Viability of Fulfilling the Nuclear-Nonproliferation Treaty in a Post-Cold War World

Anna Bridston

JSIS B 429: Nuclear Nonproliferation and Safeguards

Professor Halvor Undem

December 5, 2016

ABSTRACT

In 1945, the second World War concluded with the birth of the most dangerous weapon on the face of the earth, one that would soon become the forefront of concern in the Cold War. Ever since the creation of this technology, states have sought to rid each other of nuclear weapons, a seemingly impossible task because they cannot be un-invented, and have now found themselves in the hands and minds of rogue states which threaten to use them in modern warfare. The Nuclear Nonproliferation Treaty (NPT), one of several treaties developed following the Cold War, has an end goal of complete disarmament. Despite the creation of successful programs - such as Megatons to Megawatts between the United States and Russia - which have aimed at the gradual reduction of surplus nuclear stockpiles, the prospect of the total elimination of nuclear weapons now seems fleeting as it is no longer a bilateral issue between two hegemonic powers, but one that is widespread among states with varying interests. This paper will examine why we are struggling to successfully fulfill the NPT (and may be straying further from it), by stressing the issues of deterrence, modernization, and noncompliance in our current political climate, which has seen increases in proliferation as opposed to gradual disarmament. I will also address potential solutions to the nuclear problem, such as the creation of an international fuel bank, the use of irreversible safeguards agreements, and a program dedicated to the global recycling nuclear fuel for clean energy rather than using it for further proliferation.

Introduction: Setting the Stage

Throughout the Cold War, nuclear weapons were seen as a primary and substantial threat, as their introduction during WWII sealed their fate as the end-all weapon of the future. Much of the tension of the Cold War can be attributed to nuclear weapons, as the U.S. and the U.S.S.R. hastened to develop the larger arsenal in a quest for superiority and hegemony in a bilateral political climate. Being as nuclear weapons were the latest in destructive technology, and their development signaled great power status, the competition quickly turned into an arms race. Arms racing with a doomsday

weapon brought along a new problem; the need for deterrence. Nuclear deterrence is the concept that nuclear states will not attack each other under fear of mutually assured destruction. This resulted in the U.S. and the U.S.S.R. continuously growing their weapons arsenals. This type of deterrence was a double-edged sword in effect, as the existence of tens of thousands of nuclear weapons made the globe much less safe, but also kept the Cold War cold.

This conflict peaked with the Cuban Missile Crisis of 1962, where the two powers came incredibly close to pressing the button and beginning a nuclear war, which would have resulted in unacceptable global destruction. President John F. Kennedy expressed his fear the following year of "the possibility in the 1970's [that] the President of the United States [may have] to face a world in which [15-25] nations may have [nuclear] weapons," which he regarded as "the greatest possible danger and hazard."[1]

The Nuclear Non-Proliferation Treaty (NPT), which came into effect in 1970, was designed to go beyond the Nuclear Test Ban Treaty of 1963 by preventing the continued proliferation of nuclear weapons, rather than just halting testing. The end goal of the NPT was, and remains to be, complete weapons disarmament paired with the promotion of the use of nuclear power for peaceful energy purposes. While the NPT is typically credited with preventing the widespread proliferation that President Kennedy feared, it now faces ongoing issues with loopholes and enforcement of its strict limitations that have come into play post-Cold War.[2] In addition to problems with the wording and ambiguity of the treaty itself, issues regarding the continued desire for deterrent capabilities, modernization, noncompliance, and further proliferation have plagued efforts at fulfilling complete disarmament. The problem has become multi-lateral as well, due to there being several more state actors who now possess nuclear weapons. In addition to the Permanent Five (P-5), states who are non-signatories to the NPT add to the complication of finding a solution.

---

[1] John F. Kennedy, "News Conference 52" (speech, Washington, DC, March 21, 1963), John F. Kennedy Presidential Library and Museum.

[2] Kittrie, Orde. "Averting Catastrophe: Why the Nuclear Nonproliferation Treaty is Losing Its Deterrence Capacity and How to Restore It." *Michigan Journal of International Law* 28, no. 2 (2007): 339

The question of how to solve the nuclear dilemma has been floating around since the end of WWII, and has only gotten more difficult to answer as the international political climate strays farther from its bilateral condition upon the NPT's inception. The proposals that have stood out are the ideas of creating an international fuel bank and the closing of loopholes by making safeguards negotiations irreversible.[3] Also worth exploring is the possibility of reviving a program similar to Megatons to Megawatts, which was a successful venture between the U.S. and Russia that allowed for the repurposing of weapons-grade material from surplus Russian warheads into clean American power.[4] If an arrangement like this could be implemented on a global scale and paired with irreversible safeguards, it could aid the NPT as a secure and guided plan toward further disarmament.

