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NUCLEAR ARMS CONTROL: PROPOSED VERIFICATION AGENDA 2017-2020

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JAEA-Tokyo Office, Tokyo, Japan
Monday, 28 November 2016

Introduction

1. Thank you, Deputy Director Hori. Allow me first to congratulate you and your team on a very well organised meeting. Everything has been flawlessly put together, and I want to express my gratitude to your entire team for their effort in getting us here today.

2. This is my first trip to Japan, and the beauty of your city, your parks, and Japanese hospitality is striking. It is a shame that I am here in November, as I have heard so much about the cherry blossoming in April. Perhaps one day I will be given the opportunity to return during spring.

Nuclear security conference

3. Before I begin, allow me to make a brief advertisement. In a little over one week, on 8 December, VERTIC will hold a seminar in Vienna. The event will discuss reporting and information sharing in nuclear security, and focus on a new tool to streamline and simplify information sharing. The Consolidated National Nuclear Security Report was made available as a gift at this year's Nuclear Security Summit. Seventeen participating governments, including Japan, supported this initiative.

4. Together with Netherlands and the Nuclear Threat Initiative, VERTIC is now looking into ways to operationalise this gift. However, we need your help. The seminar welcomes both states and practitioners to discuss their experiences with reporting and information sharing in nuclear security regimes. It also aims to explore the benefits of building confidence through internationally agreed processes for such reporting. We would very much like to welcome a Japanese representative, so if you are going to the IAEA nuclear security conference, or have a colleague going, please contact me after this seminar, as I would very much like to talk to you.

Our work on disarmament

5. When reading the first concept for today's seminar, I got the impression that I would just give you an overview of VERTIC's activities in nuclear arms control and disarmament. I will focus on our work on nuclear disarmament verification, leaving safeguards and security aside. However, there is much more I could say about our work in those fields.

6. Our most recent story begins in 2006, a decade ago. That year, we at VERTIC held consultations with the British Ministry of Defence and the Norwegian Radiological Protection Authority. The objective

was to find common ground for co-operation. Building on those talks, in early 2007, we organised and hosted the first workshop bringing together various research centres from the two countries—an occasion that planted the seed for the so-called UK-Norway Initiative.

7. We agreed that VERTIC should participate in the role of an independent observer. As such, we attended all meetings and exercises of the initiative. Moreover, we provided advice as well as some limited research support to our partners. In 2010, we conducted a comprehensive review of the UK-Norway Initiative. Our findings indicated that:

    a. Confirming that an item is a warhead or a component from a warhead has been shown time and again to represent one of the most technically challenging aspects of disarmament verification. The information barrier is one way of potentially overcoming this difficulty; beginning chain-of-custody tracking at warhead deployment sites is another. Any dismantlement verification regime is likely to receive a significant confidence boost if inspectors are allowed to witness the de-mating of a warhead from its delivery platform.

    b. Establishing a robust chain-of-custody of a warhead undergoing dismantlement is a challenging, but by no means an insoluble, problem. More research in this area can be directed a wide range of verification techniques and technologies, not just the information barrier.

    c. Finding and maintaining a mutually acceptable balance between confidentiality (on the part of a host) and confidence (on the part of an inspector) is not easy, but absolutely critical to the success of a verified dismantlement process.

8. We also noted that no exercise has ever sought to explore where the inspector's demand for information optimally intersects with what the inspected host party is willing to supply. For instance: What level of access best reconciles the competing priorities of inspector and host? Can such an intersection ever be found even, given variable classification requirements and shifting tolerances?

Going beyond 2010

9. In 2010, we embarked on a new effort, namely to look at disarmament challenges from a very broad perspective, not just warhead dismantlement. In particular, we wanted to develop a clear understanding of how an organisation such as the International Atomic Energy Agency could be involved in nuclear disarmament verification.

