A CALL TO MINIMIZE THE USE OF NUCLEAR POWER IN THE TWENTY-FIRST CENTURY

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INTRODUCTION

Rumors of the death of the nuclear-power industry are greatly exaggerated. The Bush Administration's 2007 budget provided $250 million for the Global Nuclear Energy Partnership, and U.S. energy policy continues to include nuclear power as a cornerstone.[1] Nuclear power currently provides about one-fifth of the nation's power from 103 active

1. NAT'L ECON. COUNCIL, ADVANCED ENERGY INITIATIVE 11–12 (2006); *see also* OFFICE OF NUCLEAR ENERGY, U.S. DEP'T OF ENERGY, GNEP-167312, GLOBAL NUCLEAR ENERGY PARTNERSHIP STRATEGIC PLAN (2007), *available at* http://www.gnep.energy.gov/pdfs/gnepStrategicPlanJanuary2007.pdf [hereinafter GNEP 2007 STRATEGIC PLAN]; U.S. Dep't of Energy, The Global Nuclear Energy Partnership, http://www.gnep.energy.gov (last visited Mar. 5, 2008).

plants.[2] The technology is advertised as a clean, cheap, and stable energy source.[3] On a global scale, 435 commercial nuclear power plants were operational as of June 2007, and France and Lithuania rely on nuclear power for about three quarters of their electricity.[4] However, any analysis of nuclear power must include an evaluation of the economics behind the technology and the real risks associated with it—nuclear proliferation and plant safety. These are especially important in the evaluation of risks globally.

The economics of nuclear power are relevant in assessing whether the risks assumed are worth the costs. This Note analyzes the government's assertion that the economics of nuclear power justify the expansion of the industry. It explores the ability of international law to manage the proliferation of nuclear weapons in the midst of an expansion of nuclear power proposed by the administration.[5] The effectiveness of the Treaty on the Non-proliferation of Nuclear Weapons (NPT or Treaty) is questioned in light of historical and recent events. These include A. Q. Khan's establishment of a black market for nuclear technology, the addition of Pakistan and North Korea into the nuclear weapons circle, and the current crises with Iran, North Korea, and now Pakistan.[6] While the nuclear waste management problem is significant from a number of standpoints, it is analyzed here only within the scope of the proliferation issue.

Nevertheless, risk of proliferation is just one downside to the proposed expansion of nuclear power. Three Mile Island (TMI) and Chernobyl remain the poster children of nuclear power failures, although the industry hails its recent safety record as proof that the technology is within an

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2. Peter Bradford, former Comm'r, Nuclear Regulatory Comm'n, Nuclear Power and Public Policy, Course Presentation at Vermont Law School (June 19, 2006) [hereinafter Bradford June 19 Presentation] (PowerPoint on file with author).

3. NAT'L ECON. COUNCIL, *supra* note 1, at 11.

4. World Nuclear Ass'n, Nuclear Power in the World Today, http://www.world-nuclear.org/info/inf01.html?terms=power+plants+countries (last visited Jan. 30, 2008); World Nuclear Ass'n, World Nuclear Power Reactors 2006-08 and Uranium Requirements, http://www.world-nuclear.org/info/reactors.html (last visited Jan. 30, 2008).

5. NAT'L ENERGY POL'Y DEV. GROUP, EXECUTIVE OFFICE OF THE PRESIDENT, RELIABLE, AFFORDABLE, AND ENVIRONMENTALLY SOUND ENERGY FOR AMERICA'S FUTURE 5-17 (2001) [hereinafter 2001 ENERGY POLICY], *available at* http://www.whitehouse.gov/energy/National-Energy-Policy.pdf; NAT'L ECON. COUNCIL, *supra* note 1, at 12.

6. *See* GEORGE PERKOVICH ET AL., CARNEGIE ENDOWMENT FOR INT'L PEACE, UNIVERSAL COMPLIANCE: A STRATEGY FOR NUCLEAR SECURITY 42, 55 (2005), *available at* http://www.carnegieendowment.org/files/uc2.final3.pdf (identifying steps towards addressing current proliferation concerns); David Rohde & Carlotta Gall, *In Musharraf's Shadow, a New Hope for Pakistan Rises*, N.Y. TIMES, Jan. 7, 2008, http://www.nytimes.com/2008/01/07/world/asia/07kayani.html.

acceptable range of risk.[7] This Note reviews the adequacy of the current state of safety in American nuclear power plants and their ability to manage the safety risks inherent with the expansion of nuclear power. These real risks are closely tied to the acceptance of the technology within the general public. Ultimately, the analysis cannot avoid the salient issue—whether it is wise to take these additional risks when the fundamental benefit is to boil water.

I. BRIEF BACKGROUND ON NUCLEAR ISSUES

A. Uranium, Plutonium, and Nuclear Weapons

Natural uranium is mined and typically contains 0.7% of the isotope uranium-235.[8] Most reactor technologies require the enrichment of uranium to about 3% uranium-235 concentration for it to be useful as a reactor fuel.[9] By comparison, weapons grade uranium requires around 90% enrichment.[10] The bare numbers are deceptive, however, because the process requires about the same amount of work to enrich uranium from 0.7% to fuel-grade enrichment as it does from 3% to weapons-grade enrichment.[11] Therefore, enrichment technology enables a state to enrich uranium for weapons as well as for peaceful energy purposes.[12]

Spent uranium fuel may be "reprocessed" to separate the plutonium from the waste fuel,[13] and only a small amount of plutonium is needed to

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7. World Nuclear Ass'n, Information and Issue Briefs, Chernobyl Accident, http://www.world-nuclear.org/info/chernobyl/inf07.htm (last visited Mar. 8, 2007); World Nuclear Ass'n, Information and Issue Briefs, Three Mile Island: 1979, http://www.world-nuclear.org/info/inf36.htm [hereinafter WNA TMI 1979] (last visited Mar. 8, 2007).

8. RICHARD L. GARWIN & GEORGES CHARPAK, MEGAWATTS AND MEGATONS: A TURNING POINT IN THE NUCLEAR AGE? 118, 120 (2001); *see also* ELIZABETH ROLPH, NUCLEAR POWER AND THE PUBLIC SAFETY: A STUDY IN REGULATION 15 (1979) (uranium ore typically contains 0.1% extractable uranium oxide).

9. GARWIN & CHARPAK, *supra* note 8, at 118, 120.

10. Mitchell B. Reiss & Robert Galluci, *Red-Handed*, 84 FOREIGN AFF. 142, 143 (2005), *available at* http://www.foreignaffairs.org/20050301faresponse84214/mitchell-b-reiss-report-gallucci/red-handed.html.

11. E-mail from Peter Bradford, former Comm'r, Nuclear Regulatory Comm'n, to Richard Sieg (Mar. 6, 2007, 08:38:17 EST) [hereinafter Bradford E-mail] (on file with author); s*ee also* Reiss & Galluci, *supra* note 10, at 143 (noting that it "takes three times as much separative work to enrich uranium from its natural state to 5% LEU [low-enriched uranium] than it does to enrich LEU to 90% [highly enriched uranium]").

12. GARWIN & CHARPAK, *supra* note 8, at 107–08.

13. *Id.* at 135–36.

create a nuclear weapon.[14] Because of this, which states should possess reprocessing technology is a divisive issue.[15] "There is no disagreement among the United States, Britain and France that reprocessing plants in non-nuclear-weapon states should be discouraged . . . . There *is* disagreement among us, however, over whether provision of plutonium services for export helps the effort to contain proliferation."[16]

The historical debate over reprocessing illustrates the tension between security and energy that nuclear power engenders. In 1976 and 1977, Presidents Ford and Carter, respectively, announced that important nonproliferation objectives demanded suspension of the U.S. policy of reprocessing and recycling plutonium.[17] In 1977, President Carter made the suspension indefinite.[18] The United States banned the reprocessing of nuclear fuel within its borders and halted the export of reprocessed fuels to other countries.[19] In the 1980s, President Ronald Reagan attempted to lift the ban on reprocessing in the United States, but the high cost and congressional movement toward establishing a central repository ensured the ban would remain effective.[20] In 2001, the *National Energy Policy* report indicated that, globally, the collection of plutonium would continue to be "discouraged."[21] Since 2005, however, support for the technology has grown within Congress (with Senator Peter Domenici leading the way), and it has sent signals to the Department of Energy (DOE) to develop a spent nuclear fuel recycling plan.[22]

Senator Domenici's efforts to revitalize the nuclear-power industry have become well known.

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14. *Id.* at 314.

15. Victor Gilinsky, *Plutonium, Proliferation and the Price of Reprocessing*, 57 FOREIGN AFF. 374, 374 (1978).

16. *Id.*

17. President Gerald R. Ford, Statement on Nuclear Policy (Oct. 28, 1976), *available at* http://www.presidency.ucsb.edu/ws/print.php?pid=6561; President Jimmy Carter, Nuclear Power Policy Statement on Decisions Reached Following a Review (Apr. 7, 1977), *available at* http://www.presidency.ucsb.edu/ws/print.php?pid=7316 [hereinafter Carter Statement on Reprocessing]; *see also* Gilinsky, *supra* note 15, at 377–78 (noting this reversal of policy represented "an important break with . . . history").

18. Carter Statement on Reprocessing, *supra* note 17.

19. *Id.* *But see* Gilinsky, *supra* note 15, at 375 (noting that the United States made an exception for export of its own reprocessed fuels to Europe to ensure Europe's complicity in the ban on export to other countries).

20. BRICE SMITH, INSURMOUNTABLE RISKS 116 (2006).

21. *Id.*

22. *Id.*; Mike Stuckey, *Pete Domenici, Nuclear Renaissance Man: Long-Serving Lawmaker Is Driving Force Behind U.S. Industry's Rebirth*, MSNBC.COM, Jan. 24, 2007, http://msnbc.msn.com/id/15922365.

> Casting himself as Congress' "chief nuclear apostle," Domenici has for years painted a glowing picture of nuclear energy's potential to give Americans "a cleaner, healthier, sustainable and self-sufficient energy future" and even contribute to global peace, as he wrote in his 2004 book on the topic, "A Brighter Tomorrow." To those ends, he worked tirelessly as the chairman of two powerful Senate committees with direct control of federal spending on nuclear energy and regulation.[23]

In 2006, the Bush Administration announced the formation of the Global Nuclear Energy Partnership (GNEP), which will encourage global expansion of nuclear energy using "new advanced recycling technologies" that do not generate plutonium but would still include reprocessing.[24] Not surprisingly, Senator Domenici is a staunch proponent of GNEP.[25]

There are arguably barriers to the development of nuclear weapons from nuclear-energy fuels.[26]

> Reprocessing and enrichment are hard to do and not hard to detect (eventually)[; n]uclear bombs are hard to design and hard to build (though less so than before)[; t]hermonuclear (fusion) weapons development is not only enormously difficult but almost certainly requires testing. Nuclear power facilities are of little use with the hardest parts.[27]

The health hazards of managing plutonium also make this potential bomb material problematic for a terrorist inclined to use it. But despite these obstacles, "[t]he gravest danger . . . and the one requiring the most urgent attention is the possibility that terrorists could obtain highly enriched uranium . . . or plutonium for use in an improvised nuclear device."[28] If a terrorist were successful in detonating such a device in an urban area, "[h]undreds of thousand [sic] of people could die," and hundreds of thousands of others would require treatment for acute radiation exposure,

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23. Stuckey, *supra* note 22.

24. SMITH, *supra* note 20, at 117; GNEP 2007 STRATEGIC PLAN, *supra* note 1, at 1-10.

25. Stuckey, *supra* note 22.

26. Bradford June 19 Presentation, *supra* note 2.

27. *Id.*

28. CHARLES D. FERGUSON & WILLIAM C. POTTER, THE FOUR FACES OF NUCLEAR TERRORISM, at vi (2005).

not to mention the massive economic loss.[29] Considering the danger posed by nuclear material, is its use as an energy source really worth it?

B. Economics of Nuclear Power

The Bush Administration has advertised nuclear power as the cheapest source of electricity.[30] Contrary to the government's assertions, however, a recent study by the Massachusetts Institute of Technology shows that including plant construction costs in the equation reverses the seemingly cheap price of this energy source.[31] The economics of expanding nuclear power must be evaluated in light of the actual costs of the technology. Peter Bradford, a former commissioner on the Nuclear Regulatory Commission (NRC), states, "A real revival can only come when privately financed nuclear power plants are being ordered on a regular basis in countries that use transparent and competitive processes to choose their power supply by building the least expensive plants."[32] The *Advanced Energy Initiative* report plainly states that the cost of nuclear energy is less than coal.[33] Furthermore, the 2001 Energy Policy compares the various energy sources and shows nuclear and coal energy operating costs well below that of oil and gas.[34] Noticeably absent from the chart, however, are construction costs.[35] Accounting for these, the cost of nuclear power generation increases to seven or eight cents per kilowatt-hour (kWh) (up from about 1.8 cents in Bush's plan).[36] The cost of nuclear power plant construction is notoriously high, which is why the cost of nuclear power

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29. *CBS News: The Worst-Case Scenario* (CBS television broadcast Jan. 29, 2006), *available at* http://www.cbsnews.com/stories/2006/01/27/60minutes/printable1245714.shtml; *see also* MATTHEW BUNN & ANTHONY WIER, SECURING THE BOMB 2006, at 4 (2006), http://www.nti.org/securingthebomb ("Such a crude terrorist bomb would potentially be capable of incinerating the heart of any city. A bomb with the explosive power of 10,000 tons of TNT (that is, smaller than the bomb that obliterated Hiroshima), if set off in midtown Manhattan on a typical workday, could kill half a million people and cause more than $1 trillion in direct economic damage.").

30. *See* NAT'L ECON. COUNCIL, *supra* note 1, at 11 (alleging operating costs just below that of coal and at 1.8 cents per kilowatt-hour of electricity generated).

31. *Compare* JOHN DEUTCH ET AL., THE FUTURE OF NUCLEAR POWER 40 (2003) ("[N]uclear power is much more costly than the coal and gas alternatives . . . .") [hereinafter MIT STUDY], *with* NAT'L ECON. COUNCIL, *supra* note 1, at 11 (showing nuclear energy in 1998 as just below the operating cost of coal as the cheapest form of electricity).

32. PETER A. BRADFORD, NONPROLIFERATION EDUC. CTR., NUCLEAR POWER'S PROSPECTS IN THE POWER MARKETS OF THE 21ST CENTURY 2 (2005), *available at* http://www.npec-web.org/Frameset.asp?PageType=Projects [hereinafter NUCLEAR POWER'S PROSPECTS].

33. NAT'L ECON. COUNCIL, *supra* note 1, at 11.

34. 2001 ENERGY POLICY, *supra* note 5, at 5-16.

35. *Id.*

36. MIT STUDY, *supra* note 31, at 42; NAT'L ECON. COUNCIL, *supra* note 1, at 11.

moves from cheapest in the Bush plan to most expensive in the MIT study.[37]

Mr. Bradford points out that the MIT study showed that the 2003 market conditions would not support nuclear power.[38] However, the study investigated whether "plausible but unproven" measures might narrow the gap somewhat between nuclear power and coal and natural gas.[39]

> These measures are 1) reducing the cost of constructing a nuclear unit by 25% from the base case estimate of $2000 [per kWh]; 2) reducing construction times from five to four years; 3) eliminating regulatory, construction and operating cost uncertainties so as to allow nuclear projects to raise equity capital on the same terms as new coal or gas . . . ; and 4) reducing the already much improved nonfuel operation and maintenance expenditure by another 25%. If all of these are done, nuclear power is still more costly than coal, though it beats natural gas in the high and intermediate price cases.[40]

The study also looked at whether a government-imposed "carbon tax" might reduce the cost gap between nuclear energy and coal and natural gas.[41] If all these measures are successful, and the taxes are added, then nuclear power becomes cheaper than both coal and natural gas.[42] Noticeably absent from the study were energy efficiency, distributed generation, low-carbon-emission coal technology, and other energy alternatives.[43] Moreover, there are the safety and security costs: the $607 million spent by FirstEnergy because of the near-meltdown at the Davis-Besse facility (no accident occurred); and the $1 billion spent after the September 11, 2001, terrorist attacks at just one nuclear power plant, Indian Point, to increase security.[44] These are just two examples that together amount to $1.6 billion.

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37. NAT'L ECON. COUNCIL, *supra* note 1, at 11; MIT STUDY, *supra* note 31, at 37, 42.
38. NUCLEAR POWER'S PROSPECTS, *supra* note 32, at 12.
39. *Id.* at 20.
40. *Id.* at 20–21 (footnotes omitted).
41. *Id.* at 21–22.
42. *Id.* at 22.
43. *Id.*
44. Debbie Van Tassel, *Being a Watchdog of FirstEnergy Corp.*, NEIMAN REP., Summer 2004, at 27, 31; *Homeland Security: Monitoring Nuclear Power Plant Security: Hearing Before the Subcomm. on Nat'l Sec., Emerging Threats and Int'l Relations of the H. Comm. on Gov. Reform*, 108th Cong. 222 (2004) (statement of David Lochbaum), *available at* http://www.gpo.gov/congress/house. In an exchange with Congressman Dennis J. Kucinich, Mr. Lochbaum testified that $1 billion was spent on the Indian Point nuclear power plant after the September 11 terrorist attacks to "restore [the plant] to a

According to Mr. Bradford, "nuclear power's asserted comeback" does not rest on a "newfound competitiveness in power plant construction."[45] Instead, it rests "on an old formula: subsidy, tax breaks, licensing shortcuts, guaranteed purchases with risks borne by customers, political muscle, ballyhoo and pointing to other countries . . . to indicate that the U.S. is somehow 'falling behind.'"[46] In other words, nuclear power is economical only if the customers and taxpayers cover the cost of plant construction as well as the cost of the risks and, as discussed below, the consequences.

A clear indication that nuclear power may be too risky to warrant expansion is that the government must indemnify the industry in the event of a catastrophic accident.[47] Buried within the cost of nuclear power is the money needed to clean up the damage from such an event.[48] Mr. Bradford testified before Congress about the potential (now completed) renewal of the Price-Anderson Act, stating that the Act is anticompetitive for at least two reasons:

> First, new nuclear capacity appears cheaper than it really is relative to other sources . . . . This is because the cost of capital does not reflect the risk of having to pay for damages in excess of $9 billion, when estimates of worst-case accident or sabotage scenarios are much higher than that. Second, any nuclear design that is truly inherently safe or that is at least incapable of doing more than $9 billion in damage does not enjoy the benefit of its improved safety in competition with those nuclear plants that do benefit from the liability limitation. Indeed, the liability limitation ultimately is less a subsidy of nuclear power than of nuclear catastrophe.[49]

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safe level." *Id.* Mr. Lochbaum mentioned that the increased security costs at a wind farm or other renewable technology may be estimated at the high side at $100. *Id.* The issue is whether it is more wise to spend $1 billion to upgrade a nuclear power plant or to invest the funds in technologies that do not provide a similar security risk.

45. NUCLEAR POWER'S PROSPECTS, *supra* note 32, at 30.

46. *Id.*

47. Price-Anderson Act, 42 U.S.C. § 2210 (2000); *see also Renewal of the Price Anderson Act: Hearing Before the Subcomm. on Nuclear Regulation of the S. Comm. on Env't. and Pub. Works*, 107th Cong. (Jan. 23, 2002) (testimony of Peter A. Bradford, former commissioner, U.S. Nuclear Regulatory Commission), *available at* http://epw.senate.gov/107th/Bradford_01-23-02.htm [hereinafter Bradford Testimony] ("Indeed, the liability limitation ultimately is less a subsidy of nuclear power than of nuclear catastrophe.").

