ARMS CONTROL
NEGOTIATION ACADEMY

# Leveraging Nuclear Disarmament Verification for Diplomatic Breakthrough in Multilateral Disarmament: A Path Forward for the 2026 NPT Review Conference.

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***Note:*** *The views presented in this memorandum are those of the authors and do not represent the views of the organizations or institutions with which they are affiliated.*

***MEMORANDUM: LEVERAGING NUCLEAR DISARMAMENT VERIFICATION FOR DIPLOMATIC BREAKTHROUGH IN MULTILATERAL DISARMAMENT: A PATH FORWARD FOR THE 2026 NPT REVIEW CONFERENCE***

## Policy Memo

TO:

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DATE: May, 2026

SUBJECT: Leveraging Nuclear Disarmament Verification for Diplomatic Breakthrough in Multilateral Disarmament: A Path Forward for the 2026 NPT Review Conference.

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### Recommendations Summary:

***Utilize*** the growing set of practical methods, a set of tools, and lessons learned from existing initiatives/regional pathways for States to structure and guide constructive political engagement on nuclear disarmament verification

***Reframe*** verification as a diplomatic enabler that expands the space for mutual gain and transforms political incentives into actionable outcomes.

***Leverage*** the Non-Proliferation Treaty forum and Review process as a political channel for policy uptake where externally developed verification advances are received, examined, and translated into shared expectations. Repositioning verification from a static obligation to an adaptive confidence building measure, aligned with contemporary security realities, lowering political risk, rebuilding trust, and offering nuclear weapon states a credible and feasible pathway for accountable Article VI implementation.

***Underscore*** the urgency for commitment by nuclear-weapon states to accelerate progress towards the elimination of nuclear weapons in line with the 13 practical steps of the 2000 NPT Review Conference and the 64 Action Plan of 2010

***Mandate*** a structured process to identify and address factors impeding non nuclear weapon states from fully embracing nuclear disarmament verification and constraining their effective participation.

[1] This memo was written as a requirement of the 2025-2026 Arms Control Negotiation Academy program. Views expressed in the memo are the opinions of the authors and do not reflect the views of their employers.

## Introduction

The multilateral nuclear disarmament framework is currently at a diplomatic impasse.[2] It is trapped in a cycle of competing positions, shaped by a changing and volatile security environment. As the international community prepares for the 2026 Non-Proliferation Treaty (NPT) Review Conference, the divide over nuclear disarmament is a major obstacle to progress guaranteed under NPT Article VI. Nuclear disarmament verification (NDV) mechanisms offer a viable and pragmatic path forward. Verification has the potential to align different approaches to disarmament negotiations, bridge divergent interests, and create the necessary space for mutual gain.[3]

The principle of verification itself is the main approach. Alongside transparency and irreversibility, verification has historically been recognized as one of the key principles for the realization of Article VI of the NPT. It is a process of gathering and analyzing information to judge parties' compliance with an agreement, an accounting exercise to ensure the “completeness and correctness” of a state's declared status. The subject of NDV is important and delicate not only for nuclear-weapon States (NWS) but also for non-nuclear-weapon States (NNWS). Given the disarmament success of the Chemical Weapons Convention (CWC) built upon a robust verification regime, there is a unique opportunity to leverage the discourse for positive diplomatic engagement.[4] Its potential lies in its ability to foster trust and ensure all stakeholders that a party is not cheating, thereby acting as a critical confidence-building measure.

To explore this potential, section 1 examines the divergent national security approaches to nuclear disarmament among various State blocs. Section 2 goes into the details of the specific technical and political challenges of nuclear disarmament verification, particularly regarding warhead dismantlement. Section 3 analyzes the complex question of institutional responsibility, evaluating the roles of the IAEA, dedicated bodies, and regional mechanisms. Section 4 examines how NDV can be reframed as a diplomatic tool to operationalize a Zone of Possible Agreement (ZOPA). Finally, Section 5 concludes with actionable recommendations to integrate next-generation verification, promote inclusive diplomacy, and leverage regional arrangements ahead of the 2026 NPT Review Conference.

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[2] United Nations Office for Disarmament Affairs, “2020 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT),” SR.5 (Summary Record), September 9, 2022. https://docs.un.org/en/NPT/CONF.2020/SR.5.

[3]Reaching Critical Will, “NPT Preparatory Committee concludes without adopting recommendations or a decision on strengthening the review process,” *Reaching Critical Will*, May 10, 2024. https://www.reachingcriticalwill.org/news/latest-news/17479-npt-preparatory-committee-concludes-without-adopting-recommendations-or-a-decision-on-strengthening-the-review-process.

[4]Arms Control Association, “The Chemical Weapons Convention (CWC) at a Glance,” *Arms Control Association*, June 2024. https://www.armscontrol.org/factsheets/chemical-weapons-convention-cwc-glance-0.

## 1. Understanding and different approaches to nuclear disarmament

The primary obstacle to progress on Article VI is the deep divergence in positions on the appropriate approach to nuclear disarmament. These positions are not arbitrary. Instead, they are rooted in distinct national security architectures and threat perceptions. A key question, then, emerges about how verification can help to overcome this entrenched obstacle. By addressing the core security concerns that create these differing postures, verification can serve as a pragmatic bridge between competing national interests.