The challenge of fulfilling the NPT, considering the aforementioned factors, must be met with new or combined strategies that will ease state reluctance. By ignoring issues such as the perceived need for security through deterrence and the existing rights of states under the NPT, parties to the treaty will continue to challenge the document and remain stagnant in their progress toward overall disarmament.

The NPT: An Aging Document in a Changing World

In order to understand why the NPT is struggling to maintain progress in 2016 compared to when it was first developed, one must take into consideration three primary factors that are influencing current nuclear tensions: the need for deterrence, modernization and proliferation, and issues with noncompliance. Figuring out why these forces are so catastrophic to the nonproliferation regime will encourage thinking on how to combat or eliminate their influence.

In its most basic form, nuclear deterrence is the political theory that nuclear weapon states will not attack each other for fear of mutually assured destruction. This is

---

[3] Pella, Peter J., and Morgan & Claypool Publishers. *The Midlife Crisis of the Nuclear Nonproliferation Treaty*. (San Rafael: IOP Concise Physics and Morgan & Claypool Publishers, 2016): 5.1-5.12.

[4] Pella, *The Midlife Crisis*, 5.1-5.12.

actually a rather damaging concept, as it "fueled the [Cold War] arms race rather than checking it" by "fostering a paranoid approach to arms control negotiations."[5] The idea that deterrence will create stability has made it a difficult ideation to eliminate, especially in a multi-lateral climate plagued by trust issues and selfish power plays. Ideas that compromise a state's deterrent capability are very quickly taken off the table, which is what makes solving the nuclear crisis so challenging.

One way to determine that deterrence is still playing a role in the failure of the NPT regime is to look at U.S. and Russian nuclear stockpiles as compared to the numbers put up by other states that possess warheads. As of 2016, the U.S. has approximately 7,100 total warheads, with 4,571 of those as stockpile and 1,300 actively deployed.[6] Russia has about 7,300 total warheads, with 4,500 as stockpile and about 1,800 currently deployed.[7] Both the U.S. and Russia have weapons in the exact same numerical range in every category, including retired warheads (2,500 and 2,800 respectively).[8] Among the other members of the P-5, the United Kingdom has 215 total warheads, France has 300, and China has 260; these numbers are drastically lower than those between the U.S. and Russia, who have maintained a steady threat to each other's security.[9] Deterrence, however, will always be "inherently divisive," which is why relations between the nations are continuing to sour.[10]

The relationship between Russia and the U.S. has never been easy to maintain. Neither of the Cold War nations truly 'won' their psychological war, which is perhaps one of the reasons why they still cannot settle for long periods at a time; especially when nuclear weapons are involved. The two nations have made several attempts at reducing

---

[5]MccGwire, Michael, "Nuclear Deterrence." *International Affairs (Royal Institute of International Affairs 1944-)* 82, no. 4 (2006): 776-778. Author's note: theory originally focused on bilateral tensions between the U.S. and U.S.S.R.

[6] Davenport, Kelsey, "Who Has What at a Glance," October 2016, Arms Control Association.

[7] Ibid.

[8] Ibid.

[9] Ibid. Author's note: additionally, Israel has 80 total weapons, Pakistan has 140, India has 110, and North Korea have 8.

[10] MccGwire, Michael. "Nuclear Deterrence," 782.

their arsenals, with mixed amounts of success. The standouts are the Megatons to Megawatts program and the Plutonium Management and Disposition Agreement.

Megatons to Megawatts was the twenty-year program instituted in 1993 to "dismantle and dilute" the "fuel cores of decommissioned Russian warheads," in agreement with the United States, which would purchase the blended down fuel for use in its nuclear energy sector.[11] This program allowed for the reduction 500 tons of highly enriched uranium (HEU) from Russia's surplus Cold War stockpile, which could have supplied up to 20,000 nuclear warheads. In turn, "up to 10 percent of the electricity produced in the United States was generated by fuel fabricated using low enriched uranium from the Megatons to Megawatts program."[12] The program ran smoothly and was successfully completed in 2013, and also allowed the states to tout their compliance with the NPT, as they worked together to take steps toward further disarmament.

A less successful agreement made between the U.S. and Russia was developed in 2000: the Plutonium Management and Disposition Agreement (PMDA). This agreement obliged "each side… to dispose of at least 34 tons of weapons plutonium made surplus by the reduction in its Cold War arsenal," which could fuel approximately 17,000 warheads.[13] The technical plan for this agreement was that the "excess plutonium would be used to fabricate MOX [mixed-oxide] fuel, which would be irradiated in existing light-water reactors," which is a costly process that Russia decided not to pursue, so in 2010 it was re-negotiated that Russia would instead go through with irradiation while the U.S. would fully commit its resources to MOX reprocessing.[14]

The U.S. was soon plagued by project costs for the MOX Fuel Fabrication Facility (MFFF) that skyrocketed over budget, leaving the Obama administration to consider

---

[11] Kramer, Andrew E. "Power for U.S. From Russia's Old Nuclear Weapons." November 2009. The New York Times. & Pella, Peter J, *The Midlife Crisis*, 5.1-5.12.

