"Hiroshima for Global Peace" Plan

2018 Edition

Hiroshima Report

Evaluation of Achievement in Nuclear Disarmament, Non-Proliferation and Nuclear Security in 2017

Hiroshima Prefecture

Center for the Promotion of Disarmament and Non-Proliferation

The Japan Institute of International Affairs

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We would appreciate any comments or suggestions that will help us to enhance the Hiroshima Report. Please send your comments and suggestions regarding this report to chiheiwa@pref.hiroshima.lg.jp or visit our online survey at: http://www.pref.hiroshima.lg.jp/site/peace-en/hiroshimareport2018e.html.

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Preface and Acknowledgements

This report, *Hiroshima Report 2018: Evaluation of Achievement in Nuclear Disarmament, Non-Proliferation and Nuclear Security in 2017* (hereinafter referred to as "*Hiroshima Report 2018*") is an outcome of the "Hiroshima Report Publication Project,"[1] commissioned by Hiroshima Prefecture to the Japan Institute of International Affairs (JIIA). It updates the previous reports issued since 2013. As in the last five years, the *Hiroshima Report* is published in both Japanese and English.

The prospects of eliminating nuclear weapons are still distant at best. Even more worrying, the situation regarding nuclear weapons is becoming more and more complex. The five nuclear-weapon states (NWS) under the Nuclear Non-Proliferation Treaty (NPT)—China, France, Russia, the United Kingdom and the United States—and other nuclear-armed states—India, Israel and Pakistan—continue to perceive their nuclear weapons as one of the indispensable components for their national security, and have not made any definite move toward renouncing their nuclear arsenals. Instead, they have taken measures, such as modernization of nuclear forces and development of new delivery vehicles, with a view to sustaining nuclear deterrence for a longer period. Non-nuclear-weapon states (NNWS) increase their frustration over such a situation. Many of them pursue to promote a legal prohibition of nuclear weapons, and finally concluded the Treaty on the Prohibition of Nuclear Weapons (TPNW) on July 7, 2017. However, nuclear-armed states and allies refuse to sign the treaty. It is also a concern that the rift between proponents (many NNWS) and opponents (nuclear-armed states and allies) has been further widening.

The status and prospects regarding nuclear non-proliferation are also gloomy. Good news is that the international community was given a chance to solve the long-standing concern about the nuclear ambition of Iran. On the other hand, North Korea is determined to pursue building up of its nuclear forces after declaring withdrawal from the NPT and conducted six nuclear tests. The North also repeats its nuclear provocations. While the world falters in erecting a firm barrier against nuclear proliferation, the threat persists for a new proliferator to emerge on the scene. The threat of nuclear terrorism by non-state actors remains a high security concern in this globalized world. Growing worldwide interest in peaceful use of nuclear energy increases the risk of nuclear proliferation as well as terrorism. While problems facing nuclear disarmament, non-proliferation and nuclear security intensify, efforts toward solving them have progressed at a snail's pace.

The *Hiroshima Report* attempts to help the movement toward the abolition of nuclear weapons, first, by clarifying the current status of the issues and efforts surrounding nuclear disarmament, non-proliferation and nuclear security. By doing so, it aims to encourage increased debate on these issues by policy-makers, experts in and outside governments, and civil society. Furthermore, by issuing the "Report" and the "Evaluation" from Hiroshima, where a nuclear weapon was once used, it aims to help focus attention and promote further actions in various fields toward the realization of a world without nuclear weapons.

[1] This project has been conducted as a part of the "Hiroshima for Global Peace" Plan launched by Hiroshima Prefecture in 2011.

The Research Committee was established to conduct this project, namely producing the "Report" and the "Evaluation." This Committee met once within the Japanese Fiscal Year 2017 to discuss the contents. The members of the Research Committee are as follows:

Chairperson

Sumio Tarui (Director, Center for the Promotion of Disarmament and Non-Proliferation (CPDNP), JIIA)

Research Members

Sukeyuki Ichimasa (Senior Research Fellow, National Institute for Defense Studies)
Akira Kawasaki (Executive Committee Member, Peace Boat)
Masahiro Kikuchi (Board Member, Nuclear Material Control Center)
Mitsuru Kurosawa (Professor, Osaka Jogakuin College)
Kazumi Mizumoto (Vice-President, Hiroshima Peace Institute, Hiroshima City University)
Hiroshi Tamai (Senior Expert, Integrated Support Center for Nuclear Nonproliferation and Nuclear Security, Japan Atomic Energy Agency)

Research Member and Project Coordinator

Hirofumi Tosaki (Senior Research Fellow, CPDNP, JIIA)

The Research Committee appreciates the comments and advices to the "Report" given by the following experts.

Ambassador Nobuyasu Abe (Former Commissioner, Japan Atomic Energy Commission)
Mr. Mark Fitzpatrick (Executive Director of the Americas Office and head of the Non-Proliferation and Disarmament Programme, International Institute for Strategic Studies)
Professor John Simpson (Emeritus Professor of International Relations, University of Southampton)
Professor Tatsujiro Suzuki (Director, Research Center for Nuclear Weapons Abolition, Nagasaki University)

In this edition, experts posted columns on the TPNW and other nuclear disarmament and non-proliferation issues.[2]

Appreciation is also expressed to Mr. Gordon Wyn Jones (King's College London, Centre for Science and Security Studies) for editing the *Hiroshima Report* as well as valuable comments.

Views or opinions expressed in the "Report," "Evaluation" and "Columns" are those of the members of the Research Committee or respective authors, and do not necessarily represent the view of the Hiroshima Prefecture, the JIIA, or the organizations to which they belong. Not all of the members necessarily agree on all of the points discussed.

[2] Views or opinions expressed in the columns are those of the respective authors, and do not represent the view of the Hiroshima Prefecture, the JIIA, or the organizations to which they belong. The Research Committee appreciates Shun Muramatsu, Daiki Osada, Takaaki Sato, Mao Sato, and Keita Tanaka for translating those columns, as well as Dr. Wakana Mukai (Assistant Professor, Asia University) for supervising their translations and translating a column.

Introduction

(1) OVERVIEW

The most prominent event regarding nuclear issues in 2017 was convening the negotiation conference on the Treaty on Prohibition of Nuclear Weapons (TPNW), and its adoption. The negotiation conference, having been decided by the UN General Assembly Resolution in 2016, was held in March and June-July 2017. The TPNW was adopted there on July 7, and opened for signature at the UN Headquarters on September 20. Proponent countries codified the treaty—legally prohibiting, inter alia, possession and use of nuclear weapons—under their belief that legislating a prohibition norm on nuclear weapons, derived from their humanitarian dimensions, is an essential step toward total elimination of nuclear weapons. In the history of nuclear disarmament, it is a first treaty that legally bans nuclear weapons, and of which civil society proactively joined the process of establishment.

Nuclear-armed states and allies opposing the treaty did not participate in the negotiation conference (except the Netherlands). All of those countries also declared not to sign the TPNW. They—including Australia, Canada, Germany and Japan which have proactively advocated promotion of nuclear disarmament—faces criticisms by proponents of the TPNW. However, as opponents argue, the number and roles of nuclear weapons will not be immediately reduced merely by the conclusion of the treaty. Besides, it would take considerable time before a prohibition norm on nuclear weapons is accepted as a universal international norm. How to bridge the rift between proponents and opponents of the TPNW requires urgent effort for revitalizing nuclear disarmament. In the meantime, North Korea's nuclear problem has worsened further in 2017. The North conducted the sixth nuclear test on September 3, whose explosive yield was estimated at approximately 160 kt, the largest-ever of its nuclear tests. North Korea announced the success of testing a hydrogen bomb for inter-continental ballistic missiles (ICBMs). North Korea also repeated flight tests of ballistic missiles, including ICBMs, and demonstrated rapid progress of developing its nuclear and missile capabilities. In addition, a number of its illicit activities, cleverly circumventing sanction measures under the UN Security Council Resolutions, were again reported in 2017.

On the contrary, certain results have been seen over the international community's efforts to strengthen nuclear security. The nuclear security summit, which came to an end in 2016, provided certain transparency to the efforts of countermeasures against nuclear terrorism in each country and raised the interests of the international community, including the media. Therefore, throughout 2017, the matter of how to inherit the outcomes and lessons of the nuclear security summit became a focus of attention. The result was that numerous international conferences and other events related to maintenance and improvement of the highest standard of nuclear security were held throughout the year, mainly by the International Atomic Energy Agency (IAEA). It should be appreciated that a number of these ongoing efforts have been implemented. The Amendment of the Convention on the Physical Protection of Nuclear Material (CPPNM Amendment), that came into force in 2016, is also steadily increasing its member states. There are also an increasing number of regions where nuclear materials such as highly enriched uranium (HEU) and plutonium, which are attractive for terrorists, are totally removed. Meanwhile, the worldwide inventory of nuclear materials which have a potential for being diverted to make nuclear weapons is still on the rise as a result of an increase in inventory of civilian plutonium. In addition, addressing new problems, including cyber security, is an urgent issue.

(2) ITEMS

In the *Hiroshima Report 2018,* 65 items (32 for nuclear disarmament, 17 for nuclear non-proliferation and 16 for nuclear security) for study, analysis and evaluation of the selected countries' performance are identified and based mainly upon the following documents that reflected widely supported views on the issues of nuclear disarmament, non-proliferation and nuclear security:

- The Action Plan and recommendations pertaining to the implementation of the 1995 Middle East resolution contained in the Final Document adopted in the 2010 Nuclear Non-Proliferation Treaty (NPT) Review Conference;
- The final draft of a Final Document for the 2015 NPT Review Conference;
- Seventy-six recommendations contained in the 2009 International Commission on Nuclear Non-proliferation and Disarmament (ICNND) report titled *Eliminating Nuclear Threats: A Practical Agenda for Global Policymakers*;
- Proposals sponsored or co-sponsored by Japan at the Preparatory Committees for the 2015 NPT Review Conference; and
- "Resolution towards the Abolition of Nuclear Weapons" launched by the Mayors for Peace in 2011.

Items were also chosen with the aim of providing a certain degree of objective measurements for evaluation.

The *Hiroshima Report 2018* basically maintains the same structure and items as previous years, with one additional item on the TPNW:

1. Nuclear Disarmament

(1) Status of Nuclear Forces (estimates)

(2) Commitment to Achieving a World without Nuclear Weapons
  - A) Voting behavior on UNGA resolutions on nuclear disarmament proposals by Japan, NAC and NAM
  - B) Announcement of significant policies and important activities
  - C) Humanitarian consequences of nuclear weapons

(3) Treaty on the Prohibition of Nuclear Weapons (TPNW)
  - A) Signing and ratifying the TPNW
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  - A) Reduction of nuclear weapons
  - B) A concrete plan for further reduction of nuclear weapons
  - C) Trends on strengthening/modernizing nuclear weapons capabilities

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  - A) The current status of the roles and significance of nuclear weapons
  - B) Commitment to "sole purpose," no first use, and related doctrines
  - C) Negative security assurances
  - D) Signing and ratifying the protocols of the treaties on nuclear-weapon-free zones
  - E) Relying on extended nuclear deterrence

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(2) IAEA Safeguards Applied to the NPT NNWS

A) Conclusion of IAEA Safeguards Agreements

B) Compliance with IAEA Safeguards Agreements

(3) IAEA Safeguards Applied to NWS and Non-Parties to the NPT

(4) Cooperation with the IAEA

(5) Implementing Appropriate Export Controls on Nuclear-Related Items and Technologies

A) Establishment and implementation of the national control systems

B) Requiring the conclusion of the Additional Protocol for nuclear export

C) Implementation of the UNSCRs concerning North Korean and Iranian nuclear issues

D) Participation in the PSI

E) Civil nuclear cooperation with non-parties to the NPT

(6) Transparency in the Peaceful Use of Nuclear Energy

3. Nuclear Security

(1) The Amount of Fissile Material Usable for Weapons

(2) Status of Accession to Nuclear Security and Safety-Related Conventions, Participation in Nuclear Security-Related Initiatives, and Application to Domestic Systems

A) Accession status to nuclear security-related conventions

B) INFCIRC/225/Rev.5

(3) Efforts to Maintain and Improve the Highest Level of Nuclear Security

A) Minimization of HEU and Plutonium in civilian use

B) Prevention of illicit trafficking

C) Acceptance of international nuclear security review missions

D) Technology development – nuclear forensics

E) Capacity building and support activities

F) IAEA Nuclear Security Plan and Nuclear Security Fund

G) Participation in international efforts

(3) COUNTRIES SURVEYED IN THIS PROJECT

In the *Hiroshima Report 2017*, the performances of 36 countries were surveyed, based on their nuclear significance and geographical distribution—including members of the Non-Proliferation and Disarmament Initiative (NPDI), members of the New Agenda Coalition (NAC), participants of the Joint Statements on the Humanitarian Consequences of Nuclear Weapons. The *Hiroshima Report 2018* maintains to survey those same countries, as follows:

- Five nuclear-weapon states under the NPT (China, France, Russia, the United Kingdom and the United States);
- Non-state parties to the NPT (India, Israel and Pakistan);
- Non-nuclear-weapon states under the NPT (Australia, Austria, Belgium, Brazil, Canada, Chile, Egypt, Germany, Indonesia, Iran, Japan, Kazakhstan, South Korea, Mexico, the Netherlands, New Zealand, Nigeria, Norway,

the Philippines, Poland, Saudi Arabia, South Africa, Sweden, Switzerland, Syria, Turkey and UAE); and

- Other (North Korea[1])

(4) APPROACH

This project focuses on the time period of calendar year 2017. Reference documents are basically from open sources, such as speeches, remarks, votes and working papers delivered at disarmament fora (e.g., NPT Review Conference, UN General Assembly, IAEA General Conference, Conference on Disarmament, Nuclear Security Summit, and the Negotiation Conference on the TPNW) and official documents published by governments and international organizations.

As for the evaluation section, a set of objective evaluation criteria is established by which the respective country's performance is assessed.

The Research Committee of this project recognizes the difficulties, limitations and risks of "scoring" countries' performances. However, the Committee also considers that an indicative approach is useful to draw attention to nuclear issues, so as to prompt debates over priorities and urgency.

The different numerical value within each category (i.e., nuclear disarmament, nuclear non-proliferation and nuclear security) reflects each activity's importance within that area, as determined through deliberation by the Research Committee of this project. However, the differences in the scoring arrangements within each of the three categories do not necessarily reflect their relative significance in comparison with others, as it has been driven by the differing number of items surveyed. Thus, the value assigned to nuclear disarmament (full points 101) does not mean that it is more important than nuclear non-proliferation (full points 61) or nuclear security (full points 41).

Regarding "the number of nuclear weapons" (in the nuclear disarmament section) and "the amount of fissile material usable for nuclear weapons" (in the nuclear security section), the assumption is that the more nuclear weapons or weapons-usable fissile material a country possesses, the greater the task of reducing them and ensuring their security. However, the Research Committee recognizes that "numbers" or "amounts" are not the sole decisive factors. It is definitely true that other factors—such as implications of missile defense, chemical and biological weapons, conventional force imbalances and a psychological attachment to a minimum overt or covert nuclear weapon capability—would affect the issues and the process of nuclear disarmament, non-proliferation and nuclear security. However, they were not included in our criteria for evaluation because it was difficult to make objective scales of the significance of these factors. In addition, in view of the suggestions and comments made to *Hiroshima Report 2013*, the Research Committee modified criteria of the following items: current status of the roles and significance of nuclear weapons in national security strategies and policies; relying on extended nuclear deterrence; and nuclear testing. Since the *Hiroshima Report 2014*, these items have been negatively graded if applicable.

As there is no way to mathematically compare the different factors contained in the different areas of disarmament, non-proliferation and nuclear security, the evaluations should be taken as indicative of the performances in general and not as an exact representation or precise assessment of different countries' performances.

[1] North Korea declared its suspension from the NPT in 1993 and its withdrawal in 2003, and conducted nuclear tests in 2006, 2009, 2013, twice in 2016, and 2017. However, there is no agreement among the states parties on North Korea's official NPT status.

Part I Report

Surveying Trends of Nuclear Disarmament, Non-Proliferation and Nuclear Security in 2017

Chapter 1. Nuclear Disarmament[1]

(1) STATUS OF NUCLEAR FORCES (ESTIMATES)

As of December 2017, eight countries have declared that they have nuclear weapons. According to Article IV-3 of the Nuclear Non-Proliferation Treaty (NPT), "a nuclear-weapon State is one which has manufactured and exploded a nuclear weapon or other nuclear explosive device prior to 1 January 1967." China, France, Russia, the United Kingdom, and the United States meet this requirement, and have acceded to the NPT as nuclear-weapon states (NWS) as defined by the treaty. The three other countries that have tested nuclear weapons and declared having nuclear weapons are India, Pakistan and North Korea. India and Pakistan have never been parties to the NPT. Israel, a non-NPT state, has maintained a policy of "nuclear ambiguity" by neither confirming nor denying having nuclear weapons, although it is widely considered that it has them (no evidence has yet been found that Israel has conducted a nuclear test). In this report, these three additional states that have publicly declared or are believed to possess nuclear weapons are referred to as "other nuclear-armed states." In 2003 North Korea declared withdrawal from the NPT, and acquisition of nuclear weapons.

The number of nuclear weapons, which grew to approximately 70,000 at the peak of the Cold War era, has been reduced steadily since the late 1980s. According to the estimates produced by the Stockholm International Peace Research Institute (SIPRI), however, an estimated 14,935 nuclear weapons still exist on the earth, 4,150 nuclear warheads among them are deployed, and the U.S. and Russian nuclear stockpiles together constitute more than 90 percent of the total.[2] Compared to the approximately 7,600 nuclear weapons that were eliminated between 2010 and 2017, the 460 nuclear weapons eliminated between 2016 and 2017 indicates that the pace of reduction has been slowing. It is widely estimated that China, India and Pakistan have each added about 10 warheads annually for the past several years (see Tables 1-1 and 1-2).

Among nuclear-armed states, France declared it possesses 300 nuclear weapons,[3] and the United Kingdom announced plans to reduce its total nuclear stockpiles to not more than 180 by the mid-2020s. Other countries have not declassified the exact number of nuclear weapons in their arsenal.[4] Meanwhile, the United States has declassified information more actively. For example, right before the end of the Obama administration in January 2017, Vice President Joseph R. Biden announced that the United States dismantled approximately 500 nuclear warheads in 2016, and totally 2,226 warheads since 2009. He also stated that the number of the U.S.

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[1] This chapter is written by Hirofumi Tosaki.

[2] Stockholm International Peace Research Institute, *SIPRI Yearbook 2017: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2017), chapter 11.

[3] In addition, France reports that "[i]t has no undeployed weapons. All of its weapons are deployed and operational." NPT/CONF.2015/10, March 12, 2015.

[4] On this point, Bruno Tertrais explains the reasons as following: "Stockpiles include weapons which are not entirely functional (when exactly does an atomic device become a 'nuclear weapon'?), or which are used for non-destructive testing. As a result, giving an exact number can be difficult, misleading, and/or be accurate just for a given day." Bruno Tertrais, "Comments on Hiroshima Report of March 2013," *Hiroshima Report Blog: Nuclear Disarmament, Nonproliferation and Nuclear Security*, October 29, 2013, http://hiroshima-report. blogspot.jp/2013/10/op-ed-bruno-tertrais-comments-on. html.

Table 1-1: Number of nuclear weapons—2010-2017

	2010	2011	2012	2013	2014	2015	2016	2017
China	~240	~240	~240	~250	~250	~260	~260	~270
France	~300	~300	~300	~300	~290	~290	~300	~300
Russia	~12,000	~11,000	~10,000	~8,500	~8,000	~7,500	~7,290	~7,000
U.K.[a]	~225	~225	~225	~225	~225	~215	~215	~215
U.S.	~9,600	~8,500	~8,000	~7,700	~7,300	~7,260	~7,000	~6,800
India	60~80	80~100	80~100	90~110	90~110	90~110	~100-120	120-130
Pakistan	70~90	90~110	90~110	100~120	100~120	100~120	~110-130	130-140
Israel	~80	~80	~80	~80	~80	~80	~80	~80
North Korea	?	?	?	6~8	~8	~8	~10	10-20
Total	~22,600	~20,530	~19,000	~17,270	~16,383	~15,850	~15,395	~14,935

Sources: Stockholm International Peace Research Institute (SIPRI), *SIPRI Yearbook 2010: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2010), chapter 8; SIPRI, S*IPRI Yearbook 2011: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2011), chapter 7; SIPRI, *SIPRI Yearbook 2012: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2012), chapter 7; SIPRI, *SIPRI Yearbook 2013: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2013), chapter 7; SIPRI, SIPRI *Yearbook 2014: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2014), chapter 6; SIPRI, *SIPRI Yearbook 2015: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2015), chapter 11; SIPRI, *SIPRI Yearbook 2016: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2016), Chapter 16; SIPRI, *SIPRI Yearbook 2017: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2017), Chapter 11.

a) The United Kingdom, according to a document obtained under the freedom of information act, "has been decommissioning and breaking down Trident nuclear warheads at a rate of three per year, with a goal of reducing domestic stocks to 'no more than 180' by the mid-2020s," at Burghfield in Berkshire (Rob Edwards, "UK's Nuclear Weapons being Dismantled Under Disarmament Obligations," *Guardian*, August 11, 2013, http://www.theguardian.com/uk-news/2013/aug/11/uk-nuclear-weapons-dismantled-trident.). While the SIPRI estimated that the United Kingdom possessed 225 nuclear weapons from 2010 through 2014, it could be assumed that it had reduced the number of nuclear weapons gradually.

Table 1-2: The status of nuclear forces (estimates, as of January 2017)

	Total nuclear stockpile	Breakdown				Nuclear warheads	Delivery vehicles
U.S.	～6,800	Retired / Awaiting dismantlement ～2,800					
		Operational ～4,000	Non-deployed ～2,200				
			Deployed ～1,800	Non-strategic 300			
				Strategic ～3,700	ICBM	970	400
					SLBM	1,920	264
					Strategic bomber	810	60
Russia	～7,000	Retired / Awaiting dismantlement ～2,700	（Non-strategic）（1,850）				
		Operational 4,300	Non-deployed 2,350	（Non-strategic）（1,850）			
			Deployed ～1,950	Strategic ～2,460	ICBM	1,076	316
					SLBM	768	176
					Strategic bomber	616	50
U.K.	～215	Deployed 120			SLBM	215	48
France	～300	Deployed 280			SLBM	240	48
					Attack aircraft（including carrier based aircraft）	50	50
China	～270				Land-based ballistic missile	170	150
					SLBM	48	48
					Attack aircraft	20	20
					Cruise missile	n/a	150～350
India	120～130				Land-based ballistic missile	68	68
					Attack aircraft	48	48
					SLBM	2	2
Pakistan	130～140				Land-based ballistic missile	92	92
					Attack aircraft	36	36
					Cruise missile	12	12
Israel	～80				Ballistic missile Attack aircraft		
N. Korea	10～20						
World	～14,935	（Deployed）（4,150）					

ICBM：Inter-Continental Ballistic Missile　SLBM：Submarine Launched Ballistic Missile
Source: Stockholm International Peace Research Institute, *SIPRI Yearbook 2017: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2017), chapter 11.

nuclear warheads in service is 4.018,[5] which means that the United States eliminated 1,255 warheads during the Obama administration.

(2) COMMITMENT TO ACHIEVING A WORLD WITHOUT NUCLEAR WEAPONS

A) Approaches toward a world without nuclear weapons

According to the preamble of the NPT, states parties "[declare] their intention to achieve at the earliest possible date the cessation of the nuclear arms race and to undertake effective measures in the direction of nuclear disarmament, [and urge] the co-operation of all States in the attainment of this objective." Article VI of the Treaty stipulates that "[e]ach of the Parties to the Treaty undertakes to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control."

As mentioned in the previous *Hiroshima Reports*, no country, including the nuclear-armed states, openly opposes the goal of the total elimination of nuclear weapons or the vision of a world without nuclear weapons. The commitment to nuclear disarmament has been reiterated in various fora, including the NPT review process and the UN General Assembly (UNGA). At the World Economic Forum in Davos in January 2017, Chinese President Xi Jinping stated: "Nuclear weapons should be completely prohibited and destroyed over time to make the world free of nuclear weapons."[6] However, such statements do not necessarily mean that nuclear-armed states actively pursue realization of a world without nuclear weapons. The stalemate in nuclear disarmament continued again in 2017. Furthermore, Christopher Ford, Senior Director for Weapons of Mass Destruction and Counterproliferation on the U.S National Security Council (then), stated in March that review of U.S. policies by the new administration would include "whether the goal of a world without nuclear weapons is in fact a realistic objective in the near-to-medium term in light of current trends in the international security environment."[7]

As for approaches to nuclear disarmament, the five NWS and India have argued for a step-by-step approach; non-nuclear-weapon states (NNWS) allied with the United States (nuclear umbrella states) have proposed a progressive approach based on building-block principles; and the Non-Aligned Movement (NAM) countries have called for launching negotiations on a phased program for the complete elimination of nuclear weapons within a specified time frame.[8] At the 2017 NPT PrepCom, Japan stated that it would "continue to strive so that countries holding different approaches [would] engage in discussions on practical nuclear disarmament measures in a constructive manner," and introduced the following three actions which Japan would take as a first step: establishing an eminent persons group on nuclear disarmament;[9] hosting the Regional Conference for States in South East Asia, the Pacific and the Far East Region (SEAPFE), with a view to contributing to the entry into force of the CTBT; and building an international network between Youth

[5] "Remarks by the Vice President on Nuclear Security," Washington, DC., January 11, 2017, https://obamawhitehouse.archives.gov/the-press-office/2017/01/12/remarks-vice-president-nuclear-security.

[6] China's Xi calls for a world without nuclear weapons," *South China Morning Post*, January 17, 2017, http://www.scmp.com/news/china/diplomacy-defence/article/2063383/chinas-xi-calls-world-without-nuclear-weapons.

[7] "Trump administration to review goal of world without nuclear weapons: aide," *Reuters*, March 21, 2017, https://www.reuters.com/article/us-usa-trump-nuclear/trump-administration-to-review-goal-of-world-without-nuclear-weapons-aide-idUSKBN16S1M6.

[8] Regarding each country's approach, see the *Hiroshima Report 2017*.

[9] The first meeting of the Group of Eminent Persons for Substantive Advancement of Nuclear Disarmament was held in Hiroshima in November 2017.

Communicators and the CTBTO Youth Group, in order to spread awareness of the humanitarian consequences of atomic bombings across national borders and generations.[10]

B) Voting behavior on UNGA resolutions on nuclear disarmament proposals by Japan, NAC and NAM

In 2017, the UNGA again adopted a resolutions titled "United action with renewed determination towards the total elimination of nuclear weapons"[11] proposed by Japan and others; "Towards a nuclear-weapon-free world: accelerating the implementation of nuclear disarmament commitments"[12] proposed by the New Agenda Coalition (NAC); and "Nuclear disarmament"[13] by NAM members. The voting behavior of the countries surveyed in this project on the three resolutions at the UNGA in 2017 is presented below.

- "United action with renewed determination towards the total elimination of nuclear weapons"
  - Proposing: Australia, Germany, Japan, Poland, Turkey, UAE, the U.K., the U.S. and others
  - 156 in favor, 4 Against (China, Russia, North Korea and Syria), 24 Abstentions (Austria, Brazil, Egypt, India, Indonesia, Iran, Israel, South Korea, New Zealand, Nigeria, Pakistan, South Africa and others)
- "Towards a nuclear-weapon-free world: accelerating the implementation of nuclear disarmament commitments"
  - Proposing: Brazil, Egypt, Mexico, New Zealand, South Africa and others
  - 137 in favor, 31 Against (Belgium, China, France, Germany, India, Israel, North Korea, Poland, Russia, Turkey, the U.K. and the U.S.), 16 Abstentions (Australia, Canada, Japan, South Korea, the Netherlands, Norway, Pakistan and others)
- "Nuclear disarmament"
  - Proposing: Indonesia, the Philippines and others
  - 119 in favor, 41 Against (Australia, Belgium, Canada, France, Germany, Israel, South Korea, the Netherlands, Norway, Poland, Russia, Switzerland, Turkey, the U.K., the U.S. and others), 20 Abstentions (Austria, India, Japan, North Korea, New Zealand, Pakistan, South Africa, Sweden and others)

Regarding the resolution titled "United action towards the total elimination of nuclear weapons," among nuclear-armed states, France and the United Kingdom changed their positions from the previous year when they abstained, and voted in favor in 2017. On the other hand, some of the co-sponsors of the resolution in 2016 (including Austria, Belgium, Canada, Chile, Nigeria, Norway, the Philippine, Sweden and Switzerland) did not do so in 2017. The number of countries voting in favor of the 2017 resolution also slightly decreased from the previous one. Japan argued that "[t]his resolution provides a common denominator on a wide-range of issues related to nuclear disarmament and non-proliferation."[14] However, proponents of the Treaty on the Prohibition of Nuclear Weapons (TPNW), including the NGO and *Hibakusha*, criticized that the resolution did not mention the treaty and that the following points, among others, were an unacceptable

[10] "Statement by H.E. Mr. Fumio Kishida, Minister for Foreign Affairs," General Debate, First Session of the Preparatory Committee for the 2020 NPT Review Conference, May 2, 2017.

[11] A/RES/72/50, December 4, 2017.

[12] A/RES/72/39, December 4, 2017.

[13] A/RES/72/38, December 4, 2017.

[14] "Statement by Japan," Thematic Debate on Nuclear Disarmament, United Nations General Assembly, October 12, 2017.

step backward from the 2016 resolution[15] (emphasis added):

- Changing from "[r]eaffirms…the unequivocal undertaking of the nuclear-weapon States to accomplish the total elimination of their nuclear arsenals, leading to nuclear disarmament" to "[r]eaffirms…the unequivocal undertaking of the nuclear-weapon States to fully implement the Treaty on the Non-Proliferation of Nuclear Weapons, towards a safer world for all and a peaceful and secure world free of nuclear weapons"; and
- Deleting the word "any" in the 2017 resolution phrasing which read: "[e]xpressing deep concern at the catastrophic humanitarian consequences of any use of nuclear weapons".

C) Humanitarian consequences of nuclear weapons

Since the 2015 NPT Review Conference, the Humanitarian Group, which focuses on the humanitarian dimensions of nuclear weapons, has emphasized the significance of starting negotiations of a legally binding instrument on prohibiting nuclear weapons. The result was the adoption of the TPNW in 2017.

At the 2017 UNGA, Austria and other co-sponsors, as in the previous year, proposed a resolution titled "Humanitarian consequences of nuclear weapons."[16] The voting behavior of countries surveyed in this project on this resolution is presented below.

- Proposing：Austria, Brazil, Chili, Egypt, Indonesia, Kazakhstan, Mexico, New Zealand, Nigeria, Saudi Arabia, South Africa, Sweden, Switzerland and others
- 141 in favor, 15 Against (France, Israel, South Korea, Poland, Russia, Turkey, the U.K., the U.S. and others), 27 Abstentions (Australia, Belgium, Canada, China, Germany, North Korea, the Netherlands, Norway, Pakistan and others)

Furthermore, the voting behavior of the resolution titled "Ethical imperatives for a nuclear-weapon-free world"[17] led by South Africa was:

- Proposing: Austria, Brazil, Kazakhstan, Mexico, Nigeria, South Africa and others
- 130 in favor, 37 Against (Australia, Belgium, Canada, France, Germany, Israel, South Korea, the Netherlands, Norway, Poland, Russia, Turkey, the U.K., the U.S. and others), 15 Abstentions (China, India, Japan, North Korea, Pakistan, Sweden, Switzerland and others)

[15] See, for example, Masakatsu Ota, "Japan Waters Down Text of Annual Anti-nuclear Resolution to Imply Acceptable Use of Nukes," *Japan Times*, October 21, 2017, https://www.japantimes.co.jp/news/2017/10/21/national/politics-diplomacy/u-s-pressure-japan-waters-text-anti-nuclear-resolution/#.We6DqluoOUl.

[16] A/RES/72/30, December 4, 2017.

[17] A/RES/72/37, December 4, 2017.

Table 1-3: Voting behavior on selected UNGA resolutions in 2017

	China	France	Russia	U.K.	U.S.	India	Israel	Pakistan	Australia	Austria	Belgium	Brazil
United action towards the total elimination of nuclear weapons	×	○	×	○	○	△	△	△	○	△	○	△
Towards a nuclear-weapon-free world	×	×	×	×	×	×	×	△	△	○	×	○
Nuclear disarmament	○	×	×	×	×	△	×	△	×	△	×	○
Taking forward multilateral nuclear disarmament negotiations	×	×	×	×	×	×	×	×	×	○	×	○
Follow-up to the advisory opinion of the ICJ	○	×	×	×	×	△	×	○	×	○	×	○
Convention on the Prohibition of the Use of Nuclear Weapons	○	×	△	×	×	○	×	○	×	×	×	○
Humanitarian consequences	△	×	×	×	×	○	×	△	△	○	△	○
Ethical imperatives	△	×	×	×	×	△	×	△	×	○	×	○

	Canada	Chile	Egypt	Germany	Indonesia	Iran	Japan	Kazakhstan	South Korea	Mexico	Netherlands	New Zealand
United action towards the total elimination of nuclear weapons	○	○	△	○	△	△	○	○	△	○	○	△
Towards a nuclear-weapon-free world	△	○	○	×	○	○	△	○	△	○	△	○
Nuclear disarmament	×	○	○	×	○	○	△	○	×	○	×	△
Taking forward multilateral nuclear disarmament negotiations	×	○	○	×	○	○	×	○	×	○	×	○
Follow-up to the advisory opinion of the ICJ	△	○	○	×	○	○	△	○	×	○	×	○
Convention on the Prohibition of the Use of Nuclear Weapons	×	○	○	×	○	○	△	○	×	○	×	×
Humanitarian consequences	△	○	○	△	○	○	○	○	×	○	△	○
Ethical imperatives	×	○	○	×	○	○	△	○	×	○	×	○

	Nigeria	Norway	Philippine	Poland	Saudi Arabia	South Africa	Sweden	Switzerland	Syria	Turkey	UAE	North Korea
United action towards the total elimination of nuclear weapons	△	○	○	○	○	△	○	○	×	○	○	×
Towards a nuclear-weapon-free world	○	△	○	×	○	○	○	○	○	×	○	×
Nuclear disarmament	○	×	○	×	○	△	△	×	○	×	○	△
Taking forward multilateral nuclear disarmament negotiations	○	×	○	×	○	○	○	○	?	×	○	△
Follow-up to the advisory opinion of the ICJ	○	×	○	×	○	○	○	○	○	×	○	?
Convention on the Prohibition of the Use of Nuclear Weapons	○	×	○	×	○	○	×	×	○	×	○	△
Humanitarian consequences	○	△	○	×	○	○	○	○	○	×	○	△
Ethical imperatives	○	×	○	×	○	○	△	△	○	×	○	△

[○: Favor, ×: Against, △: Abstention, ?:Not voting]

(3) TREATY ON THE PROHIBITION OF NUCLEAR WEAPONS (TPNW)

In accordance with the resolution, titled "Taking forward multilateral nuclear disarmament negotiations,"[18] adopted at the UN General Assembly in 2016, the United Nations Conference to Negotiate a Legally Binding Instrument to Prohibit Nuclear Weapons, Leading towards Their Elimination (hereinafter Negotiation Conference), was convened in March and June-July 2017 in New York. On the first day of the Negotiation Conference, Austria, one of the countries which have taken initiative for its convening, stated: "I am proud and humbled to see such a large number of States assembled in this hall this morning. It shows the broad, the global support for a prohibition of [nuclear weapons]."[19]

Nearly all the countries and NGOs that participated in the Negotiation Conference were proponents of establishing a treaty banning nuclear weapons. There existed different opinions among the participants regarding concrete obligations and measures which they considered should be stipulated in a treaty, such as: whether the threat to use nuclear weapons, in addition to any actual use, should explicitly be prohibited; whether a "nuclear test explosion", which is banned by the CTBT, or a "nuclear test" which can be interpreted to include other than explosive tests, should be prohibited in a negotiated treaty; and whether a ban on transit of nuclear weapons should be included in the treaty. Nevertheless, such differences did not erode their belief that legislating norm in the form of a treaty prohibiting nuclear weapons, in light of their humanitarian consequences is an essential step toward total elimination of nuclear weapons. Nor did the above differences diminish enthusiasm for concluding a treaty during the Negotiation Conference. Under the strong leadership of the chairperson of the negotiation conference, Costa Rican ambassador Elayne Whyte Gómez, the TPNW was adopted on July 7, the last day of the Negotiation Conference, with 122 in favor, one against (the Netherlands) and one abstention (Singapore).[20]

The TPNW consists of a preamble and 20 articles. Its preamble states, inter alia, that states parties are: "deeply concerned about the catastrophic humanitarian consequences that would result from any use of nuclear weapons, and recognizing the consequent need to completely eliminate such weapons, which remains the only way to guarantee that nuclear weapons are never used again under any circumstances"; "considering that any use of nuclear weapons would be contrary to the rules of international law applicable in armed conflict, in particular the principles and rules of international humanitarian law"; "mindful of the unacceptable suffering of and harm caused to the victims of the use of nuclear weapons (*hibakusha*), as well as of those affected by the testing of nuclear weapons"; and "recognizing that a legally binding prohibition of nuclear weapons constitutes an important contribution towards the achievement and maintenance of a world free of nuclear weapons, including the irreversible, verifiable and transparent elimination of nuclear weapons, and determined to act towards that end."

Article 1 of the treaty stipulates that each state party undertakes never under any circumstances to: (a) develop, test, produce, manufacture, acquire, possess or stockpile nuclear weapons and other nuclear explosive devices (hereinafter nuclear weapons); (b) transfer them; (c) receive them; (d) use or

[18] A/RES/71/258, December 23, 2016.

[19] "Statement by Austria," United Nations Conference to Negotiate a Legally Binding Instrument to Prohibit Nuclear Weapons, Leading towards Their Total Elimination, March 27, 2017.

[20] Regarding the decision making of the negotiation conference, its rules of procedure stipulated: "[the Negotiation] Conference shall make its best endeavors to ensure that the work of the Conference is accomplished by consensus," but "[I] f the President of the Conference determines that all efforts to reach consensus have been exhausted, the decisions of the Conference on all matters of substance shall be taken by a two-thirds majority of the Member States participating at the Conference present and voting."

threaten to use them ; (e) assist, encourage or induce anyone to engage in any of the activities prohibited to a state party under the treaty, (f) seek or receive any assistance from anyone to engage in any such activity; and (g) allow any stationing, installation or deployment of any nuclear weapons in its territory or at any place under its jurisdiction or control. The TPNW also stipulates the following obligations and measures:

- Declarations (Article 2): Each state party shall submit to the UN Secretary-General a declaration on: (a) whether it owned, possessed or controlled nuclear weapons and eliminated its nuclear-weapon program; (b) whether it owns, possesses or controls any nuclear weapons; (c) whether there are any nuclear weapons in its territory or in any place under its jurisdiction or control that are owned, possessed or controlled by another state;
- Safeguards (Article 3): Each state party shall, at a minimum, maintain its IAEA safeguards obligations; and each state party which has not yet done so shall conclude and bring into force an IAEA Comprehensive Safeguards Agreement;
- Procedure to establish verification measures for eliminating nuclear weapons program (Article 4);
- National implementation (Article 5);
- Victim assistance and environmental remediation (Article 6), and international cooperation and assistance (Article 7);
- Meetings of states parties and review conferences (Article 8);
- Costs (Article 9), amendments (Article 10), and settlement of disputes (Article 11);
- Universality: encouraging a state to accede to the treaty (Article 12);
- Opening for signature at the UN Headquarters on September 20, 2017 (Article 13), and entering into force 90 days after the 50th instrument of ratification has been deposited (Article 15); and
- Reservations (Article 16), duration and withdrawal (Article 17), relationship with other agreements (Article 18), depositary (Article 19), and authentic texts (Article 20).

On September 20, 51 countries signed the TPNW. By the end of 2017, 56 countries (including Austria, Brazil, Chile, Indonesia, Mexico, New Zealand, Nigeria, the Philippines and South Africa) have signed, and three countries among them have ratified. Austria, one of the countries which led the establishment of the TPNW, stated at the UN General Assembly that "the overwhelming majority of States have come to the conclusion that their security is better served without nuclear weapons, than with them," and "based on the knowledge of the grave humanitarian consequences of nuclear weapon explosions, more and more States have come to the conclusion that the continued existence of nuclear weapons would not be advantageous or desirable in any way, but poses a threat to national as well as collective security, even human survival, and should end."[21]

Nuclear-armed/umbrella states, which were against or abstained from UN General Assembly Resolution 71/258 in 2016, did not participate in the Negotiation Conference of the TPNW, except the Netherlands.[22] Outside of the conference room on the initial day of the Negotiation Conference in March 2017, the U.S. Ambassador to the UN, Nikki Haley, together with, inter alia, the French, the U.K. and South Korean

[21] "Statement by Austria," General Debate, UN General Assembly, October 3, 2017.

[22] China and India participated in the Organizational Session of the Negotiation Conference on February 18 where rules of procedure of the Conference were discussed but did not join the conference itself. India explained that its concerns about a "noncomprehensive approach" to nuclear disarmament and the absence of international verification measures are why it abstained on the resolution establishing these negotiations in the UN General Assembly. Allison Pytlak and Ray Acheson, "States Discuss Rules for Nuclear Ban Negotiations," Reaching Critical Will, February 16, 2017, http://www.reachingcriticalwill.org/disarmament-fora/nuclear-weapon-ban/reports/11377-states-discuss-rules-for-nuclear-ban-negotiations.

ambassadors, expressed opposition to the negotiation of a treaty, stating that "There is nothing I want more for my family than a world with no nuclear weapons. But we have to be realistic. Is there anyone that believes that North Korea would agree to a ban on nuclear weapons?"[23] China stated that it "consistently upholds and actively advocates a final comprehensive ban on and total destruction of nuclear weapons, which is fundamentally in line with the purposes of negotiations on the nuclear weapon ban treaty," but "also believes that realizing disarmament, which cannot be achieved overnight, must be pressed ahead in a gradual and incremental way following the principle of safeguarding global strategic stability and compromising the security of no country." Then, China argued that its decision not to participate in the Negotiation Conference was "made to maintain the current international arms control and disarmament regime and move ahead nuclear disarmament in a gradual and incremental way. It demonstrates China's responsible attitude towards maintaining global strategic balance and stability. Therefore, whether we show up at the negotiating table or not, there is no change to China's position on supporting a final comprehensive ban on and total destruction of nuclear weapons."[24]

NWS also criticiazed the negotiation of a nuclear weapons ban treaty at the 2017 NPT Preparatory Committee (PrepCom). Russia, for instance, stated: "Many NPT Parties are tempted to reach complete nuclear disarmament overnight. While understanding the motivation that pushed them to start negotiating the prohibition of nuclear weapons, we believe they took the wrong path that endangers the viability of the NPT regime. We know that the sponsors of the negotiation process have different opinion and expect that a nuclear weapons ban treaty would complement or even strengthen the Non-Proliferation Treaty. We cannot accept this logic."[25] The United Kingdom argued:

> Productive results on nuclear disarmament can only be achieved through a consensus-based approach that takes account of the global security context. Negotiating an international ban on nuclear weapons will not bring us closer to the goal of a world without nuclear weapons. A ban will not improve the international security environment or increase trust and transparency. Nor will it address the technical and procedural challenges of nuclear disarmament verification. Pursuing a consensus based step-by-step approach to multilateral disarmament through building necessary mutual trust between states, and through putting into place the key international architecture to help build the conditions for further disarmament, offers the most realistic and effective route towards our shared goal of a world without nuclear weapons.[26]

As for nuclear-umbrella states, Australia, for example, said it would not join the Negotiation Conference because it considered that "the proposed treaty to ban nuclear weapons does not offer a practical path to effective disarmament or enhanced security."[27] Japan, which did not join the negotiation, made the following statement on the initial day of the Negotiation

[23] Michelle Nichols, "U.S., Britain, France, Others Skip Nuclear Weapons Ban Treaty Talks," *Reuters*, March 27, 2017, https://www.reuters.com/article/us-nuclear-un/u-s-britain-france-others-skip-nuclear-weapons-ban-treaty-talks-idUSKBN16Y1QI.

[24] "Foreign Ministry Spokesperson Hua Chunying's Regular Press Conference," Ministry of Foreign Affairs of China, March 20, 2017, http://www.fmprc.gov.cn/mfa_eng/xwfw_665399/s2510_665401/t1447146.shtml.

[25] "Statement by Russia," General Debate, First Session of the Preparatory Committee for the 2020 NPT Review Conference, May 2, 2017.

[26] "Statement by the United Kingdom," General Debate, First Session of the Preparatory Committee for the 2020 NPT Review Conference, May 3, 2017.

[27] "Australia to Boycott Global Summit on Treaty to Ban Nuclear Weapons," *Guardian*, February 17, 2017, https://www.theguardian.com/world/2017/feb/17/australia-to-boycott-global-summit-on-treaty-to-ban-nuclear-weapons.

Conference in March:

> A ban treaty, if it does not lead to an actual reduction of a single nuclear warhead, would be of little significance. In fact, efforts to make such a treaty without the involvement of nuclear-weapon states will only deepen the schism and division not only between nuclear-weapon states and non-nuclear-weapon states, but also among non-nuclear-weapon states, which will further divide the international community. Therefore, our common goal will be pushed away, a goal of reaching a world free of nuclear weapons. Even if such a ban treaty is agreed upon, we don't think that it would lead to the solution of real security issues, such as the threat by North Korea. This is why we voted against the UN General Assembly resolution 71/258 last year.
>
> From discussions and considerations so far, it has become clear that the ban treaty concept has been unable to obtain understanding and involvement of nuclear-weapon states. Furthermore, this negotiation has not been formulated to pursue nuclear disarmament measures that will actually lead to the elimination of nuclear weapons, in cooperation with the nuclear weapon states. Regrettably, given the present circumstances, we must say that it would be difficult for Japan to participate in this Conference in a constructive manner and in good faith.[28]

As expected, the nuclear-armed/umbrella states which did not participate in the Negotiation Conference reaffirmed their positions of not signing the TPNW. On July 7 when the treaty was concluded, France, the United Kingdom and the United States jointly issued the following statement:

> This initiative clearly disregards the realities of the international security environment. Accession to the ban treaty is incompatible with the policy of nuclear deterrence, which has been essential to keeping the peace in Europe and North Asia for over 70 years. A purported ban on nuclear weapons that does not address the security concerns that continue to make nuclear deterrence necessary cannot result in the elimination of a single nuclear weapon and will not enhance any country's security, nor international peace and security…A ban treaty also risks undermining the existing international security architecture which contributes to the maintenance of international peace and security.[29]

Three non-NPT countries and North Korea made the following statements at the UN General Assembly.

- India: "India did not participate in the negotiations leading to the adoption of the Treaty on the Prohibition of Nuclear Weapons. India, therefore, cannot be a party to the treaty, and shall not be bound by any of the obligations that may arise from it."[30]
- Pakistan: "This initiative faltered by ignoring the fundamental security considerations that underpin nuclear disarmament…[I]t only led us to the conclusion that the launch of such initiatives outside the CD, on a non-consensus basis and without all the key stakeholders on board, no matter how well intentioned and justified, would not lead to any real change on ground."[31]
- Israel: "[T]he treaty does not create, contribute

[28] "Statement by Japan," the High-level Segment of the United Nations conference to negotiate a legally binding instrument to prohibit nuclear weapons, leading towards their total elimination, March 27, 2017, New York.

[29] "Joint Press Statement from the Permanent Representatives to the United Nations of the United States, United Kingdom, and France Following the Adoption of a Treaty Banning Nuclear Weapons," July 7, 2017, https://usun.state.gov/remarks/7892.

[30] "Statement by India," General Debate, UN General Assembly, October 9, 2017.

[31] "Statement by Pakistan," Thematic Debate on Nuclear Weapons, UN General Assembly, October 13, 2017.

to the development of, or indicate the existence of customary law related to the subject or the content of the Treaty."[32]

- North Korea: "The DPRK agrees with the primary focus of the [Nuclear Ban Treaty (NBT)] on total elimination of nuclear weapons; however, since the U.S. that poses nuclear threat and blackmail on the DPRK rejects the NBT, the DPRK is not in position to accede to the treaty."[33]

Furthermore, some countries indicated that they would need to consider whether or not to sign the TPNW in spite of their concurrence with it. For example, the Swedish ambassador for disarmament said, "Despite the complexity of the matter, and the unprecedentedly limited time at our disposal, Sweden has voted in favor of the adoption of this treaty…At the same time, we recognize that there are crucial elements of this treaty that do not meet what my delegation was aiming for."[34] The Swiss permanent representative to the CD also said after the vote, "Switzerland is committed to the goal of a world free of nuclear weapons, but also sees risks that this treaty may weaken existing norms and agreements and create parallel processes and structures which may further contribute to polarization rather than reduce it."[35] As of the end of 2017, neither country had signed the TPNW.

After the opening for signature of the TPNW, the International Campaign to Abolish Nuclear Weapons (ICAN), which had taken an initiative for its conclusion, received the Nobel Peace Prize for 2017 "for its work to draw attention to the catastrophic humanitarian consequences of any use of nuclear weapons and for its ground-breaking efforts to achieve a treaty-based prohibition of such weapons."[36] At the Nobel Prize Award Ceremony on December 10, Beatrice Fihn, Executive Director of the ICAN, emphasized that nuclear weapons "can just as easily be destroyed by placing them in a humanitarian context," pointed out that "[t]he risk for nuclear weapons use is even greater today than at the end of the Cold War," and stated that "there is only one way to prevent the use of nuclear weapons: prohibit and eliminate them."[37] Accepting the Nobel prize along with Fihn, ICAN activist and *hibakusha* Setsuko Thurlow insisted that nuclear "weapons are not a necessary evil; they are the ultimate evil."[38]

Besides, parliaments of Norway, Sweden and Italy adopted their respective resolutions to require their respective governments for exploring to sign the TPNW. Each government will submit a report to its parliament regarding possible consequences of its accession to the treaty.

At the UN General Assembly on December 4, a resolution titled "Taking forward multilateral nuclear disarmament negotiations," which reaffirmed the importance of the TPNW and called for signing and ratifying it was adopted as a result of the following voting behavior:[39]

- Proposing: Austria, Brazil, Chile, Indonesia, Kazakhstan, Mexico, New Zealand, Philippines, South Africa and others
- 125 in favor, 39 against (Australia, Belgium,

[32] "Statement by Israel," General Debate, UN General Assembly, October 3, 2017.

[33] "Statement by North Korea," General Debate, UN General Assembly, October 6, 2017.

[34] Alicia Sanders-Zakre, "States Hesitate to Sign Nuclear Ban Treaty," *Arms Control Today*, Vol. 47, No. 7 (September 2017), p. 32.

[35] Ibid.

[36] Norwegian Nobel Committee, "The Nobel Peace Prize for 2017," October 6, 2017, https://www.nobelprize.org/nobel_prizes/peace/laureates/2017/press.html.

[37] "International Campaign to Abolish Nuclear Weapons (ICAN): Nobel Lecture," the Nobel Peace Prize 2017, December 10, 2017, https://www.nobelprize.org/nobel_prizes/peace/laureates/2017/ican-lecture_en.html.

[38] Ibid.

[39] A/RES/72/31, December 4, 2017.

Canada, China, France, Germany, India, Israel, Japan, the Netherlands, South Korea, Norway, Pakistan, Poland, Russia, Turkey, the U.K., the U.S. and others), 14 abstentions (North Korea and others)

The UNGA resolution titled "Follow-up to the advisory opinion of the International Court of Justice on the Legality of the Threat or Use of Nuclear Weapons" was also adopted, as was done in previous years.[40] It says that "by commencing multilateral negotiations leading to an early conclusion of a nuclear weapons convention" all states should implement the obligation in Article VI of the NPT. The voting behavior in 2017 is presented below:

- Proposing: Indonesia and others
- 131 in favor, 31 Against (Australia, Belgium, France, Germany, South Korea, the Netherlands, Norway, Poland, Russia, Turkey, the U.K., the U.S. and others), 18 Abstentions (Canada, India, Japan and others) *North Korea did not vote

In addition, an UNGA resolution titled "Convention on the Prohibition of the Use of Nuclear Weapons," requesting "to the Conference on Disarmament to commence negotiations in order to reach agreement on an international convention prohibiting the use or threat of use of nuclear weapons under any circumstances," was also proposed and adopted.[41] Voting behavior on this resolution was as follows:

- Proposing: India and others
- 123 in favor, 50 Against (Australia, Austria, Belgium, Canada, France, Germany, Israel, South Korea, the Netherlands, New Zealand, Norway, Poland, Sweden, Switzerland, Turkey, the U.K., the U.S. and others), 10 Abstentions (Japan, North Korea, Russia and others)

[40] A/RES/72/58, December 4, 2017.

[41] A/RES/72/59, December 4, 2017.

[Column 1] Treaty on the Prohibition of Nuclear Weapons and Future of Nuclear Disarmament

Mahmoud Karem

At the outset I wish to praise the excellent work for the cause of a world free of nuclear weapons, disarmament, and non-proliferation done by the Hiroshima Prefecture in its annually published "*Hiroshima Report*", and the 2011 Plan for "Global peace". No one is more fit to achieve these pioneering objectives as the brave people of Hiroshima, Japan's legends of the *hibakusha*, and the painful living memories of the first use of nuclear weapons against Humanity.

I also wish to praise the excellent work done in Hiroshima and Nagasaki in educating the youth, students with the scourge of a nuclear war and how to avert it.

Now it is necessary to historically address the question; why now a Treaty on the Prohibition of Nuclear Weapons (TPNW) and the Future of Nuclear Disarmament?

When the Nuclear Non-Proliferation Treaty (NPT) was signed in 1968, the euphoria and hope at the time was very high despite the inherent imbalances in the treaty between nuclear-weapon states and non-nuclear-weapon states. The world believed that article VI will be realized and its objectives reached in a relatively short period of time. However, the long history of repeated international crisis with the possibility of escalating into a global war closely linked to an aggressive doctrine of first use of nuclear weapons, all raised international frustration over the fact that little is being done to honor the obligations enshrined in Article VI by the nuclear-weapon states. Yes, important arms control agreements and some reductions were reached but juxtaposed against a long period of time, fifty years to be exact, these achievements seemed little and albeit insufficient.

Part of this international frustration also went back to several issues:

1) Calls for reversing military expenditures on modernizing nuclear weapons remained unheeded, exceeding $100 billion per year depriving social and economic developmental needs of humanity.

2) Despite global developmental aspirations the impact of the nuclear arms race was never reversed contradicting the objectives of the 2015-2030 UN Sustainable Development Goals.

3) The nuclear weapons states could not realize the urgent need for reversing military expenditures and allocating them to solving persistent global problems such as water security, protecting the environment, climate change, poverty, spread of epidemics, food and energy security. Instead, the world continued to live under the fear that a regional conflict and a possible confrontation between nuclear-weapon states may exacerbate quickly into a nuclear exchange. In the same time nuclear weapon states continued to operate from hair trigger alerts, threatening first use options, and forcing these doctrines on countries under extended nuclear deterrence, thereby involving those non-nuclear-weapon states in conflicts thousands of miles away from them.

4) This all underscored the fact that deterrence policy anchored on rationality may not always succeed as we have seen in the case of the regional conflict in the Korean peninsula. The fear now is that leaders who can launch nuclear missiles may not be rational enough to take rational decisions, let alone allow for a war by accident.

5) This led many states in three international

conferences to highlight the humanitarian impact of use of nuclear weapons, and no people in the world can present a moving example in this regard, other than the people of Hiroshima and Nagasaki.

In conclusion, the TPNW must be evaluated in a proper context. It sends a distress signal to world conscious that continuing with the status quo is not permissible given global challenges. Therefore, the future path of nuclear disarmament should be based on several issues:

1) A strong political will from nuclear reliant states to join the negotiations as a measure to convince NWS to cooperate.

2) The need to address at present, several compromise solutions such as, a "framework agreement" to secure a broad agreement at the beginning leaving the details to further negotiations, consonant with the convention on climate change. Another idea is holding an NPT amendment conference and adding a nuclear disarmament protocol that would also cover fissile material, nuclear weapons free zones, WMD's, de-alerting, stockpile reductions, and retirement of nuclear weapons placed in foreign countries. Further on, a no first use pledge signed and deposited in the UNSC and announced by all nuclear weapons states in an international nuclear disarmament summit that replicates efforts done previously in nuclear security summits.

3) My own preference is to consider all that under the umbrella of a new UNGA special session devoted to disarmament (SSOD) before 2020.

Finally, nuclear-weapons states should demonstrate political will and show the world that they are serious and determined to reduce their nuclear stockpiles within an agreed to timeframe towards achieving General and Complete nuclear disarmament.

Dr. Mahmoud Karem
Former Ambassador of Egypt to Japan

[Column 2] A Personal Evaluation of the Treaty Prohibiting Nuclear Weapons (TPNW), and Possible Pathways to Move Nuclear Disarmament Forward Following the Adoption of the TPNW

Tim Caughley

This evaluation of the TPNW is in two parts, headed "cause" and "effect".

1. Cause

The negotiation of the TPNW was influenced by a variety of factors. Many non-nuclear-weapon states were concerned that the sanctity of the NPT was being jeopardized by the lack of sustained action on the part of NPT nuclear weapon states to reduce their nuclear arsenals. Courses of action agreed by all that Treaty's parties towards the elimination of nuclear armaments were gaining little or no traction.

The NPT has long been dogged by tension between its five nuclear-armed parties and those 186 nations that have bound themselves never to possess nuclear weapons in the expectation that such arms would eventually be eliminated. The five NPT possessors and states allied to them see the road to a nuclear free world as requiring the banning of nuclear-weapons testing (via the CTBT) and a treaty banning production of fissile material (FMT).

