

NOTE

INADEQUATE CONTROL: INTERNATIONAL LAW AND PRINCIPLES APPLICABLE TO ADDRESS NUCLEAR WEAPON SECURITY

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I. INTRODUCTION

A state's custody of nuclear weapons imposes a duty on the state to maintain security measures commensurate with the risk of exploitation inherent to their possession. Currently, nine countries are known to possess nuclear weapons.¹ These states' nuclear arsenals are widely dispersed, with component parts and materials stored in hundreds of sites with varying degrees of security across various countries, including twenty-two non-

1. *Which Countries Have Nuclear Weapons?* INT'L CAMPAIGN TO ABOLISH NUCLEAR WEAPONS, https://www.icanw.org/nuclear_arsenals [<https://perma.cc/MKU9-GF7V>] (last visited Mar. 13, 2026). The United States, Russia, China, France, the United Kingdom, India, Pakistan, and North Korea are acknowledged nuclear weapon states, and Israel is known to possess nuclear weapons but has not formally acknowledged possession. See 2 CHARLES J. MOXLEY JR., *NUCLEAR WEAPONS AND INTERNATIONAL LAW: EXISTENTIAL RISKS OF NUCLEAR WAR AND DETERRENCE THROUGH A LEGAL LENS* 550–54 (2d ed. 2024) [hereinafter 2 MOXLEY, *NUCLEAR WEAPONS AND INTERNATIONAL LAW*].

nuclear states.² If these materials fall into the hands of terrorists or non-state actors, the consequences would be catastrophic. Nuclear security³ governs every aspect of the nuclear weapons system, including the weapons themselves, materials, components, information, personnel, and associated activities.⁴ At the facility level, security encompasses the procedures, personnel standards, and physical protections.⁵ At the weapon level, security requires “control of use,” including technical mechanisms such as permissive action links, firing-set barriers, and encoded components, as well as the organizational and communications structures that constitute command and control.⁶ Together, these measures form the broader framework of nuclear weapons system security: the integrated set of positive measures designed to minimize the risk of detonation arising from accidents, unauthorized actions, errors, or acts of nature throughout the weapon’s life cycle.⁷ Inadequate control arises when these safeguards fail or are absent, leaving the weapon vulnerable to

2. Sophia Brown et al., *Global Dialogue on Nuclear Security Priorities*, NUCLEAR THREAT INITIATIVE, <https://www.nti.org/about/programs-projects/project/global-dialogue-nuclear-security-priorities/> [https://perma.cc/F3NF-QYJT] (last visited Mar. 13, 2026).

3. The safety, security, and positive control of nuclear weapons in the United States is at times referred to as “surety.” However, there is “no universally accepted definition of the term ‘nuclear surety’ within the U.S. nuclear community.” OFF. OF THE DEPUTY ASSISTANT SEC’Y OF DEF. FOR NUCLEAR MATTERS, *THE NUCLEAR MATTERS HANDBOOK 2020 [REVISED]* 89 (2020) [hereinafter *NUCLEAR MATTERS HANDBOOK 2020*].

4. *Id.*

5. INT’L ATOMIC ENERGY AGENCY, *Security Aspects of Nuclear Facilities*, <https://www.iaea.org/topics/security-aspects> [https://perma.cc/P3BN-HZVM] (last visited Mar. 14, 2026) (“Physical protection requires a mix of hardware (security devices), procedures (organization of guards and performance of their duties) and facility design (including layout).”) [hereinafter *IAEA Security Aspects*].

6. See STRATEGIC STUD. INST. & US ARMY WAR COLL., *NUCLEAR WEAPONS SECURITY CRISES: WHAT DOES HISTORY TEACH?* 4 (Henry D. Sokolski & Bruno Tertrais eds., 2013) [hereinafter *NUCLEAR WEAPONS SECURITY CRISES*]. According to the US Department of Defense, “surety” includes safety, security, reliability, and control of use. See *NUCLEAR MATTERS HANDBOOK 2020*, *supra* note 3. This paper covers, broadly speaking, the second and fourth categories.

7. See generally INT’L ATOMIC ENERGY AGENCY, *IAEA NUCLEAR SAFETY AND SECURITY GLOSSARY: TERMINOLOGY USED IN NUCLEAR SAFETY, NUCLEAR SECURITY, RADIATION PROTECTION AND EMERGENCY PREPAREDNESS AND RESPONSE 14 (2022 [Interim] ed.)* [hereinafter *IAEA GLOSSARY*]; *NUCLEAR MATTERS HANDBOOK 2020*, *supra* note 3, ch. 8 (“In the case of nuclear weapon systems, deliberate unauthorized use refers to loss of any intentional pre-arming, arming, launch, or release, or yield of a nuclear weapon that has not been approved by proper command authority.”). *Id.* at 16.

unauthorized activation, diversion, or misuse by malicious actors.⁸ Substantial authority exists documenting the differing views on the lawfulness of use and threat of use of nuclear weapons.⁹ However, from a review of the literature, there appears to be astoundingly little discussion of the responsibility of states in maintaining their weapons security. Virtually every state has an interest in the secure maintenance of such weapons, but such responsibility remains isolated to domestic affairs. Given the transboundary catastrophic effects of unauthorized use of nuclear weapons, states should put aside the traditional notion that the maintenance of effective nuclear safeguards is a purely sovereign responsibility.¹⁰ This paper endeavors to identify international rules, principles, and authorities applicable to nuclear security responsibilities.

Despite global ensnarement in ensuring control of use and maintenance of nuclear weapons, a review of the literature reveals a lack of authority and sources on this topic. Much scholarship evaluates legality of use and threats of use of nuclear weapons.¹¹ While this area has rich authority, secure maintenance of nuclear weapons has remained relatively undiscussed.

8. See *Deliberate Unauthorized Use*, US DEP'T OF DEF., INSTR. 3150.02, DOD NUCLEAR WEAPON SYSTEMS SURETY PROGRAM 16 (DEC. 17, 2024) [hereinafter DoD 3150.02]; *IAEA Security Aspects*, *supra* note 5 ("Vulnerabilities at nuclear facilities can make them susceptible to malicious acts and create opportunities for terrorists or criminal groups."). Nuclear security differs from nuclear safety in several dimensions. Nuclear safety concerns preventing and preparing for *accidental* events, while nuclear security concerns preventing and preparing for *intentional* human actions. Matthew Bunn, *Cultures of Nuclear Security: How Different Countries Decide to Protect Their Nuclear Facilities*, presentation at the Science, Technology, and Society Circle, Harvard University, Cambridge, MA (Nov. 12, 2018) (slide 5).

9. See, e.g., *Legality of the Threat or Use of Nuclear Weapons*, Advisory Opinion, 1996 I.C.J. 226 (July 8) [hereinafter *Nuclear Weapons Advisory Opinion*]. The opinions and various submissions to the Court and transcripts of the oral proceedings are available at the case proceedings page of the Court's website. William H. Boothby, *Nuclear Weapons Part I – Opposing Perspectives*, LIEBER INST. WEST POINT (Mar. 30, 2026), <https://lieber.westpoint.edu/nuclear-weapons-part-i-opposing-perspectives/> [https://perma.cc/P9NY-ZX24]. See generally 2 MOXLEY, NUCLEAR WEAPONS AND INTERNATIONAL LAW, *supra* note 1, ch. 27.

10. See, e.g., OFF. OF THE UNDER SEC'Y OF DEF. FOR ACQUISITION, TECH. & LOGISTICS, DOD MANUAL S-5210.41, NUCLEAR WEAPON SECURITY MANUAL: THE DOD NUCLEAR WEAPON SECURITY PROGRAM vol. 1, § 6.2(a), at 44 (Aug. 11, 2016) (C1 Oct. 25, 2016) ("The concept of denying unauthorized access to nuclear weapons is a *national* responsibility. The accompanying recapture and recovery capability is not based in rules of evidence, but rather a military operation protecting or regaining control of vital national interests.") (emphasis added) [hereinafter DoD MANUAL 5210.41].

11. See *supra* note 9.

This paper addresses this gap by providing a comprehensive analysis of international law and principles as potential frameworks for regulating state control of nuclear weapons. This paper makes several key contributions. First, analyzing current conventional law, this paper conducts a textual analysis of the Nuclear Non-Proliferation Treaty, International Atomic Energy Agency conventions, and United Nations Resolution 1540, creating operational criteria that can be applied to control of nuclear weapons through existing obligations. Second, this paper demonstrates, through state practice around instances of inadequate control and the evolving landscape of bilateral agreements, that customary international law has crystallized around a state's standard of control over nuclear weapons and the duties of other states. Third, this paper identifies sources of international law principles and rules that may apply to states in their secure maintenance of nuclear weapons.

This analysis reveals that while conventional, customary, or general principles of international law may sometimes reach conclusions about particular security practices, they reflect a fundamental need for evaluating nuclear state security practices. Application of international law to nuclear security has broad ramifications, including concerns over state sovereignty. Thus, the final part of this paper recommends adoption of a clear, comprehensive, and prophylactic international convention with internationally harmonious standards of adequate control of nuclear weapons. Mechanisms previously implemented by states for cooperative threat reduction efforts, including hotline agreements and mutual assistance agreements, are useful models for addressing inadequate control of nuclear weapons.

Through this analysis, this paper aims to contribute to both legal scholarship and policy development by providing a foundation for understanding how different legal frameworks potentially address nuclear security. As threats to nuclear weapon possession continue to evolve and harness new technologies, developing clear and workable legal standards for evaluating these systems becomes increasingly critical to ensure global safety.

II. CAUSES AND CASES OF INADEQUATE CONTROL

While accidental detonations resulting from human or technical error are well-documented,¹² inadequate control and security of nuclear weapons are far less visible, often concealed by states seeking to protect nuclear secrets and national security.¹³ Inadequate control refers to lapses in state nuclear security measures that render nuclear weapons to be so insecure as to permit non-state actors to potentially get control of the weapons.¹⁴ The problem is especially profound due to the vast size of the global stockpiles, the number of countries and facilities in which stockpiles are held, and “the poor state of security for some of them.”¹⁵

Nuclear terrorism and nuclear inheritance are causes for the most acute exploitations of security vulnerabilities.¹⁶ This section describes nuclear terrorism as an exposure of inadequate control of nuclear weapons, and nuclear inheritance as an exposure. Then, this section analyzes nuclear terrorism and nuclear inheritance together, and analyzes the international response and conduct surrounding cases of inadequate control.

A. Nuclear Terrorism

Nuclear terrorism refers to the use or threat of use of nuclear or other radioactive material, or attacks on nuclear facilities, by non-state actors with the intent to cause death, injury,

12. See, e.g., ERIC SCHLOSSER, *COMMAND AND CONTROL: NUCLEAR WEAPONS, THE DAMASCUS ACCIDENT, AND THE ILLUSION OF SAFETY* (2013).

13. See Patricia Lewis et al., *Too Close for Comfort: Cases of Near Nuclear Use and Options for Policy 2-3* (2014), https://www.chathamhouse.org/sites/default/files/field/field_document/20140428TooCloseforComfortNuclearUseLewisWilliamsPelopidasAghlani.pdf [https://perma.cc/8699-TGGU] [hereinafter CHATHAM HOUSE REPORT]. Further noting the other plausible desire to avoid national embarrassment. *Id.*

14. See 2 MOXLEY, *NUCLEAR WEAPONS AND INTERNATIONAL LAW*, *supra* note 1, at 977.

15. Matthew Bunn, John P. Holdren & Anthony Wier, *Securing Nuclear Weapons and Materials: Seven Steps for Immediate Action*, PROJECT ON MANAGING THE ATOM, HARV. UNIV. & NUCLEAR THREAT INITIATIVE 4 (May 2002), https://www.nti.org/wp-content/uploads/2021/09/securing_nuclear_weapons_and_materials_May2002.pdf [https://perma.cc/262J-HAWW].

16. See CHATHAM HOUSE REPORT, *supra* note 13, at 1.

environmental contamination or coercion.¹⁷ In the context of inadequate control of nuclear weapons, there are three distinct ways in which terrorists may exploit deficiencies in control of nuclear weapons: attacking insufficiently protected facilities; acquiring a weapon lacking technical safeguards; and cyber-attacks on command and control systems.¹⁸

Insufficient physical security measures most often exist at the facility level involving the “ability to detect, assess, and respond to adversary intrusions in a timely way.”¹⁹ While one aspect of physical security measures is the presence of armed guards, US Senator Sam Nunn reported during his 1974 visit to NATO bases that “there were people guarding nuclear weapons [who] were hooked on drugs.”²⁰ Further physical security vulnerabilities include lack of protective measures. In February 2010, peace activists penetrated a Belgian airbase where US nuclear weapons were reportedly stored.²¹ The base was protected by “a simple chain-link fence with no intrusion detectors, and the group was not detected.”²² It is only a matter of time before terrorist organizations similarly exploit physical security weaknesses. In 2002, Russian officials confirmed two incidents of terrorists conducting reconnaissance at secret nuclear weapons storage sites,²³ and “in the mid-1970s, tactical nuclear weapons in Germany were so poorly secured that a small group of terrorists could have easily stolen them.”²⁴

17. International Convention for the Suppression of Acts of Nuclear Terrorism, opened for signature Sept. 14, 2005, 2445 U.N.T.S. 89 [hereinafter Nuclear Terrorism Convention].

