COMMERCIAL POWER REACTORS FOR DEFENSE PURPOSES: TRITIUM PRODUCTION AND THE UNITED STATES' DISREGARD FOR LONGSTANDING NON-PROLIFERATION POLICY AND INTERNATIONAL INTEGRITY

"Have no fear for atomic energy . . ."[1]

INTRODUCTION

Since introducing the world to the nuclear age in the 1940's, the United States has gone to great lengths to curb the proliferation of atomic weapons. A significant result of those efforts has been the creation of the International Atomic Energy Agency (IAEA) and the ratification of the Nuclear Non-Proliferation Treaty (NPT). As a leader of the non-proliferation regime, America gained significant respect for its position.

The United States tritium reserve, which is used for nuclear weapons production, is running low.[2] In 1997, the Department of Energy (DOE) initiated a test to determine whether a commercial nuclear reactor could economically produce tritium for defense needs.[3] Such action does not technically violate the literal language of the NPT; However, using a reactor in this manner undermines the basic philosophy of the non-proliferation regime—curbing the spread of nuclear weapons. By contradicting the tenets of the regime, the United States may come dangerously close to losing its credibility in international nuclear concerns. If the United States fails to follow both the letter and the spirit of the NPT, it can no longer expect the international community to follow lockstep in American non-proliferation rhetoric. If it does not practice what it preaches, the United States could unwittingly provide other nations with the impetus to defy their own NPT obligations.

This Note questions the Department of Energy's decision to use commercial reactors to produce tritium in light of the United States' impressive performance thus far in non-proliferation affairs and America's future role in global diplomacy. Part I discusses the birth of the Non-Proliferation Treaty and the United States' substantial responsibility in establishing the regime. Further, this section analyzes the relationship between the NPT and the IAEA with particular attention to safeguards applied

---

1. BOB MARLEY, *Redemption Song*, *on* LEGEND: THE BEST OF BOB MARLEY & THE WAILERS (Island Records Ltd. 1984).

2. *See* Linda Rothstein, *The Great Tritium Rush: Competing Plans for Ensuring Supply of Tritium*, BULL. ATOM. SCIENTISTS, Mar. 13, 1997.

3. *See DOE Picks Watts Bar Reactor to Test Tritium Production in Civil Reactors*, ENERGY REP., Feb. 17, 1997 [hereinafter *DOE Picks Watts*].

to American nuclear facilities. Part II acknowledges that the NPT and the IAEA do not technically monitor tritium production and discusses the relatively minor punishments placed on NPT violators. Part III considers the United States' efforts to prevent two NPT nations from acquiring nuclear weapons. This section discusses the important implication of ignoring NPT obligations—lessening our ability to prevent other nations from developing atomic weapons capability in the future.[4] This Note contends that if the United States commissions civilian reactors to produce tritium destined for nuclear warheads, it will violate its NPT and IAEA duties and obligations. Such a violation will diminish the United States' effectiveness at stopping the future proliferation of nuclear weapons.

I. THE ORIGINS OF NON-PROLIFERATION

On August 6, 1945, the world watched the United States usher in the atomic age by dropping the first of two atomic bombs on Japan.[5] Soon thereafter, the United States sought to restrict other nations from obtaining atomic secrets. Over the next twenty-five years, a majority of the global community sought to halt the spread of atomic weapons through a variety of resolutions, plans, and agencies.

A. Early Attempts at Non-Proliferation

On June 14, 1946, in an effort to prevent nuclear weapons dispersal, the United States proposed the Baruch Plan to the United Nations.[6] This Plan called for the creation of an International Atomic Development Authority (IADA) that would have complete control over military nuclear energy projects and would acquire ownership of all fissionable materials.[7] The IADA

---

4. This Note analyzes the non-proliferation aspect of the DOE's decision in isolation. The Note acknowledges that other policy and ethical implications result from the DOE's decision, but does not address them because they do not impact the strict non-proliferation assessment.

5. Paul Gray, *Doomsdays: Atomic Bombings of Nagasaki and Hiroshima, Japan During World War II*, TIME, Aug. 7, 1995, at 48. The first nuclear explosion occurred during a test on July 16, 1945 in Alamogordo, New Mexico. ALBERT CARNESALE ET AL., LIVING WITH NUCLEAR WEAPONS 3 (1983).

6. *See* Simon Crowe & Jeremy Ginifer, *Nuclear Non-Proliferation: A Brief History 1945-1970*, *in* NUCLEAR NON-PROLIFERATION: A REFERENCE HANDBOOK 15, 16 (Darryl Howlett & John Simpson eds., 1992); Ben Sanders, *The Treaty on the Non-Proliferation of Nuclear Weapons and the Relations Between the Superpowers*, *in* NUCLEAR NON-PROLIFERATION AND THE NON-PROLIFERATION TREATY 80, 82 (M.P. Fry et al. eds., 1990). The United States considered turning over all "dangerous" civilian nuclear activities— those programs that could easily be transformed from civil/electrical/medical uses to military/explosive production—to some international authority. *See* H.R. REP. NO. 91-463, pt. 21 at 3 (1977).

7. *See* CARNESALE, *supra* note 5, at 80-81. "Fissionable" is a general term indicating those isotopes whose nucleus can be fissioned (split). *See* KARL O. OTT & WINFRED A. BEZELLA,

would not only "control, inspect and license nuclear facilities," but it also would "foster the beneficial [or peaceful] uses of nuclear energy."[8] Before agreeing to grant the IADA control over all nuclear materials, the Soviet Union requested that the United States destroy its accumulated nuclear stockpile, a request that America would not accommodate.[9] Out of its distrust for the United States, the Soviet Union rejected the Baruch Plan.[10]

When the Baruch Plan failed, the United States changed the course of its efforts to prevent nuclear weapons proliferation. Indeed, America's atomic policy abruptly reversed direction from its prior stance of sharing nuclear information under the Plan. By passing the Atomic Energy Act of 1946 (AEA), the Congress sought to shroud the United States nuclear technology in a cloak of secrecy.[11]

The fantasy that the United States could somehow deny atomic secrets to the world-at-large, through AEA policy, quickly disappeared. First, although Congress attempted to restrict access to nuclear information and supplies to the United States' closest allies (including the United Kingdom and France), the AEA did not completely impede such dissemination. For instance, to assure a sufficient uranium supply, the United States entered into nuclear agreements with both Canada and Belgium.[12]

In addition, AEA policy could not prevent countries from independently developing nuclear technologies. For example, Switzerland and Sweden began their own quests for nuclear independence.[13] Ultimately, America's hope to retain sole possession of nuclear weapons secrets vanished when the Soviet Union detonated its first atomic bomb in August, 1949.[14] Soon after, many other nations began plodding down the path of harnessing the atom, thus foreshadowing the imminent failure of the United States' plan of atomic solitude.[15] By 1964, the ranks of the exclusive nuclear club had swelled to its

---

INTRODUCTORY NUCLEAR REACTOR STATICS 1 (rev. ed. 1989).

8. *See* Crowe & Ginifer, *supra* note 6, at 16, 17.

9. *See* LAWRENCE SCHEINMAN, THE NONPROLIFERATION ROLE OF THE INTERNATIONAL ATOMIC ENERGY AGENCY: A CRITICAL ASSESSMENT 8 (1985).

10. *See* Helen M. Cousinea, *The Nuclear Non-Proliferation Treaty and Global Non-Proliferation Regime: A U.S. Policy Agenda*, 12 B.U. INT'L L.J. 407, 411 (1994).

11. *See id.* The Atomic Energy Act of 1946 prohibited the United States from cooperating even with Western Allies regarding peaceful nuclear activities until Congress had satisfied itself that "effective international safeguards were in place." SCHEINMAN, *supra* note 9, at 8.

12. *See* SCHEINMAN, *supra* note 9, at 8.

13. *See id.*

14. *See* OFFICE OF TECH. ASSESSMENT, NUCLEAR SAFEGUARDS AND THE INTERNATIONAL ATOMIC ENERGY AGENCY 26 (1995) [hereinafter NUCLEAR SAFEGUARDS].