But paralysis surrounds both steps, frustrating progress towards elimination. The CTBT's entry into force and negotiation of a FMT are both blocked by states that possess nuclear weapons. Absent any recognition by possessors that multilateral nuclear disarmament had stalled, the international community reached a crossroads. The nuclear disarmament agenda could be surrendered to the possessors of nuclear weapons to take the next steps at their own pace (e.g., ratifying the CTBT; negotiating

a FMT in the CD (or elsewhere); implementing key actions agreed by them at NPT Review Conferences). Or the vacuum would be addressed in other ways.

Concern expressed universally in 2010 by NPT parties about the humanitarian impact of nuclear weapons was harnessed to draw attention not only to the risks surrounding nuclear weapons but also to the chronic impasse just mentioned. Momentum, driven by a broad coalition of non-nuclear states, civil society and inter-governmental organizations including the UN and Red Cross Movement, quickly developed for prohibiting nuclear weapons as a fresh step. Its supporters were not persuaded by the rationale–put forward by nuclear-armed states and their allies–that nuclear disarmament had become a casualty of today's fraught global security situation. To prohibition advocates, that argument was tantamount to a justification for nuclear weapons, and inconsistent with the NPT and its non-proliferation ethos.

With this standoff now deeply engrained, the decision of the UN General Assembly in October 2016 to undertake negotiation of what became the TPNW was well supported but far from consensual. The resulting treaty was adopted less than a year later with 122 in favour, one against (Netherlands) and one abstaining (Singapore). But those 50-plus UN member states that in 2016 had opposed or abstained on the call for a prohibition, largely opted out of the negotiation.

2. Effect

The TPNW has thus had a difficult and controversial birth. Assessment of its impact requires four acknowledgements:

- a prohibition of nuclear weapons is an essential step among measures needed for a nuclear-weapon free world (it already has counterparts banning chemical and biological arms);
- while the intention of the architects of the TPNW was that its terms exclude no state, support for it from weapons-possessors and their allies that chose not to participate in its negotiation will nonetheless be hard won;
- given the time-consuming process of ratifying treaties, it is too early to assess–based on the level of formal support from states that have so far signed (56) or ratified the TPNW (5)–how effective it will be legally; and
- although it augments rather than supplants the NPT, the TPNW's most valuable impact may be to precipitate moves to tackle the divide that is corroding the NPT. The TPNW's emergence underlines a disturbing reality–a continuing lack of any coherence in charting the way forward for multilateral nuclear disarmament.

It is vital that nuclear-armed states and non-possessors acknowledge this last reality. Exploring scope for common ground might focus first on *methods* for bridging the gap (e.g., format for talks, informal expert groups, procedural framework for elimination). Next, issues of substance could be pursued (mitigating risk, identifying confidence-building measures, threat reduction, etc). In either case, these efforts must begin in earnest and with urgency – the recent moving of the hands of the symbolic Doomsday Clock to 2 Minutes to Midnight shows that the threat of a nuclear war through accident, miscalculation or intent has risen to an alarming level.

Mr. Tim Caughley
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[Column 3] The Treaty on the Prohibition of Nuclear Weapons and the Future of Nuclear Disarmament

Yasuyoshi Komizo

1. Background on the Adoption of TPNW

The cold war ended more than 25 years ago, but we are still struggling with causes of conflict. While globalization proceeds, the sense of belonging to the same human family remains yet to be developed, and economic/social imbalance keeps expanding. Thus divisions, distrust, and conflicts among people remain the unfortunate reality. Furthermore, recent rise of intolerance and protectionism add risks of turning conflicts into armed confrontation. Nearly 15,000 nuclear weapons still exist in such a volatile world. Nuclear weapons are claimed to be weapons of deterrence, but they may be actually used as a result of accidents and/or miscalculations. The concept of nuclear deterrence is also contagious. It invites the danger of nuclear proliferation, as in the case of North Korea. The international community has begun to realize that the existence of nuclear weapons itself constitutes a security risk of the world. Former U.S. Secretary of Defense William Perry has stated that "the risk of nuclear catastrophe is greater today than during the Cold War."[1]

Despite strong opposition by major powers, the UN Conference adopted the Treaty on the Prohibition of Nuclear Weapons (TPNW) in July 2017. This happened under the background of heightened international awareness of the inhumanity of nuclear weapons and risks of their actual use, which is widely spreading among civil society groups and non-nuclear weapons states.

Reflecting the basis of such awareness, the Preamble to the TPNW clearly notes the testimonies and earnest appeals for the nuclear abolition by the *hibakusha* of Hiroshima and Nagasaki. The collective turning point for this reawakening to the horrors of nuclear weapons came with the three "International Conferences on the Humanitarian Impact of Nuclear Weapons" held in 2013 and 2014. Participants in these Conferences came to realize that there had been numerous nuclear accidents and repeated cases placing nations on the verge of nuclear war. With such alarming knowledge, they listened to the testimony of the *Hibakusha*. This combination awakened the participants of the risks that anyone can become a victim of nuclear catastrophes, and it brought about a strong sense of ownership among large numbers of non-nuclear weapon states in nuclear disarmament negotiations.

2. The Nature of TPNW

Article 1 of the TPNW prohibits nuclear weapons, both comprehensively and indiscriminately. Other aspects of the TPNW should also be noted: The Preamble states to the effect that the TPNW reaffirms and builds upon relevant existing international laws, reaffirms the role of the NPT as the cornerstone of nuclear disarmament and nonproliferation, and recognizes that a legally binding prohibition constitutes an important contribution towards the elimination of nuclear weapons. The last point is particularly important, since currently nuclear-weapon States (NWS) and nuclear umbrella states (hereinafter referred to collectively as "nuclear dependent states") oppose the treaty. In order for the prohibition to contribute effectively towards the elimination of nuclear weapons, the TPNW encourages all states, including nuclear dependent states, to join the TPNW (Article 12); it also incorporates measures to enable wider participation of states.

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[1] William J.Perry, "The Risk of Nuclear Catastrophe Is Greater Today Than During the Cold War," *Huffington Post*, https://www.huffingtonpost.com/william-jperry/nuclear-catastrophe-risk_b_9019558.html.

For example, while a "verification" clause is indispensable for nuclear disarmament treaties, reliable verification clauses cannot be drafted without participation of the NWS. In order to cope with this difficulty in drafting a verification clause, the TPNW adopted a type of framework-agreement approach, in line with recommendations made by Mayors for Peace (A/CONF.229/2017/NGO/WG.15). More specifically, Article 4 (on the total elimination of nuclear weapons) provides only a general outline in regard to the related verification measures, while Article 8 (Meeting of States Parties) includes in its mandate the consideration of specific measures of disarmament verification. States including nuclear dependent states that are not yet parties to the TPNW can participate in the deliberation of these meetings as observers.

3. Path towards Nuclear Disarmament

The TPNW has been adopted. Yet nuclear-dependent states oppose the treaty, arguing that it does not address security concerns. Instead, they propose a "step-by-step" approach as the only realistic measure. The problem is that there has not been any tangible progress in recent years. On the other hand, the risk of the nuclear weapons use as well as their humanitarian consequences have become much more widely recognized in the international community, and the very existence of nuclear weapons has become a serious security concern. The Nobel Peace Prize awarded last year to ICAN is clearly a reflection of such a trend.

The path we need to take is clear. Both supporters and opponents of the TPNW are under the NPT's Article VI obligation to undertake to pursue nuclear disarmament negotiations in good faith. An immediate step should be for both camps, despite their differences, to come together and engage in dialogue focused on identifying and implementing practical nuclear disarmament measures. Through such efforts, further steps towards a nuclear-weapons-free world will become clearer.

In order to overcome the notion of "nuclear deterrence", intensive efforts are needed worldwide, especially among nuclear-weapon States, to turn mutual distrust into mutual understanding. Even the difficult issues of Ukraine and North Korea can be made specific test cases for a fundamental shift from "confrontational security" to "cooperative security." Nuclear deterrence does not at all contribute to—and in many ways detracts from—the settlement of contemporary issues such as terrorism and refugees that originate from mutual distrust and confrontation. Global cooperation beyond these differences is indispensable to cope with climate change and other global security challenges. We sincerely expect the political leadership in all countries to support progress in achieving a nuclear-weapons-free world. We hope they will learn and follow the decisive leadership precedents of advancing nuclear disarmament at a peak of international tension, such as the cases between John F. Kennedy and Nikita Khrushchev, and between Mikhail Gorbachev and Ronald Reagan. Mayors for Peace will not spare any efforts, together with a wide range of civil society partners, to promote mutual understanding and cooperation in the global community, transcending differences in national boundaries, religions and cultures.

Mr. Yasuyoshi Komizo
Chairperson,
Hiroshima Peace Culture Foundation

[Column 4] The TPNW and the Future of the Nuclear Non-Proliferation and Disarmament Regime

Masahiko Asada

On July 7, 2017, the Treaty on the Prohibition of Nuclear Weapons (TPNW) was adopted by an overwhelming majority of 122 votes in favor, one against and one abstention. From a standpoint solely based on this fact, one may have an impression that an epoch-making treaty to ban nuclear weapons was concluded, reflecting the "collective will" of the international community as a whole. This is not the case, however; the 122 States do not include any of the nuclear-armed States —neither the nuclear-weapon States (NWS) under the Nuclear Non-Proliferation Treaty (NPT) nor other nuclear weapon possessor States— or non-nuclear-weapon States (NNWS) allied with NWS (nuclear-allied NNWS). This fact generates concern that the TPNW may create, or further expand, a grave "division" in the international community.

Such a division may be created and/or expanded not only between nuclear-armed States and NNWS, but also between nuclear-allied NNWS and non-aligned (NAM) NNWS. In fact, such divisions may have already emerged prior to the conclusion of the treaty. While only five States (the United States, the United Kingdom, France, Russia and Israel) voted against the United Nations General Assembly (UNGA) resolution entitled "Taking forward multilateral nuclear disarmament negotiations" in 2014, as many as 35 States (seven times more), including most of nuclear-armed States and nuclear-allied NNWS, voted against the 2016 version of the resolution according to which the UN conference to negotiate a TPNW was decided to convene. It could be said that the decision to start the negotiation and the conclusion of the TPNW resulted in pushing nuclear-allied NNWS towards the nuclear-armed States' side by pressuring them to give up their reliance on extended nuclear deterrence, notwithstanding those NNWS had, at least in surface appearance, taken similar lines with the NAM countries in terms of pursuing nuclear disarmament.

The TPNW, which was ratified by just five signatories as of January 2018, will enter into force in due course with the necessary ratifications of 50 States. According to the treaty, the TPNW process will start with the convening of the first meeting of States Parties within one year of its entry into force, which will be followed by further such meetings on a biennial basis. It would be natural that many of the NAM countries will emphasize the significance of the TPNW, which they took the initiatives to make. It is also easily expected that they would prefer the TPNW to the NPT, due particularly to the lack of progress in nuclear disarmament within the framework of the NPT. In such a case, a division between nuclear-allied NNWS and non-aligned NNWS, as well as one between nuclear-armed states and NNWS, will inevitably be further deepened. It would be more than unfortunate for nuclear disarmament should many NAM States lose interest in the NPT, and such a trend would seriously undermine the NPT process as a universal forum in which both NWS and NNWS participate.

One positive aspect of the adoption of the TPNW would be that it has dramatically demonstrated NAM countries' frustrations over a lack of conspicuous progress in nuclear disarmament both multilaterally (since the adoption of the CTBT) and bilaterally (after the entry into force of the U.S.-Russian New START). It is of great importance that the NAM countries continue to get NWS to recognize the imperative of their efforts in nuclear disarmament within the NPT process, while reaffirming the paramount value of the NPT even after the entry into force of the TPNW.

Dr. Masahiko Asada
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[Column 5] Treaty on the Prohibition of Nuclear Weapons and the Future of Nuclear Disarmament

Anton Khlopkov

I first visited Hiroshima and Nagasaki in December 2016 – almost 20 years after I began to study nuclear physics. I probably should have paid that visit a lot sooner. The Hiroshima Peace Memorial Museum and the Nagasaki Atomic Bomb Museum are must-see places for everyone involved in nuclear issues, nonproliferation, and arms control. They cannot leave anyone indifferent. They are a stark reminder of the destructive power of nuclear weapons and nuclear energy used for military purposes. They also enable a deeper understanding of the nonproliferation crises we are facing today, as well as the history and roots of those crises. For example, when I visited the memorial in Hiroshima, I was taken aback that of the 120,000 people who died in the nuclear bombing on August 6, 1945, some 20,000 were Korean.

I am delighted that the Hiroshima and Nagasaki prefectures have recently been hosting a much greater number of various seminars, forums and conferences that draw experts – beginners as well as experienced professionals – specializing in nuclear nonproliferation, arms control, and international security. Visiting the two museums and meeting the *hibakusha* is an integral part of such events. These efforts are an important long-term investment in upholding peace and security, and advancing the cause of nuclear disarmament.

The goal of nuclear disarmament is impossible to achieve overnight, because a world free of nuclear weapons does not equal the world as we know it, minus nuclear weapons. Unfortunately, such an approach – in other words, the idea of immediate mechanical renunciation of nuclear weapons – is pursued by the authors of the Treaty on the Prohibition of Nuclear Weapons (TPNW).

Nuclear weapons are deeply integrated into the complex, multi-tier, and multi-component national security systems of the nuclear-weapon states and their allies. One simply cannot mechanically snatch one of the crucial blocks from the foundation of that multi-tier pyramid without risking the whole construct teetering and perhaps falling over. What we can do, however, is use a phased, step-by-step approach to reduce the reliance of the construct on that particular block. In the longer term, we should try to re-design the construct, which is just as steady as the one we have now, but which does not rely on nuclear weapons as one of its key blocks – a construct in which the nuclear weapons block is replaced by something else.

Over the past 30 years, Russia and the United States have reduced their nuclear arsenals by 85%. Additionally, it is safe to say that Moscow and Washington have accumulated a wealth of experience in negotiating and implementing legally-binding commitments on nuclear arms reductions. With sufficient political will, that experience will enable them not only to make progress towards further reductions of their nuclear arsenals, but also to expedite the negotiations to that effect. Talks on the START I treaty, signed in 1991, took more than six years to complete. In contrast, the New START treaty, signed in Prague in 2010, took only 10 months to negotiate.

What, then, should be the nuclear disarmament priorities for the foreseeable future? As the possessors of largest nuclear arsenals, the United States and

Russia have a special responsibility to maintain strategic stability and reduce nuclear risks. But this is not a task for Russia and the United States alone – or even just for the five official nuclear-weapon states. This task requires multilateral efforts, undertaken either jointly or in parallel, depending on the specific issue.

Talking of Russia and the United States, the primary objective is to preserve and strengthen the already existing arms control architecture. The New START Treaty expires in 2021. The INF Treaty is facing difficult time. These and many other related issues require a resumption of regular, systemic dialogue between official representatives of the two states in the format of inter-agency delegations. Such dialogue would enable Russia and the United States to preserve the already concluded agreements and lay the ground for new steps towards nuclear disarmament.

Also, it is high time for all other nuclear-weapon and nuclear-armed states to make their own practical contribution to the nuclear disarmament process. They could start, for example, by making unilateral announcements of their first – perhaps symbolic – steps to reduce their arsenals.

The non-nuclear-weapon states should also make tangible steps to create an environment that would be conducive to further nuclear disarmament measures. Speaking especially of the nuclear-umbrella states, these countries should reduce the role of foreign nuclear weapons in upholding their own national security. The countries that host foreign nuclear weapons in their territory should move steadily towards those weapons' withdrawal. The non-nuclear-weapon states that have stockpiles of weapons-usable nuclear materials in their territory should consider the possibility of irreversible disposition of such materials – preferably using an economically sustainable technology (in other words, by using those materials as nuclear fuel).

Complete nuclear disarmament could not be done "at one stroke", as authors of the TPNW propose. It requires long-term investments and multilateral efforts and should proceed on the basis of increasing rather than reducing strategic stability.

Mr. Anton Khlopkov
Director,
Center for Energy and Security Studies (CENESS)

(4) REDUCTION OF NUCLEAR WEAPONS

A) Reduction of nuclear weapons

THE NEW START

Russia and the United States continue to undertake reductions of their strategic nuclear weapons under the New Strategic Arms Reduction Treaty (New START). Since the entry into force of the Treaty in February 2011, neither side has alleged non-compliance.

The status of their strategic (nuclear) delivery vehicles and warheads under the New START has been periodically updated in the U.S. State Department homepage (see Table 1-4 below). The United States also declared the number of each type of its strategic delivery vehicles (see Table 1-5). According to the data as of September 2015, the number of U.S. deployed strategy warheads fell below the upper limit stipulated in the New START for the first time. Furthermore, the data as of September 2017 revealed that the number of U.S deployed strategic delivery vehicles and deployed/non-deployed strategic delivery vehicles/ launchers, besides deployed strategic warheads, also fell below the limit. On the other hand, according to the data as of September 2017, the number of Russia's deployed strategic warheads has decreased to a level slightly exceeding the upper limit under the New START.

Since the treaty's entry into force, Russia and the United States have implemented the on-site inspections stipulated in it.[42] Neither side has asserted any non-compliance.

U.S. President Donald Trump, inaugurated in January 2017, has been critical of the New START. It was reported that in his first telephone call with Russian President Vladimir Putin in February, President Trump denounced the treaty that caps their deployment of nuclear warheads as a bad deal for the United States.[43] Reacting negatively to Putin's suggestion that the two countries begin work to extend the treaty, Trump said that the New START "[is] a one-sided deal [...and] another bad deal that the country made...We're going to start making good deals."[44] On the other hand, at his confirmation hearing on January 11, 2017, U.S. Secretary of State Rex Tillerson stated that it was important for the United States to "stay engaged with Russia, hold them accountable to commitments made under the New START and also ensure our accountability as well."[45] By the end of 2017, the U.S. government had not appeared to be seriously contemplating a withdrawal from the treaty. According to Russian media, extending the treaty was discussed at a September 2017 meeting of the biannual Bilateral Consultation Committee (BCC) established under the New START to discuss implementation matters.[46] American media did not report any such discussion. Russia and the US also exchanged views on wide range of issues regarding strategic stability at the Strategic Stability Talks launched in October 2017.[47]

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[42] "New START Treaty Inspection Activities," U.S. Department of State, https://2009-2017.state.gov/t/avc/newstart/c52405.htm.

[43] Jonathan Landay and David Rohde, "Exclusive: In Call with Putin, Trump Denounced Obama-era Nuclear Arms Treaty – Sources," *Reuters*, February 10, 2017, http://www.reuters.com/article/us-usa-trump-putin-idUSKBN15O2A5.

[44] Steve Holland, "Trump Wants to Make Sure U.S. Nuclear Arsenal at 'Top of the Pack,'" *Reuters*, February 23, 2017, https://www.reuters.com/article/us-usa-trump-exclusive/trump-wants-to-make-sure-u-s-nuclear-arsenal-at-top-of-the-pack-idUSKBN1622IF.

[45] Jonathan Landay and David Rohde, "In Call with Putin."

[46] "Russia, US Start Consultations on Extending START Treaty — Diplomat," *Tass*, September 12, 2017, http://tass.com/politics/965274.

[47] "Russia and US Beginning Strategic Stability Dialogue — Diplomat," *Tass*, July 20, 2017, http://tass.com/world/957005; "U.S., Russian Strategic Stability Talks Begin," *Arms Control Today*, Vol. 49, No. 8 (October 2017), p. 29.

Table 1-4: Russian and U.S. strategic (nuclear) delivery vehicles and warheads under the New START

<U.S.>

Year and month	Deployed strategic (nuclear) warheads (Aggregate limits：1,550)	Deployed strategic (nuclear) vehicles (Aggregate limits：700)	Deployed/non-deployed strategic delivery vehicles/launchers (Aggregate limits：800)
2011.2	1,800	882	1,124
2011.9	1,790	822	1,043
2012.3	1,737	812	1,040
2012.9	1,722	806	1,034
2013.3	1,654	792	1,028
2013.9	1,688	809	1,015
2014.3	1,585	778	952
2014.9	1,642	794	912
2015.3	1,597	785	898
2015.9	1,538	762	898
2016.3	1,481	741	878
2016.9	1,367	681	848
2017.3	1,411	673	820
2017.9	1,393	660	800

<Russia>

Year and month	Deployed strategic (nuclear) warheads (Aggregate limits：1,550)	Deployed strategic (nuclear) vehicles (Aggregate limits：700)	Deployed/non-deployed strategic delivery vehicles/launchers (Aggregate limits：800)
2011.2	1,537	521	865
2011.9	1,566	516	871
2012.3	1,492	494	881
2012.9	1,499	491	884
2013.3	1,480	492	900
2013.9	1,400	473	894
2014.3	1,512	498	906
2014.9	1,643	528	911
2015.3	1,582	515	890
2015.9	1,648	526	877
2016.3	1,735	521	856
2016.9	1,796	508	847
2017.3	1,765	523	816
2017.9	1,561	501	790

Due to the Treaty's counting rules, the number of warheads cited above does not accurately reflect the actual situation of nuclear forces in both countries. The New START Treaty counts a heavy bomber as one delivery system and one nuclear warhead, despite the fact that the bombers can actually load 6-20 warheads. Also, according to its counting rule stipulated in the Treaty, for ICBMs and SLBMs, the number of warheads shall be the number of reentry vehicles emplaced on deployed ICBMs and on deployed SLBMs.

Sources: U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, October 25, 2011, https://2009-2017.state.gov/t/avc/rls/176096.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, April 6, 2012, https://2009-2017.state.gov/t/avc/rls/178058.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, October 3, 2012, https://2009-2017.state.gov/t/avc/rls/198582.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, April 3, 2013, https://2009-2017.state.gov/t/avc/rls/207020.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, October 1, 2013, https://2009-2017.state.gov/t/avc/rls/215000.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, April 1, 2014, https://2009-2017.state.gov/t/avc/rls/224236.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, October 1, 2014, https://2009-2017.state.gov/t/avc/rls/232359.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, July 1, 2015, https://2009-2017.state.gov/t/avc/rls/240062.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, October 1, 2015, https://2009-2017.state.gov/t/avc/rls/247674.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, October 1, 2016, https://2009-2017.state.gov/t/avc/rls/2016/262624.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, January 1, 2017, https://2009-2017.state.gov/t/avc/rls/2016/266384.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, July 1, 2017, https://www.state.gov/t/avc/newstart/272337.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, January 12, 2018, https://www.state.gov/t/avc/newstart/277439.htm.

Table 1-5: U.S. strategic (nuclear) delivery vehicles

<ICBMs and ICBM Launchers>

Year and month		Deployed ICBM	Non-deployed ICBM	Deployed and Non-deployed Launchers of ICBMs	Deployed launchers of ICBMs	Non-deployed launchers of ICBMs	Test Launchers
2012.9	MM-III	449	263	506	449	57	6
	PK	0	58	51	0	51	1
	Total	449	321	557	449	108	7
2013.3	MM-III	449	256	506	449	57	6
	PK	0	58	51	0	51	1
	Total	449	314	557	449	108	7
2013.9	MM-III	448	256	506	448	58	6
	PK	0	57	51	0	51	1
	Total	448	313	557	448	109	7
2014.3	MM-III	449	250	506	449	57	6
	PK	0	56	1	0	1	1
	Total	449	306	507	449	58	7
2014.9	MM-III	447	251	466	447	19	6
	PK	0	56	1	0	1	1
	Total	447	307	467	447	20	7
2015.3	MM-III	449	246	454	449	5	4
	Total	449	246	454	449	5	4
2015.9	MM-III	441	249	454	441	13	4
	Total	441	249	454	441	13	4
2016.3	MM-III	431	225	454	431	23	4
	PK	n/a	n/a	n/a	n/a	n/a	n/a
	Total	431	225	454	431	23	4
2016.9	MM-III	416	270	454	416	38	4
	PK	n/a	n/a	n/a	n/a	n/a	n/a
	Total	416	270	454	416	38	4
2017.3	MM-III	405	278	454	405	49	4
	Total	405	278	454	405	49	4
2017.9	MM-III	399	281	454	399	55	4
	Total	399	281	454	399	55	4

MM-III: Minuteman III PK: Peacekeeper

<SLBMs and SLBM Launchers>

Year and month		Deployed SLBMs	Non-deployed SLBMs	Deployed and Non-deployed Launchers of SLBMs	Deployed launchers of SLBMs	Non-deployed launchers of SLBMs	Test Launchers
2012.9	Trident II	239	180	336	239	97	0
	Total	239	180	336	239	97	0
2013.3	Trident II	232	176	336	232	104	0
	Total	232	176	336	232	104	0
2013.9	Trident II	260	147	336	260	76	0
	Total	260	147	336	260	76	0
2014.3	Trident II	240	168	336	240	96	0
	Total	240	168	336	240	96	0
2014.9	Trident II	260	151	336	260	76	0
	Total	260	151	336	260	76	0
2015.3	Trident II	248	160	336	248	88	0
	Total	248	160	336	248	88	0
2015.9	Trident II	236	190	336	236	100	0
	Total	236	190	336	236	100	0
2016.3	Trident II	230	199	324	230	94	0
	Total	230	199	324	230	94	0
2016.9	Trident II	209	210	320	209	111	0
	Total	209	210	320	209	111	0
2017.3	Trident II	220	203	300	220	80	0
	Total	220	203	300	220	80	0
2017.9	Trident II	212	215	280	212	68	0
	Total	212	215	280	212	68	0

<Heavy Bombers>

Year and month		Deployed Heavy Bombers	Non-deployed Heavy Bombers	Test Heavy Bombers	Heavy Bombers Equipped for Non-nuclear Armament
2012.9	B-2A	10	10	1	0
	B-52G	30	0	0	0
	B-52H	78	13	2	0
	Total	118	23	3	0
2013.3	B-2A	10	10	1	0
	B-52G	24	0	0	0
	B-52H	77	14	2	0
	Total	111	24	3	0
2013.9	B-2A	11	9	1	0
	B-52G	12	0	0	0
	B-52H	78	12	2	0
	Total	101	21	3	0
2014.3	B-2A	11	9	1	0
	B-52H	78	11	2	0
	Total	89	20	3	0

2014.9	B-2A	10	10	1	0
	B-52H	77	12	2	0
	Total	87	22	3	0
2015.3	B-2A	12	8	1	0
	B-52H	76	12	3	0
	Total	88	20	4	0
2015.9	B-2A	12	8	1	0
	B-52H	73	15	2	0
	Total	85	23	3	0
2016.3	B-2A	12	8	1	0
	B-52H	68	12	2	8
	Total	80	20	3	8
2016.9	B-2A	10	10	1	0
	B-52H	46	8	2	33
	Total	56	18	3	33
2017.3	B-2A	12	8	1	0
	B-52H	36	10	2	41
	Total	48	18	3	41
2017.9	B-2A	11	9	1	0
	B-52H	38	8	2	41
	Total	49	17	3	41

Sources: U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, November 30, 2012, http:// 2009-2017.state.gov/t/avc/rls/201216.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, July 1, 2013, http:// http:// 2009-2017.state.gov/t/avc/rls/201216.htm; U.S. Department of State.state.gov/t/avc/rls/211454.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, January 1, 2014, http:// http:// 2009-2017.state.gov/t/avc/rls/201216.htm; U.S. Department of State.state.gov/t/avc/rls/21922.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, July 1, 2014, http:// http:// 2009-2017.state.gov/t/avc/rls/201216.htm; U.S. Department of State.state.gov/t/avc/rls/228652.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, October 1, 2016, https://2009-2017.state.gov/t/avc/rls/2016/262624.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, January 1, 2017, https://2009-2017.state.gov/t/avc/rls/2016/266384.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, July 1, 2017, https://www.state.gov/t/avc/newstart/272337.htm; U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," Fact Sheet, January 12, 2018, https://www.state.gov/t/avc/newstart/277439.htm.

REDUCTIONS OF NON-STRATEGIC NUCLEAR WEAPONS AND ALLEGATIONS OF NON-COMPLIANCE OF THE INF TREATY

After the conclusion of the New START in 2010, there has been little meaningful progress on U.S.-Russian mutual nuclear reductions, particularly regarding non-strategic nuclear weapons. Russia has repeatedly called on the United States and other NATO member states, as a first step, to repatriate all U.S. non-strategic nuclear weapons stored in Europe.

There is little prospect of resolving the allegations of Russian non-compliance with the Intermediate-range Nuclear Forces (INF) Treaty, which the United States officially brought up in July 2014. According to the report, titled "Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments", issued by the U.S. Department of State in July 2017, "[t]he United States has determined that in 2016, the Russian Federation… continued to be in violation of its obligations under the INF Treaty not to possess, produce, or flight-test a ground-launched cruise missile (GLCM) with a range capability of 500 kilometers to 5,500 kilometers, or to possess or produce launchers of such missiles," and pointed out the INF Treaty's provisions related to the allegations of Russia's non-compliance.[48]

In this report, the United States revealed that it "requested to convene a session of the INF Treaty's implementation body, the Special Verification Commission (SVC)" in 2016 (for the first time since October 2003), and raised the issue of Russia's violation at the SVC session in November 2016.[49] The United States reported to have "provided detailed information to the Russian Federation over the course of these bilateral and multilateral engagements, more than enough information for the Russian side to identify the missile in question and engage substantively on the issue of its obligations under the INF Treaty," as follows:[50]

- Information pertaining to the missile and the launcher, including Russia's internal designator for the mobile launcher chassis and the names of the companies involved in developing and producing the missile and launcher;
- Information on the violating GLCM's test history, including coordinates of the tests and Russia's attempts to obfuscate the nature of the program;
- The violating GLCM has a range capability between 500 and 5,500 kilometers; and
- The violating GLCM is distinct from the R-500/SSC-7 GLCM or the RS-26 ICBM.

According to a news article in February 2017, Russia has two battalions of SCC-8 GLCMs (each battalion equipped with four launchers): one is located at Russia's missile test site at Kapustin Yar in southern Russia near Volgograd; and the other was shifted in December 2016 from that test site to an operational base elsewhere in the country.[51]

For its part, Russia dismissed the U.S. claims and asserted that it is the United States that has violated the INF Treaty, claiming that:

- U.S. tests of target-missiles for missile defense have similar characteristics to intermediate-range missiles;

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[48] U.S. Department of State, "Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments," April 2017, https://www.state.gov/t/avc/rls/rpt/2017/270330.htm. Regarding the issues that the United States has pointed out, see the *Hiroshima Report 2015* and the *Hiroshima Report 2016*.

[49] The SVC was also held in December 2017.

[50] U.S. Department of State, "Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments."

[51] Michael R. Gordon, "Russia Deploys Missile, Violating Treaty and Challenging Trump," *New York Times*, February 14, 2017, https://www.nytimes.com/2017/02/14/world/europe/russia-cruise-missile-arms-control-treaty.html.

- U.S. production of armed drones falls within the definition of ground-launched cruise missiles in the Treaty; and
- The Mk-41 launch system, which the United States intends to deploy in Poland and Romania in accordance with the European Phased Adaptive Approach of the BMD, can also launch intermediate-range cruise missiles.

The United States denies the Russian argument about U.S. violation of the INF Treaty. However, as a countermeasure to Russia's alleged violation, in November 2017, the U.S. Congress passed legislation requiring the Department of Defense to establish a program to begin development of a conventional, road-mobile GLC Mand authorized $58 million for this research, which is not prohibited by the treaty.[52] In addition, the U.S. State Department announced in December 2017 that while "the United States continues to seek a diplomatic resolution through all viable channels, including the INF Treaty's Special Verification Commission (SVC)…the U.S. Department of Defense is commencing INF Treaty-compliant research and development (R&D) by reviewing military concepts and options for conventional, ground-launched, intermediate-range missile systems." At the same time, the United States clarified that it "is prepared to immediately cease this R&D if the Russian Federation returns to full and verifiable compliance with the Treaty."[53]

Meanwhile, the possibility of Russia's withdrawal from the INF Treaty has been a concern, since Russia has not concealed a complaint about the situation where only Russia (as well as the United States) is prohibited from possessing a certain class of missiles under the treaty, while its neighbors, including China, possess them without any restrictions. However, Mikhail Ulyanov, Director of the Foreign Ministry Department for Non-Proliferation and Arms Control, denied Russia would withdraw.[54]

OTHER NUCLEAR-WEAPON/ARMED STATES

Among nuclear-armed states other than Russia and the United States, France and the United Kingdom have reduced their nuclear weapons unilaterally. The United Kingdom, which previously announced plans to reduce its nuclear forces to no more than 120 operationally available warheads and a total stockpile of no more than 180 warheads by the mid 2020s, declared in January 2015 that it had completed the reduction of the number of deployed warheads on each of its Nuclear-Powered Ballistic Missile Submarine (SSBN) from 48 to 40 as committed to in 2010, and the total number of operationally available warheads has therefore been reduced to 120.[55]

Among the five NWS, China has neither declared any concrete information on the number of deployed or possessed nuclear weapons, nor any plan for their reduction, while reiterating that it keeps its nuclear arsenal at the minimum level required for its national security.[56] Although it is widely estimated that China has not dramatically increased its nuclear arsenal numerically, it is not considered to have commenced action to reduce its nuclear weapons; rather China is likely to continue actively bolstering its nuclear arsenal qualitatively.

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[52] Kingston Reif, "Hill Wants Development of Banned Missile," *Arms Control Today*, Vol. 47, No. 10 (December 2017), p. 35.

[53] Bureau of Arms Control, Verification and Compliance, U.S. Department of State, "INF Treaty: At a Glance," Fact Sheet, December 8, 2017, https://www.state.gov/t/avc/rls/2017/276361.htm.

[54] "Russia: the US Intends to Withdraw from Open Skies Treaty," *UAWire*, September 26, 2017, https://uawire.org/russia-the-us-intends-to-withdraw-from-open-skies-treaty.

[55] "UK Downsizes Its Nuclear Arsenal," *Arms Control Today*, Vol. 45, No. 2 (March 2015), http://www.armscontrol.org/ACT/2015_03/News-Brief/UK-Downsizes-Its-Nuclear-Arsenal.

[56] NPT/CONF.2015/32, April 27, 2015.

As for India, Pakistan, Israel and North Korea, there is no information, statement or analysis which suggests any reduction of their nuclear weapons or capabilities. To the contrary, as noted below, they are expanding their nuclear programs.

B) A concrete plan for further reduction of nuclear weapons

In 2017, there were no new proposals by nuclear-armed states to take new, concrete measures for further reductions of their nuclear arsenals. The new U.S. administration indicated it would not conclude a concrete policy on nuclear weapons reduction until its nuclear posture review is completed. In the meantime, Russia and the United States have made no move toward further reductions of their strategic and non-strategic nuclear arsenals. Russia has insisted that the rest of the nuclear-armed states should participate in any future nuclear weapons reductions

However, China, France and the United Kingdom have not changed their positions that further significant reduction of Russian and U.S. nuclear arsenals is needed, so as to commence a multilateral process of nuclear weapons reductions. For instance, China argued that "[c]ountries possessing the largest nuclear arsenals bear special and primary responsibility for nuclear disarmament and should take the lead in substantially reducing those arsenals in a verifiable, irreversible and legally binding manner, thus creating the conditions necessary for the ultimate goal of general and comprehensive nuclear disarmament. When conditions are ripe, other nuclear-weapon States should also join the multilateral negotiations on nuclear disarmament."[57] However, it has not mentioned the extent of reductions in U.S. and Russian nuclear weapons, by which China would then participate in a process of multilateral nuclear weapons reduction. Regarding this point, France clearly stated in February 2015: "If the level of the other arsenals, particularly those of Russia and the United States, were to fall one day to a few hundred weapons, France would respond accordingly, as it always has."[58]

Nuclear-armed states have not presented concrete plans for nuclear weapons reduction. On the contrary, they have undertaken to modernize and/or strengthen their nuclear arsenals in the unstable international and regional security situation, as mentioned later. The United States implicitly criticized such actions of others, noting that: "[T]wo NPT nuclear weapon states are now expanding their nuclear arsenals and developing new kinds of capabilities, some of them potentially quite destabilizing. Both have also contributed to rising regional tensions."[59]

C) Trends on strengthening/ modernizing nuclear weapons capabilities

While nuclear-armed states have reiterated their commitments to promoting nuclear disarmament, they continue to modernize and/or strengthen their nuclear weapons capabilities.

CHINA

It is believed that China is actively modernizing its nuclear forces, details or numbers of which have never been declassified.

In its Annual Report on the Chinese Military in 2017, the U.S. Department of Defense reported that China is estimated to possess approximately 75-100 ICBMs—DF-5A, DF-5B (MIRVed), DF-31/31A and DF-4. In the maritime, China has four operational JIN-class SSBN (Type 094) armed with JL-2 SLBMs pland a

[57] NPT/CONF.2020/PC.I/WP.36, May 9, 2017.

[58] "Statement by France," General Debate, First Session of the Preparatory Committee for the 2020 NPT Review Conference, May 3, 2017.

[59] "Statement by the United States," Cluster 1, First Session of the Preparatory Committee for the 2020 NPT Review Conference, May 4, 2017.

next generation Type 096 SSBN armed with a follow-on JL-3 SLBM will likely begin construction in the early-2020s.[60] The United States also estimates that "China maintains nuclear-capable delivery systems in its missile forces and navy and is developing a strategic bomber that officials expect to have a nuclear mission."[61]

In January 2017, it was reported that China had deployed MIRVed ICBM DF-41, capable of carrying 10-12 nuclear warheads.[62] China reportedly conducted a flight test of the MIRV'd ICBM DF-5C in the same month,[63] although China did not confirm it was MIRVed.[64]

FRANCE

In 2017 no significant movement was reported regarding nuclear modernization by France. It introduced new M-51 SLBMs in 2010, with an estimated range of 8,000 km. They were loaded in the fourth Le Triomphant-class SSBN. The previous three Le Triomphant-class SSBNs remain equipped with M-45 SLBMs that have a range of 6,000km. France plans to replace those M-45s with M-51s by 2017-2018.[65]

In a speech on nuclear policies in February 2015, President François Hollande announced France would replace the last remaining Mirage 2000N fighters with Rafales, carrying the ASMPA (improved air-to-ground medium-range missile system), by 2018. He said he had instructed the Atomic Energy Commission to prepare the necessary adaptations of its nuclear warheads ahead of the end of their operational life, without nuclear testing; and he underlined France's commitment not to produce new types of nuclear weapon. He also declassified in this speech that the French nuclear deterrent consists of 54 middle-range ALCMs and three sets of 16 SLBMs.[66]

RUSSIA

Russia continued to develop new types of strategic nuclear forces to replace its aging systems. As mentioned in the *Hiroshima Report 2017*, Russia planned to start deployment of the RS-28 (Sarmat) in 2018, which Russia has developed as a successor of the SS-18 heavy ICBMs. Russia also seeks to reintroduce a train-mobile ICBM by 2020, and reportedly plans to conduct its flight test in 2019.[67] In addition, Russia continues to build the Borei-class SSBNs.

Russia's Minister of Defense Sergei Shoigu announced in February 2017 that 90 percent of Russia's strategic nuclear forces will be armed with modern weaponry by 2020, and over 60 percent of the Strategic Missiles Forces will be armed with new weapon systems by late 2020.[68] However, due to economic difficulties, it is considered that Russia's modernizing nuclear

[60] U.S. Department of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2017*, May 2017, pp. 24, 31.

[61] Ibid., p. 61.

[62] "China Deploys Intercontinental Missiles Near Russian Border — Media," *Tass*, January 24, 2017, http://tass.com/world/926888.

[63] Bill Gertz, "China Tests Missile with 10 Warheads," *Washington Free Beacon*, January 31, 2017, http://freebeacon.com/national-security/china-tests-missile-10-warheads/.

[64] "China Says Its Trial Launch of DF-5C Missile Normal," *China Military*, February 6, 2017, http://english.chinamil.com.cn/view/2017-02/06/content_7477866.htm.

[65] See, for example, "France Submarine Capabilities," Nuclear Threat Initiative, August 15, 2013, http://www.nti.org/analysis/ articles/france-submarine-capabilities/.

[66] François Hollande, "Nuclear Deterrence—Visit to the Strategic Air Forces," February 19, 2015, http://basedoc.diplomatie.gouv.fr/vues/Kiosque/FranceDiplomatie/kiosque.php?fichier=baen2015-02-23.html#Chapitre1.

[67] "Russia to Conduct Flight Tests of Missile for 'Nuclear Train' in 2019," *Sputnik News*, January 19, 2017, https://sputniknews.com/russia/201701191049778679-russia-nuclear-missile-test/.

[68] Franz-Stefan Gady, "Russia to Arm 90 Percent of Strategic Nuclear Forces with Modern Weaponry by 2020," *Diplomat*, February 23, 2017, https://thediplomat.com/2017/02/russia-to-arm-90-percent-of-strategic-nuclear-forces-with-modern-weaponry-by-2020/.

forces will not be implemented as planned.

THE UNITED KINGDOM

In October 2015, the United Kingdom decided to construct a new class of four SSBNs as replacements of the existing Vanguard-class SSBNs. Their construction has already started.

In July 2016, the U.K. Parliament approved the government decision to maintain the U.K.'s nuclear deterrent beyond the early 2030s, with subsequent October 2016 commencement of the construction phase for a new Dreadnought-class of four SSBNs, as replacements for the existing Vanguard-class SSBNs, at a projected cost of £31 billion (with additional £10 billion contingency). The first new SSBN is expected to enter into service in the early 2030s. In parallel, the United Kingdom is participating in the U.S. current service-life extension program for the Trident II D5 missile. It is reported that a U.K. decision on a replacement warhead has been deferred until 2019/2020.[69]

THE UNITED STATES

Since the timing of renewal of the U.S. strategic delivery vehicles, which began deployment during the Cold War, is coming closer, the United States has contemplated development of succeeding ICBMs, SSBNs and strategic bombers (and LRSOs for use thereon).[70] In addition, with heightening U.S. threat perceptions vis-à-vis, among others, North Korea and Russia, interest in non-strategic nuclear forces has also been increasing both inside and outside of the U.S. administration.

Soon after his inauguration in January 2017, President Trump strongly suggested a possibility of strengthening the U.S. nuclear forces, saying: "I am the first one that would like to see ... nobody have nukes, but we're never going to fall behind any country even if it's a friendly country, we're never going to fall behind on nuclear power. It would be wonderful, a dream would be that no country would have nukes, but if countries are going to have nukes, we're going to be at the top of the pack."[71] While concrete policies on nuclear weapons modernization under the Trump administration have been contemplated along with its nuclear posture reviews, the U.S. National Security Strategy (NSS) that was releasessd in December 2017 stated: "The United States must maintain the credible deterrence and assurance capabilities provided by our nuclear Triad and by U.S. theater nuclear capabilities deployed abroad. Significant investment is needed to maintain a U.S. nuclear arsenal and infrastructure that is able to meet national security threats over the coming decades."[72]

Meanwhile, the U.S. Air Force announced new contracts for initial development of LRSO ($1.8 billion) and GBSD ($700 million) in August.[73] In addition, the U.S. Navy awarded a $5.1 billion contract to General Dynamics Electric Boat for Integrated

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[69] Claire Mills and Noel Dempsey, "Replacing the UK's nuclear deterrent: Progress of the Dreadnought class," UK Parliament, House of Commons Briefing Paper, June 19, 2017.

[70] Regarding the U.S. nuclear modernization program, see, for instance, "U.S. Nuclear Modernization Program," Fact Sheet and Brief, Arms Control Association, December 2016, https://www.armscontrol.org/factsheets/USNuclearModernization.

[71] Steve Holland, "Trump Wants to Make Sure U.S. Nuclear Arsenal at 'Top of the Pack,'" *Reuters*, February 23, 2017, https://www.reuters.com/article/us-usa-trump-exclusive/trump-wants-to-make-sure-u-s-nuclear-arsenal-at-top-of-the-pack-idUSKBN1622IF.

[72] United States of America, "National Security Strategy," December 2017, p. 30.

[73] David E. Sanger and William J. Broad, "Trump Forges Ahead on Costly Nuclear Overhaul," *New York Times*, August 27, 2017, https://www.nytimes.com/2017/08/27/us/politics/trump-nuclear-overhaul.html. Some experts have argued against development of dual-capable LRSO because of lack of necessity for its nuclear posture, as well as a possibility of misperception of nuclear attack by an opponent (even if the missile mounts a conventional warhead). See, for example, William J. Perry and Andy Weber, "Mr. President, Kill the New Cruise Missile," *Washington Post*, October 15, 2015, https://www.washingtonpost.com/opinions/mr-president-kill-the-new-cruise-missile/2015/10/15/e3e2807c-6ecd-11e5-9bfe-e59f5e244f92_story.html.

Product and Process Development (IPPD), including the design, completion, component and technology development and prototyping efforts, of the Columbia Class SSBNs in September.[74]

An estimated cost of procuring strategic nuclear forces has been increasing. The Congressional Budget Office (CBO) estimated that over the 2017-2026 period, the plans for nuclear forces specified in the 2017 budget requests by the Departments of Defense and Energy would cost a total of $400 billion, which is 15 percent higher than the CBO's most recent estimate.[75] Furthermore, the CBO estimated in October 2017 that maintenance and development of nuclear forces would cost $1.2 trillion over the 2017-2046 period: more than $800 billion to operate and sustain (that is, incrementally upgrade) nuclear forces and about $400 billion to modernize them.[76]

INDIA

India seems to be energetically pursuing developments toward constructing a strategic nuclear triad, that is: ICBMs, SLBMs and nuclear bombers. The nation's second strategic nuclear submarine Aridhant was launched in November 2017. India reportedly plans to build a bigger and more potent version of the indigenous nuclear submarine in the immediate future.[77] As for ICBMs, however, contrary to earlier predictions, as of the end of 2017 the mobile-ICBM Agni 5 had not been reported to have started operation.

ISRAEL

It is unclear whether the Israeli Jericho III IRBM remains under development or is already deployed. Along with the land- and air-based components of its nuclear deterrent, Israel is also believed to have deployed a nuclear-capable SLCM. It has signed a memorandum of understanding (MoU) relating to the purchase of three additional Dolphin-class submarines from Germany, which are capable to load the SLCM mentioned above.[78]

PAKISTAN

Pakistan has prioritized development and deployment of nuclear-capable short- and medium-range missiles for ensuring deterrence vis-à-vis India. In January 2017, Pakistan conducted the first flight test of MIRVed IRBM Ababeel, with a range of 2,200 km.[79] A U.S. think tank also assessed that "Pakistan has constructed a hardened, secure, underground complex in Baluchistan Province that could serve as a ballistic missile and nuclear warhead storage site."[80]

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[74] "Navy Awards Contract for Columbia Class Submarine Development," *America's Navy*, September 21, 2017, http://www.navy.mil/submit/display.asp?story_id=102534.

[75] Congressional Budget Office, "Projected Costs of U.S. Nuclear Forces, 2017 to 2026," February 2017, https://www.cbo.gov/sites/default/files/115th-congress-2017-2018/reports/52401-nuclearcosts.pdf.

[76] Congressional Budget Office, "Approaches for Managing the Costs of U.S. Nuclear Forces, 2017 to 2046," October 2017. See also "New CBO Report Warns of Skyrocketing Costs of U.S. Nuclear Arsenal," Arms Control Association, October 31, 2017, https://www.armscontrol.org/pressroom/2017-10/new-cbo-report-warns-skyrocketing-costs-us-nuclear-arsenal.

[77] Franz-Stefan Gady, "India Launches Second Ballistic Missile Sub," *Diplomat*, December 13, 2017, https://thediplomat.com/2017/12/india-launches-second-ballistic-missile-sub/; Dinakar Peri and Josy Joseph, "A Bigger Nuclear Submarine is Coming," *The Hindu*, October 15, 2017, http://www.thehindu.com/news/national/a-bigger-nuclear-submarine-is-coming/article19862549.ece.

[78] "Israel Signs MoU to Purchase Dolphin-class Submarines from Germany," *Naval Technology*, October 25, 2017, https://www.naval-technology.com/news/newsisrael-signs-mou-to-purchase-dolphin-class-submarines-from-germany-5956187/.

[79] "Pakistan Conducts First Flight Test of Nuclear-capable 'Ababeel' Missile," *Indian Express*, January 24, 2017, http://indianexpress.com/article/world/pakistan-nuclear-missile-test-4489709/.

[80] David Albright, Sarah Burkhard, Allison Lach and Frank Pabian, "Potential Nuclear Weapons-related Military Area in Baluchistan, Pakistan," Institute for Science and International Security, August 10, 2017, http://isis-online.org/isis-reports/detail/potential-nuclear-weapons-related-military-area-in-baluchistan-pakistan/.

NORTH KOREA

Nuclear weapons

North Korea conducted nuclear- and missile-related activities in 2017 as aggressively as previous years. The most noteworthy event was an underground nuclear test on September 3, which North Korea claimed was a hydrogen bomb. While it is uncertain whether the hydrogen bomb was used, as announced by North Korea, its explosive power was estimated to be about 160 kt, which was far beyond that of the North's past nuclear tests. According to state media, the claimed "H-bomb, the explosive power of which is adjustable from tens kiloton to hundreds kiloton, is a multi-functional thermonuclear nuke with great destructive power which can be detonated even at high altitudes for super-powerful [electro magnetic pulse (EMP)] attack according to strategic goals… All components of the H-bomb were homemade and all the processes ranging from the production of weapons-grade nuclear materials to precision processing of components and their assembling were put on the Juche basis, thus enabling the country to produce powerful nuclear weapons as many as it wants."[81]

It is also not certain whether North Korea has succeeded in miniaturizing nuclear warheads able to fit into the nosecone of its missiles. The U.S. Defense Intelligence Agency (DIA) assesses, however, that "North Korea has produced nuclear weapons for ballistic missile delivery, to include delivery by ICBM-class missiles,"[82] which would appear to mean that North Korea already succeeded in miniaturization. The North has not demonstrated missile re-entry technology, but it is considered likely that this can be mastered within a year or two, if not earlier.

Regarding the number of North Korea's nuclear weapons, a reputable U.S. think tank estimates that, based on the estimated amount of fissile material produced by the North (33 kg of separated plutonium and 175-645 kg of weapon-grade uranium), it possessed 13 to 30 nuclear weapons by the end of 2016 and that it is currently expanding its nuclear weapons at a rate of about 3-5 weapons per year. Accordingly, through 2020, North Korea is projected to have 25-50 nuclear weapons.[83]

Fissile Material

Because North Korea has not accepted external monitoring of its nuclear activities since 2002, the actual situation of its activities for further manufacturing of nuclear weapons is unclear. Based on its nuclear testing and announcements, however, as well as other evidence, there is no doubt that North Korea is aggressively expanding its nuclear program. In March 2017, IAEA Director-General Yukiya Amano stated that North Korea had doubled the size of its uranium-enriching facility in Yongbyon in recent years.[84] In September, he said that there were indications that the Yongbyon Experimental Nuclear

[81] "Kim Jong Un Gives Guidance to Nuclear Weaponization," *KCNA*, September 3, 2017, http://www.kcna.co.jp/item/2017/201709/news03/20170903-01ee.html.

[82] Joby Warrick, Ellen Nakashima and Anna Fifield, "North Korea Now Making Missile-ready Nuclear Weapons, U.S. Analysts Say," *Washington Post*, August 8, 2017, https://www.washingtonpost.com/world/national-security/north-korea-now-making-missile-ready-nuclear-weapons-us-analysts-say/2017/08/08/e14b882a-7b6b-11e7-9d08-b79f191668ed_story.html.

[83] David Albright, "North Korea's Nuclear Capabilities: A Fresh Look," Institute for Science and International Security, April 28, 2017, http://isis-online.org/isis-reports/detail/north-koreas-nuclear-capabilities-a-fresh-look/10.

[84] Jay Solomon, "North Korea Has Doubled Size of Uranium-enrichment Facility, IAEA Chief Says," *Wall Street Journal*, March 20, 2017, https://www.wsj.com/articles/north-korea-has-doubled-size-of-uranium-enrichment-facility-iaea-chief-says-1490046264.

Power Plant could be operating.[85] While North Korea maintains that this reactor is intended for civil nuclear energy purposes, it could be used to produce fissile material for weapons. Of direct relevance to weapons production, U.S. experts analyzed from satellite imagery that "[t]he Radiochemical Laboratory operated intermittently and there have apparently been at least two unreported reprocessing campaigns to produce an undetermined amount of plutonium that can further increase North Korea's nuclear weapons stockpile.[86]

Missiles

In addition to its nuclear weapons, North Korea's ballistic missile-related activities in 2017 were also extraordinarily active.

On March 6, North Korea simultaneously launched four Scud-ER MRBMs, which flew approximately 1,000 km into the Sea of Japan, three of them landing in Japan's EEZ. North Korea announced that "[i]nvolved in the drill were Hwasong artillery units of the KPA Strategic Force tasked to strike the bases of the U.S. imperialist aggressor forces in Japan in contingency."[87] On May 14, according to North Korea, with "aim[ing] at verifying the tactical and technological specifications of the newly-developed ballistic rocket capable of carrying a large-size heavy nuclear warhead," it conducted a test launch of Hwasong-12 IRBM, which "hit the targeted open waters 787 km away after flying to the maximum altitude of 2,111.5 km along its planned flight orbit."[88] Furthermore, on August 29 and September 15, the North repeated Hwasong-12 flight tests which passed over Japan in normal orbit and landed in the Pacific Ocean, flying 2,700 km in August and 3,700 km in September respectively.[89] These tests proved that its Hwasong-12 has the ability of reaching Guam. In addition, in the September test, North Korea showed a capability to shorten the time of preparation of launching missiles by directly firing from the mobile launcher.

North Korea demonstrated an ICBM capability in a latter half of 2017. In January 2017, it stated: "The DPRK's ICBM development is part of its efforts for bolstering its capability for self-defense to cope with the ever more undisguised nuclear war threat from the U.S...The ICBM will be launched anytime and anywhere determined by the supreme headquarters of the DPRK."[90] On July 4, North Korea launched a Hwasong-14 ICBM, which "was boosted to the maximum height of 2,802 km and traveled 933 km distance," according to the North.[91] A U.S. expert estimates that "[i]f the data is correct, preliminary trajectory reconstructions indicate that if the missile

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[85] "IAEA Says Indications Show DPRK's Nuclear Reactor Could be Operating," *Xinhua*, September 11, 2017, http://news.xinhuanet.com/english/2017-09/11/c_136601162.htm. In January 2017, a U.S. think tank also pointed out a possibility of resumption of this nuclear reactor. See Jack Liu and Joseph S. Bermudez Jr., "North Korea's Yongbyon Nuclear Facility: Operations Resume at the 5 MWe Plutonium Production Reactor," *38 North*, January 27, 2017, http://38north.org/2017/01/yongbyon012717/.

[86] Joseph S. Bermudez Jr., Mike Eley, Jack Liu and Frank V. Pabian, "North Korea's Yongbyon Facility: Probable Production of Additional Plutonium for Nuclear Weapons," *38 North*, July 14, 2017, http://www.38north.org/2017/07/yongbyon071417/.

[87] "Kim Jong Un Supervises Ballistic Rockets Launching Drill of Hwasong Artillery Units of KPA Strategic Force," *KCNA*, March 7, 2017, http://www.kcna.co.jp/item/2017/201703/news07/20170307-01ee.html.

[88] "Kim Jong Un Guides Test-Fire of New Rocket," *KCNA*, May 15, 2017, http://www.kcna.co.jp/item/2017/201705/news15/20170515-01ee.html.

[89] Before this test, four North Korean ballistic missiles—Taepodong-1 in 1998, Unha-2 in 2009, Unha-3 in 2012 and Kwangmyongsong-4 in 2016—passed over Japan.

[90] "DPRK's ICBM Development Is to Cope with U.S. Nuclear War Threat: FM Spokesman," *KCNA*, January 8, 2017, http://www.kcna.co.jp/item/2017/201701/news08/20170108-09ee.html.

[91] "Report of DPRK Academy of Defence Science," *KCNA*, July 4, 2017, http://www.kcna.co.jp/item/2017/201707/news04/20170704-21ee.html.

were fired on a more efficient trajectory it would reach a range of anywhere from 6,700 to 8,000 km."[92] North Korea stated that:

> The test-launch was aimed to confirm the tactical and technological specifications and technological features of the newly developed inter-continental ballistic rocket capable of carrying large-sized heavy nuclear warhead and to finally verify all technical features of the payload of the rocket during its atmospheric reentry including the heat-resisting features and structural safety of the warhead tip of ICBM made of newly developed domestic carbon compound material, in particular.
>
> ...[T]he inner temperature of the warhead tip was maintained at 25 to 45 degrees centigrade despite the harsh atmospheric reentry conditions of having to face the heat reaching thousands of degrees centigrade, extreme overload and vibration, the nuclear warhead detonation control device successfully worked, and the warhead accurately hit the targeted waters without any structural breakdown at the end of its flight.[93]

North Korea conducted a test flight of Hwasong-14 again on July 28, which was announced to have reached an altitude of 3,724.9 km and flew 998 km for 47 minutes and 12 seconds before landing"[94] in Japan's EEZ. These tests demonstrated that the Hwasong-14 has an ability of reaching the U.S homeland if it is launched in a normal orbit. On the other hand, governmental officials and experts of Japan, the United States and South Korea analyze that the re-entry vehicle from that launch failed to successfully re-enter the atmosphere.[95]

Most ominously, on November 29 North Korea launched a much larger new, ICBM, called the Hwasong-15, which soared to an altitude of 4,475 km and flew a distance of 950 km for 53 minutes before making an accurate landing in the preset waters in Japan's EEZ in the Sea of Japan, according to North Korea. If it had flown a normal rather than a lofted trajectory, it could reach the entire U.S. homeland. The North praised the successful test and stated: "With this system, the DPRK has become possessed of another new-type inter-continental ballistic rocket weaponry system capable of carrying super-heavy nuclear warhead and attacking the whole mainland of the U.S....[T]he day was a significant day when the historic cause of completing the state nuclear force, the cause of building a rocket power was realized, adding that the day, on which the great might of putting the strategic position of the DPRK on a higher stage was given birth, should be specially recorded in the history of the country."[96] U.S. experts estimated that "the Hwasong-15 can deliver a 1,000-kg payload to any point on the US mainland. North Korea has almost certainly developed a nuclear warhead that weighs less than 700 kg, if not one considerably lighter."[97] On the other hand, a U.S. governmental official stated that the North had problems with re-

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[92] John Schilling, "North Korea Finally Tests an ICBM," *38 North*, July 5, 2017, http://www.38north.org/2017/07/jschilling070517/.