48. Bradford Testimony, *supra* note 47.

49. *Id.*

Responding to the industry's claim that it still needs subsidies as it matures, Mr. Bradford pointed out, "If the technology is mature enough to cut public hearing and information rights to the vanishing point, if it is mature enough to circumscribe regulatory scrutiny with probabilistic risk assessment, then it is too mature to need a limitation on its liability for catastrophic accidents."[50]

Market economics provides an even more basic argument:

> "If a thing is not worth doing," said economist John Maynard Keynes, "it is not worth doing well." Leaving aside bomb-proliferation, waste, sabotage and uninsurable accidents, nuclear power is simply uncompetitive and unnecessary. After a trillion-dollar taxpayer investment, it delivers little more energy in the U.S. than wood. Globally, it produces several fold less energy than renewable sources. The market prefers other options. In the 1990s, global nuclear capacity rose by 1% a year, compared with 17% for solar cells (24% last year) and 24% for wind power—which has lately added about 5,000 megawatts a year worldwide, as compared with the 3,100 new megawatts nuclear power averaged annually in the 1990s. The decentralized generators California added in the 1990s have more capacity than its two giant nuclear plants—whose debts triggered the restructuring that created the state's current utility mess.[51]

Historically, nuclear energy received about 59% of the energy research and development funding from 1948 to 1998, despite its associated high cost.[52] At a time when other indicators suggest nuclear power's time has past, global warming is now being touted by some as a justification for pursuing this energy source more vigorously. Assuming a trebling of the contribution of nuclear power to energy generation, one study shows that nuclear power can improve global warming stabilization by 7.5%–15%.[53]

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50. *Id.*

51. Amory B. Lovins & L. Hunter Lovins, Opinion, *The Nuclear Option Revisited*, L.A. TIMES, July 8, 2001, at M1, *available at* http://www.rmi.org/images/other/energy/e01-19-nuclearoption.pdf.

52. Peter Bradford, Nuclear Power and Public Policy: Nuclear Power's Prospects, Course Presentation at Vermont Law School (June 29, 2006) [hereinafter Bradford June 29 Presentation] (PowerPoint on file with author).

53. S. Pacala & R. Sokolow, *Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies*, 305 SCI. MAG. 968, 969 (2004).

The MIT study shows as much as a 25% improvement.[54] In either case, one must question whether it is wise to spend 50% of the energy research and development budget on a 7.5%–25% improvement in global warming.

II. THE RISK OF NUCLEAR PROLIFERATION

There is an obvious relationship between the expansion of nuclear power and the risk of proliferation—the more nuclear power expands, the more opportunities are available for diversion of nuclear material for non-peaceful uses. However, if the international community allows certain states to use a technology, it is inequitable to restrict its use by others. Once the power of the atom is harnessed by a country, it may be for peaceful or non-peaceful use. Within that country, the risks of proliferation from energy sources[55] may arise from the transportation, storage, and use of uranium, plutonium, or spent fuel.[56] Unlike other forms of waste, nuclear waste will linger in permanent storage for hundreds of thousands of years,[57] and these wastes may be diverted for non-peaceful uses. In recent years, the desire to directly acquire nuclear weapons has expanded to non-state groups such as al Qaeda.[58] "While concern over catastrophic accidents and long-term waste management are perhaps better known, the largest single vulnerability associated with the expansion of nuclear power is likely to be its potential connection to the proliferation of nuclear weapons."[59] The risks in managing nuclear technology are numerous and significant, and with respect to power generation, these vulnerabilities are increased dramatically as technology is shared internationally. Understandably, the global community relies on the framework of international law to manage these risks.

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54. MIT STUDY, *supra* note 31, at ix (assuming global nuclear capacity expands threefold to one trillion watts by 2050).

55. *See id.* at 66 (noting that radioactive materials are generated by medicine and other industries as well).

56. FERGUSON & POTTER, *supra* note 28, at 2.

57. MIT STUDY, *supra* note 31, at 53.

58. FERGUSON & POTTER, *supra* note 28, at 2; BUNN & WIER, *supra* note 29, at 2.

59. SMITH, *supra* note 20, at 100–01.

A. Non-proliferation Law

1. Treaties

One of the most important events in the history of nuclear power was the signing of the Treaty on the Non-proliferation of Nuclear Weapons (NPT).[60] A treaty is a traditional source of international law that "create[s] specific legal obligations between the treaty parties. Treaties are the most easily discernible sources of international law because they derive their legitimacy directly from the express consent of States."[61] International law, whether by treaty or otherwise, is grounded in the concept that each country has autonomy.[62] Sometimes states choose to contract away some sovereign right for the betterment of the international community.[63]

International law may also be created through a process of creating international "norms" or "customary international law."[64] "[T]o become customary international law[,] it must 'be of a fundamentally norm-creating character such as could be regarded as forming the basis of a general rule of law.'"[65]

> As a general proposition, a customary rule of law is binding on all nations, "not because it was prescribed by any superior power, but because it has been generally accepted as a rule of conduct." To prove that a customary norm exists, a court must establish general acceptance of the rule: first, by demonstrating that State practice is consistent with the rule; and second, by demonstrating that States act in accordance with the rule from a sense of legal obligation to do so. This sense of legal obligation is known as *opinio juris*.[66]

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60. Treaty on the Non-proliferation of Nuclear Weapons, Mar. 5, 1970, 21 U.S.T. 483, 7 I.L.M. 809, *available at* 1970 WL 104532 [hereinafter NPT].

61. DAVID HUNTER ET AL., INTERNATIONAL ENVIRONMENTAL LAW AND POLICY 291 (2d ed. 2002).

62. *Id.* at 379.

63. *Id.*

64. *Id.* at 293, 313.

65. *Id.* at 313 (quoting North Sea Continental Shelf (F.R.G. v. Den.; F.R.G. v. Neth.), 1969 I.C.J. 313, at 41–42 (Feb. 20).

66. *Id.* at 311 (quoting The Scotia, 14 U.S. (Wall.) 170, 187 (1871)) (citation omitted).

Without unanimous participation in a treaty, the "traditional analysis of State practice and *opinio juris*" is necessary to evaluate whether a treaty is universally binding even among nonsignors.[67]

2. Enforcement of International Law Violations

While international law seems to bind parties to agreements, the practical means of enforcement are problematic. The infrastructure of international treaties often requires a flow of benefits arising from the voluntary limitation of state autonomy.[68] By tying compliance to receipt of benefits, the international community enjoys some leverage with a non-compliant state.[69] Some treaties provide other measures for encouraging compliance. These may include trade and other sanctions[70] and in the most egregious situations possible military action.[71]

Within the realm of international law, the United States enjoys a position of greater influence because of its economic and military strength.[72] This power allows the United States, more than other countries, to violate international law with little fear of consequences.[73] Furthermore, the United States enjoys great influence when its preferred interpretation of international law pushes the envelope.[74] This same power gives the United States the opportunity to exert great influence on the shape of new norms.[75] One example is an "exceedingly testy meeting [in 2006] between Mohamed ElBaradei, . . . who won the Nobel Peace Prize last year, and Robert Joseph, the Under-Secretary of State for Arms Control."[76] According to one diplomat, Mr. Joseph bluntly stated,

> We cannot have a single centrifuge spinning in Iran. Iran is a direct threat to the national security of the United States and our allies, and we will not tolerate it. We want you to

67. *Id.* at 291, 313.
68. *Id.* at 482.
69. *Id.*
70. *Id.*
71. Anthony Clark Arend, *International Law and the Preemptive Use of Military Force*, WASH. Q., Spring 2003, at 89, 99.
72. John E. Noyes, *American Hegemony, U.S. Political Leaders, and General International Law*, 19 CONN. J. INT'L L. 293, 296 (2004).
73. *Id.*
74. *Id.*
75. *Id.*
76. Seymour M. Hersh, *Annals of National Security: The Iran Plans*, NEW YORKER, Apr. 17, 2006, at 35.

> give us an understanding that you will not say anything publicly that will undermine us.[77]

But at the same time the United States calls for stringent enforcement of international law against other countries, it has ignored attempts at international law enforcement against itself. As just one example, on June 27, 1986, the International Court of Justice (ICJ) found that the United States violated international law by supporting the Contras against the Republic of Nicaragua.[78] As a result of these violations, the ICJ decided "that the United States of America is under an obligation to make reparation to [Nicaragua]" and ordered funding of the Contras to cease.[79] Soon after, U.S. citizens living in Nicaragua sued in federal court for injunctive and declarative relief against the United States for its policy of funding the Contras.[80] The plaintiffs used the ICJ decision as support for their claims that continued funding of the Contras violated the law.[81] The D.C. Circuit Court of Appeals, however, was unmoved.

> [A] treaty "depends for the enforcement of its provisions on the interest and honor of the governments which are parties to it. If these fail, its infraction becomes the subject of international negotiations and reclamations . . . [but] with all this the judicial courts have nothing to do and can give no redress."[82]

The ICJ discovered that without enforcement powers, the same applied to itself. On June 15, 1990, the ICJ registrar sent a letter to both parties in an attempt to set a date for a hearing on possible reparations, but the United States failed to respond.[83] In 1991, Nicaragua simply discontinued the proceedings.[84] Likewise, the dynamics of geopolitical power are very much in play as the global community grapples with nuclear power.

If an infraction is great enough, the Security Council may vote for military action—article 2(4) of the U.N. Charter "prohibits members of the United Nations from taking forcible action against the territorial integrity

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77. *Id.*

78. Military and Paramilitary Activities (Nicar. v. U.S.), 1986 I.C.J. 14, 145 (June 27), *available at* http://www.icj-cij.org/docket/files/70/6503.pdf.

79. *Id.* at 149.

80. *Id.*

81. Comm. of U.S. Citizens Living in Nicar. v. Reagan, 859 F.2d 929, 932 (D.C. Cir. 1988).

82. *Id.* at 937 (quoting The Head Money Cases, 112 U.S. 580, 598 (1884)).

83. Military and Paramilitary Activities (Nicar. v. U.S.), 1991 I.C.J. 47, 47–48 (Removal Order of Sept. 26), *available at* http://www.icj-cij.org/docket/files/70/6483.pdf.

84. *Id.*

and political independence of other states, unless authorized by the Security Council."[85] While military action is an option, the Preamble to the United Nations Charter "obligate[s] the Member States of the U.N. to 'settle their international disputes by peaceful means.'"[86] The ICJ, in an Advisory Opinion published in 1996, stated,

> This prohibition of the use of force is to be considered in the light of other relevant provisions of the Charter. In Article 51, the Charter recognizes the inherent right of individual or collective self-defence if an armed attack occurs. A further lawful use of force is envisaged in Article 42, whereby the Security Council may take military enforcement measures in conformity with Chapter VII of the Charter.[87]

In light of this, countries, including the United States, have chosen to take actions unilaterally to protect their sovereign interests.[88]

Article 51 of the U.N. Charter reads, "Nothing in the present Charter shall impair the inherent right of individual or collective self-defense if an armed attack occurs against a Member of the United Nations, until the Security Council has taken measures necessary to maintain international peace and security."[89] The plain language does not allow preemptive military action and seems to reserve "uses of force exclusively to the Security Council."[90] "However, the prevailing view is probably that . . . international law includes a right of anticipatory self-defense against an imminent attack."[91] The position of power enjoyed by the United States coupled with preemptive military ability creates an imbalance of power

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85. Frederick Michael Lorenz, Response to Terrorism: Military Force and International Law (Univ. of Wash. television broadcast, Nov. 14, 2001), *transcript available at* http://jsis.washington.edu/jsis/lorenzrev.pdf; *see also* U.N. Charter art. 2, para. 4 ("All Members shall refrain in their international relations from the threat or use of force against the territorial integrity or political independence of any state, or in any other manner inconsistent with the Purposes of the United Nations.").

86. DAVID M. ACKERMAN, INTERNATIONAL LAW AND THE PREEMPTIVE USE OF FORCE AGAINST IRAQ 3 (2003) (quoting U.N. Charter art. 2, para. 3), *available at* http://www.boozman.house.gov.

87. Legality of the Threat or Use of Nuclear Weapons, 1996 I.C.J. 226, 244 (Advisory Opinion of July 8), *available at* http://icj-cij.org/docket/files/95/7495.pdf.

88. Several examples: Israel-Iraq (1981); U.S.-Nicaragua (1982–91); U.S.-Grenada (1983); U.S.-Iraq (2003–present); Israel-Syria (2007).

89. U.N. Charter art. 51.

90. ACKERMAN, *supra* note 86, at 3.

91. Steven C. Welsh, Ctr. for Def. Information, *Preemptive War, International Law & the 2006 National Security Strategy*, Mar. 16, 2006, http://www.cdi.org/news/law/preemptive-war-031606.cfm.

shared with other nuclear-weapon states. The Iraq experience shows that nuclear-weapon countries, fearful of other states acquiring nuclear weapons but acting on inaccurate intelligence information, can seriously disrupt international peace. Yet, enforcement of international law is more likely to be against weaker countries, such as Iran, than those with military and economic might.

3. Background on the Treaty on the Non-proliferation of Nuclear Weapons

The idea that nuclear power generation brings with it the ability to pursue nuclear weapons is more than sixty years old.[92] On March 16, 1946, the Acheson-Lilienthal Report came out, which recognized that "[t]he development of atomic energy for peaceful purposes and the development of atomic energy for bombs are in much of their course interchangeable and interdependent."[93] The Acheson-Lilienthal Report proposed a plan to set up international controls over nuclear technology in order to keep its non-peaceful uses in check.[94] Bernard Baruch, President Truman's special representative to the U.N. Energy Commission, presented a version of the plan to the U.N. that sought to address concerns raised by the Soviet Union, but ultimately the proposal foundered on the Soviet desire to "break the U.S. monopoly" on nuclear weapons.[95] The development of nuclear energy technology around the globe moved forward. Countries, including the United States and Canada, contracted sales of nuclear-power technology with other countries, and with these contracts the buyers were required to sign paper agreements of "peaceful assurances."[96] These were signed to prevent misuse of the technology. Formal controls, however, were not

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92. DAVID E. LILIENTHAL ET AL., REPORT ON THE INTERNATIONAL CONTROL OF ATOMIC ENERGY § I, at 3 (1946), *reprinted in* U.S. Government Printing Office Publication 2498 [hereinafter ACHESON-LILIENTHAL REPORT].

93. *Id.* at 4.

94. *Id.*

95. Peter Bradford, Nuclear Power and Public Policy—The Beginnings of Civilian Nuclear Power, Course Presentation at Vermont Law School (June 20, 2006) [hereinafter Bradford June 20 Presentation] (PowerPoint on file with author); SMITH, *supra* note 20, at 139.

96. Peter Bradford, Nuclear Power and Public Policy—Dreams and Realities (1970–1980), Course Presentation at Vermont Law School (June 22, 2006) [hereinafter Bradford June 22 Presentation] (PowerPoint on file with author); *see also* MARK G. MCDONOUGH, CARNEGIE ENDOWMENT FOR INT'L PEACE, TRACKING NUCLEAR PROLIFERATION: A GUIDE IN MAPS AND CHARTS 112 (1998), http://www.carnegieendowment.org/publications/index (providing details of Canadian and U.S. pre-NPT transactions with India).

developed until the 1967 Treaty on the Non-proliferation of Nuclear Weapons (NPT) created a set of international safeguards.[97]

The International Atomic Energy Agency (IAEA) was established in 1957 to promote peaceful uses of nuclear energy globally, and the NPT added a safeguard function to IAEA.[98] This gave the IAEA a dual purpose: (1) "accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world," and (2) "ensure, so far as it is able, that assistance provided by it or at its request or under its supervision or control is not used [for] . . . military purpose[s]."[99] This dual mission is strikingly similar to that of the U.S. Atomic Energy Commission (AEC), and the inability of the AEC to effectively balance the dual missions led to its demise in 1974.[100]

The NPT created two types of states—"nuclear weapon" (China, United States, France, U.K. and Russia) and "non-nuclear weapon"—each responsible for certain differentiated obligations.[101] The Treaty requires nuclear-weapon states to avoid the direct and indirect transfer of nuclear weapons or devices to a non-nuclear-weapon state and also to not "assist, encourage or induce" such state in the manufacture or acquisition of nuclear weapons.[102] Also, the non-nuclear-weapon states agreed to neither accept nor request such assistance;[103] and agreed to safeguards established by the IAEA that are intended as "verification of the fulfillment of [their] 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."[104] Furthermore, transfer of material even for peaceful purposes is also restricted.

> Each State Party to the Treaty undertakes not to provide (a) source or other fissionable material, or (b) equipment or material especially designed or prepared for the processing, use or production of special fissionable material, to any

97. Peter Bradford, Nuclear Power and Public Policy—Years of Growth and Optimism (1960–1972), Course Presentation at Vermont Law School (June 21, 2006) [hereinafter Bradford June 21 Presentation] (PowerPoint on file with author).

98. *Id.*; GARWIN & CHARPAK, *supra* note 8, at 315–17.

99. Statute of the Int'l Atomic Energy Agency art. II, Oct. 26, 1956, 8 U.S.T. 1093, *available at* http://www.iaea.org/About/statute_text.html [hereinafter IAEA Statute].

100. *See* JOHN G. KEMENY ET AL., REPORT OF THE PRESIDENT'S COMMISSION ON THE ACCIDENT AT THREE MILE ISLAND 51 (1979) (noting that a purpose of the Energy Reorganization Act of 1974 was to "divorce the newly created NRC from promotion of nuclear power").

101. NPT, *supra* note 60.

102. *Id.* art. I.

103. *Id.* art. II.

104. *Id.* art. III(1).

> non-nuclear-weapon state for peaceful purposes, unless the source or special fissionable material shall be subject to the safeguards required by this Article.[105]

Importantly, the NPT specifically places within government sovereignty an "inalienable right . . . to develop research, production and use of nuclear energy for peaceful purposes without discrimination."[106] The NPT requires pursuit of "negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control."[107] Finally, article X allows member states to withdraw from the NPT altogether.[108]

4. Treaty Non-Compliance

At first glance, the success of the Treaty appears great.[109] Many countries "eschewed or abandoned nuclear weapons programs" despite the financial and technical ability to pursue these weapons.[110] In fact, there are "fewer nations with nuclear weapons programs than there were 20 or 30 years ago."[111] Furthermore, if the ultimate goal of the Treaty is to prevent the use of nuclear weapons against a state, its success in that regard is obvious. The NPT, however, has another purpose: to disarm nuclear-weapon states. The imbalance of power enjoyed by the nuclear-weapons states has allowed them to violate their obligations under the NPT. These countries, including the United States, have failed to meet their disarmament responsibility,[112] assisted select non-NPT nations in the

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105. *Id.* art. III(2).
106. *Id.* art. IV(1).
107. *Id.* art. VI.
108. *Id.* art. X.
109. According to one recent assessment,

> [s]ix nations abandoned indigenous nuclear weapon programs that were under way or under consideration in the 1960s: Egypt, Italy, Japan, Norway, Sweden, and West Germany. Since the late 1970s, Argentina, Australia, Belarus, Brazil, Canada, Iraq, Kazakhstan, Libya, Romania, South Africa, South Korea, Spain, Switzerland, Taiwan, Ukraine, and Yugoslavia have abandoned nuclear weapon programs or nuclear weapons (or both) on their territory. North Korea and Iran are the only two states that began acquiring nuclear weapon capabilities in this later period and have not ceased the effort.

JOSEPH CIRINCIONE ET AL., DEADLY ARSENALS: NUCLEAR, BIOLOGICAL, AND CHEMICAL THREATS 24 n.4 (2d ed., rev. & expanded 2005).