15. In fact, in a speech given on October 27, 1945, President Truman acknowledged the impossibility of an indefinite nuclear monopoly. *See* Crowe & Ginifer, *supra* note 6, at 15.

present number of five when Great Britain, France, and China established their atomic prowess.[16]

In the early 1950's, the United States foresaw an oncoming proliferation frenzy. In order to halt, or at least slow, the rapid pace of "horizontal proliferation,"[17] the United States emerged from AEA-invoked isolation in 1953 with the adoption of President Eisenhower's Atoms for Peace Plan.[18] The Plan's primary accomplishment was the creation of the IAEA, the original purpose of which remains the safeguarding of nuclear materials by ensuring that countries do not divert material placed under IAEA supervision or control for further military purposes.[19] But due to the IAEA's inability to apply meaningful sanctions,[20] nuclear weapons proliferation swiftly accelerated until the mid-1960's.[21] With five nations known to possess nuclear bombs,

---

16. For the purposes of this Note, the nuclear club consists of the five nations that possessed known nuclear weapons capabilities prior to January 1, 1967 (the United States, United Kingdom, France, Soviet Union, and China). *See* Treaty on the Non-Proliferation of Nuclear Weapons, *opened for signature* July 1, 1968, art. IX, para. 3, 21 U.S.T. 483, 729 U.N.T.S. 161, 174 [hereinafter NPT]. Great Britain, France, and China detonated an atomic weapon in 1952, 1960, and 1964 respectively. *See* NUCLEAR SAFEGUARDS, *supra* note 14, at 26. As seen immediately below, and discussed further at *infra* Part III small handful of nations possess a nuclear device. These nations are known as threshold states and include Israel, India, and Pakistan, none of which have acceded to the NPT. *See* David Fischer, *Drawing the Threshold States into a Regime of Restraint, by Joining the NPT or Otherwise*, *in* NUCLEAR NON-PROLIFERATION AND THE NON-PROLIFERATION TREATY 36, 36-37 (M. P. Fry et al. eds. 1990). North Korea has also achieved the distinction of being a threshold state, and has ratified the NPT. *See* U.N. DEP'T OF PUB. INFO., U.N. BLUEBOOK SERIES, VOL. III, THE UNITED NATIONS, THE UNITED NATIONS AND NUCLEAR NON-PROLIFERATION, 1995, at 180-81, U.N. DOC. NO. DPI/1628, U.N. SALES NO. E.95I.17 (1995) [hereinafter THE UNITED NATIONS]. Finally, the United States believes that Iran has become a threshold state within the last few years. *See* NUCLEAR SAFEGUARDS, *supra* note 14, at 19.

17. Horizontal proliferation refers to new nations developing nuclear weapons capabilities, whereas vertical proliferation refers to those nations already possessing nuclear weapons producing more and/or better weapons. *See* David A. Koplow, *Parsing Good Faith: Has the United States Violated Article VI of the Nuclear Non-Proliferation Treaty?*, 1993 WIS. L. REV. 301, 313-14 (1993); NUCLEAR NON-PROLIFERATION: A REFERENCE HANDBOOK 6, 9 (Darryl Howlett & John Simpson eds. 1992).

18. *See* Sanders, *supra* note 6, at 82.

19. *See* Statute of the International Atomic Energy Agency, Oct. 26, 1956, art. III, para. A(5), 276 U.N.T.S. 4, 6 [hereinafter Statute–IAEA]; THE UNITED NATIONS, *supra* note 16, at 14; NUCLEAR SAFEGUARDS, *supra* note 14, at 6. The IAEA has no unilateral authority to place safeguards on any nation's nuclear program, whether or not that nation has signed the NPT. *See* Statute–IAEA, *supra* at art. III, para. A(5), & art. XII, para. A(1), 276 U.N.T.S. at 6, 276. A nation must voluntarily submit its nuclear materials and activities to IAEA safeguards through bilateral or multilateral agreements between that nation and the IAEA. *See id.* Although the NPT "requires" NNWS parties to accept IAEA safeguards, not all NNWS signatories have. *See* NPT, *supra* note 16, at art. III, 729 U.N.T.S. at 172; *see also* THE UNITED NATIONS, *supra* note 16, at 179-83 for a list of NNWS signatories that had not concluded safeguards agreements with the IAEA as of July 1, 1994.

20. *See* discussion *infra* Part II.

21. By this point, the nuclear club had its full complement of members. *See also supra* note 16 and accompanying text.

President Kennedy predicted in 1963 that as many as twenty nations would acquire a nuclear weapon by 1975.[22]

Earlier, in 1958, Ireland proposed to the United Nations General Assembly the formation of a committee to study nuclear proliferation dangers and the suspension of nuclear tests.[23] In addition, the proposal sought promises from states not yet possessing an atomic bomb to forego acquiring one.[24] This proposal received a lackluster reception at best.[25] After modifying and resubmitting its proposal annually for four years, the U.N. General Assembly unanimously adopted the resolution on the "prevention of wider dissemination of Nuclear weapons" (more popularly known as the *Irish Resolution*).[26] The resolution urged all states to adopt an international agreement requiring that: (1) states not presently possessing nuclear weapons refrain from manufacturing or otherwise acquiring them; and (2) nuclear states not assist non-nuclear states in obtaining nuclear weapons or related technology.[27] Although the *Irish Resolution* received resounding support in the U.N., negotiations on a non-proliferation treaty did not begin in earnest until 1965.[28]

B. The Nuclear Non-Proliferation Treaty: Purpose and Effects

Five years after the *Irish Resolution*, fifty-three nations, including the United Kingdom, the Soviet Union, and the United States, ratified the Non-Proliferation Treaty .[29] The NPT, which went into force on March 5, 1970,[30] allowed the IAEA to monitor atomic weapons proliferation more efficiently.[31]

---

22. John Barry, *Future Shock*, NEWSWEEK, July 24, 1995, at 32.

23. *See generally* 1 MOHAMED I. SHAKER, THE NUCLEAR NON-PROLIFERATION TREATY: ORIGIN AND IMPLEMENTATION 1959-1979, 3-33 (1980) [hereinafter SHAKER 1].

24. *See* Crowe & Ginifer, *supra* note 6, at 20.

25. *See id.*

26. *See* SHAKER 1, *supra* note 23, at 24.

27. *See id.*

28. *See* Crowe & Ginifer, *supra* note 6, at 20-21.

29. *See* NPT, *supra*, note 16, 729 U.N.T.S. at 169 n.1. Notable nations who did not immediately ratify the NPT include Japan and the Federal Republic of Germany (*see* discussion *infra* Part III). France and the People's Republic of China (China) were the only nations possessing nuclear weapons who did not immediately ratify the Treaty. France did not ratify the Treaty until August 3, 1992. *See* NUCLEAR SAFEGUARDS, *supra* note 14, at 132. However, during the interim period, France implemented a national nuclear policy effectively making France a party to the Treaty. *See Two Countries That Have Seen the Light*, ATLANTA J. & CONST., June 9, 1991, at G4. Charles de Gaulle, the leader of France at the time, refused to compromise France's national defense by signing the Treaty. *See id.* China ratified the Treaty on March 9, 1992. *See* NUCLEAR SAFEGUARDS, *supra* note 14 at 132.

30. *See* NPT, *supra* note 16, 729 U.N.T.S. at 169 n.1.

31. *See* THE UNITED NATIONS, *supra* note 16, at 14-15. The IAEA is "an independent intergovernmental organization, affiliated with—but not a sub-unit of—the United Nations." NUCLEAR SAFEGUARDS, *supra* note 14, at 26. For instance, the IAEA has no authority to subject any nation to a

Although far from perfect, this treaty has been heralded by commentators as one of the most significant international agreements of modern times.[32] In fact, it seems to have had an impact on non-signatories as well. No ostensibly non-nuclear nation, except India and Pakistan[33], has detonated a nuclear weapon since the inception of the NPT.[34] However, since IAEA safeguard procedures only verify that "significant quantities" of certain materials have not been diverted to military purposes, nations may divert smaller quantities over a longer period of time, a practice that could go unnoticed under the current regime.[35] Most likely, those weapons have not yet been tested because the resulting detonations would theoretically have been detected.[36] To a certain extent, this is a lower form of non-proliferation since untested bombs are considered inherently too unreliable and thus will not be used in an offensive manner.[37]

By its very terms, the NPT discriminates between the nuclear "haves" and "have-nots."[38] It divides states into two groups according to their nuclear weapons status as of January 1, 1967.[39] A country that detonated a nuclear device prior to this date is classified as a nuclear weapons state (NWS) and a country that had not is designated as a non-nuclear weapons state (NNWS).[40]

---

safeguard regime—*i.e.* an inspection process to assure the international community that significant quantities of nuclear material are not diverted for military purposes. *See* SCHEINMAN, *supra* note 9, at 26. The NPT does, however, "require" NNWS parties to accept safeguards (nonetheless, not all of those parties have signed safeguard agreements). *See* discussion *infra* Part I.C and *infra* Part II. Article III.1 of the NPT states that, "[e]ach non-nuclear weapon State Party to the Treaty undertakes to accept safeguards, as set forth in an agreement to be negotiated [between individual NNWS parties and the IAEA]." NPT, *supra* note 16, 729 U.N.T.S. at 172. The IAEA, therefore, implements the NPT mandated safeguards. *See* SCHEINMAN, *supra* note 9, at 26. For a general description of the IAEA safeguard regime, *see id.* at 17-18, 25-29; NUCLEAR SAFEGUARDS, *supra* note 14.

32. *See* Richard T. Kennedy, *Nuclear Nonproliferation—Law and Policy*, 76 AM. SOC'Y INT'L L. PROC. 82, 84 (1982); Kenneth W. Abbott, *"Trust But Verify": The Production of Information in Arms Control Treaties and Other International Agreements*, 26 CORNELL INT'L L.J. 1, 30 (1993).

