, the currents that help distribute heat in the biosphere by bringing masses of warmer water from the tropics to higher and lower latitudes. They study concluded that it is plausible that such an event could occur as the result of climate change and, in the extreme, could result in a "significant drop in the human carrying capacity of the Earth's environment." Schwartz and Rundell, *An Abrupt Climate Change Scenario*, (2003).

action by a cartel of NWSs. In such a scenario, the NWSs would, individually or collectively, take militarily action to deny nuclear weapons capability to 'states of concern'. Regardless of how successful such efforts could be in preventing proliferation in the long-run – and there are good reasons for doubt<sup>179</sup> – the consequences for international security would be dire.

As this section has shown, the long-term challenges for nonproliferation go far beyond the relatively manageable, localized crises of North Korea or Iran. A shifting balance of power and disruptions to the earth's life support systems threaten to upset the stability of the global order as a whole, and to derail the current, multilateral nonproliferation regime. The future is always unclear and neither of these two hypothesised phenomena may come to pass, or if they do, their effects on nuclear proliferation may be less adverse than what has been implied here,<sup>180</sup> however, it seems more likely that the window to make meaningful progress on nuclear proliferation may be small and closing. This may be especially true in light of the accelerating spread of nuclear technology and expertise around the world, which is the subject of the following chapter.

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179. To have a good chance of succeeding in stopping or at least minimizing nuclear proliferation in a world where demand for such weapons would be high due to a deteriorated security environment, nuclear-armed states would need to collude in taking preventive military action against possible proliferators. However, in such a destabilized world, competition and conflict rather than collusion would likely characterize great power relations.

180. For example, a deteriorating security environment may lead to the re-establishment of robust alliance systems, which could help rein-in proliferation, or to a greater willingness by the great powers to engage in counter-proliferation wars. Such wars are rare in today's world partly because cooperation is the best strategy when states' horizons stretch into the indefinite future. However, in a dangerous world where the future is highly uncertain, states may well choose to focus on their immediate security needs, and to discount future cooperation. These questions deserve further study.

## CHAPTER 2: PEACEFUL USES

As part of the NPT's grand bargain, non-nuclear weapon states were assured that the treaty would not restrict their right to develop the peaceful applications of nuclear power. They were further promised active cooperation and technical assistance in the nuclear field.<sup>181</sup> Together, these rights to the 'peaceful uses' of nuclear energy are widely acknowledged as one of the three pillars of the NPT. They are codified under NPT's Article IV:

1. Nothing in this Treaty shall be interpreted as affecting the inalienable right of all the Parties to the Treaty to develop research, production and use of nuclear energy for peaceful purposes without discrimination and in conformity with articles I and II of this Treaty.

2. All the Parties to the Treaty undertake to facilitate, and have the right to participate in, the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy. Parties to the Treaty in a position to do so shall also co-operate in contributing alone or together with other States or international organizations to the further development of the applications of nuclear energy for peaceful purposes, especially in the territories of non-nuclear-weapon States Party to the Treaty, with due consideration for the needs of the developing areas of the world.<sup>182</sup>

However, because civilian nuclear expertise and technology can often be applied to military uses, there is a strong tension between Article IV rights and the regime's nonproliferation pillar. Indeed, although certain technologies, related to uranium enrichment and spent reactor fuel reprocessing, present an especially elevated proliferation risk, "Almost all nuclear technology in use around the world

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181. For the relevant negotiating history see Mohamed Ibrahim Shaker, *The Nuclear Non-Proliferation Treaty: Origin and Implementation 1959-1979*, Vol. 1 (New York: Oceana Publications Inc., 1980), 274-277.

182. Emphasis added. *The Treaty on the Non-Proliferation of Nuclear Weapons* (1968), [www.un.org/en/conf/npt/2010/npttext.shtml](http://www.un.org/en/conf/npt/2010/npttext.shtml).

today is 'dual-use', able to contribute to the production of fuel for nuclear reactors or the explosive components of nuclear weapons."<sup>183</sup>

The following illustrates some common concerns. A state could develop a domestic nuclear power program, including uranium enrichment, or plutonium separation (reprocessing) capability ostensibly for reactor fuel production, and later use these capabilities to break-out of the regime to pursue nuclear weapons. Alternatively, nuclear material could be 'diverted' from a civilian nuclear program into a parallel, clandestine weapons program. The civilian program could also help mask the covert program by disguising transactions, shipments, and the movement of staff. Lastly, developing nuclear power can be problematic even when intentions are truly benign. Because intentions are often difficult to discern, and are subject to change, neighbouring states may respond by hedging their bets and moving closer towards a weapons capability themselves.

This chapter examines the extent to which the nonproliferation regime can succeed in reconciling peaceful uses of nuclear energy and nonproliferation. To do so, it examines the mechanisms currently in place to prevent abuses of peaceful uses – the IAEA safeguards regime, and the nuclear export control regime – as well as the likelihood and the potential consequences for proliferation of the expected global 'renaissance' of nuclear power.

## **IAEA Safeguards**

Article III of the NPT creates a legal obligation for parties to conclude arrangements with the IAEA for the purpose of compliance verification. The article compels each state party to:

accept safeguards, as set forth in an agreement to be negotiated and concluded with the International Atomic Energy Agency [...] for the exclusive purpose of verification of its obligations assumed

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183. James A. Acton, "The Problem with Nuclear Mind Reading," *Survival* 51, no. 1 (February-March 2009): 119. Technical knowledge gained from even a genuinely peaceful nuclear energy program helps lay the foundation for weapons development. See also Matthew Fuhrmann, "Spreading Temptation Proliferation and Peaceful Nuclear Cooperation Agreements," *International Security* 34, no. 1 (Summer 2009).

under this Treaty with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other nuclear devices [...] The safeguards required by this article shall be applied on all source or special fissionable material in all peaceful nuclear activities within the territory of such State, under its jurisdiction or carried out under its control anywhere.<sup>184</sup>

The next two sections examine two types of IAEA safeguards: ‘comprehensive safeguards’ and safeguards established under an ‘Additional Protocol’ to a comprehensive safeguards agreement.

### Comprehensive Safeguards

The basic template for concluding safeguards agreements between the IAEA and parties to the NPT was developed in 1972. Known as INFCIRC/153,<sup>185</sup> it forms the basis for the ‘comprehensive safeguards agreements’ (CSAs) that form the core of the IAEA verification system<sup>186</sup>. INFCIRC/153 operationalizes the objective of a CSA as the “the timely detection of diversion of significant quantities of nuclear material from peaceful nuclear activities to the manufacture of nuclear weapons or of other nuclear explosive devices or for purposes unknown, and deterrence of such diversion by the risk of early detection”<sup>187</sup>. Under a CSA, a state is required to ‘declare’ to the IAEA its nuclear material<sup>188</sup> flows and inventories, as well as information on key nuclear facility design and

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184. *The Treaty on the Non-Proliferation of Nuclear Weapons* (1968), [www.un.org/en/conf/npt/2010/npttext.shtml](http://www.un.org/en/conf/npt/2010/npttext.shtml).

185. INFCIRC/153 (Corr.) (hereafter INFCIRC/153) is an abbreviation for Information Circular 153 (Corrected), the full title of which is *The Structure and Content of Agreements between the Agency and States Required in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons*, (Vienna: IAEA, 1972), [www.iaea.org/Publications/Documents/Infcircs/Others/infcirc153.pdf](http://www.iaea.org/Publications/Documents/Infcircs/Others/infcirc153.pdf).

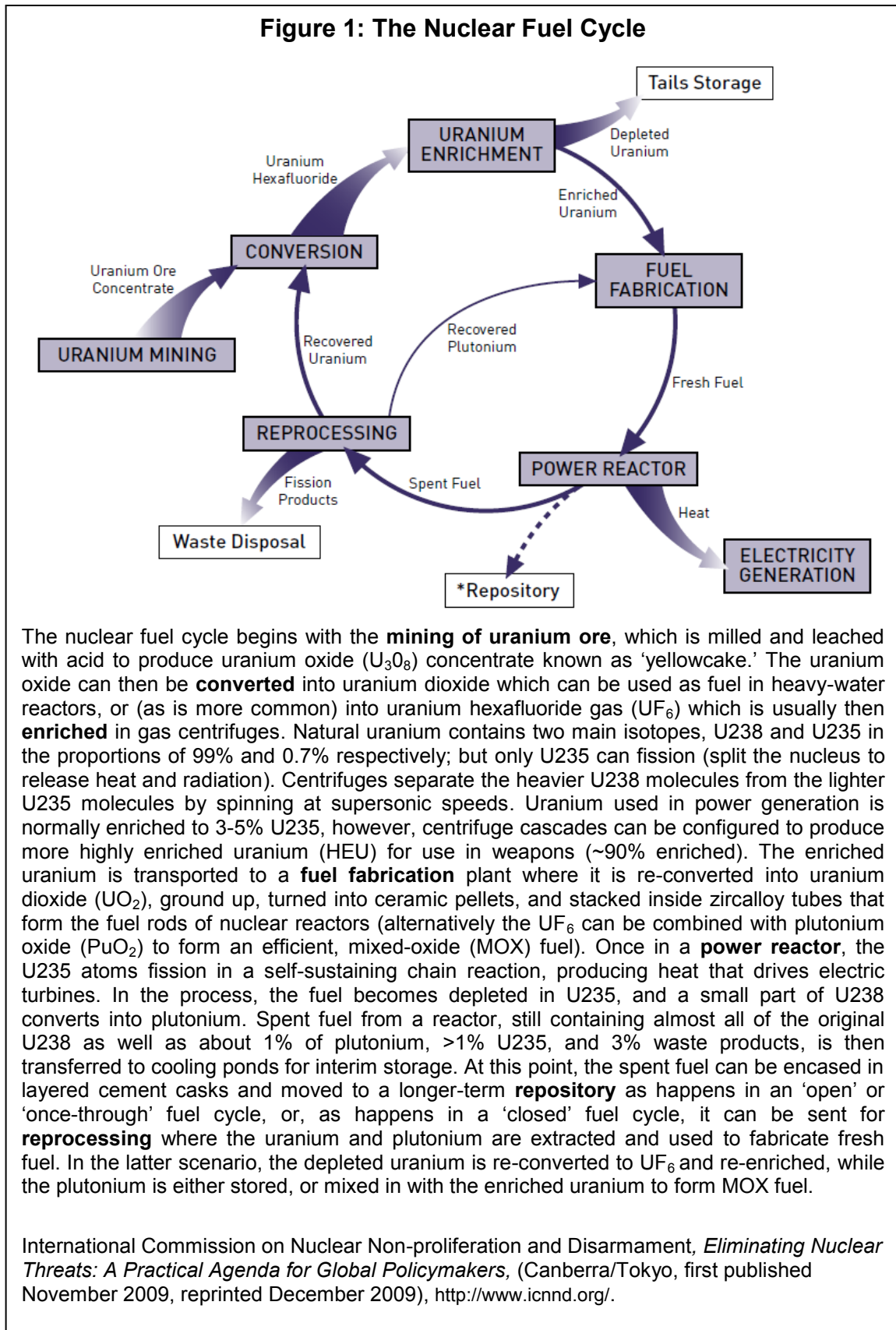
186. I use the terms ‘verification’ and ‘safeguards’ interchangeably. The former is more accurate, but the latter is very well established in the lexicon.

187. IAEA, *The Structure and Content of Agreements*, para. 28.

188. This means ‘source or special fissionable material’, where ‘source material’ is defined as natural or depleted uranium, and thorium, and ‘special fissionable material’ means plutonium-239, uranium-233, and enriched uranium. International Atomic Energy Agency, *Statute of the International Atomic Energy Agency*, Article XX, [www.iaea.org/About/statute\\_text.html](http://www.iaea.org/About/statute_text.html).



Figure 1: The Nuclear Fuel Cycle



The nuclear fuel cycle begins with the **mining of uranium ore**, which is milled and leached with acid to produce uranium oxide ( $U_3O_8$ ) concentrate known as 'yellowcake.' The uranium oxide can then be **converted** into uranium dioxide which can be used as fuel in heavy-water reactors, or (as is more common) into uranium hexafluoride gas ( $UF_6$ ) which is usually then **enriched** in gas centrifuges. Natural uranium contains two main isotopes, U238 and U235 in the proportions of 99% and 0.7% respectively; but only U235 can fission (split the nucleus to release heat and radiation). Centrifuges separate the heavier U238 molecules from the lighter U235 molecules by spinning at supersonic speeds. Uranium used in power generation is normally enriched to 3-5% U235, however, centrifuge cascades can be configured to produce more highly enriched uranium (HEU) for use in weapons (~90% enriched). The enriched uranium is transported to a **fuel fabrication** plant where it is re-converted into uranium dioxide ( $UO_2$ ), ground up, turned into ceramic pellets, and stacked inside zircalloy tubes that form the fuel rods of nuclear reactors (alternatively the  $UF_6$  can be combined with plutonium oxide ( $PuO_2$ ) to form an efficient, mixed-oxide (MOX) fuel). Once in a **power reactor**, the U235 atoms fission in a self-sustaining chain reaction, producing heat that drives electric turbines. In the process, the fuel becomes depleted in U235, and a small part of U238 converts into plutonium. Spent fuel from a reactor, still containing almost all of the original U238 as well as about 1% of plutonium, >1% U235, and 3% waste products, is then transferred to cooling ponds for interim storage. At this point, the spent fuel can be encased in layered cement casks and moved to a longer-term **repository** as happens in an 'open' or 'once-through' fuel cycle, or, as happens in a 'closed' fuel cycle, it can be sent for **reprocessing** where the uranium and plutonium are extracted and used to fabricate fresh fuel. In the latter scenario, the depleted uranium is re-converted to  $UF_6$  and re-enriched, while the plutonium is either stored, or mixed in with the enriched uranium to form MOX fuel.

International Commission on Nuclear Non-proliferation and Disarmament, *Eliminating Nuclear Threats: A Practical Agenda for Global Policymakers*, (Canberra/Tokyo, first published November 2009, reprinted December 2009), <http://www.icnnd.org/>.

operations.<sup>189</sup> Traditionally, the agency has focused on verifying the accuracy of this information through the use of ‘safeguards’ techniques consisting principally of nuclear accountancy, facility design information verification, and containment and surveillance (C/S) measures (using seals, cameras etc.) These techniques, and some of their shortcomings, are described below in more detail.

The term nuclear accountancy has two meanings in the safeguards context. In the first sense it refers to the practice of record-keeping and reporting on nuclear activities and material inventories by facility operators as specified in subsidiary agreements concluded between the state and IAEA under the authority of a CSA. In the second sense, nuclear accountancy refers to the practice of independently verifying the correctness of these records and reports by the IAEA. This second concept involves IAEA scrutiny of facility and state-wide records and record-keeping procedures, as well as the physical examination of inventories to determine if they match the records. This physical examination takes place during IAEA inspections<sup>190</sup> and consists of item counting and/or destructive and non-destructive assay measurements (measuring isotopic composition of materials).<sup>191</sup> Thus “fuel assemblies, bundles or rods, or containers of powdered compounds of uranium and plutonium”<sup>192</sup> would be counted by inspectors and their contents measured by weighing the items and/or

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189. International Atomic Energy Agency (IAEA), *IAEA Safeguards: Staying Ahead of the Game*, (Vienna: IAEA, 2007), 9 <http://www.iaea.org/Publications/Booklets/>.

190. INFCIRC/153 foresees three types of inspections: ad hoc, routine, and special. Ad hoc inspections normally result when a states notifies the IAEA of a significant change to its nuclear material inventory (for example through import of export). For routine inspections, fifty “man-days” are allotted in cases of nuclear reactors and sealed stores, and the IAEA must give one week notice of inspections. In cases of facilities containing plutonium or uranium enriched above 5%, inspections can be more frequent, and require 24 hours notice. In all cases, however, the IAEA is expected to “advise the State periodically of its general programme of announced and unannounced inspections, specifying the general periods when inspections are foreseen”. In case of special inspections, the agency must give notice “as promptly as possible” and as part of its consultation with the state regarding the special inspection. IAEA, *The Structure and Content of Agreements*, para. 78-84.

191. For a detailed description of these and related measures see International Atomic Energy Agency (IAEA), *Safeguards Techniques and Equipment* (Vienna: IAEA, 2003), [www-pub.iaea.org/MTCD/publications/PDF/NVS1-2003\\_web.pdf](http://www-pub.iaea.org/MTCD/publications/PDF/NVS1-2003_web.pdf).

192. IAEA, *Safeguards Techniques and Equipment*.

using non-destructive assay analysis such as neutron counting and gamma ray spectrometry. These techniques produce results with a margin of error of a few percent. The IAEA attempts to reduce this margin to about one percent through the use of destructive analysis of some items at an IAEA affiliated laboratory.<sup>193</sup> The findings are then statistically extrapolated to the remaining inventory.

To maintain 'continuity of knowledge' about safeguarded materials between inspections, the IAEA relies on the techniques of containment and surveillance (C/S). Containment refers to techniques and devices used to ensure, in so far as possible, the detection of access to specific areas or containers.<sup>194</sup> The IAEA practices containment through the use of seals, also called 'tamper indicating devices,' which are used on documents, equipment (the agency's or the state's), containers, and storage facilities. Several types of seals are in use by the IAEA ranging from relatively simple and inexpensive metal cap and paper seals to more hi-tech, electronic, ultrasonic and fibre-optic sealing systems. Some of these seals are verifiable *in situ* while others must be verified in an IAEA lab.<sup>195</sup> Tens of thousands of seals (mostly of the metal cap variety) are deployed by the IAEA at over 900 facilities throughout the world.<sup>196</sup>

Like containment, optical surveillance measures are concerned with the detection of access to safeguarded areas or items. Surveillance, however, is done via digital cameras, usually two or more, positioned in such a way that attempts to move or access safeguarded objects or to tamper with their seals would normally be recorded. The cameras may be set to take pictures at pre-set or random intervals or they may be triggered by motion or unusually high levels of radiation. Surveillance and containment systems reinforce one another. While

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193. The IAEA's small budget necessitates that it rely on subcontractors in member states for most of its laboratory work.

194. It is important not to conflate C/S with security measures. Security measures like locks aim to deny access to an area or item, while C/S measures like seals, cameras and other sensors aim merely to detect and alert about access. Many seals are made of materials like paper, plastic and wire and can be easily cut or otherwise opened.

195. IAEA, *Safeguards Techniques and Equipment*, 48-53.

196. *Ibid.*

cameras may help detect attempts to defeat seals, seals are normally placed on cameras to deter tampering.<sup>197</sup> In addition to containment and surveillance measures, the IAEA uses a variety of sensor systems that can detect different types of radiation as well as movement, vibration and electricity consumption.<sup>198</sup>

### **The Limits of Comprehensive Safeguards: Enter the Additional Protocol**

CSA-type safeguards have a major design defect. They focus almost exclusively on the detection of diversion of materials from *declared* activities, but are ill-suited to verifying whether or not the declarations made by the state in fact constitute full disclosure. In other words, they can verify the 'correctness' but not the 'completeness' of the states' declarations. During the drafting of Article III, NNWSs expressed strong concerns that frequent or invasive inspections would disrupt operations or reveal industrial secrets. There was a clear limit to the degree of intrusion states were willing to accept, and INFCIRC/153 reflects that reality. Simple lack of imagination on the part of the IAEA also played a role, as did the fact that at the time when INFCIRC/153 was being drafted the states of greatest proliferation potential were mostly advanced democracies (like Germany and Japan and the Netherlands, which possessed large enrichment or reprocessing facilities) with a stake in the proliferation status quo and thus

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197. IAEA, *Safeguards Techniques and Equipment*, 48-53.

