JE International Journal of Legal Theory and Philosophy
E-ISSN: 0123-3210 || P-ISSN: 0123-3210

IMBALANCE OF COMMITMENT AMONG SIGNATORY STATES: PROBLEMATICS OF RATIFICATION IN THE NUCLEAR ARMS CONTROL REGIME

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Received: May 24, 2026 Published: November 23, 2026

Abstract: The imbalance in ratification commitments among states poses significant challenges to the effectiveness and implementation of international nuclear arms control treaties, particularly the Comprehensive Nuclear-Test-Ban Treaty (CTBT), which has not entered into force despite widespread international support. This study focuses on the legal consequences of nonratification and Russia's revocation of CTBT ratification in 2023, as well as the institutional roles of international organizations in addressing these challenges. It aims to analyze the implications of unequal ratification for treaty effectiveness, international legal obligations, and nuclear arms control governance. Employing normative legal research, this study applies treaty-based, conceptual, and case approaches through qualitative analysis of international legal instruments, official institutional documents, and scholarly literature. The findings demonstrate that the failure of designated states to ratify the CTBT prevents its entry into force and limits the activation of its complete verification mechanisms, although preparatory monitoring arrangements remain operational. Russia's revocation of ratification further illustrates the strategic use of treaty participation while raising questions concerning previously expressed consent and continuing obligations associated with signature. Nevertheless, nonratification does not automatically constitute a breach of international law. The study also finds that the CTBTO Preparatory Commission, International Atomic Energy Agency, and United Nations support nuclear arms control through distinct institutional mandates, but cannot substitute for the consent required for treaty entry into force.

Keywords: Nuclear Arms Control; Ratification; Comprehensive Nuclear-Test-Ban Treaty; International Treaty Law.

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INTRODUCTION

The development of nuclear weapons has posed enduring challenges to international security since their use in Hiroshima and Nagasaki in 1945. Their destructive capacity, long-term radiological consequences, and potential environmental impacts have encouraged international efforts to prevent nuclear proliferation and promote disarmament. These efforts have resulted in international agreements aimed at restricting the acquisition, development, and testing of nuclear weapons. Tannenwald explains that the historical non-use of nuclear weapons reflects not only strategic considerations but also normative restraints that influence state conduct.[1] Nevertheless, the continued possession and modernization of nuclear arsenals demonstrate the persistent tension between national security interests and collective commitments to nuclear disarmament.

The international nuclear arms control regime comprises several instruments with distinct legal objectives and obligations. The *Treaty on the Non-Proliferation of Nuclear Weapons* (NPT), which entered into force in 1970, establishes commitments concerning nuclear non-proliferation, peaceful uses of nuclear energy, and disarmament. Articles I and II regulate the transfer and acquisition of nuclear weapons, while Article VI requires the parties to pursue negotiations in good faith on effective measures relating to nuclear disarmament. [2] The *Comprehensive Nuclear-Test-Ban Treaty* (CTBT), adopted in 1996, complements these objectives by prohibiting nuclear weapon test explosions and other nuclear explosions. However, Article XIV requires ratification by all 44 states listed in Annex 2 before the treaty can enter into force.[3] This requirement makes the legal implementation of the CTBT dependent on the ratification decisions of specifically designated states.

Ratification is an important mechanism through which states express consent to be bound by international treaties. Articles 11 and 14 of the *Vienna Convention on the Law of Treaties* 1969 (VCLT) recognize ratification as one means of expressing such consent, while Article 24 separately regulates treaty entry into force. Article 18 also establishes an obligation, under specified conditions, to refrain from acts that would

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[1] Nina Tannenwald, *The Nuclear Taboo: The United States and the Non-Use of Nuclear Weapons since 1945* (Cambridge: Cambridge University Press, 2007), https://doi.org/10.1017/CBO9780511491726.

[2] *Treaty on the Non-Proliferation of Nuclear Weapons*, opened for signature July 1, 1968, entered into force March 5, 1970, arts. I, II, and VI, https://www.un.org/en/conf/npt/2010/npttext.shtml.