110. Perkovich, *supra* note 6, at 128.
111. CIRINCIONE ET AL., *supra* note 109, at 8.
112. *Cf.* NPT, *supra* note 60, art. VI (requiring each state to pursue negotiations in good faith).

achievement of nuclear technologies[113] and discriminated against NPT signors, whom they *perceived* to be a threat.[114]

B. The Imbalance of Power under the NPT

1. The Nuclear-Weapon States' Obligations

The agreement struck in 1967 revealed that the non-nuclear-weapon states were willing to give up a greater portion of their sovereignty than the nuclear-weapon states.[115] The agreement required an equalizing of this sovereignty through nuclear disarmament.[116] "The non-nuclear-weapon States gave up their sovereign right to receive, manufacture and acquire nuclear weapons on the understanding that there would be a corresponding commitment by nuclear-weapon States to disarm. Regrettably, the nuclear [weapon] States . . . backtracked on their commitment."[117] Since the five permanent members of the U.N. Security Council are divided on how to respond to this obligation, doubts run rampant about "the capacity for action of the only international body with the legal writ to enforce nonproliferation commitments."[118]

When the NPT was ratified, disarmament was one of the major goals established to protect the global community from non-peaceful uses of the atom.[119] "However, the US still has 10,600 nuclear bombs, Russia 18,000 and the U.K. 200—and they all want to keep them. Add France, China, and others, and the world tally is about 29,800 nuclear warheads, a relatively small drop from 38,000 in 1968."[120] More than thirty-five years later, the

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113. *Cf. id.* art. I, art. III (requiring that each state not assist non-nuclear-weapon states in acquiring nuclear weapons).

114. *Cf. id.* art. II (requiring each state to act peacefully and not discriminate).

115. *See* Press Release, Security Council, Terrorist Acquisition of Nuclear Weapons 'Dangerously Close,' Norway's Foreign Minister Tells Review Conference, U.N. Doc. DC/2962 (Oct. 5, 2005), *available at* http://www.un.org/News/Press/docs/2005/dc2962.doc.htm [hereinafter Dangerously Close] (describing nuclear states' failure to meet reciprocal disarmament commitments).

116. *Id.*

117. *Id.*

118. PERKOVICH, *supra* note 6, at 16.

119. *See* Jayantha Dhanapala, Under-Secretary-General for Disarmament Affairs, U.N., Reinforcing the NPT Regime, Address to the International Workshop on the 2000 Conference of the Strengthened NPT Review Process (Nov. 1, 1999), *available at* http://cns.miis.edu/pubs/ionp/nptrein.htm (discussing the fundamental NPT obligations: non-proliferation (arts. I and II) and disarmament (art. VI)).

120. *The Final Straw for a Fragile Treaty?*, NEW SCIENTIST, June 19, 2004, at 7 [hereinafter *Fragile Treaty?*]; *see also* Carnegie Endowment for Int'l Peace, Nuclear Numbers July 2005, http://www.carnegieendowment.org/npp/numbers/default.cfm (Nuclear weapons numbers: U.S., approximately 10,300; Russia, approximately 16,000; China, 410; France, approximately 350; U.K.,

nuclear-weapon states remain a tight inner circle and show little interest in limiting their weapons.[121] In 2006, U.N. Secretary-General Kofi Annan declared, "Today, the contract between the nuclear-weapon States and the rest of the international community, which is the basis of the NPT, has been called into question."[122] The nations that agreed to abstain from nuclear weapon development will not tolerate the nuclear-weapon states' refusal to disarm indefinitely. Sooner or later, this attitude will result in an erosion of the effectiveness of the NPT. In fact, Japanese and Brazilian political leaders apparently are reweighing their nuclear-weapon options.[123] These countries can legitimately argue that one country's refusal to meet its obligations might justify another's right to withdraw from its obligations as well.[124] The failure to disarm, in the words of Kofi Annan, "blind[s] us to the [current] crisis facing the Treaty—a twin crisis, of compliance and of confidence."[125]

This issue has remained divisive between the North and the South since before the 1995 Review and Extension Conference of the Parties to the Treaty on the Non-proliferation of Nuclear Weapons.[126] "In 1995, we were told that 'the nuclear arms race has ceased,' in a declaration issued at the Conference on Disarmament by France, Russia, Britain and the United States in anticipation of the [1995 Conference.] . . . Unfortunately, this optimistic claim is not true."[127] In 2000, the IAEA Director, Mohamed ElBaradei, complained that progress on the disarmament front was sluggish since the 1995 conference.[128] In 2005, disarmament remained an important

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200; Israel, approximately 100; India, between 70 and 110; Pakistan, between 50 and 110; Global Total, approximately 27,600).

121. *Fragile Treaty?*, *supra* note 120.

122. Press Release, Secretary-General, Non-Proliferation Treaty Facing Twin Crisis of Compliance, Confidence, Secretary-General Says in Address to Conference on Disarmament, U.N. Doc. SG/SM/10527 (June 21, 2006), *available at* http://www.un.org/News/Press/docs/2006/sgsm 10527.doc.htm.

123. PERKOVICH, *supra* note 6, at 16.

124. *Id.* at 30.

125. *Id.*

126. The power brokers recommitted to disarmament at the 1995 conference. Dangerously Close, *supra* note 115. *See generally* Decisions and Resolutions Adopted by the 1995 Review and Extension Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons (New York, May 12, 1995), *appended in* MCDONOUGH, *supra* note 96, at app. A-2.

127. Jacqueline Cabasso, Executive Dir., W. States Legal Found., Compliance Assessment: The NPT Declared Nuclear Weapon States, Presentation at the 2005 Review and Extension Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons (May 11, 2005), *in* UN. Doc. NET/Conf.1995/20 (2005), *available at* http://www.un.org/events/npt2005/statements/npt11ngo-cabasso.pdf.

128. Press Release, IAEA, IAEA Director General Calls for Rededication to Nuclear Non-Proliferation Regime, IAEA 2000/11 (Apr. 20, 2000), *available at* http://www.iaea.org/NewsCenter/ PressReleases/2000/prn1100.shtml.

agenda item for the Review Conference. Mr. ElBaradei stated in his opening remarks, "As long as some countries place a strategic reliance on nuclear weapons as a deterrent, other countries will emulate them . . . ."[129] Meanwhile, the Bush Administration is pursuing new nuclear weapons to enhance the U.S. arsenal. In 2007, Bush recommitted the United States to a national strategy of producing new nuclear weapons on the basis that disarmament entailed too many strategic risks.[130]

In the end, noncompliance with article VI erodes the effectiveness of the NPT framework. Mr. Elbaradei draws a clear picture saying, "We must abandon the unworkable notion that it is morally reprehensible for some countries to pursue weapons of mass destruction yet morally acceptable for others to rely on them for security—indeed to continue to refine their capacities and postulate plans for their use."[131]

2. Anything for Nuclear-Weapon States' Friends—Article I Violations

Other Treaty failures include the imbalance of power between the NPT nuclear-weapon states and the non-nuclear-weapon states. In fact, the weapon states have violated the NPT for decades by assisting their "friends" in developing nuclear weapons. A successful strategy for inclusion in the nuclear-weapons inner circle is not signing the NPT, and aligning your country with at least one nuclear-weapon state. For example, Israel successfully became the sixth state (and the first Middle Eastern state) to gain nuclear weapons with the covert assistance of France and the United Kingdom and, at a minimum, the acquiescence of the United States; it now enjoys what is essentially a "don't ask, don't tell" U.S. policy.[132]

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129. Press Release, U.N., Nuclear Non-proliferation Treaty Review Conference Opens at Headquarters: Secretary General Says Regime Has Worked, but Is Now Under 'Great Stress,' U.N. Doc. DC/2955 (Feb. 5, 2005), *available at* http://www.un.org/news/press/docs/2005/dc2955.doc.htm; *see also* Mohamed ElBaradei, Op-Ed., *Saving Ourselves from Self-Destruction*, N.Y. TIMES, Feb. 12, 2004, at A37 (warning of a growing trend toward illicit proliferation of nuclear arms).

130. James Doyle, Carnegie Endowment for Int'l Peace, *Proliferation Analysis: U.S. National Security and Nuclear Weapons in the 21st Century*, Aug. 23, 2007, http://www.carnegieendowment.org/publications/index; *see also* Robert W. Nelson, *Nuclear Bunker Busters, Mini-Nukes, and the U.S. Nuclear Stockpile*, PHYSICS TODAY, Nov. 2003, at 32 (noting that the Bush Administration is arguing for lower yield nuclear weapons to provide a more credible deterrent effect).

131. ElBaradei, *supra* note 129.

132. AVNER COHEN, ISRAEL AND THE BOMB 1–7 (1998). In 1968, the U.S. Central Intelligence Agency informed President Johnson that they believed Israel had achieved components of nuclear weapons, at a minimum. *Id.* at 295. The United States pressured Israel to sign the NPT and even offered to sell military aircraft as an added incentive. *Id.* at 299–311. This linkage was included within a memorandum of understanding between Israel and the United States. *Id.* at 311. Israel, however, later insisted that the NPT and aircraft sale be delinked politically and offered no firm assurances on the NPT. *Id.* at 313. This linkage was broken and, after President Richard Nixon took office, U.S. policy moved

India, another country aided by Western allies, shattered early indications of purely peaceful intentions in the use of nuclear technology.[133] On May 18, 1974, it conducted underground testing of nuclear weapons under the guise of a peaceful nuclear experiment."[134] As a result, India endured "an unexpectedly high diplomatic and economic price" leading to setbacks in its civil nuclear-power program and slowed growth in its industrial base and economy.[135] The transfer of nuclear technology to India from Canada and the United States predated the NPT.[136] Before the NPT, the only safeguards keeping civilian nuclear technology from being used for military purposes were paper assurances of peaceful use given in the Agreements for Cooperation.[137] However, the United States "took the position that India had not violated [its] contract . . . on the Tarapur reactor, because the plutonium used in the explosion had been extracted from the spent fuel in the Canadian-supplied reactor, the CIRUS."[138] Canada condemned the testing as a violation of their contract and withdrew nuclear assistance to India permanently in 1976.[139] The United States did not.[140] It did, however, lose interest in dealing with India in 1980, but set up an agreement ensuring India would receive fuel from France.[141] Later, China would provide this fuel to India.[142] After the "peaceful" nuclear experiment, India denied any interest in pursuing a nuclear weapons

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toward an assumption that Israel had nuclear weapons but it would not be recognized as a nuclear-weapon state. *Id.* at 321–38. Britain's role in this affair has recently come to light. Meirion Jones, *Britain's Dirty Secret*, NEW STATESMAN, Mar. 13, 2006, http://www.newstatesman.com/200603130011 ("Secret papers show how Britain helped Israel make the A-bomb in the 1960s, supplying tons of vital chemicals including plutonium and uranium."); Statement from the Foreign Office, BBC Newsnight, Mar. 9, 2006, http://news.bbc.co.uk/2/hi/programmes/newsnight/4791360.stm (admission by U.K. government that it "was aware that Norway planned to sell the heavy water to the Israeli Atomic Energy Organisation," though the statement goes on to say that the "[U.K.] was not a party to the sale").

133. The nuclear weapon debate within India shifted toward development with China's first nuclear test in 1964. MCDONOUGH, *supra* note 96, at 119 n.10.

134. MCDONOUGH, *supra* note 96, at 111; *see also* ROBERTA WOHLSTETTER, "THE BUDDHA SMILES": ABSENT-MINDED PEACEFUL AID AND THE INDIAN BOMB 3-1 (1977) (on file with author) (noting that India had not fully explored the utility of nuclear energy before separating plutonium).

135. MCDONOUGH, *supra* note 96, at 112–13.

136. *Id.*

137. Bradford June 22 Presentation, *supra* note 96; MCDONOUGH, *supra* note 94, at 112; WOHLSTETTER, *supra* note 132, at i.

138. WOHLSTETTER, *supra* note 134, at ii.

139. MCDONOUGH, *supra* note 96, at 113.

140. *Id.*

141. *Id.* at 120 n.27.

142. *Id.*

program.[143] However, in 1998, it conducted new testing and officially declared that it was a new nuclear-weapon power.[144]

In 2006, the Bush Administration negotiated the ability to import nuclear fuel and technology into India despite its nuclear-weapons program.[145] *The Economist* criticized President Bush for his showing favoritism to a friend (and not for the first time) at the expense of principle: "He is gambling that the future benefits of accepting a rising India in all but name as a member of the nuclear club will outweigh the shock to the global anti-proliferation regime."[146] The deal with India threatened to undermine U.S. efforts to prevent North Korea and Iran from acquiring nuclear technology.[147] Despite this, on December 18, 2006, President Bush signed into law an exception to the Atomic Energy Act, allowing U.S. trade with one NPT outsider, India.[148]

This law allowed U.S. private investment in Indian (civilian) nuclear plants and trade in nuclear fuel with the country.[149] On its part, India "[opened] up its civilian nuclear facilities to international inspection."[150] However, India agreed to designate "only 14 of its 22 nuclear reactors as civilian," with the remainder excluded from international scrutiny.[151] It is estimated that this, coupled with the ability to import nuclear fuel, enables India to divert enough fuel from its facilities to build between forty and fifty nuclear weapons each year.[152] President Bush suggests that this deal is good for nonproliferation, but Henry D. Sokolski, a former Pentagon official under President George H. W. Bush and executive director of the Nonproliferation Education Center, stated, "They have pretty much signaled the end to any benefit for following the rules."[153] In 2007, India got another "sweetheart deal," receiving assurances from the United States

143. *Id.* at 111.

144. *See id.* (noting that this action provoked Pakistan's similar response two weeks later).

145. Editorial, *Dr. Strangedeal*, ECONOMIST, Mar. 11, 2006, at 9.

146. *Id.*

147. ANIRUDH SURI, CARNEGIE ENDOWMENT FOR INT'L PEACE, NORTH KOREA'S TEST AND CONGRESSIONAL DELAY: IMPLICATIONS FOR INDIA-US NUCLEAR DEAL (2006), http://www.carnegieendowment.org /publications/index.cfm?fa=view&id=18813.

148. Peter Baker, *Bush Signs India Nuclear Law: Critics Say Deal to Share Civilian Technology Could Spark Arms Race*, WASH. POST, Dec. 19, 2006, at A3, *available at* http://www.washingtonpost.com/wp-dyn/content/article/2006/12/18/AR2006121800233.html.

149. *Id.*

150. *Id.*

151. *Id.*

152. *Id.*

153. *Id.*

that its nuclear fuel will not be cut off even if it conducts nuclear testing.[154] "Perhaps the greatest surprise, however, was the U.S. agreement, in principle, to transfer sensitive nuclear technology to India that would allow for uranium enrichment and spent fuel reprocessing."[155] Not only would this enable India to produce reactor fuel, but India could use this technology to produce nuclear weapons.[156]

India's testing in 1974 energized Pakistani efforts to develop nuclear weapons.[157] In 1977 and again in 1979, the United States temporarily stopped any nuclear technology assistance to Pakistan to discourage the pursuit of weapons.[158] In 1979, the United States passed a law ending assistance to states importing nuclear technology without IAEA inspection safeguards.[159] However, the Reagan Administration, "in the wake of the Soviet occupation of Afghanistan," suspended this requirement for Pakistan and bumped up military and economic assistance to the country.[160] President Reagan's goal was the creation of a strategic partner in the struggle against the Soviets in Afghanistan.[161] Subsequent administrations sporadically and temporarily stopped assisting Pakistan after finding plutonium production taking place.[162] Meanwhile, China desired a strategic ally in Pakistan and provided assistance with a nuclear-fuel reprocessing plant.[163] In 1998, Pakistan was positioned to respond to India's nuclear-weapons testing, and it too declared itself within the nuclear-weapon inner circle.[164] Similar to the Bush Administration's treatment of India, the Administration seems less concerned about Pakistan's development of a nuclear-weapons program than with Iran's. While some political backlash occurred over the years against Pakistan, alliances have kept its nuclear-weapons program moving forward.[165]

In late 2007 and 2008, Pervez Musharraf's presidency faced growing political opposition, and his country's instability worsened.[166] In November

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154. Sharon Squassoni, *The U.S.'s Catastrophic Nuclear Deal with India: Power Failure*, NEW REPUBLIC ONLINE, Aug. 3, 2007, http://www.carnegieendowment.org/publications/index.cfm?fa=print&id=19475.

155. *Id.*

156. *Id.*

157. MCDONOUGH, *supra* note 96, at 131.

158. *Id.*

159. *Id.*

160. *Id.*

161. *Id.*

162. *Id.* at 131–34.

163. *Id.* at 133–34.

164. *Id.* at 131–32.

165. *Id.* at 131–33.

166. Rohde & Gall, *supra* note 6.

2007, Mr. Musharraf declared de facto martial law, and many viewed this move as his effort "to crush his civilian opponents and cling to power."[167] On December 27, 2007, Prime Minister Benazir Bhutto was assassinated; Pakistanis blamed Mr. Musharraf for the government's failure to provide her adequate security.[168] As the crisis deepened, the United States began looking at General Ashfaq Parvez Kayani as an important figure for Pakistan's future.[169] In any case, much uncertainty looms in an unstable Pakistan. The country is essentially run by the military: "The military not only sets Pakistan's foreign policy, it also shapes domestic politics by nourishing a climate of insecurity and sectarian violence, allowing it to portray itself as the only bulwark against extremism."[170]

The Bush Administration fears political instability in Iran and continues to forbid Iran's use of nuclear technology. Meanwhile, Pakistan, with the assistance of the West, entered the nuclear-weapon inner circle. Like Iran, Pakistan is not a democracy and is politically unstable. The current instability in Pakistan underlines the danger short-term political alliances present in the context of nuclear proliferation and global security. This type of foreign policy with Pakistan may result in the very harm the Bush Administration fears from a nuclear-powered Iran.

Israel, India, and Pakistan are all examples of countries outside the NPT legally developing nuclear weapons by aligning with one or more NPT nuclear-weapon states. In doing so, the assisting nuclear- weapon states violated article I and, in some cases, article III(2) of the NPT without consequences. The natural tendency for nations to build alliances with other states weakens the international control of nuclear technology and in the long term erodes the effectiveness of the NPT. As discussed below, the Bush strategy of controlling regimes rather than controlling nuclear technology "not only fails to solve tough cases but actually makes proliferation more likely."[171]

3. A Political Minefield for Perceived Foes—Article VII/IV Violations

Within the scope of the NPT, the nuclear-weapon states agreed to take a non-discriminatory approach to the distribution of nuclear-power

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167. *Id.*

168. *Id.*

169. *Id.*

170. FREDERIC GRARE, CARNEGIE ENDOWMENT FOR INT'L PEACE, RETHINKING WESTERN STRATEGIES TOWARD PAKISTAN 7 (2007).

171. GEORGE PERKOVICH, CARNEGIE ENDOWMENT FOR INT'L PEACE, "DEMOCRATIC BOMB": FAILED STRATEGY 1 (2006).

technologies, including uranium enrichment and fuel reprocessing.[172] While Iran's covert activities won it membership into President Bush's "Axis of Evil,"[173] other countries' covert programs draw little or no attention from the United States. The actions of the United States and other countries show that the non-discriminatory approach of the NPT is being ignored. As the international community applies the Treaty, states that make no attempt to sign and adhere to the NPT get favorable treatment over those states that do make an attempt but fall short of full compliance.

The unfair balance of power within the NPT is further exemplified by the international community's treatment of Iran as it attempts to pursue nuclear power and uranium enrichment. While political instability and a country's intentions are salient reasons for the international community to treat it with caution, the inequities present within the current system fly in the face of the NPT. For example, unlike India, Pakistan, and Israel, Iran signed the Treaty as a non-nuclear-weapon state.[174] In August 2002, an Iranian opposition group alleged that Iran established a covert nuclear program in Natanz and a heavy-water production facility in Arak.[175] After several years of investigation, it is apparent that for two decades Iran pursued nuclear weapon technology.[176] However, Iran has cooperated with the international efforts to "rectify its past failures."[177] IAEA Director Mohamed ElBaradei states that Iran has complied with a protocol that the nation has never signed.[178] However, he laid out his concern in *Newsweek*:

> For the last three years we have been doing intensive verification in Iran, and even after three years I am not yet in a position to make a judgment on the peaceful nature of the [nuclear] program. We still need to assure ourselves through access to documents, individuals [and] locations

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172. NPT, *supra* note 60, art. IV; *see also* Interview by Christopher Dickey, Newsweek, with Mohamed ElBaradei (Jan. 12, 2006), *available at* http://www.iaea.org/PrinterFriendly/NewsCenter/Transcripts/2005/newsweek12012006.html [hereinafter ElBaradei Interview] (noting Iran's right under the NPT to enrich uranium).