198. Containment, surveillance and the non-optical monitoring just described can be deployed in either the unattended monitoring mode or the remote monitoring mode. Unattended monitoring systems store the recorded information internally until such time as it is retrieved during inspection at which point it is either examined *in situ* or taken for analysis to an IAEA or affiliated lab. Unattended systems are increasingly being replaced to allow for remote monitoring, which allows the collected safeguards data (as well as the 'health' status data of the collecting device) to be transmitted off-site for storage and analysis. The data may be authenticated and encrypted and then transmitted via secure telephone, internet or satellite links. Since remote monitoring is done in real time, it denies the adversary the chance to tamper with the equipment unmolested during the often lengthy intervals between inspections. The IAEA also counts on remote monitoring technology to be less labour-intensive and thus cheaper; a significant consideration for the cash-strapped agency. The number of remote monitoring systems has grown from six to 193 between 1999 and 2009. IAEA, *IAEA Annual Report 2009*, (Vienna: IAEA, 2010), 84, <http://www.iaea.org/Publications/Reports/>. The risk of this approach is that the longer intervals between inspections made possible by the remote systems may become detrimental to safeguards if an adversary manages to defeat the monitoring system.

unlikely to cheat.<sup>199</sup> All these factors led to the institutionalization of a safeguards system ill-suited to the detection of undeclared, clandestine activities.

These shortcomings were dramatically demonstrated in the aftermath of the First Gulf War when it was revealed that Iraq had managed to get within perhaps a few years of producing nuclear weapons, all the while maintaining a clean bill of health with the IAEA.<sup>200</sup> The experience in Iraq, and to a lesser extent in North Korea a few years later, forced the IAEA to reconceptualize its safeguards system as more investigative and adversarial in order to ensure not only the non-diversion of *declared* material from peaceful uses, but also the absence of *undeclared material and activities* in the territory of the state.<sup>201</sup>

The IAEA was able to implement some reforms using the authority it already possessed under the CSAs. The most significant of these included: expanding the agency's in-house analytical capability (including greater use and analysis of satellite imagery); the tightening of requirements for the provision of facility design information; increasing the number of 'unannounced inspections'<sup>202</sup>, and the use of environmental sampling techniques on locations already covered under CSAs.<sup>203</sup> More robust reforms, however, required the IAEA to negotiate additional authority with the states. To this end, in 1997, the agency created a 'Model Additional Protocol'<sup>204</sup> (also known as INFCIRC/540) to

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199. Lawrence Scheinman, "Cooperative Oversight of Dangerous Technologies Lessons from the International Atomic Energy Agency Safeguards System," (Center for International and Security Studies at Maryland, 2005), [www.cissm.umd.edu/papers/display.php?id=103](http://www.cissm.umd.edu/papers/display.php?id=103).

200. Libya also managed to hide a clandestine program from the IAEA for a decade.

201. IAEA, *IAEA Safeguards: Staying Ahead of the Game*, 9-16.

202. Under INFCIRC/153 (Corr.) the IAEA may carry out "a portion" of its routine inspections "in accordance with the principle of random sampling". Although these inspections fall outside of the pre-agreed inspection schedule, they are never entirely unannounced. As discussed in footnote 190 above, the IAEA is obliged to provide advance notice of all inspections whenever possible.

203. International Atomic Energy Agency (IAEA), *The Safeguards System of the International Atomic Energy Agency* (Vienna: IAEA), [www.iaea.org/OurWork/SV/Safeguards/safeg\\_system.pdf](http://www.iaea.org/OurWork/SV/Safeguards/safeg_system.pdf).

serve as a template for concluding Additional Protocols (APs) to the INFCIRC/153 comprehensive safeguards agreements.

An AP extends the scope of safeguards to previously unmonitored parts of the fuel cycle like uranium mining, processing, and waste storage. It also grants the IAEA access to parts of a state's nuclear industrial complex, including equipment manufacturing, and research and development, that do not involve the direct use of nuclear materials.<sup>205</sup> A state with an AP in force is also required to provide the agency with general information on, and access to, all buildings on a site (so-called 'complementary access') including decommissioned facilities. Previously, access was restricted to select, 'strategic' buildings on a site. Importantly, under an AP, notice for routine inspections is reduced from one week to twenty-four hours (two hours for specific buildings on a site already being inspected but not included in the original notification. This requirement however may be waived by inspectors under undefined "exceptional" circumstances). The AP also makes it more difficult for a state to stone-wall inspections by denying inspectors entry visas; imposes more stringent reporting requirements on the import and export of nuclear materials and equipment; and obligates the state to submit a general, ten-year plan of its nuclear industry development; allows the IAEA greater access to staff; and finally gives the agency greater latitude to use environmental sampling techniques, especially outside of declared locations.<sup>206</sup>

There is widespread agreement among Western observers that Additional Protocols add value to IAEA safeguards. While they do not guarantee the detection of the diversion of nuclear material, or of undeclared nuclear activities, the APs do help to reduce uncertainty about the nature of nuclear activities in the

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204. International Atomic Energy Agency, *Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency for the Application of Safeguards*, INFCIRC/540 (Corrected), (Vienna: IAEA, 1997), 1-44, <http://www.iaea.org/Publications/Documents/Infcircs/1997/infirc540c.pdf>.

205. IAEA, *IAEA Safeguards: Staying Ahead of the Game*, 9-16.

206. Environmental sampling analyzes swipe samples of surfaces of objects from locations of interest for signature traces of nuclear materials like the isotopes of uranium and plutonium. Upon arrival at the IAEA clean laboratory, samples are numbered to prevent technician bias and tested using a variety of techniques. See IAEA, *Safeguards Techniques and Equipment*, 75-82.

state in question. Unfortunately, there is still a substantial, if narrowing, gap in safeguards coverage around the world. As of May 2010, 18 NNWSs party to the NPT did not yet have CSAs in force<sup>207</sup> while 89 did not yet have APs in force. Thus, in its *Safeguards Statement for 2009*, the IAEA was able to report that only a total of 89 states had both a CSA and an AP in place. Furthermore, given the lengthy process of resolving discrepancies and the significant delays of some states in submitting reports to the IAEA, the agency could only conclude that nuclear material remained in peaceful uses in 52 of these 89 states, and in Taiwan. That's just over a quarter of the 189 parties to the NPT.<sup>208</sup>

### **How Effective Can Safeguards Be?**

As already mentioned, safeguards can never guarantee the non-diversion of nuclear material from declared uses, or the absence of undeclared activities. They can only reduce uncertainty about the likely occurrence of such events, help provide early warning of illicit activities, and hopefully help deter potential proliferators. However, the current safeguards system contains a number of weaknesses. Some of these can be ameliorated or eliminated through better policy, but others cannot. These limitations must be kept in mind when drawing conclusions about the nonproliferation implications of the spread of peaceful uses of nuclear energy.

International treaty verification is by nature fraught with difficulties. In the NPT's case, while a state determined to cheat the system has no guarantees of success, it does enjoy considerable advantages over the designated oversight body. Most importantly, it has enormous resources at its disposal and it owns, and thus controls, the areas and materials of concern, whereas the IAEA's

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207. Although these states are of marginal proliferation concern: Andorra, Benin, Cape Verde, Congo, Djibouti, Montenegro, Timor-Leste, Togo, Equatorial Guinea, Mozambique, Vanuatu, Eritrea, Guinea, Guinea Bissau, Liberia, Micronesia, São Tomé & Príncipe, Somalia. International Atomic Energy Agency, "NPT Comprehensive Safeguards Agreement: Overview of Status", IAEA website, [www.iaea.org/Publications/Factsheets/English/nptstatus\\_overview.html](http://www.iaea.org/Publications/Factsheets/English/nptstatus_overview.html).

208. IAEA, *Safeguards Statement for 2009*, (Vienna: IAEA, 2010), <http://www.iaea.org/OurWork/SV/Safeguards/es2009.pdf>.

access to these is intermittent and its efforts constrained by limited funding and legal boundaries of CSAs and APs.

For example, non-destructive assay analysis performed as a key part of material accountancy produces results with a margin of error of a few percentage points. Over a period of time, a proliferator could feasibly divert nuclear materials without detection by removing sub-threshold quantities of material. Destructive assay analysis meant to alleviate this danger performs better, lowering the margin of error to around one percent, but is applied according to the principle of random sampling which means that the diversion may not be detected.

Discrepancies between facility records and the results of physical inventory inspections are referred to as 'material unaccounted for' (MUF). Because nuclear material is *expected* to go missing due to the nature of fuel cycle processes like fuel fabrication, uranium enrichment, and others, a positive value for MUF is set by the IAEA using statistical techniques. MUF in excess of this value draws scrutiny from the IAEA but, as the agency itself admits, there may sometimes be little it can do to determine the cause of the discrepancy: "if MUF is large because measurement quality is poor or because there are large quantities of material accounted for improperly, then the diversion of M [material] can be concealed."<sup>209</sup>

The possibility of concealing material diversion as MUF is especially worrisome in the case of plutonium, which tends to stick to equipment casing and is thus difficult to account for accurately. An outstanding example is that of a Japanese fuel reprocessing plant at Tokai-mura, which in 2003 reported that during a span of fifteen years its plutonium MUF had reached 206kg, or enough for about 30 weapons of the type of the 'Fat Man' weapon dropped on Nagasaki in the closing days of World War II. A fuel fabrication plant also at Tokai-mura reported in 1994 that it could not account for 69kg of plutonium for the preceding six-year period. This problem is not unique to Japan: in 2005 a British

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209. International Atomic Energy Agency, *IAEA Safeguards Glossary* (Vienna: IAEA, 2002), [www.iaea.org/OurWork/SV/Safeguards/sv.html](http://www.iaea.org/OurWork/SV/Safeguards/sv.html).



reprocessing plant reported that over the preceding year it had lost nearly 30kg of plutonium. While some of the missing material was subsequently accounted for, it is disillusioning that in some cases the missing quantities were not reported to the IAEA for years.<sup>210</sup>

Like nuclear accountancy, the techniques of containment, surveillance and non-optical sensing also have weaknesses a would-be proliferator could exploit. During 2001-2003 Roger Johnston and his colleagues from the Vulnerability Assessment Team at Los Alamos Laboratories tested 213 different models of seals, both low and high-tech, and found that all of them could be defeated quickly and inexpensively by a skilled adversary. The mean time it took Johnston's team to defeat a seal was just 2.7 minutes, at a mean cost of \$144 dollars per seal (and a marginal cost for each additional seal of the same design of only \$0.42).<sup>211</sup> While Johnston does not discuss which seal models were tested because in his view that would unfairly single out a particular seal in a field where all have failed, he notes that 16% of the seals examined are (or were in 2003) being used in nuclear safeguards applications by national governments and the IAEA. Johnston also notes that hi-tech seals are not necessarily more effective than low-tech ones and that for some of the high-tech seals studied the opposite was true.<sup>212</sup> The only good news from the tests is Johnston's conclusion that almost 60% of the successful attacks could have been prevented by

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210. Henry Sokolski, "Rethinking Nuclear Terrorism," presentation at the Round Table of the Hanns-Seidel Stiftung "Islamic Terrorism and Means of Mass Destruction," Wildbad/Kreuth, Germany, January 24-5, 2007, [www.npolicy.org/files/article060201Rethinking%20Nuclear%20Terrorism.pdf](http://www.npolicy.org/files/article060201Rethinking%20Nuclear%20Terrorism.pdf).

211. Roger G. Johnston et al., "New Approaches to Tamper and Intrusion Detection for Safeguards and Transport Security," (Phoenix, Arizona: Proceedings of the Institute of Nuclear Materials Management, July 13-17, 2003). For an earlier but more detailed account of Johnson's study see Roger G. Johnston et al., "Efficacy of Tamper-Indicating Devices," *Journal of Homeland Security* (April, 2002): 4.

212. Johnston, et al., "Efficacy of Tamper-Indicating Devices," 4.

relatively simple countermeasures.<sup>213</sup> However, Johnston is adamant that a ‘tamper-proof’ seal is and will continue to be a dangerous myth, and cautions that “ideas about tamper detection often seem to be based on misconceptions, fuzzy goals, and wishful thinking.”<sup>214</sup> In this light, it is discouraging to see one of the IAEA’s current safeguards fact sheets refer to the use of “tamper-proof” seals and cameras.<sup>215</sup>

Nor is technology the only vulnerability of the safeguards system. The IAEA has thus far been relaxed in its efforts to guard against sabotage or espionage by some of its numerous employees with access to safeguards equipment or information. Security screening has historically been lacking at the IAEA (perhaps due to budgetary constraints and the resulting difficulty in attracting and retaining expert staff) and there is no indication that the agency had recently reformed its practices in this area.

IAEA’s efforts are also chronically under-funded. From the mid-1980s to 2003 the IAEA’s budget had been frozen (following a ‘zero-real-growth’ policy that governs most UN organizations) even as responsibilities multiplied.<sup>216</sup> Since then, funding has increased, but at the margin. In 2007, the head of IAEA’s Department of Safeguards complained that:

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213. In general, Johnston recommends the development and deployment of seals that operate using the “anti-evidence” method. Regular seals work by storing the ‘alarm condition’ or the indication of tampering (usually in the form of some damage to a part or the whole of the seal) on the seal body until inspection time. Johnson explains however that it is far too easy to erase the evidence of tampering or the alarm condition by repairing or replacing the seal. Seals based on the anti-evidence method however get around this problem by storing information known only to proper authorities inside of them when they are first deployed and then erase the information immediately if tampered with. The alarm condition in this case is the absence of old information rather than presence of new information. Because the information that was erased is not known to the person conducting the attack it cannot be faked. Johnston et al., *New Approaches to Tamper and Intrusion Detection*, (2003), 1-2.

214. Roger G. Johnston, "Tamper Detection for Safeguards and Treaty Monitoring: Fantasies, Realities, and Potentials," *The Nonproliferation Review* 8, no. 1 (Spring, 2001): 102.

215. International Atomic Energy Agency, “IAEA Safeguards Overview: Comprehensive Safeguards Agreements and Additional Protocols,” IAEA, [www.iaea.org/Publications/Factsheets/English/sg\\_overview.html](http://www.iaea.org/Publications/Factsheets/English/sg_overview.html).

216. Olli Heinonen, "IAEA Safeguards: Staying Ahead of the Game," (July 16, 2006) IAEA website, [www.iaea.org/NewsCenter/Statements/DDGs/2006/heinonen16072006.html](http://www.iaea.org/NewsCenter/Statements/DDGs/2006/heinonen16072006.html).

IAEA verification today operates on an annual budget of about \$120 million - a budget that would be comparable to that of a professional baseball team or the police force of a large city, or half the price of a single fighter jet. With these resources, we oversee approximately 900 nuclear facilities in 71 countries.<sup>217</sup>

Mohamed ElBaradei, then IAEA's Director General, was much more blunt during an address to the IAEA Board of Directors (composed of IAEA member states) saying that a budget proposed for 2008 did not "by any stretch of the imagination meet our basic, essential requirements," and adding that "our ability to carry out our essential functions is being chipped away."<sup>218</sup> A year later, ElBaradei was even more scathing in an address that speaks to the history and the perils of chronically under-funding the IAEA:

What you are reaping today is what you have sown for the last 20 years. For the last 20 years we have been told in good times, when you had plenty of money, and in bad times, that the policy is zero growth, and we have been telling you that zero growth continues to erode our ability to fulfil our responsibilities. It was only three years ago that I came here and said that we will not be able to live with zero growth and I got a minor increase. Today, the situation is worse, much worse [...] I and my colleagues will not assume any responsibility if in a couple years from now we see another Chernobyl, or a nuclear terrorist attack, or a clandestine nuclear programme.<sup>219</sup>

It is encouraging that the Obama administration proposed doubling the IAEA's 2008 budget over four years, but many other major donors, including

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217. Heinonen, "IAEA Safeguards: Staying Ahead of the Game."

218. ElBaradei further stated: "But my colleagues and I cannot sit here and tell you that the agency is able to fulfil its functions if in fact it cannot." "The safeguards function is being eroded over time. Today we cannot consistently do environmental sampling analysis ourselves due in part to the unreliability of an instrument that is 28-years-old." Paul Kerr, "ElBaradei: IAEA Budget Problems Dangerous," *Arms Control Today* (July-August 2007), [www.armscontrol.org/print/2465](http://www.armscontrol.org/print/2465).

219. Mohamed ElBaradei, "Intervention on Budget at IAEA Board of Governors," (June 16, 2009), IAEA, News Centre, Statements of the Director General [www.iaea.org/NewsCenter/Statements/2009/ebsp2009n006.html](http://www.iaea.org/NewsCenter/Statements/2009/ebsp2009n006.html).

Canada, are resisting increased funding as they focus on cutting deficits at home.<sup>220</sup>

Finally, it is important to understand that safeguards only work given full cooperation by the host state. A state can impede inspector access to facilities, persons, or information, as demonstrated by the examples of Iran, North Korea, or Syria.<sup>221</sup> Furthermore, the NPT's Article X gives states the right to withdraw from the treaty after issuing three months notice. North Korea is the first and only state to have exercised that right so far, withdrawing from the treaty in 2003, and kicking out the IAEA.<sup>222</sup> This illustrates that IAEA safeguards may help deter potential proliferators, but cannot deny them access to sensitive technologies if the decision to acquire these is taken. This realization has led to attempts to strictly regulate nuclear trade, though also with mixed results, as discussed below.

## Regulating Nuclear Trade

Manifesting the inherent tension between nonproliferation and the promotion of the peaceful uses, the NPT provides few restrictions on nuclear trade. Article I obliges NWSs “not in any way to assist, encourage, or induce any non-nuclear weapon State to manufacture or otherwise acquire nuclear weapons.” Furthermore, according to Article III.2 “Each State Party to the Treaty undertakes not to provide: (a) source or special fissionable material, or (b) equipment or material especially designed or prepared for the processing, use or production of special fissionable material, to any non-nuclear-weapon State for peaceful purposes, unless the source or special fissionable material shall be

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220. Peter Crail, “IAEA Budget Gets a Modest Boost,” *Arms Control Today* 39 (September 2009), [www.armscontrol.org/act/2009\\_09/IAEBudget](http://www.armscontrol.org/act/2009_09/IAEBudget).

221. Syria has not fully cooperated in an IAEA investigation following a 2007 Israeli air strike of a facility alleged to be a nuclear reactor under construction with North Korean help, and where environmental samples have subsequently shown traces of processed uranium. IAEA, *IAEA Annual Report 2009*, 82, [www.iaea.org/Publications/Reports/Anrep2009/safeguards.pdf](http://www.iaea.org/Publications/Reports/Anrep2009/safeguards.pdf).

222. Afterwards, some ad hoc IAEA safeguards were in place in North Korea as part of the ‘six-party talks’ framework. These were discontinued when North Korea kicked out the IAEA again in 2009.

subject to the safeguards required by this article”<sup>223</sup> (i.e. to IAEA comprehensive safeguards).

The NPT provides no further clarity on what constitutes ‘assistance’ in the meaning of Article I, or how to determine what equipment or material is “especially designed or prepared for the processing, use or production of special fissionable material” as per Art. III.2. In the former case, the NWSs tend to interpret Article I broadly, as an injunction not only to refrain from intentional acts of proliferation but also to restrict the export of sensitive fuel-cycle technologies to NNWSs (an interpretation many NNWSs hotly contest). The need to interpret Article III.2 led in 1970 to the formation of a group of fifteen major nuclear supplier states, known as the Zangger Committee, to establish a list of materials and equipment the export of which would trigger the requirement of Art. III.2 for the application of IAEA safeguards. Currently the Zangger Committee consists of thirty-six members and its ‘trigger list’ is updated on an ongoing basis.