18. See generally Matthew Bunn, *Securing the Bomb 2010: Securing All Nuclear Materials in Four Years*, PROJECT ON MANAGING THE ATOM, HARV. UNIV. & NUCLEAR THREAT INITIATIVE (Apr. 1, 2010), <https://www.nti.org/analysis/reports/securing-bomb-2010/> [<https://perma.cc/WZM7-F5T6>] [hereinafter *Securing the Bomb 2010*].

19. *Id.* at 4.

20. CHATHAM HOUSE REPORT, *supra* note 13, at 8 (citing PHILIP TAUBMAN, THE PARTNERSHIP: FIVE COLD WARRIORS AND THEIR QUEST TO BAN THE BOMB 201 (2012)). For additional evidence of drug use in the US Air Force, see Eric Schlosser on US Nuclear Weapons: “People are Getting Sloppy,” GUARDIAN (Oct. 25, 2013), <https://www.theguardian.com/world/2013/oct/25/eric-schlosser-nuclear-weapons-command-control> [<https://perma.cc/G4ZN-8TUD>].

21. Bunn, *Securing the Bomb 2010*, *supra* note 18, at 4.

22. *Id.*

23. *Id.* at 14; NAT’L INTEL. COUNCIL, ANNUAL REPORT TO CONGRESS ON THE SAFETY AND SECURITY OF RUSSIAN NUCLEAR FACILITIES AND MILITARY FORCES 6 (Dec. 2004).

24. NUCLEAR WEAPONS SECURITY CRISES, *supra* note 6, at 6.

At the weapon level, many modern systems use advanced electronic locks, known as “permissive action links” (“PALs”), intended to make it difficult for unauthorized detonations of weapons. Yet, some weapons are not equipped with PALs or are equipped with older, less secure variants.²⁵ The occasional lack of weapon level security measures is exacerbated by the fact that nuclear weapon size has become so small as to render it feasible to deliver a nuke in a suitcase.²⁶ Thus, it is not implausible that if terrorists manage to steal a nuclear weapon lacking technical safeguards, they could detonate it themselves.²⁷

Third, modern technologies like cyber and artificial intelligence are introducing new risks to nuclear weapons and regulated systems.²⁸ The risk is exacerbated by digital systems increasingly relying on “commercial ‘off-the-shelf’ software,” which allows for cost cutting but increases vulnerability to hacking events.²⁹ The United States, for example, has suffered from both state and non-state actors leveraging cyberattacks against electronic controls of nuclear weapons and related systems.³⁰ In 2025, a manufacturing site within the National Nuclear Security Administration, which maintains the US nuclear weapons stockpile, suffered a cyber breach conducted by a foreign threat actor “exploiting unpatched Microsoft SharePoint vulnerabilities.”³¹ The National Nuclear Security Administration suffered a similar attack in 2020, when hackers for an espionage operation accessed the systems.³² Despite robust cybersecurity

25. Bunn, *Securing the Bomb 2010*, *supra* note 18, at 17.

26. 2 MOXLEY, NUCLEAR WEAPONS AND INTERNATIONAL LAW, *supra* note 1, at 526.

27. See Bunn, *Securing the Bomb 2010*, *supra* note 18, at 17.

28. See generally 2 MOXLEY, NUCLEAR WEAPONS AND INTERNATIONAL LAW, *supra* note 1, at 647–49.

29. Caroline Baylon, Roger Brunt & David Livingstone, *Cyber Security at Civil Nuclear Facilities: Understanding the Risks*, CHATHAM HOUSE (updated Jan. 16, 2024) [hereinafter CHATHAM HOUSE CYBER SECURITY REPORT].

30. 2 MOXLEY, NUCLEAR WEAPONS AND INTERNATIONAL LAW, *supra* note 1, at 538.

31. Cynthia Brumfield, *Foreign Hackers Breached a US Nuclear Weapons Plant via SharePoint Flaws*, CSO (Oct. 20, 2025), <https://www.csoonline.com/article/4074962/foreign-hackers-breached-a-us-nuclear-weapons-plant-via-sharepoint-flaws.html> [https://perma.cc/6UDD-CLLP].

32. Natasha Bertrand & Eric Wolff, *Nuclear Weapons Agency Breached Amid Massive Cyber Onslaught*, POLITICO (Dec. 17, 2020), <https://www.politico.com/news/2020/12/17/nuclear-agency-hacked-officials-inform-congress-447855> [https://perma.cc/A6JF-T9L2].

standards and resources,³³ the US nuclear security regime suffers from a plethora of vulnerabilities ripe for exploitation by malicious actors.³⁴

Taken together, these risks underscore the fact that current global security of nuclear weapons remains vulnerable to well-known terrorist threats.³⁵ Although nuclear terrorism has received significant attention, particularly after the September 11, 2001 terrorist attacks in the United States,³⁶ effective security measures adequate to properly mitigate these dangers are still lacking, leaving global nuclear protections “alarmingly vulnerable.”³⁷

B. Nuclear Inheritance

Nuclear inheritance refers to the abrupt change of control over nuclear weapons or other nuclear assets resulting from war, revolution, or coup d'état.³⁸ While changes in control of nuclear assets are commonplace in orderly shifts of authority, risks of nuclear inheritance are exacerbated in contested transfers of power.³⁹ Contested transfers of power “can have serious and unpredictable impact on the risk of nuclear war and international stability,” including politically strategic attacks on nuclear facilities

33. See NATIONAL CYBER SECURITY INDEX, United States, <https://ncsi.ega.ee/country/us/> [<https://perma.cc/588K-64TW>] (last visited Mar. 13, 2026).

34. See US GOV'T ACCOUNTABILITY OFF., GAO-23-106309, NUCLEAR WEAPONS CYBERSECURITY: STATUS OF NNSA'S INVENTORY AND RISK ASSESSMENT EFFORTS FOR CERTAIN SYSTEMS (2023); Page Stoutland, *Addressing Cyber-Nuclear Security Threats*, NUCLEAR THREAT INITIATIVE, <https://www.nti.org/about/programs-projects/project/addressing-cyber-nuclear-security-threats/> [<https://perma.cc/3CG5-AG5V>] (last visited Mar. 14, 2026) (“Even in the United States, officials have stated that it cannot be fully confident that [command, control, and communications] systems will operate as planned if attacked by a sophisticated cyber opponent.”).

35. Bunn, *Securing the Bomb 2010*, *supra* note 18, at 5.

36. See NAT'L RSCH. COUNCIL, PROTECTION, CONTROL, AND ACCOUNTING OF NUCLEAR MATERIALS: INTERNATIONAL CHALLENGES AND NATIONAL PROGRAMS: WORKSHOP SUMMARY 9–10 (2006) (remarks of Charles Curtis, President Emeritus, Nuclear Threat Initiative, and former Deputy Sec'y of Energy).

37. Matthew Bunn, Anthony Wier & John P. Holdren, *Controlling Nuclear Warheads and Materials: A Report Card and Action Plan*, PROJECT ON MANAGING THE ATOM, HARV. UNIV. & NUCLEAR THREAT INITIATIVE (Mar. 2003), <https://media.nti.org/pdfs/controlling-nuclear-warheads-and-materials-2003.pdf> [<https://perma.cc/FTV3-LLAT>]. For a discussion on effective nuclear security measures key to reducing risks of nuclear terrorism, see generally Bunn, *Cultures of Nuclear Security*, *supra* note 8.

38. LEONARD S. SPECTOR, *GOING NUCLEAR* 17 (1987).

39. *Id.*

or attempts to gain control of nuclear weapons for territorial authority.⁴⁰

Nuclear inheritance caused one instance of precarious control over French nuclear weapons and was threatened in China.⁴¹ In 1961, French generals in Algeria attempted a military coup at the Reganne test site where French nuclear weapons were held.⁴² While it is unclear whether the generals did exercise control over the site or the nuclear weapons themselves, “Paris was sufficiently concerned over this possibility to destroy the nuclear device there.”⁴³ Further, in 1967 during the Chinese Cultural Revolution, anti-establishment forces threatened to seize the Lop Nur nuclear test site.⁴⁴ In response, Beijing is believed to have secured or potentially destroyed a device to prevent rival factions from capturing it.⁴⁵

Even modern states with sophisticated nuclear security systems are not immune to lapses. In 2008, a US Air Force internal investigation determined that most European deployment sites for US nuclear weapons did not meet Department of Defense security requirements.⁴⁶ The risk of nuclear inheritance underscores the persistent vulnerabilities in managing arsenals, particularly dispersed arsenals.

C. Nuclear Inheritance, Nuclear Terrorism, and State Practice on Risk Reduction

Often, nuclear inheritance and nuclear terrorism are not mutually exclusive. Cases of inadequate control can occur because of a combination of state instability and terrorist efforts to gain control of nuclear weapons. Inadequate control and security

40. *Id.* at 17, 18.

41. *Id.* at 58.

42. *Id.*

43. *Id.*

44. *Id.*; see Terry C. Wallace & Mark A. Tinker, *The Last Nuclear Weapons Test? A Brief Review of the Chinese Nuclear Weapons Program*, IRIS <https://ds.iris.edu/news/IRISnewsletter/fallnews/chinese.html> [<https://perma.cc/3JD5-J8LA>] (last visited Mar. 13, 2026).

45. SPECTOR, *supra* note 38, at 35–37, 58; see Wallace & Tinker, *supra* note 44.

46. Hans Kristensen, *USAF Report: “Most” Nuclear Weapon Sites in Europe Do Not Meet US Security Requirements*, FED’N OF AM. SCIENTISTS (June 19, 2008), <https://fas.org/publication/usaf-report-most-nuclear-weapon-sites-in-europe-do-not-meet-us-security-requirements/> [<https://perma.cc/82LL-WW9N>].

measures have occurred in the past, are still happening today, and are likely to continue in the future.⁴⁷ While states contend that nuclear weapon security is a wholly national subject, the response to inadequately controlled nuclear weapons has been undoubtedly international. The fall of the Soviet Union and the actions surrounding Pakistan's nuclear weapons program each demonstrate how fears of both nuclear terrorism and nuclear inheritance emerge simultaneously from lapses in control.

As the Soviet empire collapsed, the scale of emergency became immediately apparent: "30,000 nuclear weapons and a vast weapons production complex were spread over four sovereign states:" Russia, Ukraine, Belarus, and Kazakhstan.⁴⁸ In 1991, the US Congress identified the threat of "loose nukes," the presence of poorly guarded nuclear weapons in the former Soviet Union that were vulnerable to terrorist or criminal acquisition.⁴⁹ Congress identified three types of dangers posed by loose nukes: 1) distribution of nuclear weapons among former Soviet states threatened international stability and safety; 2) vulnerabilities to seizure, theft, sale, or unauthorized use of nuclear weapons and their components; and 3) potential for world-wide proliferation via transfers of weapons and components to territories outside the former Soviet Union.⁵⁰

In response, the United States established the Department of Defense Cooperative Threat Reduction ("CTR") program, also known as the Nunn-Lugar program, to secure and dismantle weapons of mass destruction and related infrastructure across the fifteen states evolving from the former Soviet territory.⁵¹ Created by Senators Sam Nunn and Richard Lugar, the program focused on the vast nuclear arsenals inherited by Russia, Ukraine, Belarus, and Kazakhstan.⁵² The core objectives remained to consolidate and

47. CHATHAM HOUSE REPORT, *supra* note 13, at vi.

48. CTR. FOR ARMS CONTROL & NON-PROLIFERATION, THE NUNN-LUGAR COOPERATIVE THREAT REDUCTION PROGRAM 1 (Mar. 29, 2022), <https://armscontrolcenter.org/fact-sheet-the-nunn-lugar-cooperative-threat-reduction-program-2/> [<https://perma.cc/7FKE-ZW47>] [hereinafter NUNN-LUGAR THREAT REDUCTION PROGRAM FACTSHEET].

49. COUNCIL ON FOREIGN RELATIONS, *Loose Nukes* (Jan. 1, 2006), <https://www.cfr.org/background/loose-nukes> [<https://perma.cc/C7CD-6UE7>].

50. Soviet Nuclear Threat Reduction Act of 1991, tit. II of Pub. L. No. 102-228, § 211(a), 105 Stat. 1691 (1991) (codified as amended at 22 U.S.C. § 2551 note).

51. NUNN-LUGAR THREAT REDUCTION PROGRAM FACTSHEET, *supra* note 48.

52. *Id.*

secure nuclear weapons and materials, but at fewer protected sites; inventory and account for inherited weapons in the former Soviet states; ensure safe handling and disposal consistent with arms control obligations; and help employ former Soviet scientists.⁵³ The cooperative, international response to inadequate control of nuclear weapons in the face of threats of terrorism and nuclear inheritance resulting from the fall of the Soviet Union has largely been regarded as an international success.⁵⁴

A second example is instability and “nuclear porosity” in Pakistan and vulnerabilities within Pakistan’s nuclear safety and security arrangements, exacerbating the risks of terrorist groups gaining access to nuclear materials.⁵⁵ Though Pakistan’s security measures mimic those practiced in the United States, “empirical evidence points to a clear set of weaknesses and vulnerabilities in Pakistan’s nuclear safety and security arrangements.”⁵⁶ As to risks of nuclear inheritance and nuclear terrorism, in 2010 concerns were raised at the possibility of Islamic extremists seizing power, nuclear weapons being rendered vulnerable through a collapse of the Pakistani state,⁵⁷ or the Pakistani Army transferring nuclear weapons to terrorist groups deliberately.⁵⁸ Further, Pakistan’s nuclear infrastructure was constructed in areas dominated by Pakistani Taliban militants and home to al-Qa’ida.⁵⁹

In response to the Pakistani case of inadequate control of nuclear weapons, the Bush administration spent nearly US\$100 million in aid to the Pakistani President, Gen. Pervez Musharraf, in

53. *Id.*

54. NATIONAL SECURITY ARCHIVE, ABOUT THE NUNN-LUGAR PROJECT, <https://nsarchive.gwu.edu/about-nunn-lugar-project> [<https://perma.cc/GAB7-J5X4>] (last visited Mar. 14, 2026).