173. *Bush's 'Evil Axis' Comment Stirs Critics*, BBC NEWS, Feb. 2, 2002, http://news.bbc.co.uk/1/hi/world/ americas/ 1796034.stm.

174. MCDONOUGH, *supra* note 96, at 169.

175. SAMMY SALAMA & KAREN RUSTER, CTR. FOR NONPROLIFERATION STUDIES, A PREEMPTIVE ATTACK ON IRAN'S NUCLEAR FACILITIES: POSSIBLE CONSEQUENCES (2004), http://cns.miis.edu/pubs/week/040812.htm.

176. MCDONOUGH, *supra* note 96, at 169.

177. Elahe Mohtasham, The Clash of Ideologies or Peaceful Multilateral Negotiations Based on National Interests: The Degree of Iran's Commitment to the Treaty on the Non-proliferation of Nuclear Weapons, Address Before the U.N. 2005 Review and Extension Conference (May 11, 2005), *available at* http://www.un.org/events/npt2005/statements/nptngo-mohtasham.pdf.

178. ElBaradei Interview, *supra* note 172.

> that we have seen all that we ought to see and that there is nothing fishy, if you like, about the program.[179]

Unlike Israel, Pakistan and India, Iran is expected to remove the "fishy" smell from its program.

Iran's dissatisfaction with the negotiations led to the recommencement of its fuel enrichment operation in January 2006.[180] In March 2006, the IAEA reported the Iranian nuclear concerns to the U.N. Security Council.[181] The Council, as recently as August 2006, demanded that Iran eliminate fuel enrichment and reprocessing activities as a confidence-building measure for the concerned U.N. membership.[182] Mr. ElBaradei openly acknowledges that the NPT as written gives Iran the sovereign right to pursue uranium enrichment, despite the international efforts to convince its leaders to forego that right.[183] Furthermore, article X of the NPT allows Iran (or any signor) to withdraw from the Treaty altogether.[184] But now, Iran is tied up in a confrontation with the U.N. Security Council, whose permanent members are the United States, the United Kingdom, France, Russia, and China—nuclear-weapon states all.

The United States argues that Iran's desire for nuclear power makes no economic sense in light of their supply of natural gas; therefore they must intend to manufacture nuclear weapons.[185] As shown earlier, the same could be said about the history of the U.S. nuclear-power industry. As *The Economist* put it, nuclear power has gone from "too cheap to meter" to "too expensive to matter."[186] Iran may have a great supply of natural gas today, but the supply is finite. Iran has as strong an argument as the United States to justify its pursuit of nuclear power—energy diversity is wise given a host of environmental, economic, and security concerns. If nuclear power is prudent for the rest of the world, why, Iran may ask, is it not prudent for us?

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179. *Id.*

180. Press Release, IAEA, Iran To Resume Suspended Nuclear Research and Development, IAEA 2006/01 (Jan. 3, 2006), *available at* http://www.iaea.org/NewsCenter/PressReleases/2006/prn200601.html.

181. IAEA Staff Report, Report on Iran's Nuclear Programme Sent to UN Security Council, Mar. 8, 2006, http://www.iaea.org/NewsCenter/News/2006/bog080306.html.

182. Press Release, Security Council, Security Council Demands Iran Suspend Uranium Enrichment by 31 August, or Face Possible Economic, Diplomatic Sanctions, U.N. Doc. SC/8792 (July 31, 2006), *available at* http://www.un.org/News/Press/docs/2006/sc8792.doc.htm.

183. ElBaradei Interview, *supra* note 172.

184. NPT, *supra* note 60, art. X.

185. MIT STUDY, *supra* note 31, at 66–67. *But see* Daniel Benjamin, *What Price, Peace?*, LAW SCHOOL, Autumn 2006, at 12 (questioning Iran's need for nuclear reactors given their vast oil supplies).

186. *Atomic Renaissance*, ECONOMIST, Sept. 6, 2007, *available at* http://www.economist.com/research/articlesBySubject/displaystory.cfm?subjectid=821240&story_id=9762843.

The United States and others argue that Iran violated its commitment to the IAEA safeguards agreement and therefore the NPT.[187] However,

> Under the IAEA's Statutes (Article XII: c) if states found in breach of their IAEA safeguards agreements, they will be provided with an opportunity to return back to compliance within a reasonable time, before any punitative [sic] action taken against them or before their cases are referred to the United Nations Security Council. Section 19 of the IAEA's safeguards agreement (INFCIRC/153), which deals with measures in relation to verification of non-diversion and any possible non-compliance makes it clear that the IAEA's Board of Governors 'shall take account of the degree of assurance provided by the safeguards measures' and 'shall afford the State every reasonable opportunity to furnish the Board with any necessary reassurance.'[188]

Despite this, Iran, an NPT signor, is treated more harshly than India, Pakistan, and Israel, which have all consistently refused to accept the NPT framework.

The dual structure of government control in Iran also concerns some experts.[189] According to these critics, bifurcation of political power, coupled with two decades of technical noncompliance, indicates either a lack of control over the nuclear program or outright defiance.[190] Iran's political structure is not new and neither is its original signature and ratification of the Treaty. No provision exists in the NPT to cover shifts in political control of a government to disfavored regimes in order to mitigate concerns within the international community. Instead, the president of the most powerful country in the world publicly labels that state a member of the "Axis of Evil," and the international community demands a heightened standard of compliance. Meanwhile, many of these same countries turn a blind eye to nonsignors of the Treaty and, of course, to their own violations.

The reality is that all governments are prone to dynamics that change the prospect of nuclear-weapon development. The Bush Administration itself pursued "bunker busters" and other new nuclear weapons.[191] In 2007,

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187. Mohtasham, *supra* note 177.

188. *Id.*

189. *Id.*

190. *Id.*

191. Norman Solomon, *Nuclear Fundamentalism and the Iran Story*, COMMONDREAMS.ORG, May 5, 2005, http://commondreams.org/cgi-bin/print.cgi?file=/views05/0505-20.htm; *see also* Nelson,

the Administration issued a statement claiming that a new nuclear weapon, the Reliable Replacement Warhead, was essential to U.S. nuclear deterrence capabilities.[192] In non-nuclear-weapon states geopolitical tensions may cause a change in the desire to develop these weapons.[193] In fact, China's testing of a nuclear weapon in 1964 led to India's desire to do the same.[194] It was India's 1974 testing that energized Pakistan's effort.[195] Even if the U.N., the IAEA, and the United States have valid concerns about Iran, it is difficult to justify penalizing Iran for past wrongs, when the NPT weapons states have avoided compliance with numerous provisions under the Treaty without any consequences.

Compounding the issue, the United States and its allies link Iran to terrorist activities. Their accusations,

> including the risk of nuclear materials falling into the hands of terrorists, have more than any other factor thrown doubt on the legitimacy of Iran obtaining nuclear material and technology. This is exemplified by statements and images of the clash of ideologies, war or dispute between Islamic and western democratic political systems.[196]

According to Professor Gary Sick, director of the Middle East Institute at Columbia University, "terrorism is murky and highly ambiguous" and any Iranian contribution is particularly complex.[197] While their behavior in the late 1970s and 1980s can be categorized as terrorism, "Iran undoubtedly behaves differently today than it did nearly a quarter century ago."[198] Professor Sick believes that Iran's prior behavior opened it to sweeping accusations:

> Iran's past reputation for supporting terrorism, the incendiary rhetoric of its ultraconservative clerical leaders, and its almost total lack of transparency concerning issues

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supra note 130, at 32–33 (discussing the ability of potential U.S. nuclear "bunker buster" weapons to penetrate earth and reach underground targets).

192. Doyle, *supra* note 130.

193. *See* JOSEPH CIRINCIONE, A NEW NONPROLIFERATION STRATEGY 5 (2005), *available at* http://www.carnegieendowment.org/static/npp/Rome_Conference_Paper.pdf (noting that if Iran acquired nuclear weapons, "[a] nuclear reaction chain could ripple through a region and across the globe").

194. WOHLSTETTER, *supra* note 134, at 3-3.

195. MCDONOUGH, *supra* note 96, at 131.

196. Mohtasham, *supra* note 177 (citation omitted).

197. Gary Sick, *Iran Confronting Terrorism*, WASH. Q., Autumn 2003, at 83.

198. *Id.* at 84.

> of national security have created an environment in which it is easy to believe the worst. In fact, Iran's behavior since the revolution has allowed its opponents to accuse it of almost anything and to find a receptive audience for their claims. Iran's vigorous denial in all of the aforementioned cases ultimately undermined its credibility because the formula never varied, even when the evidence was quite incriminating, and there was never any visible effort by Iran to investigate the circumstances or to punish any of the individuals who might have been involved.[199]

Nonetheless, as Professor William O. Beeman, director of the Middle East Studies at Brown University, points out, Iran "has withdrawn virtually all of its support troops from Lebanon and Hezbollah."[200]

Furthermore, Professor Beeman argues, Iran's support of terrorism is overstated.[201]

> This accusation is based on only one concretely verifiable action on Iran's part—its support of Hezbollah in Lebanon. Other attempts to link Iran to Hamas, to Al-Qaeda, to the Taliban and other groups have proved utterly specious, and indeed completely improbable given the antipathy between these other groups and Iran's Shi'a leaders both on doctrinal and on political grounds.[202]

At the same time that it criticizes other countries on this point, the United States historically has also supported terrorism. To reiterate the example above, the Reagan Administration funded the Contras, an anti-communist guerrilla organization that sought to overthrow the Sandanista government of Nicaragua,[203] even after the International Court of Justice declared the United States in violation of international law.[204] Again, U.S. policy appears not to be driven by a concern for moral consistency, but by the considerations of realpolitik. Patrick Seale, a Middle East scholar, points out that the Bush Administration is under great pressure from the Israeli

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199. *Id.* at 86.

200. William O. Beeman, *Iran is Cleaning Up Its Act—Why Won't the United States Respond?*, AGENCE GLOBAL, May 2, 2005, http://www.agenceglobal.com/article.asp?id=489.

201. *Id.*

202. *Id.*

203. *See supra* notes 78–84 and accompanying text.

204. Comm. of U.S. Citizens Living in Nicar. v. Reagan, 859 F.2d 929, 932 (D.C. Cir. 1988).

government to take a hard line against Iran.[205] According to Seale, Israel wants a commitment to bomb Iran "if it does not give up its programme of uranium enrichment."[206] Such policies have been called into question by newly released intelligence on Iran. "In December [2007], an American intelligence report concluded that Iran had suspended a nuclear weapons program in 2003, a finding that has delayed a new round of United Nations sanctions."[207] Not persuaded, President Bush stated, "[T]he United States is strengthening our longstanding security commitments with our *friends* in the gulf and rallying *friends* around the world to confront this danger before it is too late."[208]

As discussed above, Israel achieved nuclear-weapon status covertly. It attained this with the assistance and acquiescence of nuclear-weapon states, yet the government still denies its nuclear capabilities. The mere existence of these weapons in Israel has a destabilizing effect on the Middle East.[209] It is not surprising that Middle Eastern states may seek to equalize the balance of power. Immanuel Wallerstein, a senior research scholar at Yale, questions the threat posed by a nuclear-armed Iran when nine other states are already nuclear-capable.[210] Others suggest that the real risk may not be an attack on U.S. interests at all.[211] "States are and will continue to be deterred from such attacks by the certainty of swift and massive retaliation."[212] Instead, the greater risk is the potential ripple effect through a region, triggering other states to pursue nuclear weapons.[213] Wallerstein says that Iran might believe that joining the nuclear-weapons circle will protect its future sovereignty.[214] It has not escaped Iran's attention that the difference in American policy between the other two members of the "Axis of Evil," Iraq and North Korea, has been motivated by the fact that one developed nuclear weapons and the other did not.[215] In this context, Iran's

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205. Patrick Seale, *Pressures Mount on Bush to Bomb Iran*, AGENCE GLOBAL, Sept. 14, 2006, http://agenceglobal.com/article.asp?id=1044.

206. *Id.*

207. Steven Lee Myers, *Bush Urges Unity Against Iran*, N.Y. TIMES, Jan. 14, 2008, *available at* http://www.nytimes.com/2008/01/14/world/middleeast/14prexy.html.

208. *Id.* (emphasis added).

209. PERKOVICH, *supra* note 6, at 28–29.

210. Immanuel Wallerstein, *Iran and the Bomb*, AGENCE GLOBAL, Feb. 15, 2006, http://agenceglobal.com/ article.asp?id=812.

211. PERKOVICH, *supra* note 6, at 27–28.

212. *Id.* at 29.

213. *Id.*

214. Wallerstein, *supra* note 210.

215. *Id.*

decades-long support of terrorist networks may be less relevant to its leaders than the dynamics of realpolitik.[216]

Under the NPT, Iran has an "inalienable right" to peaceful uses of nuclear technology.[217] Iran also has a reasonable expectation of equitable treatment among member states and certainly among the non-signatory states.[218] It is the job of the IAEA to ensure adequate safeguards so that countries who participate in non-peaceful use of nuclear technology are not only discovered but prevented from diverting nuclear material into a weapon.[219] If these safeguards are inadequate, it begs the question whether the technology should be used anywhere; if sufficient, then Iran's development of nuclear technology for peaceful use should be acceptable.[220]

4. The North Korean Crisis

North Korea signed the NPT (unlike Pakistan, Israel, and India) in 1985, but allowed no inspections of its facilities.[221] The end of the Cold War in 1989 brought with it a decline in Soviet power that cost North Korea the economic support and security guarantees it enjoyed for forty-five years.[222] In 1989, U.S. intelligence suspected that North Korea was building an atomic bomb, and it became U.S. policy to urge compliance with the terms of the NPT.[223] In May 1992, North Korea agreed to allow IAEA inspections at Yongbyon, where the agency and the United States suspected it was reprocessing spent fuel for use as weapons-grade plutonium.[224] Despite being blocked at two of the suspected sites, the inspectors discovered evidence that North Korea was not fully disclosing its plutonium operations.[225] In March 1993, North Korea threatened withdrawal from the NPT.[226] The Treaty expressly requires a ninety-day

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216. Beeman, *supra* note 200.

217. NPT, *supra* note 60, art. IV.

218. *Id.*; *see also* IAEA Statute, *supra* note 99, art. IV (accepting non-signatories as members of the IAEA who meet certain requirements and assuring each member's "sovereign equality").

219. *See id.* art. III (listing IAEA's authorized anti-proliferation functions).

220. The IAEA statute itself, however, suggests that the drafters recognized the IAEA would fail in some situations. *See id.* art. II ("The Agency . . . shall ensure, *so far as it is able*, that assistance provided by it . . . is not used in such a way as to further any military purpose.") (emphasis added).

221. PBS Frontline, Chronology: A Decade-Long Overview of Threats, Deceptions and Diplomatic Ploys That Have Shaped U.S.-North Korea Relations, http://www.pbs.org/wgbh/pages/frontline/shows/kim/etc/cron.html (last visited Dec. 23, 2006) [hereinafter PBS Chronology].

222. *Id.*

223. *Id.*

224. *Id.*

225. *Id.*

226. *Id.*

notice prior to a country's withdrawal from the terms of the Treaty, and with just one day remaining, North Korea announced suspension of the withdrawal.[227]

As the IAEA lost confidence in the North Korea's nuclear weapons status, the Clinton Administration engaged its leaders.[228] The stakes were raised on April 19, 1994, when North Korea stated it would move its supply of irradiated fuel from a reactor without any international monitoring of the process.[229] The Administration considered alternatives, including strategic bombing, but settled upon "'coercive diplomacy' . . . , diplomacy . . . backed up with a very credible threat of military force."[230] This approach worked and led to an agreement among the allies (United States, Japan, and South Korea) and North Korea.[231] The October 1994 agreement stated first, that the allies would construct two safeguarded light-water reactors for North Korea; second, that at the completion of this construction, North Korea would dismantle its Yongbyon facilities; and third, that the allies would provide 500,000 metric tons heavy fuel oil annually to the country until construction of the first reactor was completed.[232] The agreement included language that the countries would "work toward a harmonious relationship."[233] This agreement was not in the form of a treaty and many in Congress disagreed with the outcome, wishing instead that Clinton had applied pressure to overthrow North Korea's dictatorial government.[234] This led to delays in the allies fulfilling their obligations under the agreement.[235]

In 1998, South Korea established a "Sunshine Policy" that encouraged openness and engagement with its neighbor to the North.[236] In spite of South Korea's conciliatory gesture, on August 31, 1998, North Korea surprised the world by launching a test missile over the Sea of Japan,

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227. *Id.*

228. *Id.*

229. *Id.*

230. *Id.*; *Frontline*, *Interview: William Perry* (PBS television broadcast Feb. 26, 2003), *transcript available at* http://www.pbs.org/wgbh/pages/frontline/shows/kim/interviews/perry.html [hereinafter *PBS Perry Interview*].

231. *Id.*

232. PBS Chronology, *supra* note 221; MCDONOUGH, *supra* note 96, at 147, 149 ("To offset the energy deficit that North Korea claimed it would face by the freezing of its graphite-moderated reactors and related facilities, the United States was to arrange for the delivery to North Korea . . . of heavy oil for heating and electricity production 'that will reach a rate of 500,000 tons annually.").

233. *PBS Perry Interview*, *supra* note 230.

234. *Id.*

235. PBS Chronology, *supra* note 221.

236. *Id.*

spurring Congress to require a review of U.S. policy toward it.[237] North Korea agreed to inspections, but nothing was found—an embarrassment for the United States.[238] In September of 1999, North Korea agreed to a long-range missile testing freeze when President Clinton lifted forty-nine-year-old economic sanctions.[239] As tensions lessened between the South and the North, however, the construction delays of the promised reactors angered the North Korean government, and it threatened to restart the nuclear program.[240] The Clinton Administration continued to pursue diplomacy, but shortly after the second Bush Administration took office this strategy changed.[241]

President Bush publicly endorsed the Sunshine Policy, but behind closed doors stunned South Korea's president by telling him that U.S.-North Korean talks would cease—U.S. policy was no longer engagement; it was confrontation.[242] In June 2001, North Korea threatened to restart missile testing unless the Bush Administration reengaged with the diplomatic process.[243] On January 29, 2002, President Bush's State of the Union address placed the country in the "Axis of Evil" with Iraq and Iran.[244] He openly accused North Korea of amassing weapons of mass destruction "while starving its citizens."[245] In October 2002, Pyongyang admitted that North Korea was engaged in a secret uranium enrichment program, but claimed that technically this program was not a violation of the prior agreement.[246] The United States considered this a breach of the spirit of the agreement and shortly thereafter the allies stopped the promised shipments of fuel oil.[247] The year 2003 marked an escalation of tensions as North Korea announced withdrawal from the NPT and demanded the United States participate in bilateral talks to end the conflict.[248]

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237. *Id.*
238. *Id.*
239. *Id.*
240. *Id.*
241. *Id.*
242. *Id.*
243. *Id.*
244. President George W. Bush, State of the Union Address to the Joint Session of Congress (Jan. 29, 2002), *transcript available at* http://www.c-span.org/executive/transcript.asp?cat=current_event&code=bush_admin&year=2002.
245. *Id.* In the 1990s, North Korea suffered severe flooding and drought, which led to a drastic reduction in arable land and ultimately, famine. PBS Chronology, *supra* note 221.
246. *Id.*
247. *Id.*
248. *Id.*

In early 2007, the Bush Administration reversed its policy towards North Korean problem.[249] The Administration was entrenched in the Iraq "bloodbath" and faced "a series of setbacks in the Middle East and Afghanistan."[250] A diplomatic victory was needed as the Republican Party tried to recover from its 2006 election losses.[251] Bush was criticized by some for caving in to nuclear blackmail,[252] but many others surely welcomed the change.