[3] *Comprehensive Nuclear-Test-Ban Treaty*, adopted September 10, 1996, opened for signature September 24, 1996, arts. I and XIV, https://www.ctbto.org/sites/default/files/Documents/treatytext.tt.html.

defeat a treaty's object and purpose before its entry into force.[4] Consequently, the absence of ratification does not necessarily eliminate every legal consequence associated with signature. Conversely, ratification does not automatically activate all substantive obligations under a treaty that has not entered into force. This distinction is particularly relevant to the CTBT, which had received 188 signatures and 179 ratifications as of November 2026 but remained inoperative as a treaty in force because nine Annex 2 states had not fulfilled the required ratification.[5]

The imbalance in ratification commitments is particularly evident in the relationship between Russia and the United States. Both countries signed the CTBT in 1996, but their subsequent positions differed. Russia deposited its instrument of ratification in June 2000, whereas the United States has not ratified the treaty. In November 2023, Russia withdrew its instrument of ratification, citing the disparity between its position and that of the United States while retaining its status as a signatory.[6] This decision raised questions concerning the legal consequences of revoking consent previously expressed through ratification before a treaty enters into force. Although the CTBT's International Monitoring System continues to operate through preparatory arrangements, its treaty-based on-site inspection mechanism cannot be activated before entry into force. These circumstances illustrate the relationship between unequal ratification commitments, strategic reciprocity, and institutional effectiveness.

Previous studies have examined these issues from different perspectives. Sagan identifies security considerations, domestic political interests, and international norms as factors influencing states' nuclear weapons policies.[7] Tannenwald examines the normative restraints associated with nuclear non-use, while Podvig analyzes the implications of Russia's revocation of CTBT ratification for preserving the international

[4] *Vienna Convention on the Law of Treaties*, May 23, 1969, 1155 UNTS 331, arts. 11, 14, 18, and 24, https://legal.un.org/ilc/texts/instruments/english/conventions/1_1_1969.pdf.

[5] United Nations, "Comprehensive Nuclear-Test-Ban Treaty," *United Nations Treaty Collection*, chap. XXVI, no. 4, accessed November 21, 2026, https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXVI-4&chapter=26&clang=_en.

[6] United Nations Secretary-General, "Comprehensive Nuclear-Test-Ban Treaty: Russian Federation: Withdrawal of the Instrument of Ratification," Depositary Notification C.N.463.2023.TREATIES-XXVI.4, November 8, 2023, https://treaties.un.org/doc/Publication/CN/2023/CN.463.2023-Eng.pdf.

[7] Scott D. Sagan, "Why Do States Build Nuclear Weapons? Three Models in Search of a Bomb," *International Security* 21, no. 3 (Winter 1996–97): 54–86, https://doi.org/10.1162/isec.21.3.54.

nuclear testing moratorium. [8] These studies provide important explanations for nuclear policy, strategic behavior, and the maintenance of international commitments. However, further legal examination is necessary to distinguish the consequences of nonratification, treaty non-entry into force, and withdrawal of a previously deposited instrument of ratification. The distinction is important because legal obligations, political commitments, and institutional verification mechanisms operate under different conditions and cannot automatically be treated as equivalent.

This study examines unequal ratification commitments within the international nuclear arms control regime, focusing on the CTBT and Russia's revocation of ratification in the context of its relationship with the United States. The NPT is examined as a complementary legal framework, while the roles of international organizations are assessed according to their respective mandates. The study addresses three research questions: First, how does the failure of certain signatory states to ratify nuclear arms control treaties affect the effectiveness of the international nuclear arms control regime? Second, how does the imbalance in ratification commitments affect the legal status and implementation of nuclear arms control treaties, particularly following Russia's revocation of CTBT ratification? Third, what roles do international organizations play in supporting the effectiveness of nuclear arms control treaties when their entry into force or implementation remains constrained by unequal state commitments?