55. Shaun Gregory, *The Terrorist Threat to Pakistan’s Nuclear Weapons*, 2 CTC Sentinel 1 (2009).

56. *Id.* at 2.

57. Bunn, *Securing the Bomb 2010*, *supra* note 18, at 29; see NUCLEAR WEAPONS SECURITY CRISES, *supra* note 6, at viii (“[E]xpert observers worry that in the future, Pakistan’s powerful military might be divided against itself or held hostage by some faction that seizes control of some portion of Pakistan’s nuclear assets.”).

58. Gregory, *supra* note 55, at 3 (“[S]tates can become pressurized or incentivized to transfer nuclear weapons to terrorist groups because they are responding to threats from an external power but fear the consequences of being identified as the origin of a nuclear strike”).

59. *Id.* at 2.

order to secure the nuclear weapons.⁶⁰ Specifically, the United States sought to improve “physical security, like fencing and surveillance systems, and equipment for tracking nuclear material if it left secure areas.”⁶¹ Despite the international collaboration to secure Pakistan’s nuclear arms, the effort was paralyzed by suspicions held by both states: Pakistan feared the United States hoped to gather information to disable Pakistan’s arsenal, and the United States feared that technical information provided would not be properly safeguarded and would end up in terrorist possession.⁶²

The increasing risks of contemporary threats like nuclear terrorism and nuclear inheritance highlight the importance of internationalized standards of adequate control and mandatory instruments for the mutual assistance and collaboration to remedy such violations.

III. SURVEY OF EXISTING BODIES OF INTERNATIONAL LAW AND POSSIBLE APPLICATIONS TO INADEQUATE CONTROL OF NUCLEAR WEAPONS

There are a handful of existing bodies of international law that may apply to inadequate control of nuclear weapons. Part III specifically analyzes the Treaty on the Non-Proliferation of Nuclear Weapons, International Atomic Energy Agency Conventions, and United Nations Security Council Resolution 1540, finding that such instruments may be read to require nuclear weapon states to maintain adequate control of nuclear weapons.

A. Nuclear Non-Proliferation Treaty

A source of international requirements surrounding inadequate control is found in the Treaty on the Non-Proliferation

60. David E. Sanger & William J. Broad, *U.S. Secretly Aids Pakistan in Guarding Nuclear Arms*, N.Y. TIMES (Nov. 18, 2007), <https://www.nytimes.com/2007/11/18/washington/18nuke.html> [<https://perma.cc/MGZ6-CPWY>].

61. *Id.* General Musharraf wrote in his memoir: “First, at this time [the Americans] were not very sure of my job security, and they dreaded the possibility that an extremist successor government might get its hands on our strategic nuclear arsenal. Second, they doubted our ability to safeguard our assets.” *Id.*

62. *See generally id.*

of Nuclear Weapons (“NPT”).⁶³ The NPT is a multilateral treaty with 191 state signatories,⁶⁴ the objective of which is to prevent the spread of nuclear weapons and weapons technology, foster the peaceful uses of nuclear energy, and further the goal of disarmament.⁶⁵ While nuclear security throughout the world “ranges from excellent to appalling,”⁶⁶ the NPT may require at least a minimum level of control to be exercised over nuclear weapons programs through security measures.

Article I of the NPT provides that nuclear-weapon State Parties agree to “undertake[] not to transfer to any recipient whatsoever nuclear weapons or other nuclear explosive devices or control over such weapons or explosive devices directly, or *indirectly*.”⁶⁷ This statutory language creates an affirmative obligation on nuclear-weapon State Parties to prevent both direct and *indirect* transfers of control to “any recipient.”⁶⁸ If a state’s action—or failure to act—results in a terrorist organization, non-state actor, or other unauthorized entity gaining control over nuclear weapons, this loss of custody constitutes an “indirect transfer” within the meaning of Article I.⁶⁹

First, interpretive guidance supports a finding of this obligation. “Undertake,” when followed by an infinitive, is defined as “to promise, agree, or obligate oneself.”⁷⁰ Thus, nuclear-weapon States promise or obligate themselves under the NPT to avoid any direct or indirect transfer of control over nuclear weapons. Inadequate control can therefore be understood as state actions or

63. Treaty on the Non-Proliferation of Nuclear Weapons, *opened for signature* July 1, 1968, 21 U.S.T. 483, 729 U.N.T.S. 161 [hereinafter NPT].

64. NPT, *supra* note 63.

65. NPT, *supra* note 63.

66. Matthew Bunn, *Preventing Nuclear Terrorism: The Nuclear Terrorism Convention and Other Urgently Needed Steps*, presentation at United Nations Panel on the Convention for the Suppression of Acts of Nuclear Terrorism, New York (June 18, 2007), slide 7, https://www.belfercenter.org/sites/default/files/pantheon_files/files/publication/bunn_un_convention.pdf [<https://perma.cc/U7DC-HNEC>].

67. NPT, *supra* note 63, art. I (emphasis added).

68. *See id.*

69. *See* NUCLEAR WEAPONS BAN MONITOR, *The Prohibition on Transfer*, tbl. art. 1(1)(b) – Interpretation, <https://banmonitor.org/tpnw-prohibitions/the-prohibition-on-transfer-of-nuclear-weapons> [PL] (last visited Mar. 14, 2026).

70. Dictionary.com, *Undertake*, <https://www.dictionary.com/browse/undertake> [<https://perma.cc/PGE5-JJLC>] (last visited Dec. 2, 2025).

omissions that directly or indirectly confer the ability to “any recipient” to control nuclear weapons.

If nuclear-weapon State Parties are obligated to avoid intentional transfers of control through restraint and affirmative measures, then, under the Series-Qualifier Canon of statutory construction, preventing “indirect transfers” necessarily also requires proactive steps to avert such outcomes and to thus maintain a minimum level of control over their arsenals.⁷¹ As understood in the United States, the obligations in Article I of the NPT require states to take steps to “protect sensitive nuclear weapons information, facilities, and materials.”⁷² Then, preventing indirect transfers encompasses preventing loss of control due to instances such as theft, unauthorized launch enabled by weak command-and-control systems, diversion by insiders, failures in PALs, and inadequate physical or personnel security.⁷³ Further, this interpretation aligns with the International Atomic Energy Agency (“IAEA”) glossary, which incorporates “illegal transfer” within the definition of “Nuclear Security,” reinforcing that State obligations to prevent unauthorized access are part of preventing unlawful transfers, including indirect unlawful transfers.⁷⁴

The second clause of Article I similarly supports this reading. It prohibits nuclear-weapon State Parties from assisting, encouraging, or inducing any non-nuclear weapon State to “manufacture or otherwise acquire” nuclear weapons or “control over” such weapons.⁷⁵ Although this clause is limited to non-nuclear-weapon States—and therefore excludes non-state actors—it likewise presupposes a baseline level of State control.⁷⁶ A nuclear-weapon State that maintains inadequate security could

71. NPT, *supra* note 63, art. I; see generally Lydia A. Mills, *Series-Qualifier Canon of Construction Determines the Effect of a Clause at the End of a Series*, WILEY (Nov. 20, 2024), <https://www.executivesummaryblog.com/series-qualifier-canon-of-construction-determines-the-effect-of-a-clause-at-the-end-of-a-series> [<https://perma.cc/F9G5-P3LK>].

72. John S. Wolf, Assistant Sec’y for Nonproliferation, Remarks at the Third Session of the Preparatory Committee for the 2005 Review Conference of the Treaty on the Non-Proliferation of Nuclear Weapons (Apr. 30, 2004), <https://2001-2009.state.gov/t/isn/rls/rm/32290.htm> [<https://perma.cc/MW5N-XVPU>].

73. See IAEA GLOSSARY, *supra* note 7, at 4. Further, the definition of “Defence in depth” requires affirmative actions to prevent “accident conditions.” *Id.* at 51; see also IAEA *Security Aspects*, *supra* note 5.

74. See IAEA GLOSSARY, *supra* note 7, at 4.

75. NPT, *supra* note 63, art. I.

76. *Id.*

“encourage” or “induce” acquisition by creating circumstances in which a non-nuclear-weapon state is able to seize control by exploiting breakdowns in nuclear security.⁷⁷

Cybersecurity illustrates this logic in practice. It is a generally accepted principle that nuclear security must include protection against cyberthreats.⁷⁸ Information technology is entrenched in nuclear command and control systems, component parts in weapon manufacturing, and in nuclear weapons themselves.⁷⁹ Bad actors can exploit vulnerabilities in cybersecurity to compromise the security of nuclear materials and facility operations and jeopardize nuclear command and control systems.⁸⁰ Thus, if a nuclear-weapon State lacks measures to guard against cyberattacks, it knowingly risks indirectly transferring control of nuclear weapons to attacking non-state actors.⁸¹ Likewise, known deviations in cyber protections could “encourage” or “induce” non-nuclear-weapon states to exploit vulnerabilities to acquire control, in violation of the second clause of Article I.⁸²

Leonard Spector of the Monterey Institute for International Studies offers a similar interpretation.⁸³ He argues that the NPT requires all member states to maintain effective accounting and control over relevant nuclear materials because the Treaty prohibits exporting those materials without IAEA safeguards.⁸⁴ States cannot meet this standard without comprehensive and

77. See generally INT’L COMM. OF THE RED CROSS, *Briefing Note: The Prohibition to Assist, Encourage or Induce Prohibited Activities Under the Treaty on the Prohibition of Nuclear Weapons*, https://www.icrc.org/sites/default/files/document/file_list/assistance-treaty-prohibition-nuclear-weapons-briefing-note-icrc.pdf [https://perma.cc/2B6N-C7DR] (last visited Mar. 14, 2026). Notably, the ICRC finds that the terms “encourage” and “induce” are not defined in international law but interprets the terms through ordinary meaning, other weapons treaties, and other principles of interpretation. *Id.*

78. Laura Holgate, *Sustaining Attention on the Security of Nuclear Materials and Facilities: Challenges and Strategies in a Shifting Global Landscape*, NTI GLOBAL DIALOGUE 2 (July 2025), <https://www.nti.org/wp-content/uploads/2025/08/Sustaining-Attention-on-the-Security-of-Nuclear-Materials1.pdf> [https://perma.cc/2W6Q-ANLG] (“It is now generally accepted principle that nuclear security measures must incorporate provisions that protect against a range of cyberthreats, whereas previously key players had argued against the inclusion of cybersecurity as an element of nuclear security.”).

79. GAO-23-106309, *supra* note 34.

80. See Stoutland, *supra* note 34.

81. See NPT, *supra* note 63, art. I.

82. See *id.*

83. See NAT’L RSCH. COUNCIL, *supra* note 36, at 11–13 (remarks of Leonard Spector, Monterey Inst. of Int’l Studies).

84. *Id.* at 13.

effective Material Protection and Control and Accounting (“MPC&A”) measures across both civilian *and military* programs.⁸⁵

Finally, inadequate control of nuclear weapons would “defeat the object and purpose” of the NPT.⁸⁶ The Preamble instructs states to “make every effort to avert the danger of [nuclear] war and to take measures to safeguard the security of people.”⁸⁷ A state’s failure to take affirmative measures to safeguard nuclear weapons from unauthorized use resulting from inadequate security or control would undermine this core purpose and thus violate the Treaty’s object and purpose.⁸⁸

B. *International Atomic Energy Agency*

While the NPT may form the foundation for minimum security requirements, IAEA conventions may require international cooperation in cases of inadequate control. The keystone of the NPT is the safeguards system of the IAEA, a Vienna-based international organization comprising 181 member states.⁸⁹ The Agency’s safeguards consist of reporting requirements, audits, and on-site inspections, which apply to the vast majority of nuclear installations used for peaceful purposes, such as “the production of electricity, adapting to and mitigating climate change, fighting cancer, and more” in non-nuclear-weapon countries to verify that these facilities do not divert nuclear material to military programs.⁹⁰ Nuclear-weapon state obligations to respond to inadequate control and insecurity of nuclear weapons can be found in IAEA international reporting and mutual assistance conventions.

The IAEA adopted the Convention on Early Notification of a Nuclear Accident (the Early Notification Convention) and the

85. *Id.* (emphasis added).

86. Vienna Convention on the Law of Treaties art. 18, opened for signature May 23, 1969, 1155 U.N.T.S. 331 [hereinafter VCLT].

87. NPT, *supra* note 63, pmbl.

88. *See* VCLT, *supra* note 86.

89. IAEA, *List of Member States*, <https://www.iaea.org/about/governance/list-of-member-states> [<https://perma.cc/FR9C-3U69>] (last visited Mar. 14, 2026).