[12] "Megatons to Megawatts," December 2013, Centrus Energy Corporation.

[13] Clements, Tom, Edwin Lyman, and Frank Von Hippel, "The Future of Plutonium Disposition," *Arms Control Today* 43, no. 6 (2013), 8.

[14] Podvig, Pavel, "Can the US-Russia plutonium disposition agreement be saved," April 2016, Bulletin of the Atomic Scientists.

alternate routes and pulling the plug on the MFFF.[15] The U.S. had hoped to instead pursue the "dilute-and-dispose" method to fulfill their obligation to the agreement, however the PMDA did not explicitly allow for either party to use a method that was not part of the "spent fuel standard" for plutonium disposition.[16] President Putin released a statement soon after regarding Russia's concerns over the U.S. plan "to dispose of their accumulated highly enriched nuclear fuel by using a method other than what [had been] agreed on when [Russia] signed the corresponding agreement," a method which could possibly allow the U.S. to "preserve… the breakout potential" of the fuel so that it could "be retrieved, reprocessed and converted into weapons-grade plutonium again."[17] This statement demonstrates the ongoing lack of trust between the states, and how this lack of trust and need for equality in deterrent capabilities can compromise plans developed to help the NPT. In October 2016, Russia announced its suspension of the PMDA, citing concern over "the 'inability' of the United States to fulfill its plutonium disposition obligations," as well as "unfriendly actions of the United States toward the Russian Federation," likely also referring to external conflicts such as differences in the handling of the Syrian crisis.[18] As a result of the "frosty climate between the United States and Russia, the numbers of nuclear weapons are unlikely to decrease by the time of the next review conference."[19] In an analysis of the viability of the NPT, not only following the Cold War but also in today's particular political climate, deterrence still plays a colossal role, and any plan toward reducing nuclear stockpiles will have to respect its power and persuasion.

Another problem for the viability of fulfilling the NPT is the ongoing modernization of nuclear weapons and stockpiles. The idea of modernization is not only to maintain the weapons for safety purposes, but also to update and upgrade weapon

---

[15] "Russia raises concerns about changes in U.S. plutonium disposition plan," April 2016, International Panel on Fissile Materials.

[16] Podvig, Pavel, "US-Russia plutonium disposition."

[17] "Russia raises concerns."

[18] "Russia suspends implementation of plutonium disposition agreement," October 2016, International Panel on Fissile Materials.

[19] Pella, Peter J, *The Midlife Crisis*, 5.1-5.12.

technology for better reliability, quality, and effectiveness. While "the [NPT] legalizes [the P-5's] nuclear arsenals, [it also] establishes [that] they are not supposed to build and maintain such weapons in perpetuity," which suggests that ongoing modernization and life-extension efforts are working against the fulfillment of the NPT.[20] Article VI of the NPT specifies that "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 modernization is a form of arms racing.[21] Most nuclear weapon states are engaging in modernization efforts (with Britain showing the most adherence to the NPT), with the U.S., Russia, and China working the most actively toward the endeavor.[22]

The United States has actually increased the portion of the defense budget going toward nuclear endeavors from 3% a few years ago up to 7%, and despite assurances from the Obama administration that "U.S. security can be maintained while reducing the size of its deployed strategic arsenal by up to one-third below the 2010 [New START] levels, *the proposed spending is based on maintaining roughly the New START levels in perpetuity*."[23] Additionally, "over the next 10 years the United States plans to spend 355 billion USD on the maintenance and modernization of its nuclear forces, according to the US Congressional Budget Office," which suggests no effort to halt modernization efforts any time soon.[24] The U.S. is currently putting over 10 billion USD into a modernization program for the B61 gravity bomb, which "has been redesigned to be more accurate and have an adjustable yield," which could make it "tempting to use" as "there would be very little collateral damage and radioactive

---

[20] Davenport, Kelsey, "Who Has What at a Glance."

[21] U.S. Department of State, "Treaty on the Non-Proliferation of Nuclear Weapons (NPT)," March 1970, U.S. Department of State.

[22] Pella, Peter J, *The Midlife Crisis*, 5.1-5.12.

[23] Reif, Kingston, "U.S. Nuclear Modernization Programs," October 2016, Arms Control Association.