METHODS

This study employs normative legal research using treaty-based, conceptual, and case approaches to examine the legal consequences of unequal ratification commitments within the international nuclear arms control regime. The treaty-based approach analyzes the VCLT, NPT, and CTBT, particularly their provisions concerning consent to be bound, entry into force, and verification mechanisms. The conceptual approach examines treaty obligations, reciprocity, legal effectiveness, and nuclear non-proliferation, while the case approach focuses on the United States' nonratification and Russia's revocation of CTBT ratification in 2023. Primary legal materials include international treaties, United Nations depositary records, and official documents issued by relevant international institutions, supported by scholarly books and journal

[8] Tannenwald, *The Nuclear Taboo*; Pavel Podvig, "Preserving the Nuclear Test Ban after Russia Revoked Its CTBT Ratification," *Bulletin of the Atomic Scientists* 80, no. 2 (2024): 75–80, https://doi.org/10.1080/00963402.2024.2314431.

articles. These materials are collected through documentary and literature research and analyzed qualitatively through legal interpretation and comparative analysis to distinguish the consequences of ratification status from political commitments and institutional effectiveness.

RESULT DAN DISCUSSION

The Impact of Non-Ratification by Certain Signatory States on the Effectiveness of the Nuclear Arms Control Regime

The effectiveness of international nuclear arms control depends on the relationship between treaty participation, legally binding obligations, and institutional implementation. The NPT, CTBT, and *Treaty on the Prohibition of Nuclear Weapons* (TPNW) constitute distinct legal frameworks addressing nuclear non-proliferation, testing restrictions, and disarmament. Although these instruments pursue related objectives, they differ in substantive scope, entry-into-force requirements, and implementation mechanisms. The NPT has established legally binding obligations for its parties since 1970, while the TPNW entered into force in 2021 and binds its parties according to its provisions. By contrast, the CTBT remains subject to the ratification requirements established under Article XIV.[9] The consequences of nonratification must therefore be assessed according to the legal structure of each treaty rather than attributed uniformly to the international nuclear arms control regime.

Ratification determines whether a state has expressed its consent to be bound through a procedure recognized under the applicable treaty. However, the expression of consent must be distinguished from treaty entry into force. Articles 14 and 24 of the VCLT regulate these matters separately, while Article 26 establishes the principle of *pacta sunt servanda* for treaties in force.[10] Accordingly, failure to ratify a treaty does not, by itself, constitute a violation of *pacta sunt servanda*. Similarly, ratification of a treaty that has not entered into force does not necessarily make all its substantive provisions immediately binding. The legal consequences depend on the treaty's specific provisions and other applicable international legal rules, including obligations that may arise before entry into force.

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[9] *Treaty on the Non-Proliferation of Nuclear Weapons*, arts. I–VI; *Treaty on the Prohibition of Nuclear Weapons*, adopted July 7, 2017, entered into force January 22, 2021, https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXVI-9&chapter=26&clang=_en; *Comprehensive Nuclear-Test-Ban Treaty*, art. XIV.

[10] *Vienna Convention on the Law of Treaties*, arts. 14, 24, and 26.

The CTBT demonstrates the structural consequences of an entry-into-force mechanism requiring ratification by designated states. Article XIV(1) provides that the treaty enters into force 180 days after all 44 states listed in Annex 2 have deposited their instruments of ratification, subject to the minimum period specified in that provision. As of November 2026, nine Annex 2 states had not fulfilled this requirement: China, Egypt, India, Iran, Israel, the Democratic People's Republic of Korea, Pakistan, Russia, and the United States.[11] India, Pakistan, and the Democratic People's Republic of Korea had not signed the treaty, while the other six remained signatories without an operative ratification. Consequently, the treaty's entry into force remains dependent on a limited group of states despite the broad participation of the international community.

The delayed entry into force directly affects the operation of the CTBT verification regime. Article IV establishes a framework comprising the International Monitoring System (IMS), the International Data Centre (IDC), consultations and clarification, on-site inspections, and confidence-building measures. Through preparatory institutional arrangements, the IMS and IDC already collect and analyze information relevant to detecting nuclear explosions. However, the treaty-based mechanism for conducting on-site inspections cannot be activated before entry into force.[12] Nonratification therefore does not eliminate all verification activities but restricts the exercise of particular powers contemplated under the treaty. This distinction is necessary when evaluating the relationship between the CTBT's legal status and its existing technical monitoring capabilities.