33. As of this writing, India and Pakistan have not signed the NPT.

34. This statement does not preclude the possibility that one or more other nations have obtained an atomic device(s) and have not tested it or the test was not noticed on seismic readings. India's 1974 experiment was—what it called—a "peaceful" nuclear test. *See* THE UNITED NATIONS, *supra* note 16, at 10. Only one overt nuclear weapons demonstration (prior to the 1998 India-Pakistan tests) by a non-nuclear club member in almost twenty-five years evidences the seriousness that most member nations accord their NPT obligations. *See supra* note 16 and accompanying text.

35. NUCLEAR SAFEGUARDS, *supra* note 14, at 29-30.

36. *See* Koplow, *supra* note 17, at 316-17.

37. Whether correct or not, this postulate is the motivating principle supporting the Comprehensive Test Ban Treaty (CTB). *See id.* at 317-18.

38. *See* Munir Ahmad Khan, *Towards a Universal Framework of Nuclear Restraint*, *in* NUCLEAR NON-PROLIFERATION AND THE NON-PROLIFERATION TREATY 45, 47 (M. P. Fry et al. eds., 1990).

39. *See* NPT, *supra* note 16, art. IX para. 3, 729 U.N.T.S. at 174.

40. *See id.* As stated in *supra* note 16, only five nations technically fulfill the NPT definition of a nuclear weapons state. *See also* Fischer, *supra* note 16, at 41 (contending that Israel has possessed a "nuclear arsenal" since the mid- to late 1960's).

Under the treaty, the NWS parties promise to supply information, fuel, and other materials to a NNWS for commercial use;[41] to make a good faith effort to pursue disarmament;[42] and not to supply any NNWS with a nuclear weapon or assist in their obtaining one.[43] The NNWS parties, in turn, agree to three of their own obligations. First, they agree not to manufacture or otherwise acquire a nuclear weapon;[44] second, they accept safeguards on all nuclear facilities;[45] and third, they pledge not to transfer nuclear materials, unless safeguarded, to other NNWSs.[46] Essentially, NNWS parties agree to forego nuclear weapons capability and to give up some sovereignty over their nuclear activities in exchange for commercial nuclear energy information from NWS parties. However, the NPT allows the NWS parties to retain their nuclear weapons infrastructure while "pursuing" disarmament.[47]

C. The NPT, IAEA, and Safeguarding Nuclear Activities

Perhaps the most striking difference between the obligations of NWS and NNWS parties lies in the inequality of the safeguard system.[48] The NPT imposes safeguards as an early warning device to detect the diversion of significant quantities of nuclear materials from peaceful purposes to the manufacture of nuclear weapons.[49] Those NNWS parties that signed agreements with the IAEA[50] must subject all materials used in peaceful

---

41. *See* NPT, *supra* note 16, at art. IV para.2, 729 U.N.T.S. at 173

42. *See id.* at art. VI, 729 U.N.T.S. at 173. *See also* Koplow, *supra* note 17, at 303 (contending that the United States has unduly avoided its obligation under NPT article VI to disarm). The ultimate aim of Article VI is the conclusion of a Comprehensive Test Ban Treaty, which the United States and other NWS parties have avoided until recently. *See id* at 318; *see also* COMPREHENSIVE TEST BAN TREATY, *opened for signature* Sept. 24, 1996, 35 I.L.M. 1439 (1996).

43. *See* NPT, *supra* note 16, at art. I, 729 U.N.T.S. at 171.

44. *See id.* at art. II., 729 U.N.T.S. at 171.

45. *See id.* at art. III, para.1, 729 U.N.T.S. at 172.

46. *See id.* at art. III, para. 2, 729 U.N.T.S. at 172.

47. *See* Khan, *supra* note 38, at 47. For purposes of this Note, I define a nuclear infrastructure as including, but not limited to, storage, reprocessing, and enrichment facilities.

48. The safeguard system is a group of measures and policies used by the IAEA which are "designed to ensure that special fissionable and other materials, services, equipment, facilities, and information . . . under [IAEA] supervision or control are not used in such a way as to further any military purpose. . . ." Statute–IAEA, *supra* note 19, art. III, para. A(5), 276 U.N.T.S. at 6.

49. NPT, *supra* note 16, at art. III. para.1, 729 U.N.T.S. at 172. *See* Statute–IAEA, *supra* note 19, art. XII, para. A(1), 276 U.N.T.S. at 26. The IAEA has defined significant quantities as eight kilograms of plutonium and twenty-five kilograms of uranium enriched to twenty percent or more of the uranium-235 isotope. *See* NUCLEAR SAFEGUARDS, *supra* note 14, at 11. The IAEA detects diversion by conducting ad-hoc inspections at nuclear facilities, tracking nuclear exports, and using surveillance techniques including video cameras. *See id.* at 66, 80; 2 MOHAMED I. SHAKER, THE NUCLEAR NON-PROLIFERATION TREATY: ORIGIN AND IMPLEMENTATION 1959-1979, 750 (1980) [hereinafter SHAKER 2].

50. As stated in *supra* note 19, not *all* NNWS parties have signed safeguard agreements with the IAEA, but under Article III.1 of the NPT, NNWS parties have an obligation to do so.

nuclear activities to the IAEA safeguard system.[51] Conversely, the NPT imposes no obligations on a NWS party to submit any of its nuclear facilities to IAEA safeguards.[52]

Nonetheless, the United States clearly stated its intent to allow the IAEA to inspect the majority of its nuclear facilities.[53] Seven months before the NPT was opened for signing, President Lyndon Johnson announced in a televised message:

> I want to make it clear to the world that we in the United States are not asking any country to accept safeguards that we are unwilling to accept ourselves.
>
> So I am, today, announcing that when such safeguards are applied under the treaty, the United States will permit the International Atomic Energy Agency to apply its *safeguards to all nuclear activities* in the United States—*excluding* only those with *direct national security significance.*
>
> Under this offer the Agency will be able to inspect a broad range of U.S. nuclear activities, both governmental and private, including the fuel in nuclear power reactors owned by utilities for generating electricity.[54]

The United Kingdom made a similar offer two days after President Johnson's message.[55] Although it took some time before the United States actually completed negotiations with the IAEA concerning the details of the self-imposed safeguard regimen,[56] Germany and Japan both credit the United States' willingness to undergo the trials and tribulations of safeguard measures as the primary reason for their ratification of the NPT.[57]

---

51. *See* NPT, *supra* note 16, at art. III, para.1, 729 U.N.T.S. at 172. *See* NUCLEAR SAFEGUARDS, *supra* note 14, at 27.

52. Article III only applies to NNWS signatories, not to NWS parties. *See* NPT, *supra* note 16, at art. III., 729 U.N.T.S. at 172.

53. Most NNWS states wanted safeguards applied to NWS parties mainly as an economic measure (*see* discussion Part I.C.2).

54. ENVIRONMENT AND NATURAL RESOURCES POLICY DIVISION, 96th Cong., THE INTERNATIONAL ATOMIC ENERGY AGENCY: APPLICATION OF SAFEGUARDS IN THE UNITED STATES, 15 (1979)(Comm. Print 1979)(emphasis added) [hereinafter ENVIRONMENT AND NATURAL RESOURCES]. One commentator noted that the United States made its offer in a more than conciliatory manner. "In order to face up to the pressure and dissatisfaction . . . the United States and the United Kingdom made their offers to submit the nuclear activities in their respective countries to international safeguards." *See* SHAKER 2, *supra* note 49, at 670.

55. *See* SHAKER 2, *supra* note 49, at 670.

56. The U.S.-IAEA Treaty finally went into force on December 9, 1980, eleven years after President Johnson made his promise to the world. *See* Atomic Energy: Application of Agency Safeguards in the United States, Nov. 18, 1977, US-IAEA, 32 U.S.T. 3059 [hereinafter U.S.-IAEA Safeguards Agreement].

57. *See* ENVIRONMENT AND NATURAL RESOURCES, *supra* note 54, at 4, 33, 37. This "voluntary

Other nations were more skeptical of the United States' and United Kingdom's offer. India, in particular, considered it a grand gesture, but one which would not effectively inhibit vertical proliferation.[58] India contended that the safeguards were illusory as applied to the United States.[59] As a NWS party, the United States possessed a complement of military nuclear facilities that were not subject to IAEA safeguards. Further, since no treaty existed that completely prohibited the testing of nuclear weapons, America and other NWS parties were free to produce and test newer and better atomic devices; thus, allowing vertical proliferation to progress unabated. To some extent, this "illusion" that India suggested has actually disappeared—as the Cold War vanished, so did American military reactors.[60]

1. Safeguards: Objectives and Effects

Nuclear non-proliferation safeguards have the very limited scope of preventing the diversion of nuclear materials to weapons purposes. IAEA safeguards are not designed to assure the health of people living close to a nuclear site, nor do they ensure the safety of such sites.[61] Instead, the

---

offer" by the United States was certainly relied on by a variety of other NNWS parties. *See id.* at 33. During a Senate hearing on the ratification of the U.S.-IAEA Treaty, Senator Pell remarked that:

> Many nations adhered to the Non-Proliferation Treaty [NPT] in reliance upon assurances by the United States—and other nuclear weapons states—that it would open itself to international inspection of its commercial nuclear industry on the same basis as nonnuclear weapons states. . . . [The] ratification of the U.S.-IAEA Treaty will strengthen the position of the United States that the NPT does not impose unfair burdens on nonnuclear weapons states. . . .