[24] Pella, Peter J, *The Midlife Crisis*, 5.1-5.12. Author's note: Pella's work was published in 2016, indicating that the decade marker is accurate at the time of this research.

fallout."[25] This bomb is deliverable by plane, and the goal is to have it "deployed in NATO countries," meaning further proliferation.[26] Another issue with this type of modernization is that the "improvements [are] planned for the delivery systems of the warheads themselves," which "makes it hard for the [nuclear weapon states] to claim that they are working towards reducing the role of nuclear weapons in their nuclear policy," which is disheartening for proponents of the NPT.[27]

China is also working on modernization projects of its own, including updated delivery systems like the U.S.; in fact, "the Chinese have been upgrading their nuclear forces over the last 20 years," and show no signs of stopping.[28] Instead, China is now the only nuclear weapon state "planning to modestly increase the size of their arsenal from the current number of about 250 warheads," which is in direct opposition to the NPT, which calls for states to "facilitate the cessation of the manufacture of nuclear weapons…and the elimination from national arsenals… the means of their delivery."[29]

Russia is also performing threatening modernization, and has put "high priority" on "[replacing] all its old ICBMs [intercontinental ballistic missiles] and SLBMs [submarine-launched ballistic missiles] by 2025."[30] Even if the modernization projects wrap up by 2025, the improvements could extend missile longevity by decades. Russia also declassified its latest missile upgrade in October 2016: the RS-28 Sarmat intercontinental ballistic missile, nicknamed Satan 2.[31] This upgrade, timed along with Russia's suspension of the PMDA, has created a problem for NATO, which is "bolstering its defenses in countries along the Russian border amid growing concerns about

---

[25] Pella, *The Midlife Crisis*, 5.1-5.12.

[26] Ibid.

[27] Ibid.

[28] Ibid.

[29] Pella, *The Midlife Crisis*, 5.1-5.12. and state.gov NPT treaty

[30] Pella, *The Midlife Crisis*, 5.1-5.12.

[31] Shukla, Sebastian and Laura Smith-Spark, "Russia unveils 'Satan 2' missile, could wipe out France or Texas, report says," October 2016, CNN.

Moscow's military direction."[32] Perhaps the most troubling element of Russia's upgraded ICBM is the country's official statement, asserting that the weapon "is designed to provide strategic Russian forces with a guaranteed and effective fulfillment of nuclear deterrent tasks."[33] Zvezda, a Russian news network, has also claimed that the new Sarmat could "determine… which direction nuclear deterrence in the world will develop."[34] Modernization is a tool by which to maintain deterrence, and both strategies will only continue to block total disarmament as called for by the NPT if this trend continues.

Another obstacle to the NPT is the problem of noncompliance. Noncompliance can be seen through modernization efforts, but also in more serious contexts, such as refusal to sign the NPT or cheating safeguards. Noncompliance "threatens the Treaty and the broader nuclear nonproliferation regime" in three key ways: "first, it directly undermines the most important benefit the NPT brings: assurance against proliferation of nuclear weapons… second, noncompliance undermines the foundation of trust and safety upon which the benefits of international nuclear cooperation are necessarily built, [and] third, noncompliance… undermines efforts to bring about universal adherence to the NPT… [and] is thus the foundation for future progress on disarmament."[35] Two states infamous for their noncompliance are North Korea and Iran, who used loopholes and secrecy to develop their nuclear weapon programs.

North Korea originally signed the NPT, but withdrew in 2003 once it already had the facilities needed to produce nuclear weapons and materials, thereby violating their original obligation through a loophole and damaging the nonproliferation regime.[36] The state began conducting tests in 2006, and conducted two tests in 2016 that have left

---

[32] Shukla, "Russia unveils 'Satan 2'."

[33] Shukla, "Russia unveils 'Satan 2'."

[34] Mwandikwa, Gabriel, "Russia Introduces New Nuclear Missile Dubbed 'Satan 2'," November 2016, Kenyatta University TV.

[35] U.S. Department of State, "Challenges of Nonproliferation Noncompliance," April 2007, Bureau of International Security and Nonproliferation.

[36] Ibid.

many states feeling insecure, especially South Korea.[37] Iran's NPT violation was discovered in 2002, when a covert nuclear weapons program "involving the undeclared procurement and use of nuclear materials… while [also] aiming to acquire the most sensitive elements of the nuclear fuel cycle" was uncovered.[38] States have also attempted to use technical language in order to dismiss what may otherwise be considered as threatening nuclear tests. India, for example, claimed that its *Smiling Buddha* test in 1974 was a Peaceful Nuclear Explosion, but it was met with a highly critical response from the global community and lost its nuclear assistance from Canada over the incident.[39]

Without the trust that other nations will abide by their agreements, a treaty like the NPT has no hope of being fulfilled, as its words become empty and states revert to modernization and developing more advanced deterrent capabilities to ward off new security threats posed by noncompliant actors.

A Need for Innovation: Getting Back on Course

The disappointing truth is that the NPT is likely to continue gathering dust unless the status quo regarding solutions to nuclear weapons and disarmament is changed. To begin looking toward solutions, it is important to review two proposals have already been brought forward by political scientists; one that advocates for an international fuel bank, and one that requires the use of irreversible safeguards to prevent cheating.[40]

The idea of establishing an international nuclear fuel bank goes back to December 1953, when President Eisenhower delivered his "Atoms for Peace" speech, regarding the young doomsday weapon. The President presented his plan for "a bank of fissionable material" whereby "the [prudent] governments principally involved… [should] make joint contributions from their stockpiles of normal uranium and

---

[37] U.S. Department of State, "Challenges of Nonproliferation Noncompliance."