[93] "Kim Jong Un Supervises Test-launch of Inter-continental Ballistic Rocket Hwasong-14," *KCNA*, July 5, 2017, http://www.kcna.co.jp/item/2017/201707/news05/20170705-01ee.html.

[94] "Kim Jong Un Guides Second Test-fire of ICBM Hwasong-14," *KCNA*, July 29, 2017, http://www.kcna.co.jp/item/2017/201707/news29/20170729-04ee.html.

[95] Michael Elleman, "Video Casts Doubt on North Korea's Ability to Field an ICBM Re-entry Vehicle," *38 North*, July 31, 2017, http://www.38north.org/2017/07/melleman073117/; John Schilling, "What Next for North Korea's ICBM?" *38 North*, August 1, 2017, http://www.38north.org/2017/08/jschilling080117/.

[96] "Kim Jong Un Guides Test-fire of ICBM Hwasong-15," *KCNA*, November 29, 2017, http://www.kcna.co.jp/item/2017/201711/news29/20171129-14ee.html.

[97] Michael Elleman, "The New Hwasong-15 ICBM: Significant Improvement That May be Ready as Early as 2018," *38 North*, November 30, 2017, http://www.38north.org/2017/11/melleman113017/.

entry technologies, in addition to guiding ballistic missiles.[98]

North Korea's SLBM developments are also likely advanced. It conducted a test launch of Pukguksong-2 on May 21. After the test, Workers' Party of Korea chairman Kim Jong Un approved the deployment and mass-production of this weapon system.[99] North Koreaa also reportedly continues active development of SLBMs[100] and construction of a new ballistic missile submarine.[101]

(5) DIMINISHING THE ROLE AND SIGNIFICANCE OF NUCLEAR WEAPONS IN NATIONAL SECURITY STRATEGIES AND POLICIES

A) The current status of the roles and significance of nuclear weapons

No NWS announced new policies regarding the role of nuclear weapons in 2017,[102] but the United States indicated it would do so early in 2018 as a result of its nuclear posture review. Meanwhile, its NSS in December 2017 mentioned that "[w]hile nuclear deterrence strategies cannot prevent all conflict, they are essential to prevent nuclear attacks, non-nuclear strategic attacks, and large-scale conventional aggression."[103] Each nuclear-armed state emphasizes that the role of its nuclear weapons is defensive, including deterrence vis-à-vis an attack against its vital interests.

As an issue on the role of nuclear weapons, it should be noted since 2014, that Russia has engaged in repeated nuclear saber-rattling. The tone of Russia's nuclear provocation did become more sober in 2017, however. Still, Russian strategic bombers continue, inter alia, approaching and violating the airspace of European NATO countries. Russia also deploys the nuclear-capable Iskander-M SLBM in Kaliningrad, which was launched during its military exercise Zapad-2017.[104]

Again in 2017, North Korea made many provocative statements regarding nuclear weapons, including the following:

- "In case of a nuclear war on the peninsula, Japan that houses logistic bases, launching bases and sortie bases of the U.S. forces will be put under radioactive clouds before any country."[105]
- "All the military attack means of the DPRK including nuclear weapons that have already been deployed for an actual war are leveled at the U.S. imperialist aggression forces' bases

[98] Barbara Starr and Ray Sanchez, "North Korea's New ICBM Likely Broke Up Upon Re-entry, US Official Says," *CNN*, December 3, 2017, http://edition.cnn.com/2017/12/02/asia/north-korea-missile-re-entry/index.html.

[99] "Kim Jong Un Supervises Test-fire of Ballistic Missile," *KCNA*, May 22, 2017, http://www.kcna.co.jp/item/2017/201705/news22/20170522-01ee.html.

[100] See, for example, Joseph S. Bermudez, Jr., "North Korea's Submarine-launched Ballistic Missile Program Advances: Second Missile Test Stand Barge Almost Operational," *38 North*, December 1, 2017, https://www.38north.org/2017/12/nampo120117/.

[101] Ankit Panda, "The Sinpo-C-Class: A New North Korean Ballistic Missile Submarine Is under Construction," *Diplomat*, October 18, 2017, https://thediplomat.com/2017/10/the-sinpo-c-class-a-new-north-korean-ballistic-missile-submarine-is-under-construction/. See also Joseph S. Bermudez Jr., "North Korea's Submarine Ballistic Missile Program Moves Ahead: Indications of Shipbuilding and Missile Ejection Testing," *38 North*, November 16, 2017, http://www.38north.org/2017/11/sinpo111617/.

[102] For each nuclear-armed states' basic nuclear policy, see the *Hiroshima Report 2017*.

[103] United States of America, "National Security Strategy," December 2017, p. 30.

[104] "Iskander-M Missile Hits Target in Kazakhstan at Zapad-2017 Drills," *Tass*, September 18, 2017, http://tass.com/defense/966182; Maggie Tennis, "Russia Showcases Military Capabilities," *Arms Control Today*, Vol. 47, No. 9 (November 2017), p. 24.

[105] "Reckless Acts of Precipitating Ruin," *Rodong Sinmum*, May 3, 2017, http://www.rodong.rep.kp/en/index.php?strPageID=SF01_02_01&newsID=2017-05-03-0005.

in Japan as well as the U.S. mainland. And they are waiting for the moment to launch annihilating blows."[106]

- "The KPA Strategic Force is now carefully examining the operational plan for making an enveloping fire at the areas around Guam with medium-to-long-range strategic ballistic rocket Hwasong-12 in order to contain the U.S. major military bases on Guam including the Anderson Air Force Base in which the U.S. strategic bombers, which get on the nerves of the DPRK and threaten and blackmail it through their frequent visits to the sky above south Korea, are stationed and to send a serious warning signal to the U.S."[107]
- "The KPA will start the Korean-style preemptive retaliatory operation of justice to wipe out the group of despicable plot-breeders once a slight sign of the U.S. provocation scheming to dare carry out a 'beheading operation' against the supreme headquarters of the Korean revolution out of wild calculation is detected. The Korean-style earlier preemptive attack will burn up all the objects in the areas under the control of the first and third field armies of the puppet forces including Seoul the moment the U.S. reckless attempt at preemptive attack is spotted, and will lead to the all-out attack for neutralizing the launch bases of the U.S. imperialist aggression forces in the Pacific operational theatre together with the simultaneous strike at the depth of the whole of the southern half."[108]
- "Onodera, who took the post of [Japan's] defence minister on August 4, officially made public the stand by saying at a press conference that the Japan Defence Ministry is examining the 'possession of ability for attacking enemy bases aimed at mounting a preemptive attack at the missile bases of the north' as a measure for countering the DPRK's ballistic rocket launch. The DPRK has already acquired the capabilities of reducing the Japanese archipelago to ashes in a second once it makes up its mind. The Japanese reactionaries should clearly understand that their mean, frivolous and mischievous act will only face merciless telling blow by the nuclear fist and that in that case the whole Japanese archipelago might be buried in the Pacific."[109]
- "The Hwasong-12 rockets to be launched by the KPA will cross the sky above Shimane, Hiroshima and Koichi Prefectures of Japan. They will fly 3,356.7 km for 1,065 seconds and hit the waters 30 to 40 km away from Guam."[110]
- "The behaviors of Japs, sworn enemy of the Korean nation, are enraging us. The wicked Japs should not be pardoned as they have not yet made a sincere apology for the never-to-be-condoned crimes against our people but acted disgustingly, dancing to the tune of the U.S. 'sanctions.' A telling blow should be dealt to them who have not yet come to senses after the launch of our ICBM over the Japanese archipelago. The four islands of the archipelago should be sunken into the sea by the nuclear bomb of Juche. Japan is no longer needed to exist near us. This is the voices of the

[106] "Japan Should Practice Self-Control", *KCNA*, May 20, 2017. http://www.kcna.co.jp/index-e.htm.

[107] "U.S. Should Be Prudent under Present Acute Situation: Spokesman for KPA Strategic Force", *KCNA*, August 9, 2017, http://www.kcna.co.jp/index-e.htm.

[108] "U.S. War Hysteria Will Only Bring Miserable End of American Empire: Spokesman for KPA General Staff", *KCNA*, August 9, 2017, http://www.kcna.co.jp/index-e.htm.

[109] "Japanese Reactionaries Should Not Go Frivolous before Merciless Nuclear Fist", *KCNA*, August 9, 2017, http://www.kcna.co.jp/index-e.htm.

[110] "KPA Will Take Practical Action: Commander of Strategic Force", *KCNA*, August 10, 2017, http://www.kcna.co.jp/index-e.htm.

enraged Korean army and people."[111]

- Kim Jong Un stated in January 2018: "[O]ur Republic has at last come to possess a powerful and reliable war deterrent, which no force and nothing can reverse…The whole of its mainland is within the range of our nuclear strike and the nuclear button is on my office desk all the time; the United States needs to be clearly aware that this is not merely a threat but a reality."[112]

On the other hand, amid increasing tension on the North Korean issue, the United States dispatched B-1 and B-52 strategic bombers to the Korean Peninsula for conducting respective joint exercises with Japan and South Korea, aiming to bolster deterrence against the North and reassurance for its allies in Northeast Asia. In September, the U.S. Department of Defense announced that B-1B strategic bombers "flew in international airspace over waters east of North Korea. This is the farthest north of the Demilitarized Zone (DMZ) any U.S. fighter or bomber aircraft have flown off North Korea's coast in the 21st century."[113] Additionally, President Trump threatened North Korea repeatedly, saying for instance:

- "North Korea best not make any more threats to the United States. They will be met with fire and fury like the world has never seen." (Twitter, August 8, 2017)
- "The United States has great strength and patience, but if it is forced to defend itself or its allies, we will have no choice but to totally destroy North Korea. Rocket Man is on a suicide mission for himself and for his regime. The United States is ready, willing and able, but hopefully this will not be necessary."[114]
- "We are totally prepared for the second option, not a preferred option…But if we take that option, it will be devastating, I can tell you that, devastating for North Korea. That's called the military option. If we have to take it, we will."[115]
- "North Korean Leader Kim Jong Un just stated that the 'Nuclear Button is on his desk at all times.' Will someone from his depleted and food starved regime please inform him that I too have a Nuclear Button, but it is a much bigger & more powerful one than his, and my Button works!" (Twitter, January 2, 2018)

B) Commitment to "sole purpose," no first use, and related doctrines

In 2017, no nuclear-armed state changed or transformed its policies regarding no first use (NFU) or the "sole purpose" of nuclear weapons. Among the NWS, only China has highlighted a NFU policy.[116] There are expectations that the Trump Administraion will change the previous U.S. administration's policy that "[t]he fundamental role of [its] nuclear weapons remains to deter nuclear attack on the United States

[111] "KAPPC Spokesman on DPRK Stand toward UNSC "Sanctions Resolution"", *KCNA*, September 13, 2017, http://www.kcna.co.jp/index-e.htm.

[112] "Kim Jong Un's 2018 New Year's Address," January 1, 2018, https://www.ncnk.org/node/1427.

[113] U.S. Department of Defense, "U.S. Flies B1-B bomber Mission off of North Korean Coast," September 23, 2017, https://www.defense.gov/News/News-Releases/News-Release-View/Article/1322213/us-flies-b1-b-bomber-mission-off-of-north-korean-coast/.

[114] "Remarks by President Trump to the 72nd Session of the United Nations General Assembly," September 19, 2017, https://www.whitehouse.gov/briefings-statements/remarks-president-trump-72nd-session-united-nations-general-assembly/.

[115] Steve Holland and Idrees Ali, "Trump: Military Option for North Korea not Preferred, But would be 'Devastating,'" *Reuters*, September 25, 2017, https://www.reuters.com/article/us-northkorea-missiles/trump-military-option-for-north-korea-not-preferred-but-would-be-devastating-idUSKCN1C026A.

[116] However, the United States considers that "[t]here is some ambiguity…over the conditions under which China's NFU policy would apply." U.S. Department of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2017*, May 2017, p. 60.

and its Allies and partners."[117]

Among the other nuclear-armed states, India maintains a NFU policy despite reserving an option of nuclear retaliation vis-à-vis a major biological or chemical attack against it. On the other hand, Pakistan, which has developed short-range nuclear weapons to counter the "Cold Sstart doctrine" adopted by the Indian Army,[118] does not exclude the possibility of using nuclear weapons against an opponent's conventional attack. Pakistan Foreign Minister Khawaja Mohammad Asif has warned that if India launched a surgical strike on the country's nuclear installations, nobody should expect restraint from Islamabad either.[119] Against a background of such a nuclear posture by Pakistan, it has been reported that India may review its NFU policy. However, the Indian government denies any plan to change its existing nuclear policies.[120]

While North Korea had previously announced NFU of nuclear weapons, it declared a change to this policy in 2016. Foreign Minister Ri Yong Ho stated in September 2017: "We will take preventive measures by merciless pre-emptive action in case the U.S. and its vassal forces show any sign of conducting a kind of 'decapitating' operation on our headquarters or military attack against our country…However, we do not have any intention at all to use or threaten to use nuclear weapons against the countries that do not join in the U.S. military actions against the DPRK."[121]

C) Negative security assurances

No NWS changed its negative security assurance (NSA) policy in 2017: China is the only NWS that has declared an unconditional NSA for NNWS; other NWS add some conditionality to their NSA policies. The United Kingdom and the United States declared they would not to use or threaten to use nuclear weapons against NNWS that are parties to the NPT and in compliance with their non-proliferation obligations. The U.K.'s additional condition is that: "while there is currently no direct threat to the United Kingdom or its vital interests from States developing capabilities in other weapons of mass destruction, for example chemical and biological, we reserve the right to review this assurance if the future threat, development and proliferation of these weapons make it necessary."[122]

In 2015, France slightly modified its NSA commitment, which is that: "France will not use nuclear weapons against states not armed with them that are signatories of the NPT and that respect their international obligations for non-proliferation of weapons of mass destruction."[123] However, it preserves an additional

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[117] U.S. Department of Defense, "Report on Nuclear Employment Strategy," June 19, 2013, p. 4.

[118] "Short-range Nuclear Weapons to Counter India's Cold Start Doctrine: Pakistan PM," *Live Mint*, September 21, 2017, http://www.livemint.com/Politics/z8zop6Ytu4bPiksPMLW49L/Shortrange-nuclear-weapons-to-counter-Indias-cold-start-do.html.

[119] "Pakistan Warns India Against Targeting Its Nuclear Installations," *Economic Times*, October 10, 2017, http://economictimes.indiatimes.com/news/defence/pakistan-warns-india-against-targeting-its-nuclear-installations/articleshow/60967586.cms.

[120] Max Fisher, "India, Long at Odds with Pakistan, May Be Rethinking Nuclear First Strikes," *New York Times*, March 31, 2017, https://www.nytimes.com/2017/03/31/world/asia/india-long-at-odds-with-pakistan-may-be-rethinking-nuclear-first-strikes.html. See also Rajesh Rajagopalan, "India's Nuclear Strategy: A Shift to Counterforce?" Observer Research Foundation, March 30, 2017, http://www.orfonline.org/expert-speaks/india-nuclear-strategy-shift-counterforce/; Yashwant Raj, "India Could Strike Pakistan with Nuclear Weapons If Threatened, Says Expert," *Hindustan Times*, March 21, 2017, http://www.hindustantimes.com/india-news/india-could-strike-pakistan-with-nuclear-weapons-if-threatened-says-expert/story-P5N8QuKOldxAJ9UPjboijM.html.

[121] Jesse Johnson, "North Korea Foreign Minister Warns of 'Pre-Emptive Action' As U.S. Bombers Fly off Korean Peninsula," *Japan Times*, September 24, 2017, https://www.japantimes.co.jp/news/2017/09/24/asia-pacific/north-korea-foreign-minister-warns-pre-emptive-action-u-s-bombers-fly-off-korean-peninsula/#.WloDNJOFgWo.

[122] NPT/CONF.2015/29, April 22, 2015.

[123] In its report submitted to the 2014 PrepCom (NPT/CONF.2015/PC.III/14, April 25, 2014), France stated that it "has given security assurance to all non-nuclear-weapon States that comply with their non-proliferation commitments."

condition that its commitment does not "affect the right to self-defence as enshrined in Article 51 of the United Nations Charter."[124] Russia maintains the unilateral NSA under which it will not use or threaten to use nuclear weapons against the NNWS parties to the NPT unless it or its allies are invaded or attacked by a NNWS in cooperation with a NWS.

Except under protocols to the nuclear-weapon-free zone (NWFZ) treaties, NWS have not provided legally-binding NSAs. At various fora, including the NPT review process, the CD and the UN General Assembly, NNWS, mainly the NAM states, urged NWS to provide legally-binding security assurances. At the 2017 NPT PrepCom, Iran proposed to adopt a separate "decision on negative security assurances" at the upcoming 2020 NPT RevCon, in which the Conference confirms that: all the NWS unequivocally undertake to refrain, under any and all circumstances and without discrimination or exception of any kind, from the use or threat of use of nuclear weapons against any NNWS party to the NPT; and all the NWS solemnly undertake to pursue negotiations on providing universal, legally binding, effective, unconditional, non-discriminatory and irrevocable security assurances to all NPT NNWS against the use or threat of use of nuclear weapons under all circumstances, within the CD, and bring them to a conclusion no later than 2023.[125] Among NWS, only China argues that the international community should negotiate and conclude at an early date an international legal instrument on providing unconditional NSAs. Meanwhile, France stated that it "considers [the] commitment [in its statement in April 1995] legally binding, and has so stated."[126]

As written in the previous *Hiroshima Reports*, while one of the purposes of the NSAs provided by NWS to NNWS is to alleviate the imbalance of rights and obligations between NWS and NNWS under the NPT, India, Pakistan and North Korea also offered NSAs to NNWS. India declared that it would not use nuclear weapons against NNWS, except "in the event of a major attack against India, or Indian forces anywhere, by biological or chemical weapons, India will retain the option of retaliating with nuclear weapons." Pakistan has declared an unconditional NSA. In addition, North Korea has stated an NSA to NNWS so long as they do not join nuclear weapons states in invading or attacking it.

D) Signing and ratifying the protocols of the treaties on nuclear-weapon-free zones

The protocols to the nuclear-weapon-free zone (NWFZ) treaties include the provision of legally-binding NSAs. At the time of writing, only the Protocol of the Treaty for the Prohibition of Nuclear Weapons in Latin America and Caribbean (the Treaty of Tlatelolco) has been ratified by all NWS, as shown in Table 1-6 below. No new progress regarding additional ratifications by NWS has made in 2017. Among others, as for the Protocol to the Southeast Asian NWFZ Treaty, the five NWS have continued consultation with the state parties to the Treaty to resolve remaining differences, but they have yet to sign the Protocol.[127]

Some NWS have stated reservations or added interpretations to the protocols of the NWFZ treaties when signing or ratifying them. NAM and NAC have called for the withdrawal of any related reservations or unilateral interpretative declarations that are incompatible with the object and purpose of such

[124] NPT/CONF.2015/10, March 12, 2015.

[125] NPT/CONF.2020/PC.I/WP.4, March 20, 2017.

[126] NPT/CONF.2015/PC.III/14, April 25, 2014.

[127] As mentioned in the *Hiroshima Report 2016*, both ASEAN member states and NWS implied that they continued consultations over possible reservations by NWS.

treaties.[128] However, it seems unlikely that NWS will accept such a request. Upon ratification of the Protocol to the CANWFZ Treaty, for example, Russia made a reservation of providing its NSA in the event of an armed attack against Russia by a state party to the Treaty jointly with a state possessing nuclear weapons. Russia also "reserves the right not to consider itself bound by the Protocol, if any party to the Treaty 'allows foreign military vessels and aircraft with nuclear weapons or other nuclear explosive devices aboard to call at its ports and landing at its aerodromes, or any other form of transit of nuclear weapons or other nuclear explosive devices through its territory.'"[129]

Table 1-6: The status of signature and ratification of protocols to NWFZ treaties on NSAs

	China	France	Russia	U.K.	U.S.
Treaty of Tlatelolco	○	○	○	○	○
Treaty of Rarotonga	○	○	○	○	△
Southeast Asian NWFZ (SEANWFZ) Treaty					
Treaty of Pelindaba	○	○	○	○	△
Central Asia NWFZ (CANWFZ) Treaty	○	○	○	○	△

[○: Ratified △: Signed]

E) Relying on extended nuclear deterrence

The United States and its allies, including NATO countries, Australia, Japan and South Korea, maintained their respective policies on extended nuclear deterrence. Currently, the United States deploys approximately 150 B-61 nuclear gravity bombs in five NATO countries (Belgium, Germany, Italy, the Netherlands and Turkey), and thus maintains nuclear sharing arrangements with them, including supported by NATO's Nuclear Planning Group. While no U.S. nuclear weapon is deployed outside of American territory, except in the European NATO countries mentioned above, the United States established consultative mechanisms on extended deterrence with Japan and South Korea. In 2017, as the security environment has deteriorated in Europe and Asia, each alliance has sought to strengthen the reliability of extended (nuclear) deterrence. However, there were few concrete changes in their policies on extended nuclear deterrence.

In the meantime, faced with North Korea's rapid nuclear development, it was reported that "a senior national security aide to then-President Park Geun-hye raised the issue of redeploying American nuclear weapons with a U.S. National Security Council staff member, only to be turned down" in October 2016.[130]

[128] NPT/CONF.2015/WP.4, March 9, 2015. See also the UNSCR regarding the Tlatelolco Treaty (A/RES/71/27, December 5, 2016).

[129] "Putin Submits Protocol to Treaty on Nuclear-Free Zone in Central Asia for Ratification," *Tass*, March 12, 2015, http://tass.ru/en/russia/782424.

[130] Hiroshi Minegishi, "South Korea Leaves Door Open to US Nuclear Weapons," *Nikkei Asia Review*, September 12, 2017, https://asia.nikkei.com/Spotlight/North-Korea-crisis/South-Korea-leaves-door-open-to-US-nuclear-weapons.

U.S. Secretary of Defense Jim Mattis acknowledged that he and South Korea's Defense Minister Song Young-moo discussed reintroduction of U.S. tactical nuclear weapons on the Korean Peninsula in August 2017,[131] but there was no indication that the US has any intention to do this. South Korean President Moon Jae-in stated in September 2017: "I do not agree that South Korea needs to develop our own nuclear weapons or relocate tactical nuclear weapons."[132]

Japan has denied any intention to review its Three Non-Nuclear Policy (not possessing, not producing and not permitting the introduction of nuclear weapons, in line with Japan's Peace Constitution), including contemplating a possibility of deploying U.S. nuclear weapons in Japan's territory.

On the matter of the NATO nuclear sharing arrangement, especially the U.S. deployment of its tactical nuclear weapons in five NATO countries, some NNWS criticize this situation as a clear violation of non-proliferation obligations under Article I of the NPT by those transferor NWS and under Article II by those recipient NNWS.[133] Russia and China have called on NATO to withdraw the U.S. tactical nuclear weapons from the European NATO countries, and to end the nuclear sharing policy.

(6) DE-ALERTING OR MEASURES FOR MAXIMIZING DECISION TIME TO AUTHORIZE THE USE OF NUCLEAR WEAPONS

In 2017, there were no significant changes in nuclear-armed states' policies on alert and/or operational status of their respective nuclear forces.[134] Russian and U.S. strategic ballistic missiles have been on high alert status,[135] either launch on warning (LOW) or launch under attack (LUA). Forty U.K. nuclear warheads and 80 French ones are also kept on alert under their continuous SSBN patrols, albeit at lower readiness levels than those of the two nuclear superpowers.[136] It is assumed that China's nuclear forces are not on a hair-trigger alert posture because it keeps nuclear warheads de-mated from delivery vehicles.[137] There is little definitive information regarding the alert status of other nuclear-armed states' nuclear forces. In February 2014, Pakistan stated that it "would not delegate advance authority over nuclear arms to unit commanders, even in the event of crisis with India, [... and] all weapons are under the central control of the National Command Authority, which is headed by the prime minister."[138] It is widely considered that India's nuclear forces are not on a high alert status.

A number of NNWS have urged the NWS to alter their

[131] Dan Lamothe, "Pentagon Chief Says He Was Asked About Reintroducing Tactical Nuclear Weapons in South Korea," *Washington Post*, September 18, 2017, https://www.washingtonpost.com/news/checkpoint/wp/2017/09/18/pentagon-chief-says-he-was-asked-about-reintroducing-tactical-nuclear-weapons-in-south-korea/.

[132] "President Moon Rules Out Deployment of Nuclear Weapons in South Korea," *NK News*, September 14, https://www.nknews.org/2017/09/president-moon-rules-out-deployment-of-nuclear-weapons-in-south/?c=1505385412246.

[133] "Statement by Iran," Cluster 1, First Session of the Preparatory Committee for the 2020 NPT Review Conference, May 5, 2017; "Statement by Egypt," Cluster 1, First Session of the Preparatory Committee for the 2020 NPT Review Conference, May 5, 2017.

[134] See also the *Hiroshima Report 2017*.

[135] Hans M. Kristensen, "Reducing Alert Rates of Nuclear Weapons," Presentation to NPT PrepCom Side Event, Geneva, April 24, 2013; Hans M. Kristensen and Matthew McKinzie, "Reducing Alert Rates of Nuclear Weapons," United Nations Institute for Disarmament Research, 2012.

[136] See Kristensen, "Reducing Alert Rates of Nuclear Weapons"; Kristensen and McKinzie, "Reducing Alert Rates of Nuclear Weapons."

[137] On the other hand, it has also been pointed out that China may be going to take a higher alert posture along with deployment of new SSBNs and MIRVed ICBMs.

[138] Elaine M. Grossman, "Pakistani Leaders to Retain Nuclear-Arms Authority in Crises: Senior Official," *Global Security Newswire*, February 27, 2014, http://www.nti.org/gsn/article/pakistani-leaders-retain-nuclear-arms-authority-crises-senior-official/.

alert posture. Among them, Chile, Malaysia, Nigeria, New Zealand and Switzerland, as the "De-alerting Group," proactively proposed to reduce alert levels. At the 2017 NPT PrepCom, the Group urged the NWS to urgently implement "previously agreed commitments on de-alerting [sic] and take steps to rapidly reduce operational readiness—unilaterally, bilaterally or otherwise."[139]

Proponents of de-alerting have often argued that such measures are useful to prevent accidental use of nuclear weapons.[140] On the other hand, NWS emphasize that they have taken adequate measures for preventing accidental use, and express confidence regarding the safety and effective control of their nuclear arsenals.[141] Besides, India and Pakistan extended their bilateral Agreement on Reducing the Risk of Accidents Relating to Nuclear Weapons in February 2017. Pakistan, which values SRBM forces for deterrence vis-à-vis India, emphasizes that its nuclear weapons and fissile material are unlikely to fall under the control of any extremist element since their nuclear arsenals are under robust, safe and complete civilian command-and-control system through the Nuclear Command Authority (NCA).[142]

In November 2017, the U.S. Senate Foreign Relations Committee held a hearing on the matter of presidential authority to order the use of nuclear weapons. It was confirmed that the U.S. President has the authority to defend the country in accordance with the U.S. Constitution when the United States suffers actual or imminent nuclear attacks. Interestingly, former Commander of the U.S. Strategic Command Robert Kehler testified that "the United States military doesn't blindly follow orders. A presidential order to employ U.S. nuclear weapons must be legal... The basic legal principles of military necessity, distinction, and proportionality apply to nuclear weapons just as they do to every other weapon."[143] In addition, Commander of the U.S. Strategic Command John E. Hyten stated separately that he would resist any "illegal" presidential order to launch a strike and present alternatives.[144]

(7) CTBT

A) Signing and ratifying the CTBT

As of December 2017, 166 of the 183 signatories have deposited their instruments of ratification of the Comprehensive Nuclear-Test-Ban Treaty (CTBT). No countries newly signed or ratified it in 2017. Among the 44 states listed in Annex 2 of the CTBT, whose ratification is a prerequisite for the treaty's entry into force, five states (China, Egypt, Iran, Israel and the United States) have signed but not ratified, and three

[139] "Statement by Sweden on Behalf of the De-alerting Group," Cluster 1, First Session of the Preparatory Committee for the 2020 NPT Review Conference, May 4, 2017.

[140] For example, Patricia Lewis, et.al., published a report, in which they studied 13 cases of inadvertent near misuse of nuclear weapons, and concluded, *inter alia*, that "the world has, indeed, been lucky." They argue, "For as long as nuclear weapons exist, the risk of an inadvertent, accidental or deliberate detonation remains. Until their elimination, vigilance and prudent decision-making in nuclear policies are therefore of the utmost priority. Responses that policy-makers and the military should consider include buying time for decision-making, particularly in crises; developing trust and confidence-building measures; refraining from large-scale military exercises during times of heightened tension; involving a wider set of decision-makers in times of crisis; and improving awareness and training on the effects of nuclear weapons." Patricia Lewis, Heather Williams, Benoît Pelopidas and Sasan Aghlani, "Too Close for Comfort: Cases of Near Nuclear Use and Options for Policy," *Chatham House Report*, April 2014.

[141] See the *Hiroshima Report 2017*.

[142] "Short-Range Nuclear Weapons to Counter India's Cold Start Doctrine: Pakistan PM," *Live Mint*, September 21, 2017, http://www.livemint.com/Politics/z8zop6Ytu4bPiksPMLW49L/Shortrange-nuclear-weapons-to-counter-Indias-cold-start-do.html.

[143] U.S. Senate Foreign Relations Committee, "Authority to Order the Use of Nuclear Weapons," November 14, 2017, https://www.foreign.senate.gov/hearings/authority-to-order-the-use-of-nuclear-weapons-111417.

[144] Rob Crilly, "US Nuclear Commander Would Resist 'Illegal' Presidential Order for Strike," *Telegraph*, November 18, 2017, http://www.telegraph.co.uk/news/2017/11/18/us-nuclear-commander-would-resist-illegal-order-strike/.

(India, North Korea and Pakistan) have not even signed. Among the countries surveyed, Saudi Arabia and Syria, have not signed the CTBT either.

As for efforts to promote CTBT entry into force during 2017, the 10th Conference on Facilitating Entry into Force of the CTBT, or Article XIV Conference, was held on September 20. Participating countries adopted the Final Declaration, in which they, inter alia: condemned in the strongest terms the nuclear tests conducted by North Korea; urged holdouts to sign and ratify the CTBT without further delay; and called on maintaining the moratorium on nuclear weapons test explosions.[145] Prior to this conference, as Co-Coordinators of the Article XIV process on facilitating entry into force of the CTBT, Japanese and Kazakhstani Foreign Ministers, together with the Executive Secretary of the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), issued the Joint Appeal for revitalizing efforts for early entry into force of the treaty.[146] In addition, the NPDI proposed at the 2017 NPT PrepCom that "[i]n order to support defusing regional tensions, regionally coordinated ratifications [of the CTBT] could be considered."[147]

As for outreach activities for promoting the Treaty's entry into force, a document, "Activities Undertaken by Signatory and Ratifying States Under Measure (K) of the Final Declaration of the 2015 Article XIV Conference in the Period June 2015-May 2017,"[148] distributed at the Article XIV Conference, summarized activities conducted by ratifying and signatory states. It highlighted:

- Bilateral activities related to Annex 2 states (conducted by Australia, Austria, Belgium, Brazil, Canada, France, Japan, Mexico, New Zealand, Russia, Turkey, UAE, the U.K. and others);
- Bilateral activities related to non-Annex 2 states (conducted by Australia, Austria, Belgium, Brazil, Canada, France, Japan, Mexico, New Zealand, Russia, Turkey, the U.K. and others);
- Global-level activities (conducted by Australia, Belgium, Brazil, Canada, France, Japan, Mexico, New Zealand, Russia, Turkey, UAE, the U.K., the U.S. and others); and
- Regional-level activities (conducted by Australia, Belgium, Brazil, Canada, France, Japan, Mexico, New Zealand, Turkey, UAE and others).

B) Moratoria on nuclear test explosions pending CTBT's entry into force

The five NWS plus India and Pakistan maintain a moratorium on nuclear test explosions. Israel, which has kept its nuclear policy opaque, has not disclosed the possibility of conducting nuclear tests.

Despite a prohibition of nuclear testing by North Korea under repeated UNSC resolutions, it refuses to declare a moratorium; instead, the North conducted a nuclear test in 2017, as detailed in section E.

C) Cooperation with the CTBTO Preparatory Commission

Regarding the countries surveyed in this study, the

[145] CTBT-Art.XIV/2017/WP.1, September 20, 2017.

[146] "Joint Appeal by Mr. FUMIO KISHIDA, Minister for Foreign Affairs of Japan, Mr. KAIRAT ABDRAKHMANOV, Minister for Foreign Affairs of Kazakhstan and Dr. LASSINA ZERBO, Executive Secretary of the CTBTO PrepCom," May 2, 2017, https://www.ctbto.org/fileadmin/user_upload/statements/2017/02052017_CTBTO_Japan_Kazakhstan_JointAppeal.pdf.

[147] NPT/CONF.2020/PC.I/WP.3, March 17, 2017.

[148] CTBT-Art.XIV/2017/4, September 14, 2017.

status of payments of contributions to the CTBTO, as of 2017, is as follows.[149]

- Fully paid: Australia, Austria, Belgium, Canada, Chile, China, Egypt, France, Germany, Indonesia, Israel, Japan, Kazakhstan, South Korea, the Netherlands, New Zealand, Norway, Philippines, Poland, Russia, South Africa, Sweden, Switzerland, Turkey, UAE and the U.K.
- Partially paid: Mexico and the U.S.
- Voting right in the Preparatory Commission suspended because arrears are equal to or larger than its contributions due for the last two years: Brazil, Iran and Nigeria

The U.S. National Defense Authorization Act limits funding for the CTBTO, and declares that UN Security Council Resolution 2310 adopted in September 2016 does not "obligate…nor does it impose an obligation on the United States to refrain from actions that would run counter to the object and purpose" of the CTBT. Furthermore, its explanatory statement states that "it is wholly inappropriate for U.S. funds to support activities of the [CTBTO] that include advocating for ratification of the treaty or otherwise preparing for the treaty's possible entry into force."[150]

D) Contribution to the development of the CTBT verification systems

The establishment of the CTBT verification system has steadily progressed. When North Korea conducted a nuclear test in 2017, the International Monitoring System (IMS) detected unusual seismic events.

However, the pace of establishing the International Monitoring System (IMS) stations in China, Egypt and Iran—in addition to those of India, North Korea, Pakistan and Saudi Arabia which have yet to sign the CTBT—has been lagging behind, compared to that in the other signatory countries.[151] Regarding China, however, one Radionuclide Station started to operate in December 2016 and another Radionuclide Station was certified in 2017.

In February 2017, Japan announced a voluntary contribution of $2.43 million to the CTBTO "to further boost its verification abilities to detect nuclear explosions anywhere on the planet." The funding is to be used especially to procure and deploy a mobile noble gas detection system ($1.64 million),[152] which will be installed in the northern part of Japan for the first two years.

E) Nuclear testing

After conducting two nuclear tests in 2016, North Korea continued activities which appeared to be in preparation for a further nuclear test.[153] Indeed, it conducted its sixth underground nuclear test on September 3, 2017. The IMS of the CTBTO measured 6.0 magnitude. As noted above, the explosive yield of this test far exceeded that of North Korea's previous nuclear tests.[154] On the same day of the test, North Korea announced that it successfully carried out a test

[149] CTBTO, "CTBTO Member States' Payment as at 31-Dec-2017," https://www.ctbto.org/fileadmin/user_upload/treasury/52._31_Dec_2017_Member_States__Payments.pdf.

[150] Kingston Reif, "Hill Wants Development of Banned Missile," *Arms Control Today*, Vol. 47, No. 10 (December 2017), p. 37.

[151] CTBTO, "Station Profiles," http://www.ctbto.org/verification-regime/station-profiles/.

[152] "Japan Gives US$ 2.43 Million to Boost Nuclear Test Detection," CTBTO, February 23, 2017, https://www.ctbto.org/press-centre/highlights/2017/japan-gives-us-243-million-to-boost-nuclear-test-detection/.

[153] For instance, on excavation of underground tunnel at the nuclear test site, see Frank Pabian and David Coblentz, "North Korea's Punggye-ri Nuclear Test Site: Analysis Reveals Its Potential for Additional Testing with Significantly Higher Yields," *38 North*, March 10, 2017, http://38north.org/2017/03/punggye031017/.

[154] A large scale of this nuclear test caused numerous landslides throughout the Punggye-ri nuclear test site and beyond. See Frank V. Pabian, Joseph S. Bermudez Jr., and Jack Liu, "North Korea's Sixth Nuclear Test: A First Look," *38 North*, September 5, 2017, http://www.38north.org/2017/09/punggye090517/.

of a hydrogen bomb for ICBMs, "the explosive power of which is adjustable from tens kiloton to hundreds kiloton, is a multi-functional thermonuclear nuke with great destructive power which can be detonated even at high altitudes for super-powerful EMP attack according to strategic goals."[155]

Although North Korea repeatedly threatened to conduct a nuclear test in the Pacific Ocean, it did not do so in 2017. Meanwhile, it is reported to have continued tunnel work at the West Portal of the Punggye-ri Nuclear Test Site,[156] for its future nuclear tests.

Regarding experimental activities other than a nuclear explosion test, the United States continues to conduct various non-explosive tests and experiments under the Stockpile Stewardship Program (SSP), in order to sustain and assess its nuclear weapons stockpile without the use of underground nuclear tests, such as subcritical tests and experiments using the Z machine, which generates X-rays by fast discharge of capacitors, thus allowing for exploring the properties of plutonium materials under extreme pressures and temperatures. The U.S. National Nuclear Security Administration (NNSA), which is part of the U.S. Department of Energy, had released quarterly reports on such experiments, but as of December 2017 has not updated it since the first quarter of FY 2015.

France clarified that it has conducted "activities aimed at guaranteeing the safety and reliability of its nuclear weapons [including] a simulation program and hydrodynamic experiments designed to model materials' performance under extreme physical conditions and, more broadly, the weapons' functioning."[157] However, no further detail was reported. Meanwhile, France and the United Kingdom agreed to build and jointly operate radiographic and hydrodynamic testing facilities under the Teutates Treaty concluded in November 2010.[158] The status of the remaining nuclear-armed states' non-explosive testing activities in this respect is not well-known since they do not release any information.

While the CTBT does not prohibit any nuclear test unaccompanied by an explosion, the NAM countries have demanded that nuclear-armed states, inter alia, refrain from conducting nuclear weapon test explosions or any other nuclear explosions, and to close and dismantle, in a transparent, irreversible and verifiable manner, any remaining sites for nuclear test explosions and their associated infrastructure.[159]

(8) FMCT

A) Efforts toward commencing negotiations on an FMCT

In the "Decision 2: Principles and Objectives for Nuclear Non-Proliferation and Disarmament" adopted at the 1995 NPT Review and Extension Conference, participating countries agreed on "[t]he immediate commencement and early conclusion of negotiations on a non-discriminatory and universally applicable convention banning the production of fissile material for nuclear weapons or other nuclear explosive devices." However, substantive negotiations have not yet commenced. The 2017 session of the CD again ended without adopting a program of work that included the establishment of an Ad Hoc Committee on a Fissile Material Cut-Off Treaty (FMCT) negotiation, due to Pakistan's strong objection, as was the case

[155] "Kim Jong Un Gives Guidance to Nuclear Weaponization," *KCNA*, September 3, 2017, http://www.kcna.co.jp/item/2017/201709/news03/20170903-01ee.html.

[156] Frank V. Pabian, Joseph S. Bermudez Jr. and Jack Liu, "North Korea's Punggye-ri Nuclear Test Site: Tunneling at the West Portal," *38 North*, December 11, 2017, http://www.38north.org/2017/12/punggye121117/.

[157] NPT/CONF.2015/PC.III/14, April 25, 2014.

[158] NPT/CONF.2015/29, April 22, 2015.

[159] NPT/CONF.2015/WP.7, March 9, 2015.

in previous years. Pakistan has insisted that not just newly produced material but also existing stockpiles of such materials should be subject to the scope of negotiations on a treaty. It also stated that Pakistan would oppose any negotiations unless it could get assurance that India brings its entire civilian nuclear program under the IAEA safeguards.[160]

China expresses support for the commencement of negotiations on an FMCT prohibiting the future production of fissile material for nuclear weapons, but it does so less actively than the other NWS. Israel has a similar posture. China has stated that it supports "the start by the Conference on Disarmament of substantive work, in a comprehensive and balanced manner, on such important topics as nuclear disarmament, security assurances to non-nuclear-weapon States, a treaty banning the production of fissile material for nuclear weapons or other nuclear explosive devices and prevention of an arms race in outer space."[161] This stance is different from those of France, the United Kingdom and the United States, which have insisted that the commencement of negotiations for an FMCT is a top priority at the CD.

For promoting a commencement of negotiations at the CD, various efforts and measures have been attempted. Among them, the 2016 UN General Assembly decided to establish a High-Level FMCT Expert Preparatory Group, "to consider and make recommendations on substantial elements of a future non-discriminatory, multilateral and internationally and effectively verifiable treaty banning the production of fissile material for nuclear weapons or other nuclear explosive devices, on the basis of CD/1299 and the mandate contained therein." The Group, consisting of experts from 25 countries,[162] was scheduled to convene two-week meetings in 2017 and 2018, respectively.[163] Its first meeting was held in Geneva in July-August 2017, and participating experts discussed the treaty's scope, definitions, verification, and legal and institutional arrangements.

Pakistan refused to participate in the Group. At the Informal Consultative Meeting by the Chairperson of the High-level FMCT Expert Preparatory Group in March 2017, Pakistan argued that it could not join any discussion, pre-negotiation, negotiation or preparatory work on the basis of the Shannon Mandate: that is, considering a treaty which only prohibits future production and leaves the existing stocks untouched. Pakistan also argued that: the CD's role should not be undermined through UNGA-led non-universal processes that are divisive and not agreed by consensus; the discussion mandate assigned to the Expert Group can be fulfilled in the CD; the Group cannot address the underlying security concerns that are preventing the CD from reaching consensus on a balanced and comprehensive Programme of Work; and even if the selected 25 members of the Expert Group succeed in garnering consensus among themselves on a treaty related issue, it would not be binding on those states that are not represented in the Group.[164]

[160] "Pakistan Wants India's Entire Nuclear Programme under IAEA Safeguards," *Nation*, February 6, 2017, http://nation.com.pk/06-Feb-2017/pakistan-wants-india-s-entire-nuclear-programme-under-iaea-safeguards.

[161] NPT/CONF.2015/32, April 27, 2015.

[162] Algeria, Argentina, Australia, Brazil, Canada, China, Colombia, Egypt, Estonia, France, Germany, India, Indonesia, Japan, Mexico, Morocco, Netherlands, Poland, South Korea, Russia, Senegal, South Africa, Sweden, the U.K. and the U.S.

[163] "High Level Fissile Material Cut-off Treaty (FMCT) Expert Preparatory Group," United Nations Office at Geneva, July 28, 2017, https://www.unog.ch/80256EE600585943/(httpPages)/B8A3B48A3FB7185EC1257B280045DBE3?OpenDocument.

[164] "General Statement by Pakistan," Informal Consultative Meeting by the Chairperson of the High-level FMCT Expert Preparatory Group, New York, March 2-3, 2017, https://www.unog.ch/80256EDD006B8954/(httpAssets)/BBA938B952963392C12580DC0046E8C0/$file/Pakistan+Statement-GENERAL-FMCT++++Informals-NY-March2017.pdf.

B) Moratoria on production of fissile material for nuclear weapons

Among nuclear-armed states, China, India, Israel, Pakistan and North Korea have not declared a moratorium on the production of fissile material for nuclear weapons. India, Pakistan and North Korea are highly likely to continue producing fissile material for nuclear weapons and expanding production capabilities.[165] China is widely considered not to be producing fissile material for nuclear weapons currently.[166]

None of the nuclear-armed states have declared the amount of fissile material for nuclear weapons which they possess (except the U.S. declassifying the amount of its past production of HEU and plutonium). Estimates by research institutes are summarized in Chapter 3 of this Report.

(9) TRANSPARENCY IN NUCLEAR FORCES, FISSILE MATERIAL FOR NUCLEAR WEAPONS, AND NUCLEAR STRATEGY/DOCTRINE

In the Final Document of the 2010 NPT RevCon, the NWS were called upon to report on actions taken toward "accelerat[ion of] concrete progress on the steps leading to nuclear disarmament" to the 2014 PrepCom (Action 5). All states parties to the NPT, including the NWS, were also requested to submit regular reports on implementing nuclear disarmament measures agreed at the previous RevCon (Action 20), and the NWS were asked to agree on a standard reporting form, as a confidence-building measure (Action 21).

In accordance with these recommendations, the NWS submitted their respective reports on implementation of the NPT's three pillars (nuclear disarmament, non-proliferation and peaceful use of nuclear energy) to the 2014 NPT PrepCom and the 2015 RevCon, using a common framework, themes and categories. No similar report was submitted by any NWS to the 2017 NPT PrepCom, however; only seven NNWS (Australia, Austria, Canada, Iran, Japan, New Zealand, and Poland) submitted their respective reports on implementation on the NPT.

At the 2017 NPT PrepCom, there were some proposals for improving transparency through regular reporting by the NPT states parties, especially the NWS, to the NPT review process. For instance, the NAC proposed that NWS "should renew their commitment to regularly submit accurate, up-to-date, complete and comparable reports on the implementation of their Treaty obligations and commitments relating to nuclear disarmament," inter alia: number, type and status of nuclear warheads and their delivery vehicles; measures taken to reduce the role and significance of nuclear weapons, and their risks; and amount of fissile material produced for military purposes. The NAC also called on countries that maintain a role for nuclear weapons in their military and security concepts, doctrines and policies for providing information on measures taken to reduce the role and significance of nuclear weapons, and number, type (strategic or non-strategic) and status (deployed or non-deployed, and alert status) of nuclear warheads within their territories. In addition, the NAC sought to discuss options to improve the measurability of the implementation of nuclear disarmament obligations and commitments, such as a set of benchmarks or similar criteria.[167]

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[165] See the *Hiroshima Report 2017*.

[166] See, for instance, Hui Zhang, "China's Fissile Material Production and Stockpile," *Research Report*, International Panel on Fissile Materials, No. 17 (2017).

[167] NPT/CONF.2020/PC.I/WP.13, March 24, 2017.

The NPDI submitted a working paper "Transparency of Nuclear Weapons" to the 2017 NPT PrepCom, which included a new draft form for standard nuclear disarmament reporting based on 64 Actions agreed at the 2010 NPT RevCon. The NPDI also "remind[ed] the nuclear-weapon States of their commitments contained in the action plan of 2010, and further encourage[d] the regular submission of transparency reports by these States during the 2020 review cycle."[168] Previously, at the 2012 NPT PrepCom, the NPDI proposed a draft form for reporting on nuclear warheads, delivery vehicles, fissile material for nuclear weapons, and nuclear strategy/policies.[169] Using the draft form, the following table summarizes the degree of transparency taken by the nuclear-armed states.

[168] NPT/CONF.2020/PC.I/WP.17, March 19, 2017.

[169] NPT/CONF.2015/PC.I/WP.12, April 20, 2012.

Table 1-7: Transparency in nuclear disarmament

	CHN	FRA	RUS	UK	US	IND	ISR	PAK	PRK
Nuclear warheads									
Total number of nuclear warheads (including those awaiting dismantlement)		○							
Aggregate number of nuclear warheads in stockpile		○		○	○				
Number of strategic or non-strategic nuclear warheads		○	△	○	△				
Number of strategic or non-strategic deployed nuclear warheads		○	△	○	△				
Number of strategic or non-strategic non-deployed nuclear warheads		○		○	△				
Reductions (in numbers) of nuclear warheads in 2017			○	○	○				
Aggregate number of nuclear warheads dismantled in 2017									
Delivery vehicles									
Number of nuclear warhead delivery systems by type (missiles, aircraft, submarines, artillery, other)		○	△	○	○				
Reduction (in numbers) of delivery systems in 2017			○		○				
Aggregate number of delivery systems dismantled in 2017									
Nuclear disarmament since 1995									
1995-2000		○	○	○	○				
2000-2005		○	○	○	○				
2005-2010		○	○	○	○				
2010-2017		○	○	○	○				
Nuclear doctrine									
Measures taken or in process to diminish the role and significance of nuclear weapons in military and security concepts, doctrines and policies	○	○	○	○	○	○		○	
Measures taken or in process to reduce the operational readiness of the reporting State's nuclear arsenal	○	○	○	○	○	○		○	
Measures taken or in process to reduce the risk of accidental or unauthorized use of nuclear weapons	○	○	○	○	○	○		○	
Description of negative security assurances (including status and definition) by reporting States	○	○	○	○	○	○		○	○
Current status and future prospect of the ratification of the relevant protocols to nuclear-weapon-free-zone treaties	○	○	○	○	○	–	–	–	–
Current status of consultations and cooperation on entry into force of the relevant protocols of nuclear-weapon-free-zone treaties	○	○	○	○	○	–	–	–	–
Current status of review of any related reservations about the relevant protocols of nuclear-weapon-free-zone treaties by concerned States						–	–	–	–
Nuclear testing									
Current status of ratification of the Comprehensive Nuclear-Test-Ban Treaty	△	○	○	○	△		△		
Current status of the reporting State's policy on continued adherence to the moratorium on nuclear-weapon test explosions	○	○	○	○	○	○		○	
Activities to promote the entry into force of the Comprehensive Nuclear-Test-Ban Treaty at the national, regional and global levels		○		○	○				
Scheduled policy reviews									
Scope and focus of policy reviews, scheduled or under way, relating to nuclear weapon stocks, nuclear doctrine or nuclear posture				○	○				
Fissile material									
Aggregate amount of plutonium produced for national security purposes (in metric tons)				○	○				
Aggregate amount of HEU produced for national security purposes (in metric tons)				○	○				
Amount of fissile material declared excess for national security purposes (in metric tons)			△		△				
Current status (and any future plan), including the amount and year, of declarations to the International Atomic Energy Agency of all fissile material designated by the reporting State as no longer required for military purposes and placement of such material under Agency or other relevant international verification and arrangements for the disposition of such material for peaceful purposes		○	△	○	△				
Current status of the development of appropriate legally binding verification arrangements to ensure the irreversible removal of such fissile material			△	△	△				
Current status (and any future plan) of the dismantlement or conversion for peaceful uses of facilities for the production of fissile material for use in nuclear weapons		○							
Other measures in support of nuclear disarmament									
Any cooperation among Governments, the United Nations and civil society aimed at increasing confidence, improving transparency and developing efficient verification capabilities		○		○	○				
Year and official document symbol of regular reports on the implementation of Article VI, paragraph 4(c), of the 1995 decision entitled "Principles and objectives for nuclear non-proliferation and disarmament," and the practical steps agreed to in the Final Document of the 2000 Review Conference in 2017									
Activities to promote disarmament and non-proliferation education		○		○	○				

[○: Highly transparent △: Partially transparent]

(10) VERIFICATIONS OF NUCLEAR WEAPONS REDUCTIONS

Russia and the United States have implemented verification measures, including on-site inspections, under the New START.

One of the noticeable activities on verification is the "International Partnership for Nuclear Disarmament Verification (IPNDV)," launched by the United States in December 2014. With 26 participating countries (and the EU and Vatican),[170] the IPNDV continues to study verification measures and technologies on dismantlement of nuclear weapons, as well as fissile material derived from dismantled nuclear warheads. In November-December 2017, its fifth plenary meeting was held in Buenos Aires, where 22 participating countries discussed the completion of Phase I of the Partnership's work, as well as launching Phase II. According to the fact sheet issued by the U.S. State Department, "[d]uring the initial two-year phase of the Partnership's work, the working groups have focused on the dismantlement phase of the nuclear weapons lifecycle. In this context, the Partnership developed a scenario involving the dismantlement of a notional nuclear weapon, the inspection of that dismantlement by a multilateral team of inspectors, and the related technologies that could support such an inspection. This scenario has allowed the three working groups to coordinate their efforts and develop common understandings of the challenges and potential solutions associated with nuclear disarmament verification."[171] The IPNDP, in its summary report, identified several specific verification areas for additional analysis as following:[172]

- Declarations, including within the wider nuclear disarmament process and as complements to more specific monitoring and inspection of nuclear weapon dismantlement;
- Data handling requirements across the inspection process;
- Information barrier technologies;
- Technologies enabling measurements of Special Nuclear Material (SNM) and High Explosives (HE), as well as the development of nuclear weapon templates; and
- Testing and exercising potentially promising technologies and procedures.

For Phase II, the IPNDV will deepen its understanding of effective and practical verification options to support future nuclear disarmament verification and demonstrate its work through tangible activities such as exercises and demonstrations. For these purposes, the following three working group will be established: Verification of Nuclear Weapons Declarations; Verification of Reductions; and Technologies for Verification.[173]

Regarding nuclear disarmament verification measures, the respective U.K.-U.S. and U.K.-Norway joint developments were carried out.[174] In addition, some NNWS call for the involvement of the IAEA regarding, for instance, development and conclusion of legally binding verification arrangements, which

[170] The participating countries include three NWS (France, the United Kingdom and the United States), Australia, Belgium, Brazil, Canada, Chile, Germany, Indonesia, Japan, Kazakhstan, Mexico, the Netherlands, Norway, Philippines, Poland, South Korea, Sweden, Switzerland, Turkey and UAE. China and Russia participated in the Phase I of the project as observers, but do not join the Phase II.

[171] The U.S. Department of State, "The International Partnership for Nuclear Disarmament Verification: Phase I," December 8, 2017, https://www.state.gov/t/avc/rls/2017/276402.htm.

[172] International Partnership for Nuclear Disarmament Verification, "Phase I Summary Report: Creating the Verification Building Blocks for Future Nuclear Disarmament," November 2017, p. 4.

[173] The U.S. Department of State, "The International Partnership for Nuclear Disarmament Verification: Phase II," December 8, 2017, https://www.state.gov/t/avc/rls/2017/276403.htm.

[174] See the *Hiroshima Report 2017*.

would apply to all fissile material permanently removed from nuclear weapons programs.[175]

In the meantime, Article 4 of the TPNW stipulates procedures regarding verifications of nuclear weapons elimination as following

- Each State Party that after 7 July 2017 owned, possessed or controlled nuclear weapons or other nuclear explosive devices and eliminated its nuclear-weapon programme, including the elimination or irreversible conversion of all nuclear-weapons-related facilities, prior to the entry into force of this Treaty for it, shall cooperate with the competent international authority designated pursuant to paragraph 6 of this Article for the purpose of verifying the irreversible elimination of its nuclear-weapon programme…Such a State Party shall conclude a safeguards agreement with the International Atomic Energy Agency sufficient to provide credible assurance of the non-diversion of declared nuclear material from peaceful nuclear activities and of the absence of undeclared nuclear material or activities in that State Party as a whole.
- [E]ach State Party that owns, possesses or controls nuclear weapons or other nuclear explosive devices shall immediately remove them from operational status, and destroy them as soon as possible but not later than a deadline to be determined by the first meeting of States Parties, in accordance with a legally binding, time-bound plan for the verified and irreversible elimination of that State Party's nuclear-weapon programme, including the elimination or irreversible conversion of all nuclear-weapons-related facilities. The State Party, no later than 60 days after the entry into force of this Treaty for that State Party, shall submit this plan to the States Parties or to a competent international authority designated by the States Parties. The plan shall then be negotiated with the competent international authority, which shall submit it to the subsequent meeting of States Parties or review conference, whichever comes first, for approval in accordance with its rules of procedure.

(11) IRREVERSIBILITY

A) Implementing or planning dismantlement of nuclear warheads and their delivery vehicles

Just like their previous nuclear arms control agreements, the New START obliges Russia and the United States to dismantle or convert strategic (nuclear) delivery vehicles beyond the limits set in the Treaty, in a verifiable way. The New START does not stipulate to dismantle nuclear warheads, but the two states have partially dismantled retired nuclear warheads as unilateral measures.

Neither country has provided comprehensive information regarding the dismantlement of nuclear warheads, including the exact numbers of dismantled warheads. While the United States has publicized some information under the previous administration,[176] related, updated information has not been made available by the Trump administration. In May 2017, "the Republican-controlled Congress voted…to prevent the National Nuclear Security Administration (NNSA) from implementing the former administration's proposal to accelerate the rate of dismantlement of retired nuclear warheads. Congress approved $56 million for nuclear warhead dismantlement and disposition activities, a reduction of $13 million, or 19 percent, from the Obama

[175] See the *Hiroshima Report 2017*.

[176] See the *Hiroshima Report 2017*.

administration's proposal of $69 million in its final budget request."[177]

Other NWS did not provide any new or updated information regarding the elimination of their nuclear weapons in 2017, though France and the United Kingdom do continue to dismantle their retired nuclear warheads and delivery vehicles.

Table 1-8: U.S. nuclear weapons stockpile and warhead dismantlement

	2009	2010	2011	2012	2013	2014	2015	2016
Number of nuclear weapons stockpile*	5,113	5,066	4,897	4,881	4,804	4,717	4,571	4,018
Number of dismantlement		352	305	308	239	299	146	553

*Does not include weapons retired and awaiting dismantlement.