U.S.-IAEA TREATY: Hearing Before the Senate Comm. On Foreign Relations, 96th Cong. 1 (1980). Maurice Timbs, from Australia, reported to the IAEA Safeguards Committee in 1971 that the voluntary offers had a "significant bearing" on several nations' decision to sign the NPT. ENVIRONMENT AND NATURAL RESOURCES, *supra* note 54, at 21.

58. *See* SHAKER 2, *supra* note 49, at 671. *See supra* note 17 for the definition of vertical proliferation.

59. *See* discussion at Part II.

60. For example, in 1989, the Savannah River Site shifted its mission from weapons production to focusing on "environmental remediation and processing of nuclear materials for safe storage" and disposal. *Westinghouse Team Wins $6 Billion Savannah River Deal: Westinghouse Savannah River Company to Manage Savannah River Nuclear Plant*, POWER ENG'G, Nov. 1, 1996, at 18. Likewise, the Hanford Nuclear Reservation has begun the "transition from defense production operation to implement[ing] an environmental restoration and cleanup strategy." *Spectrum '96: Legacy of Work at Hanford Continued in Cleanup Mode*, ENVTL. REMEDIATION TECH., Aug. 21, 1996. Recently, this trend has reversed. For example, the Savannah River Site, although now decommissioned for weapons work, is under consideration as the site for a tritium producing accelerator. Elaine Hiruo, *DOE Field Study Maintains FFTF Could Produce Tritium*, NUCLEONICS WEEK, Dec. 11, 1997, at 14. In addition, the Secretary of Energy, Hazel O'Leary, placed the Hanford Fast Flux Reactor on "hot standby" while waiting to see if other tritium production techniques would work. George Lobsenz, *HED: It's Official, DOE to Take Another Look at FFTF*, ENERGY DAILY, Jan. 16, 1997.

61. For instance, the safeguard regime will not predict nuclear accidents such as Chernobyl or

Agency's basic function is to verify that "nuclear material[s] [are] not diverted to nuclear weapons or other nuclear explosive devices."[62] The primary IAEA safeguards objective for NWS parties is to verify that "nuclear material is not removed from safeguards, except in accordance with procedures foreseen in the agreement."[63]

Although the IAEA had been applying safeguards to nuclear facilities since its inception, the NPT presented new challenges, both political and technical. The IAEA needed a single procedure to apply to NNWS parties so they would not receive disparate treatment in their safeguards agreements. After an intense drafting process, the IAEA produced a document known as "INFCIRC/153 (corrected)," which serves as the model safeguards agreement between the IAEA and NNWS parties.[64]

While NNWS states permit the IAEA to safeguard their entire nuclear program, the IAEA's entry into the United States' nuclear program is considerably less invasive. Despite President Johnson's broad statement, the IAEA only imposes safeguards on a small portion of the United States' non-military nuclear activities. In theory, IAEA safeguards apply to the entire United States civilian nuclear infrastructure including utilities, reprocessing plants, and research reactors.[65] In practice, the American government supplies the IAEA with a list of facilities to safeguard, screened to exclude military and national defense related sites. The IAEA then applies the safeguards to a

---

Three Mile Island. *See* SHAKER 2, *supra* note 49, at 654-55.

62. REINHARD H. RAINER & PAUL C. SZASZ, THE LAW AND PRACTICES OF THE INTERNATIONAL ATOMIC ENERGY AGENCY 1970-1980: SUPPLEMENT 1 TO THE 1970 EDITION OF LEGAL SERIES NO. 7, 272 (1993) [hereinafter LAW AND PRACTICES]. Article XX of the IAEA Statute divides "nuclear materials" into two groups: special fissionable material and source material. The first group includes plutonium-239, uranium-233, uranium enriched in the isotopes 233 or 235, and other fissionable material as the Board of Governors shall later determine. *See* Statute-IAEA, *supra* note 19, at art. XX, para. 1. 276 U.N.T.S. at 38. The source group includes natural uranium, uranium depleted in the isotope 235, thorium, and any other material as the Board of Governors shall later determine. *See id* at art. XX, para. 3.

63. LAW AND PRACTICES, *supra* note 62, at 273.

64. *See id.* at 289. This document incorporates *full-scope* safeguards, defined as the application of safeguards "on *all* nuclear materials in all peaceful nuclear activities within [an NNWS party's] territory or under [its] control." NUCLEAR SAFEGUARDS, *supra* note 14, at 27. By definition, it would seem that "all peaceful nuclear activities within" an NNWS member's territory would include *all nuclear activities*, since a "Non-Nuclear Weapon State" is not supposed to have any non-peaceful nuclear activities.

65. "Presumably, all NRC licensed facilities will be on the list from which IAEA will select those to be inspected." ENVIRONMENT AND NATURAL RESOURCES, *supra* note 54, at 9. Facilities on the list include: "(1) central-station electric power reactors [electric utilities], (2) dual purpose plants (electric power and desalting), (3) experimental electric power systems (Experimental Breeder Reactor No. 2), (4) test, research and university reactors, (5) critical assembly facilities, and (6) fuel fabrication and chemical processing facilities." *Id.* at 17. Facilities excluded from the list include: "(1) military reactors, (2) plutonium production reactors, (3) space propulsion experiments, (4) auxiliary power reactors (for space applications), (5) facilities concerned at the time with military, nuclear explosive device or other classified work, and (6) facilities located in an area at a site generally engaged in military, nuclear explosive device or classified work." *Id.*

select number of those sites.[66] Thus, only a fraction of the United States' nuclear activities operate under safeguard scrutiny. Those few sites must operate under essentially full-scope safeguards, with only a few exceptions. The most salient exception allows the United States to withdraw facilities or materials from the safeguard list almost at will.[67] The only real hindrance is that the IAEA must receive notification prior to the removal; once the IAEA has received notification, the material/facility ceases to be subject to safeguards.[68]

2. Policy Reasons for Applying Safeguards to Only a Portion of American Civil Reactors

It took the United States over a decade to conclude a safeguards agreement. This was largely due to the need to find an equitable solution to fund the offer to safeguard its civilian nuclear power program. The non-proliferation community had to perform extensive cost-benefit analyses to determine an equitable solution for all interested parties.[69] Safeguards fiscally handicap those sites where they are applied. NNWS states did not feel that it was fair for them to operate under the "burdens" when NWS parties experienced no such hindrance on their nuclear programs.[70]

Moreover, the safeguarding process inadvertently burdens the efficiency of electric utilities.[71] Hence, a primary motivating factor behind a NNWS party's desire for NWS members to accept safeguards on their civilian programs is to level the economic playing field and to avoid commercial discrimination.[72] If NNWS parties must suffer the consequences of safeguards, so should NWS parties.[73]

A greater international concern focused on the sheer number of facilities eligible for safeguards under the voluntary offers. The Secretariat of the

---

66. *See* NUCLEAR SAFEGUARDS, *supra* note 14, at 65 & n.54.

67. *See* LAW AND PRACTICES, *supra* note 62, at 311. Removals from the list are made at the discretion of the United States. *See id.* at 314; David A.V. Fisher, *The International Atomic Energy Agency and Nuclear Safeguards*, *in* NUCLEAR NON-PROLIFERATION: A REFERENCE HANDBOOK 37, 39 (Darryl Howlett & John Simpson eds., 1992).

68. Atomic Energy: Application of Agency Safeguards in the United States, Dec. 9, 1980, U.S.-IAEA, art. 12, para. (a), 32 U.S.T. 3059, 3067 [hereinafter Atomic Energy].

69. *See* SHAKER 2, *supra* note 49, at 762-65.

70. *See id.* at 762-63.

71. Such burdens include the continuous accountability of certain materials, and facilitating ad-hoc and planned inspections. *See* SHAKER 2, *supra* note 49, at 748-58. These elements require the time of utility personnel resulting in decreased revenues.

72. *See* SHAKER 2, *supra* note 49, at 762.

73. The United States intended to demonstrate that safeguards would not commercially disadvantage submitting parties in international trade competition. *See* ENVIRONMENT AND NATURAL RESOURCES, *supra* note 54, at 25.