Another body, the Nuclear Suppliers’ Group (NSG) was set up in 1975 in response to India’s surprise detonation of a nuclear device the preceding year. India’s so-called ‘peaceful nuclear explosion’ was made possible in part by a Canadian-supplied heavy-water research reactor and dramatically demonstrated the proliferation risks associated with the spread of nuclear technology. The NSG attempts to regulate global nuclear trade by developing guidelines for member states relating to the export of nuclear materials, technology, and expertise. The guidelines are voluntary but generally adhered to by participating states, and the group can be reasonably effective. For example, Mark Fitzpatrick notes that “between 1998 and 2007 seven of its members stopped a total of over 75 sales to Iran of dual-use nuclear-related materials.”<sup>224</sup>

However, there remain significant divisions within the NSG about how tightly nuclear exports, particularly those relating to the sensitive areas of the

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223. *The Treaty on the Non-Proliferation of Nuclear Weapons* (1968), [www.un.org/en/conf/npt/2010/npttext.shtml](http://www.un.org/en/conf/npt/2010/npttext.shtml). Emphasis added.

224. Mark Fitzpatrick, “The Iranian Nuclear Crisis: Avoiding Worst-case Outcomes,” *Adelphi Papers* 48, no. 398 (May 2008): 28.

nuclear fuel cycle, should be controlled. This divide was plainly visible at the June 2010 NSG annual conference where proposals to further restrict the transfer of sensitive technologies from technology-holder states to new-comers ran into firm opposition from Turkey, and to a lesser extent South Africa. While the NSG has vowed to continue to examine the issue, Turkey's "shot across the bow" has effectively taken the issue off the agenda for the near future.<sup>225</sup>

Another potentially divisive issue facing the NSG is the question of how to handle China's recent deal to supply Pakistan with two nuclear reactors. NSG guidelines prohibit nuclear trade with non-NPT states. China can choose to ignore the guidelines, or to seek a case-specific 'exemption'. While most NSG members would be loath to grant such an exemption given Pakistan's record as a serial proliferator<sup>226</sup> they may have little choice given that they agreed to an even broader exemption in 2008 to cover the U.S.-India nuclear cooperation deal. The fear is that a Chinese exemption will reinforce the U.S. precedent of 'muscling' the NSG into changing the rules whenever a state's strategic and commercial interests are at stake. China appears to already have drawn that lesson, and other rising powers, like Brazil or Turkey, are surely taking note as well.

The NSG's effectiveness is further undermined by the fact that its membership does not include some key nuclear technology holders like India, Iran, Israel, Libya, North Korea, and Pakistan. The latter two in particular have a terrible proliferation record, and as long as they remain outside the NSG the nuclear trade regime will continue to leak. Finally, some NSG member states lack effective national export control systems, and thus the means to fully apply the

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225. Mark Hibbs and George Perkovich, "Nuclear Suppliers in New Zealand: Global Trade Rules at the Crossroads," Carnegie Endowment for International Peace website, (June 30 2010), [www.carnegieendowment.org/events/?fa=eventDetail&id=2953](http://www.carnegieendowment.org/events/?fa=eventDetail&id=2953).

226. Pakistan's A.Q. Khan network clandestinely provided enrichment and perhaps also weapon designs to Libya, North Korea, Iran. "A.Q. Khan," GlobalSecurity.org, [www.globalsecurity.org/wmd/world/pakistan/khan.htm](http://www.globalsecurity.org/wmd/world/pakistan/khan.htm).

guidelines.<sup>227</sup> The national systems of control are further challenged by the proliferation of dual-use technologies due to advances in nuclear and material sciences.

### The 'Nuclear Renaissance' and Peaceful Uses

Until recently, the global nuclear industry has been in decline. While the 1970s saw 255 nuclear reactor construction starts world-wide, there were only 103 such construction starts in the 1980s, and just 28 in the 1990s.<sup>228</sup> High costs, the problem of nuclear waste, and high-profile safety failures like the Three Mile Island incident in 1979 and the Chernobyl disaster in 1986, all contributed to the decline. Since the early 2000s however, many inside and outside the industry have been projecting a major expansion of nuclear power or, as the nuclear power industry refers to it, 'a nuclear renaissance'. Predictions of a nuclear renaissance "envison a doubling or tripling of nuclear capacity by 2050, spreading nuclear power to new markets in the Middle East and Southeast Asia, and developing new kinds of reactors and fuel-reprocessing techniques."<sup>229</sup> Proponents of a nuclear power revival cite growing electricity demand,<sup>230</sup> rising

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227. United States General Accounting Office, *Nonproliferation: Strategy Needed to Strengthen Multilateral Export Control Regimes* (Washington, D.C.: United States General Accounting Office, 2002), [www.state.gov/documents/organization/14867.pdf](http://www.state.gov/documents/organization/14867.pdf). In 2004 the UN Security Council passed Resolution 1540 in which it decided that "all states [...] establish, develop, review and maintain appropriate effective national export and trans-shipment controls over [nuclear, chemical and biological weapons and related materials] including appropriate laws and regulations to control export, transit, trans-shipment and re-export" of such materials. The Resolution however fails to specify what is meant by "appropriate laws" nor does it provide for any verification of enforcement mechanisms. For these reasons, the resolution will continue to have limited impact. United Nations Security Council, *Resolution 1540* (April 28, 2004), [www.un.org/Docs/sc/unsc\\_resolutions04.html](http://www.un.org/Docs/sc/unsc_resolutions04.html).

228. Sharon Squassoni, *Nuclear Energy: Rebirth or Resuscitation?* (Washington D.C.: Carnegie Endowment for International Peace, 2009), 42, [www.CarnegieEndowment.org/pubs](http://www.CarnegieEndowment.org/pubs).

229. Squassoni, *Nuclear Energy: Rebirth or Resuscitation?*, 1.

230. Projected to increase by 64% between 2010 and 2030. Calculation based on projected 2.5% growth rate until 2030. See International Energy Agency, *World Energy Outlook: Executive Summary* (Paris: International Energy Agency, 2009), 4, [www.worldenergyoutlook.org/docs/weo2009/WEO2009\\_es\\_english.pdf](http://www.worldenergyoutlook.org/docs/weo2009/WEO2009_es_english.pdf).

conventional fuel prices, concerns about reliable access to energy, and the need to de-carbonize the global economy to avert severe climate change.<sup>231</sup>

According to the World Nuclear Association (WNA), a global nuclear industry group, as of August 1<sup>st</sup> 2010, there were 440 nuclear power reactors in operation around the world with a total generating capacity of 375GWe.<sup>232</sup> There are a further 59 reactors under construction, 149 reactors planned to be constructed, and 344 proposals to construct reactors. If all these were to be built out, the world's nuclear power generation capacity would rise to around 965GW by 2030.<sup>233</sup> The WNA projects that by 2030 the world's total nuclear electricity generating capacity will be between 605GWe (low estimate) and 1350GWe (high estimate).<sup>234</sup> The IAEA's projections are lower: 511GWe (low estimate) and 807GWe (high estimate) by 2030.<sup>235</sup> The difference factor of 2.6 between the IAEA's low estimate and the WNA's high estimate is indicative of how much uncertainty there still is about the likely scope and pace of the expansion. The large discrepancy is all the more remarkable given how close to 2030 we already are considering that it takes about a decade to move a reactor through regulatory approvals and construction.

Much depends on how policy-makers approach nuclear power. It is widely acknowledged that a major expansion will not be possible without significant policy support that makes nuclear power more competitive against fossil fuels like coal and gas. If policy makers find the arguments based on energy security and

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231. World Nuclear Association, "The Nuclear Renaissance" (September 2009), [www.world-nuclear.org/info/inf104.html](http://www.world-nuclear.org/info/inf104.html).

232. A gigawatt (GW) is equal to 1,000 megawatts (MW); the electricity generating capacity of a large nuclear power plant. The generating capacity of a power plant can be measured in MW electric, or MW thermal. For example, a nuclear power plant that generates 3000MWt (thermal) might generate 1000MWe (electric) as most energy generated escapes before it can be converted to electricity.

233. See World Nuclear Association, "World Nuclear Power Reactors & Uranium Requirements," World Nuclear Association website, [www.world-nuclear.org/info/reactors.html](http://www.world-nuclear.org/info/reactors.html).

234. World Nuclear Association, "WNA Nuclear Century Outlook Data," [www.world-nuclear.org/outlook/nuclear\\_century\\_outlook.html](http://www.world-nuclear.org/outlook/nuclear_century_outlook.html).

235. International Atomic Energy Agency, *Energy, Electricity, and Nuclear Power Estimates for the Period up to 2030* (Vienna: IAEA, 2009), 17, <http://www-pub.iaea.org/MTCD/publications/>.



reducing greenhouse gas emissions convincing, than a major expansion is likely.<sup>236</sup>

Perhaps even more important than the likely size and speed of the expansion will be its geographical distribution. While the majority of new capacity is expected to be built in Asia (China, India, Japan, and South Korea, all of which have mature nuclear industries) many additional states are investigating or making plans for the introduction of nuclear power for the very first time. Yukiya Amano, the IAEA's current Director General, recently stated that around sixty countries are considering developing nuclear power for the first time. That's twice the number of states using nuclear power today. According to Amano, the IAEA expects "between 10 and 25 new countries to bring their first nuclear power plants on-line by 2030."<sup>237</sup>

What might be the proliferation impacts of an expansion and diffusion of nuclear power? At a basic level, the danger is simply the spread of nuclear expertise, technical proficiency, and the development of an industrial base which could eventually assist a state in a future nuclear weapons program.<sup>238</sup> Civilian nuclear programs "can provide crucial experience in matters such as the chemistry, metallurgy, handling, and machining of fissile materials and also in neutronics" all of which are highly relevant to nuclear weapons design and development.<sup>239</sup> Foreign technical assistance and training that will inevitably be part and parcel of the nuclear expansion will be especially valuable to developing

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236. Not everyone is convinced that the nuclear renaissance is inevitable. Sharon Squassoni argues that "A major expansion of nuclear power [...] is not a foregone conclusion" because "The traditional challenges besetting nuclear energy—cost, safety, waste, and proliferation—continue to limit widespread growth." Squassoni, *Nuclear Energy: Rebirth or Resuscitation?*, 1. See also Harold Feiveson, "A Sceptic's View of Nuclear Energy," *Daedalus* (Fall 2009).

237. Yukiya Amano, "Statement to International Conference on Nuclear Power," (August 03, 2010), [www.iaea.org/NewsCenter/Statements/2010/amsp2010n013.html](http://www.iaea.org/NewsCenter/Statements/2010/amsp2010n013.html).

238. Squassoni, *Nuclear Energy*, 62.

239. Donald MacKenzie and Graham Spinardi, "Tacit Knowledge, Weapons Design, and the Uninvention of Nuclear Weapons," *The American Journal of Sociology* 101, no. 1 (July 1995): 83.

countries, but carries risks. The words of Munir Ahmad Khan, one of the fathers of the Pakistani bomb, are illustrative:

I have no place from which to draw talented scientists and engineers to work in our nuclear establishment. We don't have a training system for the kind of cadres we need. But, if we can get France or somebody else to come and create a broad nuclear infrastructure, and build these plants and these laboratories, I will train hundreds of my people in ways that otherwise they would never be able to be trained. And with that training, and with the blueprints and the other things that we'd get along the way, then we could set up separate plants that would not be under safeguards, that would not be built with direct foreign assistance, but I would not have the people who could do that. If I don't get the cooperation, I can't train the people to run a weapons program.<sup>240</sup>

Although some of the type of assistance and training that Khan envisaged would have been related to enrichment and reprocessing, access to which is now much more restricted than it was when Pakistan was starting its weapons work, the basic proposition that there are links between civilian and military nuclear uses is still true today.

A major expansion of nuclear power will also facilitate the growth of illicit proliferation networks as technology and expertise continues to diffuse away from the current, first-tier suppliers. The 2004 revelations about the extent of the A.Q. Khan proliferation ring highlight the dangers. According to Chaim Braun and Christopher Chyba:

Evidence for the exchange of nuclear weapons-related and missile technologies among several developing countries suggests that we are entering a world in which a growing number of such countries will be able to cut themselves free from the existing nonproliferation regime [...] The full development of such proliferation rings, unless checked, will ultimately render the current export control regimes moot, as developing countries create nuclear-weapons and delivery systems technologies and manufacturing bases of their own, increasingly disconnect from first-tier state or corporate suppliers,

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240. Quoted in George Perkovich, "Nuclear Power and Nuclear Weapons in India, Pakistan, and Iran," in *Nuclear Power and the Spread of Nuclear Weapons: Can We Have One without the Other?* eds. Paul Leventhal, Sharon Tanzer, and Steven Dolley (Washington, D.C.: Brassey's, 2002), 194.

and trade among themselves for the capabilities that their individual programs lack.<sup>241</sup>

Another concern is that a significant expansion in nuclear power will likely overwhelm both the IAEA's already over-stretched safeguards system, and the nuclear industry's capacity to safely construct and operate the facilities. Mark Hibbs, a prominent nuclear industry observer, speculates that a sharp rise in demand for new nuclear reactors could overwhelm the supply capacity of the established companies. Forced to choose which orders to fill, these companies are likely to opt for doing business with advanced democracies and states with established nuclear energy programs because of lower financial, infrastructure, and nonproliferation risks associated with building and operating there. It is likely that, in time, new companies will form to fill this gap between supply and demand. In Hibbs's opinion this could have the effect of pairing states with weak nonproliferation cultures with similarly ambivalent and perhaps under-regulated suppliers. It is also possible that developing states might (perhaps erroneously) conclude that they are being discriminated against by the established nuclear suppliers. This could further alienate them and strengthen their opposition to additional restrictions on sensitive technology transfers.<sup>242</sup>

More reactors would also mean the need for more enrichment (more than twice as much, if all the reactors projected to come on-line by 2030 actually do so). If this means simply expanding enrichment in the countries that currently have that capability, the associated risk would be minimal. However, given the high projected number of new nuclear states, it is quite possible that more states will seek to develop indigenous enrichment capabilities. At the moment, South

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241. Chaim Braun and Christopher F. O. Chyba, "Proliferation Rings: New Challenges to the Nonproliferation Regime," *International Security* 29, no. 2 (Fall, 2004), 6 .

242. George Perkovich and James A. Acton, eds., *Abolishing Nuclear Weapons: A Debate* (Washington, D.C.: Carnegie Endowment for International Peace, 2009), 86, [www.CarnegieEndowment.org/pubs](http://www.CarnegieEndowment.org/pubs).

Korea is seriously considering enrichment,<sup>243</sup> as is Canada,<sup>244</sup> and states like Argentina, South Africa, and Turkey remain vocal in insisting on their right to develop enrichment in the future.<sup>245</sup> As Squassoni explains, “Additional enrichment capacity in some of these states may not cause alarm, but if they are successful, it may become more difficult to justify why other states should not develop such capabilities.”<sup>246</sup>

The final, and most serious danger is that a major expansion of nuclear power may encourage the use of reprocessing to deal with the large amount of nuclear waste (spent fuel) generated by reactors. Given how difficult the development of long-term nuclear waste repositories has proven to be<sup>247</sup> states may choose to reprocess to reduce waste volume and extend the life of uranium reserves. Because reprocessing extracts weapons-usable plutonium, it would be an attractive option for states wishing to hedge their bets or to seek nuclear weapons outright.

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243. Nuclear Threat Initiative, “South Korea Could Seek Uranium Enrichment Right, Reports Suggest,” (July 14, 2010), [www.globalsecuritynewswire.org/gsn/nw\\_20100714\\_7994.php](http://www.globalsecuritynewswire.org/gsn/nw_20100714_7994.php).

244. Canada has historically been the world’s largest uranium producer, although it was overtaken by Kazakhstan in 2009. All Canadian operating uranium mines are located in northern Saskatchewan. In December 2009 the Saskatchewan government issued a ‘strategic direction’ document that makes clear the government’s support for research and development of uranium enrichment in that province. The document states that Saskatchewan intends to work with the federal government to “to clarify the framework under which an enrichment facility could be established in the province” and further states that the Province intends to “enter into discussions with current technology developers to determine the conditions under which a commercial-scale facility could be attracted to the province within 10 to 15 years [...] with the hope that the investment climate may lead to an earlier timetable for new plants.” Government of Saskatchewan, *The Government’s Strategic Direction on Uranium Development* (Government of Saskatchewan, December 2009) 3, 8, [www.er.gov.sk.ca/adx/asp/adxGetMedia.aspx?DocID=10785,3385,5460,2936,Documents&MediaID=28992&Filename=Govt+Response+to+UDP+Report.pdf](http://www.er.gov.sk.ca/adx/asp/adxGetMedia.aspx?DocID=10785,3385,5460,2936,Documents&MediaID=28992&Filename=Govt+Response+to+UDP+Report.pdf).

245. International Commission on Nuclear Non-proliferation and Disarmament, *Eliminating Nuclear Threats*, 51.

246. Squassoni, *Nuclear Energy*, 63.

247. Yucca Mountain, the long-awaited, long-term deep geological repository for nuclear waste has been shut-down by the Obama administration. Many such facilities would be required in the event of a major expansion in nuclear power. Squassoni, *Nuclear Energy*, 65.

The question of reprocessing must also be seen in the context of a broader debate about the future of the nuclear fuel cycle. Concerns about the availability of natural uranium have led many in the nuclear industry and beyond to call for the development of new technologies to stretch the available reserves. Fast breeder reactors (FBRs) are often mentioned in this context.<sup>248</sup> FBRs can actually produce more nuclear fuel than they consume by converting a portion of the natural (i.e. depleted) uranium in the 'blanket' surrounding the reactor core into plutonium, which can then be used as part of a mixed oxide (MOX) fuel, or on its own in plutonium-fuelled reactors now under development. Intensive use of reprocessing and fast breeder technology has the potential to extend the life of conventional uranium reserves by a factor of fifty or so, from roughly one-hundred years to five or six-thousand years.

Both reprocessing and breeder technology carry significant proliferation risks because they require the production, storage, and transportation of large quantities of weapons-usable plutonium. As Barnaby and Kemp argue:

The world of the nuclear 'renaissance' will be one containing a huge amount of separated plutonium [...] By 2075, the nuclear industry predicts that most nuclear electricity will be generated by fast breeder reactors. If this is correct, more than 4,000 tonnes of plutonium will have to be fabricated into fresh reactor fuel *each year* - *twenty times the current military stockpile*.<sup>249</sup>

The difficulties of accounting for plutonium have already been mentioned, but such intensive reprocessing raises other risks as well, like the possibility that nuclear material might be acquired by non-state actors through theft from facilities or fuel transports. Although the difficulties of constructing or otherwise

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248. Squassoni, *Nuclear Energy*, 65.

249. Frank Barnaby and James Kemp, *Too Hot to Handle? the Future of Civil Nuclear Power* (London, U.K.: Oxford Research Group, 2007), 13. Emphasis added. Assuming 1% MUF, and a conservative 9kg of plutonium per weapon, this would translate to enough unaccounted-for plutonium to construct 4,444 bombs per year.

acquiring a crude plutonium weapon by a non-state group are daunting,<sup>250</sup> they may not be insurmountable, and are likely to be ameliorated as technology and expertise continues to spread.

### **Can We Square the Peaceful Uses Circle?**

The contention made at the beginning of this chapter that there is a fundamental tension between nonproliferation and the spread of peaceful uses of nuclear energy still holds. The spread of peaceful uses of nuclear energy at best helps bring states a step closer to a nuclear weapons capability by creating the technical know-how and the industrial base that could one day facilitate more aggressive hedging strategies, or an actual nuclear weapons program. At worst, it could provide legal and political cover for the development of sensitive technologies intended for use in a weapons program, and could help hide such illicit activities from the world. It is clear, therefore, that a world without nuclear power, or at least without the further spread of nuclear power, would be more conducive to nonproliferation than the alternatives. However, it is unrealistic to hope for such a world. As we have seen, there is increasing interest in nuclear power, including the sensitive parts of the fuel cycle. We should therefore look for ways to mitigate the risks associated with its inevitable spread.<sup>251</sup> Significant progress on this front is not impossible, but will require concerted efforts by numerous states.