States' decisions concerning ratification are also influenced by security interests and domestic political considerations. Sagan identifies security threats, domestic political interests, and international norms as distinct explanations for nuclear weapons acquisition. [13] These considerations are relevant to understanding why states may support nuclear non-proliferation objectives while remaining reluctant to accept particular treaty commitments. Governments may perceive restrictions on nuclear testing as affecting their strategic flexibility or the reliability of existing nuclear arsenals. However, nonratification cannot automatically be interpreted as an intention to conduct nuclear explosive tests. Such

[11] *Comprehensive Nuclear-Test-Ban Treaty*, art. XIV and annex 2; Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization, "Status of Signatures and Ratifications," https://www.ctbto.org/our-mission/states-signatories.

[12] *Comprehensive Nuclear-Test-Ban Treaty*, art. IV; Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization, "On-Site Inspection," https://www.ctbto.org/our-work/on-site-inspection.

[13] Sagan, "Why Do States Build Nuclear Weapons?," 54–86.

an assessment requires evidence of actual policies and conduct, rather than assumptions derived solely from treaty participation.

Unequal treaty commitments may also affect perceptions of fairness and reciprocity within the nuclear non-proliferation regime. The NPT differentiates the obligations of nuclear-weapon and non-nuclear-weapon states while establishing disarmament commitments applicable to its parties. This distinction has contributed to debates concerning the distribution of legal obligations and strategic advantages. The CTBT adopts a different structure by establishing a general prohibition on nuclear explosions but conditioning entry into force on ratification by specifically designated states. The resulting inequalities are therefore not identical: the NPT raises questions concerning differentiated substantive obligations, whereas the CTBT primarily presents an institutional obstacle to entry into force. These differences must be preserved when assessing the legitimacy and effectiveness of the broader regime.

The failure of designated states to ratify the CTBT consequently limits its legal implementation without extinguishing other international obligations concerning nuclear weapons. States may remain bound by the NPT, applicable IAEA safeguards agreements, or other independent legal instruments. The most identifiable consequence of nonratification within the CTBT framework is the continued inability to activate its complete treaty-based verification and compliance mechanisms. Broader effects on political confidence, strategic stability, and the legitimacy of nuclear arms control depend on additional circumstances and state conduct. Evaluating treaty effectiveness therefore requires distinguishing the legal consequences of non-entry into force from the operational achievements and political limitations of the existing regime.

The Imbalance of Ratification in Nuclear Arms Control Agreements and Its Impact on the Implementation of International Law

Unequal ratification commitments raise legal questions concerning the relationship between states' consent to be bound and the implementation of international treaties. Under the VCLT, signature, ratification, and entry into force constitute distinct legal stages. Article 14 regulates ratification as a means of expressing consent, Article 24 addresses entry into force, and Article 18 establishes certain obligations before a treaty becomes operative.[14] These provisions do not establish a general obligation for every signatory state to ratify a treaty. Nor does

[14] *Vienna Convention on the Law of Treaties*, arts. 14, 18, and 24.

the failure of one state to ratify automatically authorize another state to revoke its ratification. The legal consequences must be examined according to the relevant treaty provisions, the nature of the state's actions, and other applicable international legal rules.

The relationship between Russia and the United States illustrates the strategic significance of differing ratification positions. Both states signed the CTBT in September 1996, but Russia deposited its instrument of ratification on June 30, 2000, while the United States did not proceed to ratification. Russia subsequently enacted domestic legislation revoking its ratification and notified the United Nations Secretary-General of the withdrawal of its instrument. According to Depositary Notification C.N.463.2023.TREATIES-XXVI.4, the withdrawal was effected on November 3, 2023, and formally communicated by the depositary on November 8, 2023. [15] The notification changed Russia's recorded ratification status while leaving its signature intact. Accordingly, the action must be distinguished from withdrawal from a treaty that has already entered into force.

Russia's decision presents a particular legal issue because the CTBT does not expressly regulate the withdrawal of an instrument of ratification before entry into force. Article IX provides a withdrawal mechanism for states parties when extraordinary events related to the treaty's subject matter jeopardize their supreme interests. However, this mechanism concerns withdrawal under an operative treaty and cannot automatically be applied to Russia's action in 2023. The legal assessment must instead consider the treaty's non-entry into force, the character of Russia's previously deposited instrument, and the depositary's treatment of the subsequent notification. The United Nations depositary recorded the withdrawal, but this administrative action does not independently constitute a judicial determination of every question concerning its legal permissibility or consequences.[16]

Russia's continued status as a signatory also raises questions concerning Article 18 of the VCLT. Article 18(a) requires a state that has signed a treaty subject to ratification to refrain from acts that would defeat its object and purpose until it has made its intention clear not to become a party. Whether Russia's withdrawal of its instrument of ratification constitutes such an expression of intention requires a separate legal assessment. The withdrawal of an instrument and the termination of obligations arising from signature are not necessarily

[15] United Nations Secretary-General, Depositary Notification C.N.463.2023.TREATIES-XXVI.4.