IAEA estimated that the safeguards portion of the IAEA budget would double if all eligible United States and United Kingdom facilities were safeguarded.[74] Under any estimation, the costs associated with safeguarding America's sprawling civilian nuclear infrastructure would be enormous. Thus, most nations did not feel this voluntary offer worth the exorbitant sum required to fund safeguards at all eligible facilities.[75]

Monetary issues aside, the United States feared that if its entire civilian nuclear program operated under safeguards, the IAEA would smother in an avalanche of information.[76] Under this scenario, the IAEA could no longer effectively safeguard non-nuclear weapons states.[77] Thus, the interested parties had to decide which portion of the United States' peaceful nuclear program to safeguard in order to fulfill the purpose of the voluntary offer, yet not overly impede the functioning of the IAEA. In order to maintain Agency costs at viable levels, the parties decided that the IAEA would choose a small number of facilities in which to apply safeguards at any one time. However, the United States could, with notice, remove sites from the list, while the IAEA would retain the right to shift the safeguard status to different facilities from time to time.[78]

Although Article I presents a large loophole by allowing the United States to remove nuclear materials from safeguard status at leisure, American policy-makers should pause before taking such action. By flaunting this freedom, America may lose respect on the international political scene, and thereby suffer serious repercussions.[79] If one assumes that America has

---

74. *See* ENVIRONMENT AND NATURAL RESOURCES, *supra* note 54, at 20.

75. *See* SHAKER 2, *supra* note 49, at 760-65. By different methods, a majority of advanced nuclear energy states favored that the United States and Great Britain fund their own safeguards. *See id.* India and South Africa proposed that each nation bear the cost associated with its safeguarded facilities. *See id* at 763. Developing nations preferred that the nuclear weapon states bear all or most of the IAEA safeguards budget. *See id.*

76. *See* ENVIRONMENT AND NATURAL RESOURCES, *supra* note 54, at 5. This report also suggested that diverting even a small portion of scarce IAEA resources for "cosmetic reasons of appearance" would negatively affect the IAEA's ability to effectively safeguard those nations prone to proliferation attempts. *See id.* at 5. In 1969, eleven years before the agreement authorizing the voluntary offer went into effect, the United States Atomic Energy Commission estimated that approximately two hundred facilities would qualify under one of the six categories of nuclear sites eligible for safeguards: "(1) central-station electric power reactors [electric utilities], (2) dual purpose plants (electric power and desalting), (3) experimental electric power systems (Experimental Breeder Reactor No. 2), (4) test, research and university reactors, (5) critical assembly facilities, and (6) fuel fabrication and chemical processing facilities." *Id.* at 17.

77. *See id.* at 5.

78. *See* Atomic Energy, *supra* note 68, at arts. 1-2, 32 U.S.T. 3059, 3063. United States nuclear materials suppliers and utilities alike requested this "shifting mechanism" so that no one supplier would be under the continuous safeguards burden. Article 2 of the agreement specifically requires the IAEA to apply safeguards in a manner that "avoid[s] discriminatory treatment as between United States commercial firms similarly situated." *Id.*

79. Such repercussions would include the United States future ability to persuade nations to adhere

acquired a higher moral position since making the voluntary offer and signing a safeguards agreement, then the United States is now in the unfortunate position of violating the spirit of the NPT. Such a violation may hinder the United States ability to gather international support in future attempts to check rogue states from obtaining a nuclear weapon.

II. TRITIUM PRODUCTION IN CIVILIAN NUCLEAR PLANTS: A PUNITIVE ASSESSMENT

Neither the NPT nor the United States-IAEA safeguards agreement specifically precludes using commercial nuclear power plants to produce tritium. In fact, the NPT and IAEA safeguards do not prohibit any nation from producing tritium in their civilian nuclear power programs.[80] Therefore, under a literal reading of the Treaty and safeguards agreements, any nation, including the United States, can produce tritium for weapons without violating either the Treaty or their agreements.[81]

Nonetheless, a broad reading of the NPT, including an understanding of the policy behind the Treaty, would prohibit the use of commercial reactors to produce tritium for weapons purposes.[82] Once the Senate ratified the Treaty, authorizing the use of safeguards on America's peaceful nuclear activities, the United States impliedly accepted the obligations required of NNWS members in Article III.1. This section states that a party to the Treaty:

---

to their own NPT obligations. *See* discussion *infra* Part III.

80. Tritium is a by-product of nearly all nuclear programs. *See* Stuart Leavenworth, *Tritium Levels in Harris Lake More Headache Than Hazard*, NEWS & OBSERVER (Raleigh, NC), Dec. 27, 1993, at A1. Even normal commercial nuclear activities produce small amounts of tritium. *See id.* The connection to proliferation lies in the processing of the spent fuel to retrieve the tritium. and its use for military purposes. *See* NPT *supra* note 16, at art. III, para. 1, 729 U.N.T.S. at 172. However, one of the shortcomings of the NPT and IAEA safeguard agreements is that neither includes tritium in their definitions of safeguarded materials.

81. The NPT and the safeguards agreements are concerned with the diversion of isotopes coming within the definition of "source" or "special fissionable material." *See supra* note 59 for the definition of these terms. For one reason or another, tritium is not included in those definitions. Although NNWS parties may produce tritium for weapons, any nuclear weapons program inside such a country would certainly violate the NPT for various other reasons.

82. During a U.S. Senate floor debate, Senator Cleland stated that "most of the international effort to slow the spread of nuclear weapons has been focused on limiting access to plutonium and uranium. However, less attention has been given to tritium which can increase the capabilities of these nuclear weapons. . . . [I]t is the tritium which allows the use of smaller delivery systems because it allows a smaller weapon to produce a much greater yield. In the age of concerns about suitcase bombs and the smuggling of weapons across borders, it is critical that we also attempt to limit access to tritium. 144 CONG. REC. S7131 (daily ed. June 25, 1998) (statement of Sen. Cleland).

> undertakes to accept safeguards, as set forth in an agreement [with the IAEA] for the exclusive purpose of verification of the fulfillment 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. . . . [S]afeguards 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. . . .[83]

Unlike the IAEA safeguard agreements—INFCIRC/153 and the agreements based on the voluntary offers—the NPT does not define the word "source" or "special fissionable material." If we assume that the NPT defines these words in the same manner as the safeguard agreements, tritium would not fall within the NPT.[84] However, if one focuses upon the language, "view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons," then the issue seems less clear.[85]

This dilemma evolves from the very essence of the NPT. Both civilian and military uses of the atom employ very similar technology.[86] Therefore, to stem the proliferation of nuclear weapons, nations agreed not to divert their peaceful uses into atomic weapons production. From 1945 until 1997, the United States recognized this need to maintain a firewall between the civil and military nuclear industries.[87] An Energy Department decision to use a commercial nuclear reactor would effectively destroy that public policy. If the United States uses or leases a commercial nuclear reactor, the once separate civilian and military nuclear industries will become inextricably bound to one

---

83. *See* NPT, *supra* note 16, at art. III, para. 1, 729 U.N.T.S. at 172 (emphasis added).

84. *See* Statute-IAEA *supra* note 19, at art. III, para. 1-3; *see also supra* note 59 and accompanying text. This is a logical assumption because although the NPT does not define these words specifically, it uses them in Article III, the same article that requires NNWS parties to conclude safeguard agreements with the IAEA.

85. One source argues that safeguards, as they exist now, could include tritium verification; however, such an interpretation would be a near political impossibility. Thus,

> IAEA safeguards exist to prevent the manufacture of nuclear weapons, and they can justifiably cover a broader scope than just the nuclear materials that might be diverted to those weapons. However, IAEA safeguards under the NPT have until now not been taken to be this encompassing, and it would be difficult to gain international consensus behind this new interpretation. Moreover, implementing such an interpretation would require renegotiation of every safeguards agreement between the IAEA and a non-nuclear-weapon NPT party.

NUCLEAR SAFEGUARDS, *supra* note 14, at 93-94 (emphasis omitted).

86. *See* NUCLEAR SAFEGUARDS, *supra* note 14, at 1.

87. *See* H. Josef Herbert, *DOE Weighs Civilian Production of Tritium for Nuclear Warheads*, THE ASSOCIATED PRESS, Sept. 10, 1995.

another.[88] Such a relationship would certainly mock the underlying principles supporting the Treaty. Moreover, India's concern that the United States' voluntary offer was nothing more than illusory would be substantiated.[89] If it disregards the underlying principles of the NPT and scorns its obligations, America would be punished for that transgression. The punishment America receives would not be the innocuous punishments listed in the agreements.

A. At Present, America's Tritium Supply Is Approaching Critically Low Levels

Whether morally for or against the United States' possession of nuclear weapons, this Note accepts the premise that such weapons are, at least for the foreseeable future, a mainstay of the American military arsenal.[90] Even with the new weapons reduction treaties in place, including START I, II, and III, atomic weapons will remain an integral part of nuclear club members' military strategies.[91] In order for certain atomic weapons to function optimally, they must receive proper maintenance. Unlike conventional weapons, the "active ingredient," a radioactive isotope, in a nuclear device decays over time.[92] Isotopes may periodically require replenishing depending upon the half-life of the isotope in question.[93]

Tritium, the isotope of greatest relevance to this Note, has the rather short half-life of 12.26 years, decaying at approximately 5 percent per year.[94] That

---

88. A different scenario would develop if the DOE decided to buy the entire commercial plant. Such an action would remove most of the nuances of the commercial/military liaison. It should not matter if the Department buys an existing plant or builds a new one. In addition, by purchasing an existing plant the United States could save a considerable sum of money.