The NWSs hold a critical yet challenged role. Their official positions have centered around maintaining nuclear deterrence as essential for national and collective security.[5] Despite the entrenched nature of these positions, the underlying interests of both NWS and NNWS reveal a meaningful overlap: an emphasis on predictability, stability, and credible assurances against sudden capability shifts. These common interests create an opportunity for constructive engagement on NDV measures, serving as an actionable way to build confidence, generate credible assurances of compliance, whilst protecting national security interests.[6]

In contrast, NNWS that are part of Nuclear-Weapon-Free Zones (NWFZs) represent one of the most consistent blocs in advancing nuclear disarmament. Anchored in legally binding treaties, NWFZs embody the commitment of entire regions to renounce nuclear weapons permanently. For these States, verification not only provides assurances of compliance by NWS but also strengthens the legitimacy of the disarmament process, reinforcing their long-standing demand for accountability and trust-building.[7] Verification is part of the existing politically binding principles enshrined in the 13 practical steps of disarmament committed to by all states for the realization of nuclear disarmament. Ahead of the 2026 NPT Review Conference, the active engagement of NWFZ States in verification could create common ground and amplify their collective voice as a moral and political force for progress toward the elimination of nuclear weapons.

States under the “nuclear umbrella” offer a distinct NNWS perspective. While committed to their non-nuclear status under the NPT, their national security architectures are directly integrated with the nuclear arsenals of an allied NWS. Consequently, for this bloc, disarmament is contingent on maintaining

[5]United Nations Institute for Disarmament Research (UNIDIR), “Disarmament fora,” *UNIDIR*. https://unidir.org/focus-area/disarmament-fora.

[6]Sahil Shah, “Nuclear disarmament verification and the NPT: De-politicising the political,” *European Leadership Network*, January 9, 2024. https://europeanleadershipnetwork.org/commentary/nuclear-disarmament-verification-and-the-npt-de-politicising-the-political/.

[7] “Working paper submitted by the Group of Non-Aligned States Parties to the Treaty on the Non-Proliferation of Nuclear Weapons,” (NPT/CONF.2020/WP.18), April 20, 2022. https://docs.un.org/en/NPT/CONF.2020/PC.I/WP.18 .

strategic stability, and they view verification not only as a tool for trust but as a mechanism that must guarantee security for their alliance throughout any potential reduction process.

Given these divergent, security-based perspectives, progress lies not in debating *whether* disarmament should occur, but in determining *how* it can be credibly verified.[8] This brings the focus squarely to the challenge of framing NDV to address these competing interests.

## 2. Framing Nuclear Disarmament Verification

An NDV mechanism ensures the disposal of the fissile material, the means of its production, and its weaponization.[9] This research will focus on the correctness[10] and completeness[11] of nuclear warhead dismantlement which are critical for a credible and irreversible nuclear disarmament process. Crucially, the verification of nuclear warhead dismantlement and associated components has not been part of existing arms control arrangements. Yet the verification of the dismantlement of nuclear warheads is intrinsic and directly linked to any potential to achieve complete nuclear disarmament.[12] Warhead dismantlement is a complex process that involves, but is not limited to the separation of the fissile core from the high explosives, thereby exposing sensitive design information. Given the complexity of the components that constitute a nuclear warhead and the associated dismantlement process, onsite inspection is the most effective and credible verification approach.[13] This creates a dilemma: establishing effective verification consistent with NPT Articles 2 and 3 without compromising NWS national security.

### *a. Nuclear Weapon States*

NWSs acknowledge the prospects of multilateral NDV, with anecdotal evidence of controlling the whole verification process without NNWS or limiting NNWS to specific aspects of the verification process due to overarching safety, security, and proliferation concerns.[14] With ongoing discussions on laying the preparatory groundwork for verifiable and irreversible nuclear disarmament, what has been central among NWS's interests is their concerns over the intrusiveness of multilateral NDV and the implications

[8]German Federal Foreign Office (Auswaertiges Amt), "Toward Nuclear Disarmament: Building up Transparency and Verification," May 22, 2021. https://www.auswaertiges-amt.de/resource/blob/2462108/6dc81f5932e6b96b48b8bc222f4b2e58/towards-nuclear-disarmament-data.pdf.

[9] Tim Caughley. 2016. "Nuclear Disarmament Verification Survey of Verification Mec,,is ,,hanisms." United Nations Institute for Disarmament Research.p8

[10]"DELIVERABLE 1: Framework Document with Definitions, Principles, and Good Practices." International Partnership for Nuclear Disarmament. Accessed November 2, 2025. p2 https://www.ipndv.org/reports-analysis/deliverable-one-principles-nuclear-disarmament-verification-key-steps-process-dismantling-nuclear-weapons-14-step-diagram/.

[11] Ibid.

[12] Bowen, Wyn, Hassan Elbahtimy, Christopher Hobbs, and Matthew Moran. 2018. Trust in Nuclear Disarmament Verification. Cham: Palgrave Macmillan.p51

[13] Ibid

[14] *See* Russia's views in the United Nations General Assembly.2024.*Nuclear Disarmament Verification:Report of the Secretary-General* (A/79/93) June 2024, p20.

that it will have for the overall nonproliferation regime. This is reflected in initiatives exploring NNWS involvement in warhead dismantlement without compromising safety, security, or nonproliferation.[15] The United Kingdom-Norway Initiative (UKNI) has developed an information barrier system capable of confirming the presence of weapon grade plutonium, confidence verification processes, and onsite inspection with managed access by non nuclear weapon States without compromising safety or the proliferation of sensitive information.[16] The IPDNV, building on the work carried out by QUAD nuclear verification partnership and UKNI, is developing and refining principles for managed access, integrating them into monitoring and inspection exercises.[17]