Then, in September 2007, an event occurred that could have impacted the negotiation. Israel bombed a suspected Syrian reactor site, "apparently modeled on one North Korea has used to generate its stockpile of nuclear weapons fuel."[253] Interestingly, Syria, as a signor of the NPT, has a "legal right to complete construction of the reactor, as long as its purpose was to generate electricity."[254] Furthermore, Syria was not "obligated to disclose the existence of a reactor during the early phases of construction."[255] That Israel acted unilaterally to prevent another country from achieving nuclear-power capability drips with irony.

Despite the possibility that North Korea assisted Syria in the construction of the nuclear reactor, the Bush Administration continued to pursue a six-nation pact (North Korea, United States, China, South Korea, Russia, and Japan) to address the North Korean nuclear program.[256] In October 2007, news reports indicated that the administration achieved a diplomatic victory when North Korea agreed to "disable all facilities in return for 950,000 metric tons of fuel oil or its equivalent in economic aid."[257] In return, the United States must work toward removal of North Korea from its terrorist list "'in parallel' with the North's actions."[258] On November 5, 2007, the U.S. State Department announced that an American team of experts began disabling North Korea's only facility with a

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249. INT'L CRISIS GROUP, ASIA BRIEFING NO. 62, AFTER THE NORTH KOREA NUCLEAR BREAKTHROUGH: COMPLIANCE OR CONFRONTATION? 2 (2007), http://www.crisisgroup.org/home/index. cfm?id=4795&l=1.

250. *Id.*

251. *Id.*

252. *Id.*

253. Mark Mazzetti & William J. Broad, *The Right Confronts Rice over North Korea Policy*, N.Y. TIMES, Oct. 25, 2007, at A10.

254. David E. Sanger & Mark Mazzetti, *Analysts Find Israel Struck a Syrian Nuclear Project*, N.Y. TIMES, Oct. 14, 2007, at A1.

255. *Id.*

256. *Id.*; Thom Shanker, *North Korea Still a Threat, South Korea Tells Gates*, N.Y. TIMES, Nov. 8, 2007, at A14.

257. Helene Cooper, *North Koreans in Nuclear Pact*, N.Y. TIMES, Oct. 4, 2007, at A1.

258. *Id.*

functioning nuclear reactor.[259] But the North Korean policy reversal illustrates how arbitrary U.S. policies towards different countries can be when nuclear weapons are at stake.

The behavior of the North Korean government has been in some respects similar to India's. In fact, one might argue that India exhibited more prolonged defiance of the international framework for the management of nuclear technology. India never signed the NPT, and it conducted nuclear testing and pursued nuclear technologies covertly. Nonetheless, in December 2006 the United States created an exception in its laws allowing companies to trade nuclear technologies with India, despite the fact that some reactors would not be under international safeguards. North Korea signed the NPT, but conducted nuclear testing and pursued nuclear technologies covertly. The only apparent distinction is that, in spite of the international framework for nondiscriminatory treatment, the current Administration chose to treat North Korea as an "evil" aberration rather than a co-equal sovereign. The political need for a Republican "victory" subsequently led Bush to reverse his hard-line policy and reach a diplomatic resolution. Thus, the geopolitical power imbalance, manifested in short-term and long-term alliances with the most powerful countries—and indeed in the whims of their leaders—has led to grossly inconsistent treatment under the nonproliferation regime.

5. Imbalance of Power—Conclusion

In light of the above, we can make the following observations. The NPT is applied discriminatorily against certain non-nuclear weapons states. The NPT weapon states shirk their obligations without significant consequences. They assist countries aligned with their interests to violate express provisions of the Treaty, but use belligerent rhetoric and threats when those perceived to threaten their interests do the same. Furthermore, Bush's strategy for protecting against proliferation is incompatible with the framework established under international law. Bush shifted the emphasis from control of the weapons to control of certain regimes.[260] Regime change as a nonproliferation strategy, however, is risky.[261] First, if a government such as North Korea's is toppled, who will ensure the existing nuclear weapons will fall in safe hands?[262] Second, U.S. interventions will likely induce smaller countries to more quickly pursue nuclear technology

259. *Reactor Disabled in North Korea*, N.Y. TIMES, Nov. 6, 2007, at A16.
260. PERKOVICH, *supra* note 171, at 1.
261. *Id.* at 3.
262. *Id.*

as the best protection against U.S. military action.[263] Furthermore, the strategy of coalition-building diminishes enforcement capacity because any global coalition that hopes to unilaterally enforce an international norm is easily fractured when one state's friend becomes another's foe.[264] The United States may not perceive Israel as a nuclear threat, but Egypt and the other Middle East states do.[265] In stark contrast to Bush's strategy, the NPT is built on a foundation of nondiscrimination and sovereignty. The power imbalance problem is significant. The nuclear-weapon states are seen as the "chief enforcers *and* the most advantaged beneficiaries [of the NPT]."[266] This imbalance must be corrected: "To sustain—much less strengthen—the regime, this 'advantaged' minority must ensure that the majority sees it as beneficial and fair. The only way to achieve this is to enforce compliance universally, not selectively, and that includes the obligations the nuclear states have taken on themselves."[267]

C. Nuclear Waste and Proliferation

While environmental concerns surrounding nuclear waste outside the realm of proliferation are serious,[268] this Note concentrates on the associated proliferation risks, such as diversion of plutonium and covert reprocessing. Whenever the United States sold nuclear fuel to other countries, the sales agreement required U.S. "control" over what could be done with resulting spent fuel.[269] Despite this policy, the United States has carved out many exceptions allowing spent fuel to be reprocessed by other—primarily European—countries.[270]

> [S]trict consistency with its stated policy against premature reprocessing meant withholding assent to the transfer of spent fuel (arising from U.S.-supplied fuel and reactors) to the European plants, thereby pulling the rug from under

263. *Id.*
264. *Id.*
265. *Id.* at 3–4.
266. PERKOVICH, *supra* note 6, at 35.
267. *Id.*
268. *See, e.g.*, Natural Res. Def. Council v. Nuclear Regulatory Comm'n, 547 F.2d 633, 638–39 (D.C. Cir. 1976) ("Plutonium is generally accepted as among the most toxic substances known; inhalation of a single microscopic particle is thought to be sufficient to cause cancer[;] . . . with a half-life of 25,000 years, plutonium must be isolated from the environment for 250,000 years before it becomes harmless."), *rev'd sub nom*. Vt. Yankee Nuclear Power Co. v. Natural Res. Def. Council, 435 U.S. 519 (1978).
269. Gilinsky, *supra* note 15, at 375.
270. *Id.*

> close allies and friends. But total acquiescence in the fulfillment of the contracts implied acceptance of defeat in the effort to control reprocessing and the widespread use of plutonium before adequate protection is in place.[271]

The U.S. exceptions for allies created stores of plutonium that remain vulnerable to diversion for non-peaceful use.

Britain studied the plutonium question during the "Windscale Inquiry."[272] By 1978, both the public and Parliament had become gravely concerned about "exporting bomb-ready materials."[273] Much of the concern centered on the fact that plutonium would be returned to its owners under flawed international safeguards.[274] One commentator in the United States declared, "We have to accept the fact that we cannot put the plutonium we plan to separate into the stream of commerce until a fail-safe mechanism can be devised."[275] Furthermore, "The rules have to be strict, uniform and universal. There cannot be one set of rules for those inside the club and another for those outside."[276] In the end, the decision to reprocess spent fuel is the "choice between plutonium and [non-]proliferation."[277]

Thirty years later, the global store of separated plutonium shows that plutonium has been chosen over non-proliferation. "Despite the poor economics of reprocessing, by the end of 2001 there was already 262.5 tons of separated 'civilian' plutonium accumulated around the world."[278] It is interesting to compare this amount to that generated at both the Savannah River and Hanford Site complexes. These complexes produced about 103.4 metric tons "while the estimated inventory of separated plutonium in the former Soviet Union totaled approximately 150 metric tons."[279] The total amount of "civilian" plutonium is sufficient to create 32,800 nuclear weapons.[280]

Moreover, mischief is created by the mere acquisition of spent fuel. The waste may be reprocessed to produce plutonium, but other uses, such as dirty bombs or distribution through the postal system, are limited only by one's imagination. The public crisis created by the anthrax scares of 2001

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271. *Id.*
272. *Id.* at 381.
273. *Id.*
274. *Id.* at 381–82.
275. *Id.* at 384.
276. *Id.*
277. *Id.* at 385.
278. SMITH, *supra* note 20, at 117.
279. *Id.*
280. *Id.*

would be small in comparison. In any case, there are a number of ways that nuclear material might reach wrongdoers: diversion by a state; unauthorized assistance by an insider; mismanaged material in times of national unrest; fraud and organized criminal activities; or theft from facilities, among.[281]

In the United States, 125 sites in thirty-nine states store spent nuclear fuel at temporary facilities.[282] "These storage sites are located in a mixture of cities, suburbs, and rural areas. Most are located near large bodies of water. . . . [And] more than 161 million people reside within seventy-five miles of temporarily stored nuclear waste."[283] These sites are logical targets for theft as well as direct attack by terrorists. However, the most likely targets for theft of nuclear weapons and materials remain "storage areas in the former states of the Soviet Union and in Pakistan, and fissile material kept at dozens of civilian sites around the world."[284] Expansion of nuclear power would increase targets for terrorists, by creating more waste and thus additional management and storage facilities.

D. Non-state Bad Actors

States clearly are not the only concern. Munir Ahmad Khan, the father of the Pakistani nuclear weapons program, developed a side-business selling nuclear technology to other countries while working for his government. North Korea, Libya, and Iran are among the beneficiaries of his illegal transfer of nuclear technology.[285] Pakistani scientists are also alleged to have assisted al Qaeda.[286] Khan publicly admitted to selling nuclear technology on February 4, 2004.[287] "He [was] pardoned soon after by President Musharraf and has been under house arrest since. [Pakistan] claims that Khan acted independently and without state knowledge."[288] Khan's actions proved that nuclear technology transfers may occur without appearing on the IAEA radar screen. Experts from around the world list

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281. FERGUSON & POTTER, *supra* note 28, at 2; BUNN & WIER, *supra* note 29, at 7–8.

282. U.S. Dep't of Energy, Office of Civilian Radioactive Waste Mgmt., Current Storage Methods for Radioactive Waste, http://www.ocrwm.doe.gov/ym_repository/about_project/waste_explained/storage.shtml (last visited Nov. 6, 2007).

283. *Id.*

284. PERKOVICH, *supra* note 6, at 27.

285. John Harrington et al., *International Legal Developments in Review: 2005: National Security*, 40 INT'L LAW. 487, 490 (2006).

286. FERGUSON & POTTER, *supra* note 28, at 2.

287. MICHAEL LAUFER, CARNEGIE ENDOWMENT FOR INT'L PEACE, A.Q. KHAN NUCLEAR CHRONOLOGY 8 (2005), *available at* http://www.carnegieendowment.org/static/npp/Khan_Chronology.pdf.

288. *Id.*

this threat as one of the "top three challenges to the Nonproliferation regime."[289]

September 11, 2001 revealed that a country's security may be breached by highly organized non-state actors.[290] The National Security Strategy of the United States of America in 2002 (subsequently reinforced in 2006) reflects this threat:

> The gravest danger to freedom lies at the crossroads of radicalism and technology. When the spread of chemical and biological and nuclear weapons, along with ballistic missile technology—when that occurs, even weak states and small groups could attain a catastrophic power to strike great nations. . . . [T]he nature and motivations of these new adversaries, their determination to obtain destructive powers hitherto available only to the world's strongest states, and the greater likelihood that they will use weapons of mass destruction against us, make today's security environment more complex and dangerous.[291]

Stores of uranium remain vulnerable throughout the world. "Hundreds of tons of plutonium and weapons-usable uranium in Russia have yet to receive even rudimentary security improvements, while stocks of Soviet-origin, weapons-usable uranium remain vulnerable at research centers in other former Soviet states and elsewhere around the globe."[292] Even U.S.-origin material may be vulnerable at some locations abroad.[293] U.S. materials at home are at risk as well because of flawed protective measures.[294] Meanwhile, criminal activity relating to radioactive materials is increasing.[295] Although the probability of a terrorist event involving nuclear materials remains lower than one involving "conventional means of violence," the danger of the former is growing.[296]

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289. Press Release, Carnegie Endowment for Int'l Peace, International Experts Name Top Nonproliferation Priorities (Aug. 21, 2007), *available at* http://www.carnegieendowment.org/publications/index.

290. EXECUTIVE OFFICE OF THE PRESIDENT, THE NATIONAL SECURITY STRATEGY OF THE UNITED STATES OF AMERICA 15 (2002), *available at* http://www.whitehouse.gov/nsc/nss/2002 [hereinafter 2002 STRATEGY]; EXECUTIVE OFFICE OF THE PRESIDENT, THE NATIONAL SECURITY STRATEGY OF THE UNITED STATES OF AMERICA (2006), *available at* http://www.whitehouse.gov/nsc/nss/2006.

291. 2002 STRATEGY, *supra* note 290, at 13.

292. FERGUSON & POTTER, *supra* note 28, at 2.

293. *Id.*

294. *Id.*

295. *Id.*

296. *Id.* at 4.

E. Can International Law Manage Nuclear Proliferation Risks?

A core problem with the international use of nuclear technology is its inseparable connection with nuclear weapons. The history of nuclear power shows that one country's possession of nuclear weapons encourages others to develop weapons of their own. During the Cold War and its immediate aftermath, a strategy of nuclear deterrence arguably succeeded in keeping the Superpowers at peace. Smaller states, such as South Africa in 1993, could eschew the technology, convinced that they were unnecessary as a security measure.[297] Now, the continual power imbalance between the nuclear-weapons states and the others has created a tension. This power imbalance, if left in place, will cause states who have rejected the technology to reconsider their decision in the name of security and to protect their sovereignty.

In William Perry's view, for example, North Korea's move toward nuclear-weapon technology resulted from the government's determination that "they needed nuclear weapons for their own security."[298] Perry states that the "number one objective of the North Korean government is to ensure the survival of their regime."[299] As mentioned earlier, one must consider whether Iraq's fate would be the same if Saddam Hussein had in fact successfully developed nuclear weapons prior to Bush's invasion. The Bush strategy of controlling regimes rather than weapons is likely to encourage governments to pursue nuclear weapons as a protective measure to maintain their rule.

Naturally, the massive potential for harm posed by nuclear weapons leads countries to err on the side of their citizens' security. This tendency causes weapons states to create new uses for the technology even though they are committed to eliminating nuclear weapons altogether.[300] It has also led to preemptive warfare based on erroneous intelligence information.[301]

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297. MCDONOUGH, *supra* note 96, at 243 (noting that South Africa is among the greatest success stories, having built nuclear weapons only to subsequently destroy them and renounce their development).

298. PBS Perry Interview, *supra* note 230.

299. *Id.*

300. *See* Nelson, *supra* note 130, at 32–33 (discussing tactical military uses of low-yield nuclear weapons).

301. *See* U.S. HOUSE OF REPRESENTATIVES, COMM. OF GOV'T REFORM—MINORITY STAFF, IRAQ ON THE RECORD: THE BUSH ADMINISTRATION'S PUBLIC STATEMENTS ON IRAQ (Mar. 16, 2004) (detailing misstatements by key White House officials based on faulty intelligence); *see also* President George W. Bush, Speech in Cincinnati, Ohio (Oct. 7, 2002), *available at* http://www.whitehouse.gov/news/releases/ 2002/10/print/20021007-8.html (outlining Bush administration accusations regarding Iraq's development of weapons of mass destruction as justification for invasion); Wayne Drash, *Report: No WMD in Iraq*, CNN.COM, Oct. 7, 2004,

By the same token, non-nuclear nations pursue the technology in secret to avoid preemptive strikes.[302] The potential harm resulting from diversion of nuclear technology creates tension between countries that may result in military action. In this type of diplomatic environment, the nuclear "haves" enjoy inequitable influence on the international management of nuclear technologies and international issues in general, while the "have nots" are shut out. Expansion of nuclear power will only exacerbate this tension and provide the "have not" states the technology to develop their own nuclear weapons.

The current international framework for managing nuclear technology does not control the risk of proliferation effectively. No treaty can be effective when a select group of states may materially breach its provisions at will. Furthermore, these same states enable some countries to circumvent the NPT, but require others, such as Iran, to give up sovereign rights based on past violations. The irony is that Iran, a signor of the NPT, is treated discriminatorily in comparison to Israel, India and Pakistan—all NPT nonsignors. Numerous provisions of the Treaty have been violated by its signors, but only the states that were labeled "evil" suffer significant consequences.

1. A New Approach—"*Universal Compliance*"

A new approach to managing the international nuclear risks has been proposed by scholars at the Carnegie Endowment for International Peace.[303] This strategy integrates a "force-based approach with the traditional multilateral, treaty-based approach."[304] This new approach is provided in a report titled *Universal Compliance: A Strategy for Nuclear Security*[305] and would place new requirements on both the non-nuclear-weapon and the nuclear-weapon states.[306]

The strategy would prevent non-nuclear-weapon states from obtaining the technology by increasing penalties for withdrawal from the NPT; enforcing compliance with strengthened treaties; and radically reforming the nuclear fuel cycle to prevent states from acquiring dual-use technologies

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http://www.cnn.com/2004/world/meast/10/06/iraq.wmd.report ("Saddam Hussein did not possess stockpiles of illicit weapons at the time of the U.S. invasion in March 2003 and had not begun any program to produce them, a CIA report concludes.").