89. *See supra* Part II.

90. President Clinton clarified America's position on nuclear arms: "I consider the maintenance of a safe and reliable nuclear-weapons stockpile to be of supreme national interest to the United States." Erin Middlewood, *Going Nuclear: Your Utility Company May Soon Be Involved in Making Warheads*, THE PROGRESSIVE, June 1, 1997, at 21.

91. START I (Strategic Arms Reduction Treaty) placed the ceiling on the number of nuclear warheads owned by the United States and Russia at six thousand each. START II reduced the number to 3,500 per country. START III calls for no more than 2,500 warheads per country. *See id.*

92. This is not to say that conventional weapons do not lose their effectiveness over time, but simply that the radioactive isotopes in a nuclear bomb undergo physical change. As time passes, the atomic bomb will no longer contain the same isotopes in their original proportions.

93. The half-life of an isotope is defined as "the time required for half of the nuclei to decay, leaving half of them intact." RAYMOND L. MURRAY, NUCLEAR ENERGY: AN INTRODUCTION TO THE CONCEPTS, SYSTEMS AND APPLICATIONS OF NUCLEAR PROCESSES 24 (3rd ed. 1988). Basically, the half-life is no more than the time required for half the mass of an isotope to decay. Relative to the human life-span, certain elements utilized in atomic weapons have incredibly long half-lives. For instance, the half-life of uranium-235 is 704,000,000 years, and that of plutonium-239 is 24,110 years. *See* CRC HANDBOOK OF CHEMISTRY AND PHYSICS B-316, B-320 (Robert C. Weast, Ph.D. ed., 1988).

94. *See* CRC HANDBOOK OF CHEMISTRY AND PHYSICS, *supra* note 93, at B-109.

means that about every twelve years half the tritium in each nuclear weapon will disappear. Although the exact amount of tritium required for a nuclear device to perform as expected remains classified, the United States' military has not produced tritium since the Savannah River site closed its doors to weapons production in 1988.[95] Because of this, the Department of Energy has warned Congress that America's national defense may become "jeopardized by dwindling supplies of tritium."[96]

B. Current Proposals to Meet America's Tritium Needs

To combat this pending crisis, the Energy Department has proposed several alternatives to produce tritium. They include buying tritium from other countries, operating a linear accelerator or using, leasing, or buying a civilian nuclear power plant.[97]

The United States may, although seemingly unorthodox, buy tritium from a nation willing to sell its surplus supply. This option may appear counter to NPT obligations discussed *supra* Part I, but, for NPT purposes, tritium is not a safeguarded material.[98] Thus, two commentators suggest fulfilling tritium needs by obtaining it from America's former arch-enemy, Russia.[99] However, given the past history between the two superpowers, even taking into account the recent camaraderie, it appears doubtful that Russia would sell America the tritium that it needs to maintain its nuclear arsenal.

---

95. *See DOE Looking to Utilities for Radioactive Weapons Gas*, DOW JONES TELERATE ENERGY SERVICE, July 25, 1996 [hereinafter LOOKING TO UTILITIES].

96. Casey Bukro, *Doubt Cast on Tritium Shortage*, CHI. TRIB., Mar. 12, 1989, at 5. Even as early as 1989, defense officials observed the coming crisis. Then acting assistant energy secretary for defense, Troy Wade testified to the Senate Armed Services Committee that American "tritium demand is becoming critical." *Id.* Counter to that imminent urgency, another source stated that although not crucial at the moment, a new supply of tritium will be needed in ten years. *See* Rothstein, *supra* note 2, at 9. To add to the confusion, another DOE source announced that a new source of tritium would not be needed until 2011. *See* LOOKING TO UTILITIES, *supra* note 93.

97. Options for creating usable amounts of tritium are limited. For example:

> Production of tritium in a quantity large enough to supply the needs of the stockpile can only be accomplished through neutron capture by a stable isotope such as helium-3 or lithium-6. Presently there are only two practical systems that can make enough neutrons to produce tritium, i.e., reactors and accelerators. In a reactor, nuclear fission supplies the neutrons. In APT [accelerator technology], neutrons are made by a process known as spallation in which energetic protons from a linear accelerator interact with heavy metal nuclei, such as tungsten.

Tritium Production Before the Subcomm. on Energy and Power of the Comm. on Commerce, 104 Cong. (1995) (statement of Dr. Paul W. Lisowski, Project Leader Accelerator Production of Tritium).

98. The IAEA only safeguards "nuclear materials" as defined in Article XX. *See* Statute–IAEA, *supra* note 19, 276 U.N.T.S. at 38. For the purposes of that article, tritium is not considered a nuclear material and therefore is not safeguarded.

99. *See* Rothstein, *supra* note 2, at 9.

In late 1995, Secretary of Energy Hazel O'Leary initiated a dual-track program for tritium production.[100] The DOE would combine the second and third options by acquiring both a linear accelerator and a reactor, which would allow it to have one option in operation and the other at standby.[101] By the end of 1998, the DOE will pick one of the two as the preferred method.[102]

Initially, the reactor approach has several positive effects. The process can produce large amounts of tritium in a relatively timely manner.[103] The technology is proven; Savannah River utilized a similar method when it produced the nation's tritium.[104] The estimated costs of this method are reasonable: for example, DOE studies establish that using a reactor similar to Watts Bar "would be far less costly than building [an] accelerator."[105] The Department is now testing the viability of this method at a Tennessee Valley Authority (TVA) plant located in Spring City, Tennessee.[106] In that test, the department will use the Watts Bar-1 reactor to produce one ounce of tritium in an eighteen month period.[107]

This option also fosters some negative aspects. First, some employees in the nuclear industry chose to work in the civilian sector primarily so that they would not directly participate in the proliferation of nuclear weapons.[108]

---

100. *See* Middlewood, *supra* note 90, at 21.

101. The linear accelerator will be located at the Savannah River Plant in South Carolina. *See* 144 CONG. REC. S7096, S7129 (1988). The second option, the linear accelerator, poses no further non-proliferation problems than any other United States military installation. The accelerator would be *owned* by the DOE and designated as military, and as such would be exempt from safeguard status. *See supra* note 64 and accompanying text.

102. George Lobsenz, *HED: Southern, TVA Bid for DOE Tritium Contract*, ENERGY DAILY, Sept. 17, 1997. *See also* 144 CONG. REC. S7096, S7129 (1988).

103. During the refueling stage of a nuclear plant's fuel cycle, the Department of Energy would substitute lithium-6 mattices in the place of some burnable poison rods. *DOE to Test Tritium Production at Watts Bar*, ENERGY DAILY, Feb. 10, 1997. Nuclear reactors commonly operate on an eighteen to twenty four month fuel cycle. In that time, tritium could be produced twenty-four hours a day all year long. In that period, depending upon the number of burnable poison rods replaced, significant quantities of tritium could be produced. *See id.*

104. The only difference is that Savannah River was not designed as an electric energy production plant: its entire purpose was tritium and plutonium *production*. *See* Gerald F. Hess, *Hanford: Cleaning Up the Most Contaminated Place in the World*, 38 AZ. L. REV. 165, 177 (1996). There may be some residual safety issues involved in trying to apply this method to a utility reactor, but these issues are beyond the scope of this note.

105. *PUHCA Repeal Clears Senate Panel*, ENERGY DAILY, June 6, 1997. However, congressional sources claim that the estimated costs of the proposed linear accelerator and the reactor approaches are "a wash." Sean Scully, *Nuclear Material Causes Senate Spat: Lawmakers Fight for Home Districts*, WASH. TIMES, June 25, 1998, at A4. *See also infra* note 138 and accompanying text for further discussion of reactor and accelerator costs.

106. *See DOE Picks Watts*, *supra* note 3. TVA will receive $7.5 million to conduct this test. *See NRC Licenses Watts Bar*, DEF. CLEANUP, Sept. 19, 1997.

107. *See DOE Picks Watts*, *supra* note 3.

108. David Lochbaum, a nuclear-safety engineer with the Union of Concerned Scientists, stated that "using commercial reactors for bomb-making undermines ethical choices that people made in their

Thus, the Energy Department's decision to incorporate a civilian nuclear reactor in its weapons program presents an ethical dilemma.[109] Also, the international community could interpret America's decision to use a commercial reactor to produce tritium as an NPT transgression. Such a transgression might invoke severe repercussions in the United States' future non-proliferation efforts. The following section analyzes the negative effects of the DOE's use or lease of a commercial nuclear reactor.[110]

C. Punishments Incurred for Violating the NPT

Surprisingly, the NPT and individual safeguards agreements do little to deter nations from violating them. In fact, the NPT has no provision that punishes those who do not adhere to their Treaty obligations.[111] Moreover, the punishment procedure found in the Statute of the IAEA is complex and tortuously administrative.[112] The pertinent articles only provide for "slap-on-

---

lives." Middlewood, *supra* note 90, at 21.

