

Scenario-Based Discussion of Building Verification Confidence

Background Paper

Purpose, Scenario, and Format

The discussion will jointly explore building confidence in the verification of nuclear warhead dismantlement, identified from the very start by the International Partnership for Nuclear Disarmament Verification (IPNDV) as the key challenge of nuclear disarmament verification. The discussion will be based on the scenario set out below that posits multilateral inspections to confirm the dismantlement of nuclear warheads under a multilateral nuclear disarmament agreement. The format will be divided into two main parts: first, presentation of the scenario, including a set of verification options based on the work of IPNDV (Appendix A); second, an interactive discussion of issues in building confidence in nuclear warhead dismantlement based on questions set out by the facilitator. The discussion then will conclude with a consideration of key insights from your perspectives.

Scenario

From the start, the IPNDV has used a scenario-based approach to identify the challenges of nuclear disarmament verification and explore solutions to those challenges. It is currently using two scenarios in its work. In the first “Limitations Scenario”, a notional nuclear weapon state, Ipindovia, is one of several parties to a treaty obligating the parties to limit their nuclear arsenals to no more than 500 nuclear warheads. This scenario highlights the verification of the absence of undeclared activities in contravention to the basic obligation. In the second “Reductions Scenario”, Ipindovia is one of several treaty parties that are obligated to reduce their nuclear arsenals from 500 nuclear warheads to zero over a period of 20 years by permanently dismantling them. In both scenarios, verification is carried out by a multilateral inspectorate.



Today’s discussion will be derived from the Reductions Scenario, with the types of verification-related activities set out in the following paragraphs. It will focus on verification of the dismantlement of nuclear warheads; verification of the storage and ultimate disposition of the

components of dismantled nuclear warheads are not part of this scenario though they are analyzed by the work of the IPNDV. It is assumed to be the first quarter of the fourth year since entry into force of the treaty (“Treaty Year 4”).

Verification of Reductions by Ipindovia – Confirmation of Baseline Declaration in Treaty Year 1. Immediately after the treaty’s entry-into-force in Treaty Year 1, all treaty parties provided a “Baseline Declaration” that provided comprehensive information on its total number, type, status, and location of accountable nuclear warheads and related facilities. This includes the location, and types of nuclear-weapon operational bases, storage sites, and nuclear production/refurbishment facilities. The information provided included Unique Identifiers (UIDs – a unique alphanumeric designation specific to each warhead or separated components therefrom) for the treaty accountable items as well as site diagrams for the specific sites identified in the declaration. This Baseline Declaration provides the starting point for verification. To confirm the data provided by Ipindovia in its Baseline Declaration, inspectors inspected each of the sites listed in this declaration.

Declarations and Notifications. In line with treaty provisions, Ipindovia also is obligated to provide an annual update of this data in order to provide the inspectorate and other parties with an up-to-date and comprehensive picture on a recurring basis of its treaty-accountable material and facilities. Ipindovia also is obligated to provide notifications of time-sensitive changes that affect the accuracy of the Baseline Declaration or that could trigger planning for or implementation of inspections (e.g., day-to-day movement of nuclear warheads from one location to another, planned dismantlement of nuclear warheads, and changes in the status of nuclear-weapon bases and related facilities).

Types of Inspection Activities. The following activities were carried out by the inspectors in cooperation with Ipindovia. (For a full list of monitoring and inspection activities considered see Appendix A).

- The inspectors, in cooperation with Ipindovia, in Treaty Year 1 made a radiation template of the single type of nuclear warhead possessed by Ipindovia. This template provides a basis for comparison with the radiation emissions from containers declared to contain nuclear warheads to confirm the presence of a signature consistent with the presence of a nuclear warhead. These radiation measurements are conducted with equipment using an Information Barrier to protect proliferation- and other- sensitive information. (For a brief technical description of different monitoring and inspection tools, see Appendix B).
- Based on notifications from Ipindovia, inspectors employed a number of different inspection types as defined by the treaty to confirm (following managed access procedures) the removal of nuclear warheads from delivery systems or from storage, and the placement of those nuclear warheads in containers for onward movement in the overall dismantlement process. In so doing, they confirmed the unique identifiers for those nuclear warheads. They also observed the placing of tamper-indicating tags and seals on those containers. As part of these inspections at operational bases, inspection teams also observed the intra-base transport of nuclear warheads to short-term storage sites and observed placement of those containerized warheads into a storage bunker. The

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objective of this type of inspection is to build confidence that an actual nuclear warhead is being initialized into treaty accountability.

- Inspectors carried out a series of inspections at Ipindovia’s Central Storage site located at the LADDU facility to confirm the presence of containerized nuclear warheads declared to be in storage. Inspectors confirmed the unique identifiers of the nuclear warheads present against the declaration for the site. Using random access, they confirmed tags and seals present on the nuclear warhead containers or observed the placing of tags and seals on such containers. During some inspections they used radiation measurement equipment with an Information Barrier to confirm the presence of special nuclear material (SNM) in randomly chosen containers.
- Based on notifications received, inspectors carried out a number of inspections at Ipindovia’s dedicated dismantlement area located at the LADDU facility to confirm the dismantlement of declared nuclear warheads. Dismantlement is defined by the INPDV as separation of the Special Nuclear Material and the High Explosives from the nuclear warhead. The specific activities of a nuclear warhead dismantlement inspection are set out next.