302. For example, Israel, Pakistan, India, Iran, and North Korea.

303. CIRINCIONE ET AL., *supra* note 109, at 23.

304. *Id.*

305. PERKOVICH, *supra* note 6.

306. *Id.* at 24.

for uranium enrichment or plutonium reprocessing.[307] The threat from existing arsenals would be reduced by shrinking global stockpiles; curtailing research on new nuclear weapons; and taking the weapons off hair-trigger-alert status.[308] Finally, greater efforts would be devoted to resolving the regional conflicts that drive proliferation and bringing the three nuclear-weapon states outside the NPT into conformance with an expanded set of global nonproliferation norms.[309]

Interestingly, the Report recommends that the U.N. Security Council (on which the United States, France, Great Britain, China, and Russia are permanent members) or a similar organization serve as the enforcing agency.[310] The Report also recommends domestic legislation barring any entity from supporting states designated noncompliant by the IAEA.[311]

The strategy outlined in *Universal Compliance* includes six core obligations resulting in 100 recommendations for change.[312] The first core obligation is to "[m]ake [n]onproliferation [i]rreversible."[313] The strategy for fulfilling this obligation minimizes the vulnerability of the current regime by prohibiting the acquisition of nuclear reprocessing and enrichment facilities.[314] In return, states with those capabilities would "provide internationally guaranteed, economically attractive supplies of the fuel and services necessary to meeting nuclear energy demands."[315] Furthermore, even if a state withdrew from the Treaty, it would be held responsible for violations that occurred prior to its withdrawal.[316]

The second obligation requires an effort to "[d]evalue the [p]olitical and [m]ilitary [c]urrency of [n]uclear [w]eapons."[317] Here, the strategy mandates that all states "diminish the role of nuclear weapons in security policies and international politics."[318] This obligation is directly adverse to Bush's strategy because it mandates that nuclear-weapon states "disavow the development of any new types of nuclear weaponry, reaffirm the current moratorium on nuclear weapon testing, and ratify the Comprehensive Test Ban Treaty."[319] Furthermore, there would be a requirement to "lengthen the

307. *Id.* at 37.
308. *Id.* at 38–39.
309. *Id.* at 41–44.
310. *Id.* at 56.
311. *Id.* at 55.
312. *Id.* at 36.
313. *Id.* at 37.
314. *Id.*
315. *Id.*
316. *Id.*
317. *Id.* at 38.
318. *Id.*
319. *Id.*

time decision makers would have before deciding to launch nuclear weapons, and . . . make nuclear weapon reductions . . . irreversible and verifiable."[320]

The third obligation would require "all states [to] maintain robust standards for securing, monitoring, and accounting for all fissile materials in any form."[321] This obligation would require the United States and its partners to "identify, secure, and remove nuclear materials from all vulnerable sites within four years."[322] Meanwhile, "high-level" discussions should occur to "establish a new global standard for protecting weapons, materials, and facilities."[323]

The fourth obligation requires all states to create enforceable laws against "individuals, corporations, and states who assist others in secretly acquiring the technology, material, and know-how needed to develop nuclear weapons."[324] This obligation would also increase restrictions on the transfer of nuclear technology by the Nuclear Suppliers Group (NSG), making it mandatory for NSG to condition transfer on the existence of enforceable laws.[325] Furthermore, the NSG's sharing of information with the IAEA should be expanded and "obligatory for transfer of all controlled items."[326]

The fifth obligation requires nuclear-weapon states to lead the resolution of regional conflicts that have historically caused states to pursue nuclear weapons as a security measure.[327] This obligation requires "the major powers [to] concentrate their diplomatic influence on diffusing the conflicts that underlie these and possibly other nations' determination to possess nuclear weapons."[328]

The sixth obligation focuses on resolving the India-Israel-Pakistan problem.[329] Efforts to demand these states to abandon their nuclear weapons "absent durable peace in their respective regions and progress toward global disarmament" are unrealistic.[330] Instead, the international community should concentrate on "persuading the three states to accept all

320. *Id.* at 38–39.
321. *Id.* at 39.
322. *Id.* at 40.
323. *Id.*
324. *Id.*
325. *Id.* at 41.
326. *Id.*
327. *Id.*
328. *Id.* at 41–42.
329. *Id.* at 42.
330. *Id.* at 43.

the nonproliferation obligations accepted by the five original nuclear-weapon states, which they are now committed to do."[331]

Achieving the objectives laid out above is a major endeavor. The strategy demands a strengthened international legal regime that converts "soft" law into "hard" law.[332] This would create certainty within the world community that any violation of the rewritten Treaty would result in predictable economic sanctions and, if necessary, military action.[333] Individual states must pass domestic legislation to make this change. In addition, the Security Council and the U.N. General Assembly must adopt resolutions, such as that withdrawal from the NPT does not relieve a state from sanctions for previous violations of the Treaty.[334] Sanctions under such a resolution might include dismantling equipment associated with nuclear technology and, if a government proves recalcitrant, "destruction of the facilities, equipment, or material in question."[335] However, the less-than-stellar nuclear records of the permanent members of the Security Council cut against its credibility.[336] This must be fixed—the NPT nuclear-weapon states (for example, the five permanent members of the Security Council) must meet their own NPT obligations in order to gain legitimacy. In any case, even the *Universal Compliance* strategy perpetuates remnants of the imbalance of power—for example, by accepting existing reprocessing and uranium enrichment plants while restricting other countries from doing the same.

Nonetheless, this strategy tackles many of the problems endemic to the status quo. In the context of current world events, the selective enforcement of NPT obligations further isolates less powerful states or those not aligned with a nuclear power. But history teaches that a friend today may be a foe tomorrow. By tightening the Treaty and ensuring predictable enforcement when it is violated, the United Nations may mitigate the tensions spawned by the imbalance of power. Conversely, continued imbalance in enforcement will only encourage states to pursue nuclear weapons to protect their national interests in an unpredictable international environment.

Universal Compliance sets out a compelling strategy but faces almost insurmountable political hurdles. As seen in *Committee of U.S. Citizens*

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331. *Id.*

332. *See id.* at 192 (calling for criminalization and prosecution of both state and non-state violations of the new framework).

333. *Id.* at 55–56.

334. *Id.* at 56.

335. *Id.*

336. *Id.* at 64 ("[The Council's] disposition to enforce nonproliferation [is] gravely weakened when its members' hands are not clean.").

Living in Nicaragua v. Reagan, U.S. courts are unwilling to enforce treaty obligations that are unsupported by domestic legislation.[337] By demanding that all countries obey the NPT, the U.N. in effect asks states to sacrifice some autonomy. In the case of the United States, Congress and the Executive Branch would have to act in concert against a political climate that remains hostile to international regulation. Other global powers will be similarly resistant. Unfortunately, the permanent members of the Security Council "face a legitimacy deficit when it comes to enforcing nuclear nonproliferation."[338] This is for at least two reasons: "Not only do these five states possess nuclear arsenals and evince little genuine interest in fulfilling their commitments to dismantle them, their own track records betray varying degrees of imperfect adherence to nonproliferation norms and rules."[339] Considering the potential consequences of a failed international framework for the management of nuclear technologies, this trend must be reversed.

2. A Strengthened Non-proliferation Regime Does Not Support Expansion of Nuclear Power

Assuming the Report's "hard law" recommendations can be achieved, these changes might improve the control of nuclear technology. Even if this were true, however, it in no way suggests that an expansion of nuclear power is wise. The risks involved with the current level of nuclear power generation have proved unmanageable within an international law framework. Furthermore, given the history of nuclear-power development, the GNEP Strategic Plan's promise of new technologies to prevent misuse of nuclear materials must be viewed skeptically. In fact, the Plan itself acknowledges that this new technology is no guarantee against proliferation: "[T]here is no technology 'silver bullet' that can be built into an enrichment plant or reprocessing plant that can prevent a country from diverting these commercial fuel cycle facilities to non-peaceful use."[340]

The NPT, historically, was systematically violated by the nuclear-power states, the non-nuclear-power states and the non-NPT states. This systematic lack of adherence to the NPT strongly cuts against any claim that development and testing of nuclear weapons is a violation of international custom or law. As explained earlier, customary international law may be derived from the consistent behavior of state actors. If the

337. Comm. of U.S. Citizens Living in Nicar. v. Reagan, 859 F.2d 929, 936 (D.C. Cir. 1988).
338. *Id.* at 34.
339. *Id.* at 34–35.
340. GNEP 2007 STRATEGIC PLAN, *supra* note 1, at 3-10.

behavior of the global community is used to determine the law, then wholesale violations of the NPT seem to be the law.[341] The Treaty itself has proven insufficient to effectively manage the increasing proliferation risks associated with the technology. The threats are no longer limited to state actors. Expansion of nuclear power will create more opportunities for diversion of nuclear material and more opportunities for bad actors to gain the expertise necessary to harness the destructive power of the atom. A finding in the MIT study on the future of nuclear power expresses the proliferation concern well: "The current international safeguards regime is inadequate to meet the security challenges of the expanded nuclear deployment contemplated in the global growth scenario."[342] In other words, there are less risky ways to boil water.

III. PLANT SAFETY AND PUBLIC ACCEPTANCE OF RISK

The more nuclear power plants, the higher the risk of nuclear accidents. As recognized by the Kemeny Commission, which investigated the cause of Three Mile Island (TMI) accident, there is a strong tie between nuclear accidents and public acceptance of the technology. "We are convinced that, unless . . . industry and [the NRC] undergo fundamental changes, they will over time totally destroy public confidence and, hence, they will be responsible for the elimination of nuclear power as a viable source of energy."[343] The industry claims that the safety record for nuclear power plants is outstanding, which is true compared to a less hazardous industry. However, this logic obscures the catastrophic potential of a nuclear accident. In addition to being relatively safe, so far the industry has been exceedingly lucky. Whether an accident is caused by faulty design, aging equipment, operator error, or outright negligence, the outcome may be the same. The expansion of nuclear power increases the likelihood that a serious accident could occur.

During the lifecycle of a nuclear power plant, the risk of a catastrophic accident follows a function some call the "bathtub curve."[344] The bathtub curve predicts high failure risks during the "break-in phase" and the "wear-out phase," with relatively lower risks during a relatively stable "middle life

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341. On the other hand, since World War II, no country has ever used nuclear weapons against another, and this is arguably an important international norm as well.

342. MIT STUDY, *supra* note 31, at ix.

343. KEMENY, *supra* note 100, at 25.

344. DAVID LOCHBAUM, UNION OF CONCERNED SCIENTISTS, U.S. NUCLEAR PLANTS IN THE 21ST CENTURY: THE RISK OF A LIFETIME 3 (2004).

phase."[345] The break-in phase represents the early years where inexperience, previously undetected vulnerabilities, manufacturing defects, material imperfections and poor workmanship result in a higher failure rate.[346] Fermi-1, Three Mile Island-2, St. Laurent, Browns Ferry, the Sodium Research Experiment, Chernobyl Unit 4 and the Idaho SL-1 reactor are among the worst failures occurring in this phase.[347] During this phase, the failure rate declines until it reaches a near-constant rate.[348] The middle life phase represents the "useful lifetime" of a plant, with the lower failure rate attributed to improvements in equipment design and a better operational understanding of the technology.[349] A recent near miss at the Davis-Besse nuclear plant is a prime example of the type of safety issues that arise during this phase.[350] After a certain point, the failure rate will begin to increase again as the product enters its wear-out phase.[351] This stage is gaining analytical significance as many plants built a generation ago reach the end of their license periods and receive license extensions. In addition, the older plants appear to be susceptible to greater failures. "[W]hile the number of events is decreasing, their severity increases, with the near misses getting nearer to disaster."[352] Thus, while the nuclear-power industry has experienced a period of relative stability, this by no means indicates that a future catastrophe is becoming less likely.

A. Early Safety Studies

In 1957, the AEC's WASH-740 Report (Brookhaven Report) was the first study of reactor hazards and it predicted 3400 deaths; 43,000 injuries; between 18 and 150,000 square miles affected by radiation fallout; and $7 billion in property damage resulting from a catastrophic accident.[353] In 1964-1965, an update to the Brookhaven Report was developed with the goal of showing an improvement in safety.[354] However, larger reactors resulted in worsened consequences, and the report was not published because the AEC believed that it would be misunderstood[355] and that public

345. *Id.* at 4.
346. *Id.*
347. *Id.* at 5.
348. *Id.* at 4.
349. *Id.*
350. *Id.* at 14.
351. *Id.* at 4.
352. *Id.* at 19.
353. SMITH, *supra* note 20, at 205.
354. *Id.* at 206.
355. Bradford June 22 Presentation, *supra* note 96.

disclosure would negatively impact licensing of new reactors.[356] In 1973, the report was released in response to a Freedom of Information Act (FOIA) request by the Union of Concerned Scientists.[357] The report stated that an accident at one of the newer plants could cause around 45,000 human deaths.[358]

In 1972, the AEC funded a project intended to establish the probability of a nuclear accident.[359] The project used the "Probabilistic Risk Assessment" method, which requires sound information about the failures that can lead to an accident as well as the likelihood of failure.[360] The enormity of the project led the team to focus on one pressurized water reactor and one boiling water reactor.[361] The team then extrapolated to the ninety-eight remaining reactors in the American fleet.[362] In 1974, the resulting Rasmussen Report set the stage for an embarrassment that would deal nuclear-power industry a serious blow. This report claimed that the risks associated with living close to a nuclear plant were less than the chance of being struck by a meteorite.[363] Five years later, the partial meltdown at Three Mile Island proved the report flawed—the "particular accident sequence that occurred . . . was predicted [by the report] to have a probability of occurring of just once every 100,000 years."[364]

1. Early Push for Nuclear Power

It is difficult to understand the safety issues surrounding nuclear power plants without taking a brief look at the early years. In 1953, President Dwight Eisenhower gave his famous "Atoms for Peace" speech and created the concept of an "atomic pool"; widespread international desire for nuclear-power programs followed.[365] Soon thereafter, the AEC mentality of "too cheap to meter" developed, as did a strong drive for the promotion of

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356. SMITH, *supra* note 20, at 206.

357. *Id.*

358. *Id.*

359. *Id.*

360. *Id.* at 207.

361. *Id.*

362. *Id.*

363. *Id.*; The Nuclear History Site, Development of the Nuclear Power Industry, http://www.nuclear-history.org/power.html (last visited Mar. 6, 2007).

364. SMITH, *supra* note 20, at 207.

365. President Dwight D. Eisenhower, Address Before the General Assembly of the United Nations on Peaceful Uses of Atomic Energy (Dec. 8, 1953), *available at* http://www.eisenhower.archives.gov/speeches/Atoms_For_Peace_UN_Speech.html; Bradford June 20 Presentation, *supra* note 95; Bradford E-mail, *supra* note 11.

nuclear power.[366] The Atomic Energy Act of 1954 allowed private companies to own and operate nuclear facilities and gave licensing authority, as well as the dual missions of promotion and regulation of nuclear power, to the AEC.[367] The ambiguous safety standards of "adequate protection" or "no unacceptable risk" were created for the AEC by statute.[368] Perhaps the most telling indication of AEC attitude toward regulation of this toxic energy source was expressed by AEC Commissioner Willard Libby in 1955, when he said, "Our great hazard is that the great benefit to mankind will be killed aborning by unnecessary regulation."[369]

Despite the government's strong desire to pursue nuclear power, the utilities were hesitant.[370] The government overcame this hesitancy in several ways.[371] The passage of the Price-Anderson Act in 1957 unburdened operators of liability in the event of a catastrophic accident.[372] Large government subsidies paved the way for the atomic intoxication to come.[373] On the international front, the IAEA was created in 1957 to promote peaceful uses of nuclear technology worldwide.[374] In 1968, IAEA's mission expanded to include proliferation concerns when the NPT created international controls and safeguards over nuclear technology and material.[375]

2. Atomic Intoxication—Eyes Wide Shut

The Bandwagon Market of the 1950s and 1960s was a period characterized by government and industry intoxication with the toxic atom—an energy source and technology not understood by either.[376] As manufacturers introduced this technology at a "turnkey" contract price well below cost (unknowingly to the buyer), enthusiasm for nuclear energy grew quickly, and eight more turnkey contracts were signed.[377] The

366. Bradford June 20 Presentation, *supra* note 95; Bradford E-mail, *supra* note 11.
367. Bradford June 20 Presentation, *supra* note 95.
368. *Id.*
369. *Id.*
370. SMITH, *supra* note 20, at 7.
371. *Id.*
372. *Id.*
373. *Id.*
374. Bradford June 20 Presentation, *supra* note 95.
375. SMITH, *supra* note 20, at 9; Bradford June 20 Presentation, *supra* note 95.
376. Bradford June 22 Presentation, *supra* note 96.
377. IRVIN C. BUPP & JEAN-CLAUDE DERIAN, LIGHT WATER: HOW THE NUCLEAR DREAM DISSOLVED 48–49 (1978). A "turnkey" offer was a manufacturer's contract to build a complete nuclear generating facility at a guaranteed price, subject only to changes reflecting inflation. *Id.* at 48. "All the electric utility had to do was 'open the door' of its complete plant at a specified date in the future and start the generating equipment—hence the name 'turnkey.'" *Id.*

manufacturers provided more plants, but modified the contracts to allow for cost adjustments.[378] The pace of nuclear plant construction quickened despite a lack of knowledge about the costs of the technology.[379] The intoxication was so great that Philip Sporn, president of the American Electric Power Company, who was nearly alone in criticizing the economic analyses supporting the market, was criticized not only by the industry, but also by the AEC for his skeptical view.[380] Meanwhile, operational expertise was lacking because the technology requires time for operators to become familiar with it.[381] Even more problematic was that experience with a low-capacity plant did not translate to experience in the newer, higher capacity plants.[382] As a result, a lack of operating experience developed.[383] Furthermore, the swift pace of expansion and a shortage of licensing personnel burdened the agency with delays and increasing pressure to meet demand.[384] The emphasis on licensing took resources away from the safety side of the AEC program.[385] This bandwagon market resulted in industry and government control of a technology that they did not know how to operate.

B. The Awakening

The intoxication with nuclear power came to a screeching halt because of massive cost overruns, increased state scrutiny, and falling oil prices.[386] The Rasmussen Report, paid for by the AEC, informed the public that the chance for a major nuclear incident was only one-in-a-million; five years later, this statement was difficult to believe, and public confidence was shaken.[387] The accident at Three Mile Island (TMI) brought the general

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378. *Id.* at 49.

379. *Id.* at 47–50, 71; Bradford June 21 Presentation, *supra* note 97; Bradford E-mail, *supra* note 11.

380. BUPP & DERIAN, *supra* note 377, at 45–47, 50, 80–81.

381. *Id.* at 70–71; *see also* LOCHBAUM, *supra* note 344, at 6 (noting that nuclear accidents have "revealed problems that were not apparent on the blueprints, in the computer models, or in the laboratory").

382. BUPP & DERIAN, *supra* note 377, at 70–71.

383. *Id.*

384. Bradford June 21 Presentation, *supra* note 97.

385. KEMENY, *supra* note 100, at 20; Bradford E-mail, *supra* note 11; Bradford June 21 Presentation, *supra* note 97.

386. Bradford E-mail, *supra* note 11.

387. *Id.*; *see also* SMITH, *supra* note 20, at 209 (discussing misleading uses of probability statistics); The Nuclear History Site, *supra* note 363; KEMENY, *supra* note 100, at 13. *But see* William A. Gamson & Andre Modigliani, *Media Discourse and Public Opinion on Nuclear Power: A Constructionist Approach*, 95 AM. J. SOC'Y. 1, 15–35 (1989) (evaluating media discourse and public

public into a situation that they had been told could not happen.[388] In the wake of the accident, Arizona Congressman Morris Udall, chairman of the House Committee on Interior and Insular Affairs, said, "We may have rushed headlong into a dangerous technology without sufficient understanding of the pitfalls."[389]

1. Three Mile Island and Chernobyl

On Wednesday, March 28, 1979 at 4:00 a.m. the Three Mile Island nuclear plant was operating at nearly full power.[390] A feed water pump in the non-nuclear section of the plant tripped off, causing heat to build up in the turbines. This resulted in increased pressure in the nuclear section of the plant, and a pilot-operated relief valve (PORV) on top of the pressurizer was opened to relieve excess pressure. However, the PORV stuck open, undetected by the operators, setting the stage for the worst nuclear reactor accident in U.S. history.

As early as 6:00 a.m. on Wednesday, there was evidence of a rupture in the fuel cladding that allowed radioactive gas to escape into the coolant water.[391] The elevated radiation levels in the containment area were the first signs of a leak.[392] The uncovered fuel cladding reacted with the steam and created hydrogen.[393] A loud "thud," as described by a utility employee, was heard at 1:50 p.m. in the control room.[394] This "thud" was dismissed initially as "the slamming of a ventilation damper."[395] The recognition that the sudden pressure rise resulted from a hydrogen explosion came late Thursday.[396] The radiation released by Friday had caused higher radiation levels above the plant—a factor in determining whether to order a precautionary evacuation.[397] But the big scare came with the realization

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opinion throughout the history of nuclear power development, including the TMI accident, and suggesting erosion of public confidence may have been short-lived).

388. *See A Nuclear Nightmare*, TIME, Apr. 9, 1979, at 8, 19. Robert Byrd, Senate Majority Leader at the time, said, "We've been assured time and time again by the industry and [government] agencies that this was something that was impossible, that could not happen, but it did happen." *Id*.

389. *Id.*

390. 2 NUCLEAR REGULATORY COMM'N SPECIAL INQUIRY GROUP, THREE MILE ISLAND: A REPORT TO THE COMMISSIONERS AND TO THE PUBLIC, pt. 2, at 309 (1979) [hereinafter NRC SPECIAL INQUIRY GROUP].

391. KEMENY, *supra* note 100, at 99.

392. *Id.*

393. *Id.* at 107.

394. *Id.*

395. *Id.*

396. *Id.*

397. *See id.* at 116–23 (describing the decision-making process leading to the choice to evacuate).

that a hydrogen bubble was building within the containment building.[398] On Saturday, the fear was that an explosion within the containment building would result in greater leakage of radiation into the environment.[399] However, this risk was later proven unlikely since the oxygen level present in the building would not support an explosion.[400]

In fact, industry was quite critical of the government's "overreaction" to the event.[401] The irony of the industry's position was that the public risk was at its greatest during the first two days when the public concern was low because of a lack of information.[402] However, as the condition of the plant was brought back under control and the public risk lowered, the public anxiety worsened—fueled by misinformation, hydrogen-bubble worries, confusion and a sense that the government's actions to protect the local community were inadequate.[403] While the industry's criticism of the over-reaction to the accident at the end of the episode is perhaps understandable, it ignores the fact that during the first two days, industry and government reacted insufficiently to the potential public risk.[404] If there is a public right-to-know regarding existing risk during a catastrophic accident, TMI did not afford this right to the public.