In terms of improving the detection of diversion of materials, or of clandestine activities, those states that have not yet done so should bring APs into force. Some observers argue for making the AP a condition of supply for all

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250. Robin M. Frost, "Nuclear Terrorism After 9/11," *Adelphi Papers* no. 387 (December 2005): 88. The American, Soviet, British, French, and Chinese nuclear programs consumed significant national resources, and often encountered unanticipated and serious practical (engineering) problems. See MacKenzie and Spinardi, "Tacit Knowledge, Weapons Design, and the Uninvention of Nuclear Weapons," 73. See also Reed and Stillman, *The Nuclear Express*.

251. For overviews of mitigation strategies see Perkovich and Acton, *Abolishing Nuclear Weapons*, 83-97; and Squassoni, *Nuclear Energy*, 62-77.

nuclear materials, technology, and services.<sup>252</sup> While this outcome is not beyond the realm of possibility, such proposals will continue to meet strong opposition from states that perceive them as contrary to their Article IV rights. At the 2010 NPT Review Conference, the 189 parties to the treaty again underscored that the Additional Protocol is a voluntary measure, and not a safeguards requirement under the treaty.<sup>253</sup> A measure that could be adopted more easily is a drastic increase in the IAEA's budget to allow the agency to respond to increasing responsibilities tied to greater uptake in the APs and to the likely expansion and dispersion of nuclear power.<sup>254</sup> This should not be too difficult to do given how small IAEA's budget is currently. It is also encouraging that the U.S. has lately taken a lead on this issue.

In terms of mitigating risks associated with enrichment and reprocessing, a number of approaches have been proposed, and one important proposal has recently begun to be implemented. In November 2009, the IAEA Board of Governors voted to accept a Russian proposal to establish a low-enriched uranium fuel bank for the purpose of providing states with an assured supply of reactor fuel, and thus reducing incentives (and excuses) for states to develop native enrichment capabilities. Under the plan, states could draw on the bank as a last-resort if, for whatever reason, they were unable to purchase fuel on the open market. The only proviso would be that a state wishing to make use of the bank would need to have no unresolved issues in front of the IAEA's Board of Governors. Under the arrangement, Russia would produce the low-enriched uranium, transfer it to the IAEA which would then transfer it to the requesting state.

It is indicative of the current level of sensitivity around nuclear fuel cycle issues that even this seemingly benign measure turned out to be quite contentious. Eight of the IAEA's 35 board members voted against the resolution,

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252. Squassoni, *Nuclear Energy*, 74.

253. Hibbs and Perkovich, "Nuclear Suppliers in New Zealand."

254. See Perkovich and Acton, *Abolishing Nuclear Weapons*, 87-88 for some further suggestions on improving IAEA safeguards.

and three abstained.<sup>255</sup> This is unusual as the board normally makes decisions by consensus. The dissenting countries cited concerns that the arrangement could “erode their Article 4 rights.”<sup>256</sup> A similar proposal, by the NGO Nuclear Threat Initiative (NTI), still in front of the Board, calls for the establishment of an IAEA-owned fuel bank. NTI has already raised over \$150 million of private and matching funds to pay for the proposed bank. The advantage of this proposal is that a wholly IAEA-owned fuel bank would further increase certainty of supply.<sup>257</sup>

Going even further, in 2004 President Bush suggested that the current two-tier system of enrichment and reprocessing suppliers and consumers be institutionalized. Under such a system, suppliers would provide cradle-to-grave fuel services, including the provision of fresh fuel and the retrieval of spent fuel for reprocessing and disposal. The proposal raised serious opposition among NSG and non-NSG states concerned that it would cement the current system of nuclear haves and have-nots.<sup>258</sup>

Perhaps a proposal that would have a somewhat better chance of success would be to multinationalize all enrichment and reprocessing capabilities.<sup>259</sup> The idea of multinational control over the nuclear fuel cycle dates to the 1946 Baruch Plan, and in recent years has been regaining popularity in the West. Sharron Squassoni summarizes one of the rationales for such an approach:

One of the most difficult aspects of restricting access to sensitive nuclear technologies like enrichment and reprocessing is the element of national prestige that is often attached to these high-profile projects. Many non-nuclear-weapon states have rejected the notion that they should forgo sensitive nuclear technologies, as President Bush has urged since 2004, because they reject the creation of yet another discriminatory approach under the Non-

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255. Argentina, Brazil, Cuba, Egypt, Malaysia, Pakistan, South Africa, and Venezuela voted against the resolution, while India, Kenya, and Turkey abstained.

256. Daniel Horner, “IAEA Board Approves Russian Fuel Bank Plan,” *Arms Control Today*, (January/February, 2010), [www.armscontrol.org/act/2010\\_01-02/FuelBank](http://www.armscontrol.org/act/2010_01-02/FuelBank).

257. Horner, “IAEA Board Approves Russian Fuel Bank Plan”.

258. Squassoni, *Nuclear Energy*, 63.

259. *Ibid.*, 76.



Proliferation Treaty [...] One way of divorcing this element of national pride from the technology is ultimately to “denationalize” those activities, or get beyond a tiered system by requiring that future facilities be multinationally owned and operated. Over time, existing plants would need to be converted to multinational ownership, operation, and regulation as well.<sup>260</sup>

Because a multinational fuel cycle would eliminate the existing, unequal system of technology holders and consumers, it would also be harder to dismiss as a Western ploy to further restrict states’ Article IV rights. Such an arrangement would also make monitoring of diversion easier.

On the downside, this approach would help train cadres of technicians and engineers from around the world in uranium enrichment. That expertise could then be taken back home and potentially aid in the launching of clandestine nuclear programs. The upside would be that, once such clandestine programs were discovered, they would be much more difficult to justify on the grounds of security of fuel supply. On balance, and judged against the likely alternative of the continuing diffusion of sensitive technology to additional states, the multinational fuel cycle is an attractive, even indispensable, option. While it would likely generate considerable opposition,<sup>261</sup> bringing it up in the context of a fissile material cut-off treaty, long championed by many NNWSs and NAM states, could make it more palatable.

So where does that leave us? The NPT itself cannot be amended to preclude or limit cooperation on peaceful uses, and any attempt to force such a change would likely break the regime. The best that can be hoped for is to negotiate limits on the spread of sensitive technologies through new multilateral arrangements that would include significant concessions on the part of the current technology-holder states. Although the next generation of reactors to be

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260. Squassoni, *Nuclear Energy*, 76.

261. Perkovich and Acton state that “At present, the idea meets firm resistance from almost every state and enterprise now producing fissile materials, especially the states with nuclear weapons.” *Abolishing Nuclear Weapons*, 91; it should be also be added that the idea also meets serious resistance from many states that do not currently produce fissile materials but may wish to do so in the future.

built out will still, by and large, be light-water reactors (LWRs) the nuclear industry's apparent preference for FBR technology is very troubling given the difficulties of accounting for plutonium. It is therefore essential to build consensus around the 'once-through', or 'open' fuel cycle that makes use of enriched uranium, and to limit the further spread of reprocessing. For the time-being, however, proposals for significant reform may have to wait. The strong opposition at the recent NSG meeting by Turkey and South Africa to further restrictions on the transfer of sensitive technologies signals that real debate on these issues may have to be put off the table for at least a few years.<sup>262</sup>

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262. Hibbs and Perkovich, "Nuclear Suppliers in New Zealand."

## CHAPTER 3: DISARMAMENT

The disarmament pillar is the third and final pillar of the nonproliferation regime. Its legal foundation lies in Article VI of the NPT, which calls on all states party to the treaty to:

pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a Treaty on general and complete disarmament under strict and effective international control.<sup>263</sup>

The disarmament pillar has also been the most neglected of the three. Though deep reductions in the number of nuclear warheads have been made since the heights of the Cold War, the NWSs still hold around 20,000 of these weapons in their arsenals,<sup>264</sup> forty years after the coming into force of the NPT. What is more, until the recent initiatives by the Obama administration, the NWSs consciously eschewed the most significant steps necessary to move towards disarmament. During the George W. Bush presidency, key initiatives like the Comprehensive Test Ban Treaty (CTBT), the Fissile Material Cut-off Treaty (FMCT) were essentially abandoned, as were the ‘13 steps’ towards disarmament agreed to at the 2000 NPT review conference, and robust arms control measures between the U.S. and Russia were scrapped due to U.S. insistence on pursuing a national missile defence shield.

In short, the NWSs seemed to be acting as if they intended to keep their nuclear weapons in perpetuity. This evasion of responsibility was a leading factor contributing to what many observers over the last decade have called the crisis of

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263. *The Treaty on the Non-Proliferation of Nuclear Weapons*. 1968. [www.un.org/en/conf/npt/2010/npttext.shtml](http://www.un.org/en/conf/npt/2010/npttext.shtml). Emphasis added

264. About half of those are awaiting dismantlement, but because it may take over a decade to dismantle this backlog, during which time a the decision to dismantle may be reversed, it makes sense to count them towards the total.

the nonproliferation and disarmament regime. While the Obama administration's re-commitment to nuclear disarmament has done much to begin to repair the damage, this is not an issue that can be resolved by quickly, easily, or by the United States alone. In spite of the recent revival in nuclear abolitionist discourse and advocacy,<sup>265</sup> many observers and, privately, perhaps also some officials within the NWSs, still question both the nature of the legal obligation imposed on the NWSs by Article VI, as well as the wisdom of pursuing nuclear disarmament.

This chapter is divided into three sections. The first discusses the nature of the disarmament obligation under Article VI of the NPT; the second reviews the extent to which this obligation is being met by the NWSs; and the third and final section examines the desirability of nuclear disarmament, and draws some tentative conclusions about its prospects. The chapter finds that there is a clear, legal obligation on the NWSs move as far on the path to the total elimination as can reasonably be expected given the strategic realities of the day. The NWSs have not yet lived up to this obligation, although Obama's recent initiatives are increasing the convergence between 'is' and 'ought' in this regard. The ultimate desirability of absolute nuclear disarmament will be determined by the political conditions at the time when nuclear arsenals are much reduced from current levels. It is impossible to predict with certainty what those conditions might be, but, it is clearly desirable to move closer towards disarmament given that current nuclear arsenals are still highly excessive, and that the process of disarming may actually foster the political conditions of mutual trust and cooperation necessary for making full disarmament a reality.

### **What's Required by Article VI?**

The vagueness of the wording of Article VI has contributed to debates over the nature of the disarmament obligation on NPT parties. For example, what does it mean to "pursue negotiations in good faith"? Are negotiations alone

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265. For a good summary, see Thomas Shelling, "A World Without Nuclear Weapons?" *Daedalus* (Fall 2009): 124.

enough, or are concrete outcomes required? And how is “good faith” to be determined? Is the obligation to pursue negotiations on “effective measures *relating* to [...] nuclear disarmament” the same as actually reducing nuclear stockpiles? And what about the Treaty’s pre-amble, which seems to imply that progress on nuclear disarmament is to be made “pursuant to a Treaty on general and complete disarmament”?<sup>266</sup> This section examines some of these problems of interpretation in light of the Article’s negotiating history to discern the nature of the disarmament obligation.<sup>267</sup>

### **Are Negotiations Enough?**

It is possible to argue that because Article VI directs parties only to “pursue negotiations” rather than to conclude agreements, actual disarmament need not occur to satisfy states’ obligations under the Article. Stephen Rademaker, then U.S. Assistant Secretary of State for Arms Control, made this argument in 2005: “the obligation imposed on all NPT states parties is to “pursue negotiations in good faith on effective measures. . .” Thus, Article VI does not literally require the conclusion of “agreements” relating to disarmament.”<sup>268</sup> Christopher Ford, U.S. Special Representative for Nuclear Nonproliferation until September 2008, concurred, writing in 2007 that Article VI “merely requires all states to pursue negotiations in good faith; specific disarmament steps are not required.”<sup>269</sup>

These interpretations are too narrow to be satisfying. The Article clearly stipulates that negotiations need to be conducted in “good faith”, and aimed at

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266. *The Treaty on the Non-Proliferation of Nuclear Weapons*. 1968. paragraph 12, [www.un.org/en/conf/npt/2010/npttext.shtml](http://www.un.org/en/conf/npt/2010/npttext.shtml).

267. For a treatment of the meaning of Article VI, including this and related issues, see Bunn and Timerbaev, *Nuclear Disarmament: How much have the five nuclear powers promised in the Non-Proliferation Treaty?* (1994) .

268. Stephen G. Rademaker, Remarks at a Panel Discussion at the Arms Control Association, Feb. 3, 2005. [http://www.nti.org/e\\_research/official\\_docs/dos/dos020305.pdf](http://www.nti.org/e_research/official_docs/dos/dos020305.pdf)

269. Christopher A. Ford, “Debating Disarmament, Interpreting Article VI of the Treaty on the Non-Proliferation of Nuclear Weapons,” *Nonproliferation Review*, Vol. 14, No. 3, November 2007, p.401.

measures which are “effective”. The concept of good faith has a long pedigree in a number of legal traditions. Although difficult to define precisely, a number of rulings by the International Court of Justice found that good faith in negotiations implied “fairness, openness, impartiality, flexibility, concern for substance and purpose, cooperation, reasonableness, reciprocity or willingness to consider each other’s positions, *sustained upkeep of negotiations* and (in cases of parties to a treaty) *acting so as to further the purpose of the treaty*.”<sup>270</sup> Further guidance can be found in the American Law Institute’s Restatement of the law of Contracts:

Good faith performance [...] emphasizes faithfulness to an agreed common purpose and consistency with the justified expectations of the other party; it excludes a variety of types of conduct characterized as involving ‘bad faith’ because they violate community standards of decency, fairness or reasonableness [...]. Bad faith includes the] *evasion of the spirit of the bargain, lack of diligence and slacking off, willful rendering of imperfect performance, abuse of a power to specify terms, and interference with or failure to cooperate in the other party’s performance*.<sup>271</sup>

It stands to reason, that the absence of concluded agreements or concrete results can only be said to be in compliance with Article VI if that lack of progress occurred *despite* the parties having been engaged in diligent, sustained negotiations on “effective measures” related to nuclear disarmament. The extent to which such good faith efforts have actually occurred is discussed later in this chapter.

It is also worth noting that, in an advisory opinion on the “Legality of the Threat or Use of Nuclear Weapons,” the International Court of Justice went as far as to conclude that Article VI involves not merely an obligation to negotiate, but also to achieve a particular outcome: “the obligation involved here is an obligation

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270. Shafer, 5, <http://lcn.org/wcourt/goodfaith-shafer.pdf>. Emphasis added. On the ‘good faith’ question in relation to Art. VI, see also Sagan, in *Abolishing Nuclear Weapons: a Debate*, p203.

271. Restatement (Second) of the Law of Contracts, Section 205, Comment (c). Emphasis added. Restatements of the law are produced by the American Law Institute and are considered authoritative statements of predominant common law doctrine across jurisdictions; they are treated by courts as persuasive but not binding interpretations of the law.

to achieve a precise result, nuclear disarmament in all its aspects, by adopting a particular course of conduct, namely the pursuit of negotiations in good faith.”<sup>272</sup>

The 2010 NPT review conference, like the 1995 conference that indefinitely extended the NPT, has by consensus enshrined such an interpretation in a final document stating: “The Conference reaffirms the unequivocal undertaking of the nuclear-weapon States to *accomplish* the total elimination of their nuclear arsenals leading to nuclear disarmament, *to which all States parties are committed under article VI.*”<sup>273</sup>

That some observers continue to question whether Article VI actually requires anything more than a vague expression of commitment to disarmament at an undefined date, presumably beyond the horizon, evinces either a lack of serious study or the desire to make the interpretation fit their nuclear-retentionist policy prescriptions.<sup>274</sup>

### **Are There Pre-Conditions?**

Another question deserving consideration is whether nuclear disarmament is a stand-alone obligation, or whether it was meant to be contingent on progress towards general and complete disarmament (GCD), as Rademaker believes when he argues that:

the language [or Article VI] contains no suggestion that nuclear disarmament is to be achieved before general and complete disarmament is achieved. Nuclear disarmament would obviously be an element of general and complete disarmament. At the same time, the text and negotiating history of the NPT support the expectation that efforts toward complete nuclear disarmament would be linked with efforts toward general and complete

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272. Shafer, 9.

273. Emphasis added. *2010 NPT Review Conference final document*, page 19. [www.un.org/ga/search/view\\_doc.asp?symbol=NPT/CONF.2010/50%20%28VOL.I%29](http://www.un.org/ga/search/view_doc.asp?symbol=NPT/CONF.2010/50%20%28VOL.I%29)

274. See for example Bruno Tertrais, “The Illogic of Zero,” *The Washington Quarterly* 33, no. 2 (April 2010), 125-6 (125-138)

disarmament. In short, there is a clear relationship between these two objectives.”<sup>275</sup>

Rademaker’s interpretation is at least partly supported by NPT’s twelfth preambular paragraph, which expresses the desire of the parties to the treaty to:

further the easing of international tension and the strengthening of trust between States in order to facilitate the cessation of the manufacture of nuclear weapons, the liquidation of all their existing stockpiles, and the elimination from national arsenals of nuclear weapons and the means of their delivery *pursuant to a Treaty on general and complete disarmament* under strict and effective international control.<sup>276</sup>

At the time the NPT was being drafted, separate negotiations on GCD had been ongoing in for some years. By the time Article VI was being negotiated in the late 1960s, both Soviet and American delegations had submitted plans for GCD calling for the total elimination of nuclear weapons, but only during the third and final stage of disarmament which would entail “world-wide reductions of national armed forces and conventional arms to very low levels”. In the U.S. proposal, the pre-conditions for moving towards zero nuclear weapons included “reduced international tension, improved mechanisms for peaceful settlement of international disputes, and a strengthened United Nations peace force.”<sup>277</sup> Could this mean that the drafters of the NPT intended nuclear disarmament to be contingent on progress on broader disarmament issues?

George Bunn and Roland M. Timerbaev, who played significant roles on the U.S. and Soviet NPT negotiating teams respectively, reject this interpretation. They claim that the NPT’s negotiating history clearly shows that from early on, calls for the inclusion of a disarmament provision (which would eventually become Article VI) did not include linkages or preconditions. At the UN’s

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275. Rademaker, “U.S. Compliance With Article VI of the Non-Proliferation Treaty (NPT)”, 2005, p2. See also Keith B. Payne who claims that has been the U.S. government’s traditional position, “The Case Against Nuclear Abolition and for Nuclear Deterrence,” *Contemporary Strategy* 17 (1998), endnote 9.

276. NTP paragraph 12.

277. Bunn and Timerbaev, *Nuclear Disarmament*, 13.



Eighteen Nation Committee on Disarmament (ENDC), the body established to negotiate the NPT, voices calling the inclusion of a disarmament component in the NPT included U.S. allies such as Italy and Germany, as well as members of the Non-Aligned Movement (NAM). The latter issued a joint declaration in 1965 stating that:

A treaty on non-proliferation of nuclear weapons is not an end in itself but only means to an end. The end is the achievement of general and complete disarmament, and, more particularly, nuclear disarmament. The eight [NAM] delegations are convinced that measures to prohibit the spread of nuclear weapons should, therefore, be coupled with or followed by tangible steps, to halt the nuclear arms race and to limit, reduce and eliminate stocks of nuclear weapons and the means of their delivery.<sup>278</sup>

The fact that the statement refers to the NPT as a means to the end of general disarmament, implies that nuclear disarmament it is to *precede* general disarmament, not the other way around. Although the NAM delegations were forced to compromise somewhat on the robustness of the disarmament obligation, the general sentiment reflected in the above quote became the basis of Article VI.