There are divergent points of departure among NWS regarding States' preparatory work on multilateral NDV and the scope of that work. This is exhibited by the voting rationale by some states on the UNGA resolution tabled by Norway and Brazil on the establishment of a group of scientific and technical experts on nuclear disarmament verification[18], and States views in response to the UNSG report on NDV. This includes Russia's reservation on what it regards as delving into operational matters on NDV before the establishment of a nuclear disarmament treaty as the anchor of the discussions/negotiations.[19] In this regard, for Russia, the discourse on multilateral NDV is like putting the cart before the horse. In addition, Russia argues that developing verification procedures requires access to sensitive design information unavailable to NNWS.[20] Hence, without such information, which NNWS should not be privy to, it's virtually impossible to make recommendations.[21] This is also substantiated by their rationale for voting against the UNGA Resolution on the establishment of the Group of Scientific and Technical Experts on Nuclear Disarmament Verification (GSTE-NDV) by Norway and Brazil.[22]

Unlike Russia, China and France recognize the utility of nondiscrimination and equitable participation in any communication on NDV to enhance mutual trust while balancing the relationship between credibility

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[15] United Kingdom-Norway Initiative (UKNI) from 2007; QUAD Nuclear Verification Partnership by the USA,United Kingdom,Norway,Sweden; International Partnership for Nuclear Disarmament Verification (IPNDV) from 2014; United Nations Group of Governmental Experts (UN-GGE) on Nuclear disarmament Verification (A/RES/74/50).

[16] 2015 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, The United Kingdom-Norway Initiative: Further research into the verification of nuclear warhead dismantlement: Working paper submitted by the Kingdom of Norway and the United Kingdom of Great Britain and Northern Ireland, document,http://www.reachingcriticalwill.org/images/documents/Disarmament-fora/npt/revcon2015/documents/WP31.pdf, 22 April 2015.

[17] "Building a Nuclear Disarmament Verification Tool Kit." 2022. International Partnership for Nuclear Disarmament. Accessed November 9, 2025. https://www.ipndv.org/reports-analysis/building-a-nuclear-disarmament-verification-tool-kit/.

[18] United Nations General Assembly Draft Resolution (A/C.1/80/L.59) , Establishment of the Group of Scientific and Technical Experts on Nuclear Disarmament Verification, 16 October 2025.

[19] *See* Russia's views in the United Nations General Assembly.2024.*Nuclear Disarmament Verification:Report of the Secretary-General* (A/79/93) June 2024, p20

[20] Ibid

[21] Ibid

[22] United Nations General Assembly Draft Resolution (A/C.1/80/L.59) , Establishment of the Group of Scientific and Technical Experts on Nuclear Disarmament Verification, 16 October 2025.

and protection of sensitive information.[23] In this regard, China and France support capacity building on the technical and scientific procedures for all states to effectively participate in the verification process. However, China, consistent with Russia and France, believes NDV should be integrated with specific nuclear disarmament treaties, and it's counterproductive to work on substantive aspects of NDV in isolation from appropriate specific treaties.[24] On the other hand, despite voting against the resolution proposing the establishment of the GSTE-NDV by citing financial reasons, the United States supports the existing efforts by other States to strengthen disarmament verification and believes NDV measures can help prevent cheating and build confidence among parties.[25]

*b. Non-Nuclear Weapon States*

NNWS can be divided into two diverging sub-blocs with different conceptions of multilateral NDV. Nuclear umbrella States, consistent with NWS, share the same concerns regarding security, safety, and proliferation in the NDV process. However, some nuclear umbrella States still believe there is utility to involve NNWS in 'all stages of the disarmament verification'.[26] The nuclear umbrella States are more receptive to an inclusive participatory process that multilateral NDV entails. This position is also reflected in NNWS that have supported multilateral processes promoting inclusive and equitable participation, including components of capacity building in preparation for the appropriate time to carry out disarmament verification.[27] This bloc inadvertently acknowledges disarmament as a development that is not feasible at this moment, but like NWS, recognizes the value in setting up preparatory steps in that direction.

Within the NNWS bloc, others hold a high steadfast threshold of disarmament expectation, subscribing to imminent nuclear disarmament. This is anchored on the notion of existing past examples and structures that can be utilized by NWS willing to disarm their nuclear stockpiles and initiate verifiable processes. Therefore, before considering the hurdles associated with multilateral NDV processes, NWS can unilaterally and bilaterally disarm. Some scholars have also questioned whether it's within the ability of NWS to disarm with some *ad hoc* set of bilateral verification arrangements, but why have they not

[23] See China's views in the United Nations General Assembly.2024.Nuclear Disarmament Verification:Report of the Secretary-General (A/79/93) June 2024, p7-8; France views p10

[24] Ibid ; France's views p11

[25] Geneva, U. S. Mission. 2025. "80th Session of the United Nations General Assembly : First Committee Cluster I – Nuclear Weapons." U.S. Mission to International Organizations in Geneva, October 31. https://geneva.usmission.gov/2025/10/31/80th-session-of-the-united-nations-general-assembly/.