10. A significant portion of work performed under this project focused on nuclear fuel cycle modelling. The idea was simple: We wanted to create a virtual environment onto which verification solutions could be examined and tested. These environments provide a set of boundary conditions for our examination, which enables us to validate our solutions. Our efforts focused on creating a model of a fictional nuclear weapons-state on the brink of disarming, including information on its arsenal, its nuclear infrastructure, and the geopolitical context that led it to develop, and eventually relinquish its nuclear weapons.

11. After all, verification goes beyond the process of weapons dismantlement, and to capture that, our model also covers the surrogate state's nuclear infrastructure. We strived to make it as detailed and

believable as possible, basing it on extensive research into the historical development of nuclear science and technology in different countries. We created maps and schematics for the facilities connected to the state's nuclear fuel cycle, and for the larger sites that host them. These include facilities such as centrifuge enrichment halls, nuclear reactors, as well as the weapons assembly plants. These have been developed to the best of our knowledge, drawing from what is known of different real world examples.

12. The first full-scale model we developed replicated fuel cycle processes in the Democratic People's Republic of Korea. By the time the project finished, this model was about three to four weeks from being completed.

13. We hoped to use these models to create a detailed and comprehensive fictional environment. Participants in our planned exercises would then be able to identify practical and specific problems concerning the verification of nuclear disarmament and develop solutions applying a range of political, legal and technical tools. We envisioned running both tabletop exercises, and virtual reality applications. By providing this level of detail, we hoped to enable participants to tackle wider issues related to disarmament verification. These include securing stockpiles and potential sources of weapons-usable material throughout the fuel cycle, ensuring that the disarmament process cannot easily be reversed, and evaluating the impact of bringing formerly unsafeguarded facilities under the IAEA safeguards system.

14. The complexities of nuclear disarmament, however, are not limited to technical considerations. In any real world situation, much would also depend on the precise provisions of a disarmament agreement, and on the structure and contents of a verification protocol. Documents of this kind require a great effort of drafting and preparation, and could not be produced in a single simulation, Because of this reason, we also developed the full text of a possible disarmament agreement, already in force in our fictional simulation, including verification provisions.

15. To construct the treaty, we used the structure of applicable agreements in the nuclear sector and beyond, to identify the main provisions and formulations. We drew on partial disarmament treaties, conventions banning other kinds of weapons, and treaties establishing nuclear weapons-free zones. Our primary intention was to produce a document tailored to our fictional geopolitical background, and to set down the terms of disarmament in a clear and rigorous way; that also reads as a viable text. All of our work in crafting this model was guided by the idea of setting down the key variables of a disarmament situation, to break the larger problem of disarmament verification into a set of smaller challenges, for which solutions could be proposed and tested.

2016: UNGA resolution on disarmament verification

16. Earlier this year, the First Committee adopted Draft Resolution 57. This resolution will hopefully lay the foundation for international collaboration on verification, something which, in my mind, is long overdue. The document reaffirmed—*and I quote*—"that disarmament and arms limitation agreements should provide for adequate measures of verification." In other words, that it will not be enough to simply abolish nuclear weapons. Any instrument of abolition would need to be supported by a stringent verification regime. The sponsors recognise the centrality of verification when they argue that it be necessary in order to create confidence and to ensure that disarmament agreements are being observed.

17. Moreover, the resolution calls upon all states—*and I quote again*—"to work together to identify and develop practical and effective disarmament verification measures." Here, the resolution nods at already existing groupings such as the decade-old UK-Norway Initiative, as well as the International Partnership for Nuclear Disarmament Verification.

18. The document calls on the UN Secretary-General to seek member states views on "developing practical and effective nuclear disarmament verification measures and their importance in achieving and maintaining a world without nuclear weapons." The SG will report back to the General Assembly next autumn.

19. After that, more exciting things are scheduled. After the SG has published his report, he is asked to establish a Group of Governmental Experts, also known as a GGE, which will comprise up 25 participants. The GGE will—*and I quote*—"consider the role of verification in advancing nuclear disarmament." The experts will meet in Geneva in 2018 and 2019 for a total of 3 sessions of 5 days each. It will, in other words, report back by the time of the 2020 NPT Review Conference.