Later in 1965, the UN General Assembly adopted a resolution outlining a set of principles to guide negotiations on the NPT. The resolution stated that the treaty should “embody an acceptable balance of mutual responsibilities and obligations of the nuclear and non-nuclear powers” and that it should be a *step towards* “general and complete disarmament and, more particularly, nuclear disarmament.”<sup>279</sup> By 1967 proposals by Brazil, Burma, India, Romania, and Switzerland called on the NWSs to “adopt”, “take,” “resolve [...] to undertake,” or “undertake [...] to negotiate” specific [nuclear] disarmament measures.<sup>280</sup> Notably absent from all these calls, were attempts to link nuclear disarmament to pre-

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278. ACDA, *Documents on Disarmament*, 1965, p.424-25. In Bunn and Timerbaev, *Nuclear Disarmament*, 17.

279.. UNGA Res. 2028 of Nov. 19, 1965, ACDA, *Documents on Disarmament*, 1965, pp. 532-34. In Bunn and Timerbaev, p 17.

280. Bunn and Timerbaev, *Nuclear Disarmament*, 18.

conditions such as GCD. Rademaker, for his part, provides no support for his claim that the NPT's negotiating history shows efforts to make nuclear disarmament contingent on GCD.

What then explains NPT's twelfth preambular paragraph? Bunn and Timerbaev conclude that the apparent tension between it and Article VI stems from the fact that while the treaty's drafters clearly meant to establish a new avenue for moving towards nuclear disarmament, one that would be unencumbered by preconditions, they did not wish to foreclose the option of pursuing nuclear disarmament under the banner of GCD, independently of the NPT.<sup>281</sup> It is the latter route which foresaw nuclear disarmament linked to preconditions such as those described in U.S. and Soviet proposals for GCD. Finally, it is worth noting that an advisory opinion the International Court of Justice interpreted nuclear disarmament to be a "stand-alone obligation" not contingent on conventional disarmament.<sup>282</sup>

### **Who is Responsible for Making Reductions?**

Article VI places the obligation to pursue disarmament not just on the NWSs, but on "Each of the Parties to the Treaty." Some commentators have used this fact to attempt to excuse the NWSs from the diligent pursuit of nuclear disarmament. For example, Rademaker states that: "if anyone wishes to argue that the nuclear weapons states are in default on their obligations relating to nuclear disarmament, they will have a difficult time explaining why all NPT states parties are not also in default on their obligations relating to general and complete disarmament."<sup>283</sup> Similarly, Bruno Tertrais observes that Article VI "contains a conventional disarmament obligation that is hardly met by non-nuclear-weapon states."<sup>284</sup>

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281. Bunn and Timerbaev, *Nuclear Disarmament*.

282. Achilles Zaluar. In Perkovich, *Abolishing Nuclear Weapons, a debate* (2009), 310.

283. Rademaker, "U.S. Compliance With Article VI," 2.

284. Bruno Tertrais, "Advancing the Disarmament Debate: Common Ground and Open Questions," 182, in Perkovich and Acton eds. *Abolishing Nuclear Weapons: A Debate*

This line of criticism has two answers. First, NWSs would not be legally excused from their Article VI obligations *even if* the NNWSs were non-compliant with respect to general disarmament. Secondly, the premise that it is the NNWSs who are the principle cause of inaction on GCD borders on the ludicrous in the context of global military expenditures dominated by the NWSs. The United States itself accounted for 43% of global military spending in 2009.<sup>285</sup>

### **Was Article VI Meant to be Taken Seriously?**

On its face, Article VI can give the impression that it was never intended to be taken very seriously. Vague language combined with what seems today like an exotic, and still wildly unrealistic obligation to pursue “a Treaty on general and complete disarmament” make it sound more like the hortatory language found in preambles than as a well defined legal obligation intended for strict observance. As one observer put it, “By being so all-encompassing and unrealistic, the treaty merely makes nuclear abolition seem an idyll.”<sup>286</sup> One may legitimately wonder whether placing the obligation to pursue nuclear disarmament side-by-side the obligation to pursue GCD was not a subtle form of sabotage by some of the drafters.<sup>287</sup>

Upon closer examination however, this does not seem to have been the case. Negotiating towards GCD likely seemed more realistic in the years immediately following World War II, the most destructive in human history, than they do today. Furthermore, such idealism was not without precedent. The UN Charter, for example, prohibits the threat or use of force in international relations, and (on paper) establishes a system of collective security complete with standing

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285. Stockholm International Peace Research Institute, “Media Background – Military Expenditure SIPRI Yearbook 2010” June 02, 2010, [www.sipri.org/media/pressreleases/pressreleasetranslations/storypackage\\_milex](http://www.sipri.org/media/pressreleases/pressreleasetranslations/storypackage_milex).

286. Fred C. Ikle, “Nuclear Abolition, A Reverie,” *The National Interest* (September/October 2009): 6.

287. Other scholars question whether the treaty’s disarmament provisions should be seen on equal footing with the “real,” nonproliferation obligations of Article II and III. Bruno Tertrais, “The Illogic of Zero,” 126.

armed forces at the disposal of the UN Security Council. GCD may not have seemed so outlandish in comparison.

The first official proposal for a treaty on GCD was put before the UN in 1959 by the Soviet leader Nikita Khrushchev. By the mid-1960s, as the pitfalls of focusing on an all-or-nothing approach to general disarmament had become apparent, the focus shifted to “achieving specific short-term objectives, which could be agreed relatively easily and incorporated into legal instruments, which would contribute to, rather than hinder, the long-term goal of [general and complete disarmament].”<sup>288</sup> The NPT can be seen as an exemplar of this new approach. It is also possible that the diplomatic inertia built up around the concept of GCD in the preceding decade was enough to ensure that concept was included in any new treaty dealing with disarmament. Some of those negotiating the NPT were probably veterans of negotiations on GCD and may have seen the new treaty as a way to continue pushing the approach in which they had vested so much personal energy.

Lastly, the NPT’s negotiating history shows that the Article VI nuclear disarmament obligation did in fact reflect the intentions of the NPT’s drafters and signatories, and was not intended to be fanciful or meaningless. As previously discussed, when in 1965 the U.S. and the Soviet Union presented their first NPT drafts to the ENDC in Geneva, both drafts called for a permanent treaty, focused solely on nonproliferation, and devoid of any disarmament provisions. Italy, an ENDC member, countered with a proposal for unilateral renunciations of nuclear weapons for a limited period of time. Under that proposal, states that had renounced nuclear weapons would meet near the end of previously specified term to review “the progress which had been made toward international agreements to prevent the spread of nuclear weapons, or to halt the nuclear arms race, and to reduce nuclear arsenals.”<sup>289</sup>

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288. Adrienne Blunt, “United Nations-General and Complete Disarmament” (Government of Australia, *Research Note* 5 (1997-1998) [www.aph.gov.au/library/Pubs/rn/1997-98/98rn05.htm](http://www.aph.gov.au/library/Pubs/rn/1997-98/98rn05.htm)

289. Bunn and Timerbaev, *Nuclear Disarmament*, 16.

ENDC's eight non-aligned members<sup>290</sup> also put on the record their view that:

the [obligation preventing the] spread of nuclear weapons should, therefore, be coupled with or followed by tangible steps, to halt the nuclear arms race and to limit, reduce and eliminate stocks of nuclear weapons and the means of their delivery.<sup>291</sup>

The phrase “coupled with or followed by” represented a compromise between states like India and Sweden that advocated that the NPT itself include, or be accompanied by “tangible steps”, and those willing to settle for a commitment that these steps would come later on.<sup>292</sup> It was this second view that gained expression in the commitment to “pursue negotiations in good faith” towards disarmament.

Soon after the declaration by the non-aligned eight, India and Sweden, proposed a “package” solution that specified what was generally understood by “tangible steps” at ENDC, namely: a CTBT, a FMCT, a freeze of and gradual reductions in the number of nuclear weapons and their delivery vehicles, a ban on the use of nuclear weapons, and security assurances for the NNWSs.

Opposition from the NNWSs, including key U.S. allies, made it evident that a treaty that did not address disarmament would not garner enough support to succeed.<sup>293</sup> This forced the U.S. and U.S.S.R. to add disarmament provisions to the treaty, in effect linking the nonproliferation to disarmament, and creating the main axis of the NPT ‘grand bargain’.<sup>294</sup> Chief among these provisions was

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290. The eight non-aligned members of ENDC were Brazil, Burma, Egypt, Ethiopia, India, Mexico, Nigeria, and Sweden.

291. Bunn and Timerbaev, *Nuclear Disarmament*, 17.

292. Ambassador Thomas Graham Jr., *Nonproliferation Review* 15, no. 1 (March 2008), [http://cns.miis.edu/npr/pdfs/151\\_correspondence.pdf](http://cns.miis.edu/npr/pdfs/151_correspondence.pdf)

293. Panofsky and Bunn, 4; Muller, *A Treaty in Troubled Waters*, 41. Panofsky and Bunn go as far as to argue that Italy, Germany, and Japan, already capable of making their own nuclear weapons, had as much to do with bringing about the eventual compromise, as did the non-aligned states.

294. Panofsky and Bunn, *The Doctrine of the Nuclear-Weapon States And the Future of Non-Proliferation*, (1994), 3. [http://people.reed.edu/~ahm/Courses/Stan-PS-314-2009-Q1\\_PNP/Syllabus/EReadings/BunnPanofsky1994The-Doctrine.pdf](http://people.reed.edu/~ahm/Courses/Stan-PS-314-2009-Q1_PNP/Syllabus/EReadings/BunnPanofsky1994The-Doctrine.pdf)

Article VI, and although American and Soviet delegations were unwilling to commit to specific measures in the text of the NPT, it was generally felt among the negotiating teams in Geneva that Article VI implied that “negotiating was not an end in itself, but a means to achieving concrete results at the earliest possible date.”<sup>295</sup> This understanding was largely confirmed by an authoritative interpretation of the meaning of Article VI written shortly after the NPT’s conclusion.<sup>296</sup>

Immediately following the opening of the NPT for signature, American and Soviet chairmen of the Geneva disarmament conference put forward an agenda for achieving “effective measures relating to the cessation of the nuclear arms race at an early date and to nuclear disarmament”. Under that heading, the agenda listed “the cessation of testing, the non-use of nuclear weapons, the cessation of production of fissionable materials for weapons use, the cessation of manufacture of weapons, and the reduction and subsequent elimination of nuclear stockpiles, nuclear free zones, etc.”<sup>297</sup>

In addition to Article VI, the NWSs were also forced to accept Article VIII.3, which establishes review conferences every five years, to assure “that the purposes of the Preamble and the provisions of the Treaty are being realized,”<sup>298</sup> Article X.2, which established a 25-year sunset clause for the treaty, and Article X.1, which established the right to withdraw from the treaty under “extraordinary circumstances” as defined by the withdrawing state.<sup>299</sup>

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295. Mohamed I. Shaker, *The Nuclear Non-Proliferation Treaty: Origin and Implementation 1959 – 1979*, 31, quoted in Elizabeth J. Shafer, “Good Faith Negotiation, the Nuclear Disarmament Obligation of Article VI of the NPT, and the Return to the International Court of Justice” (paper presented at “Abolition of Nuclear Weapons, War and Armed Forces” seminar, January 26, 2008, San Jose, Costa Rica), 14.

296. See Panofsky and Bunn, 4.

297. Bunn and Timerbaev, *Nuclear Disarmament*, 21.

298. See Appendix.

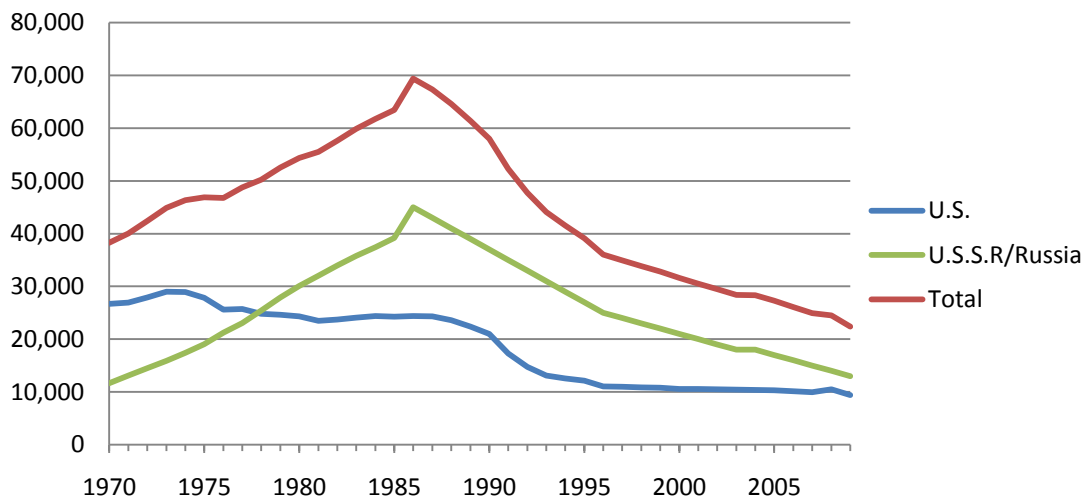
299. Bunn and Timerbaev, *Nuclear Disarmament*, 12; and Leonard Weiss, “Nuclear-Weapon States and the Grand Bargain,” *Arms Control Today* 33 (December 2003), [http://www.armscontrol.org/act/2003\\_12/Weiss](http://www.armscontrol.org/act/2003_12/Weiss).

As this history makes clear, far from being fanciful or meaningless, the obligation to pursue nuclear disarmament was the result of one of the key debates during the drafting of the NPT and reflected genuine expectations.

### What is the NWSs' Record of Compliance?

Have the NWSs lived up to their Article VI commitment? The nuclear arsenals of the U.S. and the U.S.S.R., together accounting for the overwhelming majority of the world's nuclear weapons,<sup>300</sup> actually grew from around 38,305 in 1970 when the NPT came into force, to around 69,401 in 1986. The entire increase came about through a Soviet build-up, with the American arsenal decreasing slightly, from 27,912 to 24,401 during that time.

**Figure 2: U.S. and Soviet/Russian Nuclear Warheads 1970-2009**<sup>301</sup>



300. The two powers were responsible for constructing nearly 97% of the 128,000 nuclear weapons ever created. About 55% of the total by the U.S., and about 43% by the Soviet Union/Russia. Robert S. Norris and Hans M. Kristensen, "Nuclear Notebook: Global Nuclear Stockpiles, 1945-2006," *Bulletin of the Atomic Scientists* 62, no. 4 (July/August 2006): 64.

301. Figures include all assembled warheads, whether 'active' (i.e. operational: either deployed or ready to be deployed at short notice), 'inactive' (kept in reserve at depots in a non-operational status, with their tritium bottles removed), or 'retired' (awaiting dismantlement). It should be noted, that in 2009 an estimated 4,200 U.S. weapons, and an estimated 8,150 Russian weapons fell into the last category. Figures are based on data compiled by Robert S. Norris and Hans M. Kristensen in: "Nuclear Notebook: Global Nuclear Stockpiles: 1945-2006" *Bulletin of the Atomic Scientists* 62, no. 4 (July/August 2006); and the Nuclear Notebooks for U.S. and Russia for the years 2007, 2008, and 2009, available at <http://www.thebulletin.org/>.

The 1986 peak was followed by a relatively sharp, steady reduction in the Soviet/Russian arsenal at an average rate of about 1,400 weapons a year. Starting from lower levels, the U.S. matched that rate briefly between the late 1980s and the early 1990s, but made minimal reductions thereafter. In all, U.S. and Soviet/Russian arsenals declined by 42% between 1970 and 2009, but because they started from such high levels, and because the U.S. has not made significant cuts since the mid-1990s, the two states still possess over 20,000 nuclear weapons between them.<sup>302</sup> While perhaps as many as 12,000 of these weapons are awaiting dismantlement, they are included in this tally because in the decade or more it may take to dismantle this backlog, the dismantlement decision could be easily reversed.<sup>303</sup> Even dismantlement is reversible, as it merely involves taking the weapons apart into their components, and not necessarily the destruction of components.

Although these reductions are certainly very positive, it would be a mistake to assume they are the result of a concerted effort to move towards nuclear disarmament.<sup>304</sup> The picture is more complex. On the Soviet side the grotesque overkill capacity built-up over preceding decades was simply unnecessary given that effective deterrence could be had at much lower force levels, and the economic and later the political demise of the Soviet state made maintaining

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302. Recently, the U.S. begun to disclose its number of 'active' and 'inactive' nuclear weapons, however, not the number of weapons awaiting dismantlement. At the end of 2009, the U.S. had 5,113 nuclear warheads in the first two categories (around 2,468 active and around 2,600 inactive). Tom Z. Colina, "U.S. Reveals Nuclear Force Plan, Arsenal Levels," *Arms Control Today* (June 2010), [www.armscontrol.org/act/2010\\_06/USArsenal](http://www.armscontrol.org/act/2010_06/USArsenal); and Robert S. Norris and Hans M. Kristensen, "U.S. Nuclear Forces 2010," *Bulletin of the Atomic Scientists* 66, no. 3 (May/June 2010): 57-70. <http://www.thebulletin.org/files/066003008.pdf>.

303. The Russians have been dismantling roughly 800 warheads per year in the decade from 2000 to 2009, but still maintain a substantial backlog. Their disarmament effort is constrained in part by inadequate resources. During the same period, the U.S. has been dismantling warheads at an average rate of 316 per year. At this rate it may take until 2022 or 2023 to dismantle the existing backlog, although the rate could be easily increased. U.S. Department of Defence, *Increasing Transparency in the U.S. Nuclear Weapons Stockpile*, Fact Sheet, [http://www.defense.gov/npr/docs/10-05-03\\_fact\\_sheet\\_us\\_nuclear\\_transparency\\_\\_final\\_w\\_date.pdf](http://www.defense.gov/npr/docs/10-05-03_fact_sheet_us_nuclear_transparency__final_w_date.pdf).

304. Charles Glaser for example stated bluntly in 1998 that Article VI "has not influenced actual policy." Glaser, "The Flawed Case for Nuclear Disarmament" *Survival*, 112.



such overblown arsenals unsustainable.<sup>305</sup> It may be that Mikhail Gorbachev's Reykjavik proposal for total nuclear disarmament was sincere, but it is also clear that it was well ahead of its time and has been unwelcome to subsequent Russian elites.

In the U.S., the deepest cuts occurred in response to Soviet reductions through a desire to reap the peace dividend at the end of the Cold War. Since then, the continuous modernization of the U.S. arsenal on the one hand, and the deterioration of the military readiness of the Russian forces on the other, has allowed the U.S. to actually increase its nuclear advantage over Russia even as its nuclear force shrunk. In a 2006 study, Kier Lieber and Daryl Press concluded that for the first time since the 1950s the U.S. was again nearing nuclear primacy, or the ability to launch a disarming first-strike against Russia.<sup>306</sup> Although very welcome, the reductions in the U.S. and Soviet/Russian arsenals are better seen as efforts to rationalize these arsenals than in terms of a conscious movement towards nuclear disarmament.

Moreover, the NWSs have consistently failed to deliver on key parts of the disarmament agenda, despite the opportunities to do so. The U.S. and the U.S.S.R. did not stop nuclear testing until 1991 and 1990 respectively, after collectively carrying out over 1,700 tests,<sup>307</sup> and the U.S. has yet to ratify the

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305. Arms control agreements were more the result, rather than the driver of the Soviet/Russian cuts. The Strategic Arms Reductions Treaty (START) I of 1991 limited deployed nuclear warheads (but not those in reserve or awaiting dismantlement) to 6000 each, but by then the Soviet Union had already cut 10,000 warheads in 5 years and tremendous budgetary pressures were driving it to cut more.