Sources: U.S. Department of State, "Transparency in the U.S. Nuclear Weapons Stockpile," Fact Sheet, April 29, 2014, https://2009-2017.state.gov/t/avc/rls/225343.htm; NPT/CONF.2015/38, May 1, 2015; John Kerry, "Remarks at the 2015 Nuclear Nonproliferation Treaty Review Conference," New York, April 27, 2015, http://www.state.gov/secretary/remarks/2015/04/241175.htm; http://open.defense.gov/Portals/23/Documents/frddwg/2015_Tables_UNCLASS.pdf; "Remarks by the Vice President on Nuclear Security," Washington, DC., January 11, 2017, https://obamawhitehouse.archives.gov/the-press-office/2017/01/12/remarks-vice-president-nuclear-security.

B) Decommissioning/conversion of nuclear weapons-related facilities

Few remarkable activities or progress were reported in 2017 in terms of decommissioning or conversion of nuclear weapons-related facilities.[178]

In 1996, France became the only country to decide to completely and irreversibly dismantle its nuclear test sites. They were fully decommissioned in 1998.[179]

C) Measures for fissile material declared excess for military purposes, such as disposition or conversion to peaceful purposes

In October 2016, Russian President Putin ordered the Presidential Decree on suspending implementation of the Russian-U.S. Plutonium Management and Disposition Agreement (PMDA)[180], which entered into force in July 2011. The United States argued in its report on implementation of arms control and nonproliferation, published in April 2017: "Although there is no indication the Russian Federation (Russia) violated its obligations under the PMDA, Russia's October 2016 announcement of a decision to 'suspend' the PMDA raises concerns

[177] Kingston Reif, "Congress Limits Warheads Dismantlement," *Arms Control Today*, Vol. 47, No. 5 (June 2017), p. 31.

[178] On activities or progress before 2017, see the *Hiroshima Report 2017*.

[179] NPT/CONF.2015/10, March 12, 2015.

[180] Under the agreement, each country is to dispose no less than 34 metric tons of weapon-grade plutonium removed from their respective defense programs by irradiating it as MOX in existing light-water reactors fuel.

regarding its future adherence to obligations under this Agreement."[181] On the other hand, Russia refuted that the report's finding "does not correspond to reality" because Russia only suspended the PMDA in response to U.S. "hostile actions toward Russia" and a "radical change of circumstances"[182] since the agreement was signed in 2000.

The Trump administration, like its predecessor, has sought to end construction of the mixed-oxide (MOX) fuel fabrication Facility (MFFF) at the Savannah River Site in South Carolina,[183] and to pursue the dilution and disposal approach, due to increasing cost and delaying schedule of the MFFF's construction. However, the Congress has not approved this approach, and allocated a budget for the construction of the MFFF. It also indicates several conditions on accepting such an approach, including that: the cost of the dilute and dispose option be less than approximately half of the estimated remaining lifecycle cost of the mixed-oxide fuel program; the Secretary of Energy must provide the details of any statutory or regulatory changes necessary to complete the option; and that a "sustainable future" is established for the Savannah River Site.[184]

In the meantime, the United States has stated on several occasions, including the NPT Review Process, that it has made significant reductions in its military stocks of fissile material. At the 2017 NPT PrepCom, the United Stated clarified:

> Out of the 95.4 metric tons of plutonium in the U.S. plutonium stockpile most recently reported in 2009, the United States has declared 61.5 metric tons excess to U.S. defense needs. Out of 686 metric tons in the U.S. stockpile of highly enriched uranium most recently reported in 2004, the United States has removed 374 metric tons from weapons programs. More than 153 metric tons removed from the stockpile has been downblended for use as civil reactor fuel. Additionally, under the 1993 U.S.-Russia Highly Enriched Uranium (HEU) Purchase Agreement, 500 metric tons, the equivalent of 20,000 nuclear warheads, of Russian weapons-origin HEU was downblended to LEU and used in U.S. nuclear power plants for over twenty years.[185]

(12) DISARMAMENT AND NON-PROLIFERATION EDUCATION AND COOPERATION WITH CIVIL SOCIETY

Regarding cooperation with civil society in nuclear disarmament and non-proliferation, involvement of civil society in the process of formulating the TPNW was notable. As was at the Open-ended Working Group (OEWG) to take forward multilateral nuclear disarmament negotiations held in 2016, civil society was invited to the United Nations Conference to Negotiate a Legally Binding Instrument to Prohibit Nuclear Weapons, Leading towards Their Elimination in 2017, where *hibakusha*, NGO and other organizations made statements and submitted official documents. Among them, the ICAN took an initiative towards the conclusion of the treaty with the Austria and other countries, and was awarded the

[181] U.S. Department of State, "Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments," April 2017, https://www.state.gov/t/avc/rls/rpt/2017/270330.htm.

[182] Maggie Tennis, "INF Dispute Adds to U.S.-Russia Tensions," *Arms Control Today*, Vol. 47, No. 5 (June 2017), pp. 29-30.

[183] Kingston Reif, "Trump Budget Supports MOX Termination," *Arms Control Today*, Vol. 47, No. 6 (July/August 2017), p. 30.

[184] Frank von Hippel, "Fissile Material Issues in the U.S. National Defense Authorization Act for Fiscal Year 2018," *IPFM Blog*, December 17, 2017, http://fissilematerials.org/blog/2017/12/fissile_material_issues_i.html.

[185] "Statement by the United States," Cluster 1, First Session of the Preparatory Committee for the 2020 NPT Review Conference, May 4, 2017.

Nobel Peace Prize as described above.

The NPDI submitted a working paper to the 2017 NPT Review Conference, in which they argued that educating young people, especially teenagers, is most crucial, and "[t]he amassed knowledge and experience of the realities of atomic bombings should also be passed on to younger generations, so that they can actively engage in disarmament and non-proliferation issues."[186] Japan, which has attached importance to such activities, held a discussion meeting with 22 high school students as Youth Communicators for a World without Nuclear Weapons, and Japanese and other countries' officials and experts on disarmament issues at the Delegation of Japan to the Conference on Disarmament in August 2017.

Side events held during the NPT RevCon and the First Committee of the UNGA, where NGOs can participate, are also important elements of the efforts toward civil society cooperation.[187] During the 2017 NPT PrepCom, Australia, Austria, Canada, France, Germany, Japan, Kazakhstan, South Korea, New Zealand, Mexico, Norway, Sweden, Switzerland, the United Kingdom, the United States and others hosted such events. And during the 2017 UNGA, Australia, Austria, Canada, Chile, Germany, Japan, Kazakhstan, Mexico, the Netherlands, Norway, Poland, Switzerland, the United Kingdom and others hosted such events.

Regarding cooperation with civil society, one of the important efforts for governments is to provide more information on nuclear disarmament and non-proliferation matters. Among the countries surveyed in this report, the following set up a section or sections on disarmament and non-proliferation on their official homepages (in English) and posted enlightening information: Australia, Austria, Belgium, Canada, China, France, Germany, Japan, New Zealand, Sweden, Switzerland, the United Kingdom and the United States.

Finally, a few countries started to legislate "divestment" against organizations or companies involved in producing nuclear weapons. For instance, according to the ICAN report, Switzerland and Luxembourg enacted national laws that restrict financing for nuclear weapons production. Some banks and investment funds also have policies against investing in such organizations or companies.[188] Besides, Nobel Foundation Executive Director Lars Heikensten said in October 2017, "Today, the Nobel Foundation has clear guidelines regarding ethics and sustainability. No new investments are made in funds that invest in companies that violate international conventions regarding, for example, land mines or cluster bombs, or who have investments in nuclear weapons."[189]

(13) HIROSHIMA PEACE MEMORIAL CEREMONY

On August 6, 2017, the Hiroshima Peace Memorial Ceremony was held in Hiroshima. Representatives from 80 countries and the EU, along with Japan, participated, including:

- Ambassadorial-level—Australia, Belgium, Brazil, Canada, France, India, Israel, Kazakhstan, New Zealand, Philippines, Pakistan, Poland, the United Kingdom and the United States
- Non-Ambassadorial-level—Austria, Egypt,

[186] NPT/CONF.2020/PC.I/WP.16, April 19, 2017.

[187] At the 2017 NPT PrepCom, the Hiroshima Prefectural Government hosted a side event, titled "Bridging the gap between Nuclear-Weapon States and Non-Nuclear-Weapon States," in which the Hiroshima Governor, as well as several experts, participated as panelists.

[188] See IKV Pax Christi and ICAN, "Don't Bank on the Bomb: A Global Report on the Financing of Nuclear Weapons Producers," December 2016.

[189] "Nobel Foundation Accused of Indirect Nuclear Arms Investments," *Swissinfo.ch*, October 20, 2017, https://www.swissinfo.ch/eng/politics/transparency-call_nobel-foundation-accused-of-indirect-nuclear-arms-investments/43614160.

Indonesia, Iran, South Korea, Norway, Russia and UAE (Note: underline added to denote countries whose ambassadorial-level representatives have attended the ceremony in the past three years)

- Not attending—Chile, China, Germany, Mexico, Netherlands, Nigeria, Saudi Arabia, South Africa, Sweden, Switzerland, Syria, Turkey, North Korea (Note: underline added to denote countries whose representatives have attended the ceremony at least once in the past three years)

At various fora, Japan has proposed that the world's political leaders visit Hiroshima and Nagasaki, to witness the humanitarian consequences of nuclear weapons with their own eyes. In 2017, the following leaders visited Hiroshima: Prime Minister of Czech Republic, Ministers of Bangladesh, Lithuania, and Bosnia and Herzegovina.[190]

[190] See the Hiroshima City's homepage (http://www.city.hiroshima.lg.jp/www/contents/1416289898775/index.html).

[Column 6] The NPT Regime: Towards the 2020 NPT Review Conference

Tytti Erästö and Sibylle Bauer

There are several negative dynamics at play that are boding ill for the 2020 Nuclear Non-Proliferation Treaty (NPT) Review Conference. As with the 2015 Review Conference, the nuclear-weapon states (NWS) parties to the NPT (i.e. the five permanent members of the United Nations Security Council—China, France, Russia, United Kingdom and United States—known as the P5) have little to show in terms of progress on disarmament. The frustration of non-nuclear-weapons states (NNWS) with this situation was a significant factor in the negotiation of the Treaty on the Prohibition of Nuclear Weapons (TPNW) that was adopted in July 2017. The P5 and their allies have almost uniformly rejected the new treaty as a threat to the established NPT-based order. Thus, the immediate short-term impact of the TPNW has been increased polarization.

While the TPNW seems to many like the most controversial issue among NPT members, it is merely the tip of the iceberg of deeper divisions regarding the slow pace of nuclear disarmament. Is there a way to bridge these divisions by the 2020 NPT Review Conference, and what would a failure to do so mean for the non-proliferation and disarmament regime?

1. Revitalising the NPT's disarmament pillar

Over the almost half a century of the NPT's existence, disarmament has proven to be the weakest of the treaty's three pillars (nonproliferation, the peaceful use of nuclear energy, and disarmament). The 13 "practical steps" adopted in 2000 and the 64-point action plan agreed by the 2010 NPT Review Conference created renewed hopes that were then dashed. Apart from the conclusion and implementation of the 2010 New START Treaty and the Nuclear Glossary, the P5 have had very little to show in terms of concrete disarmament steps. Another major source of frustration within the NPT has been the lack of implementation of the 1995 resolution regarding the establishment of a weapons-of-mass-destruction free zone in the Middle East. Indeed, this latter issue was the single most important reason for the lack of a final consensus document at the 2015 Review Conference.

In an attempt to escape the constraints of the consensus-based NPT framework and of the traditional security paradigm dominating discourse on nuclear weapons, the majority of the non-nuclear weapon states sought a different approach by bringing international humanitarian law to bear on the issue of nuclear weapons. In 2013–14, the NNWS organized a series of conferences highlighting the catastrophic humanitarian consequences of any use of nuclear weapons. These conferences contributed to the General Assembly vote by 113 states in December 2016 to begin negotiations on a treaty banning nuclear weapons. The negotiations were concluded in July 2017, resulting in the adoption of the TPNW.

According to its negotiators, one of the aims of the TPNW is to strengthen the NPT's disarmament pillar and fill the so-called legal gap for the prohibition and elimination of nuclear weapons. While the legal prohibition of the TPNW does not apply to nuclear weapon states as long as they remain outside of the treaty, the assumption is that the TPNW could indirectly influence them by strengthening the universal stigma against nuclear weapons.

While the TPNW may work as intended in the long term, its most evident short-term effect has been increasing polarization among the NPT membership. With the exception of the China, the P5 have criticized the TPNW for creating unrealistic expectations and

ignoring current security problems and the role of nuclear weapons in existing security doctrines. A number of factors have arguably contributed to the relatively low number of signatures and ratifications of the NWPT thus far: fears that overlaps between the NPT and the TPNW could lead to a fragmentation of disarmament efforts; reservations about parts of the TPNW text and its relationship with the NPT; and US pressure against signing the treaty.[1]

2. Importance of the 2020 Review Conference and ways ahead

Regardless of their position on the TPWN, the majority of the NNWS continue to be frustrated with what they see as the P5's lack of commitment to their disarmament obligations. From this perspective, the most effective way to reduce polarization would be for the P5 to clearly move towards meeting their long-established obligations through practical steps.

It might, therefore, make sense for all states parties to move beyond the TPNW divisions by identifying and committing to the most practicable steps towards disarmament. As outlined by previous NPT documents, these include such measures as reducing the risk of accidental or intentional use of nuclear weapons; bringing into force the Comprehensive Nuclear-Test-Ban Treaty; and starting negotiations on a fissile material cut-off treaty. Furthermore—while US-Russian strategic arms reductions have traditionally been considered separate from the multilateral disarmament issues—any progress on this front would also reinforce the NPT framework. In particular, saving the 1987 Intermediate-Range Nuclear Forces (INF) Treaty from collapsing would be crucial for preventing backward progress in nuclear arms control. More multilateral attention should be given to measures for advancing transparency and reporting on nuclear arsenals as well as to development of new tools for verifying nuclear disarmament. Moreover, the NPT's non-proliferation pillar could be reinforced by encouraging states that have not done so to adopt Additional Protocols to their existing IAEA safeguards agreements as a new verification baseline. At the same time, support for non-proliferation also means respecting existing agreements, notably continued and clear support of the Iran nuclear deal by all P5 states.

Finally, finding a more cordial way of discussing the TPNW would pave the way for constructive discussions at the NPT, as both treaties share the long-term goal of the eventual elimination of nuclear weapons. Agreeing on specific and tangible outcomes in 2020 will be essential for the future credibility and legitimacy of the NPT.

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[1] Although 122 countries voted for the adoption of the TPNW in July 2017, by Feb. 2018 only 56 countries had signed the treaty and 5 ratified it.

Chapter 2. Nuclear Nonproliferation[1]

(1) ACCEPTANCE AND COMPLIANCE WITH NUCLEAR NON-PROLIFERATION OBLIGATIONS

A) Accession to the NPT

The Nuclear Non-Proliferation Treaty (NPT) has 191 adherents (including the Holy See and Palestine). Among the current 193 United Nations (UN) Member States, those remaining outside the NPT are: India and Pakistan, both of which tested and declared having nuclear weapons in 1998; Israel, which is widely believed to possess them; and South Sudan, which declared its independence and joined the United Nations in July 2011, and does not possess any nuclear weapons; and, arguably, North Korea. North Korea declared its withdrawal from the NPT in 2003, but there is no agreement among the states parties on North Korea's official status. It has refused to return to the Treaty despite UN Security Council resolutions (UNSCRs) demanding that it do so at an early date.

B) Compliance with Articles I and II of the NPT and the UNSC resolutions on non-proliferation

NORTH KOREA

Since the NPT entered into force, no case of non-compliance with Articles I and II of the Treaty has been officially reported by the United Nations or any other international organization.[2] However, if North Korea's withdrawal is not interpreted as legally valid or if it acquired nuclear weapons before announcing its withdrawal from the NPT, such acquisition of nuclear weapons would constitute non-compliance with Article II. The U.S. State Department clearly stated in its 2017 report, titled "Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments," that North Korea was in violation of its obligations under Articles II and III of the NPT and in non-compliance with its International Atomic Energy Agency (IAEA) Safeguards Agreement at the time it announced its withdrawal from the NPT in 2003.[3]

UNSCR 1787, adopted in October 2006, stipulates that:

> [T]he DPRK shall abandon all nuclear weapons and existing nuclear programmes in a complete, verifiable and irreversible manner, shall act strictly in accordance with the obligations applicable to parties under the Treaty on the Non-Proliferation of Nuclear Weapons and the terms and conditions of its Safeguards Agreement (IAEA INFCIRC/403) and shall provide the IAEA transparency measures extending beyond these requirements, including such access to individuals, documentation, equipments and facilities as may be required and deemed necessary by the IAEA.[4]

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[1] This chapter is written by Hirofumi Tosaki.

[2] No international body is explicitly mandated with a responsibility for assessing compliance with these articles, apart from the IAEA's safeguards verification mandate.

[3] U.S. Department of State, "Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments," April 2017, https://www.state.gov/t/avc/rls/rpt/2017/270330.htm.

[4] S/RES/1718, October 14, 2006. The UN Security Council Resolution 1874 in June 2009 also demanded that North Korea "immediately comply fully with its obligations under relevant Security Council resolutions, in particular resolution 1718 (2006)."

The Security Council also decided that North Korea "shall abandon all other existing weapons of mass destruction and ballistic missile programme in a complete, verifiable and irreversible manner." In defiance, North Korea has failed to respond to the UN Security Council's decisions, and has continued nuclear weapon and ballistic missile-related activities, including its sixth nuclear test in September 2017.

The year 2017 again saw the absence of any negotiations with North Korea over its nuclear program. In August 2017, U.S. Secretary of State Rex W. Tillerson offered negotiations with North Korea if it surrendered its nuclear weapons. He also offered a set of four assurances, saying: "We do not seek a regime change, we do not seek the collapse of the regime, we do not seek an accelerated reunification of the peninsula, we do not seek an excuse to send our military north of the 38th parallel."[5] In late September, Tillerson repeated his outreach effort. A day later, however, President Donald Trump undercut these efforts by tweeting: "I told Rex Tillerson, our wonderful Secretary of State, that he is wasting his time trying to negotiate with Little Rocket Man."[6] For its part, North Korea insisted that it would not engage in dialogue unless the United States renounced its "hostile policy"; and it had no intention to negotiation over its nuclear weapons except as part of arms control talks in which the US also put its weapons on the table.[7] The Six-Party Talks have not been convened since March 2007 due to North Korea's actions contrary to the purpose of the talks and its refusal to re-commit to denuclearization.

There have been positive developments between North and South Korea, however. In his New Year address of January 2018, while flaunting possession of a claimed nuclear deterrent and urging cancelation of U.S.-South Korean joint military exercises, Kim Jong-un, the Chairman of the Workers' Party of Korea, stated:

> The north and the south should desist from doing anything that might aggravate the situation, and they should make concerted efforts to defuse military tension and create a peaceful environment. The south Korean authorities should respond positively to our sincere efforts for a detente, instead of inducing the exacerbation of the situation by joining the United States in its reckless moves for a north-targeted nuclear war that threatens the destiny of the entire nation as well as peace and stability on this land.[8]

Responding positively, South Korea repeated an offer to hold a bilateral high-level talks and announced that the United States and South Korea agreed to postpone their joint military exercise until after the Pyeongchang Winter Olympics and Paralympic Games in February-March 2018. South-North high-level talks were subsequently held on January 9, 2018. In a Joint Statement they said that they agreed on: the North's participation in the Pyeongchang Winter Olympics and Paralympic Games; alleviation of the military tension; and resolution of the South-North issues bilaterally. However, North Korea reportedly insisted that it had no intention to discuss its nuclear issues with the South.

IRAN

The E3/EU+3 (France, Germany and the United Kingdom/European Union plus China, Russia and the United States) and Iran agreed the Joint

[5] "North Korea: US Not Seeking Regime Change, Says Rex Tillerson," *BBC*, August 2, 2017, http://www.bbc.com/news/world-us-canada-40797613.

[6] Peter Baker and David E. Sanger, "Trump Says Tillerson Is 'Wasting His Time' on North Korea," *New York Times*, October 1, 2017, https://www.nytimes.com/2017/10/01/us/politics/trump-tillerson-north-korea.html.

[7] See, for instance, Foster Klug and Hyung-Jin Kim, "North Korea Refuses to Put Its Nuclear on the Negotiating Table," *Christian Science Monitor*, July 5, 2017, https://www.csmonitor.com/World/Asia-Pacific/2017/0705/North-Korea-refuses-to-put-its-nuclear-program-on-the-negotiating-table.

[8] "Kim Jong Un's 2018 New Year's Address," January 1, 2018, https://www.ncnk.org/node/1427.

Comprehensive Plan of Action (JCPOA) on July 14, 2015 in Vienna.[9] Since then, the IAEA has submitted quarterly reports to the Board of Governors confirming Iran's adherence to its nuclear obligations under the JCPOA. The main points of the IAEA November 2017 report are:[10]

- At the Fuel Enrichment Plant (FEP) at Natanz, there have been no more than 5,060 IR-1 centrifuges;
- Iran's total enriched uranium stockpile has not exceeded 300 kg of UF6 enriched up to 3.67% U-235 (or the equivalent in different chemical forms). The quantity of 300 kg of UF6 corresponds to 202.8 kg of uranium;
- Iran has not enriched uranium above 3.67% U-235;
- Iran's stock of heavy water was 114.4 metric tonnes. Throughout the reporting period, Iran had no more than 130 metric tonnes of heavy water;
- Iran has accepted the IAEA safeguards;
- Iran has continued to permit the Agency to use on-line enrichment monitors and electronic seals which communicate their status within nuclear sites to Agency inspectors, and to facilitate the automated collection of Agency measurement recordings registered by installed measurement devices;
- Iran has continued to permit the Agency to monitor…that all uranium ore concentrate (UOC) produced in Iran or obtained from any other source is transferred to the Uranium Conversion Facility (UCF) at Esfahan;
- Iran continues to provisionally apply the Additional Protocol to its Safeguards Agreement in accordance with Article 17(b) of the Additional Protocol, pending its entry into force. The Agency has continued to evaluate Iran's declarations under the Additional Protocol, and has conducted complementary accesses under the Additional Protocol to all the sites and locations in Iran which it needed to visit.
- The Agency's verification and monitoring of Iran's nuclear-related commitments set out in Section T of Annex I continues. (Section T prohibited certain activities relevant to the development of nuclear weapons, but the JCPOA did not say how these prohibitions were to be verified.)

On the other hand, statements by the U.S. new administration raised concerns about the future of the JCPOA. President Trump criticized the agreement even before his inauguration. In March 2016, he said, "My number one priority is to dismantle the disastrous deal with Iran." Under the Iran Nuclear Agreement Review Act (INARA), the president is required to issue a certification to Congress every 90 days determining that: 1) Iran is fully implementing the JCPOA; 2) Iran has not committed a material breach; 3) Iran has not taken any action that could significantly advance a nuclear weapons program; and 4) suspension of sanctions is appropriate and proportionate to the measures taken by Iran and vital to U.S. national security interests.

President Trump issued certifications in April and July 2017. However, on October 13, after a review of the administration's Iran policy, he decided not to certify Iran's compliance on grounds of the fourth condition. He also claimed "Iran is not living up to the spirit of the deal," including Iran's support for terrorism. Such certification decisions are an internal US requirement, not part of the JCPOA. Meanwhile, President Trump continued to suspend sanctions, as required by the accord. His decision not to certify triggered a 60-day period under the INARA, in which the U.S. Congress had expedited authority to re-institute pre-JCPOA sanctions, although this period

[9] "Joint Comprehensive Plan of Action," Vienna, July 14, 2015. JCPOA is posted on the U.S. State Department's website (http://www.state.gov/e/eb/tfs/spi/iran/jcpoa/).

[10] GOV/2017/48, November 13, 2017.

passed without any such Congressional action. In his October 13 statement, President Trump urged removal of the JCPOA's "sunset clause," which he said would allow Iran to conduct unrestricted nuclear activities (including enriching uranium) after a certain period. He also sought restrictions on Iran's missile program, stating that, "in the event we are not able to reach a solution working with Congress and our allies, then the agreement will be terminated."[11]

Other parties sought to protect the JCPOA. Iran insisted that it continues to fully implement the agreement. Iran's Supreme Leader Ayatollah Ali Khamenei stated, "we will not tear up the [nuclear] deal before the other party does so."[12] The EU is also determined to preserve the JCPOA.[13] In addition, IAEA Director General Yukiya Amano stated: "The IAEA's verification and monitoring activities address all the nuclear-related elements under the JCPOA. They are undertaken in an impartial and objective manner and in accordance with the modalities defined by the JCPOA and standard safeguards practice…So far, the IAEA has had access to all locations it needed to visit. At present, Iran is subject to the world's most robust nuclear verification regime."[14]

While Iran's President Hassan Rouhani underlined that Iran's preference is to remain in the accord, he warned that it would withdraw from the JCPOA and revive suspended nuclear activities if the United States continues "threats and sanctions" against Iran.[15] He also insisted that Iran had no intention to renegotiate the JCPOA.[16] Furthermore, Iran argued that its ballistic missiles were not in violation of the UN Security Council Resolution because they are not intended for delivery of nuclear warheads, and that Iran's supreme leader has restricted the range of ballistic missiles manufactured in the country to 2,000 km, which limits their reach largely to regional Middle East targets.[17] The United States was not the only state to express concern about Iran's ballistic missiles. While France maintains its position that the JCPOA should be preserved, it said that, separate from the agreement, it wanted an uncompromising dialogue with Iran about its ballistic missiles.[18]

WITHDRAWAL FROM THE NPT

Although Article X-1 of the NPT contains some guidance on how a state can legitimately withdraw from the treaty, there remains a lack of clarity over some aspects of this process. Concerns have focused on a state choosing to withdraw from the NPT, after first acquiring nuclear weapons in violation of the Treaty. Japan, South Korea and other several Western countries have proposed measures to prevent the right of withdrawal from being abused.

In 2017, few remarkable proposals or arguments were

[11] "Remarks by President Trump on Iran Strategy," October 13, 2017, https://www.whitehouse.gov/the-press-office/2017/10/13/remarks-president-trump-iran-strategy; "President Donald J. Trump's New Strategy on Iran," October 13, 2017, https://www.whitehouse.gov/the-press-office/2017/10/13/president-donald-j-trumps-new-strategy-iran.

[12] "Khamenei: Iran Won't Be First to Abandon Nuclear Deal," *Al-Monitor*, October 18, 2017, https://www.al-monitor.com/pulse/originals/2017/10/khamenei-reaction-trump-policy-speech-nuclear-deal-jcpoa.html.

[13] "EU Committed to Iran Nuclear Deal," *World Nuclear News*, October 16, 2017, http://www.world-nuclear-news.org/NP-EU-committed-to-Iran-nuclear-deal-1610177.html.

[14] "Statement by IAEA Director General Yukiya Amano," IAEA, October 13, 2017, https://www.iaea.org/newscenter/statements/statement-by-iaea-director-general-yukiya-amano-13-october-2017.

[15] Nasser Karimi, "Iranian President Threatens to Revitalize Nuclear Program," *Associated Press*, August 15, 2017, https://www.apnews.com/3a08240c809a40db86566af3ef844229.

[16] "Iran Nuclear Deal Cannot Be Renegotiated: Rouhani," *Reuters*, September 21, 2017, https://www.reuters.com/article/us-iran-politics-nuclear-deal/iran-nuclear-deal-cannot-be-renegotiated-rouhani-idUSKCN1BW1NM.

[17] Jon Gambrell, "Iran Says Supreme Leader Limiting Ballistic Missile Range," *Associated Press*, October 31, 2017, https://apnews.com/a9b9ff80f4424ce5be3a4a81e04dc8dc/Iran-Guard:-Supreme-leader-limiting-ballistic-missile-range.

[18] John Irish, "Despite EU Caution, France Pursues Tough Line on Iran Missile Program," *Reuters*, November 15, 2017, https://www.reuters.com/article/us-iran-nuclear-france-eu/despite-eu-caution-france-pursues-tough-line-on-iran-missile-program-idUSKBN1DF23M.

made. At the 2015 NPT Review Conference (RevCon),[19] western countries insisted that withdrawal from the NPT should be made difficult by adding several conditions, while they also acknowledged the right of states parties to withdraw. Among NWS, Chinese and Russian positions on this issue seem more cautious than those of France, the United Kingdom and the United States. Some NNWS, including the Non-Aligned Movement (NAM) countries, argue that there is no need to revise or reinterpret Article 10 on a withdrawal from the NPT, which is the right of all state parties.

C) Nuclear-Weapon-Free Zones

Treaties establishing nuclear-weapon-free zones (NWFZs) have entered into force in Latin America (Tlatelolco Treaty), the South Pacific (Rarotonga Treaty), Southeast Asia (Bangkok Treaty), Africa (Pelindaba Treaty), and Central Asia (Central Asian NWFZ Treaty). In addition, Mongolia declared its territory a nuclear-weapon-free zone at the UN General Assembly (UNGA) in 1992, and the UNGA has been adopting a resolution entitled "Mongolia's International Security and Nuclear-Weapon-Free-Status" every two years since 1998, in support of Mongolia's declaration.[20] All the states eligible to join the NWFZs in Latin America, Southeast Asia and Central Asia are parties to the respective NWFZ treaties.

Regarding efforts for establishing a Middle East Zone Free of WMD, the convening of an international conference, agreed at the 2010 NPT RevCon, could not be achieved before the 2015 NPT RevCon. Furthermore, at the latter RevCon, a final document was not adopted due to a lack of consensus on the language regarding that international conference. At the 2017 NPT PrepCom, Middle Eastern countries, with the notable exception of Egypt, Iran, Lebanon and Syria, urged that such a conference be held prior to the 2020 NPT RevCon.[21] Russia stated: "Convening a conference on the WMDFZ remains an urgent and achievable objective in the context of implementing the 1995 Resolution on the Middle East. Preparation for this event, including achieving the agreement on all organizational modalities and substantive issues should be started as soon as possible. Russia as one of the co-sponsors of the 1995 Resolution is willing to fully support this process."[22] However, Egypt, which repeated deep dissatisfaction about the failure of its convening by 2015, has not assented to such a proposal of holding the international conference within the 2020 NPT review process period.[23] The United States also criticized the proposal on grounds that "the conditions necessary for a Middle East WMD-free zone do not currently exist," adding that "misguided attempts to coerce an outcome, or to hold the NPT review process hostage, indicate a misunderstanding of the function and purpose of weapons-free zones."[24]

In 2017, the UNGA resolution, titled "Establishment of a nuclear-weapon-free zone in the region of the Middle East,"[25] was adopted without a vote, as had happened in the past. However, few concrete measures are mentioned in the resolution.

Concerning Northeast Asia and South Asia, while

[19] On the arguments and proposals made at the 2015 NPT RevCon by countries surveyed in this report, see the *Hiroshima Report 2016*.

[20] 53/77D, December 4, 1998.

[21] NPT/CONF.2020/PC.I/WP.30, May 4, 2017.

[22] "Statement by Russia," General Debate, First Session of the Preparatory Committee for the 2020 NPT Review Conference, May 2, 2017. See also NPT/CONF.2020/PC.I/WP.31, May 8, 2017.

[23] "Statement by Egypt," Cluster 2, Specific Issue, First Session of the Preparatory Committee for the 2020 NPT Review Conference, May 8, 2017.

[24] "Statement by the United States," Cluster 2, Regional Issues, First Session of the Preparatory Committee for the 2020 NPT Review Conference, May 8, 2017.

[25] A/RES/72/24, December 4, 2017.

initiatives for establishing NWFZs have been proposed by the private sectors in the respective regions, there is no indication that state parties in these regions are taking any serious initiative toward such a goal. Meanwhile, in its report submitted to the 2015 NPT RevCon, Mongolia expressed a willingness to "[p]lay an active role in promoting the idea of establishing a nuclear weapon-free zone in north-east Asia."[26]

[26] NPT/CONF.2015/8, February 25, 2015.

[Column 7] Regional Security and Nuclear Weapons-Free Zones

John H. King

Regional security is an important way to augment general worldwide security. But it is a confusing concept, primarily because it is so difficult to define. What are the elements of regional security? When is it achieved? Is it a goal or a process? The answers to these and related questions indicate that credible regional security depends on using a variety of security-related instruments in a redundant and overlapping way. And these elements must be directly targeted to the specific needs of any given region.

One of these instruments is the Nuclear Weapons-Free Zone (NWFZ), which has long been recognized as a way to enhance security in various regions of the world. NWFZs seek to augment regional security by emphasizing the absence of nuclear weapons there as well as by formalizing the agreement of Nuclear-Weapons States (NWS) not to bring into or use nuclear weapons within those regions. In this sense, NWFZ agreements are highly visible symbols that support the objectives of the Nuclear Non-proliferation Treaty (NPT) and give it increased political and legal weight within a region.

Furthermore, regional NWFZ treaties work even better when augmented by other legal and political instruments such as non-aggression pacts, no-first-use (of nuclear weapons) declarations, conventional arms control treaties and the like. But NWFZ treaties have a primary place in the panoply of regional security elements because of their special political visibility, the fact that the main states in the region are directly involved, and because the five nuclear powers recognized in the NPT sign special protocols giving specific assurances on observing NWFZ treaty requirements.

Although many regions of the world are already covered by NWFZ treaties, important areas remain outside these treaty zones. The two most important are the regions of the Middle East and of Northeast Asia. (Europe and North America are important regions as well but are not examined here since they are composed mostly of non-nuclear countries that nevertheless have implicit nuclear obligations as a result of their NATO treaty membership.)

While the effort to achieve a Middle Eastern NWFZ treaty has received much attention in the UN and its First Committee (Disarmament) for many years, far less attention has been focused on the possibility of such a treaty for the Northeast Asian region. While there are fewer potential members of such a treaty in this region (see below), there could be substantial benefits for the region if an appropriate NFWZ treaty could be achieved. This is because the Northeast Asian region runs through a fault line of potentially immediate nuclear conflict, given the existence there of nuclear-armed states and states protected by “nuclear-umbrella” security treaties that do not exist in other such regions. But this is also why a NWFZ treaty for this region would be so very difficult to achieve, and yet so much more important.

A definition of the Northeast Asia security region would include the following states or regions: China, Mongolia, South Korea, North Korea, Russia and Japan. Note, however, that this definition has important anomalies. Mongolia already has Nuclear Weapon-Free (NWF) status,

while formerly independent Macao and Hong Kong are now part of China even though they have a degree of autonomy within that country. China and Russia are defined as NWS, while North Korea possesses nuclear weapons and has left the NPT. South Korea and Japan have defense agreements with the United States that place them under the U.S. nuclear umbrella even if both countries foreswear permitting nuclear weapons into their territories. (Nevertheless, both are NPT members and could thus form a NWFZ.) Taiwan is not recognized as a Member State by the UN and legally cannot be a member of a state-based agreement such as a NWFZ treaty, even if it already adheres informally to the principles of many arms control and disarmament treaties.

For the Northeast Asia region, the most immediate security threat is posed by North Korea's nuclear weapons and rogue state status. This must be dealt with first and foremost, with Japan and South Korea playing a major role in view of their close proximity to North Korea. In this regard, presented below are some options for improving regional security such as modified NWFZs, related *sui generis* arrangements and political/diplomatic elements that would lead to improved confidence and security. These options admittedly require new and "outside the box" political thinking and cooperation, but the deteriorating security situation in the region requires this.

First, both Japan and South Korea could seek to join the Bangkok Treaty–amended to permit expansion–thus converting it into an East Asian NWFZ. Article 15 of that Treaty provides for accession by additional states. The main advantage is that the adhesion of both countries to the Bangkok Treaty would give that Treaty greater visibility and effectiveness within the enlarged zone in dealing with North Korea's nuclear weapons capabilities.

Second, and failing the possibility of joining the Bangkok Treaty, Japan and South Korea could simply establish a Northeast Asia NWFZ between themselves. Although lacking the greater support that an expanded Bangkok Treaty would offer, the smaller NWFZ could still produce a noticeable security effect in the region by demonstrating both countries' desire to work together to offset North Korea's threatening nuclear posture.

Third, as the regional countries most affected, Japan and South Korea together could seek – in partnership with the NWS – the normalization of relations with North Korea so as to provide the political base for dealing peacefully with the security problems caused by its nuclear status. There is precedent: the normalization of relations between the U.S. and China in 1979. Should this be possible – and there is no reason it should not be if planned and executed carefully – steps could then be taken to negotiate an end to the still-existing 1953 armistice as well as various complementary actions to reduce security tensions in the Northeast Asian area and, most importantly, to avoid a catastrophic war.

A necessary precondition, however, would have to be open recognition that North Korea's possesses nuclear weapons. In this regard, there are precedents since members of the international community have already done as much with Israel, Pakistan and India. Such recognition could facilitate negotiations leading ultimately to the re-association of North Korea with the international community and the regularization of the political status of the Korean peninsula, among other goals. A regional East Asia or Northeast Asia NWFZ treaty with its implementing/review organizations would

enhance operational and political efforts to this end and would provide a coordination mechanism concerning nuclear disarmament strategies. The benefits for regional security in Northeast Asia, and for Japan and South Korea in particular, could be enormous.

The proposals made above are just a few examples of steps that might be taken to achieve these important goals. There are obviously others or combinations thereof that can also be considered. The point is that if the security of the Northeast region is to be satisfactorily achieved, a great deal of inventiveness and willingness to shatter long-standing (not to say encrusted) policies will be needed. Hopefully the countries of the region will be able to meet the challenge.

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(2) IAEA SAFEGUARDS APPLIED TO THE NPT NNWS

A) Conclusion of IAEA Safeguards Agreements

Under Article III-1 of the NPT, "[e]ach Non-nuclear-weapon State Party to the Treaty undertakes to accept safeguards as set forth in an agreement to be negotiated and concluded with the International Atomic Energy Agency in accordance with the Statute of the International Atomic Energy Agency and the Agency's safeguards system, for the exclusive purpose of verification of the fulfillment of its obligations assumed under this Treaty with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other nuclear explosive devices." The basic structure and content of the safeguards agreement are specified in the Comprehensive Safeguards Agreement (CSA), known as INFCIRC/153, which each state negotiates with the IAEA and then signs and ratifies. As of December 2016, 12 NPT NNWS have yet to conclude CSAs with the IAEA.[27]

In accordance with a strengthened safeguards system in place since 1997, an NPT NNWS or any other state may also conclude with the IAEA an Additional Protocol to its safeguards agreement, based on a model document known as INFCIRC/540. As of December 2017, 126 NPT NNWS have ratified Additional Protocols. Honduras, Senegal and Thailand newly ratified them in 2017. Iran started provisional implementation of the Additional Protocol in January 2016, while it has yet to ratify the Protocol.

A state's faithful implementation of the Additional Protocol, along with the CSA, allows the IAEA Secretariat to draw a so-called "broader conclusion" that "all nuclear material in the State has remained in peaceful activities." This conclusion is that the Agency finds no indications of diversion of declared nuclear material from peaceful nuclear activities or any undeclared nuclear material or activities in that country. Subsequently, the IAEA implements so-called "integrated safeguards," which is defined as the "optimized combination of all safeguards measures available to the Agency under [CSAs] and [Additional Protocols], to maximize effectiveness and efficiency within available resources." As of the end of 2016, 69 NNWS have applied integrated safeguards.[28]

The current status of the signature and ratification of the CSAs and the Additional Protocols and the implementation of integrated safeguards by the NPT NNWS studied in this project is presented in the following table. In addition to the IAEA safeguards, EU countries accept safeguards conducted by EURATOM, and Argentina and Brazil conduct mutual inspections under the bilateral Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC).

In 2005, the IAEA modified what is called the Small Quantity Protocol (SQP) which until then held in abeyance most of the operative provisions of the IAEA's verification tools for states which have only very small quantities of nuclear material. In the resolution, "Strengthening the Effectiveness and Improving the Efficiency of Agency Safeguards" adopted in September 2016, the IAEA General Conference called on all States with unmodified Small Quantity Protocols (SQPs) to either rescind or amend them.[29] As of June 2017, the amended SQPs for the respective 56 countries were entered into force. Among states that have announced an intention to introduce nuclear energy, Saudi Arabia has yet to accept an amended SQP.

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[27] This number includes Palestine, which acceded to the NPT in 2015. Those 12 countries have little nuclear material, or do not conduct nuclear-related activities.

[28] IAEA, *IAEA Annual Report 2016*, September 2017, p. 14.

[29] GC(61)/16, July 26, 2017.

B) Compliance with IAEA Safeguards Agreements

The IAEA Annual Report 2016 stated:

> Of the 124 States that had both a CSA and an [Additional Protocol (AP)] in force the Agency concluded that all nuclear material remained in peaceful activities for 69 States; for the remaining 55 States, as the necessary evaluation regarding the absence of undeclared nuclear material and activities for each of these States remained ongoing, the Agency concluded only that declared nuclear material remained in peaceful activities. For 49 States with a CSA but with no AP in force, the Agency concluded that declared nuclear material remained in peaceful activities.[30]

NORTH KOREA

Because North Korea since 2002 has refused to accept the IAEA safeguards, the agency has attempted to analyze the North's nuclear activities through satellite images and other information. The IAEA Director-General summarized the current situation of North Korea's nuclear issues in relation to the implementation of the IAEA safeguards in August 2017, as follows.[31]

- 5 MW Graphite Reactor: there were indications consistent with the reactor's operation, including steam discharges and the outflow of cooling water.
- Radiochemical Laboratory: The Agency has not observed indications of it being in operation during the reporting period.[32]
- Yongbyon Nuclear Fuel Rod Fabrication Plant: There were indications consistent with the use of the reported centrifuge enrichment facility located within the plant.
- Light Water Reactor (LWR) under construction: There were indications in the LWR construction yard of an increase in activities consistent with the fabrication of certain reactor components. The Agency has not observed indications of the delivery or introduction of major reactor components into the reactor containment building.
- The Pyongsan Mine and Concentration Plant: There were indications of ongoing mining, milling and concentration activities at locations previously declared as the Pyongsan uranium mine and the Pyongsan uranium concentration plant.

In this report, the IAEA unveiled that "in August 2017, a DPRK Team was formed within the Department of Safeguards. The purpose of this team is to enhance the monitoring of the DPRK's nuclear programme; maintain updated verification approaches and procedures for the nuclear facilities known to exist within the DPRK; prepare for the Agency's return to the DPRK; and ensure the availability of appropriate verification technologies and equipment."[33]

IRAN

The IAEA verifies and monitors implementation of Iran's nuclear obligations under the JCPOA, as well as the IAEA Safeguards Agreement. As mentioned above, IAEA Director-General reports have been regularly submitted to the Board of Governors every quarter. At the 2017 IAEA General Conference, Director-General Amano stated: "The Agency continues to verify the non-diversion of nuclear material declared by Iran under its Safeguards Agreement. Evaluations regarding the absence of undeclared nuclear material

[30] IAEA, *IAEA Annual Report 2016*, September 2017, p. 92.

[31] GOV/2017/36-GOV(61)/21, August 25, 2017.

[32] As reported in the chapter on Disarmament, the radiochemical laboratory was reported to have been operating intermittently earlier in the year.

[33] GOV/2017/36-GOV(61)/21, August 25, 2017.

Table 2-1: The status of the conclusion and implementation of the IAEA safeguards agreement by the NNWS party to the NPT

(as of December 2016)

	Australia	Austria	Belgium	Brazil	Canada	Chile	Egypt	Iran	Germany	Indonesia
CSA (Year)*	1974	1996	1997	1994	1972	1995	1982	1974	1977	1980
Additional Protocol (Year) *	1997	2004	2004		2000	2003		Signed**	2004	1999
Broader conclusion drawn	○	○	○		○	○			○	○
Integrated safeguards	○	○	○		○	○			○	○

	Japan	Kazakhstan	South Korea	Mexico	Netherlands	New Zealand	Nigeria	Norway	Philippines
CSA (Year)*	1977	1995	1975	1973	1977	1972	1988	1972	1974
Additional Protocol (Year) *	1999	2007	2004	2011	2004	1998	2007	2000	2010
Broader conclusion drawn	○	○	○		○	○		○	○
Integrated safeguards	○		○		○			○	

	Poland	Saudi Arabia	South Africa	Sweden	Switzerland	Syria	Turkey	UAE	North Korea***
CSA (Year)*	2007	2009	1991	1995	1978	1992	2006	2003	1992
Additional Protocol (Year) *	2007		2002	2004	2005		2006	2010	
Broader conclusion drawn	○		○	○	○		○		
Integrated safeguards	○		○	○					

* (Year) shows when the CSA or Additional Protocol has been enforced.
**Iran has accepted to provisionally apply the Additional Protcol.
*** North Korea has refused to accept comprehensive safeguards since it announced its withdrawal from the NPT in 1993.

Source: IAEA, "Safeguards Statement for 2016," https://www.iaea.org/sites/default/files/statement_sir_2016.pdf.

and activities in Iran continue."[34]

U.S. Ambassador to the UN, Nikki Haley, in August 2017 encouraged the IAEA to seek access to Iranian military bases to ensure that Iran did not conceal activities prohibited by the JCPOA, particularly nuclear weapons-related activities prohibited under Section T.[35] However, the IAEA reportedly responded that it would only seek access when it had legitimate reason to suspect banned activity.[36]

SYRIA

As for Syria, the IAEA Director-General judged in May 2011 that the facility at Dair Alzour, which was destroyed by an Israeli air raid in September 2007, was very likely a clandestinely constructed, undeclared nuclear reactor. While the IAEA repeatedly called on Syria to cooperate fully with the Agency so as to solve the outstanding issues, Syria has not responded to that request.[37]

(3) IAEA SAFEGUARDS APPLIED TO NWS AND NON-PARTIES TO THE NPT

A NWS is not required to conclude a CSA with the IAEA under the NPT. However, to alleviate the critic isms about the discriminatory nature of the NPT, the NWS have voluntarily agreed to apply safeguards to some of their nuclear facilities and fissile material that are not involved in military activities. All NWS have also concluded tailored Additional Protocols with the IAEA.

The *IAEA Annual Report 2016* (Annex) published in September 2017 lists facilities in NWS under Agency safeguards or containing safeguarded nuclear material.[38] For these five NWS, the IAEA "concluded that nuclear material to which safeguards were applied in selected facilities remained in peaceful activities or had been withdrawn from safeguards as provided for in the agreements."[39] The IAEA does not publish the number of inspections conducted in the NWS. The safeguarded facilities include:

- China: A power reactor, a research reactor, and an enrichment plant
- France: A fuel fabrication plant, a reprocessing plant, and an enrichment plant
- Russia: A separate storage facility
- The United Kingdom: An enrichment plant and two separate storage facilities
- The United States: A separate storage facility

Each NWS has already concluded an IAEA Additional Protocol. Among them, the respective Protocols by France, the United Kingdom and the United States stipulate that the IAEA can conduct complementary access. Among them, the United States is the only country that has hosted a complementary access visit by the IAEA. Compared to the three NWS mentioned above, application of IAEA safeguards to nuclear facilities by China and Russia are more limited. No provision for complementary access visits is stipulated in their Additional Protocols.

France and the United Kingdom respectively have offered to make certain civil nuclear material subject to IAEA safeguards under trilateral agreements with EURATOM and the IAEA. However, because of the prospective withdrawal of the United Kingdom from the European Union (EU), or "Brexit", the

[34] "Director General's Statement to Sixty-first Regular Session of IAEA General Conference," September 18, 2017, https://www.iaea.org/newscenter/statements/statement-to-sixty-first-regular-session-of-iaea-general-conference-2017.

[35] "Nuclear Inspectors Should Have Access to Iran Military Bases: Haley," *Reuters*, August 26, 2017, https://www.reuters.com/article/us-iran-nuclear-usa-haley-idUSKCN1B524I.

[36] "IAEA Doesn't Check Iran Military Sites for Nukes Because There's 'No Reason To,'" *Sputnik News*, September 1, 2017, https://sputniknews.com/middleeast/201709011056978649-iran-military-sites-nuclear-weapons/.

[37] IAEA, *IAEA Annual Report 2016*, September 2017, pp. 94-95.

[38] *IAEA Annual Report 2016*, GC(61)/3/Annex, September 2017, Table A32(a). The IAEA does not declassify the number of inspections that the IAEA conducted in each NWS, respectively.

[39] *IAEA Annual Report 2016*, September 2017, p. 96.

United Kingdom will withdraw from the EURATOM. In October 2017, a Nuclear Safeguards Bill was introduced to UK parliament, whose purpose is to establish a system of domestic safeguards to replace the existing EURATOM safeguards when the United Kingdom will withdraw from it in 2019.[40] The United Kingdom stated at the IAEA General Conference: "the UK is establishing a domestic nuclear safeguards regime which will deliver to existing Euratom standards. This will ensure that the IAEA retains its right to inspect all civil nuclear facilities, and will continue to receive all current safeguards reporting, ensuring that international verification of our safeguards activity continues to be robust."[41]

Between 1996 and 2002, Russia, the United States and the IAEA undertook to investigate technical, legal and financial issues associated with IAEA verification of fissile material derived from dismantled nuclear warheads. However, such material has not yet been under the IAEA verification.

India, Israel and Pakistan have concluded facility-specific safeguards agreements based on INFCIRC/66. These non-NPT states have accepted IAEA inspections of the facilities that they declare as subject to these agreements. In this regard, Pakistan and the IAEA brought into force a safeguards agreement based on INFCIRC/66, under which two nuclear reactors provided by Pakistan are subject to the IAEA safeguards. According to the *IAEA Annual Report 2016*, the facilities placed under IAEA safeguards or containing safeguarded nuclear material in non-NPT states as of December 31, 2016 are as follows:[42]

- India: Seven power reactors, two fuel fabrication plants, two reprocessing plants, and a separate storage facility
- Israel: A research reactor
- Pakistan: Five power reactors and two research reactors

Regarding their activities in 2016, the IAEA "concluded that the nuclear material, facilities or other items to which safeguards were applied remained in peaceful activities."[43]

Concerning the protocols additional to non-NPT states' safeguards agreements (which differ significantly from the model Additional Protocol), the Indian-IAEA Additional Protocol entered into force on July 25, 2014. This Additional Protocol is similar to ones that the IAEA concluded with China and Russia, with provisions on providing information and protecting classified information but no provision on complementary access. No negotiation has yet begun for similar protocols with Israel or Pakistan.

Some NNWS call on the NWS for further application of the IAEA safeguards to their nuclear facilities in order to alleviate a discriminative nature that NNWS are obliged to accept full scope safeguards to their respective nuclear activities while NWS do not need to do so. The NAM countries, in particular, continue to demand that the NWS and non-NPT states should accept full-scope safeguards.[44]

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[40] "Nuclear Safeguards Bill Introduced Today," Press Release, *Gov.UK*, October 11, 2017, https://www.gov.uk/government/news/nuclear-safeguards-bill-introduced-today. The proposed bill is posted on the U.K. Parliament homepage (https://services.parliament.uk/bills/2017-19/nuclearsafeguards.html).

[41] "Statement by the United Kingdom," IAEA General Conference, September 18-22, 2017, https://www.iaea.org/sites/default/files/gc61-uk-statement.pdf.

[42] *IAEA Annual Report 2016*, GC(61)/3/Annex, September 2017, Table A32(a). The IAEA does not declassify the number of inspections that the IAEA conducted in each country, respectively.

[43] IAEA, *IAEA Annual Report 2016*, September 2017, p. 92.

[44] NPT/CONF.2020/PC.I/WP.21, April 20, 2017.

(4) COOPERATION WITH THE IAEA

One of the most important measures to strengthen the effectiveness of the IAEA safeguards system is to promote the universal application of the Additional Protocol. Among the countries surveyed in this project, Australia, Austria, Belgium, Canada, Chile, France, Germany, Indonesia, Japan, South Korea, Mexico, the Netherlands, New Zealand, Nigeria, Norway, the Philippines, Poland, Sweden, Switzerland, Turkey, UAE, the United Kingdom and the United States consider that the Additional Protocol is "an integral part" of the current IAEA safeguards system.[45]

Other countries, including Brazil, consider that the conclusion of an Additional Protocol should be voluntary, not obligatory, although they acknowledge the importance of the Additional Protocol with regard to safeguards, as a major component of the safeguarding element of the nuclear non-proliferation regime.[46] In the meantime, while arguing that acceptance of the Additional Protocol is a voluntary measure, South Africa nonetheless regards it as an indispensable instrument to enable the IAEA to provide credible assurances regarding the absence of undeclared nuclear material and activities in a State;[47] and Russia called upon the countries that had not yet done so, to conclude as soon as possible the Additional Protocol.[48] The NAM countries argue that "it is fundamental to make a clear distinction between legal obligations and voluntary confidence-building measures and that such voluntary undertakings shall not be turned into legal safeguards obligations."[49] In addition, Sweden proposed to stipulate an obligation of concluding an Additional Protocol in the Treaty on the Prohibition of Nuclear Weapons during its negotiations. However, this proposal was rejected.

In the resolution titled "Strengthening the Effectiveness and Improving the Efficiency of Agency Safeguards," adopted at the IAEA General Conference in 2017, the following points were stated, based on divergent views regarding additional protocols:[50]

- "Bearing in mind that it is the sovereign decision of any State to conclude an additional protocol, but once in force, the additional protocol is a legal obligation, encourages all States which have not yet done so to conclude and to bring into force additional protocols as soon as possible and to implement them provisionally pending their entry into force in conformity with their national legislation."
- "Notes that, in the case of a State with a comprehensive safeguards agreement supplemented by an additional protocol in force, these measures represent the enhanced verification standard for that State."

The IAEA has contemplated a state-level concept (SLC), in which the Agency considers a broad range of information about a country's nuclear capabilities and tailors its safeguards activities in each country accordingly, so as to make IAEA safeguards more effective and efficient. In the resolution titled "Strengthening the Effectiveness and Improving the Efficiency of Agency Safeguards," adopted at the IAEA General Conference in 2017, important assurances about the SLC mentioned below were welcomed:[51]

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[45] See statements addressed by respective countries at the IAEA General Conferences and the NPT Review Conference.

[46] "Statement by Brazil," Cluster 2, First Session of the Preparatory Committee for the 2020 NPT Review Conference, May 8, 2017.

[47] "Statement by South Africa," General Debate, First Session of the Preparatory Committee for the 2020 NPT Review Conference, May 3, 2017.

[48] "Statement by Russia," Cluster 2, First Session of the Preparatory Committee for the 2020 NPT Review Conference, May 8, 2017.

[49] NPT/CONF.2020/PC.I/WP.21, April 20, 2017.

[50] GC(61)/RES/12, September 21, 2017.

[51] Ibid.

- The SLC does not, and will not, entail the introduction of any additional rights or obligations on the part of either States or the Agency, nor does it involve any modification in the interpretation of existing rights and obligations;
- The SLC is applicable to all States, but strictly within the scope of each individual State's safeguards agreement(s);
- The SLC is not a substitute for the Additional Protocol and is not designed as a means for the Agency to obtain from a State without an Additional Protocol the information and access provided for in the Additional Protocol;
- The development and implementation of State-level approaches requires close consultation with the State and/or regional authority, particularly in the implementation of in-field safeguards measures; and
- Safeguards-relevant information is only used for the purpose of safeguards implementation pursuant to the safeguards agreement in force with a particular State—and not beyond it.

In its *Annual Report 2016*, the IAEA reported: "During 2016, the Agency completed updating State-level safeguards approaches for the remaining States in the original group of 53 States that were already under integrated safeguards at the start of 2015. In addition, it developed State-level safeguards approaches for: eight States with a CSA and an AP in force and a broader conclusion; two States with a CSA and AP in force but without a broader conclusion; and one State with a voluntary offer agreement and an AP in force."[52]

Regarding research and development of safeguards technologies, under its long-term plan,[53] the IAEA conducted the "Development and Implementation Support Programme for Nuclear Verification 2016-2017,"[54] in which 20 countries (including Australia, Belgium, Brazil, Canada, China, France, Germany, Japan, South Korea, the Netherlands, Russia, South Africa, Sweden, the United Kingdom and the United States) and the European Commission (EC) participated.

(5) IMPLEMENTING APPROPRIATE EXPORT CONTROLS ON NUCLEAR-RELATED ITEMS AND TECHNOLOGIES

A) Establishment and implementation of national control systems

On establishing and implementing national control systems regarding export controls on nuclear-related items and technologies, there were few remarkable developments in 2017. As described in the previous *Hiroshima Report*, the following countries surveyed in this Report belong to the four international export control regimes,[55] including the Nuclear Suppliers Group (NSG), have national implementation systems in place, and have implemented effective export controls regarding nuclear- (and other WMD-) related items and technologies through list and catch-all controls: Australia, Austria, Belgium, Canada, France, Germany, Japan, South Korea, the Netherlands, New Zealand, Norway, Poland, Sweden, Switzerland, the United Kingdom and the United States.

These countries have also proactively made efforts to strengthen export controls. For example, Japan held the 24th Asian Export Control Seminar in February 2017. The purpose of this annual seminar is to

[52] *IAEA Annual Report 2016*, September 2017, p. 96.

[53] IAEA, "IAEA Department of Safeguards Long-Term R&D Plan, 2012-2023," January 2013.

[54] IAEA, "Development and Implementation Support Programme for Nuclear Verification 2016-2017."

[55] Aside from the NSG, Australia Group (AG), Missile Technology Control Regime (MTCR), and Wassenaar Arrangement (WA).

"assist export control officers in Asian countries and regions." Persons in charge of export control from Asian and other regional major countries participated in the seminar.

Among other countries surveyed in this project, Brazil, China, Kazakhstan, Mexico, Russia, South Africa and Turkey are members of the NSG. These countries have set up export control systems, including catch-all controls.

As for non-NSG members, the UAE is one of the few countries that have enacted comprehensive strategic trade control legislation, including a provision on catch-all controls. However, analysts have assessed that the UAE "lack[s] the necessary expertise, and possibly the financial resources, to institute an effective [export control] system."[56] The Philippines, enacting a Strategic Trade Management Act (STMA) in November 2015, introduced list control and catch-all control. On the other hand, Egypt, Indonesia and Saudi Arabia have yet to established sufficient export control legislations and systems.