[38] Ibid.

[39] Donohue, Mark, "Pokhran-I: India's First Nuclear Bomb," March 2014, Stanford University.

[40] Pella, *The Midlife Crisis*, 5.1-5.12.

fissionable materials to an international atomic energy agency [IAEA]" which "would be set up under the aegis of the United Nations."[41] Eisenhower also expressed his belief that "the more important responsibility of this atomic energy agency would be to devise methods whereby this fissionable material would be allocated to serve the peaceful pursuits of mankind," such as "the needs of agriculture, medicine… [and] to provide abundant electrical energy in the power-starved areas of the world," which would later become one of the three pillars of the NPT.[42] This idea was set aside during the Cold War, but has come back into play in the attempt to find solutions for the current NPT dilemma.

The U.S. and the United Arab Emirates (UAE) made an agreement in 2009 that has come the closest to "a rough example of how a fuel bank might work," and "under that agreement, Abu Dhabi agreed not to exercise its right to enrich and reprocess nuclear material, while the United States agreed to furnish low-enriched uranium [LEU] to the UAE and also provide nuclear cooperation in various forms."[43] Some pros in favor of a fuel bank are that "customers would not have to build their own enrichment plants [which] would save large amounts of money," as construction can cost anywhere from $250 million upward of $3.3 billion, which is an incredible amount "especially for developing nations facing fiscal constraints and relying on foreign lending."[44] These developing countries are also the ones that would be in need of this sort of power supply, and this type of fuel bank would make that economically possible. Other pros are that a fuel bank may provide more secure storage of nuclear materials (because this task would not fall on the shoulders and wallets of every state), and it could "discourage nuclear-power-seeking nations from building their own enrichment facilities."[45]

---

[41] Eisenhower, Dwight D, "Atoms for Peace," Speech, New York City, NY, December 8 1953, International Atomic Energy Agency.

[42] Eisenhower, "Atoms for Peace."

[43] Tuan, Ta Minh, "Calculating the value of an international fuel bank," August 2012, Bulletin of the Atomic Scientists.

[44] Ibid.

[45] Tuan, "Calculating the value." & Sokova, "Nuclear Power Broker," 51.

Russia was one of the earliest advocates for a fuel bank, jumping on IAEA proposals in 2004 and 2005.[46] In short, Russia wants to develop an international uranium enrichment center [IUEC] which "will operate as a transparent, reliable source of low-enriched uranium (LEU) for nuclear power production."[47] This type of program would be particularly beneficial for Moscow, which "has taken flak for the proliferation implications of some of its projects, such as the nuclear power reactor… in Bushehr," and could use a boost in its trustworthiness toward fulfilling the NPT.[48] Additionally, Russia ensures the safety of the venture, as countries who want to become partners to the IUEC would be required to comply with both the NPT and the Additional Protocol, as well as relinquish enrichment programs at home, and the program would also in theory give the IAEA "increased means to uncover clandestine nuclear weapons programs."[49]

The IAEA has also established its own Low Enriched Uranium (LEU) Bank, to be "owned and controlled by the IAEA," which is designed as "an assurance of supply mechanism of last resort [which] will be a physical reserve of LEU available for IAEA Member States" in the event that "the supply of LEU to a nuclear power plant is disrupted due to exceptional circumstances and the Member State is unable to secure LEU from the commercial market or by any other means."[50] Approximately 90 tons of LEU would remain in the bank, to be used by qualifying states, and would "be fully funded by voluntary contributions."[51] This plan is not quite what Eisenhower had in mind, but is closer to reality than Russia's plan, which is just as much an economic scheme as it is an NPT venture.

---

[46] Sokova, Elena, and Cristina Hansell Chuen, "Nuclear Power Broker," *Bulletin of the Atomic Scientists* 63, no. 5 (2007): 51.

[47] Sokova, "Nuclear Power Broker," 51.

[48] Sokova, "Nuclear Power Broker," 52.

[49] Sokova, "Nuclear Power Broker," 52.

[50] "The IAEA LEU Bank," International Atomic Energy Agency.

[51] Pella, *The Midlife Crisis*, 5.1-5.12.

Despite the pros and ideas put forward so far for an international fuel bank, there are many negative considerations to take into account. One concern to consider is that "a fuel bank would be designed to provide fuel only when the need for it arose — that is, when disruptions occurred in nuclear fuel's normal supply chain."[52] The fear is that this could result in a markup in prices on the market, which would continue to cost developing nations more money than they may have. This concern is specifically addressed by the IAEA however, which states that "a key principle of the IAEA LEU Bank, as an assurance of supply mechanism of last resort, is that it must not distort the commercial market."[53] While it may not be a perfect system, it is designed with the hope that market prices will not be affected by use of the bank.