306. Kier A. Lieber and Daryl G. Press, "The End of MAD? The Nuclear Dimension of U.S. Primacy," *International Security* 30, no. 4 (Spring 2006). [7-44]

307. Arms Control Association, "The Nuclear Testing Tally," Arms Control Association Factsheet, [www.armscontrol.org/factsheets/nucleartesttally](http://www.armscontrol.org/factsheets/nucleartesttally).

CTBT. A verifiable FMCT has not yet been negotiated, and security guarantees to the NNWSs are still too weak.<sup>308</sup>

This poor performance was not for want of pressure from the NNWSs. The 1995 NPT review conference, for example, adopted a set of “principles and objectives” for the “full realization and effective implementation of article VI” as condition of the treaty’s indefinite extension. These included the early conclusion of the CTBT, FMCT, and the “determined pursuit by the nuclear-weapon States of systematic and progressive efforts to reduce nuclear weapons globally, with the ultimate goals of elimination of those weapons.”<sup>309</sup>

At the 2000 review conference, the parties specified in more detail the “systematic and progressive efforts to implement Article VI” in the so-called ‘13 Steps’. The most significant of these included:

- An unequivocal undertaking by the NWSs to accomplish the total elimination of their nuclear arsenals leading to nuclear disarmament;
- The entry into force of the CTBT at an early date;<sup>310</sup>
- The negotiation of a verifiable Fissile Material Cut-off Treaty;
- The need to apply the principle of irreversibility to nuclear disarmament;
- The need to strengthen the Anti-Ballistic Missile (ABM) Treaty;
- Steps by the NWSs to reduce their arsenals unilaterally, diminish the role of nuclear weapons in their security policies, and engage

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308. In 2010 both Russia and the U.S. strengthened their negative security assurances somewhat, but continued to shy away from a non-first-use policy. The U.S. policy states that the U.S. will not “will not use or threaten to use nuclear weapons against non-nuclear weapons states that are party to the Nuclear Non-Proliferation Treaty and in compliance with their nuclear non-proliferation obligations” Department of Defence, United States of America, *Nuclear Posture Review Report*, April 2010, viiii. However, as Norris and Kristensen note, this still leaves states like North Korea, Iran, Syria open to nuclear coercion. “U.S. Nuclear Forces,” 59-60. Russian declaratory policy is better, allowing for the use on nuclear weapons only when “the very existence of Russia is under threat.” NTI website, Russia/Soviet Union, [http://www.nti.org/db/disarmament/country\\_russia.html](http://www.nti.org/db/disarmament/country_russia.html).

309. Sagan, “Good Faith and Nuclear Disarmament Negotiations,” 205-6.

310. A CTBT had been negotiated in 1996, but could not enter into force unless ratified by a number of specifically named states, including nuclear powers like the U.S., China, North Korea, Pakistan, India, and Israel ratify it. France, the U.K. including 149 others already ratified the treaty. See [www.ctbto.org/](http://www.ctbto.org/).

“as soon as appropriate” in a process leading to their total elimination;

- Reaffirmation by the NWSs that the ultimate objective of the efforts of States in the disarmament process is GCD under effective international control.<sup>311</sup>

However, when the Bush administration came into office in 2000 it repudiated the 13 Steps, failed to send the CTBT to Congress for ratification, refused to negotiate on a verifiable FMCT, and withdrew from the ABM Treaty in order to pursue a destabilizing national missile defence system,<sup>312</sup> in the process scuttling the START arms reductions process, replacing it with an unverifiable Moscow Treaty (SORT).<sup>313</sup> The U.S. also pursued the development of a “more flexible and aggressive nuclear force posture,”<sup>314</sup> including new roles for U.S. nuclear weapons,<sup>315</sup> and new weapon systems to carry out the new missions.<sup>316</sup>

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311. 2000 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, *Final Document, Volume 1* (New York, 2000), 14.

312. Even a modestly-effective national missile defence would represent a significant step towards an American first-strike capability as it could be used to ‘mop-up’ the few Russian missiles that might be expected to escape an American surprise attack. This would increase instability during serious crises by forcing the Russians to choose between outright capitulation, risking an American first-strike, or nuclear pre-emption of their own. It is conceivable that the Russians could choose the last option if the first was sufficiently unpalatable to them.

313. The treaty committed the U.S. and Russia to reduce their “strategic nuclear warheads” to between 1,700 – 2,200 by the end of 2012, but did not define “strategic nuclear warheads” or how they were to be counted, and made no provisions for verification. Unlike previous arms control agreements, SORT did not require the destruction of delivery vehicles. Arms Control Association website, “The Strategic Offensive Reductions Treaty At A Glance,” <http://www.armscontrol.org/factsheets/sort-glance>; Harald Muller, “A Treaty in Troubled Waters: Reflections on a Failed NPT Review Conference,” *The International Spectator* 3 (2005), 39; and Sagan, “Good Faith and Nuclear Disarmament Negotiations,” 206.

314. Daryl Kimball, “New Nuclear Weapons vs. Nonproliferation: The Choice Before Congress” (April 29, 2003). [www.armscontrol.org/events/newnuclearweapons\\_apr03](http://www.armscontrol.org/events/newnuclearweapons_apr03).

315. These would include deterring biological and chemical attacks on U.S. forces and allies, dissuading adversaries from seeking weapons of mass destruction (WMD), and defeating adversaries’ WMD capabilities – preventively if needed. Glaser and Fetter, “Counterforce Revisited,” 84-5; and James A. Russell, “Nuclear Strategy and the Modern Middle East,” *Middle East Policy* 11, no. 3 (Fall 2004); excerpts from the NPR, on GlobalSecurity.org [www.globalsecurity.org/wmd/library/policy/dod/npr.htm](http://www.globalsecurity.org/wmd/library/policy/dod/npr.htm); Hans M. Kristensen, “The Role of U.S. Nuclear Weapons: New Doctrine Falls Short of Bush Pledge” *Arms Control Today*, (September 2005), [www.armscontrol.org/act/2005\\_09/Kristensen](http://www.armscontrol.org/act/2005_09/Kristensen).

316. The U.S. sought to develop new very low-yield nuclear warheads (‘mini-nukes’) for use when very high temperatures are desired to ensure total burn-up of potential stocks of biological or chemical agents, or to use as part of a ‘robust deep earth penetrator’ system to be used against ‘hard and deeply-buried targets. Glaser and Fetter, (2005), 86.

In all, one diplomat's characterization of the Bush years as "the darkest ages of nuclear disarmament and arms control, a period when the 'D' word was hardly used in London, Washington, and other capitals" was probably not unfair.<sup>317</sup>

The foregoing is not to suggest that the U.S. alone bears the responsibility for the lack of action on disarmament since 1970, or even since 2000. George Perkovich, a prominent nuclear abolitionist, notes that it would be naive to see the United States as the "determinative obstacle to progress [on nuclear disarmament.] Many who hold this view felt that President George W. Bush and his administration were the impediment to all progressive changes in the world, and that the ascent of an enlightened post-Cold War leader like Barack Obama would open the way." The picture is, unfortunately, far more complex:

Russia, China, France, Israel, Pakistan, India, and North Korea balk at many, and in some cases all, of the steps required even to approach the abolition of nuclear arsenals. Key non-nuclear-weapon states passively resist other necessary policies. The United States alone cannot change their calculations.<sup>318</sup>

### **Obama's Nuclear Agenda**

On April 5, 2009 in Prague, Barack Obama publically announced his nonproliferation and disarmament agenda and recommitted the United States to "seek the peace and security of a world without nuclear weapons," and to take "concrete steps" toward that goal. Notably, he committed to:

- reduce the role of nuclear weapons in American national security strategy;

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317. Jean du Preez of the Comprehensive Test Ban Treaty Organisation speaking to the U.K. Foreign and Commonwealth Office (Dec. 2009) [www.youtube.com/watch?v=pNa\\_LD1Cr30&feature=channel](http://www.youtube.com/watch?v=pNa_LD1Cr30&feature=channel); For an excellent summation and critique of U.S. security, and especially nuclear weapons policy from the 1990s to the late 2000s see William Walker's "Nuclear Enlightenment and Counter-Enlightenment," *International Affairs* 83, no. 3 (2007): 443-446.

318. George Perkovich, "The Obama Nuclear Agenda One Year After Prague," [www.carnegieendowment.org/files/prague4.pdf](http://www.carnegieendowment.org/files/prague4.pdf) For an excellent overview of each nuclear-armed states nuclear weapons policies see Perkovich and Acton, *Abolishing Nuclear Weapons: A Debate*, 25-30.

- negotiate a follow up to the Strategic Arms Reductions Treaty (START) with Russia, to “set the stage for further cuts” in nuclear arsenals that would include all nuclear weapon states;
- “immediately and aggressively pursue U.S. ratification of the Comprehensive Test Ban Treaty;”
- seek a verifiable fissile materials cut-off treaty (FMCT); and
- secure vulnerable nuclear materials around the world within four years.<sup>319</sup>

Obama’s policy has been misinterpreted by some on the right as well as the left as transformative of the role of nuclear weapons in U.S. national security strategy. But as the Prague speech and the policy pronouncements that followed make clear, the administration is taking a cautious (it would say pragmatic) approach. Obama repudiated some of the most counterproductive Bush-era policies, and deemphasized others, but he also acknowledged that disarmament is a long-term project, stating: “This goal will not be reached quickly — perhaps not in my lifetime,” and that as long as nuclear weapons exist anywhere “the United States will maintain a safe, secure and effective arsenal to deter any adversary, and guarantee that defense to our allies.”<sup>320</sup>

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319. U.S. Government, The White House, Office of the Press Secretary, “Remarks by President Barack Obama: Hradcany Square, Prague Czech Republic,” April 5, 2009, [http://www.whitehouse.gov/the\\_press\\_office/Remarks-By-President-Barack-Obama-In-Prague-As-Delivered/](http://www.whitehouse.gov/the_press_office/Remarks-By-President-Barack-Obama-In-Prague-As-Delivered/) Obama also spoke of the need for a revised framework for civil nuclear cooperation, including a strengthened IAEA, greater consequences for NPT non-compliance, and the need to make it more difficult to leave the treaty “without cause.”

320. U.S. Government, The White House, “Remarks by President Obama: Prague.” On Obama’s nuclear agenda and its misinterpretations see George Perkovich, “The Obama Nuclear Agenda One Year After Prague.”

Notable steps taken by the administration so far have included: the conclusion of the New START treaty with Russia;<sup>321</sup> a decisive recommitment by the U.S. to the goal of nuclear disarmament and the 13 Steps in particular; and the resumption of work towards a Middle-East NWFZ.<sup>322</sup> These efforts are progressively restoring trust in the U.S. as a good-faith participant in the nonproliferation regime, and have enabled the successful conclusion of the 2010 NPT review conference. But Obama does face significant hurdles in moving the disarmament project forward, including a domestic public that on the whole does not understand the complex linkages between disarmament, proliferation, and the overall security environment, and is easily frightened by misrepresentations of Obama's policy by right-wing pundits and defence hawks.<sup>323</sup> It's unclear how strongly even his own party supports Obama on this issue. To Perkovich, the U.S. president looks like a "leader who has broken through lines of resistance but looks back to find that few other leaders of the most powerful states have joined him and relatively few citizen soldiers have enlisted in this campaign."<sup>324</sup> It is quite possible that the CTBT may be rejected by the U.S. Congress. As a treaty, the CTBT requires two-thirds approval by the U.S. Senate to pass; a hurdle made

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321. A "fake" counting rule under the treaty treats each nuclear-capable bomber as one nuclear warhead, even though in reality some U.S. and Russian bombers can carry up to twenty nuclear weapons, including nuclear air-launched cruise missiles (ALCMs). This means that the New START may not actually reduce the numbers of deployed strategic weapons. It does however revive the START treaty process, making significant reductions possible down the road. As Ivan Oelrich and Hans Kristensen put it, "The New START Treaty is not so much a nuclear *reductions* treaty as it is a *verification and confidence building* treaty" meant to "be a bridge between the expired START Treaty and the next treaty, which is going to fundamentally reshape the nuclear relationship of the Cold War legacy nuclear powers." SIS Hub website, "New START Treaty Reduces Limit for Strategic Warheads But Not Number," <http://www.fas.org/blog/sis/2010/08/18/new-start-treaty-reduces-limit-for-strategic-warheads-but-not-number/>. I thank Douglas Ross for pointing out the New START's shortcomings.

322. Deepti Choubey, "Understanding the 2010 NPT Review Conference," Q&A, June 3, 2010, <http://carnegieendowment.org/publications/index.cfm?fa=view&id=40910#2>.

323. Perkovich argues that the opponents of disarmament have a "psychological advantage" because the arguments in favour are so complex, while the arguments against are easy to make and frightening (even if spurious).

324. Perkovich, "The Obama Nuclear Agenda One Year After Prague"

more daunting by concerted Republican opposition to the treaty and their recent gains in the Senate.<sup>325</sup>

## Is Disarmament Desirable?

The question of the legal obligation to disarm is quite separate from the ultimately more important question of whether disarmament is actually desirable. In answer to the latter, this section picks up the nuclear optimism/pessimism debate begun in Chapter 1, and examines the key arguments in favour and against disarmament. These are arguments about: the possibility of deterrence failures; the possibility of accidental or nuclear war; the existence and the likely effects of the stability/instability paradox; the link between disarmament and nonproliferation; and finally about the dangers of disarmament in an anarchic international system.

### Deterrence Failures

Optimists maintain that nuclear weapons have are a profoundly stabilizing force in international relations.<sup>326</sup> This assertion rests on the deductive logic of Rational Deterrence Theory (RDT),<sup>327</sup> which holds that deterrence requires that one's opponent believe that one:

- has an effective military capability;
- which could impose unacceptable costs if used; and

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325. Senator Kyle of Arizona who led the opposition to the CTBT in the late 1990s is now the Republican whip and remains a staunch opponent.

326. See Waltz, "More May be Better" in Sagan and Waltz, *The Spread of Nuclear Weapons*; Bueno de Mesquita and Riker, "An Assessment of the Merits of Selective Nuclear Proliferation"; James Wood Forsyth, B. Chance Saltzman, and Gary Schaub Jr., "Remembrance of Things Past: The Enduring Value of Nuclear Weapons," *Strategic Studies Quarterly* 4, no. 1 (Spring 2010). See also "Does Proliferation Matter" in Chapter 1 of this paper.

327. See a symposium on Rational Deterrence Theory in *World Politics*, Vol. 41, no. 2. (1989), 143-247; or, for an authoritative overview of the state of deterrence theory after the Cold War, see Patrick M. Morgan, *Deterrence Now* (Cambridge, United Kingdom: Cambridge University Press, 2003), 331.

- which would be used if one were to be attacked.<sup>328</sup>

Because nuclear weapons are so powerful, the optimists argue, they make these calculations easy, as even a small risk of nuclear retaliation is enough to outweigh any potential benefits of aggression.<sup>329</sup> Optimists argue that the anomalously lengthy period of great power peace since 1945 validates RDT and their beliefs about the unique, deterrence-enhancing properties of nuclear weapons.

Pessimist retort that RDT does not translate neatly into the real world, and fear that psychological biases, organizational pathologies, and imperfect information may upset the deterrence equation and lead to deterrence failures. There are a number of common psychological biases that work against deterrence.<sup>330</sup> Laboratory experiments confirm that people tend to be overconfident in their factual judgements and predictions, potentially leading decision makers to underestimate deterrent threats; overestimate how well they are able to manage risks and control escalation; and overestimate the probability that the other side received and correctly understood a deterrent threat.<sup>331</sup>

The fundamental attribution error is one bias with important implications for deterrence theory. It refers to the human tendency to overestimate how much actors' behaviour is a function of their personalities, and underestimate how

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328. William W. Kufmann, *The Requirements of Deterrence* (Princeton: Princeton University, 1954). Quoted in Morgan, op. cit., 4.

329. Although there are disagreements among optimists just how much nuclear deterrence is enough, with some believing that very few weapons are needed because the adversary would need to be absolutely sure of being able to destroy them all before he'd be confident enough to attack, to those from the 'nuclear war-fighting' school who maintain the need to preserve a wide range of capabilities

330. The following paragraphs draw heavily on Tetlock et al. But for foundational studies of the psychology of nuclear deterrence see Jervis, Stein and Lebow in the symposium on Rational Deterrence Theory in *World Politics*, Vol. 41, no. 2. (1989), 143-247.

331. Scott and Sari relate Nixon's mistaken belief that he could successfully pursue risk-free tactics of nuclear coercion towards the Soviets by manipulating U.S. nuclear force deployments and readiness levels. Not only did the Soviets likely fail to understand his signals, but Nixon clearly overestimated the degree to which he could control how his own military implemented his orders, leading to behaviour that was decidedly not risk-free. Scott D. Sagan and Jeremy Suri, "The Madman Nuclear Alert," *International Security* 27, no. 4 (Spring 2003). [150-183].



much it is a function of their circumstances. This kind of thinking helps drive the 'security dilemma' as states perceive each other's arming behaviour as internally motivated, rather than as a response to the anarchic structure of the international system. Fundamental attribution error thus stokes the fears that feed arms races and hinder conflict resolution. In the extreme, it may convince one side that the other is innately aggressive, or insane, and thus potentially undeterrable. Deterrence can fail if one comes to see the costs of attacking a nuclear-armed adversary as 'acceptable,' which one may well, if the only alternative appears to be nuclear war at a later date, against a potentially strengthened adversary. From that perspective, striking the first blow may make sense.<sup>332</sup>

The example of LeMay and the Cuban missile crisis mentioned in Chapter 1 could be seen in this light. LeMay was convinced that the U.S. would eventually need to fight the Soviets, whom he viewed as implacable. This may have caused LeMay to welcome the Cuban crisis as an opportunity to strike first, while the U.S. still maintained relative nuclear superiority.<sup>333</sup> A year earlier, during the 1961 Berlin crisis, president Kennedy had seriously considered a preventive, first-strike option aimed at taking out the still-small number of Soviet ICBMs, and strategic bomber bases. During one meeting, one high-ranking U.S. general argued that "the time of our greatest danger of a Soviet surprise attack is now" and advised the president that "if a general atomic war is inevitable, the U.S. should strike first."<sup>334</sup> Kennedy rejected the advice, but perhaps not every other leader would have. In a study of brinkmanship, Richard Ned Lebow found that decision makers who believed that aggressive action was necessary "became predisposed to see

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332. Indeed U.S. forces seemed to be postured to do just that for much of the Cold War, in spite of many RDT scholars predicting that deterrence could be maintained at far lower arsenal levels. "From the 1960s through 1980, during the era of publically declared commitment to mutual assured destruction, the US nuclear posture was built nevertheless to be able to assault and significantly degrade Soviet and Chinese offensive nuclear capabilities". Douglas A. Ross, "Nuclear Weapons and American Grand Strategy," *International Journal* (Autumn 2008): 858.