[16] *Comprehensive Nuclear-Test-Ban Treaty*, art. IX; United Nations Secretary-General, Depositary Notification C.N.463.2023.TREATIES-XXVI.4.

identical legal acts. Furthermore, the obligation contemplated under Article 18 must be distinguished from the complete prohibition and verification requirements that would operate under the CTBT following entry into force. Russia's legal position therefore cannot be determined solely by its changed ratification status.

The United States' position presents related but distinct legal considerations. Although the United States signed the CTBT in 1996, it has not deposited an instrument of ratification. Its nonratification does not constitute a breach of the CTBT's substantive obligations as a treaty in force, because the treaty has not entered into force. Nevertheless, signature may have legal consequences under the applicable rules reflected in Article 18 of the VCLT. Since the United States is not a party to the VCLT, any reliance on these provisions must account for the customary international law status of the relevant rules. A determination of international responsibility would require identification of a binding obligation and conduct attributable to the state that breaches that obligation. Differences in ratification status alone do not satisfy these requirements.

Russia's decision also reflects strategic considerations arising from its relationship with the United States. Podvig explains that the revocation of Russian ratification increased uncertainty surrounding the nuclear testing moratorium and the future of nuclear arms control cooperation.[17] However, the revocation does not itself establish that Russia has resumed nuclear explosive testing or abandoned all forms of restraint. Its political significance lies partly in the use of treaty participation as an instrument of strategic communication. Distinguishing legal status from subsequent conduct is therefore essential when assessing whether changes in ratification commitments have produced actual violations or altered the operation of the nuclear testing moratorium.

The imbalance in CTBT ratification consequently affects international law through several related mechanisms. The absence of required ratifications prevents entry into force, the withdrawal of Russia's instrument raises questions concerning previously expressed consent, and differences in national security interests may undermine confidence in the durability of international commitments. These consequences should not be interpreted as a general failure of *pacta sunt servanda*, which concerns the performance of treaties in force. Rather, the CTBT demonstrates how international treaty law may encounter limitations at

[17] Podvig, "Preserving the Nuclear Test Ban," 75–80.

the stages of consent formation and entry into force, even where the treaty's underlying objectives receive broad international support.

The Role of International Organizations in Supporting the Effectiveness of Nuclear Arms Control Treaties

International organizations contribute to nuclear arms control through monitoring, verification, information exchange, and diplomatic cooperation. Their authority, however, derives from specific international legal instruments and institutional mandates. The Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), the International Atomic Energy Agency (IAEA), and the United Nations perform different functions within the broader nuclear non-proliferation regime. Although these institutions can support treaty implementation and international cooperation, they cannot independently replace the consent required for a treaty to enter into force. Their contribution must therefore be assessed according to the legal authority and operational mechanisms available to each institution.

The CTBTO Preparatory Commission was established on November 19, 1996, through a resolution adopted by the CTBT signatory states. Its principal responsibility is to prepare the verification system and institutional arrangements necessary for the treaty's implementation following entry into force. Through its Provisional Technical Secretariat, the Commission develops and operates the International Monitoring System and International Data Centre. [18] The IMS uses seismic, hydroacoustic, infrasound, and radionuclide technologies to detect and identify events potentially associated with nuclear explosions. Information collected through this network is processed and distributed through the IDC, providing a technical basis for monitoring nuclear testing activities even before the treaty becomes legally operative.