Another concern is that a fuel bank, especially one mandated by the IAEA, could be "discriminatory in nature" toward developing nations, who already feel slighted by the "club" of nuclear weapon states benefitting from the NPT.[54] The primary fear is "that a fuel bank owned or controlled by a power bloc or an individual nation might choose not to provide fuel to a specific country for geopolitical reasons."[55]

Finally, security fears branch from the fuel bank suggestion. The issue is that NPT signatories "are permitted to maintain enrichment facilities for peaceful nuclear energy programs, but the same facilities might be used to produce weapons-grade uranium."[56] It has been falsely claimed that being a fuel bank member would force the state to relinquish "their right to domestic uranium enrichment" and the necessary facilities, but under the NPT this is not the case.[57] Article IV specifically states that it is an "inalienable right of all the Parties to the Treaty to develop research, production and

---

[52] Toukan, Khaled, "For a fuel bank, fairness is paramount," August 2012, Bulletin of the Atomic Scientists.

[53] "The IAEA LEU Bank."

[54] Toukan, "Fairness is paramount." & Rajaraman, Ramamurti, "Despite qualms, fuel banks hold promise," August 2012, Bulletin of the Atomic Scientists.

[55] Rajaraman, "Despite qualms."

[56] Rajaraman, "Despite qualms."

[57] Toukan, "Fairness is paramount."

use of nuclear energy for peaceful purposes without discrimination."[58] The real issue is that "providing a nation with LEU (20 percent enriched) gives it a major leg up," as it is far less difficult to reach the 90 percent needed for the uranium to be weapons grade once it has been enriched to 20.[59] Due to the fact that the purpose of a fuel bank is to discourage further enrichment, rather than prevent it, states may still exploit the loophole in the NPT that allows member states to leave the agreement once it already has enrichment facilities and possibly LEU from bank stores; this is the path North Korea took when it decided to leave the NPT in 2003.[60] However, the security flaw in the fuel bank proposal could also be its greatest selling point, as states may instead decide "to forego establishing an indigenous enrichment capability" in order to save on costs, which would inherently "lessen the likelihood of the technology being diverted toward a weapons program."[61] This would actually put the proposal in line with fulfilling the NPT by preventing further proliferation and promoting the use of peaceful nuclear energy.

The second proposal is not so much a detailed plan, rather than a new precedent. The idea of "irreversible safeguards agreements" is now being championed, with the idea that "once a country signs its safeguards agreement with the IAEA, those agreements would become permanent… so even if the country decided to leave the NPT [like North Korea in 2003], it would still have to fulfill its obligations under its safeguards agreement."[62] This proposal is both realistic and clever, as it closes the loophole being exploited in the NPT and would allow for greater oversight on the part of the IAEA. The only drawback to irreversible safeguards agreements would be that the IAEA would still be limited in its inspection rights, and would still be in the dark if undeclared facilities existed. Additionally, states that have already made their

---

[58] U.S. Department of State, "NPT."

[59] Etzioni, Amitai, "A Deeply Flawed Fuel Bank: Providing Nations with Enriched Uranium will not Prevent Proliferation. It Will Promote It," *World Policy Journal*, 27, no. 4 (2010): 109-10.

[60] Etzioni, "A Deeply Flawed Fuel Bank," 104.

[61] Pella, *The Midlife Crisis*, 5.1-5.12.

[62] Pella, *The Midlife Crisis*, 5.1-5.12.

agreements and backed out or who have refused to sign the NPT would likely choose not to sign irreversible agreements, and these are the states which have already developed nuclear programs, and the ones of most concern. Irreversible agreements would be more useful in preventing future proliferation but would not do much to solve the current proliferation crisis.

In researching the difficulties facing the NPT as well as the solutions that have been proposed, it is easy to note that there is no overarching solution to the nuclear crisis, which, if it continues to go unchecked, will likely escalate beyond the means of the NPT to solve. More innovation on a solution may be required, or a mixture of the different solutions that have been suggested so far. While the fuel bank would in theory help to prevent further proliferation, it ignores the other half of the issue; surplus Cold War stockpiles and excess material, particularly plutonium, still need to be dealt with. Megatons to Megawatts successfully eliminated a large amount of surplus, but each state still has decommissioned weapons and even larger non-deployed stockpiles that need to begin decreasing in order to accomplish disarmament at any point in time. I would like to offer my own proposal to be built upon:

A program like Megatons to Megawatts is not viable at this point in time, because the U.S. and Russia have poor relations due to global issues and the stalling and suspension of the PMDA. However, that is not to say that a similar program could not work on a global scale, mandated not between countries but by an overarching power, such as the IAEA, working in unison with the United Nations or NATO. This program would require a conference to determine a material elimination schedule to adhere to, in which states would begin decommissioning and dismantling a certain share of their nuclear weapon totals based on preexisting ratios. The program would begin with already decommissioned weapons, eventually moving on to stockpiled and finally deployed warheads. The NPT prohibits the transfer of nuclear weapons between states, so dismantling would have to take place in the home state under IAEA overwatch. Failure to turn in the pre-determined amount of surplus material in the allotted time would result in a failing safeguards grade as well as sanctions. Many of these warheads contain weapon-grade plutonium, which “cannot be blended with other materials to make it unusable in weapons,” hence the aforementioned PMDA disagreement between

the U.S. and Russia, but "it can be fabricated into [MOX] fuel and irradiated in civil nuclear power reactors to produce electricity."[63] This was the original plan for the U.S. to dispose of its weapons grade plutonium, but another solution would be to use a Canada Deuterium Uranium (CANDU) reactor.