India, Israel and Pakistan have also set up national export control systems, including catch-all controls.[57] India's quest for membership in the NSG is supported by some member states, but consensus on the matter was not reached in 2017.

At the time of writing, the status of export control implementation by North Korea, Iran and Syria is not clear. Rather, cooperation among these countries in ballistic missile development remains a concern, as mentioned below. In addition, North Korea was involved in the past in constructing a graphite-moderated reactor in Syria to produce plutonium.

A U.S. think tank pointed out that among the 122 countries voting in favor of adopting the Treaty on the prohibition of Nuclear Weapons (TPNW), only 29 (or 24 percent) have adequate export control legislation.[58]

B) Requiring the conclusion of the Additional Protocol for nuclear export

Article III-2 of the NPT stipulates, "Each State Party to the Treaty undertakes not to provide: (a) source or special fissionable material, or (b) equipment or material especially designed or prepared for the processing, use or production of special fissionable material, to any non-nuclear-weapon State for peaceful purposes, unless the source or special fissionable material shall be subject to the safeguards required by this Article." In the Final Document of the 2010 NPT RevCon, "[t]he Conference encourage[d] States parties to make use of multilaterally negotiated and agreed guidelines and understandings in developing their own national export controls" (Action 36). Under the NSG Guidelines Part I, one of the conditions for supplying materials and technology designed specifically for nuclear use is to accept the IAEA comprehensive safeguards. In addition, NSG member states agreed on the following principle in June 2013:[59]

> Suppliers will make special efforts in support of effective implementation of IAEA safeguards for enrichment or reprocessing facilities, equipment or technology and

[56] "Middle East and North Africa 1540 Reporting," Nuclear Threat Initiative, January 31, 2014, http://www.nti.org/analysis/reports/middle-east-and-north-africa-1540-reporting/. See also Aaron Dunne, "Strategic Trade Controls in the United Arab Emirates: Key Considerations for the European Union," *Non-Proliferation Papers*, No. 12 (March 2012).

[57] Regarding a situation of Pakistani export controls, see Paul K. Kerr and Mary Beth Nikitin, "Pakistan's Nuclear Weapons," *CRS Report*, August 1, 2016, pp. 25-26.

[58] David Albright, Sarah Burkhard, Allison Lach and Andrea Stricker, "Most Nuclear Ban Treaty Proponents are Lagging in Implementing Sound Export Control Legislation," Institute for Science and International Security, September 27, 2017, http://isis-online.org/isis-reports/detail/most-nuclear-ban-treaty-proponents-are-lagging-in-implementing-sound-export.

[59] INFCIRC/254/Rev.12/Part 1, November 13, 2013.

> should, consistent with paragraphs 4 and 14 of the Guidelines, ensure their peaceful nature. In this regard suppliers should authorize transfers, pursuant to this paragraph, only when the recipient has brought into force a Comprehensive Safeguards Agreement, and an Additional Protocol based on the Model Additional Protocol or, pending this, is implementing appropriate safeguards agreements in cooperation with the IAEA, including a regional accounting and control arrangement for nuclear materials, as approved by the IAEA Board of Governors.

The NPDI and the Vienna Group of Ten have argued that conclusion and implementation of the CSA and the Additional Protocol should be a condition for new supply arrangements with NNWS.[60] Some of the bilateral nuclear cooperation agreements that Japan and the United States concluded recently with other capitals make the conclusion of the Additional Protocol a prerequisite for their cooperation with respective partner states. On the other hand, the NAM countries continue to argue that supplier countries should "refrain from imposing or maintaining any restriction or limitation on the transfer of nuclear equipment, material and technology to other States parties with comprehensive safeguards agreements."[61]

ISSUES ON ENRICHMENT AND REPROCESSING UNDER THE BILATERAL NUCLEAR COOPERATION AGREEMENTS

Enriching uranium and reprocessing spent fuel by NNWS is not prohibited under the NPT if the purpose is strictly peaceful and the activities are under IAEA safeguards, Yet they are highly sensitive activities in light of nuclear proliferation. The spread of enrichment and reprocessing (E&R) technologies would mean that more countries would acquire the potential for manufacturing nuclear weapons. As mentioned above, NSG guidelines make implementation of the Additional Protocol by the recipient state a condition for transfer of enrichment or reprocessing facilities, equipment or technology.

While the U.S.-UAE and U.S.-Taiwan Nuclear Cooperation Agreements stipulate a so-called "gold standard"—the recipients are obliged to forgo enrichment and reprocessing activities—other bilateral agreements concluded and updated by the United States, such as one with Vietnam in 2014, do not stipulate similar obligations. Relatedly, under the updated U.S.-South Korean Nuclear Cooperation Agreement signed in July 2015, the United States does not give advance consent to enrich or reprocess U.S.-origin fuel while both countries agreed to continue joint research on *pyroprocessing*—which South Korea sought to promote—under their consultation and agreement. The Japan-U.S. Nuclear Cooperation Agreement, which stipulates comprehensive prior consent to Japan's E&R activities, and is to expire in July 2018, will be automatically extended since neither sides notified an intention to terminate or re-negotiate the agreement by January 2018, six months prior to its expiration.

C) Implementation of the UNSCRs concerning North Korean and Iranian nuclear issues

With regard to the North Korean nuclear issue, the UN Member States are obliged to implement measures set out in the resolutions adopted by the UN Security Council, including embargos on nuclear-, other WMD-, and ballistic missile-related items, material, and technologies. The Panel of Experts, established pursuant to UNSCR 1874 (2009), published annual reports on their findings and recommendations about the implementation of the resolutions. As for the Iranian nuclear issue, the Iran Sanctions Committee and Panel of Experts ceased to exist after the conclusion of the JCPOA, at the insistence of Iran,

[60] For example, NPT/CONF.2020/PC.I/WP.2, March 15, 2017.

[61] NPT/CONF.2015/WP.6, March 9, 2015.

and the UN Security Council now has responsibility of oversight of remaining limitations.[62]

NORTH KOREA

The UN Security Council has adopted numerous resolutions criticizing North Korean nuclear and missile activities. In 2017, in response to the North's repeated ballistic missile tests, UNSCR 2356 was unanimously adopted on June 2. Under this resolution, Security Council "[c]ondemn[ed] in the strongest terms the nuclear weapons and ballistic missile development activities including a series of ballistic missile launches and other activities conducted by the DPRK since 9 September 2016 in violation and flagrant disregard of the Security Council's resolutions," and decided on four entities and 14 individuals being subject to a travel ban and/ or asset freeze.[63] Subsequently, after the North's ICBM launch, UNSCR 2371 was unanimously adopted on August 5, which stipulates the following sanction measures, inter alia:[64]

- Adding nine individuals and four entities being subject to travel ban and/or asset freeze;
- Prohibiting North Korea from supplying, selling or transferring coal, iron, iron ore, seafood, lead and lead ore, and prohibiting other countries from procuring these items from the North;
- Prohibiting states from newly accepting North Korean overseas workers; and
- Prohibiting the opening of new joint ventures or cooperative entities with the North's entities or individuals, or the expansion of existing joint ventures through additional investments

In addition, nine days after North Korea's sixth nuclear test on September 3, the Security Council unanimously adopted UNSCR 2375, which stipulated the following sanction measures:

- Adding one individual and three entities being subject to travel ban and/or asset freeze;
- Designating additional items, materials, technologies and so on for export controls regarding WMD and conventional weapons;
- Requesting states to inspect vessels with the consent of the flag State, on the high seas, if they have information that provides reasonable grounds to believe that the cargo of such vessels contains items the supply, sale, transfer or export of which is prohibited by resolutions;
- Restricting to supply, sell or transfer crude oil and refined petroleum products to North Korea;
- Prohibiting from supplying, selling or transferring condensates and natural gas liquids to North Korea;
- Prohibiting from supplying, selling or transferring textiles by, and procuring from, North Korea;
- Prohibiting states from providing work authorizations for North Korean nationals; and
- Prohibiting the opening, maintenance and operation of joint ventures or cooperative entities with North Korea, and requiring the closing of existing joint ventures and cooperative entities.

Furthermore, after the North's ICBM test in November, UNSCR 2397 was unanimously adopted on December 22, which stipulated the following additional sanction measures:

- Restricting exports of crude oil to North Korea, not exceeding 4 million barrels per year, and requesting provider countries to report such exports;
- Restricting exports of refined petroleum

[62] David Albright and Andrea Stricker, "JCPOA Procurement Channel: Architecture and Issues," Institute for Science and International Security, December 11, 2015, http://isis-online.org/uploads/isis-reports/documents/Parts_1_and_2_JCPOA_Procurement_Channel_Architecture_and_Issues_Dec_2015-Final.pdf.

[63] S/RES/2356, June 2, 2017.

[64] S/RES/2371, August 5, 2017.

products to North Korea, in the aggregate amount of up to 500,000 barrels per year, and requesting provider countries to report such exports;
- Prohibiting UN member states from supplying, selling or transferring food and agricultural products, machinery, electrical equipment, earth and stone including magnesite and magnesia, wood, and vessels;
- Repatriating to North Korea all its nationals earning income in that Member State's jurisdiction and all the North's government safety oversight attachés monitoring DPRK workers abroad immediately but no later than 24 months from the date of adoption of this resolution;
- Implementing more strictly measures on maritime transportations; and
- Considering further measures on restricting a provision of petroleum if North Korea conduct a further test of nuclear weapons and ICBM-class missiles.

The annual Report of the Panel Experts published in February 2017 pointed out North Korea's activities in defiance of the UNSCRs, such as:[65]

- North Korea is flouting sanctions through trade in prohibited goods, with evasion techniques that are increasing in scale, scope and sophistication;
- Designated entities and banks have continued to operate in the sanctioned environment by using agents who are highly experienced and well trained in moving money, people and goods, including arms and related materiel, across borders. These agents use non-nationals of North Korea as facilitators, and rely on numerous front companies;
- Diplomats, missions and trade representatives of the North systematically play key roles in prohibited sales, procurement, finance and logistics; and
- North Korea continues to export banned minerals to generate revenue.

The Panel also noted in its mid-term report in September 2017 the following activities:[66]

- North Korea continues to violate the financial sanctions by stationing agents abroad to execute financial transactions on behalf of national entities;
- North Korea continued to violate sectoral sanctions through the export of almost all of the commodities prohibited in the resolutions; and
- North Korea provided weapons and trainings to African countries' militaries and police.

Although the whole picture of such illegal activities by North Korea has not been elucidated, it has alleged to have engaged in various activities, including earning foreign currency to support nuclear weapons development by utilizing foreign networks. Some news articles highlighted the following alleged cases:

- North Korea has been switching the export destinations of coal subject to sanctions under the UNSCRs from China to Southeast Asian countries.[67]
- At least eight North Korean ships that left Russia with a cargo of fuel this year headed for their homeland despite declaring other destinations. Reuters has no evidence of wrongdoing by the vessels, whose movements were recorded in Reuters ship-tracking data… [but] changing destination mid-voyage is a hallmark of North Korean state tactics to circumvent the international trade sanctions imposed over Pyongyang's nuclear weapons

[65] S/2017/150, February 27, 2017.
[66] S/2017/742, September 5, 2017.
[67] *Mainichi Shimbun*, August 20, 2017, https://mainichi.jp/articles/20170821/k00/00m/030/113000c. (in Japanese)

program.[68]

- In December, Australian Federal Police arrested a Korean-Australian individual who was charged with acting as an agent for North Korea by allegedly attempting to broker sales for Pyongyang including ballistic missiles, and their items and technologies.[69]

Regarding sanctions against North Korea, China's behavior has been drawing attention because of its close relationship with North Korea. China announced its implementation and reinforcement of sanctions. For example, in January 2017, China's Commerce Ministry announced more than 100 additional items, equipment and technologies for nuclear and missile development, which are subject to prohibited for export to North Korea in accordance with the UNSCRs. In February, the Commerce Ministry also announced that China would suspend all imports of coal from the North through the end of 2017.

However, China has also been criticized for weak enforcement efforts.[70] In 2017, the following cases, for instance, were reported:

- China "has purchased greater quantities of iron ore, low-end manufactured goods, and seafood…resulting in an overall increase in trade revenue for North Korea compared to 2016."[71]
- Chinese clothing companies sent fabrics and other materials to North Korea, to make clothing labeled "Made in China," and obtained and exported such commodities. North Korean garment industry records sales of more than $500 million in 2016.[72]
- United States prosecutors accused a Chinese company, Mingzheng International Trading Limited (operated as a front company for North Korea's state-run Foreign Trade Bank), of laundering money for North Korea and said they would seek $1.9 million in civil penalties.[73]
- South Korean officials revealed in late December that the government had inspected and seized a Hong Kong-flagged vessel, which was alleged to transfer 600 tons of refined petroleum products to a North Korean ship in international waters.[74] In addition, it was reported in late December that U.S. reconnaissance satellites have spotted Chinese ships selling oil to North Korean vessels on

[68] Polina Nikolskaya, "From Russia with Fuel - North Korean Ships May Be Undermining Sanctions," *Reuters*, September 20, 2017, https://www.reuters.com/article/us-northkorea-missiles-russia-exclusive/exclusive-from-russia-with-fuel-north-korean-ships-may-be-undermining-sanctions-idUSKCN1BV1DC

[69] "Sydney Man Charged with Brokering North Korea Missile Sales," *Associated Press*, December 16, 2017, https://www.nbcnews.com/news/north-korea/sydney-man-charged-brokering-north-korea-missile-sales-n830451.

[70] Shirley A. Kan, *China and Proliferation of Weapons of Mass Destruction and Missiles: Policy Issue*, Congressional Research Service, RL31555, January 5, 2015, p.21.

[71] Will Edwards, "Can China Actually Restrain Kim Jong-Un?" *CIPHER Brief*, June 20, 2017, https://www.thecipherbrief.com/article/asia/can-china-actually-restrain-kim-jong-un-1091.

[72] Jane Perlez, Yufan Huang and Paul Mozur, "How North Korea Managed to Defy Years of Sanctions," *New Yoke Times*, May 12, 2017, https://www.nytimes.com/2017/05/12/world/asia/north-korea-sanctions-loopholes-china-united-states-garment-industry.html?_r=0.

[73] Jonathan Soble, "U.S. Accuses Chinese Company of Money Laundering for North Korea," *New York Times*, June 16, 2017, https://www.nytimes.com/2017/06/16/business/north-korea-money-laundering-mingzheng.html.

[74] Yi Whan-woo, "Chinese Vessel Seized over North Korea Oil Trafficking," *Korea Times*, December 29, 2017, http://www.koreatimes.co.kr/www/nation/2017/12/103_241669.html; Choe Sang-Hun, "South Korea Seizes Ship Suspected of Sending Oil to North Korea," *New York Times*, December 29, 2017, https://www.nytimes.com/2017/12/29/world/asia/south-korea-ship-seized.html.

the West Sea around 30 times since October 2017.[75]

In addition to sanctions under the UNSCRs, some countries impose respective unilateral sanctions against North Korea. For example, Japan, South Korea and the United States have expanded their respective lists of entities and individuals subject to a travel ban and/or asset freeze over their involvement in the North's nuclear and missile developments. The lists include not just North Korean but also Chinese and Russian entities and individuals. The EU also decided to impose unilateral sanctions in October 2017, including total bans on the export of petroleum and investment to North Korea. In November, the United States announced redesignation of the North as a state sponsor of terror, which had been removed in 2008 in exchange for progress in denuclearization talks. Furthermore, particularly after the nuclear test in September 2017, several countries reduced foreign and economic relationships with North Korea. The Philippines announced suspension of trade with North Korea, and Egypt cut off military cooperation with North Korea (after the US reduced aid because of that military trade). In October, the UAE stated that it would cease approval of visas to North Korean nationals and licenses to the North's entities. In addition, some African countries announced a cut-off of military and/or trade relations with North Korea.

Each UN member state is requested to report to the Security Council on the measures taken for implementing UNSCRs. According to the Report of the Panel of Experts in September 2017, 78 countries submitted their national implementation reports on the UNSCR 2321. The submission rate has been steadily increasing although it is still limited,.[76] Among countries surveyed in the *Hiroshima Report*, Austria, Iran, Kazakhstan, Nigeria, Norway, the Philippines and Syria did not submit their respective reports.[77]

IRAN

In accordance with the JCPOA, approval of the Procurement Working Group, establishment under the agreement, is required for Iranian procurement of nuclear-related items and material. From the implementation day of the JCPOA through mid-June 2017, the Procurement Working Group received 16 procurement proposals.[78] Regarding procurement of dual-use items and technologies under the NSG Guidelines Part II: during January through June 2017, among 10 new proposals submitted, five of them were approved, one was withdrawn and four were under review;[79] and during July through December 2017, among eight new proposals submitted, four of them were approved, two were rejected and two were withdrawn.[80]

NUCLEAR-RELATED COOPERATION BETWEEN CONCERNED STATES

In addition to the (reported) illicit activities mentioned above, it is often alleged that North Korea and Iran have been engaged in nuclear and missile

[75] Yu Yong-weon and Kim Jin-myung, "Chinese Ships Spotted Selling Oil to N.Korea," *Chosunilbo*, December 26, 2017, http://english.chosun.com/site/data/html_dir/2017/12/26/2017122601156.html. China denied the report that it had illicitly sold oil products to North Korea. Philip Wen and David Brunnstrom, "After Trump Criticism, China Denies Selling Oil Illicitly to North Korea," *Reuters*, December 29, 2017, https://www.reuters.com/article/us-northkorea-missiles/after-trump-criticism-china-denies-selling-oil-illicitly-to-north-korea-idUSKBN1EN0D3. In the late December, it was also reported that Russian tankers had supplied oil or oil products to North Korea on at least three occasions by transferring cargoes at sea. Guy Faulconbridge, Jonathan Saul and Polina Nikolskaya, "Russian Tankers Fueled North Korea Via Transfers at Sea—Source," *Reuters*, December 30, 2017, https://www.reuters.com/article/us-northkorea-missiles-russia-oil-exclus/exclusive-russian-tankers-fueled-north-korea-via-transfers-at-sea-sources-idUSKBN1EN1OJ.

[76] S/2017/742, September 5, 2017, p. 7.

[77] Ibid., p. 43.

[78] S/2017/537, June 27, 2017.

[79] Ibid.

[80] S/2017/1058, December 15, 2017.

development cooperation. Bilateral cooperation has been well documented in the area of missiles. In 2016, the United States imposed sanctions against such cooperation.[81] However, no concrete evidence has been revealed to support allegations of nuclear-related cooperation.[82]

Meanwhile, it was assessed that the engines of North Korea's Hwasong-12 IRBM and Hwasong-14 ICBM are likely RD250s that were developed by the Soviet for the SS-18 ICBM, and may have been transferred to North Korea by entities in Russia or Ukraine. Both countries denied the allegation.[83]

D) Participation in the PSI

As of 2017, a total of 105 countries—including 21 member states of the Operational Expert Group (Australia, Canada, France, Germany, Japan, South Korea, the Netherlands, New Zealand, Norway, Poland, Russia, Turkey, the United Kingdom, the United States and others) as well as Belgium, Chile, Israel, Kazakhstan, the Philippines, Saudi Arabia, Switzerland, Sweden, the UAE and others—have expressed their support for the principles and objectives of the Proliferation Security Initiative (PSI). Many of them have participated and cooperated in PSI-related activities.[84]

The interdiction activities actually carried out within the framework of the PSI are often based on information provided by intelligence agencies; therefore, most of them are classified. However, several cases were reported of interdictions involving shipments of WMD-related material to North Korea and Iran. Additionally, participating states have endorsed the PSI statement of interdiction principles and endeavored to reinforce their capabilities for interdicting WMD through exercises and outreach activities. In September 2017, Australia hosted an interdiction exercise, named "Pacific Protector 17," in which 21 countries participated.[85]

E) Civil nuclear cooperation with non-parties to the NPT

In September 2008, the NSG agreed to grant India a waiver, allowing nuclear trade with the state. Since then, some countries have sought to engage in civil nuclear cooperation with India, and several countries, including Australia, Canada, France, Kazakhstan, South Korea, Russia and the United States, have concluded bilateral civil nuclear cooperation agreements with India. In June 2017, Japan ratified the Japan-India Nuclear Cooperation Agreement signed in November 2016.[86] Prior to its ratification, Committee on Foreign Affairs and Defense, Japan's House of Councillors adopted the resolution, in which it requested the Japanese government to terminate the Agreement when India conducted a subcritical test.

Actual nuclear cooperation with India has not

[81] U.S. Department of Treasury, "Treasury Sanctions Those Involved in Ballistic Missile Procurement for Iran," January 17, 2016, https://www.treasury.gov/press-center/press-releases/Pages/jl0322.aspx.

[82] John Park and Jim Walsh, *Stopping North Korea, Inc.: Sanctions Effectiveness and Unintended Consequences* (Cambridge, MA: MIT Security Program, 2016), p. 33; Paul K. Kerr, Steven A. Hildreth and Mary Beth D. Nilitin, "Iran-North Korea-Syria Ballistic Missile and Nuclear Cooperation," *CRS Report*, February 26, 2016, pp. 7-9.

[83] Michael Elleman, "The Secret to North Korea's ICBM Success," *IISS Voices*, August 14, 2017, https://www.iiss.org/en/iiss%20voices/blogsections/iiss-voices-2017-adeb/august-2b48/north-korea-icbm-success-3abb. Ukraine's report of investigation is "Report of Secretary of the National Security and Defense Council of Ukraine, Head of the Working Group Oleksandr Turchynov on Investigation of the Information Stated in the Article of The New York Times," National Security and Defense Council of Ukraine, August 22, 2017, http://www.rnbo.gov.ua/en/news/2859.html.

[84] Bureau of International Security and Nonproliferation, U.S. Department of State, "Proliferation Security Initiative Participants," June 9, 2015, http://www.state.gov/t/isn/c27732.htm.

[85] "Exercise Pacific Protector 17," Australian Government, September 2017, http://www.defence.gov.au/psi/ExPP17.asp.

[86] See the *Hiroshima Report 2017*.

necessarily been concluded,[87] except India's receipt of uranium from France, Kazakhstan and Russia, and its conclusion of agreements to receive uranium from Argentina, Australia, Canada, Mongolia and Namibia.[88]

Again in 2017, the NSG could not achieve consensus on India's membership application. China, the main opponent, has argued that applicant countries must be parties to the NPT. It is also reported that China will not accept India's participation in the NSG unless Pakistan is also accepted as a member.[89] Pakistan has argued that, as a state behaving responsibly regarding nuclear safety and security, it is qualified to be accepted as an NSG member. The NSG has considered a draft set of nine criteria to guide membership applications from states that are not party to the NPT. Items of condition written in a draft document in December 2016 included safeguards, moratorium on nuclear testing, and support of multilateral non-proliferation and disarmament regime.[90]

Meanwhile, China has been criticized for its April 2010 agreement to export two nuclear power reactors to Pakistan, which may constitute a violation of the NSG guidelines. China has claimed an exemption for this transaction under the "grandfather clause" of the NSG guidelines (i.e. it was not applicable as China became an NSG participant after the start of negotiations on the supply of the reactors). China will also supply enriched uranium to Pakistan for running those reactors.[91] Their construction started in November 2013 in Karachi. Because all other Chinese reactors that were claimed to be excluded from NSG guidelines under the grandfather clause were built at Chashma, there is a question about whether the exemption can also apply to the Karachi plant.[92]

The NAM countries have been critical of civil nuclear cooperation with non-NPT states, including India and Pakistan, and continue to argue that exporting states should refrain from transferring nuclear material and technologies to those states which do not accept IAEA comprehensive safeguards.[93]

(6) TRANSPARENCY IN THE PEACEFUL USE OF NUCLEAR ENERGY

A) Efforts for transparency

In addition to accepting IAEA full-scope safeguards, as described earlier, a state should aim to be fully transparent about its nuclear-related activities and future plans, in order to demonstrate that it has no intention of developing nuclear weapons. A state that concludes an Additional Protocol with the IAEA is obliged to provide information on its general plans for the next ten-year period relevant to any nuclear fuel cycle development (including nuclear fuel cycle-related research and development activities). Most countries actively promoting the peaceful use of nuclear energy have issued mid- or long-term nuclear

[87] See, for example, the *Hiroshima Report 2017*.

[88] Adrian Levy, "India Is Building a Top-Secret Nuclear City to Produce Thermonuclear Weapons, Experts Say," *Foreign Policy*, December 16, 2015, http://foreignpolicy.com/2015/12/16/india_nuclear_city_top_secret_china_pakistan_barc/.

[89] "China and Pakistan join hands to block India's entry into Nuclear Suppliers Group," *Times of India*, May 12, 2016, http://timesofindia.indiatimes.com/india/China-and-Pakistan-join-hands-to-block-Indias-entry-into-Nuclear-Suppliers-Group/articleshow/52243719.cms.

[90] See Kelsey Davenport, "Export Group Mulls Membership Terms," *Arms Control Today*, Vol. 47, No. 1 (January/ February 2017), p. 50.

[91] "Pakistan Starts Work on New Atomic Site, with Chinese Help," *Global Security Newswire*, November 27, 2013, http://www.nti.org/gsn/article/pakistan-begins-work-new-atomic-site-being-built-chinese-help/.

[92] Bill Gertz, "China, Pakistan Reach Nuke Agreement," *Washington Free Beacon*, March 22, 2013, http://freebeacon.com/ china-pakistan-reach-nuke-agreement/.

[93] "Statement by Indonesia on behalf of the Non-Aligned Movement State," Cluster 3, First Session of the Preparatory Committee for the 2020 NPT Review Conference, May 9, 2017.

development plans, including the construction of nuclear power plants.[94] The international community may be concerned about the possible development of nuclear weapon programs when states conduct nuclear activities without publishing their nuclear development plans (e.g., Israel, North Korea and Syria), or are engaged in nuclear activities which seem inconsistent with their plans (e.g., allegedly, Iran).

From the standpoint of transparency, communications received by the IAEA from certain member states concerning their policies regarding the management of plutonium, including the amount of plutonium held, are also important. Using the format of the Guidelines for the Management of Plutonium (INFCIRC/549) agreed in 1997, the five NWS, Belgium, Germany, Japan and Switzerland annually publish data on the amount of civil unirradiated plutonium under their control. By December 2017, all except the United Kingdom had declared their civilian plutonium holdings as of December 2016. France and Germany had reported their respective holdings of not only civil plutonium but also HEU. Japan's report submitted to the IAEA, mentioned above, was based on the annual report "The Current Situation of Plutonium Management in Japan" released by the Japan Atomic Energy Commission.[95]

Australia, Austria, Brazil, Canada, Chile, Egypt, Iran, Kazakhstan, South Korea, Mexico, the Netherlands, New Zealand, Nigeria, Norway, the Philippines, Poland, Saudi Arabia, South Africa, Sweden, Turkey and the UAE have published the amount of fissile material holdings, or at least have placed their declared nuclear material under IAEA safeguards. From this, it may be concluded that these states have given clear evidence of transparency about their civil nuclear activities.

B) Multilateral approaches to the fuel cycle

Several countries have sought to establish multilateral approaches to the fuel cycle, including nuclear fuel banks, as one way to dissuade NNWS from adopting indigenous enrichment technologies. Austria, Germany, Japan, Russia, the United Kingdom, the United States and the EU, as well as six countries (France, Germany, the Netherlands, Russia, the United Kingdom and the United States) jointly, have made their respective proposals.

Among those proposals, nuclear fuel banks have actually and concretely made progress. Subsequent to the establishment of the International Uranium Enrichment Centre (IUEC) in Angarsk (Russia) and the American Assured Fuel Supply, the IAEA LEU fuel bank in Kazakhstan was inaugurated in August 2017. The LEU fuel bank was mainly funded by the Nuclear Threat Initiative (NTI), Kuwait, Norway, UAE, the United States and the EU. The IAEA LEU bank will store up to 90 tons of LEU—sufficient to run a 1,000 MW light-water reactor—in the form of uranium hexafluoride.[96] This is the first fuel bank under the direct support of the international organization: the IAEA will bear the costs of purchase and delivery of LEU; and Kazakhstan will meet the cost of LEU storage.[97]

[94] The World Nuclear Association's website (http://world-nuclear.org/) provides summaries of the current and future plans of civil nuclear programs around the world.

[95] Office of Atomic Energy Policy, Cabinet Office, "The Status Report of Plutonium Management in Japan—2016," August 1, 2017, http://www.aec.go.jp/jicst/NC/about/kettei/170801_e.pdf.

[96] "LEU Fuel Bank in Kazakhstan is Inaugurated," *IPFM Blog*, August 29, 2017, http://fissilematerials.org/blog/2017/08/leu_fuel_bank_in_kazakhst.html.

[97] "Kazakhstan Signs IAEA 'Fuel Bank' Agreement," *World Nuclear News*, May 14, 2015, http://world-nuclear-news.org/UF-Kazakhstan-signs-IAEA-fuel-bank-agreement-14051502.html.

Chapter 3. Nuclear Security[1]

Even today, approximately 15,000 nuclear weapons still exist in various arsenals around the worldwide. Meanwhile, the peaceful use of nuclear energy continues to expand, partly as a way to mitigate global warming and for sustainable development. Under these circumstances, securing weapons-grade fissile material – what is sometimes termed "loose-nukes" —and ensuring the safety of civil-use fissile material that may be attractive to terrorists remains a global security issue. In order to minimize these dangers, it is important that all countries undertake continuous efforts to strengthen nuclear security in line with their respective responsibilities. Also, since the Nuclear Security Summit (NSS) process ended in 2016, a new challenge confronts the world in terms of how to carry forward the outcomes and lessons learned from the summit process in order to strengthen the international nuclear security framework.

These were the subjects of particular attention in the nuclear security area in 2017. Through the NSS process from 2010 to 2016, with high-level participation of more than 50 concerned states, efforts to strengthen nuclear security in each country were reported the form of statements and documents. A number of joint proposals for strengthening nuclear security in the form of the "gift basket" method were launched and political commitments made. With the end of the NSS process, there is concern that nuclear security itself will no longer be an outstanding issue of the international community. In particular, the decline of momentum in implementing nuclear security-related measures in each country must be avoided.

Recognizing this need, a large number of experts from universities, research institutes and civil society, along with high-level officials from governments and regulatory bodies as well as practitioners, participated in the International Conference on Nuclear Materials and Nuclear Facilities organized by the IAEA in Vienna, Austria in November 2017, presenting their past nuclear security efforts and discussing technical challenges.[2] This initiative was highly evaluated as progress after the end of the NSS process.

An additional issue came to the fore over the interpretation of the Amendment of the Convention of Physical Protection of Nuclear Material (CPPNM Amendment), which after several years finally came into force in 2016 as a result of outreach activities through the NSS. Relatedly, questions arose operation of the CPPNM review conference.[3] Furthermore, the implementation of the Ministerial Declaration[4] of the second International Conference on Nuclear Security organized by the IAEA in December 2016, which was held in parallel with the NSS in Washington, was considered to be an important step in the efforts of the international community to tackle nuclear security challenges. In fact, at the 61st IAEA General Conference in 2017, several countries mentioned the

[1] This chapter is written by Sukeyuki Ichimasa.

[2] "International Conference on Physical Protection of Nuclear Material and Nuclear Facilities," IAEA website, November 13–17, 2017, https://www.iaea.org/events/physical-protection-of-nuclear-material-conference-2017/programme.

[3] Kenneth C. Brill and John H. Bernhard, "Preventing Nuclear Terrorism: Next Steps in Building a Better Nuclear Security Regime," *Arms Control Today*, Vol.47, No.8, October 2017, pp. 6-11.

[4] "Ministerial Declaration, International Conference on Nuclear Security: Commitments and Actions," December 5-9, 2016, https://www.iaea.org/sites/default/files/16/12/english_ministerial_declaration.pdf.

importance of fulfilling the Ministerial Declaration. [5]

The mandate entrusted to the IAEA is not limited to hosting international conferences on physical protection of nuclear materials and nuclear-related facilities. Today, the role that the IAEA plays in the nuclear security field is expanding further, and the presence of the IAEA is increasing, especially in the areas of nuclear security advisory services and peer reviews. [6] In fact, "nuclear security plan 2018-2021" submitted to the IAEA General Conference in 2017 clearly stated details regarding the IAEA's nuclear security activities from 2018 to 2021 including the approaches to the information management, security of nuclear materials and facilities, nuclear security of materials out of regulatory control, and outreach activities to support member states to be carried out. With regard to the expanding nuclear security-related mission of the IAEA, the international community has come to the stage of concrete policy debate about how to construct and maintain an international nuclear security framework, including discussions on financial aspects.[7] In particular, one of the areas of focus is on how to replace the NSS Sherpa meetings, which played an important role, including in setting the NSS agendas. In this connection, the nuclear security contact group, which has newly changed its presidency from Canada to Jordan,[8] has been drawing attention from the international community.

As symbolized by the rise of international terrorist threats, the international community needs to keep constant vigilance regarding the emergence of new threats to nuclear security. Also, as can be seen in recent cases such as cyber threats and the spread of the drone technologies, attention must also be paid to possible new vulnerabilities introduced by technological advances. In this sense, national regulatory authorities and contractors in each state must maintain a prompt and sustainable response to these new emerging vulnerabilities.[9] Although there is a premise that each country is responsible for its own nuclear security, there is also room for multilateral cooperation. Indeed, many countries hope to strengthen nuclear security through collaboration with international organizations such as the IAEA and regional organizations.

Against this backdrop, the trends of international conferences related to nuclear security, such as the 7th Review Meeting of the Contracting Parties of the Convention on Nuclear Safety (March 27-April 7, Vienna)[10], the International Ministerial Conference on "Nuclear Power in the 21st Century", organized by the IAEA (October 30-November 1, Abu Dhabi, UAE) [11] and the technical meeting of the Representatives of

[5] 2017 IAEA General Conference Remarks as Prepared for Delivery Secretary Rick Perry, https://www.iaea.org/sites/default/files/gc61-usa-statement.pdf.; Australian National Statement by Ambassador Brendon Hammer, Governor and Permanent Representative to the IAEA, 61st Regular Session of the IAEA General Conference, September 2017, https://www.iaea.org/sites/default/files/gc61-australia-statement.pdf.

[6] "Nuclear Security after the Summits," Vienna Center for Disarmament and Non-Proliferation, October 18, 2016, http://vcdnp.org/nuclear-security-after-the-summits/.

[7] "Director General's Statement to Sixty-First Regular Session of IAEA General Conference," IAEA website, September 18, 2017, https://www.iaea.org/newscenter/statements/statement-to-sixty-first-regular-session-of-iaea-general-conference-2017.

[8] Canadian Statement at the IAEA 61th General Conference, https://www.iaea.org/sites/default/files/gc61-canada-statement.pdf.

[9] Matthew Bunn, Martin B. Malin, Nickolas Roth and William H. Tobey, "Project on Managing the Atom: Preventing Nuclear Terrorism Continuous Improvement or Dangerous Decline?" Harvard Kennedy School Belfer Center for Science and International Affairs, March 2016, p. i.

[10] Convention on Nuclear Safety: 7th Review Meeting of the Contracting Parties, March 27-April 7, 2017, http://www-pub.iaea.org/iaeameetings/49023/Convention-on-Nuclear-Safety-7th-Review-Meeting-of-the-Contracting-Parties.

[11] Nuclear Power in the 21st Century—International Ministerial Conference, October 30-November 1, 2017, Abu Dhabi, United Arab Emirates, https://www.iaea.org/events/nuclear-power-conference-2017/statements.

States Parties to the CPPNM and the CPPNM Amendment (November 9 - November 10, Vienna)[12], attracted attention in 2017.

In addition to this, the IAEA reported on various nuclear security-related efforts. As outlined below by item, events related to nuclear security were held around the world from a developed country to a developing country on a wide range of topics, and efforts to improve the level of nuclear security were promoted.

- Regarding physical protection of nuclear material
  - A regional training course on the use of Threat Based Risk—Informed Approach for Protection of Materials and Facilities (July, Niamey, Niger). [13]
  - A regional workshop on Threat Assessment and Development of a Design Basis Threat (October, Accra, Ghana).[14]
- Prevention of acts of sabotage
  - A regional training course on Protection and Prevention Measures against Sabotage of Nuclear Facilities (March, Lima, Peru).[15]
- Nuclear security regulatory framework
  - A regional workshop to launch a Project on Enhancing National Regulatory Frameworks for Nuclear Security in Africa (April, Rabat, Morocco).[16]
  - An international training course on Regulations and Associated Administrative Measures for Nuclear Security (April, Vienna).[17]
  - A regional training course on the Development and Drafting of Regulation to Support National Nuclear Security Regimes (May, Livingston, Zambia).[18]
  - A regional training course on the Development and Drafting of Regulation to Support National Nuclear Security Regimes (May, Niamey, Niger).[19]
- Framework of information exchange on nuclear security
  - The 13th Nuclear Security Information Exchange Meeting (April, Vienna).[20]
  - A regional meeting (Balkan Region) on

[12] Technical Meeting of the Representatives of States Parties to the Convention on the Physical Protection of Nuclear Material (CPPNM) and the CPPNM Amendment, November 9-10, 2017, https://www.iaea.org/events/technical-meeting-of-the-representatives-of-states-parties-to-the-convention-on-the-physical-protection-of-nuclear-material-cppnm-and-the-cppnm-amendment.

[13] Regional Training Course on the use of Threat Based Risk-Informed Approach for Protection of Materials and Facilities, July 24-27, 2017, https://www.iaea.org/events/regional-training-course-on-the-use-of-threat-based-risk-informed-approach-for-protection-of-materials-and-facilities-0.

[14] Regional Workshop on Threat Assessment and Development of a Design Basis Threat, October 2-5, 2017, https://www.iaea.org/events/regional-workshop-on-threat-assessment-and-development-of-a-design-basis-threat.

[15] Regional Training Course on Protection and Prevention Measures against Sabotage of Nuclear Facilities, March 31, 2017, https://www.iaea.org/events/regional-training-course-on-protection-and-prevention-measures-against-sabotage-of-nuclear-facilities-0.

[16] Regional Workshop to Launch a Project on Enhancing National Regulatory Frameworks for Nuclear Security in Africa, April 3-7, 2017, https://www.iaea.org/events/regional-workshop-to-launch-a-project-on-enhancing-national-regulatory-frameworks-for-nuclear-security-in-africa.

[17] International Training Course on Regulations and Associated Administrative Measures for Nuclear Security, April 17-20, 2017, https://www.iaea.org/events/international-training-course-on-regulations-and-associated-administrative-measures-for-nuclear-security.

[18] Regional Training Course on the Development and Drafting of Regulations to Support National Nuclear Security Regimes, May 8-10, 2017, https://www.iaea.org/events/regional-training-course-on-the-development-and-drafting-of-regulations-to-support-national-nuclear-security-regimes.

[19] Regional Training Course on the Development and Drafting of Regulations to Support National Nuclear Security Regimes, May 22-26, 2017, https://www.iaea.org/events/regional-training-course-on-the-development-and-drafting-of-regulations-to-support-national-nuclear-security-regimes-0.

[20] 13th Nuclear Security Information Exchange Meeting, April 6-7, 2017, https://www.iaea.org/events/13th-nuclear-security-information-exchange-meeting.

Nuclear Security Information Exchange and Coordination (August, Tirana, Albania).[21]

- ✧ The 14th Nuclear Security Information Exchange Meeting (October, Vienna).[22]
- ✧ A subregional meeting on Nuclear Security Information Exchange and Coordination (October, Manama, Bahrain).[23]
- ✧ A regional meeting on Nuclear Security Information Exchange and Coordination (November, Mexico City, Mexico).[24]

➢ Effort to combat illegal transfer

- ✧ An international coordination meeting on Developing a Defense in Depth Approach for the Detection of Illicit Movement of Nuclear and Radioactive Material out of Regulatory Control (April, San Jose, Costa Rica).[25]
- ✧ An international training course of New and Prospective Points of Contact for the Incident and Trafficking Database (ITDB) (July, Vienna).[26]

➢ Computer security related to prevention of nuclear terrorism

- ✧ A regional workshop on the Development of National Training Program for Advanced Topics in Computer Security (July, Hanoi, Vietnam).[27]
- ✧ A regional training course on Conducting Computer Security Assessments at Nuclear and Other Radioactive Material Facilities (September, Helsinki, Finland).[28]
- ✧ A regional training course on Information and Computer Security for Awareness for Nuclear Security Regimes (September, Rabat, Morocco).[29]

➢ International Nuclear Security Review Missions by the IAEA

- ✧ A Technical Meeting to Assess the Overall Structure, Effectiveness and Efficiency of Peer Review and Advisory Services in the Areas of Nuclear Safety and Security (August, Vienna).[30]
- ✧ An international workshop on the International Physical Protection Advisory Service (IPPAS) for Potential Team Members

[21] Regional Meeting on Nuclear Security Information Exchange and Coordination (Balkan Region), August 28-31, 2017, https://www.iaea.org/events/regional-meeting-on-nuclear-security-information-exchange-and-coordination-balkan-region.

[22] 14th Nuclear Security Information Exchange Meeting, October 12, 2017, https://www.iaea.org/events/14th-nuclear-security-information-exchange-meeting.

[23] Subregional Meeting on Nuclear Security Information Exchange and Coordination, October 24-26, 2017, https://www.iaea.org/events/subregional-meeting-on-nuclear-security-information-exchange-and-coordination.

[24] Regional Meeting on Nuclear Security Information Exchange and Coordination, November 14-16, 2017, https://www.iaea.org/events/regional-meeting-on-nuclear-security-information-exchange-and-coordination-0.

[25] International Coordination Meeting on Developing a Defence in Depth Approach for the Detection of Illicit Movement of Nuclear and Radioactive Material out of Regulatory Control, April 24-28, 2017, https://www.iaea.org/events/international-coordination-meeting-on-developing-a-defence-in-depth-approach-for-the-detection-of-illicit-movement-of-nuclear-and-radioactive-material-out-of-regulatory-control.

[26] International Training Course of New and Prospective Points of Contact for the Incident and Trafficking Database (ITDB), July 24-28, 2017, https://www.iaea.org/events/international-training-course-of-new-and-prospective-points-of-contact-for-the-incident-and-trafficking-database-itdb.

[27] Regional Workshop on the Development of National Training Programme for Advanced Topics in Computer Security, July 10-14, 2017, https://www.iaea.org/events/regional-workshop-on-the-development-of-national-training-programme-for-advanced-topics-in-computer-security.

[28] Regional Training Course on Conducting Computer Security Assessments at Nuclear and Other Radioactive Material Facilities, September 4-8, 2017, https://www.iaea.org/events/regional-training-course-on-conducting-computer-security-assessments-at-nuclear-and-other-radioactive-material-facilities.

[29] Regional Training Course on Information and Computer Security Awareness for Nuclear Security Regimes, September 11-15, 2017, https://www.iaea.org/events/regional-training-course-on-information-and-computer-security-awareness-for-nuclear-security-regimes.

[30] Technical Meeting to Assess the Overall Structure, Effectiveness and Efficiency of Peer Review and Advisory Services in the Areas of Nuclear Safety and Security, August 30-31, 2017, http://www.ursjv.gov.si/fileadmin/ujv.gov.si/pageuploads/Info_sredisce/Tecaji_konference_seminarji/tecaji_MAAE/Peer_Review_2017_InfoSheet.pdf.

of Future IPPAS Missions (October, Vienna).[31]

- International capacity-building support for nuclear security
  - A regional Train the Trainers Course on the Development of Nuclear Security Training and Support Center Capabilities in Nuclear Security Detection (September, Kuala Lumpur, Malaysia).[32]
- International efforts to promote nuclear security culture
  - A regional workshop on Nuclear Security Culture in Practice (September, Rabat, Morocco).[33]
- Other nuclear security related events
  - The 29th meeting of the Advisory Group on Nuclear Security (April, Vienna).[34]
  - An international workshop on the Essential Elements of Nuclear Security (May, Argonne, U.S.).[35]
  - The first plenary meeting of the International Project on Demonstration of the Operational and Long-Term Safety of Geological Disposal Facilities for Radioactive Waste (May, Vienna).[36]
  - A domestic workshop on Emergency Preparedness and Response for Japan (July, Fukushima, Japan).[37]
  - A regional training course on Threat Assessment and a Risk Informed Approach for Nuclear and Other Radioactive Material out of Regulatory Control (July, Asuncion, Paraguay).[38]
  - A regional workshop on Security in Practice for the Uranium Ore Concentrate Industry Including during Transport (July, Lubumbashi, Democratic Republic of the Congo).[39]
  - An international training course on Nuclear Material Accounting and Control for Nuclear Security at Facilities (August, Vienna).[40]
  - A regional workshop on Developing and Implementing Nuclear Security Systems and Measures for Major Public Events (August,

[31] International Workshop on the International Physical Protection Advisory Service (IPPAS) for Potential Team Members of Future IPPAS Missions, October 23-27, 2017, https://www.iaea.org/events/international-workshop-on-the-international-physical-protection-advisory-service-ippas-for-potential-team-members-of-future-ippas-missions.

[32] Regional Train the Trainers Course on the Development of Nuclear Security Training and Support Centre Capabilities in Nuclear Security Detection, September 4-8, 2017, https://www.iaea.org/events/regional-train-the-trainers-course-on-the-development-of-nuclear-security-training-and-support-centre-capabilities-in-nuclear-security-detection.

[33] Regional Workshop on Nuclear Security Culture in Practice, September 11-14, 2017, https://www.iaea.org/events/regional-workshop-on-nuclear-security-culture-in-practice.

[34] 29th Meeting of the Advisory Group on Nuclear Security, April 18-21, 2017, https://www.iaea.org/events/29th-meeting-of-the-advisory-group-on-nuclear-security.

[35] International Workshop on the Essential Elements of Nuclear Security, May 15-26, 2017, https://www.iaea.org/events/international-workshop-on-the-essential-elements-of-nuclear-security.

[36] First Plenary Meeting of the International Project on Demonstration of the Operational and Long-Term Safety of Geological Disposal Facilities for Radioactive Waste, May 22-26, 2017, https://www.iaea.org/events/first-plenary-meeting-of-the-international-project-on-demonstration-of-the-operational-and-long-term-safety-of-geological-disposal-facilities-for-radioactive-waste.

[37] Domestic Workshop on Emergency Preparedness and Response for Japan, July 18-21, 2017, https://www.iaea.org/events/domestic-workshop-on-emergency-preparedness-and-response-for-japan.

[38] Regional Training Course on Threat Assessment and a Risk Informed Approach for Nuclear and Other Radioactive Material out of Regulatory Control, July 24-28, 2017, https://www.iaea.org/events/regional-training-course-on-threat-assessment-and-a-risk-informed-approach-for-nuclear-and-other-radioactive-material-out-of-regulatory-control.

[39] Regional Workshop on Security in Practice for the Uranium Ore Concentrate Industry Including during Transport, July 24-28, 2017, https://www.iaea.org/events/regional-workshop-on-security-in-practice-for-the-uranium-ore-concentrate-industry-including-during-transport.

[40] International Training Course on Nuclear Material Accounting and Control for Nuclear Security at Facilities, August, 21-25, 2017, https://www.iaea.org/events/international-training-course-on-nuclear-material-accounting-and-control-for-nuclear-security-at-facilities.

Tokai, Japan).[41]

- ✧ A regional workshop on Developing a Road Map for Building a Nuclear Security Detection Architecture for Material out of Regulatory Control (September, Ouagadougou, Burkina Faso).[42]
- ✧ An international training course on the Development of a Nuclear Security Regime for Member States with Nuclear Power Program (September, St. Petersburg, Russia).[43]
- ✧ A regional coordination meeting on Nuclear Security Implementation Strategy in Latin America and the Caribbean (October, Montevideo, Uruguay).[44]
- ✧ An international training course on Regulations and Associated Administrative Measures for Nuclear Security (October, Cairo, Egypt).[45]
- ✧ A regional training course on Nuclear Security in Practice: Field Training for University Students (October, Obninsk, Russia).[46]
- ✧ A regional training course on Development of a Nuclear Security Detection Architecture Design Plan (November, Vienna).[47]
- ✧ A regional workshop and tabletop exercise on Management of the Response to a Nuclear Security Event at a Nuclear Power Plant (December, Vienna).[48]

➢ Nuclear safety and security interface

- ✧ A technical meeting to Review and Revise IAEA Safety Guides and Related Reports on Leadership Management for Safety and Safety Culture (July, Vienna).[49]
- ✧ An international workshop on Nuclear Security Measures and Emergency Response Arrangements for Ports (November, Las Vegas, USA).[50]
- ✧ The 12th meeting of the Nuclear Security

[41] Regional Workshop on Developing and Implementing Nuclear Security Systems and Measures for Major Public Events, August 28-September 1, 2017, https://www.iaea.org/events/regional-workshop-on-developing-and-implementing-nuclear-security-systems-and-measures-for-major-public-events.

[42] Regional Workshop on Developing a Road Map for Building a Nuclear Security Detection Architecture for Material out of Regulatory Control, September 11-15, 2017, https://www.iaea.org/events/regional-workshop-on-developing-a-road-map-for-building-a-nuclear-security-detection-architecture-for-material-out-of-regulatory-control.

[43] International Training Course on the Development of a Nuclear Security Regime for Member States with Nuclear Power Programme, September 25-29, 2017, https://www.iaea.org/events/international-training-course-on-the-development-of-a-nuclear-security-regime-for-member-states-with-nuclear-power-programme.

[44] Regional Coordination Meeting on Nuclear Security Implementation Strategy in Latin America and the Caribbean, October 2-4, 2017, https://www.iaea.org/events/regional-coordination-meeting-on-nuclear-security-implementation-strategy-in-latin-america-and-the-caribbean.

[45] International Training Course on Regulations and Associated Administrative Measures for Nuclear Security, October 16-19, 2017, https://www.iaea.org/events/international-training-course-on-regulations-and-associated-administrative-measures-for-nuclear-security-0.

[46] Regional Training Course on Nuclear Security in Practice: Field Training for University Students, October 16-27, 2017, https://www.iaea.org/events/regional-training-course-on-nuclear-security-in-practice-field-training-for-university-students.

[47] Regional Training Course on Development of a Nuclear Security Detection Architecture Design Plan, November 13-17, 2017, https://www.iaea.org/events/regional-training-course-on-development-of-a-nuclear-security-detection-architecture-design-plan.

[48] Regional Workshop and Tabletop Exercise on Management of the Response to a Nuclear Security Event at a Nuclear Power Plant, December 4-8, 2017, https://www.iaea.org/events/regional-workshop-and-tabletop-exercise-on-management-of-the-response-to-a-nuclear-security-event-at-a-nuclear-power-plant.

[49] Technical Meeting to Review and Revise IAEA Safety Guides and Related Reports on Leadership Management for Safety and Safety Culture, July 10-12, 2017, https://www.iaea.org/events/technical-meeting-to-review-and-revise-iaea-safety-guides-and-related-reports-on-leadership-management-for-safety-and-safety-culture.

[50] International Workshop on Nuclear Security Measures and Emergency Response Arrangements for Ports, November 6-10, 2017, https://www.iaea.org/events/international-workshop-on-nuclear-security-measures-and-emergency-response-arrangements-for-ports.

Guidance Committee (November, Vienna).[51]

- ✧ The 11th meeting of the Steering Committee of the Global Nuclear Safety and Security (GNSSN) Network (November, Vienna).[52]
- ✧ A technical meeting to evaluate the ConvEx-3 (2017)[53] Exercise (December, Vienna).[54]

As described above, even though the NSS process came to an end in 2016, a number of nuclear security-related events, especially the IAEA conference, were implemented and various steps related to strengthening the nuclear security system were somehow maintained in many countries. From the viewpoint of strengthening sustainable nuclear security, such steady efforts should receive appropriate appraisals. With this regard, in contrast to the former U.S. President Barack Obama, who led the nuclear security summit process, international community's attention gathered the new nuclear security policy of the U.S. Trump administration. However, so far no announcement has been made that will change a major policy in the field of nuclear security.

In view of the factors mentioned above, this report surveys the following items to evaluate the implementation of nuclear security-related measures of each country. In order to assess the nuclear security risks of each country, this report considers: indicators of the presence of nuclear material that may be "attractive" for malicious intent, facilities that produce such material, and related activities. It also examines the accession status to nuclear security-related international conventions, the implementation status of existing nuclear security measures and proposals to enhance them, and official statements related to nuclear security approaches, in order to evaluate the nuclear security performance and status of each county.

(1) PHYSICAL PROTECTION OF NUCLEAR MATERIALS AND FACILITIES

According to the IAEA definition, a nuclear security threat is "a person or group of persons with motivation, intention and capability to commit criminal or intentional unauthorized acts involving or directed at nuclear material, other radioactive material, associated facilities or associated activities or other acts determined by the state to have an adverse impact on nuclear security."[55] The IAEA recommends that the state's physical protection requirements for nuclear material and nuclear facilities should be based on a Design Basis Threat (DBT), specifically for unauthorized removal of Category I nuclear material, sabotage of nuclear material and nuclear facilities that have potentially high radiological consequences.[56] Furthermore, the IAEA recommended that security requirements for radioactive material "should be adopted depending on whether the radioactive material concerned is sealed source, unsealed source,

[51] Twelfth Meeting of the Nuclear Security Guidance Committee, November 27-30, 2017, https://www.iaea.org/events/twelfth-meeting-of-the-nuclear-security-guidance-committee.

[52] GNSSN: 11th Meeting of the Steering Committee of the Global Nuclear Safety and Security Network, December 11-12, 2017, https://www.iaea.org/events/gnssn-11th-meeting-of-the-steering-committee-of-the-global-nuclear-safety-and-security-network.

[53] Technical Meeting to Evaluate the ConvEx-3 (2017) Exercise, December 18-19, 2017, https://www.iaea.org/events/technical-meeting-to-evaluate-the-convex-3-2017-exercise.

[54] "ConvEx-3 exercise in Hungary," Hungarian Atomic Energy Authority website, June 21, 2017, http://www.oah.hu/web/v3/HAEAPortal.nsf/web?OpenAgent&article=news&uid=38478E6895D11956C1258146004DD488.

[55] IAEA Nuclear Security Series No.20, "Objective and Essential Elements of a State's Nuclear Security Regime," 2013, http://www-pub.iaea.org/MTCD/Publications/PDF/Pub1590_web.pdf.

[56] IAEA Nuclear Security Series No.13, "Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Revision 5)," 2011, p. 13.

disused sealed source or waste, and should cover transport."[57]

The latest version of the IAEA's "Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities" (INFCIRC/225/Rev.5) was revised and published in 2011. In this revised edition, the IAEA recommends that requirements for physical protection should be based on a graded approach, taking into account the current evaluation of the threat, the relative attractiveness, the nature of the nuclear material and potential consequences associated with the unauthorized removal of nuclear material and with the sabotage against nuclear material or nuclear facilities.[58] The IAEA also suggests that the physical protection system should be designed to deny unauthorized access of persons or equipment to the targets, minimize opportunity of insiders, and protect the targets against possible stand-off attacks—an attack, executed at a distance from the target nuclear facility or transport, which does not require adversary hands-on access to the target, or require the adversary to overcome the physical protection system—consistent with the state's threat assessment or DBT.[59] The objectives of the state's physical protection regime, which is an essential component of the state's nuclear security regime, should be to protect against unauthorized removal, locate and recover missing nuclear material, protect against sabotage, and mitigate or minimize effects of sabotage.[60]

The nuclear material itself is the primary factor for determining the physical protection measures against unauthorized removal. Therefore, categorization based on the different types of nuclear material in terms of element, isotope, quantity and irradiation is the basis for a graded approach for protection against unauthorized removal of "attractive" nuclear material that could be used in a nuclear explosive device, which itself depends on the type of nuclear material, isotopic composition, physical and chemical form, degree of dilution, radiation level, and quantity (see Table 3-1).[61]

Generally, plutonium with an isotopic concentration of Pu-239 of 80% or more is more attractive than other plutonium isotopes from a standpoint of manufacturing nuclear explosive devices by terrorists. Weapons-grade highly enriched uranium (HEU) is usually enriched to 90% or higher levels of U-235. Both of these high-grade nuclear materials require high-level protection measures. In assessing the importance of preventing illegal transfers and sabotage, even if countries do not possess weapon-grade HEU or plutonium, they are at risk if they possess a uranium enrichment facility or a nuclear reactor and a plutonium reprocessing facility. The number of such sensitive facilities in a country will be the subject of assessment for a state's effort in enhancing nuclear security. Of course, the level of these protection measures will vary depending on the geopolitical circumstance or the domestic security situation. Table 3-2 shows the latest evaluations made by the International Panel on Fissile Material (IPFM) and by other relevant research bodies including the Nuclear Threat Initiative (NTI) in its "Civilian HEU Dynamic Map," of fissile material holdings.

Even today, HEU and plutonium equivalent to nearly

[57] IAEA Nuclear Security Series No.14, "Nuclear Security Recommendations on Radioactive Material and Associated Facilities," 2011, p. 14.

[58] IAEA Nuclear Security Series No.13, "Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Rev.5)," 2011, paragraph 3.37.

[59] Ibid., paragraph 5.14.

[60] Ibid., paragraph 2.1.

[61] Ibid., paragraph 4.5.