Nuclear Dismantlement Inspection: At the start of each Treaty Year, Ipindovia is obligated to notify the inspectorate of its nuclear warhead dismantlement plan for that year:

- The number of nuclear warheads to be transported from Central Storage to the dedicated dismantlement and dismantled
- The UIDs associated with those nuclear warheads
- The specific dates that inspectors should plan to be present for the conduct of dismantlement inspections during the coming year (assuming a limit on the number of such inspections to be carried out in any given year).

Having made a decision to be present for a nuclear warhead dismantlement inspection, the inspectors accomplished the following:

- Prior to the dismantlement of a nuclear warhead:
 - ⇒ Inspectors entered the dedicated dismantlement area to confirm no undeclared means of access/egress as well as to use simple radiation measurement equipment to confirm that no undeclared Special Nuclear Material was present in that area
 - ⇒ The inspectors used closed-circuit TV and Perimeter Portal Monitoring (PPM) equipment to confirm no undeclared access to/egress from the area prior to dismantlement
 - ⇒ Inspectors confirmed the unique identifier and the intact tags and seals on the container declared to contain the nuclear warhead
- Given the need to protect proliferation- and other-sensitive information, inspectors were not present in the dedicated dismantlement area during the actual dismantlement of the nuclear warheads – the separation of the Special Nuclear Material and the High Explosives and their placement into two separate containers for onward processing

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- ⇒ During this dismantlement process, the inspectors used Perimeter Portal Monitoring equipment to confirm no undeclared access/egress of the dedicated dismantlement area
- After dismantlement of the nuclear warhead, the inspectorate carried out the following inspection activities:
 - ⇒ Confirmed new unique identifiers for the separated Special Nuclear Material and High Explosives associated with the dismantled warheads, and placed tags and seals on those containers after completion of the dismantlement
 - ⇒ Used radiation measurement techniques with an Information Barrier to confirm the presence of Special Nuclear Material in its container after dismantlement
 - ⇒ Made technical measurements to confirm the presence of High Explosives in its container after dismantlement
 - ⇒ Rechecked the dedicated dismantlement area to ensure the absence of Special Nuclear Material

The inspectors encountered no difficulties, anomalies, or unexpected contingencies (e.g., a bad weather event or an equipment failure) in carrying out its inspection and received the full cooperation of Ipindovia.

Appendix A: IPNDV Monitoring and Inspection Options

- Visual confirmation of information and applicable documentation provided about the characteristics and status of sites and items subject to the agreement.
- Visual observation of treaty-implementation activities, including specific inspection-related activities determined by the NWRT to be carried out by the host.
- Use of UIDs and tamper-indicating tags and seals to sustain chain of custody of containerized nuclear warheads being monitored.
- Visual confirmation of UIDs, tamper-indicating tags and seals and locations against applicable documentation.
- Accompanying movement of accountable items, e.g., of nuclear warheads being moved within a declared site.
- Use of radiation detection equipment, most often with an Information Barrier, to confirm the presence or the absence of SNM.
- Use of radiation detection equipment with an Information Barrier to measure the attributes of nuclear warheads to compare against a previously made template for that type of nuclear warhead.
- Use of radiation, spectroscopic, and x-ray techniques to confirm presence or absence of High Explosives (HE).
- Use of perimeter portal monitoring systems to detect unauthorized ingress or egress from specified areas subject to inspection, whether on an ad hoc or a continuous basis (with Information Barrier, as appropriate).
- Use of Closed-Circuit TV (CCTV) and other monitoring systems to detect unauthorized activity in a location or area.
- Periodic reviews of the data provided by perimeter portal monitoring and other monitoring systems.
- Measurement of the physical dimensions of treaty-defined facilities, with comparison of those measurements to information provided by site diagrams.

Appendix B: Technical Inspection Activities		
Term	Definition	Notes
Tags/Seals	Tools applied to a closure on objects or infrastructure to record whether the closure has been accessed.	Provided by inspectors but installed by host country under inspector observation.
Unique Identifier (UID)	Typically, an alphanumeric applied to a Treaty Accountable Item that is used to confirm the identity of that item.	Should be consistent throughout the item's life cycle. While the UID is associated with the nuclear warhead, inspectors will only see the UID located on the nuclear warhead container.
Radiation Measurement-Absence	The use of radiation detection equipment to confirm that any radioactive emissions from an item of inspection are consistent with natural emissions from the environment.	Has been applied in treaties such as New START.
Radiation Measurement-Presence	The use of radiation detection equipment to evaluate the radioactive emissions from an item of inspection declared to be radioactive, to confirm the emitted radiation is consistent with the declarations and parameters for that Treaty Accountable Item.	This type of measurement of sensitive items is more intrusive.
High Explosives Measurement – Presence or Absence	Use of radiation, spectroscopic, x-ray, or other techniques to confirm presence or absence of High Explosives (HE)	The separation of special nuclear material and HE defines nuclear warhead dismantlement in this scenario.
Information Barrier	A technological or procedural mechanism that enables only certain information that is collected by inspection equipment to be shared with inspectors.	This could help alleviate security concerns, so long as parties have confidence that the information barrier adequately prevents collection of sensitive information.
Portal Monitoring	A process of using devices that register that an object with observable properties (e.g. emits radiation above a certain threshold) has or has not passed through a specific passageway.	Important to understand what set off a portal monitor if something did, depending on application. They are often placed along routes that Treaty Accountable Items transit through (e.g. gates, doors, roads).
Closed Circuit Television (CCTV)	Video surveillance that transmits to a specific feed; assumed that this is optical 2D video surveillance	CCTV positioning is negotiated between the inspectors and hosts to minimize intrusiveness.