333. Robert McNamara, *The Fog of War* (2003)

334. Fred Kaplan, "JFK's First-Strike Plan," *The Atlantic Monthly* (October 1 2001): 85.

their objectives as attainable," that is, they convinced themselves that the risks were manageable.<sup>335</sup>

Some other significant biases include 'belief perseverance', which is the human tendency to maintain a belief in the face of disconfirming evidence, and 'groupthink' or the tendency of a group to uncritically fall into line behind a dominant voice or an emerging consensus. Both of these impede rational decision making by creating blind spots. As one recent study concluded, *all* of the dozens of biases identified by psychological research over the past several decades predispose humans to confrontation and aggression:

psychological impulses [...] incline national leaders to exaggerate the evil intentions of adversaries, to misjudge how adversaries perceive them, to be overly sanguine when hostilities start, and overly reluctant to make necessary concessions in negotiations. In short, these biases have the effect of making wars more likely to begin and more difficult to end.<sup>336</sup>

Biases may also be exacerbated by institutional arrangements. Sagan, for example, argues that organizational pathologies may prevent or slow the development of survivable nuclear forces, thus diminishing deterrence by making a 'splendid first-strike' more likely to succeed. For example, the U.S. Navy objected to the development of the Submarine-Launched Ballistic Missile system (SLBM), which is the most survivable of the U.S. nuclear triad of bombers, land-based ICBMs, and SLBMs.<sup>337</sup>

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335. Richard Ned Lebow, "Conclusions" in *Psychology and Deterrence*, eds. Robert Jervis, Richard Ned Lebow and Janice Gross Stein (Baltimore and London: The Johns Hopkins University Press, 1985), 212.

336. Daniel Kahneman and Jonathan Renshon, "Why Hawks Win," *Foreign Policy*, (January/February 2007).

337. Sagan and Waltz *The Spread of Nuclear Weapons: A Debate Renewed* (2003), 69-72.

### Accidental Nuclear War

Discussion in Chapter 1 already provided one compelling illustration of how close we might have come to accidental nuclear war, but there are others.<sup>338</sup> One incident occurred in 1979 and involved duty officers at NORAD and two other U.S. command centres suddenly being confronted by what appeared on their displays to be a full-scale Soviet nuclear attack. A threat assessment conference was convened and nuclear forces were put on alert but, after directly accessing the early warning sensors data (satellites and radar stations) which showed no indication of attack, the officers concluded the warning was a false alarm. As in the Cuban missile crisis incident, a training tape inadvertently inserted into the system was later found to be the culprit. The following year, another incident, this time involving a malfunctioning computer chip, led the displays at a Strategic Air Command (SAC) command post to indicate a major Soviet attack. The displays were behaving erratically, at one time showing 2 incoming missiles, then zero, then 200, then 2,000. Again, direct contact with the sensors indicated that no missile launches or missiles in the air had been detected.<sup>339</sup>

As Sagan notes, “It is difficult to know what overall lesson should be drawn from such incidents, since they represent both a *failure* of the command system to prevent false warnings of attack and a *success* of the command system to avoid premature nuclear retaliation.”<sup>340</sup> Optimists will no doubt focus on the successes, and emphasize that redundant sensors and two different types of sensor technology (satellites and radars) virtually assure that false warnings are

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338. See page 26. One observer summarized the issues this way: “[during the Cold War] Nuclear weapons fell out of planes, fires occurred in missile silos, false alarms moved weapons to high-alert levels, some weapons were temporarily stolen, highly threatening steps were taken by armed forces elements during crises in ways unknown to and not authorized by their civilian superiors, etc.” Morgan, *Deterrence Now*. More recently, in 2007, a USAF B-52 flew over the continental U.S. with six nuclear warheads onboard, without authorization or awareness of the nature of the cargo. Thirty-six hours elapsed before the mistake was discovered. *The Independent*, September 24, 2007.

339. See Scott D. Sagan, *The Limits of Safety: Organizations, Accidents, and Nuclear Weapons* (), 228-34.

340. Sagan, *The Limits of Safety*, 233.

easily identified. They will also point out that the specific failures that led to the aforementioned incidents have now been addressed, further limiting the possibilities for future failure. Pessimists are likely to argue that virtual assurance is not good enough when the stakes are as high as they are with nuclear weapons, and predict that novel problems will continue to arise. Pessimists will also point out that the above examples occurred in the context of low international tensions, leading the officers on duty to look for, and find, evidence confirming their suspicions of a false alarm. Might the same psychological dynamics have led them down the opposite path if the incidents had occurred during a serious crisis?<sup>341</sup>

Another issue deserving of additional attention is that of risks associated with the current 'launch-on-warning' posture, currently employed by both the U.S. and Russia. Launch-on-warning is a nuclear force posture designed to retaliate against a perceived nuclear attack upon warning of the attack and before detonation occurs. Because missile flight times are extremely short, launch-on-warning imposes severe time pressures on those in command to evaluate warnings and decide on a response. Commanders may have at most 15-20 minutes warning of attack, about 30 seconds of which are designated to brief the president, who may then have only a minute or two to decide on the course of action. Bruce Blair, a former nuclear launch control officer comments that "The bias in favour of launch on electronic warning is so powerful that it would take enormously more presidential will to withhold an attack than to authorize it. The option to 'ride out' the onslaught and then take stock of the proper course of action exists only on paper."<sup>342</sup>

Nuclear optimists respond that even if prompt-launch postures and keeping weapons on 'hair-trigger alert'<sup>343</sup> are a problem (and not all optimists

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341. Sagan explores some possible scenarios of 'what could have gone wrong'. *Limits of Safety*, 234-7.

342. Bruce Blair, quoted in Phillips and Starr, "Let's Go No-LOW" (2004).

343. That is, being ready to be launched on very short notice (about 15 minutes) of the decision to do being taken.

acknowledge that they are) these issues could be addressed by measures well short of nuclear disarmament.<sup>344</sup> There is certainly merit to this argument, however optimists may have too much faith in the willingness or ability of states to always pursue safe nuclear policies. The fact that both the U.S. and Russia to this day, two decades after the end of the Cold War, maintain thousands of weapons on hair-trigger to be launched on warning of attack is a sobering illustration. Sustainable nuclear disarmament may be the only sure way of avoiding these dangers.

### **Stability/Instability Paradox**

The stability/instability paradox is the hypothesized tendency for stability at the strategic level of conflict to cause instability at lower levels. Pessimists fear that in a post-proliferated world states may attempt to exploit fear of nuclear escalation through brinkmanship, *fait accompli*, and military adventurism. Far from the perpetual peace predicted by nuclear optimists, politics in such a world may resemble a high-stakes game of chicken where states attempt to force one another to capitulate by behaving in apparently reckless ways.<sup>345</sup> During the Cold War, worries that the Soviet Union might attempt to exploit mutually assured destruction (MAD) by seeking conventional military gains in Europe were real enough to force the U.S. to deploy a 'trip-wire' force equipped with tactical nuclear weapons in Germany to artificially increase the risk that a Soviet invasion would escalate to an all-out nuclear war. Recent quantitative research also lends support to the stability/instability hypothesis by showing that a dyad where both states possess nuclear weapons is far more likely to engage in military conflict short of major war than one where only one, or neither of the states are nuclear-armed.<sup>346</sup>

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344. Charles Glaser, "The Flawed Case for Nuclear Disarmament," (1998).

345. Marc Trachtenberg, "Waltzing to Armageddon," *National Interest*, no. 69 (2002), 69.

346. Rauchhouse, "Evaluating the Nuclear Peace Hypothesis,"

### A Link to Proliferation?

Proponents of nuclear disarmament offer several arguments linking disarmament to proliferation.<sup>347</sup> Notably, they claim that the NWSs' existing arsenals are threatening to the NNWSs making the latter more likely to seek nuclear weapons of their own. Nuclear arsenals can threaten directly, through nuclear coercion, or indirectly, by catalyzing regional proliferation races or intensifying hedging.<sup>348</sup> Pessimists also note that lack of action on disarmament reinforces the idea that nuclear weapons are useful tools of national policy, and potent symbols of great power status. Lastly, lack of good-faith action on disarmament divides the NPT community, making robust cooperation on the other two pillars much harder. According to this argument, even if some states use the lack of progress on disarmament as cover for their own inaction on strengthening the regime, would it not be worthwhile to deprive them of that excuse?

Nuclear retentionists (optimists) reject the linkage between disarmament and proliferation, arguing that proliferation stems from more local security concerns rather than the fear of nuclear attack by a nuclear-armed state.<sup>349</sup> If the NWSs agreed to give up their weapons tomorrow, the argument goes, Iran and North Korea, would not be dissuaded from proliferating. Some observers even argue that disarmament would actually drive proliferation as states currently relying on the U.S. nuclear umbrella would feel compelled to develop their own

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347. Harald Muller sums them up well in, "The Future of Nuclear Weapons in an Interdependent World," 71-2.

348. Harald Muller notes that even conventional threats made by nuclear powers carry a "nuclear shadow". Harald Muller, "The Future of Nuclear Weapons in an Interdependent World," *The Washington Quarterly* 31, no. 2 (Spring 2008): 72. [63-75] Nuclear weapons can create threats in a round-about way. For example, U.S. nuclear threats against China during the Korean war undoubtedly played a part in that country's decision to go nuclear. China's nuclear weapons now influence Japanese threat assessments and almost certainly played a part in India's decision to acquire the bomb, which in turn influenced Pakistan to seek the same. It would be unreasonable to assume that the existing chain reactions have wholly petered out, especially in the face of a changing geopolitical environment.

349. For example, Bruce M. Sugden, "Assessing the Strategic Horizon: Nonproliferation, Security, and the Future U.S. Nuclear Posture," *Nonproliferation Review* 15, no. 3 (November 2008). [499-514]. Charles Glaser, "The Flawed Case for Nuclear Disarmament" 119-120.

nuclear deterrents. Richard Betts takes this position when he argues that “If we look beyond righteous rhetoric, to the normal dynamics of international relations it seems more likely that superpower disarmament at best would be irrelevant to proliferation, and at worst would spur it” since “Security incentives for getting a bomb are less likely to flow from fear of superpower nuclear intervention than from fear of non-intervention” by a superpower on one’s behalf during a crisis.<sup>350</sup> Retentionists further argue that NNWSs have more at stake in the regime than the NWSs, because they want to avoid new proliferation in their immediate neighbourhoods. If the NNWSs really cared about disarmament they would have extended the NPT for a limited period only, or held out for greater concessions from the NWSs.<sup>351</sup>

While these arguments are not without merit, they do have serious shortcomings. Firstly, astute abolitionists do not claim that nuclear disarmament by the NWSs will remove all, or even most of the motivations of would-be nuclear powers, especially when it comes to states with severe security concerns. Disarmament is, however, a serious consideration for the majority of responsible, *status quo* states, with moderate security concerns. Those states could be tempted to acquire nuclear weapons ‘just in case’ (currently a key rationale for the French and British arsenals) especially if these weapons continue to be seen as symbols of national prowess and prestige.

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350. Betts, *Paranoids Pygmies*, 102. Frankel agrees with Betts that the NWSs’ failure to disarm will not induce proliferation (62). Pierre Hassner agrees with Betts that the non-fulfillment by the NWSs of their pledge to pursue disarmament is not the basic cause of proliferation: “I think that if they were to keep their word, the power of their example would not be sufficient, in most cases, to prevail against the motivations in terms of status, domination or security that may push some of the non-nuclear states to seek nuclear status...and some of them might even be encouraged or reinforced in their decision to go nuclear by the removal of the threat of nuclear retaliation by one of the existing nuclear powers” Hassner, “Who killed nuclear enlightenment” 462-3”. See also Keith Payne et al. *Planning the Future U.S. Nuclear Force* (National Institute Press, 2009), 22; Bruno Tertrais, “Advancing the Disarmament Debate: Common Ground and Open Questions,” in George Perkovich and James A. Acton eds. *Abolishing Nuclear Weapons: A Debate* (Washington D.C.: Carnegie Endowment for International Peace, 2009), 181-2; Bruno Tertrais,

351. Tertrais, “The Illogic of Zero,” 126.

Secondly, the argument that disarmament by the nuclear powers is more likely to lead to proliferation than otherwise, both underestimates the degree to which NNWSs feel threatened by existing nuclear arsenals and wrongly assumes that only some states would disarm while others did not. The U.S., for example, will not disarm unless all other states do so as well, at which point the key function of its extended deterrent (to deter nuclear use against U.S. allies) will become moot. Presumably, the U.S. will maintain committed to the conventional defence of its allies.

Lastly, it is true that many NNWSs have just as much, or perhaps even more, to gain from an effective NPT regime than the NWSs, but this will not translate into a free ride for the NWSs. The NNWSs would not have accepted the 1995 indefinite extension without a re-affirmation by the NWSs of their Article VI obligations and a commitment to additional steps towards disarmament. Had the NWSs tried to deny their obligations, some NNWSs may well have walked, and the regime would likely have collapsed. Perkovich and Acton are probably correct in concluding that "Double standards on matters as materially and psychologically important as nuclear weapons will produce instability and non-compliance, creating enforcement crises that increase the risk of conflict and nuclear anarchy."<sup>352</sup>

### **Disarming Prematurely: Verification, Rearmament, and the Importance of System Conditions**

Nuclear optimists see the pursuit of disarmament as profoundly dangerous in a world of sovereign states which lacks a reliable mechanism for the prevention of war. To make the world safe for disarmament, optimists argue, would require nothing less than a transformation of the international system into one where war is virtually eliminated as a possibility. Unfortunately, they say, there is little to indicate that such a transformation is even possible, much less at hand.

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352. Perkovich and Acton, 16.



Nuclear optimists field two key arguments for why a world without nuclear weapons would be dangerous. First, a disarmed world would be unstable. States could never be sure that a dozen or so nuclear weapons were not stashed away by an old adversary or a potential rival, or that old weapons programs could never be reconstituted without detection.<sup>353</sup> If the excellent international relations that enabled disarmament in the first place deteriorated even a little, the logic of the security dilemma would re-assert itself very quickly, leading to the breakdown of the regime and to a mad race to re-arm.<sup>354</sup> As Thomas Shelling points out:

a “world without nuclear weapons” would be a world in which the United States, Russia, Israel, China, and half a dozen or a dozen other countries would have hair-trigger mobilization plans to rebuild nuclear weapons and mobilize or commandeer delivery systems, and would have prepared targets to preempt other nations’ nuclear facilities, all in a high-alert status, with practice drills and secure emergency communications. Every crisis would be a nuclear crisis, any war could become a nuclear war [...] It would be a nervous world.<sup>355</sup>

Secondly, retentionists observe that arms races would likely be more dangerous in a disarmed world because small nuclear forces are usually more vulnerable than larger ones, and thus more likely to tempt preventive attack. As Shelling puts it, “The urge to preempt would dominate; whoever gets the first few weapons will coerce or preempt.”<sup>356</sup> Aware of this, new nuclear states might choose to disperse their forces and delegate launch authority to lower-level commanders in an effort to maximize force survivability. But this would increase the risk of accidental or unauthorized launch, especially during a crisis. Finally, it is likely that if states were to re-arm in a hurry, their arsenals would lack the sophisticated safety, warning, and command and control systems of more mature nuclear forces, again exacerbating first-strike pressures and the risk of accidental use, or even theft.

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353. Colby, “Nuclear Abolition: A Dangerous Illusion,” (2008): 429.

354. Charles Glaser, “The Flawed Case for Nuclear Disarmament,” (1998).

355. Thomas Schelling, “A World Without Nuclear Weapons,” 127.

356. Shelling, 127.

For all the above reasons, retentionists see the abolitionists as conflating cause and effect. Nuclear disarmament will not create great power peace – in the absence of which disarmament can be very dangerous – and great power peace, if it can be maintained, makes nuclear weapons virtually irrelevant. As Charles Glaser posits, the “absolute long-term safety from the use of nuclear weapons lies in a permanent revolution in international relations, not in disarmament.”<sup>357</sup>

Abolitionists are able to blunt some of the technical criticisms about the feasibility of designing effective verification regimes, although they cannot dismiss them completely.<sup>358</sup> However, thoughtful abolitionists acknowledge that nuclear weapons are primarily a political problem, not one of regime design.<sup>359</sup> Where the two camps really differ is that while the former is on the whole extremely sceptical of the possibility for a an improvement in international relations significant and sustainable enough to make disarmament desirable, the latter are both more optimistic about the possibility for improved international relations and, importantly, recognize that meaningful progress towards nuclear disarmament can actually *catalyze* such political change. As Harald Muller argues, “The function of arms control, disarmament, and nonproliferation [...] is to help move the world from an era of self-help into an era of cooperative and collective security” much as it helped to create trust and lower tensions between the U.S. and the Soviet Union in its final years.<sup>360</sup>

It is not necessary to for this paper to definitively answer whether total nuclear disarmament is desirable, or whether all that can be hoped for are further

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357. Glaser, 124.

358. See Perkovich and Acton, “Abolishing Nuclear Weapons: A Debate”. Perkovich and Acton for example acknowledge the impossibility of accurately verifying the full disclosure of fissile materials or nuclear weapons noting that “substantial uncertainties in fissile-material inventories are unavoidable. Even with blameless intentions and honest accounting, such uncertainties would be on the order of at least a few per cent of production.” In the cases of the U.S. and Russia, this “few percent” can amount to enough material for well over a thousand nuclear weapons. (63-4).

359. Harald Muller for example emphasizes the need for something akin to the great power concert that followed the Napoleonic wars as a precondition for disarmament.

360. Muller, 65.

reductions of nuclear arsenals to very low levels (perhaps ending with some dozens, or at most a few hundred de-alerted 'bombs in the basement' worldwide). As a practical matter, this point will remain moot for decades, as that is how long it will take for the NWSs to transition towards minimum deterrence postures, political conditions permitting. What is clear, is that large cuts in the current forces are possible, and that it makes sense to begin the work of winding down the arsenals now.

The desirability of continuing with deep reductions in the U.S. arsenal is even starting to be acknowledged by senior U.S. military planners. Recently, B. Chance Saltzman, chief of the U.S. Air Force's Strategic Plans and Policy Division co-authored an article arguing that "America's nuclear security can rest *easily* on a relatively small number of counterforce and countervalue weapons totaling just over 300."<sup>361</sup> If Saltzman's proposal were realized, it would represent a roughly 80% reduction from current (and New START-mandated) levels. Saltzman et al. argue that these reductions would make sense *even if* Russia maintained its nuclear forces at current levels. How much further could we cut if reductions were reciprocated, relations improved, and ideas about how much is enough to deter aggression continued to evolve as a result of growing trust among the great powers?

Some time, perhaps around mid-century, once states arrive at the threshold at which they feel that further reductions could seriously compromise their security, they will be able to assess the political context and decide if they want to take the final steps towards full disarmament. If, as the abolitionists hope, efforts at building a cooperative world order will have progressed far enough by then, it will be wise to proceed, if not, then nothing will have been lost.

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<sup>361</sup> Forsyth, Saltzman, and Schaub, "Remembrance of Things Past," 83. Emphasis added.

## CONCLUSIONS

This paper set out to explore the status and prospects of the nuclear nonproliferation and disarmament regime. It has presented a picture of a regime beset by immediate regional crises as well as by larger, systemic challenges still mostly on the horizon. In terms of the immediate crises, this paper has argued that, if skilfully managed, North Korean nuclear capabilities can likely be frozen at close to current levels – perhaps even rolled-back in the longer term – and that further regional proliferation can likely be avoided. Likewise, the Iranian nuclear program can probably be arrested on the basis of capping enrichment capacity at close to current levels, and acceptance by Iran of more intrusive inspections until trust can be restored in its peaceful intentions. In exchange, Iran would require the lifting of sanctions, strengthened security guarantees, and other inducements. If this can be achieved, regional impacts on proliferation are likely to be small. However, the long-term sustainability of the regime depends on addressing the broader conditions driving proliferation including: continuing, and perhaps rising, regional and global tensions; increasing access to sensitive technology and nuclear expertise; and the continued existence of large nuclear arsenals. As this paper has shown, significant barriers to progress exist in all three areas.