20. A huge majority adopted this resolution, with 177 states in favour. Nuclear armed states in support included: France, India, Israel, the United States and the United Kingdom. Not a single state voted against. However, China, DPRK, Pakistan and the Russian Federation, all nuclear armed, abstained from voting. So did Belarus, Iran and Syria.

21. That no one voted against is important. We are likely to see the participation of many of the states that voted for the resolution—although it remains to be seen if the United States will join under its new president—and we may even see some of those that abstained joining.

The benefit of a GSE

22. The existence of a strong and agreed verification knowledge-base and level of multilateral capacity will show that transparent disarmament is viable and desirable—and thereby increase the likelihood of this goal being realised. At VERTIC, we believe that it is time not only to establish a GGE but also to supplement it with a Group of Scientific Expert (a GSE). Alternatively, perhaps, work to convince the GGE to recommend the establishment of one under the auspices of the United Nations.

23. The concept is not without precedence. In the run-up to negotiations on a Comprehensive Nuclear Test Ban Treaty, there were scientific and political disagreements over the verifiability of the proposed treaty. To achieve at least partial progress on the issue, Sweden proposed the establishment of a new group to study the technical aspects of verification. This group, set up under the auspices of the Conference on Disarmament, became known as the 'Group of Scientific Experts'. It was active for 20 years, from 1976 to 1996. The GSE's mandate was to—*and I quote*—"consider and report on international co-operative measures to detect and identify seismic events, so as to facilitate the monitoring of a comprehensive test ban".

24. The GSE reported to the Conference on Disarmament (CD) and produced several substantive reports. Also, it held three exercises to test developed concepts. It comprised roughly 50 participants under the leadership of a chair and a scientific secretary. Moreover, it had permanent support from one Senior

Political Officer appointed by the United Nations. It met in Geneva twice a year for two weeks at a time—about ten working days. The GSE was just the tip of the iceberg, however. Most of the work was carried out on the national level, in participating states, where scientists were working to design and test systems proposed by the group. The total number of participants in this network is not publicly available today but likely ranged in the hundreds.

25. The work of the CTBT Group of Scientific Experts cannot be understated. It got its mandate from the Conference on Disarmament; it was open to participation from all CD states and observers, and it operated uninterrupted for 20 years—to the day negotiations on the CTBT had been completed. This group focused on solving real practical problems. They sought solutions, and found them, at a time when there was no political will to negotiate the test ban itself. Since most of us believe that nuclear abolition is a long way off, there is, in my mind at least, an urgent need for like-minded states to brush off this idea, and to get seriously involved in the details of disarmament verification.

26. Over the next six months, VERTIC will, therefore, gather points-of-views from relevant stakeholders in four regions of the world. Information will be collected through the holding of a series of workshops and synthesised in a series of workshop reports. Our project initially aims to explore European, Latin American, African and Asian views on the concept.

27. Our hope is that our work may contribute to fostering a disarmament verification research community in developing and developed regions. This community would help encourage shared understandings of technical, legal and policy issues and disarmament scenarios, and raise awareness worldwide of the benefits of efforts to improve multilateral verification capabilities. At a later stage, we would very much want to resume our hands-on work on disarmament verification, and complete our tabletop training model.

Why should scientists be involved in this effort?

28. I previously referred to our involvement in the UK-Norway Initiative. What made it so special? Why is that recipe for success so difficult to replicate? Well, it was the first time a nuclear weapon state, a non-nuclear weapon state and a non-governmental organisation had collaborated on something as sensitive as nuclear disarmament verification. What I just said is well known. In fact, it has been stated many times. However, that is only part of the answer.

29. What made it special was the individuals that were involved in the work. The vast majority of us were scientists: nuclear engineers, physicists, chemists, and metallurgists. The others had a keen interest in science and technology.

30. It is easy to forget that scientists brought nuclear weapons into being. Remarkable, intelligent men and women. Their pursuit was driven not only by the desire to win an incredibly cruel war, but also by an inherent need to understand the nature of our universe, to master the splitting of the atom, and all that comes with it. These were not men of war. They were people of science and learning, curious minds. In my mind, science and engineering will have as much role in the abolition of the bomb, as it had in its creation.