Table 3-1: Categorization of Nuclear Material*

Material	Form	Category I ← High	Category II Attractiveness	Category IIIc) → Low
1. Plutonium[a]	Unirradiated[b]	≧ 2kg	2kg > > 500g	500g ≧ > 15g
2. Uranium-235 (^{235}U)	Unirradiated[b] — Uranium enriched to 20% ^{235}U or more	≧ 5kg	5kg > > 1kg	1kg ≧ > 15g
	— Uranium enriched to 10% ^{235}U but less than 20% ^{235}U	------	≧ 10kg	10kg > > 1kg
	— Uranium enriched above natural, but less than 10% ^{235}U	------	------	≧ 10kg
3. Uranium-233 (^{233}U)	Unirradiated[b]	≧ 2kg	2kg > > 500g	500g ≧ > 15g
4.Irradiated fuel**			Depleted or natural uranium, thorium or low enriched fuel (less than 10% fissile content) [d/e]	

*: This is “special fissionable material” or “source material” that is defined in Statute of the IAEA. The Statute defines “special fissional material” as plutonium-239; uranium-233; uranium enriched in the isotopes 235 or 233; any material containing one or more of the foregoing; any such other fissionable material as the Board of Governors shall from time to time determine; but the term “special fissionable material” does not include source material. It also defines “source material” as uranium containing the mixture of isotopes occurring in nature; uranium depleted in the isotope 235; thorium; any of the foregoing in the form of metal, alloy, chemical compound, or concentrate; any other material containing one or more of the foregoing in such concentration as the Board of Governors shall from time to time determine; and such other material as the Board of Governors shall from time to time determine. International Atomic Energy Agency (IAEA), “Statute,” As Amended up to 23 February 1989.

**: The categorization of irradiated fuel in the table is based on international transport considerations. The State may assign a different category for domestic use, storage and transport taking all relevant factors into account.

a) All plutonium except that with isotopic concentration exceeding 80% in plutonium-238.

b) Material not irradiated in a reactor or material irradiated in a reactor but with a radiation level equal to or less than 1 Gy/h. (100 rad/h) at 1 m unshielded.

c) Quantities not falling in Category III and natural uranium, depleted uranium and thorium should be protected at least in accordance with prudent management practice.

d) Although this level of protection is recommended, it would be open to States, upon evaluation of the specific circumstances, to assign a different category of physical protection.

e) Other fuel which by virtue of its original fissile material content is classified as Category I or II before irradiation may be reduced one category level while the radiation level from the fuel exceeds 1 Gy/h (100 rad/h) at one metre unshielded.

Source: IAEA, “Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Revision 5),” IAEA Nuclear Security Series No. 13, 2011. This table was originally shown in the “Hiroshima Report-Evaluation of Achievement in Nuclear Disarmament, Non-Proliferation and Nuclear Security: 2014,” March 2014, p.68.

200,000 nuclear weapons exist in the whole world.[62] Furthermore, more than 90% of the global HEU and weapon-grade plutonium stockpile is possessed by the United States and Russia. For terrorist's intent on acquiring material for a nuclear weapons, these and other fissile material holdings can be considered to present the most attractive targets. While the global stockpile of HEU and separated plutonium has been occupying the attention of the international community and civil society, there is little officially disclosed information about stockpiles of HEU and weapon-grade plutonium by individual states, due to the sensitivity of these materials.

In spite of these constraints, transparency of nuclear material holdings is important, in principle. According to the NTI's "Civilian HEU Dynamic Map,"[63] the estimated holdings of HEU and plutonium of some countries other than the ones in Table 3-2 are estimated as follows:

- Countries assumed to retain approximately 1 ton of HEU (category I is 5 kg and more): Kazakhstan (10,470-10,770kg), Canada (1,038kg*)
- Countries assumed to retain 1 kg and more but less than 1 ton of HEU：Australia (2kg), Iran (8kg), the Netherlands (730-810kg), Nigeria (less than 1 kg*), Norway (1～9kg), South Africa (700-750 kg (unspecified)*), Syria (less than 1 kg*)

*: Updated figures in 2017.

As a result of activities of the recent Global Threat Reduction Initiative (GTRI), the number of countries that completely removed HEU has increased in recent years. Mexico, Jamaica, Colombia, Chile, Argentina, Brazil, Sweden, Denmark, Spain, Portugal, Switzerland, Austria, Czech Republic, Poland, Hungary, Romania, Bulgaria, Greece, Ukraine, Turkey, Georgia, Iraq, Uzbekistan, Latvia, Ghana, Thailand, Vietnam, Indonesia, the Philippines, South Korea, etc. are cited as countries that achieved complete removal of such HEU.[64] For reference information, estimated holdings of HEU and plutonium of some countries not in the list of this survey are as follows:

- Countries assumed to retain 1 kg and more but less than 1 ton of HEU: Belarus (80-280 kg), Italy (100-119 kg)[65]

Any operating reactor or facility for handling spent fuel presents a potential risk of illicit transfer of fissile material or sabotage against facility. Research reactors can pose a greater risk if they utilize HEU fuel and if they are associated with spent-fuel reprocessing facilities or even unsecured storage of spent fuel.

The IAEA's Research Reactor Database (RRDB)[66] shows that 221 out of a total of 787 research reactors are currently in operation (137 in developed countries, 84 in developing countries). Another 20 reactors (11 in developed countries, nine in developing countries) are temporarily shut down, seven reactors (four in developed countries, three in developing countries) are under construction, 12 reactors (three in developed countries, nine in developing countries) are scheduled for construction, 111 reactors (97 in developed countries, 14 in developing countries) have been shut down, 352 reactors (336 in developed countries, 26 in developing countries) are decommissioned, and construction of 15 reactors (11 in developed countries, four in developing countries) have been canceled. Compared with the previous year,

[62] Zia Mian and Alexander Glaser, "Global Fissile Material Report 2015: Nuclear Weapon and Fissile Material Stockpile and Production," NPT Review Conference, May 8, 2015, http://fissilematerials.org/library/ipfm15.pdf. While HEU stocks are decreasing, plutonium stocks are increasing, mainly due to increased inventory of civilian plutonium.

[63] NTI, "Civilian HEU Dynamic Map," Nuclear Threat Initiative website, December 2017, http://www.nti.org/gmap/other_maps/heu/index.html.

[64] Ibid.

[65] Ibid.

[66] IAEA, Research Reactor Data Base, IAEA website, https://nucleus.iaea.org/RRDB/RR/ReactorSearch.aspx?rf=1.

Table 3-2: Stockpiles of fissile material usable for weapons

[Metric Tons]

	China	France	Russia	U.K.	U.S.	India
HEU	**18 ± 4**	**(max) 30.6**	**679**	**21.2**	**599**	**3.2 ±1.1**
Stockpile available for weapons		26, or maximum 10±2, minimum 6±2	650	19.8	253	
Naval (fresh)			20		152	
Naval (irradiated)					31	
Civilian Material	1*	4.8*	4.9+3*	1.4	8.4*	4.5
Excess (mostly for blend-down)			2.9*		6.3*	
Weapon Pu	**1.8**	**6**	**128 ±8**	**3.2**	**87.6**	**5.7**
Military stockpile	1.8	6	88	3.2	38.3	0.4
Excess military material			34	0	49.3	
Additional strategic stockpile			6			5.1*
Civilian use Pu	**0.04***	**81.7***	**57.2***	**129.4***	**49.4***	**0.4**
Civilian stockpile, stored in country		65.4*				0.4*
Civilian stockpile, stored outside country		16.3*		23.2*		

	Israel	Pakistan	Belgium	Germany	Japan	Switzerland	N. Korea	Others
HEU	**0.3**	**3.1 ± 0.4**	**0.7-0.727**	**1.23***	**1.2-1.8**	**0**	**0**	**15**
Stockpile available for weapons								
Naval (fresh)								
Naval (irradiated)								
Civilian Material	0.034*	0.017*					0.042	15
Excess (mostly for blend-down)								
Weapon Pu	**0.86**	**0.19**					**0.03**	
Military stockpile	0.86	0.19					0.03	
Excess military material								
Additional strategic stockpile								
Civilian use Pu			**< 0.05***	**2.5-3.5***	**47***	**< 0.002***		**52.8**
Civilian stockpile, stored in country				0.5*	9.9*			
Civilian stockpile, stored outside country				2-3*	37.1*			

Sources: International Panel on Fissile Materials, "Fissile Materials Stocks," International Panel on Fissile Materials, July 29, 2016; International Panel on Fissile Materials, "Global Fissile Material Report 2015: Nuclear Weapon and Fissile Material Stockpiles and Production," International Panel on Fissile Materials, December 2015; "Civilian HEU Dynamic Map," Nuclear Threat Initiative website, December 2017, http://www.nti.org/gmap/other_maps/heu/; Document distributed at the 24th session of the Japan Atomic Energy Commission, July 27, 2016, http://www.aec.go.jp/jicst/NC/iinkai/teirei/siryo2016/siryo24/siryo1.pdf; "2016 civilian plutonium reports submitted to IAEA," IPFM Blog, October 21, 2017, http://fissilematerials.org/blog/2017/10/2016_civilian_plutonium_r.html.

*: Updated figures in 2017.

the number of research reactors increased by 13 in the whole world, while the number of research reactors with shutdown (closed) status decreased to 24 in developed countries and six in developing countries. In addition, the number of research reactors that were decommissioned increased by six in total. It is also noteworthy that the number of research reactors whose construction has been canceled has increased to seven in developed countries.

According to the IAEA, 20,663 spent fuel assemblies from research reactors are enriched to levels above 20% and 9,532 of these stored fuel assemblies are enriched to levels at or above 90%.[67] In terms of geographical distribution: 10,627 spent HEU fuel assemblies, which are over half of the total, are currently stored in Eastern Europe, 572 are located in Africa and Middle East, 3,492 in Asia, 4,273 in Western Europe, 85 in Latin America and 1,614 in North America.[68] In this way, in view of the regional distribution of substances with a high attractiveness to terrorists, prevention of illegal transfers and sabotage against facilities becomes critically important as a measure against nuclear security risk, regardless of whether or not the reactor is in operation.

Table 3-3 outlines the presence of nuclear power plants, research reactors, uranium enrichment facilities, and reprocessing facilities in surveyed countries, as risk indicators.

The IAEA recommends that a state defines the risk based on the amount, forms, composition, mobility, and accessibility of nuclear and other radioactive material and takes prospective measures against the defined risk. In terms of unauthorized removal, nuclear or other radioactive material and related production facilities are also potential targets.[69] To reduce the potential for sabotage within a plant, the IAEA recommends that a state "establishes its threshold(s) of unacceptable radiological consequences" and identifies the vital areas where risk associated materials, devices, and functions are located are designated "in order to determine appropriate levels of physical protection taking into account existing nuclear safety and radiation protection."[70]

In recent years, efforts are also being made on nuclear security of radioactive sources (RI security). In this field, the IAEA publishes "Nuclear Security Series No.11, Security of Radioactive Sources (2009)"[71] and "Nuclear Security Series No.14, Nuclear Security Recommendations on Radioactive Material and Associated Facilities (2011)".[72] Also, at the Washington Nuclear Security Summit in 2016, 28 countries and INTERPOL jointly released a "Gift Basket" statement on strengthening the security of high activity sealed radioactive sources, reflecting the IAEA's code of conduct on the safety and security of radioactive sources.[73] Regarding the individual efforts of each country related to RI security, in March 2017, a regional training course on the Security of

[67] IAEA, Worldwide HEU and LEU assemblies by Enrichment, IAEA website, https://nucleus.iaea.org/RRDB/Reports/Container.aspx?Id=C2.

[68] IAEA, Regionwise distribution of HEU and LEU, IAEA website, https://nucleus.iaea.org/RRDB/Reports/Container.aspx?Id=C1.

[69] IAEA Nuclear Security Series No. 14, "Nuclear Security Recommendations on Radioactive Material and Associated Facilities," 2011, http://www-pub.iaea.org/MTCD/publications/PDF/Pub1487_web.pdf.

[70] Ibid., p. 14.

[71] IAEA Nuclear Security Series No. 11, "Security of Radioactive Sources," 2009, http://www-pub.iaea.org/MTCD/publications/PDF/Pub1387_web.pdf.

[72] IAEA Nuclear Security Series No. 14, "Nuclear Security Recommendations on Radioactive Material and Associated Facilities," 2011, http://www-pub.iaea.org/MTCD/publications/PDF/Pub1487_web.pdf.

[73] "Joint Statement Strengthening the Security of High Activity Sealed Radioactive Sources (HASS)," 2016 Washington Nuclear Security Summit, March 11, 2016, https://static1.squarespace.com/static/568be36505f8e2af8023adf7/t/57050be927d4bd14a1daad3f/1459948521768/Joint+Statement+on+the+Security+of+High+Activity+Radioactive+Sources.pdf.

Table 3-3: Nuclear fuel cycle facilities

	China	France	Russia	U.K.	U.S.	India	Israel	Pakistan	Australia	Austria	Belgium	Brazil
Nuclear Power Plant	○	○	○	○	○	○		○			○	○
Research Reactor	○	○	○	○	○	○	○	○	○	○	○	○
Uranium Enrichment Facility	○	○	○	○	○	○[a]	?	○[a]				○
Reprocessing Facility	○	○	○[b]	○	○	○[b]	○[a]	○[a]				

	Canada	Chile	Egypt	Germany	Indonesia	Iran	Japan	Kazakhstan	South Korea	Mexico	Netherlands	New Zealand
Nuclear Power Plant	○			○		○	○	○	○	○	○	
Research Reactor	○	○	○	○	○	○	○	○	○	○	○	
Uranium Enrichment Facility				○		○	○				○	
Reprocessing Facility							△[e]					

	Nigeria	Norway	Philippines	Poland	Saudi Arabia	South Africa	Sweden	Switzerland	Syria	Turkey	UAE	North Korea
Nuclear Power Plant						○	○	○			△[c]	
Research Reactor	○	○		○	△[c]	○	△[df]	○	○	○		○[a]
Uranium Enrichment Facility						△[c]						△[c]
Reprocessing Facility												△[af]

○: Currently operated, △: Un-operated

a) Military use/ b) Military and civilian use/ c) Under construction/ d) Under shut down and decommissioning/ e) Under test operation / f) Stand-by

Sources: IAEA, Research Reactor Database, IAEA Website, https://nucleus.iaea.org/RRDB/RR/ReactorSearch.aspx?filter=0; IAEA, Nuclear Fuel Cycle Information System, IAEA Website, http:// infcis.iaea.org/NFCIS/About.cshtml; IAEA, Power Reactor Information System, IAEA Website, https://www.iaea.org/PRIS/home.aspx.

Radioactive Sources was held in Obninsk, Russia.[74] In April, a meeting of the Working Group Meeting on Radioactive Source Security was held in Vienna.[75] In addition, in July the international training course on the Security of Radioactive Sources was held in Vienna[76] and in the same month the regional training course on Security of Radioactive Material in Transport for French-speaking African Countries was held in Dakar, Senegal.[77]

(2) STATUS OF ACCESSION TO NUCLEAR SECURITY AND SAFETY-RELATED CONVENTIONS, PARTICIPATION IN NUCLEAR SECURITY-RELATED INITIATIVES, AND APPLICATION TO DOMESTIC SYSTEMS

A) Accession status to nuclear security-related conventions

This section examines the accession status of each country to the following nuclear security and safety-related conventions that are mentioned in the Nuclear Security Summit communiqué,[78] namely: the Convention on the Physical Protection of Nuclear Material (CPPNM); Amendment to CPPNM (CPPNM Amendment); the International Convention for the Suppression of Acts of Nuclear Terrorism (Nuclear Terrorism Convention); the Convention on Nuclear Safety (Nuclear Safety Convention); the Convention on Early Notification of a Nuclear Accident; the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management; and the Convention on Assistance in the Case of Nuclear Accident or Radiological Emergency.

- The CPPNM became effective in 1987. As of January 2018, 156 countries have signed and 44 countries have ratified this treaty.[79] The CPPNM requires its party states to take appropriate protection measures for international transfer of nuclear material used for peaceful purposes, and not permit its transfer in the case that such measures are not in place. It also calls for the criminalization of acts including unauthorized receipt, possession, use, transfer, alteration, disposal or dispersal of nuclear material, and which cause damage to any person or property, as well as theft or robbery of nuclear material.
- The CPPNM Amendment became effective in 2016. As of January 2018, 116 states have approved the Amendment.[80] The Amendment makes it legally binding for states to establish, implement and maintain an appropriate physical protection regime applicable to nuclear material and nuclear facilities under their jurisdiction. It provides for the criminalization of new and extended specified acts, and requires countries to put in place measures to protect nuclear material and nuclear facilities against sabotage. In this

[74] Regional Training Course on the Security of Radioactive Sources, March 13-17, 2017, https://www.iaea.org/events/regional-training-course-on-the-security-of-radioactive-sources-0.

[75] Meeting of the Working Group on Radioactive Source Security, April 24-27, 2017, https://www.iaea.org/events/meeting-of-the-working-group-on-radioactive-source-security.

[76] International Training Course on the Security of Radioactive Sources, July 3-7, 2017, https://www.iaea.org/events/international-training-course-on-the-security-of-radioactive-sources.

[77] Regional Training Course on Security of Radioactive Material in Transport for French-speaking African Countries, July 3-7, 2017, https://www.iaea.org/events/regional-training-course-on-security-of-radioactive-material-in-transport-for-french-speaking-african-countries.

[78] "Nuclear Security Summit 2016 Communiqués," 2016 Washington Nuclear Security Summit, April 1, 2016.

[79] Convention on the Physical Protection of Nuclear Material, January 11, 2018, http://www.iaea.org/Publications/Documents/Conventions/cppnm_status.pdf.

[80] Amendment to the Convention on the Physical Protection of Nuclear Material, January 11, 2018, https://www.iaea.org/Publications/Documents/Conventions/cppnm_amend_status.pdf.

sense, the Amendment expands the existing offences identified in the CPPNM, including the theft and robbery of nuclear material, and establishes new ones, such as the smuggling of nuclear material and the actual or threatened sabotage of nuclear facilities. A number of the offences were also expanded to include substantial damage to the environment. As the key legally binding international undertaking in the area of physical protection of nuclear material, ratification of the Amendment should be continuously promoted.

- The Nuclear Terrorism Convention, which entered into force in 2007, requires party states to criminalize acts of possession and use of radioactive material[81] or nuclear explosive devices with malicious intent, and against those seeking to use and damage nuclear facilities in order to cause radioactive dispersal. The convention and the CPPNM Amendment are mutually necessary to support a legal framework for nuclear security.
- The Nuclear Safety Convention became effective in 1996. This treaty is aimed at ensuring and enhancing the safety of nuclear power plants. Party states of this Convention are required to take legal and administrative measures, report to the review committee established under this convention, and accept peer review in order to ensure the safety of nuclear power plants under their jurisdiction.
- The Convention on Early Notification of a Nuclear Accident entered into force in 1986. It obligates its party states to immediately report to the IAEA when a nuclear accident has occurred, including the type, time, and location of the accident and relevant information.
- The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management became effective in 2001. It calls for its member states to take legal and administrative measures, report to its review committee, and undergo peer review by other parties, for the purpose of ensuring safety of spent fuel and radioactive waste.
- The Convention on Assistance in the Case of Nuclear Accident or Radiological Emergency entered into force in 1987. This convention establishes the international framework that enables equipment provision and dispatch of experts with the goals of preventing and/or minimizing nuclear accidents and radioactive emergencies.

Some, if not all, of these nuclear safety-related conventions can be interpreted as providing protective measures for nuclear security purposes, and thus could be listed as nuclear security-related international conventions. Table 3-4 summarizes the signature and ratification status of each country to these conventions.

B) INFCIRC/225/Rev.5

In 2011, the IAEA published a fifth revision of the "Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Rev.5)" in 2011. In comparison with the INFCIRC/225/Rev.4, this latest revision introduced new measures on nuclear security: inter alia, creation of limited access areas, graded approaches, the enhancement of defense-in-depth, and protection against "Stand-off Attack" and airborne threat, counter measures against insider threat, development of nuclear security culture as a preventive measure against security breaches by insiders, and the provision of redundancy measures to ensure the functions of the central response station during an emergency. Implementation of the protective measures in accordance with the recommendation made by this fifth revision has

[81] International Convention for the Suppression of Acts of Nuclear Terrorism, United Nations, 2005, https://treaties.un.org/doc/db/terrorism/english-18-15.pdf, Article 1.

Table 3-4: Signature and ratification status for major nuclear security- and safety-related conventions

	China	France	Russia	U.K.	U.S.	India	Israel	Pakistan	Australia	Austria	Belgium	Brazil
CPPNM	○	○	○	○	○	○	○	○	○	○	○	○
CPPNM Amendment	○	○	○	○	○	○	○	○	○	○	○	
Nuclear Terrorism Convention	○	○	○	○	○	○	△		○	○	○	○
Nuclear Safety Convention	○	○	○	○	○	○	△	○	○	○	○	○
Convention on Early Notification of a Nuclear Accident	○	○	○	○	○	○	○	○	○	○	○	○
Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management	○	○	○	○	○				○	○	○	○
Convention on Assistance in the Case of Nuclear Accident or Radiological Emergency	○	○	○	○	○	○	○	○	○	○	○	○

	Canada	Chile	Egypt	Germany	Indonesia	Iran	Japan	Kazakhstan	South Korea	Mexico	Netherlands	New Zealand
CPPNM	○	○	△	○	○		○	○	○	○	○	○
CPPNM Amendment	○	○		○	○		○	○	○	○	○	○
Nuclear Terrorism Convention	○	○	△	○	○		○	○	○	○	○	○
Nuclear Safety Convention	○	○	△	○	○		○	○	○	○	○	
Convention on Early Notification of a Nuclear Accident	○	○	○	○	○	○	○	○	○	○	○	○
Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management	○	○		○	○		○	○	○		○	
Convention on Assistance in the Case of Nuclear Accident or Radiological Emergency	○	○	○	○	○	○	○	○	○	○	○	○

	Nigeria	Norway	Philippines	Poland	Saudi Arabia	South Africa	Sweden	Switzerland	Syria	Turkey	UAE	North Korea
CPPNM	○	○	○	○	○	○	○	○		○	○	
CPPNM Amendment	○	○		○	○		○	○		○	○	
Nuclear Terrorism Convention	○	○	△	○	○	○	○	○	△	○	○	
Nuclear Safety Convention	○	○	△	○	○	○	○	○	○*	○	○	
Convention on Early Notification of a Nuclear Accident	○	○	○	○	○	○	○	○	△	○	○	△
Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management	○	○	△	○	○	○	○	○			○	
Convention on Assistance in the Case of Nuclear Accident or Radiological Emergency	○	○	○	○	○	○	○	○	△	○	○	△

○: Ratification, acceptance, approval, and accession
△: Signature
*: Updated figures in 2017.

been encouraged internationally, with a view to establishing a stronger nuclear security system. Furthermore, this revision stipulates a number of state responsibilities for establishing a contingency plan, including interfaces with safety, as appropriate, ensuring that operator prepares contingency plans to effectively counter the threat assessment or DBT taking actions of the response forces into consideration, evaluating effectiveness of the physical protection system through exercises, and determining the trustworthiness policy.

Since the INFCIRC/225/Rev.5 was released at the same time as the start of the nuclear security summit, when participating in the Summit, countries tended to announce the introduction of physical protection measures in accordance with the fifth revision of the recommendation. This trend continued until the last nuclear security summit in 2016[82] and confirms the high-level attention that countries gave to introducing the IAEA's recommended measures.

In this regard, the application status of the recommended measures of INFCIRC/225/Rev.5 can serve as a significant indicator to assess the nuclear security system of this report's surveyed countries. This report refers to official statements made available in the 61st IAEA General Conference and 10th Plenary Meeting of the Global Initiative to Combat Nuclear Terrorism (GICNT), as well as other opportunities to evaluate the national nuclear security stance and performance of each state.

APPLICATION STATUS OF EACH COUNTRY OF THE MEASURES RECOMMENDED IN INFCIRC/225/REV.5

As a result of the end of the nuclear security summit, held four times over seven years, opportunities for disseminating information on the introduction and application of the recommendation measures of INFCIRC/225/Rev.5 are gradually decreasing. The reason for the reduction of information dissemination is not entirely clear. It may be because there are few items to be newly added in each country with regard to INFCIRC/225/Rev.5, which, at the time of preparing this report, had been announced seven years earlier. Or it may be because opportunities to mention the application of the recommendation measures themselves have diminished as a result of shrinking occasions to disseminate information. The cases where there were statements on the introduction of recommendation measures of INFCIRC225/Rev.5 directly or indirectly in the surveyed country are as follows.

In the field of the development of legal instruments, China's National People's Congress adopted a Nuclear Safety Act in 2017.[83] In addition, China is in the stage of completing a public comment on the Regulation on Nuclear Security (2016) and measures necessary for adopting the bill are finally in place.[84] In the United Kingdom, the Office of Nuclear Regulation established Security Assessment Principles[85] in 2017, as a new regulatory framework for contractors.[86] Nigeria drafted the Nigerian Regulations on the Physical

[82] "Highlights of National Progress Reports," 2016 Washington Nuclear Security Summit, April 5, 2016, http://www.nss2016.org/news/2016/4/5/highlights-from-national-progress-reports-nuclear-security-summit.

[83] China National Statement at the 61th General Conference of the IAEA, September 2017, https://www.iaea.org/sites/default/files/gc61-china-final-stat.pdf.

[84] Jia Jinlei, "The Legal and Regulatory Systems for Nuclear Security in China," paper presented at the International Conference on Physical Protection of Nuclear Material and Nuclear Facilities, November 13-17, Vienna, Austria.

[85] "New Internal Guidance - Security Assessment Principles (SyAPs)," Department for Business, Energy & Industrial Strategy-Office for Nuclear Regulation, April 2017, http://www.onr.org.uk/documents/2017/rpc-3625-1-decc-onr.pdf.

[86] UK National Statement at the 61th General Conference of the IAEA, September 2017, https://www.iaea.org/sites/default/files/gc61-uk-statement.pdf.

Protection of Nuclear Material and Nuclear Facilities based on the INFCIRC/225/Rev.5 in 2015.[87] Also, Nigeria established an autonomous Regulatory and Nuclear Safety Authority (ARSN) and adopted the law on security and peaceful use of the Atomic Energy.[88] Saudi Arabia will set up an independent regulatory authority on the safety of nuclear and radioactive materials by the third quarter of 2018 and will prepare relevant domestic laws based on a review by the IAEA.[89] UAE established a Regulation for Physical Protection of Nuclear Material and Nuclear Facilities-FANR-REG-08 based on INFCIRC225/Rev.5 in 2010 and revised it in 2016.[90] Pakistan has introduced a comprehensive nuclear security regime and regularly reviews it according to IAEA guidance documents and best practices.[91] Although it is not directly related to application of the measures recommended in INFCIRC/225/Rev.5, France adopted the law on the use of drone in 2016 in the context of nuclear security. [92] It was a remarkable new movement for the drone flight problem near the nuclear facilities, which is a concern of recent years in physical protection of nuclear material.

Regarding the field of strengthening physical protection of nuclear material, Russia's ROSATOM established guidelines for evaluating the effectiveness of nuclear material protection systems at nuclear facilities in 2015. It introduced computer programs called "Vega-2" and "Polygon" as a means of evaluating the effectiveness of these guidelines.[93] Israel has taken measures under the guidelines of the IAEA for the protection of nuclear facilities, and the protection of nuclear material used for research and application.[94] Belgium temporarily placed its nuclear facilities under army protection, to compensate for the delayed implementation of resident measures of a specially formed armed policy unit.[95] In Pakistan, regulations for the protection of nuclear materials and nuclear-related facilities are underway, and it is expected that final approval will be obtained after review processes at relevant ministries and

[87] Nasiru-Deen A. Bello, "Legislative and Regulatory Framework for the Physical Protection of Nuclear Material and Nuclear Facilities in Nigeria," paper presented at the International Conference on Physical Protection of Nuclear Material and Nuclear Facilities, November 13-17, Vienna, Austria, https://www.iaea.org/sites/default/files/17/11/cn-254-bello2-presentation.pdf.

[88] Republic of Niger National Statement at the 61th General Conference of the IAEA, September 2017, https://www.iaea.org/sites/default/files/gc61-niger-statement_fr.pdf.

[89] Kingdom of Saudi Arabia, Statement by HE Dr. Hashim Yamani, President, King Abdullah City for Atomic and Renewable Energy, at the Nuclear Power in the 21st Century – International Ministerial Conference, Abu Dhabi, United Arab Emirates, October 30-November 1, 2017, https://www.iaea.org/sites/default/files/cn-247-saudi-arabia-statement_ar.pdf.

[90] Sara Al Saadi, "Nuclear Security Regulatory Authorization and Assessment Process for Barakah NPP in United Arab Emirates," paper presented at the International Conference on Physical Protection of Nuclear Material and Nuclear Facilities, November 13-17, Vienna, Austria, https://www.iaea.org/sites/default/files/17/11/cn-254-alsaadi-presentation.pdf.

[91] Statement by Khalil Hashmi, Director General (Disarmament), MFA Head of Pakistan Delegation at the 10th Plenary Meeting of the GICNT, June 2, 2017, http://www.gicnt.org/statements/documents/2017-plenary/Pakistan.pdf.

[92] "National Statement by France" at the 10th Plenary Meeting of the GICNT, June 1, 2017, http://www.gicnt.org/statements/documents/2017-plenary/France.pdf.

[93] Alexander Izmaylov, "Systematic Aspects of High Effective Physical Protection Systems Design for Russian Nuclear Sites," paper presented at the International Conference on Physical Protection of Nuclear Material and Nuclear Facilities, November 13-17, Vienna, Austria, https://www.iaea.org/sites/default/files/17/11/cn-254-izmaylov-presentation.pdf.

[94] Statement by Mr. Zeeb Snir, Head, Israel Atomic Energy Commission at the 61th General Conference of the IAEA, September 2017, https://www.iaea.org/sites/default/files/gc61-israel-statement.pdf.

[95] Declaration Nationale Belge, Intervention de Monsieur Jan Bens, Directeur Général de l'Agence Fédérale de Contrôle Nucléaire, 61ème Session De La Conférence Générale De L'AIEA, Septembre 20, 2017, https://www.iaea.org/sites/default/files/gc61-belgium-statement.pdf.

agencies.[96] In connection with this issue, a regional training course on Introduction to Physical Protection System Effectiveness Evaluation was held in October 2017 in Daejeon, South Korea.[97]

Protection measures for sabotage actions against nuclear materials and related facilities are as follows. Pakistan launched an independent nuclear security special unit consisting of land, sea and air components. Pakistan also established an early warning system dedicated to nuclear security.[98] In France, the Ministry of the Interior launched the Specialized Command for Nuclear Security (CoSSeN) and is promoting safety of transportation and physical protection of nuclear material.[99] In South Korea, the Korea Institute of Nuclear Nonproliferation and Control (KINAC) is using virtual reality to develop an evaluation system for sabotage acts on nuclear facilities.[100] China launched a nuclear emergency rescue team, capable of immediate response.[101]

Regarding response to cyber threats, the U.K. Office for Nuclear Regulation in 2017 announced a new regulatory framework called Security Assessment Principles, and strengthened measures against cyber threats in the domestic nuclear industry.[102] Belgium established a center for cyber security in 2014 and is expected to strengthen further collaboration with the nuclear safety authorities.[103] Germany held an international conference on computer security in 2015. After holding this conference, Germany has made some progress as a result of continuing to create additional computer security guidance for this field.[104] In connection with these cyber threat issues, a regional training course on Computer Security for Industrial Control Systems at Nuclear Facilities was held in Rio de Janeiro, Brazil in April 2017.[105] In May, a technical meeting on Engineering and Design Aspects of Computer Security in Instrumentation and Control Systems for Nuclear Power Plants was held in

[96] Syed Majid Hussain Shah, "Development of Physical Protection Regulatory Requirements in Pakistan," paper presented at the International Conference on Physical Protection of Nuclear Material and Nuclear Facilities, November 13-17, Vienna, Austria, https://www.iaea.org/sites/default/files/17/11/cn-254-shah-presentation.pdf.

[97] Regional Training Course on Introduction to Physical Protection System Effectiveness Evaluation, October 16-20, 2017, https://www.iaea.org/events/regional-training-course-on-introduction-to-physical-protection-system-effectiveness-evaluation.

[98] Statement by the Leader of the Pakistan Delegation, 61th Annual General Conference of the IAEA, September 18-22, 2017, https://www.iaea.org/sites/default/files/gc61-pakistan-statement.pdf.

[99] S. Basille, "Specialized Command for Nuclear Security: Coordinate the Response of State Security Forces to Nuclear Threats and Breaches," paper presented at the International Conference on Physical Protection of Nuclear Material and Nuclear Facilities, November 13-17, Vienna, Austria,https://www.iaea.org/sites/default/files/17/11/cn-254-basille-presentation.pdf.

[100] Yeonwook Kang, "TESS: Tool for evaluation security system Introduction and Development status, paper presented at the International Conference on Physical Protection of Nuclear Material and Nuclear Facilities," November 13-17, Vienna, Austria, https://www.iaea.org/sites/default/files/17/11/cn-254-kang2-presentation.pdf.

[101] Remarks by Chinese Delegation at the 10th Plenary Meeting of the GICNT, June 1, 2017, http://www.gicnt.org/statements/documents/2017-plenary/China.pdf.

[102] UK National Statement at the 61th General Conference of the IAEA, September 2017, https://www.iaea.org/sites/default/files/gc61-uk-statement.pdf.

[103] Declaration Nationale Belge, Intervention de Monsieur Jan Bens, Directeur Général de l'Agence Fédérale de Contrôle Nucléaire, 61ème Session De La Conférence Générale De L'AIEA, Septembre 20, 2017, https://www.iaea.org/sites/default/files/gc61-belgium-statement.pdf.

[104] Germany Statement at the 61th General Conference of the IAEA, September 19, 2017, https://www.iaea.org/sites/default/files/gc61-germany-statement.pdf.

[105] Regional Training Course on Computer Security for Industrial Control Systems at Nuclear Facilities, April 24-28, 2017, https://www.iaea.org/events/regional-training-course-on-computer-security-for-industrial-control-systems-at-nuclear-facilities.

Gloucester, the United Kingdom.[106] Regarding cyber security in nuclear facilities, information disclosure in each country regarding cases occurred in the past was limited, so it was extremely difficult to grasp the essence of the problem. Therefore, it is pointed out that the contractors of each country may not have adequate risk assessment and response.[107] In any case, cyber security is considered to be a new issue in strengthening nuclear security in each country.

Regarding the safety of transportation, in October 2017, an international training course on Security of Nuclear Material in Transport was held in Karlsruhe, Germany.[108] In December, the 35th Technical Meeting of the Transport Safety Standards was held in Vienna.[109]

In the field of countermeasures against insider threats, although it does not impose a legal obrigation, Japan introduced the revision of related Nuclear Regulation Authority Ordinances Publishing Guideline for Trustworthiness Check in 2016, and announced strengthening measures to monitor suspicious acts of insiders within protected areas.[110] As an event related to this field, a regional training course on Preventive and Protective Measures against Insider Threats was conducted in Tokai, Japan from 27th February to 3rd March 2017.[111] The importance of internal threats is a new point raised at INFCIRC/225/Rev.5, and legislation for countermeasures against internal threats is also a subject to be considered in each country. However, it should be noted that experts point out that internal threats can not be prevented only by determining the trustworthiness of indivisuals.[112]

Regarding nuclear security culture, in India, the Homi Bhabha National Institute (HBNI) conducts nuclear security culture education through one year of training for scientists and engineers.[113] In addition, as an event on this field, a technical meeting to Share Experiences Related to Activities under the Coordinated Research Project Development of Nuclear Security Culture Enhancement Solutions was held in Vienna in October 2017.[114]

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[106] Technical Meeting on Engineering and Design Aspects of Computer Security in Instrumentation and Control Systems for Nuclear Power Plants, May 8-12, 2017, https://www.iaea.org/events/technical-meeting-on-engineering-and-design-aspects-of-computer-security-in-instrumentation-and-control-systems-for-nuclear-power-plants.

[107] Caroline Baylon, Roger Brunt and David Livingstone, "Chatham House Report Cyber Security at Civil Nuclear Facilities: Understanding the Risks," September 2015, https://www.chathamhouse.org/sites/files/chathamhouse/field/field_document/20151005CyberSecurityNuclearBaylonBruntLivingstone.pdf.

[108] International Training Course on Security of Nuclear Material in Transport, October 9-13, 2017, https://www.iaea.org/events/international-training-course-on-security-of-nuclear-material-in-transport.

[109] 35th Technical Meeting of the Transport Safety Standards, December 11-15, 2017, https://www.iaea.org/events/35th-technical-meeting-of-the-transport-safety-standards.

[110] Naohito Uetake, "Current Nuclear Security Regime and Regulatory Framework in Japan-Efforts for Compliance with NSS-13 and CPPNM Amendment-," paper presented at the International Conference on Physical Protection of Nuclear Material and Nuclear Facilities, November 13-17, Vienna, Austria, https://www.iaea.org/sites/default/files/17/11/cn-254-uetake-presentation.pdf.

[111] Regional Training Course on Preventive and Protective Measures against Insider Threats, February 27-March 3, 2017, https://www.iaea.org/events/regional-training-course-on-preventive-and-protective-measures-against-insider-threats.

[112] Matthew Bunn and Scott D. Sagan, "A Worst Practices Guide to Insider Threats: Lessons from Past Mistakes," American Academy of Arts & Sciences, 2014, https://www.amacad.org/multimedia/pdfs/publications/researchpapersmonographs/insiderThreats.pdf, p. 4.

[113] Jayarajan Kutuvan, Building Robust Nuclear Security Culture in Nuclear Research Centers, paper presented at the International Conference on Physical Protection of Nuclear Material and Nuclear Facilities, November 13-17, Vienna, Austria, https://www.iaea.org/sites/default/files/17/11/cn-254-kutuvan-presentation.pdf.

[114] Technical Meeting to Share Experiences Related to Activities under the Coordinated Research Project Development of Nuclear Security Culture Enhancement Solutions, October 23-25, 2017, https://www.iaea.org/events/technical-meeting-to-share-experiences-related-to-activities-under-the-coordinated-research-project-development-of-nuclear-security-culture-enhancement-solutions.

Table 3-5: Application status and efforts for recommended measures of INFCIRC/225/Rev.5

	China	France	Russia	U.K.	U.S.	India	Israel	Pakistan	Australia	Austria	Belgium	Brazil
Application Status and Efforts for Recommended Measures	○	○	○	○	○	○	○	○	○		○	○

	Canada	Chile	Egypt	Germany	Indonesia	Iran	Japan	Kazakhstan	South Korea	Mexico	Netherlands	New Zealand
Application Status and Efforts for Recommended Measures	○	○		○	○	○	○	○	○	○	○	○

	Nigeria	Norway	Philippines	Poland	Saudi Arabia	South Africa	Sweden	Switzerland	Syria	Turkey	UAE	North Korea
Application Status and Efforts for Recommended Measures	○		○	○	○*	○	○	○		○	○	

"○" is shown for only the countries for which the related information is available or that have made official remarks about their effort for INFCIRC/225/Rev.5.
*: Updated figures in 2017.

(3) EFFORTS TO MAINTAIN AND IMPROVE THE HIGHEST LEVEL OF NUCLEAR SECURITY

A) Minimization of HEU and plutonium stockpile in civilian use

Since HEU, in addition to fueling some research reactors, can also be used for the manufacture of nuclear explosive devices, it is regarded as "two sides of the same coin" for weapons and civilian use. Therefore, from the viewpoint of "attractiveness" to terrorists, it is difficult to deny the possibility that fissile materials will pose a nuclear security risk to the country holding such nuclear material. HEU has long been considered to pose a proliferation risk in terms of state-to-state technology transfers. More recently, the "9.11" terrorist attacks in the United States triggered nuclear security concerns regarding the spread of fissile material to non-state actors, including international terrorists.[115] To address this particular concern, the United States in 2004 introduced the Global Threat Reduction Initiative (GTRI), to manage the return of Russian and U.S.-origin HEU located in civilian sites to its country of origin, and the conversion of research reactors to operate with low enriched uranium (LEU).

It can be said that GTRI raised a caution for the international community about the risk of "attractive" fissile material being stolen for terrorist use, and encouraged concrete counter measures. However, it was then U.S. President Barack Obama's "Prague speech" in April 2009 that was a major factor in raising world public awareness, including international media, about the importance of nuclear security. Then, as a measure to pursue strengthening of nuclear security, the need to minimize HEU and plutonium became better understood in concerned countries.[116]

Throughout the Nuclear Security Summit process, minimization of HEU in civilian use had been treated as one of the top priority issues. The 2014 Hague Nuclear Security Summit Communiqué stipulates keeping state stockpiles of separated plutonium to the minimum level consistent with national requirements.[117] According to the U.S. fact sheet published at the Washington Nuclear Security Summit in March 2016, HEU and plutonium have been removed or down-blended at 50 facilities in 30 countries.[118] In addition, as a result of Indonesia completing the withdrawal of domestic HEU in 2017,[119] Southeast Asia, following South America and Central Europe, has become a region where there is no nuclear material attractive for terrorists.

Meanwhile, there was a discussion at the 61st IAEA General Conference in 2017 about the need to give a high level of protection to nuclear materials used for military purposes. Specifically, it was suggested that nuclear security should not be isolated from wider efforts to promote nuclear disarmament, non-proliferation and peaceful uses of nuclear energy. In particular, from the viewpoint of realizing a sustainable global nuclear security strategy, it was pointed out that the security measures that are applied to civil-use nuclear materials should also

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[115] "Past and Current Civilian HEU Reduction Efforts," Nuclear Threat Initiative website, December 20, 2017, http://www.nti.org/analysis/articles/past-and-current-civilian-heu-reduction-efforts/.

[116] Remarks By President Barack Obama in Prague as Delivered, The White House Office of the Press Secretary, April 5, 2009, https://www.whitehouse.gov/the-press-office/remarks-president-barack-obama-prague-delivered.

[117] "Hague Communiqué," 2014 Hague Nuclear Security Summit, March 25, 2014.

[118] The White House Office of the Press Secretary, "Fact Sheet: The Nuclear Security Summits: Securing the World from Nuclear Terrorism," March 29, 2016, https://obamawhitehouse.archives.gov/the-press-office/2016/03/29/fact-sheet-nuclear-security-summits-securing-world-nuclear-terrorism.

[119] NTI, "Civilian HEU Dynamic Map," Nuclear Threat Initiative website, December 2017, http://www.nti.org/gmap/other_maps/heu/index.html.

be applied to the vast stocks of HEU and separated plutonium in states possessing nuclear weapons.[120] It was also noted that fissile material used for military purposes, which accounts for 85% of the existing nuclear material in the world, represents a risk factor for peace and international security, and that these substances should also be treated as subjects for nuclear security protection.[121] Although it is an issue beyond the category of civilian use, it can be said that these are points to be noticed when considering the direction of arguments over future nuclear security. In another development at the conference, Kazakhstan expressed an intention to hold a Global Summit on Nuclear Security in its capital Astana.[122] Since this proposal was made by Kazakhstan, the host country of the IAEA's LEU bank, attention needs to be paid to how this initiative develops.

In the above regard, at the 61th IAEA General Conference, International Conference on Physical Protection of Nuclear Material and Nuclear Facilities organized by the IAEA, and on other occasions, the following updates on commitments to minimize HEU and plutonium use were made:

- China promoted the conversion of Ghana's Miniature Neutron Source Reactor (MNSR) to an LEU fuel system in cooperation with the IAEA, the US and Ghana, and the conversion work was completed in August 2017.[123]
- Poland completed the removal of HEU fuel for research reactors by the end of 2016. As a result all research reactors in Poland operate with LEU.[124]
- In Belgium, conversion of the HEU-type research reactor "BR 2" to an LEU fuel system continued.[125]
- Canada promotes the reliable management and removal of high-level radioactive material derived from Canada in Brazil under the cooperation of the IAEA.[126]
- Indonesia is implementing a process of down-blending nuclear fuel from HEU to LEU.[127]
- Norway will host the 3rd International Symposium on HEU Minimization in June next year, in cooperation with the IAEA.[128]
- The U.S. Senate and House Armed Services Committees completed on November 9, 2017 their work on the policy framework relating to military activities in the form of a Conference Report on the Fiscal Year 2018 National Defense Authorization Act (NDAA). The report discussed the development of LEU fuel

[120] Statement by H. E. Ambassador Marcel Biato, Permanent Representative of Brazil to the IAEA at the 61st IAEA General Conference, Vienna, September 18-22, 2017, https://www.iaea.org/sites/default/files/gc61-brazil-statement.pdf.

[121] Chile Declaration of the Permanent Representative Ambassador Armin Andereya at the 61th General Conference of the IAEA, September 20, 2017, https://www.iaea.org/sites/default/files/gc61-chile-final-statement.pdf.

[122] Statement of the Minister of Energy of the Republic of Kazakhstan K.A Bozumbayev at the 61st Session of the IAEA General Conference, September 2017, https://www.iaea.org/sites/default/files/gc61-kazakhstan-statement.pdf.

[123] Statement at the 61th IAEA General Conference by TANG Dengjie, Head of the Chinese Delegation, September 2017, https://www.iaea.org/sites/default/files/gc61-china-final-statement.pdf.

[124] Statement By Andrzej J. Piotrowski, Undersecretary of State Ministry of Energy Poland on the occasion of the 61th Session of the General Conference of the IAEA, September 2017, https://www.iaea.org/sites/default/files/gc61-statement-poland-final.pdf.

[125] Declaration Nationale Belge, Intervention de Monsieur Jan Bens, Directeur Général de l'Agence Fédérale de Contrôle Nucléaire, 61ème Session De La Conférence Générale De L'AIEA, Septembre 20, 2017, https://www.iaea.org/sites/default/files/gc61-belgium-statement.pdf.

[126] Canadian Statement at the IAEA 61th General Conference, https://www.iaea.org/sites/default/files/gc61-canada-statement.pdf.

[127] Statement by His Excellency Ambassador Dr. Darmansjah Djumala, Ambassador Extraordinary and Plenipotentiary/ Permanent Representative of the Republic of Indonesia Head of Delegation of the Republic of Indonesia At the 61st General Conference of the IAEA, September 2017, https://www.iaea.org/sites/default/files/gc61-indonesia-statement-final.pdf.

[128] Norway National Statement at the 61th General Conference of the IAEA, September 2017, https://www.iaea.org/sites/default/files/gc61-norway-statement.pdf.

for naval reactors and the disposition of excess weapons plutonium.[129]

- Japan Nuclear Fuel Ltd, operator of the Rokkasho reprocessing plant, in December 2017 announced that the opening of the facility was again delayed, this time for about three years. Japan Nuclear Fuel does not expect operations of the plant to begin earlier than the first half of 2021 fiscal year.[130] Also, the fast breeder reactor "Monju", whose decommissioning was decided in December 2016, was completely closed in December 2017.[131] In this connection, as a result of the revision of the Spent Nuclear Fuel Reprocessing Fund Act in 2016, the nuclear reprocessing business became a project matter to be approved by the Minister of Economy, Trade and Industry.[132] In addition, it was also decided by a supplementary resolution at the National Diet that the Minister of Economy, Trade and Industry had to seek advice of the Atomic Energy Commission about the plutonium balance.[133]

B) Prevention of illicit trafficking

Nuclear detection, nuclear forensics, research and development of new technologies to strengthen enforcement capacity of law enforcement machinery and customs department, participation for the IAEA's Incident and Trafficking Base (ITDB) have been regarded as important measures for preventing illicit trafficking of nuclear materials. In particular, the IAEA ITDB is the database on incidents related to unauthorized possession, illicit trafficking, illegal dispersal of radioactive material, and discovery of nuclear and other radioactive material out of regulatory control. The ITDB has been regarded not only as an essential component of the information platform supporting the IAEA's Nuclear Security Plan, but also in terms of statistics, which bring to light the real existence of a nuclear security threat.[134]

As of 31 December 2016, 134 states participate in the ITDB program.[135] According to the latest IAEA Annual Report 2016, states confirmed 189 incidents during 2016.[136] Considering that the number of reports to ITDB was 226 in 2015,[137] the number of cases decreased by 37 in 2016.

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[129] Frank von Hippel, "Fissile Material Issues in the U.S. National Defense Authorization Act for Fiscal Year 2018," IPFM Blog, December 17, 2017, http://fissilematerials.org/blog/2017/12/fissile_material_issues_i.html.

[130] "Rokkasho Plant will not start until 2021," *IPFM Blog*, December 22, 2017, http://fissilematerials.org/blog/2017/12/rokkasho_plant_will_not_s.html.

[131] "Monju Reactor is Finally Shut Down," *IPFM Blog*, December 13, 2017, http://fissilematerials.org/blog/2017/12/monju_reactor_is_finally_.html.

[132] "Saisyori Tou Kyosyutsu Kin Hou Ga Kakugi Kettei Saremasita" (Cabinet decision on "Spent Nuclear Fuel Reprocessing Fund Act" was decided), METI website, http://www.meti.go.jp/press/2015/02/20160205001/20160205001.html.

[133] "Dai 190 Kai Kokkai Kakuhou Dai 17 Gou Hutai ketsugi" (The 190th National Diet Cabinet Law No.17 Supplementary Resolution) House of Councilors website, http://www.shugiin.go.jp/internet/itdb_rchome.nsf/html/rchome/Futai/keizaiA434A071B3E18FCE49257F9C00271C6D.htm.

[134] IAEA, "ITDB: Incident and Trafficking Database," https://www.iaea.org/sites/default/files/16/12/16-3042_ns_to_itdb_web-20160105.pdf.

[135] IAEA, "IAEA Incident and Trafficking Database (ITDB) Incidents of Nuclear and Other Radioactive Material Out of Regulatory Control," IAEA Website, https://www.iaea.org/sites/default/files/17/12/itdb-factsheet-2017.pdf.

[136] IAEA Annual Report 2016, GC(61)/3, https://www.iaea.org/sites/default/files/publications/reports/2016/gc61-3.pdf, p. 86.

[137] IAEA Annual Report 2015, GC(60)/9, https://www.iaea.org/About/Policy/GC/GC60/GC60Documents/English/gc60-9_en.pdf, pp. 90-91.

On the other hand, the IAEA Nuclear Security Report[138] specifies the following details. During the reporting period, states reported, or otherwise confirmed to the ITDB program, a total of 162 incidents. Of these, 115 occurred between 1 July 2016 and 30 June 2017, and the remaining cases had occurred prior to 1 July 2016 but were not reported by that date. Of the 162 newly reported incidents, four were related to trafficking, two related to attempted malicious use and one was a scam. All of the material involved in these incidents was seized by the relevant competent authorities within the reporting state. No incident involved high enriched uranium, plutonium or Category I sources. On the other hand, there were 30 reported incidents in which the intent to conduct trafficking or malicious use could not be determined. These included 13 thefts and 17 incidents of missing materials. In 19 incidents the materials were not recovered, including one incident relating to Category II and Category III radioactive sources. In addition to this, there were also 125 reported incidents in which the material was out of regulatory control, but not related to trafficking, malicious use or scams. Most of these incidents involved unauthorized disposal, unauthorized shipments and unexpected discoveries of material such as previously lost radioactive sources.

As of 31 December 2016, the ITDB contained a total of 3,068 confirmed incidents reported by participating states since 1993. Of these 3,068 confirmed incidents there are 270 incidents that involved a confirmed or likely act of trafficking or malicious use (Group I), 904 incidents for which there is insufficient information to determine if it is related to trafficking or malicious use (Group II), and 1,894 incidents that are not related to trafficking or malicious use (Group III).[139]

In order to protect sensitive information, detailed information on incidents and illicit trafficking is not published.[140] Therefore, as it is not possible to assess the involvement of the surveyed countries, this report considers only their respective participation status.

Preventive measures against illicit trafficking of nuclear and other radiological material include the development of legal instruments for export control and enforced detection capability, such as the installation of sensing devices for radiological material at national borders and reinforcing nuclear forensic capabilities. The following describe some of efforts taken from 2016 to 2017 as preventive measures against illicit trafficking of nuclear and other radiological material:

- Canada provided assistance to Jordan for strengthening illegal transfer detection and prevention capacity of nuclear materials.[141]
- The Chilean Nuclear Energy Commission promotes the nuclear material detection project near the border. In September 2017, Chile conducted an emergency management exercise (Paihuen II) on radioactive materials in collaboration with Argentina, and verified their responses in their respective territories and countermeasures against nuclear terrorism threats between the two countries.[142]
- Egypt introduced into the penal code sanctions

[138] IAEA, Nuclear Security Report 2017, GOV/2017/31-GC(61)/14, July 25, 2017, https://www.iaea.org/About/Policy/GC/GC61/GC61Documents/English/gc61-14_en.pdf, p. 3.

[139] IAEA, IAEA Incident and Trafficking Database (ITDB) Incidents of Nuclear and Other Radioactive Material out of Regulatory Control 2017 Fact Sheet, https://www.iaea.org/sites/default/files/17/12/itdb-factsheet-2017.pdf, p. 2.

[140] Ibid., p. 1.

[141] Canadian Statement at the IAEA 61th General Conference, https://www.iaea.org/sites/default/files/gc61-canada-statement.pdf.

[142] Chile Declaration of the Permanent Representative Ambassador Armin Andereya at the 61th General Conference of the IAEA, September 20, 2017, https://www.iaea.org/sites/default/files/gc61-chile-final-statement.pdf.

Table 3-6: The implementation status of the minimization of HEU and Plutonium Stockpile for peaceful purposes and measures for the prevention of illegal transfer

	China	France	Russia	U.K.	U.S.	India	Israel	Pakistan	Australia	Austria	Belgium	Brazil
HEU and Plutonium stockpile minimization for peaceful purposes	○	○	○	○	○	○	○		○	○	○	○
Participation in the ITDB	○	○	○	○	○	○	○	○	○	○	○	○
Preventive measures against illegal transfer	○	○	○	○	○	○	○	○	○	○	○	○

	Canada	Chile	Egypt	Germany	Indonesia	Iran	Japan	Kazakhstan	South Korea	Mexico	Netherlands	New Zealand
HEU and Plutonium stockpile minimization for peaceful purposes	○	○		○	○*		○	○	○	○	○	○
Participation in the ITDB	○	○		○	○	○	○	○	○	○	○	○
Preventive measures against illegal transfer	○	○	○	○	○		○	○	○	○	○	○

	Nigeria	Norway	Philippines	Poland	Saudi Arabia	South Africa	Sweden	Switzerland	Syria	Turkey	UAE	North Korea
HEU and Plutonium stockpile minimization for peaceful purposes	○	○	○	○		○	○	○	○	○		
Participation in the ITDB	○	○	○	○	○	○	○	○		○	○	
Preventive measures against illegal transfer	○	○	○	○		○	○	○		○	○	

"○" is provided to the countries for which public information on the effort in these areas is obtained.

*: Updated figures in 2017.

that severely punish illegal acts on nuclear materials and other radioactive materials.[143]

- Indonesia has installed a radiation measurement portal monitor at major domestic ports.[144]
- Pakistan has set up radiation monitoring posts at the entry and departure points as part of a nuclear detection architecture.[145]

In terms of international and regional organization efforts, INTERPOL provides a forum for collecting data on prevention of nuclear terrorism, supporting investigation, and confidence building and coordination among national law enforcement agencies. In accordance with the INTERPOL report, radiological and nuclear investigations-related courses and counter illicit trafficking exercises were held in Ukraine and Tanzania (July), in Panama (August) and in the Czech Republic (November) respectively.[146] These exercises and training initiatives are intended to expand the recognition of illegal transfers of nuclear materials as nuclear security measures of INTERPOL.[147] The exercises include: Operation STONE (Stop Trafficking Of Nuclear Elements), which is aimed at strengthening the nuclear and nuclear detection and deterrence capacity of law enforcement agencies; Operation Conduit, which is carried out at international airports and seaports, and aims to improve the ability of police, customs and border security agencies to coordinate cross-border investigations into the smuggling of nuclear materials; a workshop on countermeasures against smuggling of nuclear materials; and radioactive/nuclear-related investigation courses, or table top exercises.

Table 3-6 shows the implementation status regarding the minimization of HEU for peaceful purposes, participation status for the ITDB and measures for the prevention of illegal transfer of nuclear material and other radiological materials, based on official statements made at the Washington Nuclear Security Summits, IAEA Nuclear Security Conference in 2016, and any other opportunities.

C) Acceptance of international nuclear security review missions

The International Physical Protection Advisory Service (IPPAS) provides recommendations to improve the physical protection system of nuclear material, associated facilities, and transport systems of the state, upon the request of a member state. In IPPAS missions, an IPPAS team, consisting of physical protection experts organized by the IAEA, visits government organizations and nuclear facilities in a state, reviews the physical protection system of the facility in detail, and conducts hearing investigations, in order to assess whether or not the reviewed physical protection system is in line with the recommendations of the IAEA INFCIRC/225, and to provide advice where necessary for its improvement. As was pointed in the previous issue of this report,[148]

[143] Fathi Elsisi, "Sanctions as a Legal Deterrence Mean in the National Physical Protection Regime," paper presented at the International Conference on Physical Protection of Nuclear Material and Nuclear Facilities, November 13-17, Vienna, Austria, https://www.iaea.org/sites/default/files/17/11/cn-254-elsisi-presentation.pdf.

[144] Statement by His Excellency Ambassador Dr. Darmansjah Djumala, Ambassador Extraordinary and Plenipotentiary/ Permanent Representative of the Republic of Indonesia Head of Delegation of the Republic of Indonesia At the 61st General Conference of the IAEA, September 2017, https://www.iaea.org/sites/default/files/gc61-indonesia-statement-final.pdf.

[145] Statement by Khalil Hashmi, Director General (Disarmament), MFA Head of Pakistan Delegation at the 10th Plenary Meeting of the GICNT, June 2, 2017, http://www.gicnt.org/statements/documents/2017-plenary/Pakistan.pdf.

[146] "News and Events," INTERPOL website, https://www.interpol.int/Crime-areas/CBRNE/News-and-Events.

[147] Radiological and Nuclear Terrorism, INTERPOL website, March 2017, https://www.interpol.int/en/content/download/34610/453663/version/5/file/Radnuc-trifold-EN-web.pdf.

