



Phase II Presentations Summary

Working Group 6: Technologies for Verification

April 2020

In Phase II of the International Partnership for Nuclear Disarmament Verification (IPNDV), the Working Group on Technologies for Verification (Working Group 6, WG6) focused on identifying and evaluating key verification technologies across the IPNDV's 14-step dismantlement framework. WG6 reviewed requirements for information barriers to protect proliferation-sensitive information when using verification technologies and evaluated key verification technologies based on the findings from Phase I, where gaps were identified in the ability to detect and monitor a nuclear explosive device and its key components.

The group also reviewed practical activities, including technology developments by partner countries, and undertook two demonstrations and one measurement campaign.

At the first joint working group meeting of Phase II in Stockholm, Sweden, in March 2018, Working Group 6 discussions focused on continued development of a “toolbox” of potentially applicable technologies that could support future verification of nuclear weapon dismantlement. The group discussed technology gaps identified in Phase I and considered ways to make progress on work in Phase II, including plans for a potential technology demonstration. Members of WG6 heard presentations on:

- The European Commission's Science and Knowledge Service, and possible EU-JRC contributions to nuclear disarmament verification;
- Detection of exit material flow;
- Muon tomography and the possibility of having such a technology demonstration;

- The Quad Nuclear Verification Partnership’s LETTERPRESS Exercise; and,
- Direction-sensitive neutron detectors.

At the joint working group meeting convened in Seoul, South Korea, in July 2018, Working Group 6 continued building that “toolkit” of potential technologies that could be applied to the procedures at each of the 14 steps in the nuclear weapons dismantlement process. Several presentations detailed work being done internationally and experts tried to identify critical information that could be applied to the Partnership’s technology investigations. These included:

- A presentation about the United Kingdom’s nuclear weapons enterprise and where Steps 1 and 2 take place in the UK;
- Radiowave spectrometer technology and its potential applications in the nuclear weapon dismantlement process;
- Multiplicity spectrometer technology;
- A computer simulated verification technology using a heavy-metal-based mock-ups and special nuclear material (SNM) configurations;
- Lessons learned from the U.S.-Russian Highly Enriched Uranium (HEU) Agreement and applicability to the Partnership’s work; and
- Design options for dismantlement room verification measurements to address technology gaps identified in Phase I.

In London, Working Group 6 discussed technology gaps identified in Phase I and considered ways to make progress on work in Phase II, including planned technology demonstrations. Following several informal discussions, the Belgian measurement campaign was proposed at this plenary session. Members heard from colleagues on the following topics:

- A “Food-for-Thought” paper focused on the disposition of dismantled nuclear weapon components in Step 14;
- The end state of Step 8 (nuclear weapons dismantlement) and sensitivity analysis; and
- Absence measurements.

In Helsinki, Working Group 6 continued preparations for the Phase II practical activities, engaged with other members of the Partnership on applying technology throughout the 14-step process, and developed concrete plans for their deliverables for the end of the phase. They heard the following presentations:

- The Black Sea experiment and its applicability to IPNDV’s discussions;
- Absence measurements and when to end monitoring of non-nuclear components; and

- Plans for WG6 technology demonstrations scheduled for the second half of 2019 by Belgium and Canada, respectively.

In Utrecht, Belgium briefed an update on the upcoming measurement campaign planned for September, and Canada updated the group on a planned visit to Canadian Nuclear Laboratories in December following the Phase II plenary in Ottawa. The group also heard a presentation from Finland on a proposal for a dedicated dismantlement facility under “optimal conditions,” which aims to address a major technology gap identified by Working Group 3 in the Phase I Final Report: technologies enabling measurements of SNM and high explosives.

In Ottawa, Belgium briefed on the results of the measurement campaign as did Australia, Canada, the European Union Joint Research Centre, Finland, Japan, Norway, and the UK. Additional presentations were on the following:

- Classification-visualization of technologies for nuclear disarmament verification;
- Demonstration of gamma-ray/neutron passive detection technologies and cosmic ray muon tomography for nuclear disarmament verification
- Explosive detection for nuclear disarmament verification

All presentations and subsequent in-depth discussions throughout Phase II continued to inform the expanded Working Group 6 Chain of Custody Technologies Mapping Table and the Nuclear Explosive Device and Component Monitoring Technologies Tables.

This is a product of the IPNDV Working Group 6: Technologies for Verification. For more information on the IPNDV Working Groups, please see www.ipndv.org/working-groups.

About the IPNDV:

The IPNDV is an ongoing initiative that includes more than 25 countries with and without nuclear weapons. Together, the Partners are identifying challenges associated with nuclear disarmament verification and developing potential procedures and technologies to address those challenges.

The IPNDV is working to identify critical gaps and technical challenges associated with monitoring and verifying nuclear disarmament. To do this, the Partnership assesses monitoring and verification issues across the nuclear weapon lifecycle.

The IPNDV is also building and diversifying international capacity and expertise on nuclear disarmament monitoring and verification. Through the Partnership, more countries understand the process, as well as the significant technical and procedural challenges that must be overcome. At the same time, the Partnership is highlighting the importance of verification in future reductions of nuclear weapons.