109. *See id.*

110. If the DOE purchases an entire reactor facility (with absolutely no further utility involvement) then no NPT violations would occur. The United States, through Part I Article 1(a), could remove the facility from the eligibility list and the site would be designated as military. *See* U.S.-IAEA Safeguards Agreement, *supra* note 56, 276 U.N.T.S. at 3063. An even better solution would be to purchase a partially built plant, such as the Bellafonte site owned by the Tennessee Valley Authority, already offered for sale to the DOE. This method would alleviate most NPT concerns, and the military would obtain tritium in a reasonable amount of time. Although this Note seems idealistic in some respects, a sense of reality must be instilled from time to time. For instance, if the DOE could purchase a reactor for one billion dollars, the American government would (or should) have to determine: (1) if its use of a civilian reactor would affect its credibility and therefore political influence in non-proliferation matters, and if it does, (2) is that loss of credibility worth four billion dollars (the difference between the hypothetical purchase price of a nuclear plant and operating the FFTF).

111. *See* NPT, *supra* note 16.

112. The following is the complete procedure for IAEA sanctions:

> The inspectors shall report any non-compliance to the Director General who shall thereupon transmit the report to the Board of Governors. The Board shall call upon the recipient State or States to remedy forthwith any non-compliance which it finds to have occurred. The Board shall report the non-compliance to all members and to the Security Council and General Assembly of the United Nations. In the event of failure of the recipient State or States to take fully corrective action within a reasonable time, the Board may take one or both of the following measures: direct curtailment or suspension of assistance being provided by the Agency or by a member, and call for the return of materials and equipment made available to the recipient member or group of members. The Agency may also, in accordance with article XIX, suspend any non-complying member from the exercise of the privileges and rights of membership.

Statute–IAEA, *supra* note 19, art. XII, para. C, 276 U.N.T.S. at 30. Article XIX, paragraph B of the IAEA Statute further describes the available sanctions:

> A member which has persistently violated the provisions of this Statute or of any agreement entered into by it pursuant to this Statute may be suspended from the exercise of the privileges and rights of membership by the General Conference

the-wrist" measures. The most punitive provision merely suspends an offending nation from exercising the privileges of Treaty membership: the sharing of technical knowledge and nuclear materials.[113]

This punitive scheme is supported by the basic purpose of the NPT and the IAEA. As previously noted, the primary function of the IAEA is the *verification*, through material accountancy, *that certain materials are not diverted from peaceful purposes to military ones.* Thus, the mission of IAEA and its safeguard regime lies in detection, not penalization. Once the IAEA has determined that a significant quantity of specific material has been diverted, it passes that information on to the world community via the United Nations General Assembly.[114] Upon continued non-compliance, the United Nations Security Council may become involved passing resolutions which, at most, may revoke the offending nation's membership in the NPT.[115] These sanctions would probably not have a major deterrent effect on an economically stronger industrialized NWS member such as the United States.

Another possibly more effective mechanism of deterrence occurs when NPT member states act in smaller blocks.[116] These nations can effectively deter individual countries from taking actions contrary to international sentiment.[117] The international community operates in a "tit-for-tat" atmosphere; if a country behaves reasonably towards its neighbors, it can expect reciprocal treatment and a higher level of respect when offering its views on world affairs. Conversely, if a nation ignores international obligations, its respect and authority will experience a continued derogation. That nation cannot expect other nations to follow its advice—certainly, it cannot expect that other nations will heed its warnings to adhere to the same international obligations that it has ignored.[118]

> acting by a two-thirds majority of the members present and voting upon recommendation by the Board of Governors.

113. *See id.*, art. XIX, para. B, 276 U.N.T.S. at 36.

114. *See id.*, art. XII, para. C, 276 U.N.T.S. at 30.

115. *See id. See also* SHAKER 2, *supra* note 49, at 768-69 (arguing that a nation that consistently violates IAEA safeguards may be subject to military intervention from the United Nations).

116. *See id.* at 768-70.

117. *See id.* Instead of requiring the agreement of a large body of nations to take an action against an offending nation, a smaller group of nuclear material supplier nations can boycott the transfer of nuclear materials to the offending nation; thus, ending their nuclear program (unless the nation has become nuclear self-sufficient). *See id.*

118. Several members of Congress have acknowledged that the United States actions regarding tritium acquisition may impact America's ability to positively influence other nation's proliferation. For instance,

> [t]he recent nuclear tests in India and Pakistan sent a strong signal across the world that the efforts, particularly those of the United States, to prevent the proliferation of nuclear weapons have not fully succeeded. In this light we must upgrade our efforts to halt nuclear proliferation. Should Congress allow the commercial

Since 1945, the United States has led the world in non-proliferation matters. America has generously supported the IAEA and has repeatedly encouraged states to adhere to their own NPT promises.[119] The United States cannot scoff at its duties and expect other countries to observe their own.

III. THE EXPANDING NUCLEAR CLUB AND THE UNITED STATES' INABILITY TO COMPEL PROLIFERATION COMPLIANCE

America abandoned caution when the DOE decided to use civilian reactors to produce tritium for nuclear weapons. Few options, short of military intervention, exist to thwart a nation determined to obtain a nuclear weapon.[120] Perhaps the most effective option is diplomacy.[121] For diplomacy to remain a viable option for the United States in non-proliferation matters, it must exercise caution regarding its own non-proliferation obligations.[122] Recent events in Southeast Asia highlight the likelihood that more countries will obtain a nuclear weapon—or other weapon of mass destruction (WMD).[123]

The international community is a dynamic institution. Alliances come and go, coalitions are forged and dismantled. Regional conflicts seem to flare up on a continuous basis.[124] With the prevalence of weapons of mass destruction in countries ruled by despots, hundreds of millions of people live under the constant threat of imminent doom. Although biological and chemical weapons have been called "the poor man's nuclear weapon,"[125] any nation can obtain a nuclear device if it so desires.[126]

> production of weapons grade tritium we would take a step backwards in our efforts to curtail proliferation. We would tell the rest of the world that commercial reactors are a viable means to enhance a nuclear arsenal. This is no time to send this kind of message.

144 CONG. REC. S7096, S7130 (1998) (statement of Sen. Coverdell). Moreover, Senator Cleland queried "How can we urge the governments of India, Pakistan, North Korea, and any other country seeking a nuclear weapons capability not to attempt to use reactors designed for peaceful energy production for military purposes when we are contemplating doing a very similar thing here in America?" *Id.* at S7131.

119. *See* discussion *infra* Part III.

120. *See* KENNETH R. TIMMERMAN, SIMON WIESENTHAL CTR., WEAPONS OF MASS DESTRUCTION: THE CASES OF IRAN, SYRIA, AND LIBYA 7 (1992).

121. Diplomacy need not be limited to bilateral negotiations with the problem state. Good relations with other interested parties may, in fact, prove even more valuable.

122. *See supra* note 117 and accompanying text.

123. For purposes of this Note, weapons of mass destruction include nuclear, biological, and chemical weapons.

124. Consider Israel and its neighbors, Iran and Afghanistan, and India and Pakistan.

125. *See* Stewart M. Powell, *U.S. to Vaccinate Top Troops for Anthrax: Elite Forces Protected from Germ Warfare*, S. F. EXAMINER, Mar. 28, 1997 at A11; *Ban Chemical Weapons*, S. F. CHRON. Apr. 3, 1997, at A20.

126. *See* David Fischer, *Drawing the Threshold States into a Regime of Restraint, by Joining the*

For example, in early May 1998, in an open act of saber rattling, India conducted five underground nuclear tests.[127] Not to be outdone, India's arch-enemy Pakistan announced its readiness to join the nuclear club with blasts of its own.[128] According to federal law, the United States must impose economic sanctions against any previously non-nuclear nation that conducts a nuclear test.[129] Immediately after India's test, the United States, supported by a few other nations, imposed various sanctions.[130] Well aware that similar sanctions would be imposed on their country, Pakistani leaders chose to press forward with tests of their own.[131] They did this while intense diplomatic sessions were being held after the Indian explosions.[132] These nations knew that potentially crippling economic sanctions would be initiated, but nevertheless conducted the tests.

It seems puzzling why a nation would purposefully do something that would trigger such severe consequences. However, the answer relates to the theme of the Cold War: one must have a nuclear weapon in order *not* to use it. The United States developed a stockpile of nuclear weapons; the former Soviet Union replied in kind. America improved her weapons; the Soviets reciprocated. The conventional wisdom held that as long as each side knew of the other's retaliatory capacity, each side would refrain from initiating an offensive strike. The situation between India and Pakistan mirrors that Cold War nuclear arms race, albeit on a smaller scale.