First, "Canada [has] always held a firm belief that nuclear technology should be used for peaceful purposes," and has supplied reactors, such as the CIRUS reactor in India, to states seeking peaceful energy solutions.[64] Second, the CANDU reactor is capable of burning plutonium with "relatively few modifications," as "more than half of the energy [in its normal operation] is provided by fissioning plutonium produced in the fuel as the reactor operates."[65] This would be a cheaper alternative to using a MOX facility, and because CANDU reactors can burn several types of fuel, they could serve multiple purposes in the burning of fuel to sell toward peaceful energy.[66] Difficulties with the CANDU may come from getting technological licensing from Canada, the need for "more intensive safeguarding," security risks in transporting the fuel to the reactor, and the possibility that the reactor's shorter burn-up keeps plutonium closer to its weapons grade "isotopic composition."[67]

To solve some of the security risks, CANDU facilities for the specific purpose of burning excess weapons surplus could be located in neutral zones (for example Canada and Kazakhstan, as fuel bank negotiations are already taking place in the latter). A law developed in 2007 allowed for "foreign entities to import nuclear materials into Russia for processing and re-export, without altering the ownership of the materials," which if duplicated could assure states that they would still have full ownership of their burned fuel while also allowing multiple states to use the same site (helping the security issue,

---

[63] U.S. Department of State, "2000 Plutonium Management and Disposition Agreement," April 2010, U.S. Department of State.

[64] Donohue, "Pokhran-I."

[65] "'Burning' Weapons Plutonium in CANDU Reactors," 1994, Committee on International Security and Arms Control, U.S. National Academy of Sciences.

[66] "'Burning' Weapons Plutonium."

[67] "'Burning' Weapons Plutonium."

as sites and transfers would not be scattered).[68] These sites would be placed under tight security, with members from each weapons state participating in control and maintenance. By having reactors in multiple states, this also makes it less risky to transport nuclear materials, as they will not have to travel as far to reach their destinations, and prevents power blocs on behalf of one country. States would have the option to sell their burned fuel as nuclear energy to developing states such as how a fuel bank would operate, and could also access their own stores free of charge as an incentive and reward for participating in the program. In essence, it is the exchange of old warheads for clean energy.

Deterrence is still an issue, however, and the dismantling and burning up of warheads does not sound like an attractive option when other nuclear states are continuing to modernize and proliferate. For the time being, members of the P-5 would be allowed to maintain a much smaller, mandated arsenal to alleviate fears of not having a deterrent capability while proceeding with total disarmament. These arsenals could be reduced to maintain the same ratio as current stockpiles, so as not to disadvantage states with larger existing arsenals (such as the U.S. and Russia) or to give advantage to states with smaller arsenals. Modernization would be allowed, but only as far as to maintain the warheads as mandated for safety purposes; technological upgrading would defeat the purpose of this buffer-style deterrent.

Nuclear weapons states that are not part of the P-5 would be incentivized to join the NPT if they have not already, or take on the Additional Protocol under the agreement that they could be re-labeled as "Amended Nuclear Weapon States". Existing weapons arsenals would not be penalized, however modernization efforts would be halted and the states would be required to begin disarmament under irreversible safeguards agreements. The incentive is that this would give both the P-5 and amended nuclear weapon states a safety umbrella under which to continue to disarm, with the P-5 maintaining a small nuclear safety barrier in case of cheating or covert proliferation, so as to make it a more attractive and secure process.

---

[68] Sokova, "Nuclear Power Broker," 53.

A program like this could allow for vast decreases in nuclear weapons arsenals, while also legitimizing and working with nuclear weapon states that are not part of the P-5 in the hopes that they will feel safe and incentivized enough to disarm. All nuclear weapons material would be going toward clean energy purposes and providing resources to developing countries, thus fulfilling the second pillar of the NPT regarding the sharing of peaceful nuclear technology. At the very least, this program would provide a neutral and guided middleman to continue working toward NPT goals, even if complete disarmament is not yet possible. Member states to these fuel banks would be required to pay something similar to a carbon tax for existing material in warheads, that would act as something of a sanction to keep progress moving while also funding the project. This would also allow non-nuclear weapon states an advantage, as they would not have to pay this sort of tax, while also benefitting from the nuclear energy being produced. When it comes to fulfilling the NPT, all progress is good progress.