[26] See Canada's reply in the United Nations General Assembly.2025.Group of Scientific and Technical Experts on Nuclear Disarmament Verification:Report of the Secretary-General (A/80/93) July 2025, p15-16; Brazil and Norway p13 ; Mexico p15-16;

[27] See The Group of Governmental Experts to consider the role of verification in advancing nuclear disarmament, established by the General Assembly in its resolution (A/71/67); The adoption by the United Nations' First Committee of draft resolution (A/C.1/80/L.59) to establish the Group of Scientific and Technical Experts on Nuclear Disarmament Verification within the United Nations.

done so? [28] This is not a novel exercise, as between 1994 and 2009, the United States dismantled an average of 580 weapons per year, while Russia dismantled 200-300 per year.[29] In addition, South Africa's disarmament of its indigenous nuclear weapons programme provides a great example of how a State can unilaterally disarm and cooperatively work with an independent organisation like the International Atomic Energy Agency (IAEA) to carry out a credible verification exercise.[30] With a key caveat that South Africa's arsenal was small in comparison with the current NWS' arsenal and the time allocated to dismantlement of a single warhead is not public information, these examples have been the anchor of the skepticism some NNWS have over the notion of multilateral NDV. Nuclear disarmament is stalled **not** as a result of inadequate technology but due to a lack of political will. This is reflected in some NNWS positions that have implicitly and explicitly framed the discourse of irreversibility and verification within multilateral processes as a potential diversion from the actual issue, which is disarmament.[31]

## 3. Designating the NDV responsibility: who should verify?

Determining ***who*** should be responsible for verifying nuclear disarmament remains one of the most politically sensitive and technically complex dimensions of the process. The issue lies at the intersection of sovereignty, trust, and institutional legitimacy. Verification is not only a technical exercise—it is an expression of confidence in the international system and in the institutions mandated to uphold it. Therefore, the question of **who** verifies is inextricably linked to the question of ***whose verification is trusted***.

a) *The Role of the IAEA and Its Limitations*

The IAEA is frequently cited as the most legitimate and technically capable body to lead NDV. Its institutional authority, neutrality, and global membership give it a unique position to manage sensitive processes. Past practice reinforces this perception: South Africa is the only State to have fully dismantled an indigenous nuclear weapons programme under IAEA oversight. Nonetheless, the IAEA has ***never*** directly verified nuclear weapons-related activities, including nuclear warhead dismantlement. Nevertheless, the IAEA also played important roles in Kazakhstan, Ukraine, and Belarus after these States relinquished Soviet-era nuclear arsenals, verifying the absence of non-peaceful activities and, in Kazakhstan's case, conducting surveys of former nuclear testing infrastructure. These experiences,

[28] David Cliff, Hassan Elbahtimy, David Keir, and Andreas Persbo. 2013. "Nuclear Disarmament Verification: The Case for Multilateralism." Verification Research, Training and Information Centre. https://www.vertic.org/media/assets/Publications/VERTIC%20Brief%2019.pdf. p3

[29] Ibid p2; Hans Kristensen. 2024. "United States Discloses Nuclear Warhead Numbers; Restores Nuclear Transparency." Federation of American Scientists, 2024. https://fas.org/publication/united-states-discloses-nuclear-warhead-numbers-restores-nuclear-transparency/.

[30] Kelley, Robert E. 2023. Verifying Nuclear Disarmament: Lessons Learned in South Africa, Iraq and Libya. Stockholm International Peace Research Institute. https://doi.org/10.55163/HRWA2721.

[31] See Egypt' reply in the United Nations General Assembly.2025.Group of Scientific and Technical Experts on Nuclear Disarmament Verification:Report of the Secretary-General (A/80/93) July 2025. p20; South Africa p30 .

together with initiatives such as the Trilateral Initiative[32]demonstrate that the Agency can operate in disarmament contexts when specifically mandated by its Member States.[33]

However, the IAEA's involvement also raises concerns. Several NNWS caution that expanding the Agency's mandate into nuclear disarmament may stretch resources, politicize the organization, or blur the distinction between safeguards and disarmament verification. Skepticism is further reinforced by structural issues inherent to the Agency itself: its budget relies heavily on a small number of major contributors, leading some States to worry that financial dependence could translate into disproportionate influence over policy or operational decisions. Additionally, past allegations of leaks or inadvertent disclosure of sensitive information have contributed to a perception among some Member States that the Agency's information-protection systems may not always meet the stringent confidentiality standards required for warhead-related verification.

NWS, meanwhile, remain wary of exposing sensitive design information to an institution fundamentally oriented toward non-proliferation rather than managing classified military stockpiles. Any future role for the IAEA will require tailored legal arrangements, firewalling of information, and possibly new institutional mechanisms within the Agency to handle classified tasks.[34]

b) A Dedicated NDV Body

Future NDV may ultimately require a *purpose-built institution* with its own mandate, procedures, and information-protection architecture. Such a body could combine the legitimacy of a multilateral framework with the flexibility needed to address the security concerns of NWS while still meeting NNWS' expectations of transparency and inclusivity. A dedicated verification organization could draw on the model of the Organisation for the Prohibition of Chemical Weapons (OPCW), which dedicated verification division and inspectorate operate under treaty-specific authorities that are separate from other non-proliferation mechanisms. An OPCW-style NDV body could similarly create a clear institutional separation between safeguards and disarmament tasks while providing the technical capacity, confidentiality procedures, and political oversight necessary for sensitive operations such as warhead dismantlement or fissile material disposition.

This question has also featured prominently in the Meetings of States Parties to the Treaty on the Prohibition of Nuclear Weapons (TPNW). Article 4 requires States Parties to designate a *competent*

[32]A 1996-2002 US-Russia-IAEA cooperative effort to develop a system for verifying fissile materials released from nuclear weapons programs to establish the technical, legal, and financial framework for the IAEA to verify weapon-origin plutonium and highly enriched uranium, which required special safeguards beyond the standard system for peaceful nuclear materials.