90. IAEA, *What are Nuclear Safeguards? And What Do IAEA Safeguards Inspectors Do?* (Sept. 30, 2025), <https://www.iaea.org/newscenter/multimedia/videos/what-are-nuclear-safeguards-and-what-do-iaea-safeguards-inspectors-do> [<https://perma.cc/3EUG-W6KF>]; *see* SPECTOR, *GOING NUCLEAR*, *supra* note 38, at 6; Bunn, *Securing the Bomb 2010*, *supra* note 18, at 10–11.

Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (the Assistance Convention) at its Special Session, held in September 1986 and then entered into force a month later.⁹¹ The conventions establish the duty of states to notify potentially affected states, directly or through the IAEA, regarding nuclear accidents with actual or possible transboundary effects, and requires states to cooperate in arranging for assistance in the case of a nuclear accident or radiological emergency.⁹² State obligations under the conventions derive from their objectives, which are to minimize and mitigate consequences of a radiological emergency, and to protect life, property, and the environment.⁹³ In addition, the conventions contain obligations related to emergency planning, notification, and the content of required information and general requirements concerning assistance.⁹⁴

The conventions, accepted by five Nuclear Weapons States (China, France, UK, US, and USSR, and subsequently Russia), obligate parties to notify and provide detailed information on all actual or reasonably anticipated accidents.⁹⁵ Article 1 of the Early Notification Convention lists facilities and activities covered that, under Article 2, trigger mandatory notification in case of accident.⁹⁶

The primary argument against the application of the Early Notification Convention is whether it applies to military nuclear programs or whether the scope is limited to civil programs.⁹⁷ While five of the six facilities and activities covered relate to the use of nuclear and radioactive material in civil use, “the transport and

91. Convention on Early Notification of a Nuclear Accident, opened for signature Sept. 26, 1986, 1439 U.N.T.S. 275, IAEA Doc. INFCIRC/335 [hereinafter Early Notification Convention]; Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, opened for signature Sept. 26, 1986, IAEA Doc. INFCIRC/336/Add.1 [hereinafter Assistance Convention].

92. Johan Rautenbach, Wolfram Tonhauser & Anthony Wetherall, *Overview of the International Legal Framework Governing the Safe and Peaceful Uses of Nuclear Energy: Some Practical Steps*, in IAEA, *International Nuclear Law in the Post-Chernobyl Period*, Joint Report 10 (2006) [hereinafter *Nuclear Law in the Post-Chernobyl Period Joint Report*].

93. *Id.*

94. *Id.*

95. *Id.* at 10 n.10.

96. Early Notification Convention, *supra* note 91, art. 1, § 2.

97. See Norbert Pelzer, *Learning the Hard Way: Did the Lessons Taught by the Chernobyl Nuclear Accident Contribute to Improving Nuclear Law?*, in *Nuclear Law in the Post-Chernobyl Period Joint Report*, *supra* note 92, at 75.

storage of nuclear fuel or radioactive wastes”⁹⁸ may more broadly apply to military facilities. Other conventions relating solely to civil use nuclear programs typically include exclusionary provisions explicitly renouncing application to military programs.⁹⁹ Here, a reading that includes military programs is bolstered by the absence of such an exclusionary provision.¹⁰⁰

However, other tools of statutory interpretation may limit this argument such as the canon of *ejusdem generis*, “where general words follow an enumeration of two or more things, they apply only to . . . things of the same general kind or class specifically mentioned.”¹⁰¹ Thus, the limitation of all other facilities and activities relating to civil use programs, may similarly apply to “nuclear fuels or radioactive wastes.”¹⁰²

However, similar language was used in The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Joint Convention).¹⁰³ In the Joint Convention, as opposed to the Early Notification Convention, the five nuclear weapon states successfully negotiated for language excluding the Joint Convention’s application to waste and spent fuel resulting from military or defense programs.¹⁰⁴ Where no such language appears in the Early Notification Convention, one could argue it applies to military activities and thus triggers mandatory notification. On the other hand, the Joint Convention may serve as a way to understand the plain meaning of the Early Notification

98. Early Notification Convention, *supra* note 91, art. 1, § 2.

99. See, e.g., IAEA, Convention on the Physical Protection of Nuclear Material, art. 1A, Oct. 26, 1979, 1456 U.N.T.S. 24631; Nuclear Terrorism Convention, *supra* note 17.

100. See generally *Expressio Unius, Statutory Interpretation: Theories, Tools, and Trends*, CONGRESS.GOV (last updated Mar. 10, 2023), <https://www.congress.gov/crs-product/R45153> [<https://perma.cc/Q52M-T2EW>].

101. UNIV. OF HOUSTON L. CTR., *Canons of Construction (adapted from Scalia & Garner)* 2, <https://www.law.uh.edu/faculty/adjunct/dstevenson/2018Spring/CANONS%20OF%20CONSTRUCTION.pdf> [<https://perma.cc/F2EG-U3AK>] (last visited Mar. 14, 2026).

102. Early Notification Convention, *supra* note 91, art. 1, § 2.

103. INT’L ATOMIC ENERGY AGENCY, Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, opened for signature Sept. 5, 1997, IAEA Doc. INFCIRC/546; Ben McRae, *The Compensation Convention: Path to a Global Regime for Dealing with Legal Liability and Compensation for Nuclear Damage, in Nuclear Law in the Post-Chernobyl Period* Joint Report, *supra* note 92, at 208.

104. Joint Convention, *supra* note 103, pmbl. (viii); McRae, *The Compensation Convention*, *supra* note 103, at 208.

Convention to exclude military use.¹⁰⁵ Similarly, such a reading may be redundant in light of Article 3 of the convention. Thus, it is likely that the mandatory notification requirements of Article 2 do not apply to military use of nuclear fuel. Application to accidents caused by nuclear weapons may more appropriately be found under Article 3.¹⁰⁶

Article 3 of the Early Notification Convention expands nuclear accidents to events “other than those specified in article 1,” but removes mandatory notification requirements by substituting the mandatory language “shall notify” for the permissive “may notify.”¹⁰⁷ Consequently, the Convention establishes notification requirements for nuclear weapons programs only for the willing, allowing states to evade the obligation to notify if they desire.¹⁰⁸ Setting aside the lack of security standards, the Convention suffers from an obvious weakness by excluding military nuclear facilities in mandatory reporting of actual or potential accidents.¹⁰⁹

The Assistance Convention lacks even greater obligations. The Convention instructs Parties to undertake to cooperate mutually and with the IAEA in accordance with the convention “to facilitate prompt assistance in the event of a nuclear accident or radiological emergency to minimize its consequences and to protect life, property and the environment from the effects of radioactive releases.”¹¹⁰ To facilitate such cooperation, Parties may agree on bilateral or multilateral arrangements in order to prevent or

105. See *General-Terms Canon*, in Valerie C. Brannon, CONG. RSCH. SERV., R45153, STATUTORY INTERPRETATION: THEORIES, TOOLS, AND TRENDS (2023).

106. See McRae, *The Compensation Convention*, *supra* note 103, at 121 n.3 and accompanying text (“The plants and activities listed in Article 1, paragraph 2, do not, as already pointed out, include all possible sources of damage with transboundary radiological consequences. In particular, there is no mention of plants and activities connected with nuclear weapons and the testing of such weapons. Article 3 allows for such cases but in an incomplete fashion.”).

107. Early Notification Convention, *supra* note 91, art. 3; see *Mandatory/Permissive Canon*, *supra* note 100.

108. See McRae, *The Compensation Convention*, *supra* note 103, at 80.

109. *Id.* at 122 (“This supplementary field of application of the convention is therefore purely optional. It is a regrettable omission but can be explained by the fact that states in possession of nuclear weapons are not prepared for their military sector to be subject to international regulations in respect of nuclear or any type of weapon.”). Further, the representative of India made the same complaint during the signing of the convention. *Id.* at 122 n.4 (citing IAEA, INF/CIRC/355/Add.2 (May 20, 1988)).

110. Assistance Convention, *supra* note 91, art. 1(1).

minimize injury and other damage.¹¹¹ The Assistance Convention's scope exceeds that of the Convention on Early Notification in that it applies not only to accidents but also to radiological emergencies.¹¹² While the term "nuclear accident" is interpreted in light of the Early Notification Convention referring to civil facilities, radiological emergency is not as restricted and therefore may include emergencies resulting from military programs.¹¹³ If so, international assistance would be triggered if a state suffered damage as a result of activities involving nuclear weapons.¹¹⁴

However, the main criticism of the Assistance Convention lies in Article 2. If a Party needs assistance, it may call for it from another Party, directly or through the IAEA, and from the IAEA or from other intergovernmental organizations.¹¹⁵ This result, however, can be achieved without an agreement, nor does the convention provide any mechanisms to render or require acceptance of assistance.¹¹⁶ As a consequence, the convention has been strongly criticized in legal literature.¹¹⁷

111. See Pelzer, *supra* note 97, at 81.

112. See *id.*

113. See *id.* at 123.

114. See *id.* For a discussion on whether the Assistance Convention would apply in such a situation, or whether the decision to assist is left to state discretion, see *id.* at 124:

Of itself, the expression radiological emergency would have to be understood in its unlimited sense and would therefore include damage or the threat of damage due to the testing and use of atomic weapons. On the other hand, . . . the role of the IAEA is to concern itself with the peaceful uses of nuclear energy so that measures connected with the use of atomic weapons for military purposes are excluded from its field of responsibility – and this would apply to regulations drawn within the IAEA framework. Against this, . . . there is the fact that Article 3 of the [Early Notification Convention] leaves it to the States Parties to decide whether to notify in cases other than the accidents listed in Article 1 as set out above, and these include the military sector. Because of this confusion it would seem important to clarify the situation by making the necessary additions to the wording of the [Assistance Convention]. This could be done by an amendment as provided under Article 16. *Id.*

115. Assistance Convention, *supra* note 91, art. 2.

116. McRae, *The Compensation Convention*, *supra* note 103, at 81.

117. See in particular the article-by-article commentary by Zehetner (footnote 37), Silagi (footnote 35) and the other authors cited in NUCLEAR LAW IN THE POST-CHERNOBYL PERIOD JOINT REPORT, *supra* note 92. NUCLEAR ENERGY AGENCY, *INTERNATIONAL NUCLEAR LAW IN THE POST-CHERNOBYL PERIOD* (OECD Publishing 2006), https://www.oecd-neo.org/jcms/pl_14152/international-nuclear-law-in-the-post-chernobyl-period?details=true [<https://perma.cc/SA6T-Y2CZ>].

C. UN Resolution 1540

The 2004 United Nations Security Council Resolution 1540 (“UNSCR 1540”) obligates all states to provide “appropriate effective” security, physical protection, and accounting for all nuclear weapons and related materials.¹¹⁸ The resolution, which is binding on all UN Member States, requires that acts involving weapons of mass destruction be treated as criminal acts by the state in which the acts take place.¹¹⁹

To truly be “appropriate” and “effective,” a security system should provide effective protection against all the plethora of adversarial attempts to gain control over nuclear weapons that might plausibly occur in the country.¹²⁰ Indeed, the resolution requires states to implement and enforce effective measures to physically protect and “secure such items in production, use, storage or transport.” While¹²¹ these provisions may contemplate a minimum level of security, they are far from requiring specific standards.

Further, the binding legal force and enforcement mechanism of the Resolution is unclear.¹²² The UN Charter obligates Member States to comply with Council decisions.¹²³ Mandatory Security Council Resolutions “impose obligations on third parties (primarily the Member States) or authorize action by third parties that might otherwise be unlawful.”¹²⁴ But, some resolutions “deal with substantive matters in a general way,” including nuclear weapons and terrorism.¹²⁵ In adopting UNSCR 1540, “the Security Council decided that all States shall refrain from providing *any*

118. S.C. Res. 1540, U.N. Doc. S/RES/1540 (Apr. 28, 2004) [hereinafter UNSCR 1540].

119. UNSCR 1540, *supra* note 118, ¶ 3(d).

120. See Matthew Bunn, Nickolas Roth & William H. Tobey, *Protecting Nuclear Materials and Facilities Against the Full Spectrum of Plausible Threats*, IAEA-CN-254-262, Int’l Conference on Physical Prot. of Nuclear Materials & Nuclear Facilities (Nov. 13–17, 2017), at 2, ¶ 2, https://matthewbunn.scholars.harvard.edu/sites/g/files/omnuum3466/files/bunn_protecting_nuclear_materials_and_facilities_against_the_full_spectrum_of_plausible_threats_01.pdf [<https://perma.cc/W8C8-F5YT>].

121. UNSCR 1540, *supra* note 118, at 3.

122. See generally Michael C. Wood, *The Interpretation of Security Council Resolutions*, 2 MAX PLANCK Y.B. U.N. L. 73 (1998).

123. UNRCCA, *United Nations Security Council Resolutions*, at 1, https://unrcca.unmissions.org/sites/default/files/6unrcca_handout_unsc_resolutions_eng_2020_1_2.pdf [<https://perma.cc/ZC94-PKFL>] (last visited Mar. 14, 2026).

124. Wood, *supra* note 122, at 79.

125. *Id.*

form of support to non-State actors” that attempt to acquire control over nuclear weapons.¹²⁶ The manner through which this was done required implementation through national legislation within each country.¹²⁷ Thus, any possible binding nature of the resolution is limited to domestic actions. So long as the state has legislation on the matter, deviations from international standards would not violate the resolution. Further, even if security measures were required, the resolution lacks liability for a violating state. While Article 3, paragraph D, instructs states to establish and enforce criminal or civil penalties, this instruction is limited to export control and would therefore not apply to storage and maintenance of nuclear weapons.¹²⁸

Thus, while the NPT may be read as to require minimum standards of control for nuclear-weapon state parties to the treaty, the NPT, IAEA Conventions, and UNSCR 1540 fall short of establishing internationalized standards to prevent inadequate control and implement effective measures of nuclear security in military programs. Customary international law may be a better way to hold states responsible for inadequate control of nuclear weapons. Part IV will examine this contention in part.