Conclusion

The NPT is facing a greater challenge today than it has in the past, and the UN has warned that "the erosion of the non-proliferation regime could become irreversible and result in a cascade of proliferation" if there is not a change in behavior.[69] Fear is now spreading that even deterrence may not stop proliferation in the future, due in part to having a multi-lateral state system with varying motives and priorities. In order for states to become less reliant on deterrence, a new solution needs to be put in place. If the deterrence theory can be replaced with the idea that "if nuclear weapons might not deter nuclear attacks, do not deter conventional attacks, and do not reliably provide diplomatic leverage," then "the case for disarmament, nonproliferation, and banning nuclear weapons is immeasurably strengthened."[70] By instituting a nonproliferation regime on a global scale, states may feel more secure in finally letting go of their nuclear weapons, which could eventually lead to total disarmament and the success of the NPT.

---

[69] Kittrie, Orde. "Averting Catastrophe," 340.

[70] Wilson, Ward, "The Myth of Nuclear Deterrence," *The Nonproliferation Review* 15, no. 3 (2008): 421-39.

Bibliography

"'Burning' Weapons Plutonium in CANDU Reactors." 1994. Committee on International Security and Arms Control, U.S. National Academy of Sciences.

Clements, Tom, Edwin Lyman, and Frank Von Hippel. "The Future of Plutonium Disposition." *Arms Control Today* 43, no. 6 (2013): 8-15.

Davenport, Kelsey. "Nuclear Weapons: Who Has What at a Glance." October 2016. Arms Control Association.

Donohue, Mark. "Pokhran-I: India's First Nuclear Bomb." March 2014. Stanford University.

Eisenhower, Dwight D. "Atoms for Peace." Speech, New York City, NY, December 8 1953. International Atomic Energy Agency.

Etzioni, Amitai. "A Deeply Flawed Fuel Bank: Providing Nations with Enriched Uranium will not Prevent Proliferation. It Will Promote It." *World Policy Journal*, 27, no. 4 (2010): 103-10.

Kennedy, John F. "News Conference 52." Speech, Washington, DC, March 21, 1963. John F. Kennedy Presidential Library and Museum.

Kittrie, Orde. "Averting Catastrophe: Why the Nuclear Nonproliferation Treaty is Losing Its Deterrence Capacity and How to Restore It." *Michigan Journal of International Law* 28, no. 2 (2007): 337-430.

Kramer, Andrew E. "Power for U.S. From Russia's Old Nuclear Weapons." November 2009. The New York Times.

McCGwire, Michael. "Nuclear Deterrence." *International Affairs (Royal Institute of International Affairs 1944-)* 82, no. 4 (2006): 771-84.

“Megatons to Megawatts.” December 2013. Centrus Energy Corporation.

Mwandikwa, Gabriel. “Russia Introduces New Nuclear Missile Dubbed ‘Satan 2’.” November 2016. Kenyatta University TV.

Pella, Peter J., and Morgan & Claypool Publishers. *The Midlife Crisis of the Nuclear Nonproliferation Treaty*. San Rafael: IOP Concise Physics and Morgan & Claypool Publishers, 2016.

Podvig, Pavel. “Can the US-Russia plutonium disposition agreement be saved?” April 2016. Bulletin of the Atomic Scientists.

Rajaraman, Ramamurti, “Despite qualms, fuel banks hold promise,” August 2012, Bulletin of the Atomic Scientists.

Reif, Kingston. “U.S. Nuclear Modernization Programs.” October 2016. Arms Control Association.

“Russia raises concerns about changes in U.S. plutonium disposition plan.” April 2016. International Panel on Fissile Materials.

“Russia suspends implementation of plutonium disposition agreement.” October 2016. International Panel on Fissile Materials.

Shukla, Sebastian and Laura Smith-Spark. “Russia unveils ‘Satan 2’ missile, could wipe out France or Texas, report says.” October 2016. CNN.

Sokova, Elena, and Cristina Hansell Chuen. "Nuclear Power Broker." *Bulletin of the Atomic Scientists* 63, no. 5 (2007): 50-54.

“The IAEA LEU Bank.” International Atomic Energy Agency.

Toukan, Khaled. “For a fuel bank, fairness is paramount.” August 2012. Bulletin of the Atomic Scientists.

Tuan, Ta Minh. “Calculating the value of an international fuel bank.” August 2012. Bulletin of the Atomic Scientists.

U.S. Department of State. “Challenges of Nonproliferation Noncompliance.” April 2007. Bureau of International Security and Nonproliferation.

U.S. Department of State. “Treaty on the Non-Proliferation of Nuclear Weapons (NPT).” March 1970. U.S. Department of State.

U.S. Department of State. “2000 Plutonium Management and Disposition Agreement.” April 2010. U.S. Department of State.

Wilson, Ward. "The Myth of Nuclear Deterrence." *The Nonproliferation Review* 15, no. 3 (2008): 421-39.