31. Scientists and engineers will make sure that weapons slated for dismantlement are destroyed safely. The combination of fissile, radioactive materials and high explosives in a confined space means that they cannot just be crushed or burned, like an assault rifle or a tank. They cannot just be incinerated, like chemical weapons. They cannot be blown up, like mines or conventional explosives.

32. Scientists and engineers will make sure that the fissile material is removed safely, and destroyed in an irreversible way. Uranium and plutonium cannot just be dumped in a landfill. It cannot just be buried and forgotten. These metals will need to be stored in ways that are safe for future generations.

33. Scientists and engineers will oversee the decommissioning of factories and other installations devoted to the production and processing of these materials. Moreover, scientists and engineers will design the equipment we need to ensure that all of this is done in a verifiable and as transparent way.

34. These are not easy problems. You cannot just wish them away. You cannot just say; the weapons are banned; let's get on with it. However, scientists and engineers will be able to guide us towards solutions that work in the real world: durable, robust solutions.

35. This is exactly why scientific expertise is required.

Getting on without science?

36. Can you discuss verifiable and irreversible disarmament without a clear plan of how to do it? Is it enough to point at one-off experiences such as the International Atomic Energy Agency's mission in South Africa and say: we know how to do it? Are we prepared, technically or methodologically, to embark on the dismantlement of some 15,000 nuclear explosive devices? Something on this scale has never been attempted before.

37. Do we know how to dispose of the nuclear material lodged in these weapons in a verifiable way? Do we know how to manage the production legacy of large weapons programmes? Can we ever get confidence that all nuclear weapons have been dismantled, and that all nuclear material is in peaceful use? If we do not have the answers, are we ready to embark on earnest disarmament ventures?

The application of science and technology

38. We can only answer many of these questions by supporting scientific and technical investigations into the challenges associated with nuclear disarmament. A Group of Scientific Experts may help us get some of those answers.

39. Some will object, saying that it is not necessary because nuclear weapons exist, plays a prevalent role in the defence planning of many nations and that the preconditions to nuclear abolition are not here. I would want those people to recall the work of the CTBT-GSE. For the first 15 years of existence, there was no political appetite for a test ban. Yet, the group continued to work.

40. Some will object, saying that these efforts detract from a ban treaty. I believe this to be a straw-man argument. It does not detract from a ban more than a prohibition diverts from examinations into verifiability.

41. Some will say that there is no appetite amongst the nine weapons states to do this work. I think that Resolution 57 have shown us that there is interest amongst the nine, although some are justifiably cautious.

42. Some will say that it may be costly. Perhaps. The CTBT-GSE was funded through national governments that wanted to see action. Spearheaded by Scandinavian nations. Supported by the UN, quite modestly, with a P-5 member of staff that helped coordinate it all. The costs are small compared to the rewards that a scientific and technical collaboration could bring.

43. The one criticism that is easily dismissed is a shortage of time. Even if there are successful negotiations on a ban treaty next year, nuclear weapons themselves are unlikely to go away in the next few decades. The threat they pose is real, and this should install a sense of urgency. However, a long time scale to nuclear abolition also needs time to prepare; time that should not be wasted.

What can Japan do?

44. Japan should be part of this effort. You have a world-class cadre of technical and policy expertise that could be encouraged to join.

    a. As a first step, Japan should seek to join the GGE in 2018.

    b. However, Japan should also try to promote the concept of scientific engagement.

45. Just imagine where we would be 20 years from now if we allow a group of scientists and engineers from around the world to come up with real and workable solutions. Would that not remove a very real practical obstacle to abolition? Would not such work remove a very easy argument; namely that disarmament is technically challenging and difficult to verify?

46. Science and engineering brought the bomb to being; science and engineering will be crucial in their abolition. I see no reason why this work should not start soon.

47. I thank you for your kind attention. I hope that some of you would be interested in joining the conversation that VERTIC plan to start in 2017.