IV. SURVEY OF GENERAL PRINCIPLES OF CUSTOMARY INTERNATIONAL LAW AND POSSIBLE APPLICATIONS TO INADEQUATE CONTROL OF NUCLEAR WEAPONS

There are a handful of existing bodies of customary international law that may apply to inadequate control of nuclear weapons. Part IV specifically analyzes the creation of customary international law and general principles of customary international law. Section A of this Part argues that state practice and *jus cogens* surrounding inadequate control of nuclear weapons has crystallized into customary international law. Section B discusses other paths of customary international law that may apply to inadequate control of nuclear weapons and discusses potential consequences of application. Section D analyzes International Criminal Law in the context of inadequate control of nuclear weapons.

126. UNSCR 1540, *supra* note 118.

127. *Id.* at 2, 3, 6.

128. *Id.* ¶ 3(d).

A. *Crystallization of Customary International Law: Cooperative Threat Reduction Programs and Hotline Agreements*

Customary international law is a source of international law.¹²⁹ Customary international law emerges over time, evidenced through “state practices converging and achieving a level of uniformity, consistency, and regularity that in turn generates expectations that the practice reflects existing law.”¹³⁰ “When [state military practice] attains a degree of regularity and is accompanied by the general conviction among nations that behavior in conformity with that practice is obligatory, it can be said to have become a rule of customary law binding all nations.”¹³¹ This section argues that international practices surrounding inadequate control and security of nuclear weapons have “attained the stature of accepted principles of norms, and are recognized as international law of practice.”¹³²

While implementation of specific security measures may not reach the level of customary international law,¹³³ this section finds that state practice, evidenced through cooperative threat reduction agreements, and principles of international norms, such as the internationalization of nuclear civil programs, can be found to form the basis of international legal requirements for international cooperation in the face of inadequate control of nuclear weapons.

129. 1 CHARLES J. MOXLEY JR., *NUCLEAR WEAPONS AND INTERNATIONAL LAW: EXISTENTIAL RISKS OF NUCLEAR WAR AND DETERRENCE THROUGH A LEGAL LENS* 72 (2d ed. 2024) [hereinafter 1 MOXLEY, *NUCLEAR WEAPONS AND INTERNATIONAL LAW*].

130. JEFFREY L. DUNOFF, MONICA HAKIMI, STEVEN R. RATNER & DAVID WIPPMAN, *INTERNATIONAL LAW: NORMS, ACTORS, PROCESS: A PROBLEM-ORIENTED APPROACH* 64 (5th ed. 2020).

131. US DEP’T NAVY, *ANNOTATED SUPPLEMENT TO THE COMMANDER’S HANDBOOK ON THE LAW OF NAVAL OPERATIONS: NWP I-14M/MCWP S-2.1 5-8* (1997), *reprinted in* 1 MOXLEY, *NUCLEAR WEAPONS AND INTERNATIONAL LAW*, *supra* note 129, at 19.

132. US DEP’T AIR FORCE, *INTERNATIONAL LAW—THE CONDUCT OF ARMED CONFLICT AND AIR OPERATIONS: PAMPHLET 110-31*, at 1-3 (1976), *reprinted in* 1 MOXLEY, *NUCLEAR WEAPONS AND INTERNATIONAL LAW*, *supra* note 129, at 19.

133. Professor Newell L. Highsmith argues “While customary international law may prohibit states from launching unprovoked attacks, it does not require states to take any specific measures to avoid *accidental* nuclear attacks (or to avoid actions that might be misperceived as nuclear attacks).” Newell L. Highsmith, *On the Legality of Nuclear Deterrence*, *Livermore Papers on Global Security* No. 6, at 68 (Apr. 2019).

1. State Practice: Threat Reduction Agreements

State practice takes numerous forms, including treaties, executive agreements, diplomatic contracts, public statements of government officials, and actions or inactions.¹³⁴ Here, state practice surrounding inadequate control of nuclear weapons is evidenced through threat reduction agreements. While the Nunn-Lugar Agreement was imagined for a limited engagement,¹³⁵ the Cooperative Threat Reduction Program born from it was extended by Congress in 2004 to activities beyond the territory of the former Soviet Union, and in 2008, the activities were globalized.¹³⁶ The CTR Program works with more than thirty countries to secure and protect nuclear weapons and materials.¹³⁷

However, US-Russian cooperation under the CTR Program was stymied in 2014 following Russia's annexation of Crimea, resulting in a cessation of CTR program operations in conjunction with Russia.¹³⁸ Further, the program is only operative in two nuclear states, India and Pakistan,¹³⁹ as partnerships with Russia and China have been closed.¹⁴⁰ While this may seem like an absence of state practice, the principles of the program can be found in a plethora of bilateral agreements, known as hotline agreements.

134. DUNOFF ET AL., *supra* note 130, at 65.

135. *See supra* Section II.C and accompanying notes for a discussion of the Nunn-Lugar Agreement.

136. NUNN-LUGAR THREAT REDUCTION PROGRAM FACTSHEET, *supra* note 48.

137. *Id.*

138. NUNN-LUGAR THREAT REDUCTION PROGRAM FACTSHEET, *supra* note 48.

139. DEF. THREAT REDUCTION AGENCY, *Cooperative Threat Reduction Directorate*, <https://www.dtra.mil/About/Mission/Cooperative-Threat-Reduction/> [<https://perma.cc/V4WV-X7TE>] (last visited Mar. 14, 2026).

140. *Id.*

Shortly after the Cuban Missile Crisis,¹⁴¹ the United States and Soviet Union signed the first 1963 Hotline Agreement.¹⁴² The purpose of the agreement was to establish communication between the two governments to prevent and mitigate incidents of accidental nuclear war.¹⁴³ The hotline was indeed used on various volatile occasions: after the assassination of President John F. Kennedy; to clarify the intentions of US fleet movements during the 1967 Six Day War between Israel, Egypt, Jordan, and Syria; the Indo-Pakistani War of 1971; the 1973 Arab-Israeli War; and many other recorded as well as classified uses of the hotline.¹⁴⁴ As technology advanced, the hotline improved.¹⁴⁵ In 1987, the United States and the Soviet Union signed an agreement creating Nuclear Risk Reduction Centers (“NRRCs”), which became operational a year later.¹⁴⁶

While the US-Russia Hotline met its demise around 2024,¹⁴⁷ the principles of bolstering communication and nuclear security

141. The Cuban Missile Crisis of October 1962 consisted of thirteen days of escalating military actions between the United States and the Soviet Union. See CTR. FOR ARMS CONTROL & NON-PROLIFERATION, *The Cuban Missile Crisis*, <https://armscontrolcenter.org/the-cuban-missile-crisis/> [https://perma.cc/EW3S-LPZJ] (last visited Mar. 14, 2026). The high-alert nature of the event was exacerbated by the direct and indirect communications between the two heads of state, unable to decipher the intentions of the other. See OFF. OF THE HISTORIAN, *The Cuban Missile Crisis, October 1962*, <https://history.state.gov/milestones/1961-1968/cuban-missile-crisis> [https://perma.cc/83AW-SBXJ] (last visited Mar. 14, 2026). This event underscored the importance of quick and reliable communications directly between the heads of government for nuclear weapon states to reduce the potential for miscalculation or miscommunication in future relations. See *id.*

142. ARMS CONTROL ASS'N, *Hotline Agreements* (May 2020), <https://www.armscontrol.org/factsheets/hotline-agreements> [https://perma.cc/7WPL-S2JV].

143. *Id.*

Each government was responsible for the communication link on their territory. The hotline would connect Washington and Moscow In the case the wire circuit was interrupted, messages would be transmitted via radio circuit. Critically, the countries decided against the use of a telephone, opting instead for telegraphs where careful reading and response is favored over rapid translation.

Id.

144. *Id.*

145. *Id.*

146. *Id.*

147. Lidia Kelly, *Kremlin Says Russia-US Hotline to Deflate Crisis Not in Use*, REUTERS (Nov. 20, 2024), <https://www.reuters.com/world/kremlin-says-russia-us-hotline-deflate-crisis-not-use-2024-11-20/> [https://perma.cc/43FV-X3CG]. In 2024, Russian President Vladimir Putin confirmed that the hotline between the Kremlin and the White House was no longer in use. Citing heightened tensions between the two States, the

through international cooperation inspired similar agreements in other countries. In 2004, India and Pakistan agreed to set up a nuclear hotline, and in 2011 the two states agreed to a “terror hotline,” which allows Indian investigators to visit Pakistani sites in connection with terrorist attacks.¹⁴⁸ In 1998, China established nuclear hotlines first with Russia, then with the United States.¹⁴⁹ North Korea and South Korea similarly established a nuclear hotline, with the most recent confirmed use being in 2018.¹⁵⁰ A number of additional bilateral hotline agreements have been pursued.¹⁵¹

While the argument against customary state practice is that risk reduction treaties may lack uniformity as they have not applied to all states,¹⁵² the very actions that states have taken can be found consistently amongst a plethora of agreements enacted subsequently to the Nunn-Lugar Agreement. While the agreements may not be multi-lateral, hotline agreements are evidence of multi-state cooperation in pursuit of the same principles of threat reduction.

However, though hotline agreements may evince state practice of communication, they may instead be born from fear:

Whereas the popularized image of the ‘Moscow–Washington hotline’ gives the illusion that vital communication in times of crisis is possible, these incidents reveal the reality that those who possess nuclear weapons will continue to be distrustful of one another and remain reliant on data transmitted by systems that are vulnerable to error or misjudgment, particularly when leaders have to respond too quickly to be able to make fully informed decisions.¹⁵³

decision is noted to have lowered the threshold for a nuclear strike in response to a broader range of attacks. *Id.*

148. *Hotline Agreements*, *supra* note 142. However, the hotline may no longer exist. See Harry Hannah, *A Hotline Between National and Nuclear Command Authorities to Manage Tensions*, SOUTH ASIAN VOICES (July 24, 2019), <https://southasianvoices.org/hotline-between-command-authorities-to-manage-tensions/> [https://perma.cc/Z27H-64SK].

149. *Hotline Agreements*, *supra* note 142.

150. *Id.*

151. See *id.* (finding additional hotlines between South Korea and China, India and China, Vietnam and China, and Taiwan and China).

152. Highsmith, *supra* note 133, at 68.

153. CHATHAM HOUSE REPORT, *supra* note 13, at vi.

2. International Norms: Internationalization of Civil Nuclear Program

The attitude against internationalization of legal requirements around nuclear weapons most likely originates from the importance that states attribute to their national nuclear programs. Nuclear weapons are one of the most sensitive areas of national security.¹⁵⁴ Consequently, states argue that the control and maintenance of nuclear arsenals is a national matter of major sensibility, and any international requirements interfere with national sovereignty.¹⁵⁵ However, strict protocols exist for civil use of nuclear material where deviation results in legal liability.¹⁵⁶

Within six months of the nuclear accident at the Chernobyl nuclear power plant, the international community negotiated and adopted a plethora of conventions and protocols regulating communication, cooperation, and safety benchmarks for nuclear accidents.¹⁵⁷ These “international regimes governing liability for nuclear damage have been significantly reinforced,” resulting in a robust global regime.¹⁵⁸ Yet no similar standards govern or hold responsible state possession of nuclear weapons. It is against all interests to wait for a nuclear weapons accident resulting in devastating consequences to prompt international cooperation.

The same concerns underlying the international community’s effort to globalize nuclear safety requirements in the wake of Chernobyl are similarly present in the use of nuclear weapons.

[P]rior to the Chernobyl accident, there had been little by way of legally binding international commitments. Nuclear power plant safety had differed in that regard from air safety or safety at sea, where binding international rules had long existed. The difference was not surprising: unlike an airplane or ship, these plants are clearly sedentary, remaining firmly situated in the national jurisdiction of one state.¹⁵⁹

154. See McRae, *The Compensation Convention*, *supra* note 103, at 87.

155. See *id.*; see also DoD MANUAL 5210.41, *supra* note 10.

156. See generally Nuclear Law in the Post-Chernobyl Period Joint Report, *supra* note 92.

157. *Id.* at 3.

158. *Id.*

159. Rautenbach, Tonhauser & Wetherall, *supra* note 92, at 8.

Despite the national interests in nuclear power plants, the international community acknowledged their international responsibilities by adopting regulations.¹⁶⁰

Arguments against internationalization of nuclear military programs, however, may reasonably hold significantly higher national significance than civil programs given the very nature that they are militaristic. Further, there is no evidence of state efforts to implement mandatory technical standards for nuclear security, nor discussions on binding international instruments on adequate control of nuclear weapons.¹⁶¹

While the transboundary consequences of inadequate control provide tenable arguments for international regulation, state practice may be lacking, and arguments for maintaining sole national jurisdiction may remain too strong. Despite the possible lack of direct customary international law around the issue, principles of international law still apply.

B. Environmental Law and the No-Harm Rule (Sic utere tuo ut alienum non laedas)

Even if customary international law has not yet crystallized, other bodies of customary international law may apply, including environmental law.