[148] Center for the Promotion of Disarmament and Non-Proliferation, The Japan Institute of International Affairs ed., *2016 Edition Hiroshima Report: Evaluation of Achievement in Nuclear Disarmament, Non-Proliferation and Nuclear Security in 2015*, Hiroshima Prefecture, March 2016, http://www.pref.hiroshima.lg.jp/uploaded/attachment/206407.pdf, p.133.

acceptance of the IAEA missions is a valuable opportunity for member states to have an authoritative third-party peer review of their national nuclear security systems. Of course, there are various nuclear security-related treaties and guidelines. However, since the details of concrete implementation will ultimately be left to the governments of each country, measures to strengthen nuclear security tend to be self-righteous in some cases. For this reason, the peer review process that points out the items and methods to be improved mutually by external organizations is useful for implementing nuclear security related measures. In this sense, the external evaluation and recommendations obtained from the IPPAS mission are useful for reviewing the policy of future nuclear security enhancement in the host country. According to the nuclear security-related events list released by the IAEA in 2017, there were 14 events related to international evaluation missions.[149] Since the number of events in the previous year was 26,[150] the number in 2017 decreased by 12.

In 2017 the IAEA announced the completion of an IPPAS mission in China in September,[151] Germany in October[152] and Australia in November.[153] Outside the surveyed countries, the IAEA announced that IPPAS missions were completed in Hungary in July 2017,[154] in Lithuania in October[155] and in the Democratic Republic of Congo in December.[156] In addition, at the IAEA General Conference in 2017, New Zealand announced acceptance of an IPPAS mission.[157] In this regard, Turkey has announced that it intends to accept an IPPAS mission in 2018.[158] Also, Switzerland announced its intention to accept an IPPAS mission in 2018 at the GICNT Plenary Meeting in 2017.[159] Japan announced that it is in talks with the IAEA over the acceptance of an IPPAS follow-up mission in 2018.[160]

Apart from the IPPAS missions, the IAEA also provides the International Nuclear Security Advisory Service (INSServ) and the Integrated Nuclear Security Support Plan (INSSP), for the sake of developing nuclear security systems and capabilities. In accordance with the IAEA, the INSServ provides

[149] "Meetings, Conferences and Symposia: Meetings on Nuclear Safety and Security," IAEA website, http://www-ns.iaea.org/meetings/default.asp?tme=ns&yr=2017&s=10&l=79&submit.x=7&submit.y=7.

[150] "Meetings, Conferences and Symposia: Meetings on Nuclear Safety and Security," IAEA website, http://www-ns.iaea.org/meetings/default.asp?tme=ns&yr=2016&s=10&l=79&submit.x=5&submit.y=7.

[151] IAEA Completes Nuclear Security Advisory Mission in China, September 8, 2017, https://www.iaea.org/newscenter/pressreleases/iaea-completes-nuclear-security-advisory-mission-in-china.

[152] IAEA Completes Nuclear Security Advisory Mission in Germany, October 6, 2017, https://www.iaea.org/newscenter/pressreleases/iaea-completes-nuclear-security-advisory-mission-in-germany.

[153] IAEA Completes Nuclear Security Advisory Mission in Australia, November 10, 2017, https://www.iaea.org/newscenter/pressreleases/iaea-completes-nuclear-security-advisory-mission-in-australia.

[154] IAEA Completes Nuclear Security Advisory Mission in Hungary, July 7, 2017, https://www.iaea.org/newscenter/pressreleases/iaea-completes-nuclear-security-advisory-mission-in-hungary.

[155] IAEA Completes Nuclear Security Advisory Mission in Lithuania, October 20, 2017, https://www.iaea.org/newscenter/pressreleases/iaea-completes-nuclear-security-advisory-mission-in-lithuania.

[156] IAEA Completes Nuclear Security Advisory Mission in the Democratic Republic of the Congo, December 15, 2017, https://www.iaea.org/newscenter/pressreleases/iaea-completes-nuclear-security-advisory-mission-in-the-democratic-republic-of-the-congo.

[157] New Zealand Statement Delivered by H.E. Nicole Roberton, New Zealand Ambassador at the 61th General Conference of the IAEA, September 2017, https://www.iaea.org/sites/default/files/gc61-new-zealand-statement.pdf.

[158] Republic of Turkey Statement Delivered by Ambassador Birnur Fertekligil at the IAEA 61st General Conference, September 18-22, 2017, https://www.iaea.org/sites/default/files/gc61-turkey-statement.pdf.

[159] Statement by Minister Peter Nelson, Deputy Head of Mission of the Embassy of Switzerland in Japan at the 10th Plenary Meeting of the GICNT, June 1, 2017, http://www.gicnt.org/statements/documents/2017-plenary/Switzerland.pdf.

[160] Naohito Uetake, "Current Nuclear Security Regime and Regulatory Framework in Japan:Efforts for Compliance with NSS-13 and CPPNM Amendment," paper presented at the International Conference on Physical Protection of Nuclear Material and Nuclear Facilities, November 13-17, Vienna, Austria, https://www.iaea.org/sites/default/files/17/11/cn-254-uetake-presentation.pdf.

recommendations to improve a broad spectrum of nuclear security activities of the state, by reviewing its nuclear security system and requirements.[161] Also, INSSP provides a platform for nuclear security work to be implemented over a period of time, thus ensuring sustainability. INSSP review missions enable the IAEA, the state concerned, and any donors financing the work, to plan and coordinate activities from both a technical and a financial point of view—optimizing the use of resources and avoiding duplications.[162]

Regarding advisory services by IAEA other than IPPAS, a Topical Meeting on INSSPs: Benefits to Members States from their Development to their Implementation was held in Vienna in January 2017.[163] In March, a regional coordination meeting on Integrated Nuclear Security Support Plans for Southern African Development Community was held in Gaborone, Botswana.[164]

D) Technology development — nuclear forensics

Since the first Washington Nuclear Security Summit in 2010, it has been recommended at each summit to build nuclear forensic capability and multilateral cooperation for that purpose. [165] In fact, at the fourth Washington Nuclear Security Summit in 2016, 30 concerned states issued a Joint Statement on Forensics in Nuclear Security, reflecting the growing awareness of the international community about the importance of nuclear forensics.[166] In accordance with the "IAEA Nuclear Security Series No.2-G (Rev.1) Nuclear Forensics Support (2006)"[167] definition, nuclear forensics is the technological method for the investigation of nuclear and other radiological material that has been removed without authorization from regulatory control and seized by a law enforcement authority of state. Following the increased threat perception of nuclear terrorism, technological development of nuclear forensics has been required so as to complement existing efforts to strengthen nuclear security. In particular, analysis on intercepted illicit nuclear or radioactive material and any associated material, to provide evidence for nuclear attribution, is the subject matter of nuclear forensics. Therefore, nuclear forensic analysis includes the characterization of the material and correlation with its production history.[168]

As initiatives on nuclear forensics conducted in 2017, a regional training course on Introduction to Nuclear Forensics was held in Pretoria, South Africa in April,[169] and the JAEA/ISCN International Symposium on

[161] International Nuclear Security Advisory Service (INSServ), IAEA website, https://www.iaea.org/services/review-missions/international-nuclear-security-advisory-service-insserv.

[162] Integrated Nuclear Security Support Plan (INSSP), IAEA website, http://www-ns.iaea.org/security/inssp.asp?s=4.

[163] Topical Meeting on INSSPs: Benefits to Member States from their Development to their Implementation, January 23, 2017, https://www.iaea.org/events/topical-meeting-on-inssps-benefits-to-member-states-from-their-development-to-their-implementation.

[164] Regional Coordination Meeting on Integrated Nuclear Security Support Plans for Southern African Development Community States, March 6–10, 2017, https://www.iaea.org/events/regional-coordination-meeting-on-integrated-nuclear-security-support-plans-for-southern-african-development-community-states.

[165] The White House, Office of the Press Secretary, "Work Plan of the Washington Nuclear Security Summit," April 13, 2010.

[166] "Joint Statement on Forensics in Nuclear Security," 2016 Washington Nuclear Security Summit, April 5, 2016, http://www.nss2016.org/document-center-docs/2016/4/1/joint-statement-on-forensics-in-nuclear-security.

[167] IAEA Nuclear Security Series No.2-G (Rev.1), "Nuclear Forensics Support," 2006, http://www-pub.iaea.org/books/IAEABooks/10797/Nuclear-Forensics-in-Support-of-Investigations.

[168] Ibid., p. 3.

[169] Regional Training Course on Introduction to Nuclear Forensics, April 3-6, 2017, https://www.iaea.org/events/regional-training-course-on-introduction-to-nuclear-forensics.

Nuclear Forensics and Regional Cooperation was held in Tokyo, Japan in June.[170] In July 2017, the technical meeting on Nuclear Forensics Peer Review Advisory Missions[171] and Technical Meeting on Nuclear Forensics and Cooperation with African States[172] were held in Vienna. In September 2017, a regional seminar on Introduction to Nuclear Forensics was held in Moscow, Russia,[173] and in October an international training course on Practical Introduction to Nuclear Forensics was held in Budapest, Hungary.[174]

As for a case of multilateral cooperation on nuclear forensics, the Nuclear Forensics International Technical Working Group (ITWG), was established in 1996 under the auspices of the G8 Non-Proliferation Expert Group (NPEG), for the purpose of addressing the issue of illegal transfers following the end of the Cold War. The ITWG serves as the platform to support the technological development and sharing of nuclear forensic methods. Over the past few years, it has pursued a number of activities. These include conducting comparative nuclear material exercises (CMX) that socialize nuclear forensic techniques and identify best practices. Also, ITWG conducted exercises that clarify the uses and utility of national nuclear forensic libraries in helping identify the origin of nuclear or other radioactive material found outside regulatory control.[175] The ITWG has been focusing on the promotion of nuclear forensic best practice through the development of guidelines for forensic analysis of nuclear, radioactive, and radiologically contaminated materials, and published "Guidelines for Evidence Collection in a Radiological or Nuclear Contaminated Crime Scene (2011)"[176] and "Proposed Framework for National Nuclear Forensics Libraries and International Directories (2011)."[177] In 2017 the 22nd ITWG annual meeting was held in Karlsruhe, Germany.[178] At the annual meeting, reviews on the outcomes and lessons of CMX-5, discussions on the nuclear forensics library exercise (Galaxy Serpent) in progress, and new CMX planned to be implemented in 2018 were conducted. The 2018 annual meeting of ITWG will be held in Switzerland.[179]

Another international cooperation initiative, the Nuclear Forensic Working Group (NFWG), has been established under the framework of the GICNT, which actively organized a number of workshops and

[170] "ITWG Nuclear Forensics Update," No.3, June 2017, https://www.nf-itwg.org/newsletters/ITWG_Update_no_3.pdf, p. 5.

[171] Technical Meeting on Nuclear Forensics Peer Review Advisory Missions, July 11-13, 2017, https://www.iaea.org/events/technical-meeting-on-nuclear-forensics-peer-review-advisory-missions.

[172] Technical Meeting on Nuclear Forensics and Cooperation with African States, July 11-13, 2017, https://www.iaea.org/events/technical-meeting-on-nuclear-forensics-and-cooperation-with-african-states.

[173] Regional Seminar on Introduction to Nuclear Forensics, September 4-8, 2017, https://www.iaea.org/events/regional-seminar-on-introduction-to-nuclear-forensics.

[174] International Training Course on Practical Introduction to Nuclear Forensics, October 2-6, 2017, https://www.iaea.org/events/international-training-course-on-practical-introduction-to-nuclear-forensics.

[175] "EU-US Nuclear Forensics International Technical Working Group (ITWG) Joint Statement," 2016 Washington Nuclear Security Summit, April 1, 2016, http://www.nss2016.org/document-center-docs/2016/4/1/eu-us-nuclear-forensics-international-technical-working-group-itwg-joint-statement.

[176] ITWG "Guideline," ITWG website, http://www.nf-itwg.org/sites/default/files/pdfs/ITWG_Guideline_for_RN_Evidence_Collection_FINAL.pdf.

[177] "Nuclear Forensics Libraries," ITWG website, http://www.nf-itwg.org/sites/default/files/pdfs/National_Nuclear_Forensic_Libraries_TOR_FINAL.pdf.

[178] "Nuclear Forensics Practitioners Strengthen Best Practices and International Cooperation," U.S. Department of State, Bureau of International Security and Nonproliferation website, July 12, 2017, https://www.state.gov/t/isn/rls/other/2017/272553.htm.

[179] Ibid.

tabletop exercises.[180] In June 2017 the 10th senior-level Plenary Meeting of GICNT was held in Tokyo.[181] In relation to NFWG, Australia announced that it is implementing nuclear forensics-related activities with Southeast Asian countries from 2017 to 2018.[182]

As part of the countermeasures against nuclear terrorism, the importance of nuclear forensics is definitely increasing. However, public information on the nuclear forensics capabilities of each country has been limited. For reference, Table 3-7 below outlines the nuclear forensics capabilities of the surveyed countries (based on the reports made at the ITWG-17 in 2012, and as posted in a previous edition of the Hiroshima Report).[183]

E) Capacity building and support activities

Around the time when the Nuclear Security Summit process started, in many states and regions, capacity in nuclear security also began to be built up and international cooperation efforts for nuclear security were actively promoted. As an example of these efforts, in 2017, Canada announced the implementation of financial support for the IAEA's activities to enhance regulatory capacity in Africa and South America.[184] These activities included developing teaching and training in nuclear security, for example, by setting up training courses in that field, and establishing Centers of Excellence (COE) for experts from these states and regions, to improve their capacity in nuclear security. In particular, it is remarkable that many states concerned with this issue established COEs. In this regard, trends in 2017 on the development of COEs for nuclear security are as follows. China expressed its intention to utilize the COE set up in 2016 for nuclear security education and training in the Asia-Pacific region.[185] The Pakistan Center of Excellence for Nuclear Security COE (PCENS) carries out education for domestic and foreign experts on nuclear safety, nuclear security, cyber security, insider threats, nuclear material accounting and control. In addition, the Pakistan National Security and Security Research Institute (NISAS) and Engineering Applied Science Institute (PIEAS) conduct similar training for domestic and foreign experts.[186] Canada has implemented international cooperation on physical protection of nuclear material in nuclear facilities for Malaysia, Thailand and the Philippines.[187] Indonesia has established its COE (I-CoNSEP) for nuclear security and emergency response.[188] Via the Asian Regional Network (ARN) that was established with each COE within the region, Japan has strengthened

[180] "Key Multilateral Events and Exercises," GICNT website, http://www.gicnt.org/documents/GICNT_Past_Multilateral_Events_June2015.pdf.

[181] "ITWG Nuclear Forensics Update," No.3, June 2017, https://www.nf-itwg.org/newsletters/ITWG_Update_no_3.pdf, p. 5.

[182] Australia Statement at the 10th Plenary Meeting of the GICNT, June 1-2, 2017, http://www.gicnt.org/statements/documents/2017-plenary/Australia.pdf.

[183] This table was originally shown in the "Hiroshima Report-Evaluation of Achievement in Nuclear Disarmament, Non-Proliferation and Nuclear Security: 2014," March 2014, p. 82.

[184] Canadian Statement at the IAEA 61th General Conference, https://www.iaea.org/sites/default/files/gc61-canada-statement.pdf.

[185] Statement at the 61th IAEA General Conference by Tang Dengjie, Head of the Chinese Delegation, September 2017, https://www.iaea.org/sites/default/files/gc61-china-final-statement.pdf.

[186] Statement by the Leader of the Pakistan Delegation, 61st Annual General Conference of the IAEA, September 18-22, 2017, https://www.iaea.org/sites/default/files/gc61-pakistan-statement.pdf.

[187] Canadian Statement at the IAEA 61th General Conference, https://www.iaea.org/sites/default/files/gc61-canada-statement.pdf.

[188] Statement by His Excellency Ambassador Dr. Darmansjah Djumala, Ambassador Extraordinary and Plenipotentiary/Permanent Representative of the Republic of Indonesia Head of Delegation of the Republic of Indonesia At the 61st General Conference of the IAEA, September 2017, https://www.iaea.org/sites/default/files/gc61-indonesia-statement-final.pdf.

Table 3-7: Nuclear forensics capabilities that were reported at the ITWG-17

	Uranium	Plutonium	Other radioactive material*	Evidence contaminated by radiological material
Categorization	France U.K. U.S. Australia Canada Japan South Korea Sweden Switzerland	France U.K. U.S. Canada South Korea Sweden 	 Canada Japan South Korea Sweden Switzerland	 U.S. Canada
Characterization	France U.K. U.S. Canada Japan South Korea Switzerland EC-JRC(ITU)	France U.K. U.S. Canada Japan South Korea Switzerland EC-JRC(ITU)	 U.K. U.S. Canada Japan South Korea Switzerland EC-JRC(ITU)	 U.S. Canada EC-JRC(ITU)
Interpretation	France U.S. Canada Japan Switzerland EC-JRC(ITU)	France U.S. Canada Japan Switzerland EC-JRC(ITU)	 U.S. Japan EC-JRC(ITU)	 U.S. Canada EC-JRC(ITU)

*: Irradiated fuel, Th, Cm, Cs, Am, Industrial radiation source, Sealed source

interagency exchanges between the JAEA-ISCN, SNSTC in China and INSA in Korea.[189] JAEA-ISCN also holds joint seminars with countries including Bangladesh, Kazakhstan, Mongolia, Malaysia, Vietnam, Jordan, Turkey and Saudi Arabia.[190] Egypt implemented training that leads to the promotion of nuclear security culture and technical cooperation to relevant organizations in the country by utilizing the Egypt Nuclear Security Support Center (ENSSC) established in 2012. In cooperation with the IAEA, Egypt is also strengthening its capacity on radiation detection and physical protection of nuclear material.[191] Russia has established the Institute for Global Nuclear Safety & Security (GNSSI) under the ROSATOM Technical Academy, and is implementing education and training related to nuclear security. As of 2017, 896 people from 54 countries participate in this training.[192] Each country's efforts, to set up the COE and implement training as described above, not only helps capacity building related to global nuclear security, but also contributes to promoting understanding of nuclear security to regional experts, operators and related organizations. Moreover, strengthening cooperation with each country's COE has advantages such as mutual exchange of instructors among COEs. At the same time, it is an important task to avoid duplication in the activities of each COE that has been installed in each region during the past several years, to promote efficient cooperation and closer information sharing. These tasks include building a broad network around the IAEA and strengthening education and training through international support.

To maintain and further facilitate exchange of experts, information and training material, the International Network for Nuclear Security Training and Support Centres (NSSC Network) was established in 2012 under the leadership of the IAEA. In this relationship, in February 2017, the Annual Meeting of the NSSC Network was held in Vienna.[193] In addition, as an approach of the same kind, there is the activity of the International Nuclear Security Education Network (INSEN network) by IAEA, to further advance technology development and information sharing related to nuclear security education. In July 2017, the Annual Meeting of the INSEN was also held in Vienna.[194]

F) IAEA Nuclear Security Plan and Nuclear Security Fund

The IAEA's fifth Nuclear Security Plan covering the period 2018-2021,[195] was approved in September 2017 and has been executed. For the sake of successful implementation of this plan, since 2002, when the

[189] Naoko Noro, "ISCN's Activities to Promote Universalization of INFCIRC/225/Rev.5 (NSS 13)," paper presented at the International Conference on Physical Protection of Nuclear Material and Nuclear Facilities, November 13-17, Vienna, https://www.iaea.org/sites/default/files/17/11/cn-254-noro-presentation.pdf.

[190] Nobumasa Akiyama, "Japan's Commitment to the Universalization of CPPNM and Its Amendment," paper presented at the International Conference on Physical Protection of Nuclear Material and Nuclear Facilities, November 13-17, Vienna, https://www.iaea.org/sites/default/files/17/11/cn-254-akiyama-presentation.pdf.

[191] Mohamed Helmyhazzaa, "A Proposal for the Role of Nuclear Security Support Center to Sustain a National Nuclear Security Regime," paper presented at the International Conference on Physical Protection of Nuclear Material and Nuclear Facilities, November 13-17, Vienna, https://www.iaea.org/sites/default/files/17/11/cn-254-hazzaa-presentation.pdf.

[192] A. Kuskov, "Training and additional professional education of the specialists in the field of nuclear security in RF," paper presented at the International Conference on Physical Protection of Nuclear Material and Nuclear Facilities, November 13-17, Vienna, Austria, https://www.iaea.org/sites/default/files/17/11/cn-254-kuskov-presentation.pdf.

[193] Annual Meeting of the International Network for Nuclear Security Training and Support Centres (NSSC Network), February 20–24, 2017, https://www.iaea.org/events/annual-meeting-of-the-international-network-for-nuclear-security-training-and-support-centres-nssc-network.

[194] Annual Meeting of the International Nuclear Security Education Network (INSEN), July 24–28, 2017, https://www.iaea.org/events/annual-meeting-of-the-international-nuclear-security-education-network-insen.

[195] Nuclear Security Plan 2018-2021, GC(61)/24, September 14, 2017, https://www.iaea.org/About/Policy/GC/GC61/GC61Documents/English/gc61-24_en.pdf.

IAEA established the Nuclear Security Fund (NSF) as a voluntary funding mechanism to prevent, detect, and respond to nuclear terrorism, the Agency has been calling on member states to make voluntary contributions to the Fund. According to the 2016 IAEA Annual Report (the latest at the time of writing this report), the countries that declared financial commitment to NSF are as follows. Belgium, Canada, China, Estonia, Finland, France, Germany, India, Italy, Japan, South Korea, New Zealand, Romania, Russia, Spain, Switzerland, UAE, the United Kingdom and the United States. Actual NSF revenue for FY 2016 was €47.4 million.[196] It is an increase of €17 million compared with the previous year.

In this regard, the state of commitments to the NSF by the surveyed countries, which was clarified from the statements at the 61st IAEA General Conference and GICNT plenary meeting in 2017, is as follows. The United Kingdom expressed a contribution of £8.5 million to the NSF.[197] Pakistan did not mention the amount, but expressed its willingness to contribute to the NSF in 2018.[198] The Netherlands declared a contribution of €1 million to NSF for the implementation of a new Nuclear Security Plan.[199] New Zealand also pledged to contribute $150,000 to NSF in the future.[200] Belgium, for its part, revealed that its contributions to NSF since 2010 have exceeded $ 2 million.[201]

G) Participation in international efforts

The international efforts on nuclear security that this report draws attention to are not limited to the IAEA's International Conference on Nuclear Security, the NSS process that ended in 2016, UN Security Council Resolution 1540[202] and various contributions made by INTERPOL. In the present circumstances, various other multilateral frameworks relevant to nuclear security are operating around the world. The establishment of a "Global Partnership against the Spread of Weapons and Materials of Mass Destruction" (G8GP) was agreed at the G8 Kananaskis Summit in 2002. It committed the G8 to raising up to $20 billion over the next 10 years to fund nonproliferation projects, principally in Russia but also in other nations. The so-called "10 plus 10 over 10" initiative called for the United States to contribute $10 billion, and the other original G7 nations a combined $10 billion to help the projects.[203]

In addition to the G8 member states (including France, Germany, Japan, the U.K., the U.S. and Russia), other donor participants (Australia, South Korea, Sweden, Switzerland, etc.) have participated in the G8GP and carried out various projects, in particular denuclearization cooperation in Russia. This work also includes destruction of chemical weapons,

[196] IAEA, "IAEA Annual Report 2016," https://www.iaea.org/About/Policy/GC/GC61/GC61Documents/English/gc61-3_en.pdf, p. 87.

[197] UK National Statement at the 61th General Conference of the IAEA, September 2017, https://www.iaea.org/sites/default/files/gc61-uk-statement.pdf.

[198] Statement by the Leader of the Pakistan Delegation, 61st Annual General Conference of the IAEA, September 18-22, 2017, https://www.iaea.org/sites/default/files/gc61-pakistan-statement.pdf.

[199] Statement by Ms Anke ter Hoeve-van Heek, Deputy Permanent Representative of the Kingdom of the Netherlands to the IAEA, September 20, 2017, https://www.iaea.org/sites/default/files/gc61-netherlands-statement.pdf.

[200] New Zealand Statement Delivered by H.E. Nicole Roberton, New Zealand Ambassador at the 61th General Conference of the IAEA, September 2017, https://www.iaea.org/sites/default/files/gc61-new-zealand-statement.pdf.

[201] Belgium Statement at the 10th Plenary Meeting of the GICNT, June 1-2, 2017, http://www.gicnt.org/statements/documents/2017-plenary/Belgium.pdf.

[202] Joint Statement on Promoting Full and Universal Implementation of UNSCR 1540 (2004), 2016 Washington Nuclear Security Summit, April 5, 2016, http://www.nss2016.org/document-center-docs/2016/4/1/joint-statement-on-1540-committee.

[203] NTI, "Global Partnership Against the Spread of Weapons and Materials of Mass Destruction ("10 Plus 10 Over 10 Program")," June 20, 2017, http://www.nti.org/learn/treaties-and-regimes/global-partnership-against-spread-weapons-and-materials-mass-destruction-10-plus-10-over-10-program/.

secure dismantling and transport of decommissioned nuclear powered submarines, improved detection of nuclear and radiological materials, re-employment of former WMD scientists and technicians to civilian programs, and the removal and safe transportation of nuclear material in Kazakhstan. In relation to nuclear security, the Nuclear Safety and Security Group (NSSG) has been established under the G8GP and has been working with nuclear security summits and the IAEA's international conferences on nuclear security. However, due to the Russian annexation of Crimea in March 2014, the leaders of the G-7 collectively decided to expel Russia from the G8 as a punitive measure.[204] As a result, the former G8 initiative has officially changed the name to "G7 Global Partnership Against the Spread of Weapons and Materials of Mass Destruction."[205]

In May 2017, on the premise of global expansion of peaceful use of nuclear energy, the Communiqué of the Taormina Summit in Italy pointed out the importance of nuclear security along with nuclear safety and nonproliferation.[206] Besides this, the G7GP, on the initiative of the Presidency of Italy, launched a new policy focusing on Africa, as well as responding to potential threats that chemical and biotechnology are diverted to malicious actions.[207] In the NSSG report, a policy was stated for avoiding overlap with existing international nuclear security measures, such as the IAEA, United Nations, INTERPOL and GICNT, and to strengthen the global nuclear security system by effectively managing the limited resources of the NSSG.[208]

On the other hand, GICNT, which was agreed by the U.S.-Russia initiative at the St. Petersburg Summit in 2006, is another important international effort in the field of nuclear security. GICNT is a framework of voluntary international cooperation by concerned states. As mentioned in the previous section on nuclear forensics technology development, the presence of multilateral activities by GICNT for strengthening nuclear security has greatly increased in recent years. The GICNT now includes participation from 88 partner countries (including Australia, China, France, Germany, India, Israel, Japan, South Korea, Pakistan, Russia, Sweden, Switzerland, the U.K. and the U.S.) and five international organizations as official observers.[209] All partner nations have voluntarily committed to implementing the GICNT Statement of Principles (SOP), a set of broad nuclear security goals encompassing a range of deterrence, prevention, detection, and response objectives.[210] The eight principles contained within the SOP aim to improve accounting, control, and protection of nuclear/radiological material, enhance security of civilian nuclear facilities, detect and suppress illicit trafficking of nuclear/radiological material, assure denial of safe haven and resources from terrorists seeking to acquire or use nuclear/radiological material, and so on. Since 2010, the Implementation and Assessment Group (IAG) was established as a working arm of the GICNT partnership. IAG has several priority functional areas with working groups, such as the Nuclear Detection Working Group (NDWG, chaired by the U.K.), the Nuclear Forensic Working Group (NFWG, chaired by

[204] Ibid.

[205] "G7 Global Partnership Against the Spread of Weapons and Materials of Mass Destruction," G7 2017 Italy website, http://www.g7italy.it/it/node/190.

[206] G7 Taormina Leaders' Communiqué, http://www.g7italy.it/sites/default/files/documents/G7%20Taormina%20Leaders%27%20Communique_27052017_0.pdf.

[207] Ibid.

[208] "Italian G7 Presidency 2017 Report," Nuclear Safety and Security Group (NSSG), http://www.g7italy.it/sites/default/files/documents/NSSG-Report_FINAL_0.pdf.

[209] "Global Initiative to Combat Nuclear Terrorism Partner Nations List," June 2017, http://www.gicnt.org/documents/GICNT_Partner_Nation_List_June2017.pdf.

[210] "Overview," GICNT website, http://www.gicnt.org/index.html.

Canada) and Response and the Mitigation Working Group (RMWG, chaired by Argentina).[211]

Individual efforts concerning GICNT are as follows. In January 2017 a workshop entitled "Vigilant Marmot," organized by Canada, the United Nations Drug and Criminal Offices (UNODC) and Slovakia, was held in Bratislava, Slovakia. In this workshop, issues related to reviewing the legal framework of nuclear security in each country were examined.[212] In addition, a workshop called "Magic Maggiore," aimed at enlightenment and promotion of nuclear material detection architecture, was held by EC-JRC in March in Ispra, Italy.[213] In May, the workshop "Sentinel" was held, with the cooperation of the United Kingdom and Bulgaria, on the theme of preparing nuclear security exercise plans at the national level, to maintain the nuclear security capacity of each country.[214] In June 2017, the 10th Senior Level GICNT Plenary Meeting was held in Japan and agreed on the GICNT plan for 2017 to 2019, including priority issues in NDWG, NFWG and RMWG.[215] Regarding the plan after 2017, China shows the intention to host a regional seminar on nuclear emergency response and a regional workshop on the safety of radioactive sources from 2018 to 2019.[216] Likewise, the United Kingdom expressed its intention to hold a GICNT workshop focusing on recovery systems and resource management in preparing for recovering from terrorist attacks involving nuclear or radioactive materials in February 2018.[217]

In this report, it is expected that the acceptance of international nuclear security review missions such as IPPAS by the IAEA, national efforts regarding nuclear forensics, and commitments to nuclear security capacity-building and support will contribute to enhancing surveyed countries' nuclear security-related capabilities and performances, and make more effective their respective nuclear security systems. Furthermore, the contributions to the IAEA NSF, and participation in the G8GP (G7GP) and the GICNT are indicators of the desire of states to enhance their commitment to nuclear security and can be used to undertake an overall evaluation of each country's nuclear security system. Table 3-8 below shows the participation status and efforts regarding these nuclear security initiatives.

[211] "Global Initiative to Combat Nuclear Terrorism Fact Sheet," GICNT website, November 2017, http://www.gicnt.org/documents/GICNT_Fact_Sheet_Nov2017.pdf.

[212] "Global Initiative to Combat Nuclear Terrorism 2017 Plenary Meeting Joint Co-Chair Statement," http://www.mofa.go.jp/files/000261774.pdf.

[213] Ibid.

[214] Ibid.

[215] Statement by Japan at the 61th IAEA General Conference, Minister of State Masaji Matsuyama, September 18, 2017, https://www.iaea.org/sites/default/files/gc61-japan-statement_v2.pdf.

[216] Remarks by Chinese Delegation at the 10th Plenary Meeting of the GICNT, June 1, 2017, http://www.gicnt.org/statements/documents/2017-plenary/China.pdf.

[217] UK National Statement at the 10th Plenary Meeting of the GICNT, June 1-2, 2017, http://www.gicnt.org/statements/documents/2017-plenary/UK.pdf.

Table 3-8: The participation status in and effort for nuclear security initiatives

	China	France	Russia	U.K.	U.S.	India	Israel	Pakistan	Australia	Austria	Belgium	Brazil
IPPAS	○*	○		○	○				○			
Nuclear Forensics	○	○	○	○	○		○	○	○		○	
Capacity Building & Support Activities	○	○	○	○	○	○		○	○	○		○
Nuclear Security Fund	○	○	○	○	○	○	○	○	○	○	○	
G8 Global Partnership	△	○	○	○	○	△			○	△	○	△
GICNT	○	○	○	○	○	○	○	○	○	○	○	

	Canada	Chile	Egypt	Germany	Indonesia	Iran	Japan	Kazakhstan	South Korea	Mexico	Netherlands	New Zealand
IPPAS	○	○	○	○*	○	○	○	○	○	○	○	○
Nuclear Forensics	○	○		○			○		○		○	
Capacity Building & Support Activities	○	○	○*	○	○		○	○	○		○	
Nuclear Security Fund	○			○		○	○	○	○		○	○
G8 Global Partnership	○			○			○	○	○	○	○	○
GICNT	○	○		○			○	○	○	○	○	○

	Nigeria	Norway	Philippines	Poland	Saudi Arabia	South Africa	Sweden	Switzerland	Syria	Turkey	UAE	North Korea
IPPAS		○	○	○*			○	○		○	○*	
Nuclear Forensics		○				○	○	○		○		
Capacity Building & Support Activities	○	○	○		○	○	○	○			○	
Nuclear Security Fund		○					○	○*		○	○*	
G8 Global Partnership		○	○	○	△	△	○	○		△	△	
GICNT	○*	○	○	○	○*		○	○		○	○	

IPPAS: "△" is assigned for the countries that are planning to accept IPPAS or have held a related workshop.
G8 Global Partnership: "△" is assigned for the countries that are considering of the participation in it.

*: Updated figures in 2017.

Part II Evaluation

Country-by-Country Analysis

Introduction—Evaluation Points and Criteria

In this "Evaluation" part, the performances of the 36 countries surveyed in this project on three areas, that is, nuclear disarmament, non-proliferation and nuclear security, are evaluated numerically, based upon study and analysis compiled in the "Report" section.

Evaluation of the four groups—nuclear-weapon states (NWS), non-parties to the Nuclear Non-Proliferation Treaty (NPT), non-nuclear-weapon states (NNWS), and one particular state (North Korea)—is made separately because of their different characteristics. Since different sets of criteria are applied to different groups of countries, full points differ according to the group each country belongs to. Then, as a measure to visualize a comparison of 36 countries' relative performances, each country's performances in each area is shown on a chart in percentage terms.

[Full Points for each group of countries]

Groups / Areas	(1) NWS	(2) Non-NPT Parties	(3) NNWS	(4) Other
	China France Russia U.K. U.S.	India Israel Pakistan	Australia, Austria, Belgium, Brazil, Canada, Chile, Egypt, Germany, Indonesia, Iran, Japan, Kazakhstan, South Korea, Mexico, the Netherlands, New Zealand, Nigeria, Norway, the Philippines, Poland, Saudi Arabia, South Africa, Sweden, Switzerland, Syria, Turkey, UAE	North Korea*
Nuclear Disarmament	101	98	42	98
Nuclear Non-Proliferation	47	43	61	61
Nuclear Security	41	41	41	41

* North Korea declared its suspension from the NPT in 1993 and its withdrawal in 2003, and has conducted totally six nuclear tests in 2006, 2009, 2013, 2016 (twice) and 2017. However, there is no agreement among the states parties on North Korea's official status.

Following is point and scale of measurement of each evaluation criteria.

[Nuclear Disarmament]

Evaluation criteria	Maximum points	Scale of measurement
1. Status of Nuclear Forces (estimates)	**-20**	
Status of nuclear forces (estimates)	(-20)	-5 (～50); -6 (51～100); -8 (101～200); -10 (201～400); -12 (401～1,000); -14 (1,001～2,000); -16 (2,001～4,000); -17 (4,001～6,000); -19 (6,001～8,000); -20 (8,001～) (not applicable to the NNWS)
2. Commitment to Achieving a World without Nuclear Weapons	**11**	
A) Voting behavior on UNGA resolutions on nuclear disarmament proposals by Japan, NAC and NAM	(6)	On each resolution: 0 (against); 1 (abstention); 2 (in favor)
B) Announcement of significant policies and important activities	(3)	Add 1 point for each policy, proposal and other initiatives having a major impact on the global momentum toward a world without nuclear weapons (maximum 3 points).

Evaluation criteria	Maximum points	Scale of measurement
C) Humanitarian consequences of nuclear weapons	(2)	On each resolution: 0 (against); 0.5 (abstention); 1 (in favor)
3. Treaty on the Prohibition of Nuclear Weapons (TPNW)	**10**	
A) Signing and ratifying the TPNW	(7)	0 (not signing); 3 (not ratifying); 7 (ratifying)
B) Voting behavior on UNGA resolutions on a legal prohibition of nuclear weapons	(3)	On each resolution: 0 (against); 0.5 (abstention); 1 (in favor)
4. Reduction of Nuclear Weapons	**22**	
A) Reduction of nuclear weapons	(15)	・Add 1～10 points in accordance with the decuple rate of reduction from the previous year for a country having declared the number of nuclear weapons. ・For a country having not declared it, add some points using the following formula: (the previous target – the latest target)÷the estimated number of nuclear weapons×10. ・Add 1 (engaging in nuclear weapons reduction over the past 5 years); add 1 (engaging in nuclear weapons reduction under legally-binding frameworks such as New Strategic Arms Reduction Treaty); add 1 (announcing further reduction plan and implementing it in 2016) ・Give a perfect score (15 points) in case of the total abolition of nuclear weapons. (not applicable to the NNWS)
B) A concrete plan for further reduction of nuclear weapons	(3)	0 (no announcement on a plan of nuclear weapons reduction); 1 (declaring a rough plan of nuclear weapons reduction); 2 (declaring a plan on the size of nuclear weapons reduction); 3 (declaring a concrete and detailed plan of reduction) (not applicable to the NNWS)
C) Trends on strengthening/modernizing nuclear weapons capabilities	(4)	0 (modernizing/reinforcing nuclear forces in a backward move toward nuclear weapons reduction; 2～3 (modernizing/reinforcing nuclear forces which may not lead to increasing the number of nuclear weapons; 4 (not engaging in nuclear modernization/reinforcement) (not applicable to the NNWS)
5. Diminishing the Role and Significance of Nuclear Weapons in National Security Strategies and Policies	**8**	
A) The current status of the roles and significance of nuclear weapons	(-8)	-7～-8 (judged based on the declaratory policy) (not applicable to the NNWS)
B) Commitment to “sole purpose,” no first use, and related doctrines	(3)	0 (not adopting either policy); 2 (adopting a similar policy or expressing its will to adopt either policy in the future); 3 (already adopting either policy) (not applicable to the NNWS)
C) Negative security assurances	(2)	0 (not declaring); 1 (declaring with reservations); 2 (declaring without reservations) (not applicable to the NNWS)
D) Signing and ratifying the protocols of the treaties on nuclear-weapon-free zones	(3)	Add 0.5 point for the ratification of one protocol; a country ratifying all protocols marks 3 points (not applicable to countries expect NWS)
E) Relying on extended nuclear deterrence	(-5)	(not applicable to the NWS and Non-NPT Parties) (applied solely to the NNWS): -5 (a country relying on the nuclear umbrella and participating in nuclear sharing); -3 (a country relying on the nuclear umbrella); 0 (a country not relying on the nuclear umbrella)

Evaluation criteria	Maximum points	Scale of measurement
6. De-alerting or Measures for Maximizing Decision Time to Authorize the Use of Nuclear Weapons	**4**	
De-alerting or measures for maximizing decision time to authorize the use of nuclear weapons	(4)	0～1 (maintaining a high alert level); 2 (maintaining a certain alert level); 3 (de-alerting during peacetime); add 1 point for implementing measures for increasing the credibility of (lowered) alert status (not applicable to the NNWS)
7. CTBT	**11**	
A) Signing and ratifying the CTBT	(4)	0 (not signing); 2 (not ratifying); 4 (ratifying)
B) Moratoria on nuclear test explosions pending CTBT's entry into force	(3)	0 (not declaring); 2 (declaring); 3 (declaring and closing the nuclear test sites) (not applicable to the NNWS)
C) Cooperation with the CTBTO Preparatory Commission	(2)	0 (no cooperation or no information); 1～2 (paying contributions, actively participating in meetings, and actively engaging in the outreach activities for the Treaty's entry into force)
D) Contribution to the development of the CTBT verification systems	(2)	Add 1 point for establishing and operating the IMS; add another 1 point for participating in the discussions on enhancing the CTBT verification capabilities
E) Nuclear testing	(-3)	-3 (conducting nuclear test explosions in the past 5 years); -1 (conducting nuclear tests without explosion or the status is unclear); 0 (not conducting any nuclear tests) (not applicable to the NNWS)
8. FMCT	**10**	
A) Commitment, efforts, and proposals toward immediate commencement of negotiations on an FMCT	(5)	Add 1 (expressing a commitment); add 1～2 (actively engaging in the promotion of early commencement); add 1～2 (making concrete proposals on the start of negotiations)
B) Moratoria on the production of fissile material for use in nuclear weapons	(3)	0 (not declaring); 1 (not declaring but not producing fissile material for nuclear weapons); 2 (declaring); 3 (declaring and taking measures for the cessation of the production as declared) (not applicable to the NNWS)
C) Contribution to the development of verification measures	(2)	0 (no contribution or no information); 1 (proposing a research on verification measures); 2 (engaging in R&D for verification measures)
9. Transparency in Nuclear Forces, Fissile Material for Nuclear Weapons, and Nuclear Strategy/Doctrine	**6**	
Transparency in nuclear forces, fissile material for nuclear weapons, and nuclear strategy/ doctrine	(6)	Add 1～2 (disclosing the nuclear strategy/doctrine); add 1～2 (disclosing the status of nuclear forces); add 1～2 (disclosing the status of fissile material usable for nuclear weapons) (not applicable to the NNWS)
10. Verifications of Nuclear Weapons Reductions	**7**	
A) Acceptance and implementation of verification for nuclear weapons reduction	(3)	0 (not accepting or implementing); 2 (limited acceptance and implementation); 3 (accepting and implementing verification with comprehensiveness and completeness); deduct 1～2 points in case of non-compliance or problems in implementation (not applicable to the NNWS)

Evaluation criteria	Maximum points	Scale of measurement
B) Engagement in research and development for verification measures of nuclear weapons reduction	(1)	0 (not engaging or no information); 1 (engaging in R&D)
C) The IAEA inspections to fissile material declared as no longer required for military purposes	(3)	0 (not implementing), 1 (limited implementation); 3 (implementing); add 1 point if a country engages in the efforts for implementing or strengthening the implementation, except in the case of already implementing (not applicable to the NNWS)
11. Irreversibility	**7**	
A) Implementing or planning dismantlement of nuclear warheads and their delivery vehicles	(3)	0 (not implementing or no information); 1 (perhaps implementing but not clear); 2～3 (implementing) (not applicable to the NNWS)
B) Decommissioning/conversion of nuclear weapons-related facilities	(2)	0 (not implementing or no information); 1 (implementing in a limited way); 2 (implementing extensively) (not applicable to the NNWS)
C) Measures for fissile material declared excess for military purposes, such as disposition or conversion to peaceful purposes	(2)	0 (not implementing or no information); 1 (implementing in a limited way); 2 (implementing); 3 (implementing extensively) (not applicable to the NNWS)
12. Disarmament and Non-Proliferation Education and Cooperation with Civil Society	**4**	
Disarmament and non-proliferation education and cooperation with civil society	(4)	Add 1 (participating in the joint statement); add 1-2 (implementing disarmament and non-proliferation education); add 1～2 (cooperating with civil society). Maximum 4 points
13. Hiroshima Peace Memorial Ceremony	**1**	
Hiroshima Peace Memorial Ceremony	(1)	0 (not attending); 0.5 (not attending in 2017 but has attended at least once during the past 3 years); 1 (attending)

[Nuclear Non-Proliferation]

Evaluation criteria	Maximum points	Scale of measurement
1. Acceptance and Compliance with Nuclear Non-Proliferation Obligations	**20**	
A) Accession to the NPT	(10)	0 (not signing or declaring withdrawal); 3 (not ratifying); 10 (in force)
B) Compliance with Articles I and II of the NPT and the UNSC resolutions on non-proliferation	(7)	・0 (non-complying with Article I and II of the NPT); 3～4 (having not yet violated Article I and II of the NPT but displaying behaviors that raise concerns about proliferation, or not complying with the UNSC resolutions adopted for relevant nuclear issues); 5 (taking concrete measures for solving the non-compliance issue); 7 (complying). ・As for the non-NPT states (maximum 3 points) : 2 (not complying with the UNSC resolutions adopted for relevant nuclear issues); 3 (other cases)
C) Nuclear-Weapon-Free Zones	(3)	1 (signing the NWFZ treaty); 3 (ratifying the treaty)
2. IAEA Safeguards Applied to the NPT NNWS	**18**	
A) Signing and ratifying a Comprehensive Safeguards Agreement	(4)	0 (not signing); 1 (not ratifying); 4 (in force)
B) Signing and ratifying an Additional Protocol	(5)	0 (not signing); 1 (not ratifying); 3 (provisional application); 5 (in force)

Evaluation criteria	Maximum points	Scale of measurement
C) Implementation of the integrated safeguards	(4)	0 (not implementing); 2 (broader conclusion) 4 (implementing)
D) Compliance with IAEA Safeguards Agreement	(5)	0 (not resolving the non-compliance issue); 2 (taking concrete measures for solving the non-compliance issue); 5 (complying)
3. IAEA Safeguards Applied to NWS and Non-Parties to the NPT	**7**	
A) Application of the IAEA safeguards (Voluntary Offer Agreement or INFCIRC/66) to their peaceful nuclear in facilities	(3)	0 (not applying); 2 (applying INFCIRC/66); 3 (applying Voluntary Offer Agreement)
B) Signing, ratifying, and implementing the Additional Protocol	(4)	0 (not signing); 1 (not ratifying); 3 (in force); add 1 point if widely applied to peaceful nuclear activities
4. Cooperation with the IAEA	**4**	
Cooperation with the IAEA	(4)	Add 1 (contributing to the development of verification technologies); add 1～2 (contributing to the universalization of the Additional Protocol); add 1 (other efforts)
5. Implementing Appropriate Export Controls on Nuclear-Related Items and Technologies	**15**	
A) Establishment and implementation of the national control systems	(5)	0 (not establishing); 1 (establishing but insufficient); 2 (establishing a system to a certain degree); 3 (establishing an advanced system, including the Catch-all); add 1～2 (if continuing to implement appropriate export controls); deduct 1～2 (not adequately implementing)
B) Requiring the conclusion of the Additional Protocol for nuclear export	(2)	0 (not requiring or no information); 1 (requiring for some cases); 2 (requiring)
C) Implementation of the UNSCRs concerning North Korean and Iranian nuclear issues	(3)	0 (not implementing or no information); 2 (implementing); 3 (actively implementing); deduct 1～3 (depending on the degree of violation)
D) Participation in the PSI	(2)	0 (not participating); 1 (participating); 2 (actively participating)
E) Civil nuclear cooperation with non-parties to the NPT	(3)	0 (exploring active cooperation); 1～2 (contemplating cooperation, subject to implementing additional nuclear disarmament and non-proliferation measures); 3 (showing a cautious attitude or being against it)
6. Transparency in the Peaceful Use of Nuclear Energy	**4**	
A) Reporting on the peaceful nuclear activities	(2)	0 (not reporting or no information); 1 (reporting but insufficiently); 2 (reporting)
B) Reporting on plutonium management	(2)	0 (not reporting or no information); 1 (reporting); 2 (reporting on not only plutonium but also uranium); add 1 (ensuring a high level of transparency in plutonium although not being obliged to report)

[Nuclear Security]

Evaluation criteria	Maximum points	Scale of measurement
1. The Amount of Fissile Material Usable for Weapons	**-16**	
The amount of fissile material usable for weapons	(-16)	Firstly, -3 (if possessing fissile material usable for nuclear weapons). Then, deduct if: ・ HEU: -5 (>100t); -4 (>20t); -3 (>10t); -2 (>1t); -1 (possessing less than 1t) ・Weapon-grade Pu: -5 (>100t); -4 (>20t); -3 (>10t); -2 (>1t); -1 (possessing less than 1t) ・Reactor-grade Pu: -3 (>10t); -2 (>1t); -1 (possessing less than 1t)

Evaluation criteria	Maximum points	Scale of measurement
2. Status of Accession to Nuclear Security and Safety-Related Conventions, Participation in Nuclear Security Related Initiatives, and Application to Domestic Systems	**21**	
A) Convention on the Physical Protection of Nuclear Material and the 2005 Amendment to the Convention	(3)	0 (not signing the Treaty); 1 (not ratifying the Treaty); 2 (Treaty in force, not ratifying the Amendment); 3 (both the Treaty and Amendment in force)
B) International Convention for the Suppression of Acts of Nuclear Terrorism	(2)	0 (not signing); 1 (not ratifying); 2 (in force)
C) Convention on Nuclear Safety	(2)	0 (not signing); 1 (not ratifying); 2 (in force)
D) Convention on Early Notification of a Nuclear Accident	(2)	0 (not signing); 1 (not ratifying); 2 (in force)
E) Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management	(2)	0 (not signing); 1 (not ratifying); 2 (in force)
F) Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency	(2)	0 (not signing); 1 (not ratifying); 2 (in force)
G) INFCIRC/225/Rev.5	(4)	0 (not applying or no information); 2 (applying to the national implementation system); 4 (applying and implementing adequately)
H) Enactment of laws and establishment of regulations for the national implementation	(4)	0 (not establishing domestic laws and regulations and the national implementation system); 1～2 (establishing them but insufficiently); 4 (establishing appropriately)
3. Efforts to Maintain and Improve the Highest Level of Nuclear Security	**20**	
A) Minimization of HEU in civilian use	(4)	0 (no effort or no information); 1 (limited efforts); 3 (active efforts); add 1 (committed to further enhancement)
B) Prevention of illicit trafficking	(5)	0 (not implementing or no information); 2 (limited implementation); 4 (active implementation); add 1 (committed to further enhancement)
C) Acceptance of international nuclear security review missions	(2)	0 (not accepting or no information); 1 (accepting); 2 (actively accepting)
D) Technology development —nuclear forensics	(2)	0 (not implementing or no information); 1 (implementing); 2 (actively implementing)
E) Capacity building and support activities	(2)	0 (not implementing or no information); 1 (implementing); 2 (actively implementing)
F) IAEA Nuclear Security Plan and Nuclear Security Fund	(2)	0 (no effort or information); 1 (participating); 2 (actively participating)
G) Participation in international efforts	(3)	0 (not participating); 1 (participating in a few frameworks); 2 (participating in many or all frameworks); add 1 (if contributing actively)

As for the evaluation section, a set of objective evaluation criteria is established by which the respective country's performance is assessed. Along with the adoption of the Treaty on the Prohibition of Nuclear Weapons (TPNW), its signature and ratification status was newly added to the evaluation item in this *Hiroshima Report 2018*.

The Research Committee of this project recognizes the difficulties, limitations and risk of "scoring" countries' performances. However, the Committee also considers that an indicative approach is useful to draw attention to nuclear issues, so as to prompt debates over priorities and urgency.

The different numerical value within each category (i.e., nuclear disarmament, nuclear non-proliferation and nuclear security) reflects each activity's

importance within that area, as determined through deliberation by the Research Committee of this project. However, the differences in the scoring arrangements within each of the three categories does not necessarily reflect its relative significance in comparison with others, as it has been driven by the differing number of items surveyed. Thus, the value assigned to nuclear disarmament (full points 101) does not mean that it is more than twice as important as nuclear non-proliferation (full points 61) or nuclear security (full points 41).

Regarding "the number of nuclear weapons" (in the nuclear disarmament section) and "the amount of fissile material usable for nuclear weapons" (in the nuclear security section), the assumption is that the more nuclear weapons or weapons-usable fissile material a country possesses, the greater the task of reducing them and ensuring their security. However, the Research Committee recognizes that "numbers" or "amounts" are not the sole decisive factors. It is definitely true that other factors—such as implications of missile defense, chemical and biological weapons, or conventional force imbalance and a psychological attachment to a minimum overt or covert nuclear weapon capability—would affect the issues and the process of nuclear disarmament, non-proliferation and nuclear security. However, they were not included in our criteria for evaluation because it was difficult to make objective scales of the significance of these factors. In addition, in view of the suggestions and comments made to the *Hiroshima Report 2013*, the Research Committee modified criteria of the following items: current status of the roles and significance of nuclear weapons in national security strategies and policies; reliance on extended nuclear deterrence; and nuclear testing.

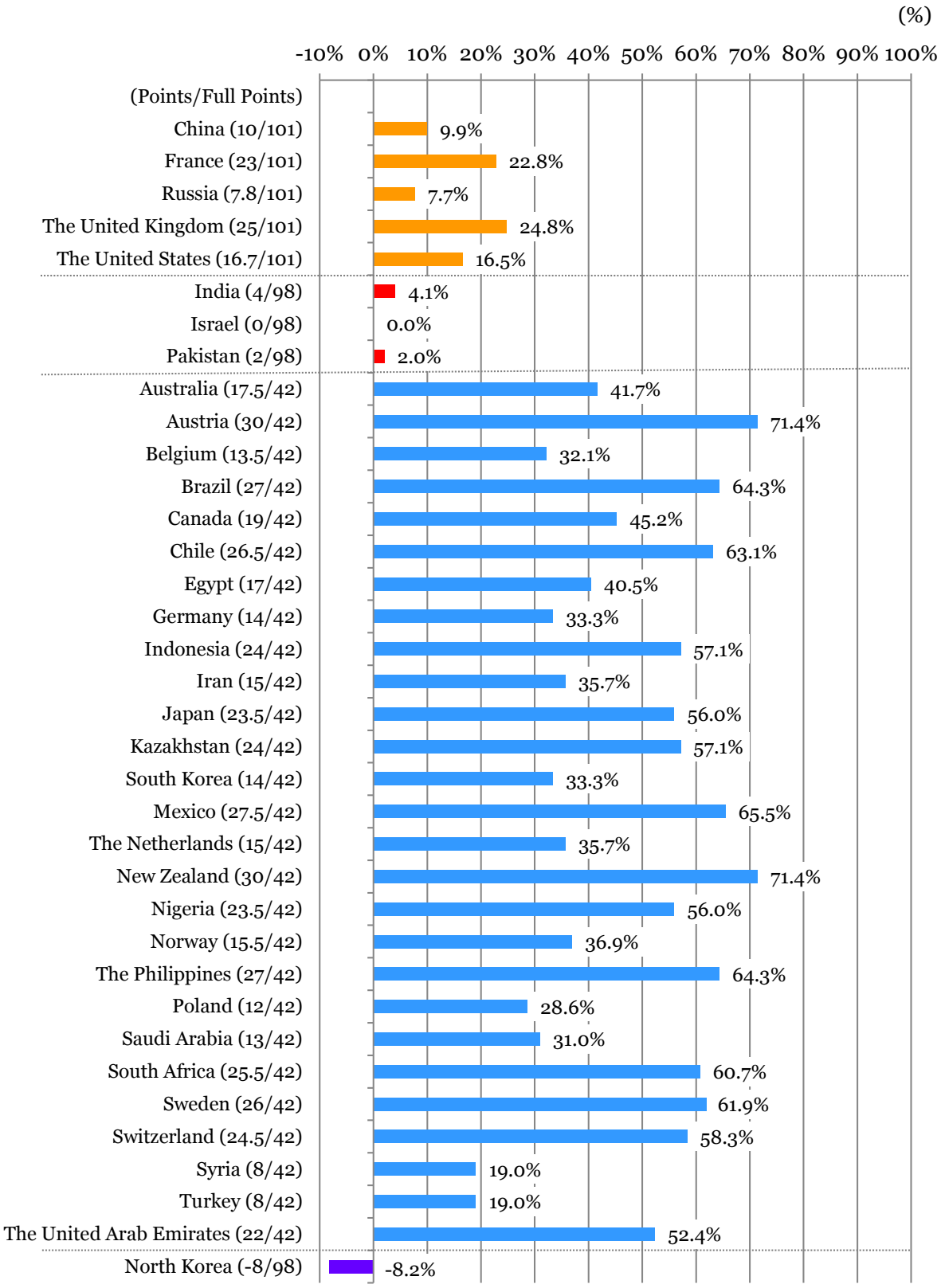
After all, there is no way to mathematically compare the different factors contained in the different areas of disarmament, non-proliferation and nuclear security. Therefore, the evaluation points should be taken as indicative of the performances in general but by no means as an exact representation or precise assessment of different countries' performances. Since the *Hiroshima Report 2014*, such items as "relying on extended nuclear deterrence" and "nuclear testing" have been negatively graded if applicable.

For the NWS, radar charts were produced to illustrate where each country stands in different aspects of nuclear disarmament. For this purpose the 12 issues used for nuclear disarmament evaluation were grouped into six aspects: (1) the number of nuclear weapons, (2) reduction of nuclear weapons, (3) commitment to achieving a "world without nuclear weapons," (4) operational policy, (5) the status of signature and ratification of, or attitudes of negotiation to relevant multilateral treaties, and (6) transparency.

Aspects	Issues
Number	Number of nuclear weapons
Reduction	Reduction of nuclear weapons
Commitments	Treaty on the Prohibition of Nuclear Weapons (TPNW)
	Commitments to achieving a world without nuclear weapons
	Disarmament and non-proliferation educations and cooperation with the civil society
	Hiroshima Peace Memorial Ceremony
Operational policy	Diminishing roles and significance of nuclear weapons in the national security strategies and policies
	De-alerting, or measures for maximizing decision time to authorize the use of nuclear weapons
Multilateral treaties	Comprehensive Nuclear-Test-Ban Treaty (CTBT)
	Fissile Material Cut-Off Treaty (FMCT)
Transparency	Transparency regarding nuclear forces, fissile material for nuclear weapons, and nuclear strategy/doctrine
	Verifications of nuclear weapons reductions
	Irreversibility

Chapter 1. Area Summary

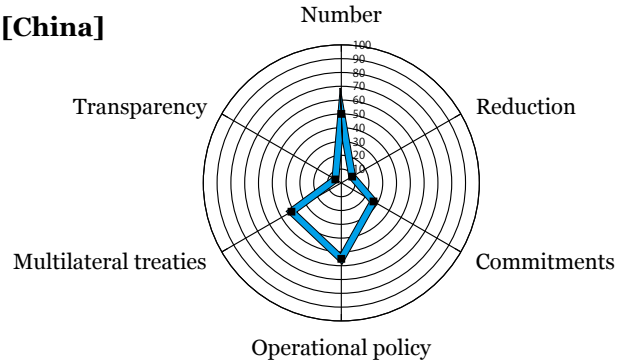
(1) NUCLEAR DISARMAMENT



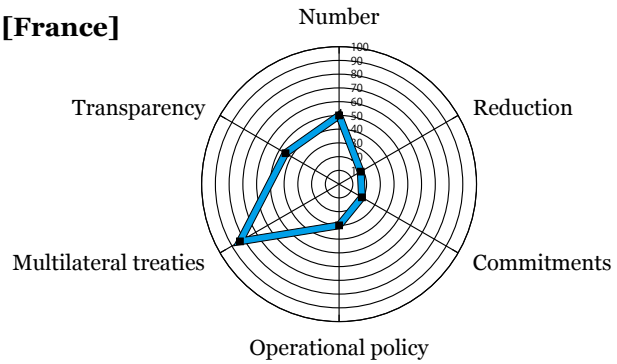
6-point Nuclear Disarmament Radar Charts

According to the following radar charts illustrating where each nuclear-weapon state stands in different aspects of nuclear disarmament, China is required to improve its efforts for nuclear weapons reduction and transparency. To a lesser extent, France could be more transparent regarding its nuclear weapons-related issues. Russia and the United States are urged to undertake further reductions of their nuclear arsenals. The performances of the United Kingdom are relatively well-balanced.