[33] Leonardo Bandarra, Noah Mayhew, Malte Göttsceh, "The IAEA and Irreversibility: Addressing Political, Institutional,and Technological Verification Challenges in FormerNuclear-Armed States", Journal for Peace and Disarmament, 2024, Vol. 7, No. 2, p. 305. https://www.tandfonline.com/doi/epdf/10.1080/25751654.2024.2440115?needAccess=true

[34] David Cliff, Hassan Elbahtimy, David Keir, Andreas Persbo, "Nuclear disarmament verification: the case for multilateralism", Vertic Brief 19, April 2013, p.4

*international authority or authorities* to negotiate, oversee, and verify the irreversible elimination of a nuclear-armed State Party's weapons programme. However, the Treaty deliberately provides little institutional detail. As underscored by Brazil and Mexico, this flexibility allows States Parties to reflect, consult scientific and technical expertise, and avoid premature decisions before a nuclear-armed state signals its intention to join.

In line with the incremental approach set out in Article 4 and reaffirmed by the co-facilitators, States Parties have therefore prioritized preparatory and intersessional work rather than early institutional decisions. This includes clarifying what "designation" entails; identifying which verification tasks may be carried out by existing organizations and which require new structures; examining cooperative transparency approaches; and considering how the authority would relate to other TPNW bodies.

These discussions reflect a shared understanding: the conceptual, legal, and technical foundations for a competent international authority must continue to evolve, but the final institutional model may only be determined once a nuclear-armed state announces its intention to accede and triggers the negotiation and verification processes foreseen under Article 4.[35]

c) Regional and Hybrid Verification Pathways

Regional approaches could serve as complementary mechanisms to multilateral verification efforts. Existing organizations, such as the Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC) and Euratom, demonstrate that regional verification can build trust, foster transparency, and reduce political sensitivities.

The ABACC employs joint inspections, shared procedures, and cooperative data analysis to ensure transparency and build trust between former rivals. Euratom, meanwhile, maintains its own inspectorate and verification system, working closely with the IAEA under joint-safeguards agreements. Both bodies illustrate how regional agencies can sustain continuous verification, enhance confidence in peaceful nuclear programmes, and provide an institutional buffer that helps reconcile national sensitivities with international scrutiny.[36]

Latin America's own experience offers an important historical lesson. The discussions about having a regional inspection capability reflected a belief that regional verification could reinforce compliance and strengthen collective security. However, with the establishment of the IAEA and the rapid development of its safeguards system, States Parties ultimately chose to avoid duplication and rely on the Agency's technical system rather than create a parallel regional inspectorate. Today, this complementary approach

[35] First Meeting of States Parties to the Treaty on the Prohibition of Nuclear Weapons, TPNW/MSP/2022/WP.1, Designation of a competent international authority/authorities Working paper submitted by the co-facilitators, Brazil and Mexico - https://digitallibrary.un.org/record/3976719/files/TPNW_MSP_2022_WP.1-EN.pdf

[36] Leonardo Bandarra, Noah Mayhew, Malte Göttsceh, "The IAEA and Irreversibility: Addressing Political, Institutional,and Technological Verification Challenges in FormerNuclear-Armed States", Journal for Peace and Disarmament, 2024, Vol. 7, No. 2, p. 309.
https://www.tandfonline.com/doi/epdf/10.1080/25751654.2024.2440115?needAccess=true

is reflected in OPANAL's cooperation agreement with the IAEA and in the fact that all Parties to the Treaty of Tlatelolco maintain safeguards agreements with the IAEA, in parallel with their NPT commitments.

These experiences suggest that regional verification bodies can serve as valuable components of a multilayered disarmament verification architecture. As NDV evolves, regional pathways offer flexible and credible models that could be adapted to future scenarios, particularly in contexts where global mechanisms require supplemental legitimacy, capacity, or political acceptability.

Across all proposals, entrusting the task to the IAEA, creating a dedicated verification organization, or building multilayered regional–global arrangements, a single political–technical tension persists: balancing NWS' insistence on protecting sensitive design information with NNWS's demand for inclusive, transparent, and credible verification. NWSs emphasize security, confidentiality, and non-proliferation imperatives, often favoring tightly controlled mechanisms or institutions with proven experience in safeguarding classified data. NNWSs, however, view verification as a collective responsibility central to fulfilling Article VI commitments and ensuring that disarmament is not merely declared but demonstrably irreversible. Any viable future verification system will therefore need to reconcile these divergent expectations through carefully calibrated institutional design, one that provides robust protection of sensitive information while ensuring sufficient participation, oversight, and legitimacy. A layered architecture that leverages global bodies, specialized mechanisms, and regional institutions may ultimately offer the most politically acceptable path forward, precisely because it distributes responsibilities in a way that balances trust, sovereignty, sense of ownership, and technical credibility.

## 4. Striking a balance for the realization of multilateral NDV

As examined, the political deadlock around Article VI stems not from a lack of technical capabilities and tools, but from the absence of credible, politically acceptable institutional and procedural arrangements for their use. The central challenge is thus to design an NDV framework that balances the competing demands: NWS security concerns, protecting sensitive information, and preventing/mitigating proliferation risks, while ensuring NNWS have credible, meaningful political participation that demonstrates legitimacy and irreversibility.[37] Achieving this balance is essential to establishing a Zone of Possible Agreement in which both NWS and NNWS can jointly endorse credible verification without compromising core (security) interests.