Customary international law imposes on states a due-diligence obligation to prevent significant transboundary or global harm arising from activities within their jurisdiction or control.¹⁶² When applied to nuclear weapons, this body of law reinforces that failure to maintain adequate control of nuclear weapons is incompatible with states' international obligations.

The no-harm rule was first formulated in the *Trail Smelter* Arbitration.¹⁶³ The arbitration tribunal held that:

under the principles of international law . . . no State has the right to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another or

160. *Id.*

161. See Pelzer, *supra* note 97, at 87.

162. See, e.g., *Trail Smelter Case* (U.S. v. Can.), 3 R.I.A.A. 1905 (1941); *Pulp Mills on the River Uruguay* (Arg. v. Uru.), Provisional Measures, 2006 I.C.J. 113 (July 13); *Nuclear Weapons Advisory Opinion*, *supra* note 9.

163. See generally *Trail Smelter Case*, *supra* note 162.

the properties or persons therein, when the case is of serious consequence and the injury is established by clear and convincing evidence.¹⁶⁴

Though pertaining to transboundary air pollution, *Trail Smelter* is frequently cited in support of a customary duty to prevent significant transboundary harm.¹⁶⁵

While transboundary pollution is common, few risks match the gravity of potential harm posed by nuclear weapons.¹⁶⁶ Invoking the no-harm principle, the International Court of Justice (“ICJ”) in its 1996 Advisory Opinion on *Legality of the Threat or Use of Nuclear Weapons* confirmed that states’ harm prevention obligations under customary law apply to global environmental concerns.¹⁶⁷ The ICJ noted that “nuclear weapons could constitute a catastrophe for the environment,” and “the existence of the general obligation of States to ensure that activities within their jurisdiction and control respect the environment of other States or of areas beyond national control is now part of the corpus of international law relating to the environment.”¹⁶⁸

In the context of inadequate control of nuclear weapons, states have a duty to prevent the potential environmental impact of a potential unauthorized use of nuclear weapons—this would mean implementing adequate security standards to prevent such a use. In *Obligations of States in Respect of Climate Change*, the ICJ explicitly stated that the “[f]ailure of a State to take appropriate action to protect the climate system... may constitute an internationally wrongful act.”¹⁶⁹ Thus, if it can be established that a state is not taking measures commensurate with the risk of climate harm resulting from unauthorized use of nuclear weapons, the state may incur legal consequences under the law of state responsibility, including the “obligations of cessation and non-repetition.”¹⁷⁰

164. *Id.* at Part Three.

165. DUNOFF ET AL., *supra* note 130, at 562.

166. See 2 MOXLEY, NUCLEAR WEAPONS AND INTERNATIONAL LAW, *supra* note 1, ch. 14.

167. *Nuclear Weapons Advisory Opinion*, *supra* note 9, ¶ 29.

168. *Id.*

169. *Obligations of States in Respect of Climate Change*, Advisory Opinion (Gen. List No. 187, July 23, 2025).

170. *Id.* ¶ 445.

Crucially, the Court has clarified that harm need not have occurred for a violation of the rule to arise.¹⁷¹ The duty to prevent is triggered by risk, not by injury.¹⁷² The Court explained that failure to take due-diligence measures may violate international obligation “whether that act causes harm or not.”¹⁷³ Therefore, a nuclear-weapon state that fails to take preventive measures that *could* result in the unauthorized use of nuclear weapons in a manner that causes transboundary environmental harm may commit an internationally wrongful act even if no harm is suffered.

This path may be more desirable than some conventional laws solely requiring states to implement formal rules nationally.¹⁷⁴ In *Pulp Mills on the River Uruguay*, due diligence requires more: it “entails not only the adoption of appropriate rules and measures, but also a certain level of vigilance in their enforcement and the exercise of administrative control” over activities that risk causing harm.¹⁷⁵ The *Obligations of States in Respect of Climate Change* opinion deepens this duty by emphasizing that due diligence is an objective standard, measured by factors such as extent of risk, technological feasibility, foreseeability, and the consequences of failure.¹⁷⁶

Applied to nuclear weapons, these principles imply that states must take all reasonable security measures in an objectively adequate manner to prevent unauthorized access, loss of control, accidental use, theft, diversion, or any other lapse in security that could foreseeably result in catastrophic harm. Given the immense destructive potential of nuclear weapons, even a small increase in risk constitutes “significant” risk as postulated in the customary due-diligence precedent.¹⁷⁷ Inadequate control of nuclear weapons and military materials therefore falls within the category of conduct that international law obligates states to prevent.

171. *Id.* ¶¶ 427, 433.

172. *Id.*

173. *Id.*

174. *See, e.g.*, UNSCR 1540, *supra* note 118; *see also infra* Part III(c).

175. *Pulp Mills*, *supra* note 162, ¶ 197, at 69.

176. *Obligations in Respect of Climate Change*, *supra* note 169, ¶ 300, at 136.

177. *Id.*

C. *International Humanitarian Law: Threats, Superfluous Injury, Controllability, and the Rule of Precaution*

International humanitarian law, or the Law of Armed Conflict, is another existing body of customary international law that could be applicable to the inadequate control of nuclear weapons. The United States recognizes that the law of armed conflict, including the rules of threats, superfluous injury, controllability, and the rule of precaution, apply to the use of any weapon, including any nuclear weapon.¹⁷⁸

Even if states take the position that there is no conventional or customary rule of law obligating states to implement effective safeguards to adequately control nuclear weapons, the law of armed conflict imposes obligations to avoid inadequate control. Indeed, the United States recognizes this body of international humanitarian law as applicable to the threat and use of nuclear weapons.¹⁷⁹

This part applies rules of the law of armed conflict to inadequate control of nuclear weapons. When one conducts this analysis, the conclusion is compelling that insecure authority over a state's nuclear weapons would be unlawful in international law.

1. Threats

The unlawfulness of inadequate control may be found from the rule that unlawful threats of nuclear weapons are themselves unlawful.¹⁸⁰ Assuming that the use of nuclear force by non-state actors is *per se* unlawful, this section argues that a state's failure to properly secure nuclear weapons from such use amounts to a threat of unlawful use of nuclear weapons.

The UN Charter contains a general prohibition on threats to use force in international law. Article 2(4) of the UN Charter prohibits "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."¹⁸¹ "Threat" as used in the Charter is widely understood as an explicit or

178. 1 MOXLEY, NUCLEAR WEAPONS AND INTERNATIONAL LAW, *supra* note 129, at 1.

179. *Id.* at 71.

180. *Nuclear Weapons Advisory Opinion*, *supra* note 9, ¶¶ 47–48, at 246–47.

181. UN Charter art. 2(4).

implicit promise to use force.¹⁸² Explicit threats typically include written or verbal assertions.¹⁸³ Implicit threats, however, may arise from non-verbal state conduct, such as abrupt increases in force posture, accelerated weapons deployments, military demonstrations, or significant shifts in defense spending.¹⁸⁴ Russia's 2021 military buildup on Ukraine's border is cited as an example of implicit threat of force.¹⁸⁵

While the legal certainty of implicit threats remains unsettled,¹⁸⁶ the ICJ Advisory Opinion on the Legality of Nuclear Weapons provides significant clarification. The Court found that "if the use of force itself in a given case is illegal—for whatever reason—the threat to use such force will likewise be illegal."¹⁸⁷ The Court further emphasized that this principle applies not only to the UN Charter's *jus ad bellum* framework, but also to international humanitarian law: "If an envisaged use of weapons should not meet the requirements of humanitarian law, a threat to engage in such use would also be contrary to that law."¹⁸⁸ The ICJ also affirmed the interdependence of "threat" and "use" within Article 2(4) of the UN Charter, noting that the legality of the threat depends on the legality of the hypothetical use.¹⁸⁹

Applying this framework, can inadequate control of nuclear weapons constitute an unlawful implicit threat under international law? Because such deficiencies create a foreseeable risk of an unlawful use of force, a plausible argument is that they amount to an implicit threat of force in violation of Article 2(4).¹⁹⁰ A nuclear weapon vulnerable to non-state actor acquisition and potential launch would then seem to constitute an unlawful use of force under the Charter and international humanitarian law. Consequently, a state's maintenance of conditions that

182. Anna Hood & Monique Cormier, *Nuclear Threats Under International Law Part I: The Legal Framework*, 7 J. FOR PEACE & NUCLEAR DISARMAMENT, 157, 168 (2024).

183. *Id.*

184. *Id.*

185. Sava Jankovic & Volker Roeben, *Mind the Gap: The Determination, Legality and Consequences of Implicit Threats of Force*, 38 LEIDEN J. INT'L L. 812, 814 (2025).

186. *Id.*

187. *Nuclear Weapons Advisory Opinion*, *supra* note 9, ¶ 47.

188. *Id.* ¶ 78, at 257.

189. *Id.*

190. *See* UN Charter art. 2(4).

meaningfully increase that risk may itself represent an implicit threat to use force, even absent hostile intention.

This reasoning suggests that inadequate control of nuclear weapons, when it creates a real and foreseeable risk of unlawful nuclear use, can be an implicit threat under Article 2(4) of the UN Charter.¹⁹¹ Thus, the state controlling an insecure arsenal may be in violation of UN Charter law, triggering the rights of other states.¹⁹²

2. Superfluous Injury

Codified in Article 23 of the Annex to Hague IV and Article 25 of Additional Protocol I, the rule against superfluous injury prohibits the use of weapons or methods of warfare that cause suffering disproportionate to the military advantage gained.¹⁹³ Although states generally accept the rule's existence, they differ on how to determine when a weapon violates it.¹⁹⁴ The rule requires an assessment, balancing military necessity against expected harm, including consideration of feasible, less harmful alternatives.¹⁹⁵

The rule applies to "means and methods of warfare," not limited to weapons in the technical sense nor to material.¹⁹⁶ Rather, "means of warfare" is to be understood as the mode of use of means of warfare in accordance with certain military concepts or tactics.¹⁹⁷ Article 54(1) of Additional Protocol I identifies starvation as one such prohibited method. In principle, the design of a nuclear weapon or its associated facilities could fall within this

191. *Id.*

192. *See infra* Part IV(C)(5).

193. *See* 2 MOXLEY, NUCLEAR WEAPONS AND INTERNATIONAL LAW, *supra* note 1, at 961.

194. *See* INT'L HUMANITARIAN L. DATABASES, *Practice Relating to Rule 70. Weapons of a Nature to Cause Superfluous Injury or Unnecessary Suffering*, <https://ihl-databases.icrc.org/en/customary-ihl/v2/rule70> [<https://perma.cc/DWH4-43SB>] (last visited Mar. 16, 2026) [hereinafter IHL DATABASES, Rule 70].

195. US DEP'T OF DEF., DEPARTMENT OF DEFENSE LAW OF WAR MANUAL 359–60 (June 2015) (updated Dec. 2016), *cited in* 2 MOXLEY, NUCLEAR WEAPONS AND INTERNATIONAL LAW, *supra* note 1, at 869.

196. Henri Meyrowitz, *The Principle of Superfluous Injury or Unnecessary Suffering: From the Declaration of St. Petersburg of 1868 to Additional Protocol I of 1977*, 34 INT'L REV. RED CROSS 98, 102 (1994).

197. Protocol Additional to the Geneva Conventions of Aug. 12, 1949, and Relating to the Protection of Victims of International Armed Conflicts (Protocol I), art. 35(2), June 8, 1977, 1125 U.N.T.S. 3 [hereinafter Additional Protocol I].

concept, even though no weapon has been declared unlawful solely because of inadequate safety design.¹⁹⁸

The United States has at times framed the superfluous injury rule in terms of whether excessive effects were intentionally designed into a weapon.¹⁹⁹ If “design” includes the manner of storage and safety engineering, inadequate control of nuclear weapons could implicate this rule. For example, nuclear weapon safety features like “stronglinks” are integral design elements intended to prevent unauthorized or accidental detonation.²⁰⁰ The IAEA similarly treats facility design as part of nuclear physical protection,²⁰¹ and US doctrine includes design features intended to minimize radiological release in accidents.²⁰²

A logical inference, therefore, is that a state failing to incorporate adequate safety mechanisms may fail to design a weapon safe from unauthorized detonation. This finding would be significant as the Statute of the International Criminal Court (“ICC”) includes the use of “methods of warfare which are of nature to cause superfluous injury or unnecessary suffering” as a war crime.²⁰³

One shortcoming of this argument may be the level of *mens rea* that the rule requires. “The United States has at times defined the superfluous injury rule as based on whether the excessive effects were *intentionally designed into the weapon*.”²⁰⁴ If inadequate control of nuclear weapons resulted from negligence on the part of the violating state, then it would seem there is a lack of intentionality.

198. See IHL DATABASES, Rule 70, *supra* note 194, under the heading “Examples” for a comprehensive list of weapons regarded as violating the Rule Against Superfluous Injury.

199. 1 MOXLEY, NUCLEAR WEAPONS AND INTERNATIONAL LAW, *supra* note 129, at 64 (citing Naval Commander’s Handbook § 5.3.1).

200. NUCLEAR MATTERS HANDBOOK 2020, *supra* note 3, at 92–94. A “stronglink” is a gateway built into the barrier that encloses detonation-critical components, designed to ensure that only the proper signals can reach the firing set. It prevents unintended energy sources from powering or operating the weapon’s functions and can also block firing-set stimuli from reaching the detonators. *Id.*

201. IAEA Security Aspects, *supra* note 5.

202. NUCLEAR MATTERS HANDBOOK 2020, *supra* note 3, at 91–94.

203. IHL DATABASES, Rule 70, *supra* note 194; see *infra* Section IV.D.

204. 1 MOXLEY, NUCLEAR WEAPONS AND INTERNATIONAL LAW, *supra* note 129, at 64 (emphasis added in part, emphasis maintained in part).