Today's anomalously benign international security environment may well deteriorate as economic power shifts east away from the trans-Atlantic region, and as the impacts of climate change become severe. The changing global balance of power will undoubtedly make rising powers like China more assertive on the world stage, leading to increased friction with the established, *status quo* powers. The extent to which such friction will translate into actual conflict will depend on how responsibly all parties manage the transition. This task will be especially difficult in the context of a changing climate, which threatens to cause severe food shortages, inundations of densely-populated coastal areas, mass-

migrations, and perhaps even attempts at coercion by nuclear-armed states. The uncertainties of such a world are likely to increase nuclear weapon retentionism among the nuclear-armed states, and motivate proliferation among the NNWSs.

Just as demand for nuclear weapons may well be set to increase, so too may the supply of expertise and technology needed to make them. Nuclear power is expected to spread to perhaps two dozen additional states within just twenty years. As has been shown, even with the Additional Protocol in place, IAEA's safeguards offer only moderate level of assurance against cheating. IAEA's capacity to carry out its verification function is already badly overstretched and, absent drastic increases in funding, the realities of the nuclear renaissance are likely to overwhelm the agency. Especially worrisome is the possibility of adoption of a 'closed' nuclear fuel cycle as the nuclear industry standard, as this would create massive amounts of separated plutonium which could be readily diverted to weapons applications. Furthermore, the expectation of a major expansion in nuclear power appears to be eroding agreement about the need for restraint in exporting sensitive technologies. Internationalizing the fuel cycle and rejecting any further expansion of reprocessing (opting instead for a 'once-through' fuel cycle) would ameliorate these concerns considerably, however, such proposals are currently off the table and will remain difficult to negotiate, especially if the security environment deteriorates.

The possibilities of deterrence failure, accidental nuclear war, and increased incidence of lower-level conflict that could escalate to the nuclear level, as well as the link between disarmament and nonproliferation, all make nuclear disarmament desirable. As this paper has argued, however, the prospects for the regime's disarmament pillar are mixed at best. The NWSs' record so far has been disappointing. Though deep reductions in the number of nuclear warheads have been made since the heights of the Cold War, over 20,000 of these weapons still remain, and the past decade has been marked by atrophy and setbacks. While the Obama administration is attempting to re-invigorate nuclear disarmament, it remains to be seen whether some key initiatives like the CTBT will actually be adopted, and how willing future administrations, and other

nuclear-armed states, will be to negotiate further reductions. Real progress on disarmament will require not only a genuine rejection of primacist security strategies by the U.S., but an improvement in great power relations to the point where war between them seems almost unimaginable, and where other sources of insecurity are greatly reduced. Although the obstacles are many, such a future may well be achievable and, therefore, it makes sense to work towards it. At the same time, states should be mindful of the dangers of disarming prematurely, under inauspicious political circumstances.

This paper has described the current state of the nonproliferation regime, as well as some possible future trends. It has argued that the regime potentially faces some very serious challenges in the coming decades, although the future is much too opaque to allow for robust predictions about how these dynamics will play themselves out. For this reason, and in the interest of avoiding any blind spots in the analysis, it would be useful to examine a some hypothetical scenarios for the regime's future. Two such scenarios are presented below, and both of them are intended to be plausible.

### **Scenario 1: The Cassandras Were Mostly Wrong...**

It's 2050, and geo-engineering techniques seem to be working without major side effects. The global average temperature is slowly levelling off at 1.4°C above pre-industrial levels, and the scientific community is fairly confident it will start to decrease by century's end. Meanwhile, significant national investments in nuclear power, along with the mass-adoption of alternative energy technologies like geo-thermal and algal bio-mass, have helped cut GHG emissions by 40% from 1990 levels, and reductions continue apace.

China has just held its third truly free general election. After a nerve-racking standoff with the U.S. over Taiwan in 2033 it entered into reunification talks with the Taiwanese government on the understanding that the island would be repatriated in return for wide-ranging autonomy. It's now been thirty-five years since the reunification of the Korean peninsula and the dismantlement of the

## CONCLUSIONS

DPRK's small nuclear arsenal under international supervision. In the region, only Japan is still suspected of retaining a hidden stock of plutonium as a hedge against the renewed tensions with China.

Meanwhile, 'the long peace' continues and international relations remain very good. This year marks a decade since the historic, 'Concert of New Delhi' where the seven preeminent world powers (U.S., China, the European Union, Russia, Brazil, Japan, and Indonesia) have recognized their 'special responsibility' to uphold order and good governance of the international system. The world is a generally a prosperous place, but water scarcity, environmental degradation, population growth, and poor governance continue to plague many parts of the world, especially Africa.

Globally, there are now only seven nuclear-armed states (the British and French nuclear arsenals were consolidated under a common European defence force), which in total possess around 200 de-alerted nuclear weapons. However, some states do not yet feel comfortable proceeding towards full nuclear disarmament, citing a continuing imbalances in conventional forces, and the uncertainty about the future security environment.

In the Middle East, the peace process finally produced a viable Palestinian state, Israel is now formally at peace with all its neighbours, and has committed, in principle, to a establishing a Middle East zone free from weapons of mass destruction as the only way to ensure its long-term security in the region.

The IAEA is now a much better resourced organization, with greater powers of monitoring and inspection. While imperfect, its safeguards regime complements national intelligence and other sources to offer additional assurance that any cheating will be detected early. The Treaty on the Multinationalization of the Nuclear Fuel Cycle came into force in 2020 as a sister treaty to the NPT, setting out time limits for the phasing out of commercial reprocessing, and internationalizing uranium enrichment.

## Scenario 2: Climate Disaster and Power Politics

The year is 2055, and climate change impacts are becoming severe. Faith in geo-engineering silver-bullets has been shuttered, although a few of the more drastic measures are still in reserve – their use now being contemplated as the situation becomes critical. Global temperatures average 2°C above pre-industrial levels, badly impacting some of the world’s most prolific crop-growing areas. Asian agriculture has suffered the most as the monsoon shifted northward, and as warmer temperatures have made it harder to germinate rice. The numbers of environmental migrants now moving north are reaching alarming proportions. Disputes over water, demands by the worst-affected states for unprecedented levels of assistance and for open boarder policies are increasingly leading to bitter international disputes, military tensions and, in a few cases so far, even armed conflict. Increasingly, the worst-affected states of the global south are being pitted against the relatively unscathed northern nations.

The NPT still exists on paper, although about fifteen states in as many years have used their right to withdraw from the treaty citing national security concerns. A number of other states nominally remain within the treaty but are either pursuing weapons research outright or working towards a threshold capability. All this, of course, is being done as clandestinely as possible to reduce the risk of preventive strikes by powerful neighbours or the great powers. It is estimated that fourteen states currently possess nuclear weapons, and another six have well-advanced weapon programs. No nuclear weapons have yet been used in conflict, but the situation is tense.

Failure to stem the spread of enrichment and reprocessing technologies early on in the century, coupled with a renaissance of nuclear power and a growing proliferation black market, have made acquiring nuclear weapons easier than ever before. With the *de facto* collapse of the multilateral, NPT-based regime, nuclear-armed states have increasingly relied on the use of force to prevent and roll-back proliferation. However, even they have been overwhelmed by the sheer scope of the problem, and stymied by the fact that some of the



regime defectors are either their own close allies or protected by great power patrons. Great power relations had been souring for quite some time. In particular, U.S. efforts to strategically isolate China, and to maintain military superiority over any potential 'peer competitor' has fuelled arms racing and mistrust between the leading states.

### **Where Do We Go From Here?**

No one really knows which of the above scenarios more closely approximates our future and, certainly, many other possibilities exist. More than anything, the above scenarios illustrate that the regime and the broader international order are currently at a crux. The problems are large, but quite possibly surmountable. To increase the chances of avoiding some of the worst outcomes, all states, but particularly the nuclear-armed powers, should: 1) Work to lower international tensions and enhance international security. This includes redoubling efforts to resolve regional disputes (e.g. the Israeli-Palestinian, and the Pakistani-Indian conflict); exercising restraint in military doctrines and postures to avoid provoking arms racing; pursuing conventional arms control; providing 'no-first-use' security assurances; and de-emphasizing counter-proliferation. 2) Vigorously pursue nuclear disarmament, including the entry into force of the CTBT and the FMCT, and reducing arsenals to low levels at an early date. 3) Take current arsenals off launch-on-warning. 4) Seek a new global agreement on the nuclear fuel cycle, including moving towards a 'once-through' fuel cycle, and multinationalizing uranium enrichment. 5) Resource the IAEA to credibly do its job. 6) Invest heavily in geo-engineering research and development, while working urgently to reduce green house gas emissions worldwide.

The nonproliferation regime provides valuable services to the international community. In a world where states are tempted to acquire nuclear weapons as a deterrent to aggression, but where the spread of such weapons is undesirable, the regime provides a mechanism for the collective renunciation of nuclear weapons and for the verification of this renunciation. It also helps to socialize

states to a non-nuclear status by further delegitimizing nuclear weapons. By legally requiring the NWSs to work towards eventual disarmament, the regime also provides important leverage on these states to disarm and to behave as responsible nuclear powers in the interim. Finally, the process of negotiating disarmament can build trust between the great powers and encourage further cooperation. This not only makes further action on disarmament more likely, but has benefits that extend into other spheres of great power relations.

The regime does all of this at a very low cost relative to the alternatives of letting nuclear weapons spread unabated or waging counter-proliferation wars to roll back nuclear weapons programs across the globe. Therefore, states would be wise to maintain and strengthen the regime. Unfortunately, the window for action on nonproliferation may be starting to close. States should act now, and with resolve, to strengthen the regime in preparation for more challenging times ahead.

## **APPENDIX: THE TREATY ON THE NON-PROLIFERATION OF NUCLEAR WEAPONS (NPT)**

The States concluding this Treaty, hereinafter referred to as the Parties to the Treaty,

Considering the devastation that would be visited upon all mankind by a nuclear war and the consequent need to make every effort to avert the danger of such a war and to take measures to safeguard the security of peoples,

Believing that the proliferation of nuclear weapons would seriously enhance the danger of nuclear war,

In conformity with resolutions of the United Nations General Assembly calling for the conclusion of an agreement on the prevention of wider dissemination of nuclear weapons,

Undertaking to co-operate in facilitating the application of International Atomic Energy Agency safeguards on peaceful nuclear activities,

Expressing their support for research, development and other efforts to further the application, within the framework of the International Atomic Energy Agency safeguards system, of the principle of safeguarding effectively the flow of source and special fissionable materials by use of instruments and other techniques at certain strategic points,

Affirming the principle that the benefits of peaceful applications of nuclear technology, including any technological by-products which may be derived by nuclear-weapon States from the development of nuclear explosive devices, should be available for peaceful purposes to all Parties to the Treaty, whether nuclear-weapon or non-nuclear-weapon States,

Convinced that, in furtherance of this principle, all Parties to the Treaty are entitled to participate in the fullest possible exchange of scientific information for, and to contribute alone or in co-operation with other States to, the further development of the applications of atomic energy for peaceful purposes,

Declaring their intention to achieve at the earliest possible date the cessation of the nuclear arms race and to undertake effective measures in the direction of nuclear disarmament,

Urging the co-operation of all States in the attainment of this objective,

Recalling the determination expressed by the Parties to the 1963 Treaty banning nuclear weapons tests in the atmosphere, in outer space and under water in its Preamble to seek to achieve the discontinuance of all test explosions of nuclear weapons for all time and to continue negotiations to this end,

Desiring to further the easing of international tension and the strengthening of trust between States in order to facilitate the cessation of the manufacture of nuclear weapons, the liquidation of all their existing stockpiles, and the elimination from national arsenals of nuclear weapons and the means of their delivery pursuant to a Treaty on general and complete disarmament under strict and effective international control,

Recalling that, in accordance with the Charter of the United Nations, States must refrain in their international relations from the threat or use of force against the territorial integrity or political independence of any State, or in any other manner inconsistent with the Purposes of the United Nations, and that the establishment and maintenance of international peace and security are to be promoted with the least diversion for armaments of the world's human and economic resources,

Have agreed as follows:

### **Article I**

Each nuclear-weapon State Party to the Treaty undertakes not to transfer to any recipient whatsoever nuclear weapons or other nuclear explosive devices or control over such weapons or explosive devices directly, or indirectly; and not in any way to assist, encourage, or induce any non-nuclear-weapon State to manufacture or otherwise acquire nuclear weapons or other nuclear explosive devices, or control over such weapons or explosive devices.

### **Article II**

Each non-nuclear-weapon State Party to the Treaty undertakes not to receive the transfer from any transferor whatsoever of nuclear weapons or other nuclear explosive devices or of control over such weapons or explosive devices directly, or indirectly; not to manufacture or otherwise acquire nuclear weapons or other nuclear explosive devices; and not to seek or receive any assistance in the manufacture of nuclear weapons or other nuclear explosive devices.

### **Article III**

1. Each non-nuclear-weapon State Party to the Treaty undertakes to accept safeguards, as set forth in an agreement to be negotiated and concluded with the International Atomic Energy Agency in accordance with the Statute of the International Atomic Energy Agency and the Agency's safeguards system, for the exclusive purpose of verification of the fulfilment of its obligations assumed under this Treaty with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other nuclear explosive devices. Procedures for the safeguards required by this Article shall be followed with respect to source or special fissionable material whether it is being produced, processed or used in any principal nuclear facility or is outside any such facility. The safeguards required by this Article shall be applied on all source or special fissionable material in all peaceful nuclear activities within the territory of such State, under its jurisdiction, or carried out under its control anywhere.

2. Each State Party to the Treaty undertakes not to provide: (a) source or special fissionable material, or (b) equipment or material especially designed or prepared

for the processing, use or production of special fissionable material, to any non-nuclear-weapon State for peaceful purposes, unless the source or special fissionable material shall be subject to the safeguards required by this Article.

3. The safeguards required by this Article shall be implemented in a manner designed to comply with Article IV of this Treaty, and to avoid hampering the economic or technological development of the Parties or international co-operation in the field of peaceful nuclear activities, including the international exchange of nuclear material and equipment for the processing, use or production of nuclear material for peaceful purposes in accordance with the provisions of this Article and the principle of safeguarding set forth in the Preamble of the Treaty.

4. Non-nuclear-weapon States Party to the Treaty shall conclude agreements with the International Atomic Energy Agency to meet the requirements of this Article either individually or together with other States in accordance with the Statute of the International Atomic Energy Agency. Negotiation of such agreements shall commence within 180 days from the original entry into force of this Treaty. For States depositing their instruments of ratification or accession after the 180-day period, negotiation of such agreements shall commence not later than the date of such deposit. Such agreements shall enter into force not later than eighteen months after the date of initiation of negotiations.

#### **Article IV**

1. Nothing in this Treaty shall be interpreted as affecting the inalienable right of all the Parties to the Treaty to develop research, production and use of nuclear energy for peaceful purposes without discrimination and in conformity with Articles I and II of this Treaty.

2. All the Parties to the Treaty undertake to facilitate, and have the right to participate in, the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy. Parties to the Treaty in a position to do so shall also co-operate in contributing alone or together with other States or international organizations to the further development of the applications of nuclear energy for peaceful purposes, especially in the territories of non-nuclear-weapon States Party to the Treaty, with due consideration for the needs of the developing areas of the world.

#### **Article V**

Each Party to the Treaty undertakes to take appropriate measures to ensure that, in accordance with this Treaty, under appropriate international observation and through appropriate international procedures, potential benefits from any peaceful applications of nuclear explosions will be made available to non-nuclear-weapon States Party to the Treaty on a non-discriminatory basis and that the charge to such Parties for the explosive devices used will be as low as possible and exclude any charge for research and development. Non-nuclear-weapon States Party to the Treaty shall be able to obtain such benefits, pursuant to a special international agreement or agreements, through an appropriate

international body with adequate representation of non-nuclear-weapon States. Negotiations on this subject shall commence as soon as possible after the Treaty enters into force. Non-nuclear-weapon States Party to the Treaty so desiring may also obtain such benefits pursuant to bilateral agreements.

#### **Article VI**

Each of the Parties to the Treaty undertakes to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control.

#### **Article VII**

Nothing in this Treaty affects the right of any group of States to conclude regional treaties in order to assure the total absence of nuclear weapons in their respective territories.

#### **Article VIII**

1. Any Party to the Treaty may propose amendments to this Treaty. The text of any proposed amendment shall be submitted to the Depositary Governments which shall circulate it to all Parties to the Treaty. Thereupon, if requested to do so by one-third or more of the Parties to the Treaty, the Depositary Governments shall convene a conference, to which they shall invite all the Parties to the Treaty, to consider such an amendment.

2. Any amendment to this Treaty must be approved by a majority of the votes of all the Parties to the Treaty, including the votes of all nuclear-weapon States Party to the Treaty and all other Parties which, on the date the amendment is circulated, are members of the Board of Governors of the International Atomic Energy Agency. The amendment shall enter into force for each Party that deposits its instrument of ratification of the amendment upon the deposit of such instruments of ratification by a majority of all the Parties, including the instruments of ratification of all nuclear-weapon States Party to the Treaty and all other Parties which, on the date the amendment is circulated, are members of the Board of Governors of the International Atomic Energy Agency. Thereafter, it shall enter into force for any other Party upon the deposit of its instrument of ratification of the amendment.

3. Five years after the entry into force of this Treaty, a conference of Parties to the Treaty shall be held in Geneva, Switzerland, in order to review the operation of this Treaty with a view to assuring that the purposes of the Preamble and the provisions of the Treaty are being realised. At intervals of five years thereafter, a majority of the Parties to the Treaty may obtain, by submitting a proposal to this effect to the Depositary Governments, the convening of further conferences with the same objective of reviewing the operation of the Treaty.

### **Article IX**

1. This Treaty shall be open to all States for signature. Any State which does not sign the Treaty before its entry into force in accordance with paragraph 3 of this Article may accede to it at any time.
2. This Treaty shall be subject to ratification by signatory States. Instruments of ratification and instruments of accession shall be deposited with the Governments of the United Kingdom of Great Britain and Northern Ireland, the Union of Soviet Socialist Republics and the United States of America, which are hereby designated the Depositary Governments.
3. This Treaty shall enter into force after its ratification by the States, the Governments of which are designated Depositaries of the Treaty, and forty other States signatory to this Treaty and the deposit of their instruments of ratification. For the purposes of this Treaty, a nuclear-weapon State is one which has manufactured and exploded a nuclear weapon or other nuclear explosive device prior to 1 January 1967.
4. For States whose instruments of ratification or accession are deposited subsequent to the entry into force of this Treaty, it shall enter into force on the date of the deposit of their instruments of ratification or accession.
5. The Depositary Governments shall promptly inform all signatory and acceding States of the date of each signature, the date of deposit of each instrument of ratification or of accession, the date of the entry into force of this Treaty, and the date of receipt of any requests for convening a conference or other notices.
6. This Treaty shall be registered by the Depositary Governments pursuant to Article 102 of the Charter of the United Nations.

### **Article X**

1. Each Party shall in exercising its national sovereignty have the right to withdraw from the Treaty if it decides that extraordinary events, related to the subject matter of this Treaty, have jeopardized the supreme interests of its country. It shall give notice of such withdrawal to all other Parties to the Treaty and to the United Nations Security Council three months in advance. Such notice shall include a statement of the extraordinary events it regards as having jeopardized its supreme interests.
2. Twenty-five years after the entry into force of the Treaty, a conference shall be convened to decide whether the Treaty shall continue in force indefinitely, or shall be extended for an additional fixed period or periods. This decision shall be taken by a majority of the Parties to the Treaty.<sup>1</sup>

### **Article XI**

This Treaty, the English, Russian, French, Spanish and Chinese texts of which are equally authentic, shall be deposited in the archives of the Depositary Governments. Duly certified copies of this Treaty shall be transmitted by the Depositary Governments to the Governments of the signatory and acceding States.

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