These overlapping core interests *(predictability, legitimacy,* and *assurance against cheating or sudden capability shifts)* provide a basis for negotiation consensus. Verification becomes a diplomatic tool by reducing the political costs of cooperation. Besides questioning *what* should be verified and by ***who***, it is thus as important as to ***how*** an effective NDV framework can be implemented through methods that alter incentives and reduce barriers to compromise. The central challenge is therefore *diplomatic*: How

[37] See IPNDV Capstone Report, "Verification of Nuclear Disarmament, June 2024, pp. 44ff, https://www.ipndv.org/wp-content/uploads/2024/06/IPNDV-Capstone_FINAL-1.pdf

to design a verification framework that lowers political risk, creates shared incentives and open space for negotiated compromise.[38]

*a) Reframing verification as diplomatic tool*

Technological tools in NDV function not merely as technical instruments but as diplomatic enablers that expand the space for mutual gain, viewing verification as mechanism that transforms political incentives. Where negotiation deadlocks arise based on (political) mistrust, its resolving element is not necessarily capability, but rather verification, constituting the moving instrument to alter hampered dynamics.[39]

Thereby, three critical elements (addressing the just outlined overlapping core interests) enable NDV to function as a political and diplomatic lever: Reducing Risk (*assurance against cheating*), Expanding Participation (*creating legitimacy*), and (*Strengthening*) Predictability: NDV's primary contribution lies in reducing risk. Secure verification methodologies lower NWS' concerns and perceived vulnerability that cooperation might compromise deterrence or reveal sensitive operational capabilities.[40] At the same time, structured participation, especially through joint initiatives, procedural oversight, and distributed responsibilities, fosters meaningful NNWS participation and legitimacy, thereby strengthening perceptions of inclusivity and mutual accountability. Finally, reliable verification enhances predictability, transparency, and stabilizes expectations by reducing uncertainty about compliance, enabling more credible and durable political commitments. Together, these attributes translate verification into tangible CBM that enable cooperation even amid persistent geopolitical shifts and tensions.[41]

*b) How verification tools reshape diplomatic incentives*

Verification approaches like managed access systems, information barriers, and zero-knowledge protocols share one diplomatic function:[42] they establish a structured environment of managed limited transparency that allows for cooperation without compromising on national security interests. These techniques are of high diplomatic value given that they directly address NWS secrecy and security concerns via calculated visibility, while offering NNWS the necessary assurances that verification doesn't constitute a black box. Both follow a mutually shared approach whereby the degree of intrusiveness of

[38] See Appendix 1

[39] Erästö, Tytti et al, "Operationalizing Nuclear Disarmament Verification", SIPRI Insights on Peace and Security, Stockholm International Peace Research Institute, April 2019, pp. 4, 11, https://www.sipri.org/sites/defa,ult/files/2019-04/sipriinsight1904_0.pdf

[40] UK-Norway Initiative, Managed Access Exercise Report (2008–2010 exercises), "The United Kingdom - Norway Initiative: Further Research into Managed Access of Inspectors During Warhead Dismantlement Verification", pp. 1-3, 9-10, https://assets.publishing.service.gov.uk/media/5a78e298e5274a277e690394/20120426_2010_ukni_man_access_exercise.pdf

[41] See Caughley, Tim, "Nuclear Disarmament Verification: Survey of Verification Mechanisms", Geneva, United Nations Institute for Disarmament Research (UNIDIR), 2016, https://unidir.org/files/publication/pdfs/survey-of-verification-mechanisms-en-657.pdf

[42] Cf. Sébastien Philippe et al., "A Physical Zero-Knowledge Object-Comparison System for Nuclear Warhead Verification," Nature Communications, 2016, https://doi.org/10.48550/arXiv.1602.07717

agreed measures is carefully calibrated to ensure credible (maximum) assurance of compliance with the minimum necessary exposure, thus allowing States to explore immediate forms of engagement.[43]

Similarly, emerging AI-based tools and technologies will further expand the scope of verification. AI, machine learning, and automated sensing systems can reduce human access to sensitive environments by shifting analysis to pre-validated and potentially trusted algorithms. In parallel, demonstrative verification, where States showcase capabilities or simulated processes without revealing sensitive data (via controlled demonstrations using retired components or realistic mock-ups), can be leveraged as political signals. Even before full-scale implementation, pilot activities like demonstrations, joint experiments, or managed trials show (good) intention, political will, and reduce uncertainty, and can be leveraged in early-staged phases as efficient confidence-building measures, particularly amid times of dynamic and shifting geopolitical tensions. Illustratively, recent press reports claim that Chinese research groups have managed to develop a machine-learning system that is capable of differentiating between genuine warheads and decoys, using residual signature patterns, while preserving classification through concealment and shielding.[44] While both technical maturity and political acceptability remain uncertain, such developments nonetheless point to potential diplomatic leverage: If independently validated and subject to appropriate governance, such AI-enabled verification could significantly reduce the need for intrusive inspections and lower the political costs for NWS participation.

*c) Bridging divergent interests: Operationalizing the Zone of Potential Agreement (ZOPA)*

The ZOPA for NDV emerges at the intersection where verification is informative enough to assure NNWS of credible reduction (efforts) while sufficiently protective of NWS' security-sensitive information. This space materializes when the three identified requirements (protection, assurance, participation) align: (1) ensuring that inspection processes protect/prevent the transfer of sensitive information; (2) providing credible evidence that declared reductions are real, complete, irreversible and can be independently verified; (3) allowing NNWS to engage as meaningful verification partners (instead of falling short as passive observers), in order to satisfy both equity and legitimacy demands under the NPT (obligations).[45]

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[43] See United Nations Institute for Disarmament Research (UNIDIR), VERTIC, "Coming to Terms with Security: A Handbook on Verification and Compliance", 2003, (UNIDIR/2003/10), p.2, https://unidir.org/publication/coming-to-terms-with-security-a-handbook-on-verification-and-compliance/

[44] See China Institute of Atomic Energy (reports covered in press): Stephen Chen, "China Unveils World's First AI Nuke Inspector," South China Morning Post, 30.05.2025, https://www.scmp.com/news/china/science/article/3312270/china-unveils-worlds-first-ai-nuke-inspector.