Instead of acting in a manner counter to nuclear proliferation, such as dismantling or mothballing its nuclear weapons, the United States is contributing to the notion that nuclear weapons keep one's enemies at bay. America's unprecedented use of a civilian nuclear reactor to produce weapons material squarely supports the idea that nuclear weapons are not only appropriate, but essential.[133]

For better or worse, the United States has asserted itself in a crusade to stop nations in their military-nuclear quest. Unfortunately, the number of those in search of a nuclear weapon will most likely continue to escalate.[134]

NPT or Otherwise, *in* NUCLEAR NON-PROLIFERATION AND THE NON-PROLIFERATION TREATY 36, 37 (M. P. Fry et al. eds. 1990)

127. *Pakistan Retaliates*, THE ECONOMIST, May 30, 1998, at 4.

128. *The Tinderbox in Kashmir*, THE ECONOMIST, June 13, 1998, at 41.

129. *See* The Arms Export Control Act of 1994, 22 U.S.C § 2799aa-1 (1994).

130. Through the World Bank, the International Monetary Fund and several other lending institutions the United States effectively blocked $2 billion in loans earmarked for India. *See* T.R. Reid, *G-7 Steps up Pressure on India & Pakistan*, WASH. POST, June 13, 1998, at A15.

131. *See India & Pakistan*, The ECONOMIST, May 30, 1998, at 41; Shahid-ur-Rehnam, *Pakistan: One Test Could Bust the Nation*, BUSINESS WK., June 1, 1998, at 35.

132. *See* Casper Weinberger, *The Nuclear Genie is Out of the Bottle*, FORBES, July 6, 1998, at 37.

133. *See* James B. Edwards, *Tritium Troubles*, WASH. TIMES, July 30, 1998, at A23.

134. *See supra* note 16 for a list of just a few states known to be in the market for, or already have,

If the United States wishes to prevent another India-Pakistan situation, it must maintain impeccable non-proliferation credentials.[135]

Using or leasing a civilian nuclear reactor to produce tritium could tarnish these credentials. In today's political arena, any blemish could prevent the creation of a coalition to stand up to the next challenger to the nuclear club's status quo. To continue to be influential in global nuclear concerns, America must realize "that what the United States does in the nuclear area, both at home and abroad, does matter to other countries. A U.S. decision to move in a certain direction unleashes potent forces in other countries that tend to push those countries in the same general direction."[136] Therefore, America's leaders must choose a benign proliferation option that will supply the nation's tritium needs in a timely manner.

The choice is simple. Congress should select the dual-track alternative that is the safest and cheapest[137] but also satisfies America's NPT and IAEA

---

a nuclear weapon. Since the Soviet bloc disintegrated, a rising black market trade has developed in radioactive materials and other nuclear weapon components. *See* Michael B. Gerrard, *Fear and Loathing in the Siting of Hazardous and Radioactive Waste Facilities: A Comprehensive Approach to a Misperceived Crisis*, 68 TUL. L. REV. 1047, 1086 (1994). *See generally*, Barry Kellman & David S. Gualtieri, *Barricading the Nuclear Window--A Legal Regime to Control Nuclear Smuggling*, 1996 U. ILL. L. REV. 667.

135. This Note does not contend that America's recent non-proliferation activities were the perpetuating or leading cause of the India-Pakistan nuclear tests.

136. John Glenn, *Nuclear Nonproliferation–Law and Policy*, 76 AM. SOC'Y INT'L L. PROC. 77, 80 (1982).

137. Determining the safest option is beyond the scope of this Note. Interestingly, determining the cheapest may be as well, as it seems that no two people can agree upon a single price, even when relying upon the same source. For instance, Representative Wamp estimated that the accelerator would cost "more than $4 billion with a pretty high annual operation cost," and that the reactor option would be about "2 ½ billion less than the accelerator." 144 CONG. REC. H366, H3680 (1998). Representative Graham rebutted this estimate by stating that the accelerator would cost only $2.6 billion while the reactor would cost anywhere from $2 ½ billion to "over 4 billion to complete." *Id.* Representative Aderholt responded that the "unproven accelerator option . . . is three times the cost of" the reactor. Moreover, "[e] can safely spend $1.8 to $2 billion on a commercial lightwater reactor or risk $4 billion to $6 billion on the accelerator option." *Id.* To truly confuse the issue, Representative Hillary noted that the accelerator option would have a "price tag around $7 billion", but then announced that the option would "sink[] upwards of $8 billion into a new special facility." *Id.* at H3684.

The Senate has not helped to settle the cost debate and continued to toss out figures haphazardly. For example, Senator Sessions stated that the accelerator option "could saddle the taxpayers with a $14.5 billion debt." 144 CONG. REC. S7096, S7126 (1998). Bill Cohen, Secretary of Defense, wrote that "[t]he lifecycle cost of the APT could be as high as $8.8B. The lifecycle cost of the [reactor] could be as low as $1.2B." *Id.* at S7128. Later in the debate, Senator Sessions stated that

> the life-cycle operating costs for the [APT] would be a staggering $11.356 billion over forty years. In total, the operations and maintenance costs to complete construction of APT could top $16.756 billion. The [reactor] will cost only $1.9 billion--an investment which will be paid back and generate additional revenue to the Treasury in excess of $2.4 billion over the [life-cycle].

Id. at S7129. Senator Coverdell similarly noted this phenomenon when he stated that although the reactor option would cost $1.8 to $2 billion and that "this initial investment is similar to a loan, so every tax dollar

obligations. If Congress chooses the accelerator approach, then there will be no proliferation concerns as the facility would be strictly military and fall within the protected realm of military facilities.[138] However, if Congress selects the reactor option, it can also avoid all proliferation concerns if it buys the reactor.[139] If the Department of Energy purchases a functioning or partially completed reactor instead of leasing or using a utility's, the facility would then cease to be civilian and would convert into a military site.[140] Such a conversion would automatically remove the reactor from the safeguarded site list to the non-safeguarded list.[141] If Congress either chooses the accelerator option or purchases a reactor, America would have a stronger position in future attempts to champion the nuclear non-proliferation banner.

Finally, the reason behind America's voluntary offer should not matter at this point; the United States should accept the same safeguards that an NNWS party accepts on its *peaceful* nuclear activities. Further, the United States should treat all peaceful facilities as safeguarded, not merely those that the IAEA has chosen from an eligible list.[142] If money were no object, all of the United States' peaceful nuclear activities would now be safeguarded.[143]

CONCLUSION

America thrust the world into the nuclear age by unveiling the destructive powers of the atom. Since that time, the United States has been at the forefront of every major nuclear non-proliferation effort—from the failed Baruch Plan to the NPT to the Comprehensive Test Ban. Through its efforts, the International Atomic Energy Agency safeguards non-nuclear weapons

---

spent will be returned to the Treasury." *Id.* at S7130.

138. Recall that military installations, or other installations pertaining to national security, are excluded from the facilities list submitted by the United States for the IAEA to safeguard. *See* Statute-IAEA, *supra* note 19.

139. This is strictly a non-proliferation analysis that ignores obvious policy considerations including whether or not to have nuclear weapons or even nuclear reactors at all.

140. If the Department merely leased or used the reactor, the facility would fall within the nether regions of either a non-safeguarded civilian site or a safeguarded military site, labels never coined during the U.S.-IAEA negotiations for a United States safeguards agreement. The firewall erected between American military and civilian nuclear applications prevented the need for such terms as the two categories never mixed. *See* 144 CONG. REC. S7096, S7130 (1998) (statement of Sen. Coverdell).

141. *See supra* Part I.C.1, I.C.2.

142. *See supra* Part II.C.2. Even if a facility is not safeguarded at a particular moment, it is considered to be on standby, and may be placed on the safeguard list at any time. *See supra* note 64.

143. In the author's opinion, with sufficient money, enough personnel could be employed to adequately process the large amount of information from United States and United Kingdom facilities Further, this would negate the United States' fear of information overload, and NNWS parties' concern for illusory or unfair treatment between obligations required under the voluntary offers and INFCIRC/153(corrected) agreements.

states' (NNWS) nuclear programs so that these nations will not develop an atomic weapon.

Although drastic differences exist between NWS and NNWS obligations, the United States narrowed that gap when it voluntarily offered to allow full-scope safeguards—the same that applied to an NNWS party—on a small portion of its civilian nuclear program. However, even full-scope safeguards do not prohibit the generation of tritium. Nonetheless, the underlying policy behind the NPT and the safeguards program is to prevent nations from using their civilian nuclear reactors to produce materials used in nuclear weapons. If the United States follows through with the tritium production test at Watts Bar and fully implements this method in its weapons program, it will no longer bring a commanding presence into diplomatic efforts and international conflicts.

With unstable regimes across the globe determined to obtain a nuclear weapon, the United States must maintain as flawless a non-proliferation record as possible. To expect other nations to abide by American non-proliferation requests, the United States should have no "skeletons in the closet." America should continue to set a good example for the world to follow. If American policy-makers determine that a continuous supply of tritium is necessary to preserve our national security, that tritium should be manufactured in a non-proliferation friendly manner. If the DOE considers the reactor option the more appropriate route, non-proliferation objectives would be met only if the department purchased the plant from the utility.

Christopher G. Barnes