The CTBTO Preparatory Commission nevertheless operates within significant legal limitations. Although it develops monitoring capabilities and conducts preparatory verification activities, it cannot exercise the CTBT's treaty-based on-site inspection powers before entry into force. Its current responsibilities include developing inspection procedures, preparing equipment, training personnel, and conducting exercises. Article XIV of the CTBT also provides for conferences intended to facilitate entry into force by encouraging the remaining designated

[18] Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization, "The Comprehensive Nuclear-Test-Ban Treaty," https://www.ctbto.org/our-mission/the-treaty.

states to complete ratification.[19] These mechanisms demonstrate that international institutions can maintain technical preparedness and diplomatic engagement despite incomplete treaty participation. However, their existence does not alter the conditions for entry into force or create an independent authority to compel the required ratifications.

The IAEA performs a separate verification function under its Statute and applicable safeguards agreements. Article III of the NPT requires non-nuclear-weapon states parties to accept safeguards through agreements with the IAEA to verify compliance with their non-proliferation obligations. Under these agreements, the Agency examines nuclear material accounting records, conducts inspections, and employs monitoring and verification technologies to assess whether nuclear material has been diverted from peaceful uses.[20] The scope of its authority depends on the applicable safeguards instruments and the legal commitments of the state concerned. IAEA safeguards must therefore be distinguished from the CTBT verification regime, particularly because verification of nuclear material use is not equivalent to investigating suspected nuclear explosions through CTBT on-site inspections.

The United Nations also supports the nuclear arms control regime through treaty administration, diplomatic negotiations, and decisions adopted by its principal organs. The Secretary-General serves as depositary of the CTBT, receiving instruments of signature and ratification as well as notifications concerning changes in treaty participation. The General Assembly facilitates multilateral discussions concerning disarmament, while the Security Council may adopt binding decisions addressing threats to international peace and security within its authority under the UN Charter. Security Council Resolution 1540 (2004), for example, establishes obligations requiring states to prevent the proliferation of nuclear, chemical, and biological weapons and their means of delivery to non-state actors.[21] Nevertheless, the exercise of these institutional functions does not automatically satisfy or replace the specific ratification requirements established under Article XIV of the CTBT.

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[19] *Comprehensive Nuclear-Test-Ban Treaty*, arts. IV and XIV; Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization, "On-Site Inspection"; "Article XIV Conferences," https://www.ctbto.org/our-mission/article-xiv-conferences.

[20] *Treaty on the Non-Proliferation of Nuclear Weapons*, art. III; International Atomic Energy Agency, *The Agency's Safeguards*, https://www.iaea.org/sites/default/files/gc/gc58-5_en.pdf.

[21] United Nations Security Council, Resolution 1540 (2004), S/RES/1540 (2004), April 28, 2004, https://digitallibrary.un.org/record/520326.

The effectiveness of institutional support consequently depends on the distinction between technical capacity and legal authority. The CTBTO Preparatory Commission can maintain monitoring infrastructure and support efforts to facilitate the CTBT's entry into force, while the IAEA verifies compliance with safeguards obligations established under separate legal instruments. The United Nations provides diplomatic and institutional mechanisms that support international cooperation and treaty participation. These functions mitigate certain operational consequences of unequal ratification commitments but cannot independently resolve the political disagreements or legal conditions preventing the CTBT from entering into force. Full implementation remains dependent on the required state ratifications and the subsequent activation of the treaty's institutional mechanisms.

CONCLUSION

The imbalance of ratification commitments within the international nuclear arms control regime creates distinct legal, institutional, and strategic challenges. The failure of designated Annex 2 states to ratify the CTBT prevents its entry into force under Article XIV, limiting the activation of its complete verification and compliance mechanisms despite the continued operation of preparatory monitoring arrangements. Russia's withdrawal of its instrument of ratification in November 2023 further illustrates how differences in treaty participation can become instruments of strategic positioning while raising questions concerning previously expressed consent and continuing obligations associated with signature. However, nonratification or withdrawal of a ratification instrument does not automatically constitute a breach of *pacta sunt servanda* or establish international responsibility without an identifiable applicable obligation and inconsistent state conduct. The CTBTO Preparatory Commission, IAEA, and United Nations support nuclear arms control through distinct monitoring, verification, and diplomatic functions, but their authority cannot replace the consent required for treaty entry into force. The effectiveness of the regime therefore depends on the interaction between treaty-based legal commitments, institutional verification capabilities, and states' willingness to sustain international cooperation in nuclear non-proliferation and disarmament.

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