[45] United Nations, *Treaty on the Non-Proliferation of Nuclear Weapons (NPT)*, Article VI, https://treaties.unoda.org/t/npt; See also: *NPT/CONF.2026/PC.II/SR.5*, "General debate on issues related to all aspects of the work of the Preparatory Committee (continued)", Statement by Singapore (and others), https://digitallibrary.un.org/record/4067928/files/NPT_CONF.2026_PC.II_SR.5-EN.pdf (*"The legitimacy, credibility and relevance of the Treaty continued to be undermined by some Staties parties' non-compliance with their disarmament and safeguards obligations, as well as by a divergence of views between the nuclear-weapon and non-nuclear-weapon States."*)

The previously outlined multitude of potential technologies and institutional arrangements offer a workable balance across these requirements. Together, they create a functional compromise that narrows and operationalizes the ZOPA, offering a catalog of options, from tailored managed-access systems, adaptable verification setups, to gradual transparency steps, enabling progress in a highly security-sensitive environment, marked by unequal capabilities, allowing States to reassess and rebalance risk and assurance in response to evolving political dynamics. Moving away from an interpretation of verification as a mere static technical requirement and solution and reframing it as a dynamic diplomatic tool, NDV can be leveraged to bridge the entrenched positions of NWS and NNWS and create negotiation spaces for mutual gain.

## 5. Actionable recommendations/path forward

*a) Incorporate Next-Generation Verification*

A realistic and credible path forward to break the diplomatic stagnation and revive implementation under the NPT lies exactly in integrating the evolving next-generation verification discourse, especially centered around AI-assisted data analytics, digital traceability, and non-intrusive sensing, into the diplomatic process and NPT discussion space itself. Advances in AI-assisted anomaly detection, enhancement of analytical capabilities and information processing, secure digital chain-of-custody systems, model-based prediction tools and open-source data analytics showcase that emerging technologies have the potential to indeed enhance assurances and generate independent verification insights without revealing or compromising classified or operational sensitive information; developments that align strongly with the ZOPA requirements identified in this paper.[46] The newly adopted UNGA resolution from October 2025[47], mandating the creation of a Group of Scientific and Technical Experts on NDV, further reinforces this momentum. While not yet operational, its forthcoming work, together with the existing findings and outputs of verification experience generated by existing initiatives such as the UK–Norway Initiative, the IPNDV, the TPNW Article 4 Working Group, and previous U.S.-Russian dismantlement arrangements, builds a growing set of practical methods and lessons learned which states can use to structure and guide constructive political engagement.

Rather than replicating technical processes, this approach is genuinely complementary. State Parties could use the NPT forum and Review process as a political channel for policy uptake: externally developed verification advances are received, examined, and translated into shared expectations. This would reposition verification from a static obligation to an adaptive CBM, aligned with contemporary security realities, lowering political risk, rebuilding trust, and offering NWS a credible and feasible pathway for accountable Article VI implementation. More broadly, it would reorient the NPT from a

[46] International Atomic Energy Agency, “Emerging Technologies Workshop: Artificial Intelligence for Nuclear Verification” Workshop report, 2025, https://www.iaea.org/sites/default/files/25/07/emerging-technologies-workshop-artificial-intelligence-for-nuclear-verification.pdf

[47] UNGA A/C.1/80/L.59, “Brazil and Norway: draft resolution. Establishment of the Group of Scientific and Technical Experts on Nuclear Disarmament Verification” ,16.10.2025, https://digitallibrary.un.org/record/4091638?v=pdf

current state of positional bargaining toward a structured political space that operationalizes technical verification progress into diplomatic leverage and renewed momentum on Article VI.

*b) Promote inclusive diplomacy*

Discussions on cooperative verification often overlook the capacity deficit impeding effective NNWS participation. There is a need to strengthen inclusive disarmament diplomacy by (1) recognizing factors impeding NNWS from embracing the NDV discourse and tailoring any effort to incentivize their meaningful participation, which includes unpacking the cost-benefit calculus, (2) supporting existing initiatives promoting capacity building to ensure equitable participation, geographical representation, and sustainable capacity development for NNWS preparedness, (3) ahead of the NPT Review Conference, package verification in conjunction with article VI of the NPT's fundamental principles - transparency and irreversibility, and other substantial discussions on nuclear arms reduction and nonproliferation.

*c) Embrace regional arrangements and build on bilateral experience*

The debate over who should verify nuclear disarmament often defaults prematurely to global institutions, overshadowing the practical and politically grounded value of regional and hybrid verification pathways already operating successfully. Past experiences demonstrate that regional bodies can cultivate trust, manage sensitivities, and sustain long-term verification relationships in ways that global institutions alone may not achieve. Strengthening future verification arrangements requires: (1) acknowledging the existing ecosystem of regional and bilateral verification mechanisms and systematically integrating their lessons into multilateral disarmament discussions, especially where these models have built confidence between former rivals or supplemented global oversight structures; and (2) leveraging ongoing regional initiatives to explore scalable practices, including shared inspectorates, joint procedures, and cooperative transparency measures tailored to politically sensitive environments.