3. Controllability

Further, under the requirement of necessity, a state must be able to control the level of destructiveness of a weapon and assure that its use will involve only such a level of destructiveness as is necessary in the circumstances.²⁰⁵ This raises the natural conclusion that a state that cannot ensure the security of nuclear weapons, nor ensure the weapons will not be used by non-state actors, violates the rule of controllability.

The Law of Armed Conflict, as recognized by the United States, is clear that the use of weapons whose effects are uncontrollable cannot comply with the law of armed conflict, including the rules of distinction, proportionality, and necessity.²⁰⁶ In the ICJ Advisory Opinion, the United States argued that the effects of nuclear weapons can be controlled.²⁰⁷ However, if a state cannot guarantee that the weapon will be used in an appropriate way, then even the effects cannot be controlled.

4. Rule of Precaution

Further, the Law of Armed Conflict imposes the Rule of Precaution upon states, requiring that they take reasonable precautions and preventative measures to ensure that their military and other representatives comply with international law.²⁰⁸ Article 57 of Additional Protocol I requires “constant care” in the conduct of military operations.²⁰⁹ While the maintenance and security measures used by states to manage nuclear weapons appear to fit within preventative measures required by the Rule of Precaution, one could argue that Additional Protocol I only applies in the *conduct* of military operations, not to *pre-military operations*.²¹⁰

Customary international law suggests that the Rule of Precaution applies both during times of war and peace, which also

205. *Id.* at 28.

206. *Id.* at 24.

207. *See id.* at 144.

208. *Id.* at 933–34.

209. Additional Protocol I, *supra* note 197.

210. *See* IHL DATABASES, PROTOCOL Additional to the Geneva Conventions of Aug. 12, 1949, and Relating to the Protection of Victims of International Armed Conflicts (Protocol I), June 8, 1977, ¶ 152 (“‘Military Operations’ means the movements, maneuvers and actions of any sort, carried out by the armed forces with a view of combat.”).

suggests that inadequate control of nuclear weapons during any period of control, whether in war or peace, would violate the Rule of Precaution.²¹¹ Dr. John Burroughs notes that some authorities regard the rule as a principal one, governing the lawfulness of the *potential* use of nuclear weapons.²¹² The International Committee of the Red Cross (“ICRC”) finds that the rule begins “in the choice of means and methods of warfare.”²¹³

The US *Air Force Manual on International Law* formulates the Rule of Precaution: “those who plan or decide upon an attack” must “[t]ake all feasible precautions in the choice of means and methods of attack with a view to avoiding, and in any event to minimizing, incidental loss of civilian life, injury to civilians, and damage to civilian objects.”²¹⁴ “Those who plan or decide upon an attack” could be argued as broadly including the training of personnel from the point of acquiring the weapon to the actual decision-maker of detonation. US military policy typically includes pre-military operations in the “constant care” of nuclear security: “safe, secure, and under positive control applies across the stockpile, to individual weapons, throughout the US nuclear weapons life cycle.”²¹⁵ The *Air Force Manual* further requires that States “follow the law not only as national policy but to ensure its

211. See 2 MOXLEY, NUCLEAR WEAPONS AND INTERNATIONAL LAW, *supra* note 1, at 985; Isabelle Gallino & Sylvain Vit , *Complying with IHL in Large-Scale Conflicts: Key Preparedness Measures*, HUMANITARIAN L. & POL’Y (Apr. 3, 2025), <https://blogs.icrc.org/law-and-policy/2025/04/03/complying-with-ihl-in-large-scale-conflicts-key-preparedness-measures/> [<https://perma.cc/KD8L-NPKM>]; Rule 15. *Principle of Precautions in Attack*, IHL DATABASES, https://ihl-databases.icrc.org/customary-ihl/eng/docs/v1_rul_rule15 [<https://perma.cc/7M9F-3BAS>] (last visited Dec. 11, 2022).

212. See John Burroughs, *International Humanitarian Law*, in UNSPEAKABLE SUFFERING: THE HUMANITARIAN IMPACT OF NUCLEAR WEAPONS 71 (Feb. 2013).

213. *International Humanitarian Law: From Law to Action: Report on the Follow-up to the International Conference for the Protection of War Victims*, Presented by the International Committee of the Red Cross, *reprinted in* How Does Law Protect in War? ICRC Report 1995, Section C (Annex, Principle of Distinction, Rule 17), <https://casebook.icrc.org/case-study/icrc-customary-international-humanitarian-law> [<https://perma.cc/9UAG-9TWC>].

214. US DEP’T AIR FORCE, INTERNATIONAL LAW—THE CONDUCT OF ARMED CONFLICT AND AIR OPERATIONS: PAMPHLET 110-31, at 5-9 (Nov. 19, 1976) [hereinafter AIR FORCE MANUAL ON INTERNATIONAL LAW]; 1 MOXLEY, NUCLEAR WEAPONS AND INTERNATIONAL LAW, *supra* note 129, at 59.

215. NUCLEAR MATTERS HANDBOOK 2020, *supra* note 3, at 89; see DoD Directive 3150.02, *DoD Nuclear Weapons Surety Program*; DoD Directive 5210.41, *Nuclear Weapon Security Manual: The DoD Nuclear Weapon Security Program*.

implementation, observance and enforcement by its own combatant personnel” and that a violation can occur through deliberate state policy or “failure to take adequate preventative measures.”²¹⁶

Despite debate over whether Additional Protocol I applies to “pre-military operations,” the broader picture of treaty law, state practice, and authoritative commentary may show that the Rule of Precaution extends to all periods in which a state exercises control over nuclear weapons. If states must take reasonable preventative measures to avoid unlawful harm in the conduct of hostilities, then the same logic requires adequate security, training, and control from the moment nuclear weapons are acquired.²¹⁷ Consequently, inadequate control at any stage risks violating the Rule of Precaution, because failing to prevent loss, misuse, or unlawful use is itself a failure to take the precautions international law demands.

5. Anticipatory Self-Defense & Unable or Unwilling

Perhaps most alarmingly, inadequate control of nuclear weapons under *jus ad bellum* may amount to an armed attack threatening international peace and security, triggering the right of other states to use force against the violating state.²¹⁸ Under *jus ad bellum*, and Article 51 of the UN Charter, a state may use force in the exercise of its inherent right of self-defense not only in response to armed attacks that have already occurred but also in “anticipatory self-defense” responding to “imminent attacks” before they occur.²¹⁹ The United States has articulated factors to determine whether an armed attack is “imminent” for purposes of the initial use of force against another state or on its territory, including: the nature of the threat, probability that an attack will occur, whether the expected strike fits within a broader pattern of hostility, scale of harm absent preventative action, and whether there will be later, less harmful opportunities to act in self-defense.²²⁰ The United States adds that imminence does not

216. AIR FORCE MANUAL ON INTERNATIONAL LAW, *supra* note 214, at 15-1.

217. See 2 MOXLEY, NUCLEAR WEAPONS AND INTERNATIONAL LAW, *supra* note 1, at 792.

218. See DUNOFF ET AL., *supra* note 130, at 707.

219. *Id.*; UN Charter Ch. VII, Art. 51.

220. THE WHITE HOUSE, REPORT ON THE LEGAL AND POLICY FRAMEWORKS GUIDING THE UNITED STATES' USE OF MILITARY FORCE AND RELATED NATIONAL SECURITY OPERATIONS (2016) [hereinafter LEGAL AND POLICY FRAMEWORKS REPORT] (citing Daniel Bethlehem, *Self-Defense*

require precise, articulable details about the timing or location of an attack, and that the concept must account for the modern capabilities, methods, and technological innovations of contemporary terrorist organizations.²²¹

After the September 11, 2001 attacks, efforts to establish and expand a right to anticipatory self-defense became more prominent.²²² The United States specifically advanced the argument to justify the 2003 Iraq War where the “imminent threat” was terrorist acquisition or potential use of weapons of mass destruction.²²³ The same reasoning could readily be used (or misused) in future crises involving lapses in nuclear security by nuclear-armed states, where fears of terrorist access or uncontrolled proliferation create a similarly elastic narrative of “imminent danger.” Absent internationalized yardsticks of adequate security measures, a state that allows its nuclear weapons to be insecure as to invite acquisition by non-state actors, or a state that is undergoing political turmoil with the prospect of nuclear weapons control changing hands, may be a strong enough basis for states to argue that, in the absence of an armed attack, the potential occurrence of the use of such weapons is an imminent threat. The application of these arguments may seem more applicable to nuclear states that have undergone recent political turmoil or are known to operate near terrorist groups, but “[e]ven in high stable states, recent examples of poor control of nuclear weapons and materials are giving rise to concerns about laxity in safety, security, and command and control.”²²⁴

Thus, a state’s lax control of nuclear weapons can trigger the right of other states to exercise self-defense in the absence of an armed attack where the inadequate control of nuclear weapons can result in an imminent attack.

In the context of the international response to inadequate control of nuclear weapons, collaborative efforts such as the Nunn-Lugar Agreement or hotline agreements may not take effect in the

Against an Imminent or Actual Armed Attack by Nonstate Actors, 106 Am. J. Int’l L. 769 (2012)).

221. *Id.*

222. DUNOFF ET AL., *supra* note 130, at 707.

223. See THE WHITE HOUSE, THE NATIONAL SECURITY STRATEGY OF THE UNITED STATES OF AMERICA pt. V (2002).

224. CHATHAM HOUSE REPORT, *supra* note 13, at 1.

absence of consent from the target state. Instead, when a state's nuclear weapons are so poorly secured that they risk falling into the hands of non-state actors, the "unable or unwilling" doctrine could allow threatened states to use force either against the dangerous non-state actors, or potentially, against the state itself for failing to control them.²²⁵ Use of this doctrine appeared to at least be contemplated by the United States in reports planning to intervene militarily in Pakistan in the scenario where Pakistan loses, or appears to lose, control over its nuclear weapons.²²⁶

Under the analysis as proffered by the United States, a state may be deemed "unable" where inability can be demonstrated, such as where a state has lost or abandoned effective control over the portion of its territory where the armed group is operating.²²⁷ With respect to "unwilling," unwillingness might be demonstrated where, for example, a state is colluding with or harboring a terrorist organization operating from within its territory and refuses to address the threat posed by the group.²²⁸ In the absence of international standards, may the threatened state subjectively determine when another state has lost control over nuclear weapons? Could the United States have argued that the lack of physical protections around Pakistan's nuclear arsenals that were in known terrorist occupied territories sufficed?²²⁹

Given the potential arguments around anticipatory self-defense and the unable or unwilling doctrine, there is at least a minimum threshold required for control of nuclear weapons: a state cannot inadequately control nuclear weapons to the point of creating a threat that another state may perceive as imminent, or where the state is unable or unwilling to rectify the situation or grant consent for mutual assistance.²³⁰

225. See 2 MOXLEY, NUCLEAR WEAPONS AND INTERNATIONAL LAW, *supra* note 1, at 982.

226. See Jeffrey Goldberg & Marc Ambinder, *The Pentagon's Secret Plans to Secure Pakistan's Nuclear Arsenal*, GOV'T TRAINING INST. (Nov. 9, 2011), https://gtitraining.org/news_110911.htm [<https://perma.cc/FYR5-29A7>].

227. LEGAL AND POLICY FRAMEWORKS REPORT, *supra* note 220, at 10.

228. *Id.* at 10.

229. See *supra* Section II.C, notes 48–55 and accompanying text.

230. See 2 MOXLEY, NUCLEAR WEAPONS AND INTERNATIONAL LAW, *supra* note 1, at 982.

D. International Criminal Law

International criminal law is one existing body of international law that may apply to inadequate control of nuclear weapons. The ICC oversees international criminal law and has jurisdiction over persons for the most serious international crimes, including genocide, crimes against humanity, war crimes, and the crime of aggression.²³¹ The inadequate control of nuclear weapons may violate international criminal law under Article 8 or Article 8 *bis* of the Rome Statute of the International Criminal Court (“Rome Statute”), regarding war crimes and the crime of aggression, respectively.²³²

ICC jurisdiction is triggered under Article 8 “*when committed as part of a plan or policy* or as part of a large-scale commission of such crimes.”²³³ Thus, inadequate control of nuclear weapons must be understood in relation to “war crime” and “plan or policy.” Under Article 8, Paragraph 2, one example of a war crime is “attacking or bombarding, by whatever means, towns, villages, dwelling or building, which are undefended and which are not military objectives.”²³⁴ On its face, this example could logically include nuclear detonation (“attacking or bombing”) resulting from inadequate control (“by whatever means”).²³⁵ “Plan or policy,” on the other hand, is not similarly defined or elaborated upon in the Rome Statute. However, in the separate context of analyzing the phrase as it operates in Article 7 of the Rome Statute, covering crimes against humanity, the United Nations stated that a “plan or policy does not need to be explicitly stipulated or formally adopted and can, therefore, be inferred from the totality of the circumstances.”²³⁶ Thus, from the totality of the circumstances, it is likely that nuclear policies surrounding adequate control of nuclear weapons falls under the auspices of Article 8. For example, the United States’ *DoD Nuclear Weapon Systems Surety Program*,

231. Rome Statute of the International Criminal Court, July 17, 1998, 2187 U.N.T.S. 90 [hereinafter Rome Statute].

232. *See id.* arts. 8, 8 *bis*.