TMI taught the NRC and industry that the presence of human operators would not necessarily improve a situation where equipment fails.[405] This "mindset" is addressed early in the Kemeny Commission Report as a substantial factor in the seriousness of the accident.[406] "To prevent nuclear accidents as serious as Three Mile Island, fundamental changes will be necessary in the organization, procedures, and practices – and above all – in the attitudes of the Nuclear Regulatory Commission and . . . of the nuclear industry."[407] The absence of serious accidents lulled the NRC and industry into a "conviction" that the technology was safe. "The Commission is

398. *Id.* at 126.

399. *Id.*

400. *Id.* at 134.

401. *See* WNA TMI 1979, *supra* note 7 ("[A] political storm was raging based on confusion and misinformation."); *see also* KEMENY, *supra* note 100, at 126, 134 (criticizing NRC for failing to inform the public that fears of an explosion were unfounded).

402. KEMENY, *supra* note 100, at 18; Peter Bradford, Nuclear Power and Public Policy—Stalemate and Retrenchment, 1982-1992, Course Presentation at Vermont Law School (June 27, 2006) (PowerPoint on file with author) [hereinafter Bradford June 27 Presentation].

403. KEMENY, *supra* note 100, at 18; Bradford June 27 Presentation, *supra* note 402.

404. Bradford June 27 Presentation, *supra* note 402; *see also* KEMENY, *supra* note 100, at 112–15 (chronicling a lax official response until NRC became aware of the seriousness of core damage on March 29).

405. KEMENY, *supra* note 100, at 8–9.

406. *Id.*

407. *Id.* at 7

convinced that this attitude must be changed to one that says nuclear power is by its very nature potentially dangerous, and, therefore, one must continually question whether the safeguards already in place are sufficient to prevent major accidents. A comprehensive system is required in which equipment and human beings are treated with equal importance."[408] Operator training became a focus of improvements after this report.

The Energy Reorganization Act of 1974 "divorce[d] the newly created NRC from promotion of nuclear power."[409] However, the Commission found that the NRC had not properly abandoned its prior mission and was still trying to "nurture a growing industry."[410] Also, the NRC failed to communicate known safety problems to facilities with similar reactors, thereby preventing lessons learned at one plant from being available to the entire industry.[411] In fact, an accident at another plant involving operator error in turning off the cooling system had occurred prior to TMI.[412]

> [W]e were lucky that the circumstances under which this error was committed did not lead to a serious accident[; a senior engineer] warned that under similar circumstances (like those that would later exist at Three Mile Island), a very serious accident could result. He urged, in the strongest terms, that clear instructions be passed on to the operators. This memorandum was written 13 months before the accident at Three Mile Island, but no new instructions resulted from it.[413]

Perhaps the most disturbing fact is that the utility found itself operating a nuclear reactor under unknown and unpredictable conditions.[414] In its report to the Commissioners, the NRC Special Inquiry Group stated that a meltdown of the core "almost occurred twice" on the first day.[415] The report estimates that "the reactor was probably within about 30 to 40 minutes of [meltdown]," but the lack of information on the condition of the core makes it impossible to reasonably estimate how close the reactor came to meltdown as the event approached its fourth hour.[416] When the dust cleared, the industry and agency discovered that the TMI Unit 2 core

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408. *Id.* at 9.
409. *Id.* at 51.
410. *Id.*
411. *Id.* at 10.
412. *Id.*
413. *Id.*
414. *Id.* at 15.
415. NRC SPECIAL INQUIRY GROUP, *supra* note 390, at 536.
416. *Id.*

experienced a partial meltdown "just one year and one day after first achieving criticality."[417]

The Chernobyl disaster proved that a worse event could result from operator error.[418] The nuclear technology used at Chernobyl was dissimilar to the American light water reactors.[419] Experts, however, urged that the accident held "important lessons for all nuclear power plants."[420] For example, radioactive contamination impacted land 100 miles away.[421] At the time of the accident, this impact was ten times greater in distance than any emergency planning zone established in the United States.[422]

Other lessons learned from Chernobyl included the possibility that a "worst case" accident was no longer speculative; more safety devices than used even in the West were needed to prevent an accident; human error remained a significant risk in the safe operation of a nuclear power plant; many gaps existed in emergency response procedures; and timely notifications to the global community were needed when an event occurs.[423] Dr. Morris Rosen, a top American staff member at the IAEA in 1986, stated that Chernobyl showed that even the existing containment vessels in the West are vulnerable to failure in the event of explosions that could result from a similar accident.[424] Despite these lessons, one year later a spokesperson for the NRC and industry stated that a similar accident in the United States was "precluded by differences in design . . . including the requirement that commercial reactors have containment domes."[425] The salient question is whether this change in opinion was driven by sound science or by economic interests. As one commentator noted, "[O]ne could envision Pravda in 1979 [after TMI] saying, 'It can't happen here.'"[426]

The American nuclear industry may rightfully take pride in its safety and productivity record since TMI. Over that period (1981–2005), capacity increased by about 1.9 times, but production increased threefold.[427] Also,

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417. SMITH, *supra* note 20, at 31.

418. Stuart Diamond, *Chernobyl Causing Big Revisions in Global Nuclear Power Policy*, N.Y. TIMES, Oct. 27, 1986, at A1.

419. Malcolm W. Browne, *The 1986 Disaster at Chernobyl: A Year Later, Lessons are Drawn; In West, After Anxiety, No Major Technical Changes in Industry*, N.Y. TIMES, Apr. 26, 1987, at A1.

420. Diamond, *supra* note 418.

421. *Id.* Within 100 miles of the Indian Point nuclear power plant lies New York City, Albany, Trenton and Hartford—and 20 million people.

422. *Id.*

423. *Id.*

424. *Id.*

425. Browne, *supra* note 419.

426. Barry S. Zitser, *Connecticut Opinion; Chernobyl Puts Us All on the Spot*, N.Y. TIMES, May 18, 1986, at 11CN.

427. Bradford June 29 Presentation, *supra* note 52.

plant capacity factors improved from 65% in 1990 to 90% in 2002.[428] In addition to this significant improvement, the industry has reduced the number of detected "significant" safety events from fifty in 1990 (one for every two units) to one for every three units in 2000.[429] The question is whether this avoidance was the result of sound industry practices or luck. The near miss at the Davis-Besse plant in Ohio in 2002 sheds some light on this.

2. Davis-Besse

After shutdown of the plant in February 16, 2002, the utility discovered that a boric acid leak had eaten through 6-3/4 inches (or seventy pounds) of carbon steel from a relatively important piece of equipment—the nuclear reactor head.[430] The remaining 3/16-inch stainless steel liner, though "bulged," managed to withstand the "2000-plus pounds per square inch pressure inside the pressure vessel."[431] After the discovery, the NRC evaluated the operator FirstEnergy's performance and found its safety program weak.[432] Davis-Besse's corrective action program was ineffective in monitoring and fixing recurring leakage from the reactor cooling system.[433] FirstEnergy personnel did not systematically enter equipment issues into the corrective action system because the individuals responsible for recording them were also responsible for fixing the problem.[434] Finally, cost considerations appeared to be the primary rationale for FirstEnergy's failing to complete modifications designed to more easily detect problems on the pressure vessel head.[435] However, the spotlight soon turned to the actions of the NRC itself.[436]

While the mere existence of a "pineapple-sized" hole in a reactor is a concern, the events leading up to that discovery indicated more severe

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428. Dr. Richard A. Meserve, former Chairman, U.S. Nuclear Regulatory Comm'n, Remarks at the 2002 INPO CEO Conference, Safety Culture: An NRC Perspective (Nov. 8, 2002), *in* NRC NEWS, No. S-02-033.

429. *Id.*

430. DAVID LOCHBAUM & PAUL GUNTER, UNION OF CONCERNED SCIENTISTS, ANATOMY OF A FLAWED DECISION: NRC HAS A BRAIN, BUT NO SPINE 1 (2002), http://www.nirs.org/reactorwatch/aging/nirsucsrptnrcbrainbutnospine.pdf; Matthew L. Wald, *Safety Lapse at Ohio Reactor Is Cited as Potential Peril for Others*, N.Y. TIMES, Nov. 20, 2002, at A21.

431. LOCHBAUM & GUNTER, *supra* note 430, at 1.

432. U.S. GEN. ACCOUNTING OFFICE, REPORT TO CONGRESSIONAL REQUESTORS: NRC NEEDS TO MORE AGGRESSIVELY AND COMPREHENSIVELY RESOLVE ISSUES RELATED TO THE DAVIS-BESSE NUCLEAR POWER PLANT'S SHUTDOWN 28 (2004) [hereinafter GAO SHUTDOWN REPORT].

433. *Id.*

434. *Id.*

435. *Id.*

436. *Id.* at 2.

concerns, such as the NRC's tendency to continue to weigh economic concerns over public safety.[437] In March 2001, circumferential cracking of control rod drive mechanisms were discovered at the Davis-Besse sister plant (Oconee in South Carolina).[438] Cracking at other plants was found subsequent to the Oconee discoveries.[439] In August 2001, the NRC issued a bulletin[440] ordering certain units, including Davis-Besse, to inspect vessel heads by December 31, 2001, or to "provide technical justification for later inspections."[441] FirstEnergy challenged the deadline, but NRC staff continued to fight for the December 31, 2001 deadline.[442] Ignoring established safety policies and procedures, NRC management overruled the staff order for FirstEnergy to meet the established deadline.[443] "The NRC . . . wanted to avoid economically penalizing FirstEnergy by requiring Davis-Besse to be immediately shut down before the company had time to stage the personnel and equipment needed to conduct the vessel head inspections."[444]

A General Accounting Office (GAO) review and others were heavily critical of the NRC oversight at Davis-Besse. In its negotiation with Davis-Besse over shutdown, the NRC ignored four out of five safety principles, any of which would have been sufficient to order the shutdown of a nuclear power plant.[445] The NRC's mindset still favors the promotion of nuclear

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437. *Id.* at 37–38.

438. *Id.* at 15; LOCHBAUM & GUNTER, *supra* note 430, app. 1.

439. *Id.*

440. The GAO report explained NRC's use of bulletins:

> NRC uses generic communications—such as bulletins, generic letters, and information notices—to provide information to and request information from the nuclear industry at large or specific groups of licensees. Bulletins and generic letters both usually request information from licensees regarding their compliance with specific regulations. They do not require licensees to take any specific actions, but do require licensees to provide responses to the information requests. In general, NRC uses bulletins, as opposed to generic letters, to address significant issues of greater urgency. NRC uses information notices to transmit significant recently identified information about safety, safeguards, or environmental issues. Licensees are expected to review the information to determine whether it is applicable to their operations and consider action to avoid similar problems.

GAO SHUTDOWN REPORT, *supra* note 432, at 11.

441. *Id.* at 15; LOCHBAUM & GUNTER, *supra* note 430, at 9.

442. *Id.* app. 1.

443. GAO SHUTDOWN REPORT, *supra* note 432, at 37; LOCHBAUM & GUNTER, *supra* note 430, app. 2.

444. *Id.* at 7; *see also* GAO SHUTDOWN REPORT, *supra* note 432, at 37–38 ("NRC's decision was driven in large part by a desire to lessen the financial impact on FirstEnergy that would result from an early shutdown.").

445. LOCHBAUM & GUNTER, *supra* note 430, at 7, app. 1.

power over its role to regulate safety. Given Senator Domenici's strong-arming of the NRC in 1998, this is not surprising. During a "showdown" with the NRC head, the Senator "threatened to slash the agency's budget unless it became friendlier to industry."[446]

On November 1, 2005, in the wake of Davis-Besse, NRC staff reported that forty-eight out of forty-nine recommendations for improvement were implemented in response to findings surrounding the Davis-Besse near miss.[447] However, the GAO concluded that the NRC was not addressing three major systemic issues: the inability to detect an eroding safety culture within a plant; deficiencies in making a reasoned decision to order a plant shutdown; and the lack of long-term tracking of fixes resulting from experiences similar to that found at Davis-Besse.[448]

The following sequence of events reported by the Union of Concerned Scientists further emphasizes the fact that the NRC was aware of the safety problems that resulted in the Davis-Besse near miss.

> Less than two years after another similarly skipped inspection contributed to an accident at the Indian Point 2 nuclear plant, the NRC allowed Davis-Besse to skip the mandated 2001 year-end inspection.
>
> After CRDM nozzle cracking was reported at Bugey Unit 3 in 1991, the NRC initiated a research program to examine the issue for [U.S.] reactors. As the NRC research program was plodding along, Greenpeace International petitioned the NRC on March 24, 1993, to require inspections of CRDM nozzles at all US reactors and to make the inspection results publicly available. Greenpeace also sought to shut down all reactors with cracked nozzles. The NRC denied Greenpeace's requests nearly two years later.
>
> NRC denied Greenpeace's petition in large part because of a research report prepared by the Idaho National Engineering Laboratory for the NRC. This report, released in October 1994, concluded "CRDM nozzle cracking is not a short-term safety issue. All the detected cracks on the nozzle inside surface are axially oriented. . . . Some

446. Stuckey, *supra* note 22.

447. U.S. Nuclear Regulatory Comm'n Staff, PowerPoint Presentation on Status of Implementation of Davis-Besse Lessons Learned Task Force Recommendations (Nov. 1, 2005), *available at* http://www.nrc.gov/reading-rm/doc-collections/commission/slides/2005/20051101/staff_files/frame.html.

448. GAO SHUTDOWN REPORT, *supra* note 432, at 45.

> analyses have shown that short, circumferential cracks on the outside surface are possible; however, these cracks are not expected to grow through-wall . . . ." At the time of this conclusion, a grand total of one (1) US nuclear plant (Point Beach Unit 1 in Wisconsin) had been inspected for CRDM nozzle cracking.
>
> After large, through-wall, circumferential cracking was found on the outside surface of two CRDM nozzles at Oconee Unit 3 in August 2001, the NRC asked plant owners to write them about inspections of CRDM nozzles and the extent of identified cracking. In essence, the NRC only did part of what Greenpeace asked eight years earlier.
>
> After a huge gaping hole was found in the reactor head at Davis-Besse, the NRC finally sought the inspections that Greenpeace requested nine years earlier.[449]

Both the NRC and industry were aware of the problem that caused the corrosion of the reactor head ten years earlier.[450] In fact, other countries took actions years before to resolve the identified problem.[451] However, both U.S. industry and the NRC dropped the concern because they believed leaks would be detected in time to prevent the corrosion.[452]

C. Civilian Versus Military Nuclear Safety

A discussion of nuclear safety is incomplete without a comparison of civilian and military safety records. The accidents considered relevant for this Note are those where contamination reached the environment. In other words, accidents consisting of property damage, but no environmental release, are not included. Also, this analysis only includes civilian power generation facilities and military nuclear ships (including submarines). It should be noted that environmental releases of nuclear material occur at all stages of the nuclear-fuel lifecycle, including mining, power generation, reprocessing, and waste storage.

Historically, at least ten accidents have occurred at civilian power generation facilities causing releases to the environment.

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449. UNION OF CONCERNED SCIENTISTS, DAVIS-BESSE: THE REACTOR WITH A HOLE IN ITS HEAD 4–5 (2002), *available at* http://www.ucsusa.org/assets/documents/clean_energy/ACFNx8tzc.pdf (footnotes omitted).

450. *Id.*

451. GAO SHUTDOWN REPORT, *supra* note 432, at 31.

452. Union of Concerned Scientists, *supra* note 449.

Table 1. Civilian Accidents (Not Necessarily Releases)[453]

Date	Location	Accident	Release
Dec. 12, 1952	Chalk River, Ontario	Damaged reactor core	Air release
Oct. 10, 1957	United Kingdom (Windscale)[454]	Fire	Radioactive material – massive air releases
July 26, 1959	Santa Susana Field Laboratory, California	Partial Meltdown	Radioactive gases – significant air releases
Feb. 22, 1977	Jaslovske Bohunice, Czechoslovakia	Damaged fuel rod assembly	Release into plant area
Mar. 28, 1979	Middletown, Pennsylvania	Partial Meltdown	Radioactive gases – air release.
Mar. 13, 1980	Orleans, France	Fuel bundles – rupture	Nuclear materials - release
Apr. 26, 1986	Prypiat, Ukraine	Meltdown	Radioactive material – major air release
May 4, 1986	Hamm-Uentrop, Germany	Fuel damaged	Radioactive material detected two kilometers away
Apr. 10, 2003	Hungary (Paks–2)[455]	Fuel damaged during cleaning	Radioactive material – stack discharges
July 16, 2007	Japan (Kashiwazaki-Kariya)[456]	Earthquake	Radioactive releases to air and water

453. Wikipedia, List of Civilian Nuclear Accidents, http://en.wikipedia.org/wiki/List_of_civilian _nuclear_accidents (last visited Feb. 11, 2008). The Prypiat meltdown was the last major civilian nuclear-power environmental incident.

454. GEORGUI KASTCHIEV ET AL., RESIDUAL RISK—AN ACCOUNT OF EVENTS IN NUCLEAR POWER PLANTS SINCE THE CHERNOBYL ACCIDENT IN 1986, at 92 (2007), *available at* http:// www.greens-efa.org/cms/topics/dokbin/181/181995.pdf.

455. KASTCHIEV, *supra* note 454, at 77–78 (providing a summary of the radioactive releases and doses endured within the vicinity of the plant); WISE/NIRS Nuclear Monitor, Serious Incident at Hungarian Paks–2 Reactor, Apr. 25, 2003, http://www10.antenna.nl/wise/586/5507.html (last visited Feb. 11, 2008).

The number of civilian nuclear "accidents" listed above may seem misleading. While the incidents are characterized as accidents, the amount of radioactive material released during some "accidents," if any, may present little risk to the public. The most recent major U.S. accident, TMI, caused some environmental releases, but investigations and assessments indicate that "most of the radiation was contained."[457] Studies estimated an average dose of one millirem for each of the two million people in the area.[458] In comparison, "exposure from a full set of chest x-rays is about 6 millirem."[459] Maximum exposure at the property boundary was estimated at less than 100 millirem, and the "actual release had negligible effects on the physical health of individuals or the environment."[460]

On the other hand, Chernobyl was a major accident with much worse environmental and health effects. According to Dr. Burton Bennett, chairman of the Chernobyl Forum, "This was a very serious accident with major health consequences, especially for thousands of workers exposed in the early days who received very high radiation doses . . . ."[461] The accident was credited with 4000 cases of thyroid cancer (primarily in children), nine fatal.[462] "As of mid-2005 . . . 50 deaths [were] directly attributed to radiation from the disaster . . . ."[463] After the accident, some areas were restricted because of contamination by radiation materials.[464] Despite the difference in environmental and health harm between Chernobyl and TMI, the significance is that the civilian nuclear power plant operators lost control of the reactor sufficiently to release radioactive material into the environment.

Information on military-reactor accidents causing only an environmental release could not be found, but the number of naval reactor accidents gives some sense of the frequency with which such releases may occur. Nine such accidents in the Soviet Navy occurred between 1960 and 1985, as shown below.

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456. IAEA, PRELIMINARY FINDINGS AND LESSONS LEARNED FROM THE 16 JULY 2007 EARTHQUAKE AT KASHIWAZAKI-KARIWA NPP 11 (2007), *available at* http://www.iaea.org.

457. U.S. NRC, Fact Sheet: Three Mile Island, http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/fstmi.html.

458. *Id.*

459. *Id.*

460. *Id.*

461. Press Release, World Health Org., Chernobyl: The True Scale of the Accident (Sept. 5, 2005), *available at* http://www.who.int/mediacentre/news/releases/2005/pr38/en/index.html.