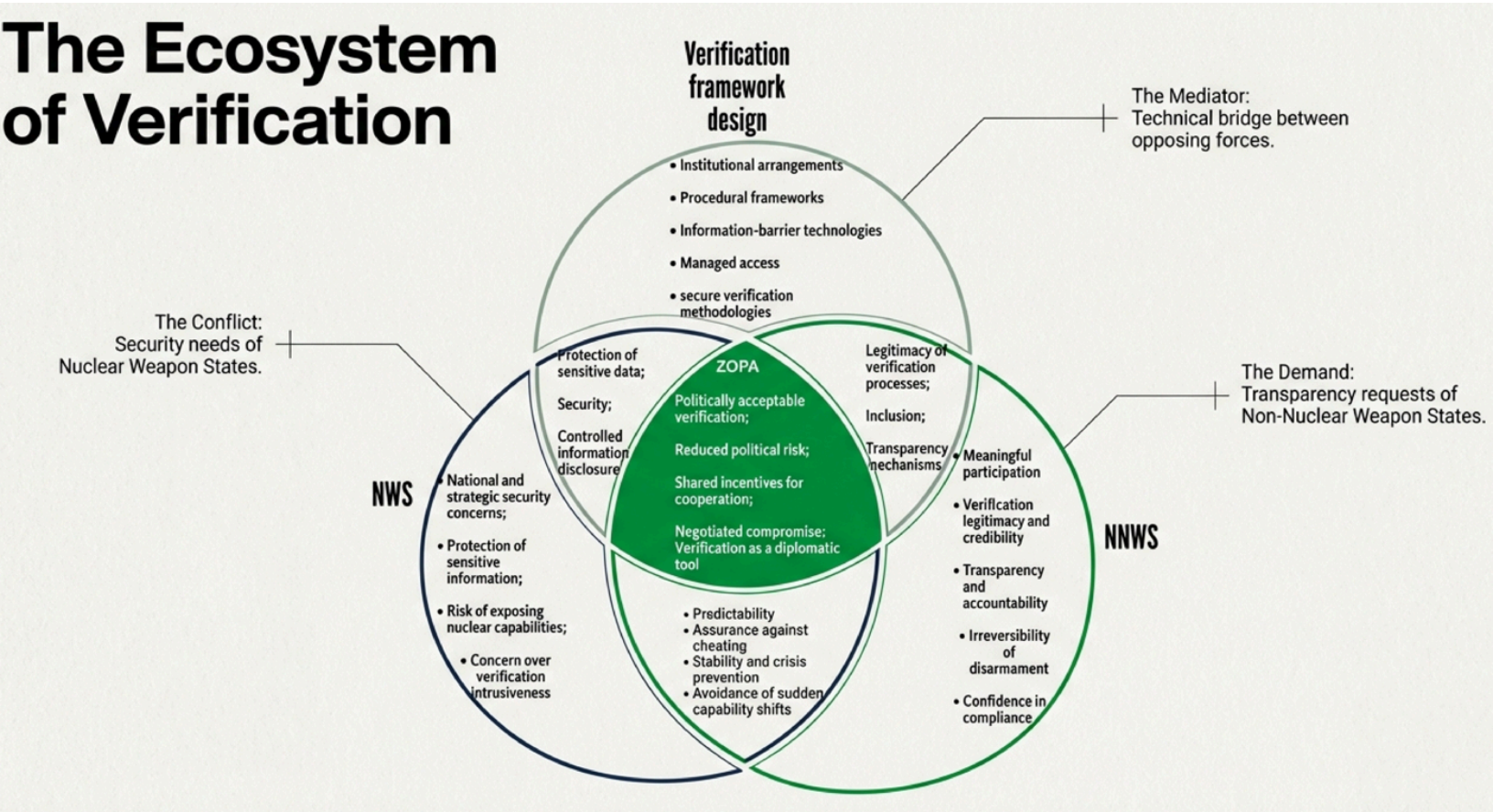
Such an approach would allow the international community to build a more credible, politically acceptable, and operationally resilient verification system—one that draws strength not only from global mandates but also from the proven stability and adaptability of regional and bilateral cooperation.

## 6. Conclusion

NDV represents more than a mere technical way forward to disarmament; it is a vital diplomatic enabler capable of bridging the entrenched divide between NWS and NNWS. By reframing verification from a zero-sum political contest into a collaborative problem-solving exercise, States can move beyond fixed positions toward a zone of potential agreement that successfully balances the competing imperatives of national security, non-proliferation, and international accountability. The analysis shows that this balance—securing NWS sensitive information while ensuring NNWS meaningful participation is technically and institutionally achievable. While it remains to be seen whether these overlapping interests can be fully operationalized through technical and institutional means, exploring a hybrid

architecture—one that leverages the IAEA's established legitimacy, the flexibility of regional arrangements such as ABACC, and the potential of next-generation technologies such as AI and zero-knowledge proofs—provides a necessary framework to investigate whether a robust verification regime can be constructed. Ultimately, operationalizing NDV serves as a critical confidence-building measure. It offers a pragmatic, actionable pathway to de-risk cooperation and re-establish contours of trust, ensuring that the principles of transparency, irreversibility, and verifiability remain central to the integrity of the NPT framework and the eventual realization of a world without nuclear weapons.

**Appendix 1. Striking a balance for the realization of multilateral NDV**



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