233. *See id.* art. 8(1).

234. *See id.* art. 8(2)(b)(v).

235. *Id.*

236. *Crimes Against Humanity*, UN OFF. GENOCIDE PREVENTION & THE RESP. TO PROTECT, <https://www.un.org/en/genocide-prevention/definition> [https://perma.cc/N5GB-VBPK] (last visited Mar. 14, 2026).

establishing nuclear weapon safety policy and assigning responsibilities pertaining to national nuclear weapon systems security and control,²³⁷ would be a “plan or policy,” as would Pakistan’s measures provided in the Army’s Strategic Plans Division.²³⁸ Given this initial analysis of these provisions, it follows that the ICC may have jurisdiction over inadequate control of nuclear weapons because such conduct, or lack of care, resulting in a detonation could constitute a war crime.

ICC jurisdiction is also triggered by crimes of aggression, under Article 8 *bis*.²³⁹ Crimes of aggression are defined as the “*planning, preparation, initiation or execution, by a person in a position effectively to exercise control over or to direct the political or military action of a State, of an act of aggression which, by its character, gravity and scale, constitutes a manifest violation of the Charter of the United Nations.*”²⁴⁰ The Statute recognizes that preparatory conduct (“*planning, preparation*”) can amount to a threat to commit aggression under certain circumstances.²⁴¹ To the extent that inadequacies in nuclear control systems constitute a failure to prevent an unlawful use of force, or render such use foreseeably possible, such conduct may resemble preparatory acts of aggression under the Statute.²⁴²

Critiques of applying the Rome Statute provisions to inadequate control may include *mens rea*, statutory interpretation, or procedural issues. As to *mens rea*, the ICC does not require a specific mental state in either Article 8 or Article 8 *bis*.²⁴³ However, under Article 30, “intent” or “knowledge” applies to the Statute as a whole.²⁴⁴ If intent or knowledge were required for inadequate control, state negligence as to implement sufficient security standards may fulfill this requirement. However, certain national plans or policies may prescribe the responsibility and supplant *mens rea*. For example, the United States DoD Directive 5210.41 *Security Policy for Protecting Nuclear Weapons*, states: commanders will maintain complete and positive physical US

237. DoD 3150.02, *supra* note 8, at 1.

238. See Gregory, *supra* note 55, at 1.

239. Rome Statute, *supra* note 231, art. 8 *bis*.

240. *Id.* ¶ 1.

241. *Id.*; see also Jankovic & Roeben, *supra* note 185, at 3.

242. See Jankovic & Roeben, *supra* note 185, at 814.

243. See Rome Statute, *supra* note 231, art. 8, ¶¶ 1, 2; *id.* art. 8 *bis* ¶¶ 1, 2(b).

244. See Rome Statute, *supra* note 231, art. 30.

custody and control of nuclear weapons at all times unless transfer is authorized by a competent authority.²⁴⁵ Two conclusions derive from this. First, national documents include statements from which *mens rea* can be derived. Second, because the ICC has jurisdiction over persons with individual criminal liability, state policies may also identify those who are held responsible for violations.²⁴⁶

A further critique may be the lack of enforceability. Though signed by 139 states, 29 have not yet ratified the Rome Statute.²⁴⁷ Seven nuclear weapon states—China, Russia, United States, India, Pakistan, Israel, and North Korea—are not parties to the Rome Statute, and the United States does not recognize ICC jurisdiction.²⁴⁸ The ICC relies on international cooperation to make arrests and hold perpetrators accountable.²⁴⁹ It is thus in the interest of all nuclear-weapon states, including future-nuclear-weapon states, to pursue binding international agreements that set objective yardsticks for measuring adequate safety features and provide mandatory instructions in cases of inadequate control that elevate mutual cooperation and communication.

V. RECOMMENDATIONS FOR CHANGE

This paper has analyzed different sources of international law and principles applicable to the inadequate control of nuclear weapons. While international law can be read to require minimum levels of adequate control over nuclear weapons, more robust protections are needed. International cooperation on this matter is more important than ever: attention of states and leaders to nuclear security is waning, and the risks themselves are shifting.²⁵⁰

245. US DEP'T OF DEF., DIRECTIVE 5210.41, SECURITY POLICY FOR PROTECTING NUCLEAR WEAPONS § 3.3(b) (Jan. 22, 2015).

246. See Rome Statute, *supra* note 231, arts. 1, 5.

247. Parliamentarians for Global Action, *Signatories Which Have Not Ratified the Rome Statute* (last updated Jan. 8, 2025), <https://www.pgaction.org/ilhr/rome-statute/signed-but-not-ratified.html> [<https://perma.cc/U47G-VLNU>].

248. See generally INT'L CRIM. CT., *The States Parties to the Rome Statute*, <https://asp.icc-cpi.int/states-parties> [<https://perma.cc/R9UH-8T7Y>] (last visited Mar. 16, 2026). See Exec. Order No. 14203, 90 Fed. Reg. 9369 (Feb. 12, 2025).

249. See *How the Court Works*, INT'L CRIM. CT., <https://www.icc-cpi.int/about/how-the-court-works> [<https://perma.cc/8BMU-2UUJ>] (last visited Mar. 16, 2026).

250. Holgate, *supra* note 78, at 3.

This section offers recommendations on where and how the international community can best address these risks.

A. *International Convention on Minimum Nuclear Security Standards*

The first recommendation is for states to adopt a mandatory, prophylactic, international convention establishing mandatory minimum security standards, implementing procedures in case of emergency, and asserting criminal liability for deviations. Guided by IAEA technical recommendations and in coordination with expert groups, such an instrument could provide binding international yardsticks to assess the appropriateness of national policies and procedures related to control over nuclear weapons.²⁵¹ Such a feat is not beyond the ken of the UN, as similar agreements exist for civil nuclear programs.²⁵² Civil nuclear security agreements may serve as useful models for such a treaty. Just as states set aside national interest in the aftermath of the Chernobyl disaster to prevent future nuclear accidents, states possess greater incentives to establish international minimum standards for nuclear weapon security. Such standards would reduce the risk that bad actors exploit vulnerabilities in existing nuclear programs and help ensure that any future nuclear-weapon states develop programs with adequate safeguards. While the accident at the Chernobyl power plant served as a catalyst for addressing “deficiencies and gaps in the international legal and regulatory norms that had been established to govern the safe and peaceful uses of nuclear energy,”²⁵³ the far greater destructive power of nuclear weapons counsels states to act proactively rather than waiting for a comparable catastrophe to spur reform.

Further, this effort could similarly be accomplished through UN resolutions, such as UNSCR 1540. While there may be limits to the UN resolution’s mandatory authority, recommendations with greater specificity to growing consensus around technology and other security measures may provide greater clarity for states and allow for growing consensus on implementations. An additional

251. See generally IAEA, *Safety Standards*, <https://www.iaea.org/resources/safety-standards> [<https://perma.cc/94NY-CZ8M>] (last visited Mar. 26, 2026).

252. See *supra* Part IV(a)(ii).

253. Rautenbach, Tonhauser & Wetherall, *supra* note 92, at 7.

consideration, however, is the confidentiality of certain technical standards and the unwillingness of states to share information, such as in the relationship between the United States and Pakistan.²⁵⁴ But, “in the past . . . the United States has shared ideas—but not technologies—about how to make the safeguards that lie at the heart of American weapons security.”²⁵⁵ While nuclear weapon states will likely not want to share technical standards, it is beneficial to create international platforms from where states can conduct their own trade-offs in what can be shared to maintain peace.

The risk of disaster is further amplified by increasingly sophisticated cyber threats and the emerging role of artificial intelligence (“AI”). While states may be able to agree upon relatively static standards for physical security, the rapidly evolving technological threat environment will likely require states to revisit and update those standards on a continual basis. Moreover, AI is likely to be employed not only by potential attackers but also within nuclear weapon systems themselves.²⁵⁶ The integration of such technologies raises significant governance questions requiring states to understand technology trends and update security models.

Additionally, recent developments underscore the urgency of renewed international cooperation. The Treaty Between the United States of America and the Russian Federation on Measures for the Further Reduction and Limitation of Strategic Offensive

254. See Sanger & Broad, *supra* note 60.

Harold M. Agnew, a former director of the Los Alamos weapons laboratory, which designed most of the United States’ nuclear arms, argued that recent federal reluctance to share warhead security technology was making the world more dangerous. “Lawyers say it’s classified,” Dr. Agnew said in an interview. “That’s nonsense. We should share this technology. Anybody who joins the club should be helped to get this.” “Whether it’s India or Pakistan or China or Iran,” he added, “the most important thing is that you want to make sure there is no unauthorized use. You want to make sure that the guys who have their hands on the weapons can’t use them without proper authorization.” *Id.*

255. *Id.*

256. See Jill Hruby & Nina Miller, *Assessing and Managing the Benefits and Risks of Artificial Intelligence in Nuclear-Weapon Systems*, NUCLEAR THREAT INITIATIVE (Aug. 26, 2021), <https://www.nti.org/analysis/articles/assessing-and-managing-the-benefits-and-risks-of-artificial-intelligence-in-nuclear-weapon-systems/> [https://perma.cc/2QZD-PKAH].

Arms (“New START Treaty”),²⁵⁷ expired in February 2026.²⁵⁸ Originally signed in 2010 between the United States and Russia, the Treaty limited the deployment of strategic nuclear weapons, permitted reciprocal on-site inspections of nuclear facilities in the two countries, and facilitated the exchange of information and data between the two nuclear superpowers.²⁵⁹ The expiration of this bilateral arms control agreement necessitates renewed international cooperation on nuclear weapon security standards.

The prospect of a comprehensive and widely accepted treaty establishing nuclear weapon security standards may appear ambitious. Nevertheless, all states share a fundamental interest in cooperation to avoid the potentially catastrophic consequences of the lowest common denominator in nuclear security practices. Even preliminary efforts to convene states and discuss such standards would facilitate valuable information-sharing and transparency.

B. Expand Cooperative Threat Reduction Initiatives and Technical Assistance Programs

A second recommendation is to bolster Cooperative Threat Reduction measures and agreements in order to increase communication and trust between nuclear-weapon states and properly prepare for scenarios of inadequate control through mutual assistance. Some sources suggest that an NRRC-like structure could be created on a more global scale, or a “hotline-plus” communications link.²⁶⁰ Specifically, the Nunn-Lugar Agreement between the United States and former Soviet states would prove an instructive model to address other international challenges. For example, Rose Gottemoeller of the Carnegie Endowment for International Peace suggests looking to the US experience with the former Soviet states as an influence for

257. Treaty Between the United States of America and the Russian Federation on Measures for the Further Reduction and Limitation of Strategic Offensive Arms, Russ.-U.S., Apr. 8, 2010, T.I.A.S. No. 11-205.

258. Sarah Shamim, *Last US-Russia Nuclear Treaty is Expiring: Does it Really Matter?*, AL JAZEERA (Feb. 3, 2026), <https://www.aljazeera.com/news/2026/2/3/last-us-russia-nuclear-treaty-is-expiring-does-it-really-matter> [https://perma.cc/87P5-9FZD].

259. *Id.*

260. See Hannah, *supra* note 148.

security assurances, assistance, and elimination of nuclear materials in other states.²⁶¹

This can also similarly be done through an amendment to the Early Notification Convention and the Assistance Convention. More robust provisions would be needed to rectify the shortcomings, but additions such as mandatory reporting for nuclear weapons programs and mandatory mutual assistance may be two. However, an argument against amending international treaties is the “rule” that “the more participants take part in the negotiations the greater will be the risk that a less binding and vaguer instrument will be the result of negotiations.”²⁶²

VI. CONCLUSION

International law around nuclear weapons is a contentious topic. Nuclear weapons security remains under the sole jurisdiction of nations despite the transboundary consequences of inadequate control. The threats exacerbating inadequate control are real and growing. Drawing on principles of existing international law and principles of customary international law can be helpful in determining appropriate standards for security and response. However, when the most applicable principle may threaten the sovereignty of states, internationalization of yardsticks for prevention of such circumstances is in the international and self-interest of all states.

Security of nuclear weapons cannot remain solely a matter of national discretion given the catastrophic transboundary risks posed by inadequate control. Through analysis of conventional international law, this paper demonstrates that existing legal frameworks can reasonably be interpreted to impose obligations on nuclear-weapon states to maintain effective control over their arsenals. It further shows that patterns of state practice alongside principles of customary international law reinforce the conclusion that states have a duty to prevent conditions that could enable unauthorized use, diversion, or seizure of nuclear weapons. At the same time, the international landscape remains fragmented and insufficient to establish clear, enforceable standards of nuclear

261. See NAT'L RSCH. COUNCIL, *supra* note 36, at 13–14 (remarks of Rose Gottemoeller, Carnegie Endowment for Int'l Peace).

262. See Pelzer, *supra* note 97, at 82.

weapons security. Because lapses in control can create global risks, the international community has a shared interest in establishing clearer legal yardsticks. Accordingly, this paper calls on states to pursue a comprehensive international framework establishing minimum nuclear security standards and mechanisms for cooperation and assistance, thereby reducing the risk that inadequate control of nuclear weapons becomes the catalyst for catastrophic harm.