462. *Id.*; U.S. NRC, Fact Sheet on the Accident at the Chernobyl Nuclear Power Plant, http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/fschernobyl.html (last visited Feb. 11, 2008).

463. World Health Org., *supra* note 461.

464. *Id.*

Table 2. Radiation Casualties and Naval Reactors[465]

Date	Vessel, Location	Accident Type	Comments
Oct. 13, 1960	K-8 Sub, Barents Sea	Reactor leak	Radioactive gases leak into vessel
July 4, 1961	K-19 Sub, North Atlantic	Reactor accident	Coolant leak leads to exposure to radioactive steam
Feb. 12, 1965	K-11 Sub, Severodvinsk, USSR	Refueling reactor – accident	Criticality excursions during refueling
May 24, 1968	K-27 Sub, Barents Sea	Reactor accident	Coolant failure leads to radiation exposure
Jan. 18, 1970	Sormova, Russia	Construction accident	Radioactive vapor released
Dec. 28, 1976	K-386 Sub, Unknown	Reactor accident	No data
Dec. 28, 1978	K-171 Sub, Pacific Ocean	Reactor accident	Radiation exposure
1979	USSR Sub, Unknown	Reactor accident	No data
Aug. 10, 1985	K-431 Sub, Chazhma Bay, Vladivostok, Russia	Refueling reactor – accident	Explosion during refueling, radiation exposure, releases

This data shows that, similar to civilian nuclear-power operators, military operators experienced difficulties operating nuclear power plants. The U.S. Navy has proven more successful. Admiral Hyman Rickover, who is widely acknowledged as the father of the U.S. "Nuclear Navy," is credited with imbuing the Navy nuclear program with a strong safety culture that resulted in an excellent safety record. Since 1948, "[U.S.] nuclear-powered ships . . . safely steam[ed] more than 128 million miles, equivalent to over 5,000 trips around the Earth . . . without a reactor accident . . . indeed, with no measurable negative impact on the

465. This table compiles information provided at Wm. Robert Johnston, Naval Reactor Accidents Causing Radiation Casualties, http://www.johnstonarchive.net/nuclear/radevents/radevents3.html (last visited Feb. 11, 2008).

environment."[466] Admiral Skip Bowman stated, "Our record of safety is the result of our making safety part of everything we do, day to day, not a magic formula."[467] Interestingly, some credit Admiral Rickover's "*obsessive fixation* on safety and quality control [with giving] the U.S. nuclear Navy a vastly superior safety record to the Soviet one."[468] The very nature of nuclear technology and its consequences demand application of the so-called "obsessive fixation" on safety. This fixation must not be limited to the nuclear side of a nuclear plant. History has shown that the failure of non-nuclear components may cascade to problems with the nuclear reactor itself. Interestingly, it was Rickover's drive for "perfection" that motivated defense contractors to pursue his removal from the Navy—a purge carried out under Reagan.[469]

This data is not all bad for the civilian industry—it indicates that since Chernobyl, no major nuclear accident has occurred. The civilian nuclear industry has operated more than twenty years without a catastrophic release of radiation. The problem is that society is likely unwilling to tolerate high-risk technology with such severe consequences if the industry cannot assure safety. During the twenty years since Chernobyl, history showed an industry willing to sacrifice safety for cost savings and, in the United States, a regulatory agency willing to allow such sacrifices. Historically, the safety mindset within the civilian nuclear-power industry was not even close to the Rickover philosophy of excellence. Such a mindset is a necessary component for the future of civilian nuclear power.

D. The Recipe for Failure with High-Risk Technologies

Nuclear power is not the only high-risk technology society tolerates everyday, but it is likely the one with the worst consequences should failure occur. Other technologies include petrochemical plants, aircrafts, dams,

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466. Statement of Admiral F. L. "Skip" Bowman, U.S. Navy Dir., Naval Nuclear Propulsion Program, Before the House Committee on Science (Oct. 29, 2003) [hereinafter Bowman Testimony], *available at* http://www.navy.mil/navydata/testimony/safety/bowman031029.txt; Martin Sieff, *BMD Focus: O'Reilly Moves Up—Part 1*, UNITED PRESS INT'L, Oct. 4, 2007, *available at* http://www.upi.com/International_Security/Industry/Analysis/2007/10/04/bmd_focus_oreilly_moves_up_part_1/5682.

467. Bowman Testimony, *supra* note 466.

468. Sieff, *supra* note 466 (emphasis added).

469. *60 Minutes: Interview by Dianne Sawyer with Admiral Rickover* (CBS television Broadcast Dec. 9, 1984), *transcript available at* http://www.people.vcu.edu/~rsleeth/rickover.htm; *see also Rickover Says He Accepted Gifts from General Dynamics Corp. 'So Did Others,' He Claims on TV, but Doesn't Identify Them*, BOSTON GLOBE, Dec. 10, 1984, at 3, *available at* 1984 WLNR 69854 (noting that Rickover received gifts from at least five defense contractors during his career).

mines, and space and weapon systems.[470] Typical ingredients of system accidents that relate to human behavior include:

> (1) initial incomprehension about what was indeed failing; (2) failures are hidden and even masked; (3) a search for a *de minimus* explanation, since a *de maximus* one is inconceivable; (4) an attempt to maintain production if at all possible; (5) mistrust of instruments, since they are known to fail; (6) overconfidence in ESDs and redundancies, based upon normal experience of smooth operation in the past; (7) ambiguous information is interpreted in a manner to confirm initial (*de minimus*) hypotheses; (8) tremendous time constraints, in this case involving not only the propagation of failures, but the expending of vital consumables; and (9) invariant sequences, such as the decision to turn off a subsystem that could not be restarted.[471]

Some of these ingredients, as outlined above, played a role in the TMI accident and the Davis-Besse near miss. These same ingredients played a role in the Apollo 13 accident,[472] and the space shuttle Challenger and Columbia accidents.[473] An important distinction between the nuclear-power events and these space flight accidents is that NASA, a government entity, is responsible for space flight.[474] The analogy to space flight is not perfect, yet some interesting similarities in flawed decision-making exist. Both shuttle accidents resulted from known system deficiencies that remained unresolved: ambivalence about an identified, critical problem as successful operations continued; the push for production over safety; and ultimate failure or near-failure as decision-makers ignored the problem (and the

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470. CHARLES PERROW, NORMAL ACCIDENTS: LIVING WITH HIGH-RISK TECHNOLOGIES 3 (Princeton Univ. Press 1999) (1984).

471. *Id.* at 277.

472. *Id.*

473. *See generally* Ed Magnuson, *Fixing Nasa: As a Tough Report on* Challenger *Is Readied, the U.S. Debates Its Space Future*, TIME, June 9, 1986, at 14, *available at* http://www.time.com/time/magazine/printout/0,8816,961562,00.html (discussing the role institutional flaws at NASA played in the *Challenger* disaster and aftermath); PRESIDENTIAL COMM'N ON THE SPACE SHUTTLE CHALLENGER ACCIDENT (ROGERS COMMISSION), REPORT OF THE PRESIDENTIAL COMMISSION ON THE SPACE SHUTTLE CHALLENGER ACCIDENT 82 (1986), *available at* http://history.nasa.gov/rogersrep/genindex.htm (discussing flaws in decision making prior to the *Challenger* launch); U.S. DEP'T OF ENERGY, DEPARTMENT OF ENERGY ACTION PLAN: LESSONS LEARNED FROM THE COLUMBIA SPACE SHUTTLE ACCIDENT AND DAVIS-BESSE REACTOR PRESSURE-VESSEL HEAD CORROSION EVENT 1, 8–10 (2005) [hereinafter DOE LESSONS LEARNED].

474. At least with respect to flight, "the more commercial the activity, the safer it is." PERROW, *supra* note 470, at 126.

advice of their own experts) because of a sound safety record. "In both the Challenger and Columbia accidents: 'The machine was talking to us, but nobody was listening.'"[475]

While FirstEnergy and the NRC dodged a bullet at Davis-Besse, there are striking similarities to the shuttle disasters. FirstEnergy and the NRC knew of the nozzle leakage problem ten years before the accident. The industry and regulators agreed that the risk was so low that no immediate action was required. While pursuing some work on the safety concern, any other work was indefinitely delayed with the permission or acquiescence of the NRC. Worsening signs of the corrosion problem were found by FirstEnergy employees, and evidence—including a picture of the corroding reactor head—was in the possession of NRC inspectors well before shutdown. More than sufficient information was available for the industry and the regulators to conclude that the problem was serious. Furthermore, continued operation without incident was taken as a sign that all was well with the plant. Finally, despite staff arguments to the contrary, the NRC and the industry decision-makers sacrificed safety to the protection of other interests (i.e., economic and production). At Davis-Besse (and at its sister plants), the reactor was talking, but nobody was listening.

E. Safety—Conclusion

History shows that an expansion of nuclear power is risky. While equipment failures are a concern (especially as plants age), human failures were significant factors in the worst accidents and near misses thus far. Mr. Bradford puts the importance of the human factor into context, stating, "The abiding lesson that Three Mile Island taught Wall Street was that a group of [NRC] Reactor operators, as good as any others, could turn a $2 billion asset into a $1 billion cleanup job in 90 minutes."[476] This history shows that the old mindset of production over safety still imbues the nuclear-power industry—a mindset seemingly shared by regulators.

Unfortunately, the cutting of corners by the nuclear-power industry is not limited to U.S. plants. In 2002, the "Japanese Nuclear Industrial Safety Agency (NISA) shocked the nation with the public revelation of a massive data falsification scandal at [the Tokyo Electric Power Company] (TEPCO)."[477] TEPCO, the largest Japanese utility and among the largest

475. DOE LESSONS LEARNED, *supra* note 473, at 21.

476. Matthew L. Wald, *Interest in Building Reactors, but Industry Is Still Cautious*, N.Y. TIMES, Apr. 2, 2005, at A19.

477. Kastchiev et al., *supra* note 454, at 88.

worldwide, falsified records covering 200 events over twenty-five years.[478] Two other Japanese utilities were found to have falsified records as well, but not to the extent of TEPCO.[479] Despite the embarrassment suffered by the Japanese nuclear-power industry and NISA because of the revelation, more falsification incidents followed.[480] "The scandal of the data falsification, cover-up and misleading of safety authorities does not seem to end."[481] In 2007, Hokuriku Electric "admitted to a criticality incident" occurring nearly eight years ago.[482] Two similar incidents, though unconfirmed, followed at plants owned by Tohoku Electric and Chuba Electric.[483]

The events leading up to nuclear accidents are avoidable yet seem inevitable, repeating a familiar pattern of human failure to adequately anticipate disasters that have a low probability of occurring. Domestically, the NRC continues to prove that safety is not paramount in its regulatory mission and indeed has openly questioned whether it needs to play any role in regulating for public safety. Dr. Meserve, a former Chairman of the NRC, states that the NRC has resisted regulation of safety culture for a number of reasons: safety culture is very subjective; regulation "would intrude inappropriately on management prerogatives"; the best safety cultures develop because of the management's commitment; and regulatory pressure is viewed as unnecessary by some.[484] While he recognizes as critical the development of a strong safety culture within the nuclear industry, he states that, in the end, it will not be the NRC who determines whether a real safety culture will flourish.[485] "Ultimately [the nuclear industry itself] will determine whether an appropriate safety culture is created and maintained."[486]

Historically, the civilian industry failed to create a safety culture similar to Admiral Rickover's standard. As revealed by the Davis-Besse near miss, the domestic industry is willing to cut corners at the expense of public safety. Safety must compete with economics and this is a battle that led both the industry and the regulators to put the public at significant risk. By all accounts, Davis-Besse could have been much worse. Where the industry and NRC failed, Lady Luck saved the day. With or without an

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478. *Id.* at 89.
479. *Id.* at 90.
480. *Id.*
481. *Id.* at 91.
482. *Id.*
483. *Id.*
484. Meserve, *supra* note 428.
485. *Id.*
486. *Id.*

expansion of the industry, accidents are inevitable, but any expansion of this industry increases the risk of nuclear catastrophe. If Dr. Meserve is correct that the NRC cannot imbue a real safety culture within the nuclear industry, the question is whether the nuclear industry can be trusted to place the public interest above its own economic interest. The history of nuclear-power development suggests the answer is no.

CONCLUSION

The industry's recent successes show that nuclear power can be generated safely. However, as with other high consequence technologies, nuclear-power generation must be managed with a determined safety culture willing to resolve even the smallest risks with due care and diligence. While nuclear power can be generated safely, it is more likely that the competing economic priorities will lead to another Three Mile Island or worse. If this is not bad enough, the false divorce between peaceful and non-peaceful uses of the atom leave the global community vulnerable to state or terrorist-group mischief. While the U.S. and the global nuclear industry may survive another Three Mile Island, the diversion of nuclear material for a successful terrorist strike would threaten its very existence. Finally, the economics of nuclear power make little sense. The advertised economic competitiveness of this technology is an illusion created to move high and unpredictable costs away from the industry to the customer and taxpayer. Given the high cost, inherent risks and current vulnerabilities of this technology, an expansion of the nuclear-power technology is unwise.

While this Note has not discussed the environmental hazards of nuclear energy, these too raise significant questions about the industry's viability. If the NRC's approach to nuclear waste management documented in *Natural Resources Defense Council v. U.S. Nuclear Regulatory Commission* represents the current NRC mentality, expansion of nuclear power will be undermined by lack of government planning. In this 1976 case, the Natural Resources Defense Council alleged that the agency inadequately assessed the environmental effects of the generation and management of nuclear waste.[487] Dr. Frank K. Pittman, who directed the AEC's Division of Waste Management and Transportation, provided the

487. Natural Res. Def. Council v. Nuclear Regulatory Comm'n, 547 F.2d 633, 637–38 (D.C. Cir. 1976), *rev'd sub nom.* Vt. Yankee Nuclear Power Co. v. Natural Res. Def. Council, 435 U.S. 519 (1978).

only information on "high-level waste disposal techniques" in the record.[488] The AEC (now NRC) plan to create a repository in a salt mine was deferred and his new plan for a surface storage facility was delayed indefinitely.[489] Unable to offer a specific solution for disposal of this extraordinarily toxic waste, Dr. Pittman's "vague, but glowing" statement is best conveyed by quoting his words: "I hope I will be able to allay what I feel are unwarranted fears . . . and show that the *bugaboo* of waste management cannot logically be used as a rationale for delays in the progress of an essential technology for meeting our growing power demands."[490] His "conclusory reassurances" did not convince the court.[491] Spent fuel storage remains a divisive political and environmental issue, even as the government plans for the central nuclear waste repository at Yucca Mountain to start operating in 2017.[492]

Furthermore, as Davis-Besse's near hit indicates, the nuclear-power industry remains vulnerable to real safety risks. The deregulation of the electricity sector in 1992 subjects these power companies to pressures characteristic of a competitive marketplace.[493] "A disturbing but inevitable side-effect of nuclear power's need to cut costs is that it will resist costs of all kinds, including safety and safeguards."[494] The existence of this pressure heightens the need for the NRC to regulate nuclear safety firmly.

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488. *Id.* at 647.

489. *Id.* at 648.

490. *Id.* (emphasis added).

491. *Id.* at 653–55. On appeal the Supreme Court reversed, finding that the court could not require an agency to use additional procedures in creating the record for informal rulemaking under the Administrative Procedure Act, 5 U.S.C. § 533 (1976). Vt. Yankee Nuclear Power Co. v. Natural Res. Def. Council, 435 U.S. 519, 525 (1978). The Supreme Court upheld the NRC's decisions, but only on a relatively deferential standard of judicial review. *Id.* at 554.

492. NUCLEAR ENERGY INST., GOVERNMENT MUST COMPLETE YUCCA MOUNTAIN REPOSITORY TO MEET USED FUEL RESPONSIBILITY 1 (2006), *available at* http://www.nei.org/documents/Fact_Sheet_Government%20Must%20Complete%20Yucca%20Mountain%20Repository_0806.pdf. Pete Domenici, the Senate Energy and Natural Resources Committee Chairman, "hinted that the [DOE] might not make its new 2017 deadline for opening the chronically delayed Yucca Mountain nuclear waste repository." Mary O'Driscoll, *Yucca Mountain: Domenici Questions DOE's 2017 Deadline*, ENV'T & ENERGY DAILY, Aug. 4, 2006 (on file with author); *see also Fiscal Year 2008 Appropriations Hearing Before the S. Comm. on Appropriations*, 110th Cong. (2007) (statement of Edward F. Sproat III, Dir. for Civilian Radioactive Waste Mgmt., U.S. Dep't of Energy), *available at* http://www.ocrwm.doe.gov/info_library/program_docs/testimonies/testimony_3-07-2007.pdf (testifying that the agency timetable to meet the March 2017 Yucca Mountain opening date depends on passage of the Nuclear Waste Management Disposal Act reintroduced by the Bush Administration as well as other factors outside DOE's control).

493. NUCLEAR POWER'S PROSPECTS, *supra* note 32, 9–10.

494. *Id.* at 32.

It is also apparent that the international framework for managing nuclear-power technology cannot handle proliferation adequately. The signors of the NPT violate its provisions continually. Division among the weapons and non-weapons states grows as inequities abound. The countries that have defied the international community for decades by never signing the Treaty get preferential treatment over states that signed the Treaty and exhibit similar behavior. The Bush Administration's strategy of regime control rather than technology control will lead smaller countries to consider pursuing nuclear weapons for their own national security. In the end, enforcement of NPT provisions is selective, depending on subjective criteria heavily influenced by the most powerful nations. "Soft" international law depends on the good faith of countries to abide by decisions of international tribunals. But U.S. behavior towards the ICJ in the dispute over its support of the Contras in Nicaragua viscerally demonstrates that power has its perks in the international realm.

In *Universal Compliance* the Carnegie Institute recommends strengthening international law by creating an expectation of consequences when the NPT is breached. While interesting in theory, it is unlikely that countries will be willing to sacrifice more of their sovereignty in today's international climate. Such a change may require a shift in U.S. jurisprudence on the integration of international law and domestic law; enforcement must be mandatory.

Finally, the economics of nuclear power cut against the expansion of the industry. While the government claims that electricity from nuclear power is the cheapest method of generation, a closer look at the costs of the technology reveals otherwise. Nuclear power remains an attractive investment only because it benefits from "subsidy, tax breaks, licensing shortcuts, guaranteed purchases with risks borne by customers, political muscle, ballyhoo and pointing to other countries . . . to indicate that the U.S. is somehow 'falling behind.'"[495] Government handouts and indemnification through the Price-Anderson Act might draw investors to the industry, but the cost of nuclear power is unchanged—the cost is borne by taxpayers and customers. As stated earlier, the MIT study on the future of nuclear power did not include an evaluation of alternative energy sources of electricity, low-carbon coal technology, and conservation efforts. Any solution to the global energy crisis should maximize these sources and minimize nuclear power. While this will not rid the world of nuclear weapons, it will greatly reduce the risk of nuclear technology intended for peaceful purposes being diverted for non-peaceful purposes.

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495. *Id.* at 30.

After Three Mile Island, President Jimmy Carter stated,

> [I]n this country nuclear power is an energy source of last resort. By this I mean[] that as we reach our goals on conservation, on the direct use of coal, on development of solar power and synthetic fuels, and enhanced production of American oil and natural gas—as we reach those goals, then we can minimize our reliance on nuclear power.[496]

India's nuclear weapons tests and the TMI accident in the 1970s awoke the American public to the multiple risks of nuclear energy technology. The days of blind faith in the toxic atom were thought to be over. As the government chooses to pursue this technology vigorously once again, it would be wise to reconsider the risks and costs of using the atom to boil water. Nuclear power was the "energy source of last resort" in 1979; it should remain so today.

496. President James E. Carter, Remarks Announcing Actions in Response to the Three Mile Island Commission's Report (Dec. 7, 1979), *available at* http://www.presidency.ucsb.edu/ws/index.php? pid=31788&st=Three+mile+island&stl.