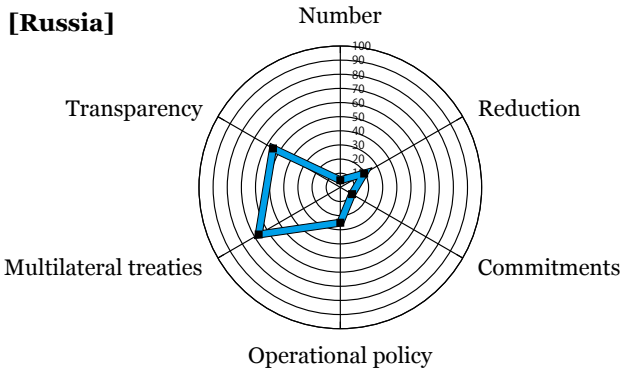
[China]



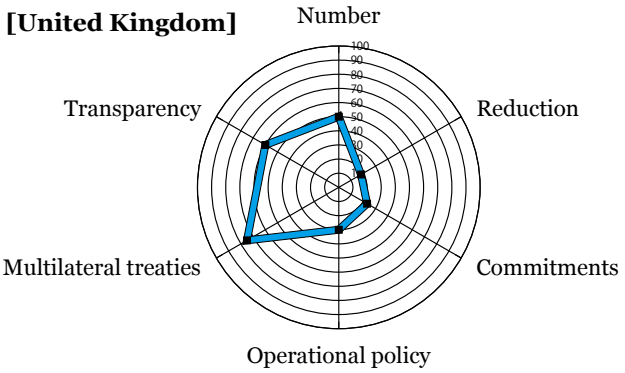
[France]



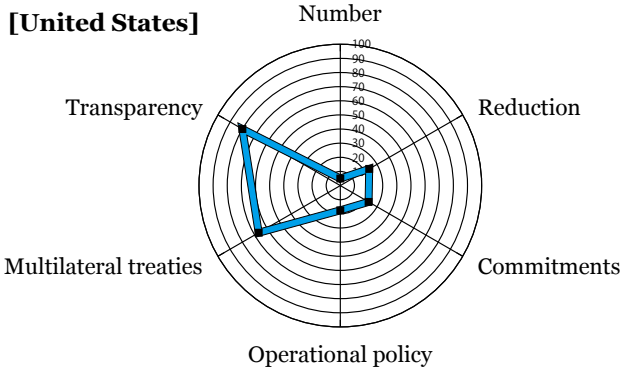
[Russia]



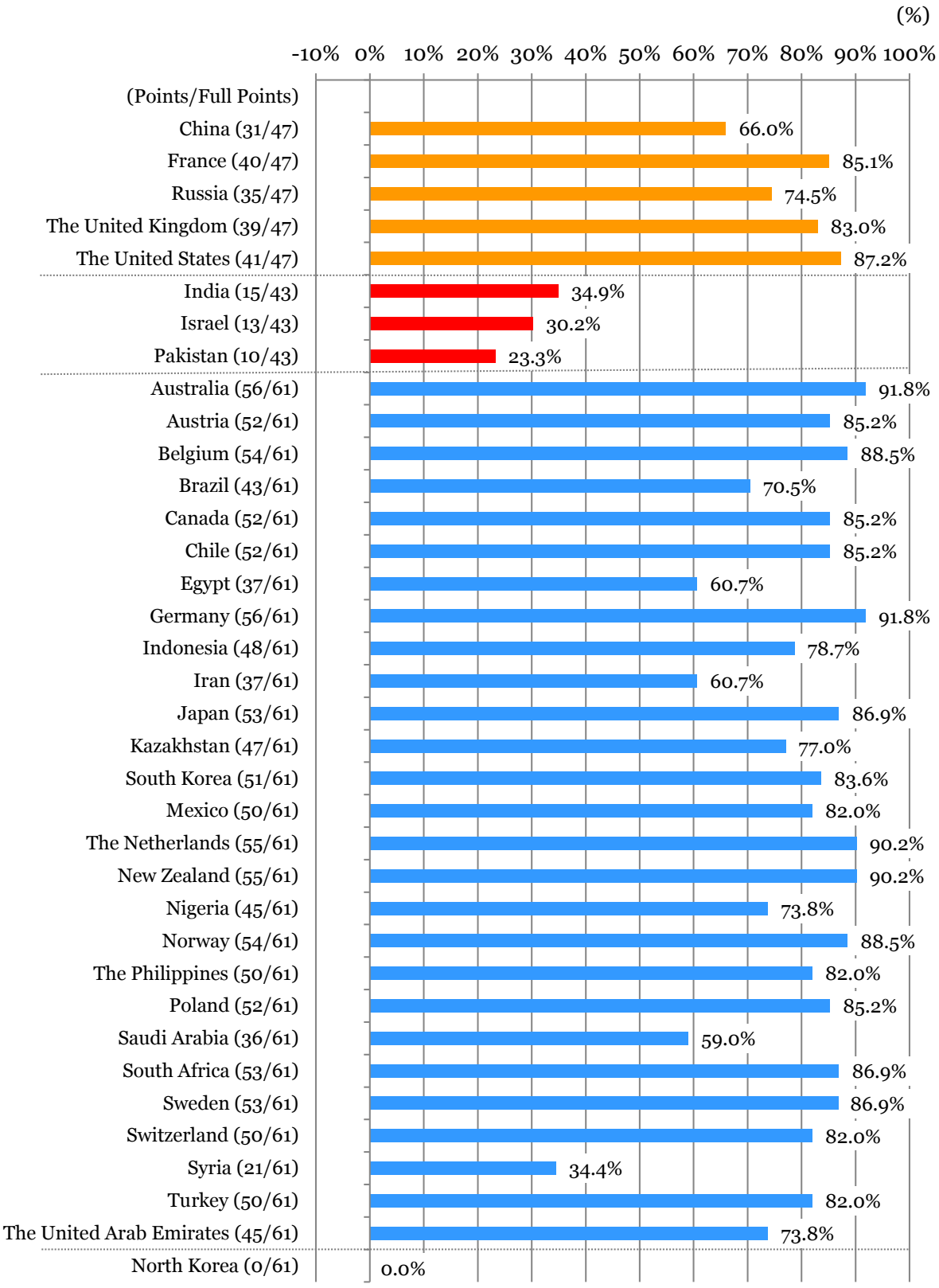
[United Kingdom]



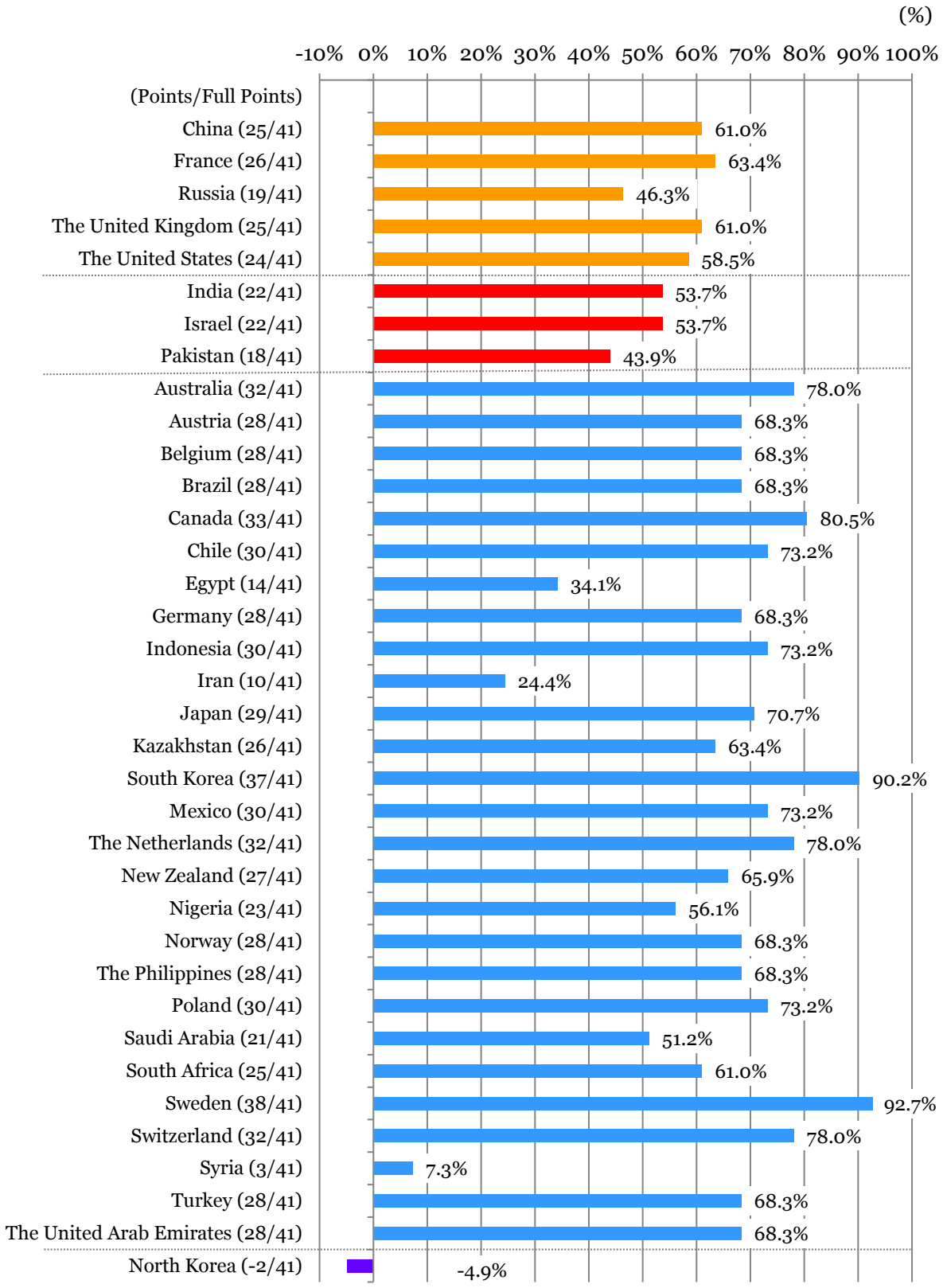
[United States]



(2) NUCLEAR NON-PROLIFERATION



(3) NUCLEAR SECURITY



Chapter 2. Country-by-Country Summary

(1) NUCLEAR-WEAPON STATES

1. China (Nuclear-Weapon State)

Points / Full Points (%)

Nuclear Disarmament	*10/101 (9.9%)*
China, possessing approximately 270 nuclear warheads, has promoted active modernization programs for its nuclear forces (particularly, ICBMs and SLBMs). It neither participated in the negotiation conference of the TPNW, nor signed the treaty. While reiterating a commitment toward a world without nuclear weapons, China is the only NWS that has not reduced its nuclear arsenals. China has neither ratified the CTBT nor declared a moratorium on production of fissile material for nuclear weapons. It has declared no first use of nuclear weapons and the unconditional negative security assurance. While arguing the importance of transparency in intention, China has maintained the least transparency about nuclear weapons capabilities among the NWS.	
Nuclear Non-Proliferation	*31/47 (66.0%)*
China acceded to the IAEA Additional Protocol, in which no provision for complementary access visits is stipulated. It has announced to take efforts to strengthen implementation of sanction measures vis-à-vis North Korea under the UN Security Council Resolutions, as well as its export-control mechanisms. Questions remain as to whether China is conducting adequate and strict implementation, however. China has also been criticized for exporting two nuclear power reactors to Pakistan, which may constitute a violation of the NSG guidelines.	
Nuclear Security	*25/41 (61.0%)*
China is advancing the introduction of the recommendation measures of INFCIRC/225/Rev.5, such as legislation and physical protection measures against sabotage acts. In addition, China is taking a positive attitude toward strengthening nuclear security, including efforts to minimize HEU, acceptance of IAEA IPPAS mission, and capacity building activities through newly established COE.	

2. France (Nuclear-Weapon State)

Points / Full Points (%)

Nuclear Disarmament	*23/101 (22.8%)*
France has announced its maximum number of nuclear warheads as 300, and has reduced its overall nuclear forces. It has also converted fissile material excess for military purpose to civilian purposes, which has been placed under the international safeguards. It voted against most of the UNGA Resolutions regarding nuclear disarmament, and showed a negative attitude to the issues on humanitarian dimensions, as well as legal prohibition of nuclear weapons, in particular. It neither participated in the negotiation conference of the TPNW, nor signed the treaty. There was little progress in diminishing the role of nuclear weapons. Meanwhile, France has engaged in promoting the CTBT's entry into force, and developing its verification systems.	
Nuclear Non-Proliferation	*40/47 (85.1%)*
France acceded to the IAEA Additional Protocol, with the provision for complementary access visits. All of its civilian nuclear material covered by the EURATOM Treaty is subject to its safeguards. France has engaged in nuclear non-proliferation proactively, including contributions to the IAEA safeguards systems, and the establishment and implementation of its export control systems.	
Nuclear Security	*26/41 (63.4%)*
France has ratified all relevant treaties and is involved in the prevention of illicit transfers and cooperation in nuclear forensics. France continues to implement the recommendation measures of INFCIRC/225/Rev.5, such as legislation development, transport safety and strengthening of physical protection of nuclear material.	

3. Russia (Nuclear-Weapon State)

	Points / Full Points (%)
Nuclear Disarmament	***7.8/101 (7.7%)***
The number of Russia's nuclear weapons has been reduced. It also continues to implement the New START. Still, it is estimated to possess approximately 7,000 nuclear warheads, and has actively developed and deployed new ICBMs and SLBMs for replacing aged delivery vehicles. Furthermore, Russia is alleged to have violated the INF Treaty. It voted against most of the UNGA Resolutions regarding nuclear disarmament, and showed a negative attitude to the issues on humanitarian dimensions as well as legal prohibition of nuclear weapons, in particular. It neither participated in the negotiation conference of the TPNW, nor signed the treaty. It continued to repeat nuclear saber-rattling vis-à-vis the U.S. and NATO.	
Nuclear Non-Proliferation	***35/47 (74.5%)***
Russia acceded to the IAEA Additional Protocol, in which no provision for complementary access visits is stipulated. It considers that the conclusion of an Additional Protocol should be voluntary. It has implemented measures on nuclear non-proliferation proactively, though to a lesser extent than the western countries.	
Nuclear Security	***19/41 (46.3%)***
Russia has ratified all relevant treaties, is involved in the prevention of illicit transfers and nuclear forensics cooperation, and the introduction of the recommended measures of INFCIRC/225/Rev.5 is proceeding. Russia carries out diverse education and training related activities under the ROSATOM Tech Academy, and its contribution to capacity building in the field of nuclear security is remarkable.	

4. The United Kingdom (Nuclear-Weapon State)

	Points / Full Points (%)
Nuclear Disarmament	***25/101 (24.8%)***
The size of the U.K. nuclear arsenal has decreased incrementally. The United Kingdom plans to reduce to no more than 120 operationally available warheads and a total stockpile of no more than 180 warheads by the mid-2020s. Construction of a new class of four SSBNs, as replacement for the existing Vanguard-class vessels, was commenced. It neither participated in the negotiation conference of the TPNW, nor signed the treaty. Meanwhile, the U.K. has engaged in promoting the CTBT's entry into force, and developing its verification systems.	
Nuclear Non-Proliferation	***39/47 (83.0%)***
The U.K. acceded to the IAEA Additional Protocol with the provision for complementary access visits. All of its civilian nuclear material is subject to the international safeguards. A Nuclear Safeguards Bill was introduced to U.K. parliament, whose purpose is to establish a system of domestic safeguards to replace the existing EURATOM safeguards when the United Kingdom will withdraw from it. It has proactively engaged in nuclear non-proliferation, including implementation of export controls.	
Nuclear Security	***25/41 (61.0%)***
The U.K. is advancing the introduction of the recommendation measures of INFCIRC/225/Rev.5, mainly focusing on legislation development and cyber threat countermeasures. In addition to hosting the IAEA's nuclear security related technical conferences, the U.K. also makes contributions such as financial commitment to the NSF. In addition, the U.K. is also focusing on multilateral cooperation in the field of nuclear security as seen in the involvement in the GINCT.	

5. The United States (Nuclear-Weapon State)

	Points / Full Points (%)
Nuclear Disarmament	***16.7/101 (16.5%)***
The U.S., possessing 6,800 nuclear warheads, continues to implement the New START. Its reports on nuclear weapons have been the most transparent among the NWS. The U.S. has established and led the "International Partnership for Nuclear Disarmament Verification (IPNDV)." On the other hand, it is pointed out the possibilities of an increasing role of nuclear weapons by the Trump administration. Negative responses to the CTBT has also gradually appeared, particularly compared to the U.S. previous administration. The United States neither participated in the negotiation conference of the TPNW, nor signed the treaty. The U.S. voted against most of the UNGA Resolutions regarding nuclear disarmament, except that proposed by Japan.	
Nuclear Non-Proliferation	***41/47 (87.2%)***
The U.S. has proactively led the efforts to bolster nuclear non-proliferation, including contributions to the IAEA safeguards systems and implementation of stringent export controls. It acceded to the IAEA Additional Protocol with the provision for complementary access visits. On the other hand, statements by the U.S. new administration raised concerns about the future of the JCPOA on the Iranian nuclear issue.	
Nuclear Security	***24/41 (58.5%)***
The U.S. has continued involvement in the IAEA's efforts to strengthen nuclear security and has hosted several international workshops related to nuclear security through 2017. It has also expressed its financial contribution to the NSF. On the other hand, from the contrast with the former Obama administration, which led the nuclear security summit process, attention is focused on the new nuclear security policy of the U.S. Trump administration. However, as of 2017, such a policy to strengthen nuclear security by the U.S. has not been announced.	

(2) NON-PARTIES TO THE NPT

6. India (Non-Party to the NPT)

Points / Full Points (%)

Nuclear Disarmament	***4/98 (4.1%)***
India is estimated to possess approximately 120-130 nuclear warheads, having added incrementally. It also continues to actively develop nuclear delivery vehicles, including ICBM and SLBM, and to produce fissile material for nuclear weapons. India voted positively to some extent in the UNGA Resolutions regarding nuclear disarmament. However, it neither participated in the negotiation conference of the TPNW, nor signed the treaty. India maintains a moratorium on nuclear test explosions, but refuses to sign the CTBT.	
Nuclear Non-Proliferation	***15/43 (34.9%)***
India acceded to the IAEA Additional Protocol, in which no provision for complementary access visits is stipulated. India's quest for membership in the NSG is supported by some member states, but the group has not yet made a decision.	
Nuclear Security	***22/41 (53.7%)***
India has ratified almost all nuclear security-related treaties. Also, India is advancing the introduction of the recommendation measures of INFCIRC/225/Rev.5, such as efforts to foster nuclear security culture. In addition, India makes financial contributions to the NSF as a contribution to the IAEA nuclear security program.	

7. Israel (Non-Party to the NPT)

Points / Full Points (%)

Nuclear Disarmament	***0/98 (0.0%)***
Israel has consistently pursued the policy of "nuclear opacity" while estimated to possess approximately 80 nuclear warheads. Due to such a policy, its nuclear capabilities and posture remain unclear. Israel has yet to ratify the CTBT. Nor has it declared a moratorium on production of fissile material for nuclear weapons. It voted against most of the UNGA Resolutions regarding nuclear disarmament. Israel neither participated in the negotiation conference of the TPNW, nor signed the treaty.	
Nuclear Non-Proliferation	***13/43 (30.2%)***
Israel argues that improvement of the regional security is imperative for establishing a Middle East Zone Free of WMD. It has established solid export control systems. However, Israel has not acceded to the IAEA Additional Protocol.	
Nuclear Security	***22/41 (53.7%)***
Israel has implemented measures for prevention of illicit trafficking, nuclear forensic efforts, and multilateral cooperation through the GICNT. Also, Israel is advancing the introduction of the recommendation measures of INFCIRC/225/Rev.5.	

8. Pakistan (Non-Party to the NPT)

	Points / Full Points (%)
Nuclear Disarmament	***2/98 (2.0%)***
Pakistan seems to be increasing its nuclear arsenal incrementally, and is estimated to possess 130-140 nuclear warheads. In addition to continuing to develop short- and medium-range ballistic missiles, it revealed a possession of low-yield, small nuclear weapons. Such developments raise concerns about the increased possibility for early use of nuclear weapons. It neither participated in the negotiation conference of the TPNW, nor signed the treaty. While maintaining a moratorium on nuclear test explosions, it refuses to sign the CTBT. Pakistan continues to block the commencement of negotiations on an FMCT at the CD. It has yet to declare a moratorium on production of fissile material for nuclear weapons.	
Nuclear Non-Proliferation	***10/43 (23.3%)***
Pakistan has not yet acceded to the IAEA Additional Protocol. It argues that it has made efforts to enhance its export control systems: however, it is still unclear how robust or suc-cessfully implemented such export control systems are in practice.	
Nuclear Security	***18/41 (43.9%)***
Pakistan is advancing the introduction of the recommendation measures of INFCIRC/225/Rev.5 through the improvement of domestic laws and the strengthening of physical protection of nuclear material. Pakistan is also focusing on preventing illicit transfer and contributing to capacity building activities. In addition, Pakistan has announced its contribution to the IAEA's NSF in FY2018.	

(3) NON-NUCLEAR-WEAPON STATES

9. Australia (Non-Nuclear-Weapon State)

Points / Full Points (%)

Nuclear Disarmament	***17.5/42 (41.7%)***
Along with other U.S. allies, Australia advocates the "progressive approach" toward a world without nuclear weapons, through incremental, practical measures. Australia has engaged in promoting the CTBT's entry into force, and developing its verification systems. It neither participated in the negotiation conference of the TPNW, nor signed the treaty.	
Nuclear Non-Proliferation	***56/61 (91.8%)***
Australia is also a state party to the South Pacific Nuclear-Free Zone Treaty. It acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards. Australia-India Nuclear Cooperation Agreement was adopted in 2015.	
Nuclear Security	***32/41 (78.0%)***
Australia has ratified all nuclear security-related conventions and is also focusing on international efforts on nuclear security. Australia completed accepting the IPPAS mission in 2017. Also, as an activity related to NFWG, Australia intends to coordinate for nuclear forensics cooperation with Southeast Asian countries from 2017 to 2018.	

10. Austria (Non-Nuclear-Weapon State)

Points / Full Points (%)

Nuclear Disarmament	***30/42 (71.4%)***
Austria has played a leading role for promoting the issue on the humanitarian dimensions of nuclear weapons, and adopting the TPNW. It has also proactively engaged in cooperation with the civil society.	
Nuclear Non-Proliferation	***52/61 (85.2%)***
Austria has participated in and implemented the related treaties and measures. It acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards.	
Nuclear Security	***28/41 (68.3%)***
Austria has ratified major conventions on nuclear security and nuclear safety and is also involved in minimizing HEU, measures to prevent illicit transfers, and capacity building-related activities.	

11. Belgium (Non-Nuclear-Weapon State)

Points / Full Points (%)

Nuclear Disarmament	***13.5/42 (32.1%)***
Belgium is hosting U.S. non-strategic nuclear weapons as part of NATO's nuclear sharing policy. It neither participated in the negotiation conference of the TPNW, nor signed the treaty. Along with other U.S. allies, Belgium advocates the "progressive approach" toward a world without nuclear weapons, through implementing practical measures. It has engaged in promoting the CTBT's entry into force, and developing its verification systems.	
Nuclear Non-Proliferation	***54/61 (88.5%)***
Belgium acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards. It has engaged in non-proliferation, including the establishment of the solid export control systems.	
Nuclear Security	***28/41 (68.3%)***
Belgium has ratified all treaties related to nuclear security and is also working to minimize HEU and to prevent illicit transfers. In light of the attempted terrorist attacks on nuclear power plants that were discovered after the Brussels terror attack in March 2016, Belgium has been actively strengthening nuclear security, including provisionally placing domestic nuclear facilities under military guard.	

12. Brazil (Non-Nuclear-Weapon State)

	Points / Full Points (%)
Nuclear Disarmament	***27/42 (64.3%)***
Brazil has played a leading role for adopting the TPNW. It voted for most of the UNGA Resolutions regarding nuclear disarmament.	
Nuclear Non-Proliferation	***43/61 (70.5%)***
Brazil is also a state party to the Latin America Nuclear-Weapon-Free Zone Treaty. While it complies with nuclear non-proliferation obligations, Brazil continues to be reluctant about accepting the IAEA Additional Protocol. It considers that the conclusion of an Additional Protocol should be voluntary.	
Nuclear Security	***28/41 (68.3%)***
Brazil has signed a CPPNM Amendment and has undertaken the development of counter-terrorism legislation. In 2017 Brazil managed and removed high-level radioactive substances in the country, and held a regional training course on computer security organized by IAEA.	

13. Canada (Non-Nuclear-Weapon State)

	Points / Full Points (%)
Nuclear Disarmament	***19/42 (45.2%)***
Along with other U.S. allies, it advocates the “progressive approach” toward a world without nuclear weapons, through implementing practical measures. It neither participated in the negotiation conference of the TPNW, nor signed the treaty. Canada has engaged in promoting the CTBT’s entry into force, and developing its verification systems. Canada has also undertaken active cooperation with civil society.	
Nuclear Non-Proliferation	***52/61 (85.2%)***
Canada acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards. Canada exported uranium to India, as their civil nuclear cooperation.	
Nuclear Security	***33/41 (80.5%)***
Canada has ratified all relevant treaties concerning nuclear security and is also implementing the recommendation measures of INFCIRC/225/Rev.5. In 2017, Canada provided nuclear security cooperation to Brazil, Jordan, Malaysia, Thailand, the Philippines and the Africa region, and made a financial contribution to the IAEA’s NSF. In addition, Canada has also made remarkable efforts in the field of nuclear forensics.	

14. Chile (Non-Nuclear-Weapon State)

	Points / Full Points (%)
Nuclear Disarmament	***26.5/42 (63.1%)***
Chile voted for most of the UNGA Resolutions regarding nuclear disarmament, and has expressed approval of the issues on the humanitarian dimensions and legal prohibition of nuclear weapons. It also signed the TPWN.	
Nuclear Non-Proliferation	***52/61 (85.2%)***
Chile is also a state party to the Latin America Nuclear-Weapon-Free Zone Treaty. It has acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards. Meanwhile, more efforts are needed to strengthen its nuclear-related export controls sys-tem.	
Nuclear Security	***30/41 (73.2%)***
Chile has ratified major treaties on nuclear security and nuclear safety, and is actively contributing to prevention of illicit transfer, nuclear forensics and relevant capacity building activities. In addition, Chile has completed removal of domestic HEU.	

15. Egypt (Non-Nuclear-Weapon State)

	Points / Full Points (%)
Nuclear Disarmament	***17/42 (40.5%)***
Egypt voted for most of the UNGA Resolutions regarding nuclear disarmament, and has expressed approval of the issues on the humanitarian dimensions and legal prohibition of nuclear weapons. However, it has not yet signed the TPNW. Nor has it actively engaged in promotion of nuclear disarmament. Egypt has not ratified the CTBT, either.	
Nuclear Non-Proliferation	***37/61 (60.7%)***
Egypt has been active toward establishing a WMD-free zone in the Middle East. Meanwhile, it has yet to conclude the IAEA Additional Protocol. Egypt has made efforts for, inter alia, putting export control legislation in place and setting enforcement agencies. Still, its export controls remain at an insufficient level, due to a lack of introduction of important elements including list control and catch-all control provisions. While signing, it has not yet ratified the Africa Nuclear-Weapon-Free Zone Treaty.	
Nuclear Security	***14/41 (34.1%)***
Egypt has signed the CPPNM and the CPPNM Amendment before 2017. In 2017, Egypt proceeded with the development of domestic law on prevention of illicit transfers, held an international training course organized by the IAEA, and worked to foster nuclear security culture utilizing its COE.	

16. Germany (Non-Nuclear-Weapon State)

	Points / Full Points (%)
Nuclear Disarmament	***14/42 (33.3%)***
While Germany has proactively engaged in nuclear disarmament, it was against, or abstained, in the votes on the other UNGA Resolutions related to the humanitarian dimensions as well as legal prohibition of nuclear weapons. It neither participated in the negotiation conference of the TPNW, nor signed the treaty. Along with other U.S. allies, Germany advocates the “progressive approach” toward a world without nuclear weapons, through incremental practical measures. Germany is hosting U.S. non-strategic nuclear weapons as part of NATO’s nuclear sharing policy.	
Nuclear Non-Proliferation	***56/61 (91.8%)***
Germany acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards. It has engaged in non-proliferation, including the establishment of solid export control systems.	
Nuclear Security	***28/41 (68.3%)***
Germany has ratified all nuclear security-related conventions and is actively involved in international efforts such as capacity building and nuclear forensics. In 2017, Germany contributed to the IAEA's nuclear security strengthening efforts through the implementation of multiple training courses on computer security and transport safety, and hosted the ITWG annual meeting.	

17. Indonesia (Non-Nuclear-Weapon State)

	Points / Full Points (%)
Nuclear Disarmament	***24/42 (57.1%)***
Indonesia has actively advocated promotion of nuclear disarmament at various nuclear disarmament fora, including the OEWG and the UNGA. It voted for most of the UNGA Res-olutions regarding nuclear disarmament. Indonesia signed the TPNW.	
Nuclear Non-Proliferation	***48/61 (78.7%)***
Indonesia is also a state party to the Southeast Asia Nuclear-Weapon-Free Zone Treaty. It has concluded the IAEA Additional Protocol, of which the NAM countries are less enthusiastic about acceptance. Indonesia is applied the integrated safeguards. On export controls, however, Indonesia has yet to prepare a list of dual-use items and technologies, or to implement catch-all control.	
Nuclear Security	***30/41 (73.2%)***
Indonesia completed domestic removal of HEU in 2017. By doing this, Indonesia contributed to making Southeast Asia an area without risky nuclear material. In addition to implementing illicit transfer prevention measures, Indonesia is promoting capacity building-related activities through its COE (I-CoNSEP) for the nuclear security and emergency response.	

18. Iran (Non-Nuclear-Weapon State)

	Points / Full Points (%)
Nuclear Disarmament	***15/42 (35.7%)***
Iran voted for most of the UNGA Resolutions regarding nuclear disarmament, including the UNGA resolution titled “Taking forward multilateral nuclear disarmament ne-gotiations,” and other UNGA Resolutions related to the humanitarian dimensions as well as legal prohibition of nuclear weapons. However, it has not actively engaged in promotion of nuclear disarmament. Iran has neither ratified the CTBT nor signed the TPNW.	
Nuclear Non-Proliferation	***37/61 (60.7%)***
Iran has complied with the Joint Comprehensive Plan of Action (JCPOA) agreed in July 2015. While Iran has not ratified the IAEA Additional Protocol, it has accepted its provisional application, under which the IAEA conducted complimentary access visits.	
Nuclear Security	***10/41 (24.4%)***
In Iran, although application of the recommendation measures of INFCIRC/225/Rev.5 has been partially advanced, efforts such as ratification of related conventions, minimization of HEU, participation in Nuclear Security Initiative and prevention of illegal transfers have not progressed yet.	

19. Japan (Non-Nuclear-Weapon State)

Points / Full Points (%)

Nuclear Disarmament	***23.5/42 (56.0%)***
Along with other U.S. allies, Japan advocates the "progressive approach" toward a world without nuclear weapons, through incremental practical measures. It neither participated in the negotiation conference of the TPNW, nor signed the treaty. Japan has proactively engaged in nuclear disarmament, as one of the countries that lead efforts to promote and strengthen those areas, particularly for achieving a world without nuclear weapons, promoting entry into force of the CTBT, and undertaking disarmament and non-proliferation education.	
Nuclear Non-Proliferation	***53/61 (86.9%)***
Japan has acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards. It has proactively engaged in nuclear non-proliferation, including the establishment of solid export control systems and conducting outreach activities. In 2017 Japan ratified the Japan-India Nuclear Cooperation Agreement signed the previous year.	
Nuclear Security	***29/41 (70.7%)***
Japan contributed to the efforts to strengthen nuclear security by the IAEA, such as holding various workshops and training courses. There was also partial progress in the introduction of the recommendation measures of INFCIRC/255/Rev.5, such as adopting countermeasures against insider threats. In 2017, Japan carried out capacity building activities and multilateral cooperation to regional countries, using its experienced COE (JAEA-ISCN), and actively participated in international efforts through holding the GINCT plenary meeting.	

20. Kazakhstan (Non-Nuclear-Weapon State)

Points / Full Points (%)

Nuclear Disarmament	***24/42 (57.1%)***
Kazakhstan has actively advocated the importance of the CTBT. It voted for the UNGA Resolutions regarding nuclear disarmament, and has expressed approval of the issues on the humanitarian dimensions and legal prohibition of nuclear weapons. It has not signed the TPNW.	
Nuclear Non-Proliferation	***47/61 (77.0%)***
Kazakhstan is also a state party to the Central Asia Nuclear-Weapon-Free Zone Treaty. It has acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards. The IAEA LEU Fuel Bank established in Kazakhstan started to be opera-tional in 2017.	
Nuclear Security	***26/41 (63.4%)***
Kazakhstan has ratified all the relevant treaties and the introduction of the recommendation measures of INFCIRC/225/Rev.5 is progressing, and it is also actively involved in international efforts to strengthen nuclear security. Kazakhstan is expressing an intention to hold a new Global Summit on Nuclear Security in the future.	

21. South Korea (Non-Nuclear-Weapon State)

	Points / Full Points (%)
Nuclear Disarmament	***14/42 (33.3%)***
South Korea was against, or abstained, in the voting on the UNGA Resolutions related to the humanitarian dimensions as well as legal prohibition of nuclear weapons. It neither par-ticipated in the negotiation conference of the TPNW, nor signed the treaty. Along with other U.S. allies, it advocates the "progressive approach" toward a world without nuclear weapons, through incremental practical measures. South Korea has engaged in promoting the CTBT's entry into force, and developing its verification systems.	
Nuclear Non-Proliferation	***51/61 (83.6%)***
South Korea acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards. It has proactively engaged in the issue of how to make withdrawal from the NPT more difficult. Meanwhile, facing North Korea's nuclear and missile build-up, arguments for re-deployment of the U.S. nuclear arsenals and their sharing have been increasing from outside of the South Korean government.	
Nuclear Security	***37/41 (90.2%)***
South Korea has ratified all related treaties and actively participates in international efforts, in addition to minimizing the use of HEU and preventing illicit transfers. In 2017, South Korea contributed to the IAEA's efforts to strengthen nuclear security, including holding a training course on physical protection system evaluation. In addition, advanced measures such as development of an evaluation system for sabotage acts on nuclear facilities utilizing virtual reality technology were implemented.	

22. Mexico (Non-Nuclear-Weapon State)

	Points / Full Points (%)
Nuclear Disarmament	***27.5/42 (65.5%)***
Mexico has played a leading role for promoting the issue on the humanitarian dimensions of nuclear weapons, as well as adopting the TPNW, which it has already signed.	
Nuclear Non-Proliferation	***50/61 (82.0%)***
Mexico is also a state party to the Latin America Nuclear-Weapon-Free Zone Treaty. Mexico acceded to the IAEA Additional Protocol, but has not yet been drawn a broader conclusion.	
Nuclear Security	***30/41 (73.2%)***
Mexico held a Regional Meeting on Nuclear Security Information Exchange and Coordination in 2017, cooperating with the IAEA to strengthen nuclear security. In addition to ratifying nearly all related conventions, Mexico has introduced INFCIRC/255/Rev.5 recommended measures, minimizes the use of HEU, and making efforts to prevent illicit transfers.	

23. The Netherlands (Non-Nuclear-Weapon State)

	Points / Full Points (%)
Nuclear Disarmament	***15/42 (35.7%)***
The Netherlands is the only U.S. ally that participated in the negotiation conference of the TPNW, at which it voted against its adoption. The Netherlands has not signed the treaty. Along with other U.S. allies, it advocates the "progressive approach" toward a world without nuclear weapons, through incremental practical measures. It is hosting U.S. non-strategic nuclear weapons as part of NATO's nuclear sharing policy.	
Nuclear Non-Proliferation	***55/61 (90.2%)***
The Netherlands acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards. It has actively engaged in non-proliferation activity, including the establishment of solid export control systems.	
Nuclear Security	***32/41 (78.0%)***
The Netherlands has ratified all relevant treaties and is actively involved in minimizing the use of HEU, preventing illicit transfers and international efforts to strengthen nuclear security. In particular, in the field of nuclear forensics, the Netherlands is leading a five-year project named "The Hague Innovations Pathway 2014-2019 on Forensics in Nuclear Security" under the Netherlands Forensic Institute (NFI).	

24. New Zealand (Non-Nuclear-Weapon State)

Points / Full Points (%)

Nuclear Disarmament	***30/42 (71.4%)***
New Zealand was actively involved in the process of adopting the TPNW, and has already signed it. It has also proactively advocated promotion of nuclear disarmament at various fora, including the UN General Assembly. It has engaged in promoting the CTBT's entry into force, and developing its verification systems.	
Nuclear Non-Proliferation	***55/61 (90.2%)***
New Zealand is also a state party to the South Pacific Nuclear-Free Zone Treaty. It has acceded to the IAEA Additional Protocol, and has been drawn the broader conclusion.	
Nuclear Security	***27/41 (65.9%)***
New Zealand is advancing the introduction of the recommended measures of INFCIRC/225/Rev.5, and is working to minimize the use of HEU and to prevent illicit transfers. In 2017, New Zealand completed acceptance of the IPPAS mission and expressed its financial contribution to the NSF by the IAEA.	

25. Nigeria (Non-Nuclear-Weapon State)

Points / Full Points (%)

Nuclear Disarmament	***23.5/42 (56.0%)***
Nigeria voted for most of the UNGA Resolutions regarding nuclear disarmament. It has already signed the TPNW.	
Nuclear Non-Proliferation	***45/61 (73.8%)***
Nigeria is also a state party to the Africa Nuclear-Weapon-Free Zone Treaty. It acceded to the IAEA Additional Protocol, and has not been drawn the broader conclusion. Its implementations on export controls and nuclear security-related measures are not necessarily adequate. Nigeria amended and withdrew the SQP.	
Nuclear Security	***23/41 (56.1%)***
Nigeria has ratified all relevant treaties and is also working to minimize the use of HEU and to prevent illicit transfers. In 2017, Nigeria established an independent regulatory authority and made progress with the introduction of the recommended measures of INFCIRC/225/Rev.5, such as adopting the law on nuclear security and peaceful use of nuclear power. Nigeria also strengthened its involvement in international efforts by newly participating in the GICNT.	

26. Norway (Non-Nuclear-Weapon State)

Points / Full Points (%)

Nuclear Disarmament	***15.5/42 (36.9%)***
Along with other U.S. allies, Norway advocates the "progressive approach" toward a world without nuclear weapons, through incremental practical measures. It neither participated in the negotiation conference of the TPNW, nor signed the treaty.	
Nuclear Non-Proliferation	***54/61 (88.5%)***
Norway acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards. It has engaged in non-proliferation, including the establishment of the solid export control systems.	
Nuclear Security	***28/41 (68.3%)***
Norway has ratified all relevant treaties and is actively involved in the prevention of illegal transfers and capacity building activities. Norway is scheduled to hold an International Symposium on HEU Minimization in 2018, in cooperation with the IAEA.	

27. The Philippines (Non-Nuclear-Weapon State)

	Points / Full Points (%)
Nuclear Disarmament	***27/42 (64.3%)***
The Philippines voted for most of the UNGA Resolutions regarding nuclear disarmament. It has already signed the TPNW.	
Nuclear Non-Proliferation	***50/61 (82.0%)***
The Philippines is also a state party to the Southeast Asia Nuclear-Weapon-Free Zone Treaty. It has concluded the IAEA Additional Protocol, and has been drawn the broader conclusion. The Philippines introduced list control and catch-all control in its export control system.	
Nuclear Security	***28/41 (68.3%)***
The Philippines has completed the removal of domestic HEU, and is also working on illicit transfer prevention and capacity building activities. In addition, the Philippines is advancing the introduction of the recommendation measures of INFCIRC/225/Rev. 5 in the country.	

28. Poland (Non-Nuclear-Weapon State)

	Points / Full Points (%)
Nuclear Disarmament	***12/42 (28.6%)***
Like other NATO countries, Poland maintains a cautious stance on legally banning nuclear weapons. It neither participated in the negotiation conference of the TPNW, nor signed the treaty.	
Nuclear Non-Proliferation	***52/61 (85.2%)***
Poland acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards. It has engaged in non-proliferation, including the establishment of solid export control systems.	
Nuclear Security	***30/41 (73.2%)***
Poland has ratified all relevant treaties and is advancing the introduction of the recommendation measures of INFCIRC/225/Rev.5. As of 2017, Poland has completed the withdrawal of domestic HEU and operates all domestic research reactors with LEU fuel.	

29. Saudi Arabia (Non-Nuclear-Weapon State)

	Points / Full Points (%)
Nuclear Disarmament	***13/42 (31.0%)***
Saudi Arabia voted for most of the UNGA Resolutions regarding nuclear disarmament related to the humanitarian dimensions as well as legal prohibition of nuclear weapons. However, it has not signed the TPNW or the CTBT.	
Nuclear Non-Proliferation	***36/61 (59.0%)***
Saudi Arabia has not acceded to the IAEA Additional Protocol. Its national implementation regarding export controls also came up short.	
Nuclear Security	***21/41 (51.2%)***
Saudi Arabia has ratified all relevant treaties and is also involved in capacity building activities. Saudi Arabia is planning to establish an independent regulatory authority on the safety of nuclear and radioactive materials in 2018 and is working to introduce the recommendation measures of INFCIRC/225/Rev.5, such as promoting related domestic legislation development. Saudi Arabia is also engaged in international efforts such as newly joining the GICNT.	

30. South Africa (Non-Nuclear-Weapon State)

	Points / Full Points (%)
Nuclear Disarmament	***25.5/42 (60.7%)***
South Africa has played a leading role for promoting the issue on the humanitarian dimensions of nuclear weapons, as well as adopting the TPNW. It has already signed the treaty.	
Nuclear Non-Proliferation	***53/61 (86.9%)***
South Africa is also a state party to the Africa Nuclear-Weapon-Free Zone Treaty. It acceded to the IAEA Additional Protocol, and has been drawn the broader conclusion. It considers that the conclusion of an Additional Protocol should be voluntary.	
Nuclear Security	***25/41 (61.0%)***
South Africa has ratified all major treaties on nuclear security and safety, except for the CPPNM amendment. It has been progressing to establish legal instruments, strengthen physical protection measures and transport security based on the INFCIRC/225/Rev.5. South Africa has set up a nuclear security COE in the country.	

31. Sweden (Non-Nuclear-Weapon State)

	Points / Full Points (%)
Nuclear Disarmament	***26/42 (61.9%)***
Sweden participated in the negotiation conference on the TPNW, at which it voted in favor of adopting the treaty. However, Sweden has not yet signed the TPNW. It has actively advocated promotion of nuclear disarmament. It has engaged in promoting the CTBT's entry into force, and developing its verification systems.	
Nuclear Non-Proliferation	***53/61 (86.9%)***
Sweden acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards. It has engaged in non-proliferation, including the establishment of solid export control systems.	
Nuclear Security	***38/41 (92.7%)***
In addition to ratifying all related treaties, Sweden is actively participating in international nuclear security efforts, in addition to minimizing HEU and preventing illicit transfers.	

32. Switzerland (Non-Nuclear-Weapon State)

	Points / Full Points (%)
Nuclear Disarmament	***24.5/42 (58.3%)***
Switzerland participated in the negotiation conference on the TPNW, at which it voted in favor of adopting the treaty. However, Switzerland had not yet signed the TPNW. It has actively advocated promotion of nuclear disarmament. It has engaged in promoting the CTBT's entry into force, and developing its verification systems. It has also taken a proac-tive attitude regarding cooperation with civil society. It enacted national laws, which restrict financing for nuclear weapons production.	
Nuclear Non-Proliferation	***50/61 (82.0%)***
Switzerland acceded to the IAEA Additional Protocol. It was drawn the broader conclusion. It has engaged in non-proliferation, including the establishment of solid export control systems.	
Nuclear Security	***32/41 (78.0%)***
Switzerland has ratified all the relevant treaties and is actively participating in contributions in the field of nuclear forensics and international nuclear security efforts. It has made a financial contribution to the IAEA's NSF and is planning to hold an ITWG plenary meeting in 2018.	

33. Syria (Non-Nuclear-Weapon State)

Points / Full Points (%)

Nuclear Disarmament	***8/42 (19.0%)***
Syria voted for most of the UNGA Resolutions related to the humanitarian dimensions, as well as legal prohibition of nuclear weapons. However, Syria, which has not signed the TPNW or the CTBT, has not actively engaged in promotion of nuclear disarmament.	
Nuclear Non-Proliferation	***21/61 (34.4%)***
Syria has yet to address and resolve the allegation of constructing a clandestine nuclear power plant, despite repeated requests by the IAEA. Syria has not concluded the IAEA Additional Protocol, and has yet to take appropriate measures on export controls.	
Nuclear Security	***3/41 (7.3%)***
Syria ratified the Nuclear Safety Convention in 2017, while there has been no progress at the moment in preventing illicit transfers, applying the recommended measures of INFCIRC/225/Rev.5 and participating in international nuclear security efforts.	

34. Turkey (Non-Nuclear-Weapon State)

Points / Full Points (%)

Nuclear Disarmament	***8/42 (19.0%)***
Along with other U.S. allies, Turkey advocates the “progressive approach” toward a world without nuclear weapons, through incremental practical measures. It neither participated in the negotiation conference of the TPNW, nor signed the treaty.	
Nuclear Non-Proliferation	***50/61 (82.0%)***
Turkey acceded to the IAEA Additional Protocol, and has been applied the integrated safeguards. It has engaged in non-proliferation, including the establishment of solid export control systems.	
Nuclear Security	***28/41 (68.3%)***
Turkey has ratified almost all relevant treaties and is also involved in minimizing HEU usage and preventing illicit transfers. Turkey is advancing the introduction of the recommended measures of INFCIRC/225/Rev.5 and plans to accept the IPPAS mission in 2018.	

35. UAE (Non-Nuclear-Weapon State)

Points / Full Points (%)

Nuclear Disarmament	***22/42 (52.4%)***
UAE voted for most of the UNGA Resolutions related to the humanitarian dimensions as well as legal prohibition of nuclear weapons. However, it has not yet signed the TPNW.	
Nuclear Non-Proliferation	***45/61 (73.8%)***
UAE acceded to the IAEA Additional Protocol, but has not been drawn a broader conclusion. On export controls, it established national legislation, which includes a catch-all control, but it is not clear how effectively UAE has implemented such measures.	
Nuclear Security	***28/41 (68.3%)***
The UAE has ratified all relevant treaties, and is proceeding with the prevention of illicit transfers and the introduction of the recommended measures of INFCIRC/225/Rev.5. It also announced a new financial contribution to the NSF of the IAEA.	

(4) OTHER

36. North Korea (Other)

Points / Full Points (%)

Nuclear Disarmament	***-8/98 (-8.2%)***
North Korea continued to conduct activities for development of nuclear weapons and their delivery vehicles aggressively again in 2017, including the sixth nuclear test. It continued repeated nuclear provocations vis-à-vis Japan, the United States and South Korea. It has emphasized bolstering its nuclear deterrent and rejected its denuclearization. North Korea seemed to produce fissile material for nuclear weapons. It neither participated in the negotiation conference of the TPNW, nor signed the treaty. North Korea has not yet signed the CTBT.	
Nuclear Non-Proliferation	***0/61 (0.0%)***
North Korea, which declared to withdraw from the NPT in 2003, ignores or reneges on most of the nuclear-related treaties, agreements, obligations and norms. It is reported to actively engage in illicit transfers and procurements of nuclear and missile related items.	
Nuclear Security	***-2/41 (-4.9%)***
In North Korea, no noticeable progress has yet been observed in the areas such as ratification of nuclear security/safety related treaties, minimization of HEU, acceptance of measures recommended in the INFCIRC/225/Rev.5 and participation in nuclear security initiatives.	

Appendix

Chronology (January-December 2017)

Mar	The United Nations Conference to Negotiate a Legally Binding Instrument to Prohibit Nuclear Weapons, Leading towards Their Elimination (First session) (27th-31st) Informal Consultative Meeting by the Chairperson of the High-level FMCT Expert Preparatory Group in New York Convention on Nuclear Safety: 7th Review Meeting of the Contracting Parties in Vienna (27th –April 7th)
Apr	29th Meeting of the Advisory Group on Nuclear Security in Vienne (18th – 21th)
May	NPT Preparatory Committee in Vienna.
Jun	Adoption of the UNSCR 2356 regarding North Korea's nuclear issues The United Nations Conference to Negotiate a Legally Binding Instrument to Prohibit Nuclear Weapons, Leading towards Their Elimination (Second session) (15th-July 7th)
Jul	Adoption of the Treaty on the Prohibition of Nuclear Weapons (TPNW) (7th) First meeting of High-level FMCT Expert Preparatory Group in Geneva
Aug	Adoption of the UNSCR 2371 regarding North Korea's nuclear issues Hiroshima Peace Memorial Ceremony Nagasaki Peace Ceremony Inauguration of the IAEA LEU fuel bank in Kazakhstan
Sep	North Korea conducted the sixth underground nuclear test Adoption of the UNSCR 2375 regarding North Korea's nuclear issues Open for Signatory of the TPNW at the UN (20th) 10th Conference on Facilitating Entry into Force of the CTBT in New York
Oct	Nuclear Power in the 21st Century – International Ministerial Conference in Abu Dhabi (30th –November 1st)
Nov	Fifth plenary meeting of International Partnership for Nuclear Disarmament Verification (IPNDV) in Buenos Aires International Conference on Physical Protection of Nuclear Material and Nuclear Facilities in Vienna (13th – 17th)
Dec	The International Campaign to Abolish Nuclear Weapons (ICAN) received the Nobel Peace Prize for 2017 Adoption of the UNSCR 2397 regarding North Korea's nuclear issues

Abbreviation

ABACC	Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials
AG	Australia Group
BCC	Bilateral Consultative Commission
BMD	Ballistic Missile Defense
CBM	Confidence-Building Measure
CBO	Congressional Budget Office
CD	Conference on Disarmament
CMX	Comparative Material Exercise
COE	Center of Excellence
CPPNM	Convention on the Physical Protection of Nuclear Material
CSC	Convention on Supplementary Compensation for Nuclear Damage
CTBT	Comprehensive Nuclear-Test-Ban Treaty
CTBTO	CTBT Organization
DBT	Design Basis Threat
DIA	Defense Intelligence Agency
EEZ	Exclusive Economic Zone
EMP	Electromagnetic Pulse
EU	European Union
EURATOM	European Atomic Energy Community
FMCT	Fissile Material Cut-Off Treaty
FMWG	Fissile Material Working Group
GICNT	Global Initiative to Combat Nuclear Terrorism
GLCM	Ground-Launched Cruise Missile
GTRI	Global Threat Reduction Initiative
HEU	Highly Enriched Uranium
IAEA	International Atomic Energy Agency
ICAN	International Campaign to Abolish Nuclear Weapons
ICBM	Inter-Continental Ballistic Missile
ICJ	International Court of Justice
ICNS	International Convention on Nuclear Security
IMS	International Monitoring System
INF	Intermediate-range Nuclear Forces
INSEN	International Nuclear Security Education Network
INSServ	International Nuclear Security Advisory Service
INSSP	Integrated Nuclear Security Support Plan
INTERPOL	International Criminal Police Organization
IPNDV	International Partnership for Nuclear Disarmament Verification
IPPAS	International Physical Protection Advisory Service
IRBM	Intermediate-range Ballistic Missile
ISCN	Integrated Support Center for Nuclear Nonproliferation and Nuclear Security
ITDB	Incident and Trafficking Database

ITWG	Nuclear Forensics International Technical Working Group
JCPOA	Joint Comprehensive Plan of Action
LEU	Low Enriched Uranium
LOW	Launch on Warning
LRSO	Long-Range Stand Off
LUA	Launch under Attack
MFFF	Mixed Oxide Fuel Fabrication Facility
MIRV	Multiple Independently-targetable Reentry Vehicle
MNSR	Miniature Neutron Source Reactors
MOX	Mixed Oxide
MRBM	Medium-Range Ballistic Missile
MTCR	Missile Technology Control Regime
NAC	New Agenda Coalition
NAM	Non-Aligned Movement
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NCA	Nuclear Command Authority
NFWG	Nuclear Forensics Working Group
NGO	Non Govermental Organization
NNSA	National Nuclear Security Administration
NPDI	Non-Proliferation and Disarmament Initiative
NPEG	Non-Proliferation Experts Group
NPG	Nuclear Planning Group
NPR	Nuclear Posture Review
NPT	Nuclear Non-Proliferation Treaty
NSC	National Security Council
NSF	Nuclear Security Fund
NSG	Nuclear Suppliers Group
NSS	National Security Strategy
NSSC	Nuclear Security Training and Support Centres
OEWG	Open-Ended Working Group
PAROS	Prevention of an Arms Race in Outer Space
PMDA	Plutonium Management and Disposition Agreement
PSI	Proliferation Security Initiative
RI	Radioisotope
RMWG	Response and Mitigation Working Group
RRDB	Research Reactor Database
SEAPFE	South East Asia, the Pacific and the Far East
SIPRI	Stockholm International Peace Research Institute
SLBM	Submarine Launched Ballistic Missile
SLA	State-Level Approach
SLC	State-Level Concept
SLCM	Submarine Launched Cruise Missile

SRBM	Short-Range Ballistic Missile
SSBN	Nuclear-Powered Ballistic Missile Submarine
SSP	Stockpile Stewardship Program
START	Strategic Arms Reduction Treaty (Talks)
SVC	Special Verification Commission
TPNW	Treaty on the Prohibition of Nuclear Weapons
UAE	United Arab Emirates
UN	United Nations
UNGA	United Nations General Assembly
UNODC	United Nations Office on Drugs and Crime
WA	Wassenaar Arrangement
WMD	Weapons of Mass Destruction

Country-by-Country Evaluation

	Nuclear Disarmament	Maximum points	Scale of measurement	Nuclear-Weapon States					Non-NPT Parties			Non-Nuclear Weapon States																											Other
				CHN	FRA	RUS	UK	USA	IND	ISR	PAK	AUS	AUT	BEL	BRA	CAN	CHL	EGY	GER	IDN	IRN	JPN	KAZ	ROK	MEX	NED	NZL	NGA	NOR	PHL	POL	SAU	RSA	SWE	SWI	SYR	TUR	UAE	PRK
1	**Status of Nuclear Forces (estimates)**	**-20**																																					
	Status of nuclear forces (estimates)	-20	-5 (〜50); -6 (51〜100); -8 (101〜200); -10 (201〜400); -12 (401〜1,000); -14 (1,001〜2,000); -16 (2,001〜4,000); -17 (4,001〜6,000); -19 (6,001〜8,000); -20 (8,001〜) (not applicable to the NNWS)	-10	-10	-19	-10	-19	-8	-6	-8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	-5
2	**Commitment to Achieving a World without Nuclear Weapons**	**11**																																					
	A) Voting behavior on UNGA resolutions on nuclear disarmament proposals by Japan, NAC and NAM	6	On each resolution: 0 (against); 1 (abstention); 2 (in favor)	2	2	0	2	2	2	1	3	3	4	2	5	3	6	5	2	5	5	4	6	2	6	3	4	5	3	6	2	6	4	5	4	4	2	6	1
	B) Announcement of significant policies and important activities	3	Add 1 point for each policy, proposal and other initiatives having a major impact on the global momentum toward a world without nuclear weapons (maximum 3 points).	0	0	0	0	0	0	0	0	0	2	0	1	0	1	1	0	1	1	1	1	0	2	0	2	1	0	1	0	1	2	1	1	0	0	1	0
	C) Humanitarian consequences of nuclear weapons	2	On each resolution: 0 (against); 0.5（abstention); 1 (in favor)	1	0	0	0	0	1.5	0	1	0.5	2	0.5	2	0.5	2	2	0.5	2	2	1.5	2	0	2	0.5	2	2	0.5	2	0	2	2	1.5	1.5	2	0	2	1
3	**Treaty on the Prohibition of Nuclear Weapons (TPNW)**	**10**																																					
	A) Signing and ratifying the TPNW	7	0 (not signing); 3 (not ratifying); 7 (ratifying)	0	0	0	0	0	0	0	0	0	3	0	3	0	3	0	0	3	0	0	0	0	3	0	3	3	0	3	0	0	3	0	0	0	0	0	0
	B) Voting behavior on UNGA resolutions on a legal prohibition of nuclear weapons	3	On each resolution: 0 (against); 0.5 (abstention) ; 1 (in favor)	2	0	0.5	0	0	1.5	0	2	0	2	0	3	0.5	3	3	0	3	3	1	3	0	3	0	2	3	0	3	0	3	3	2	2	2	0	3	1
4	**Reduction of Nuclear Weapons**	**22**																																					
	A) Reduction of nuclear weapons	15	・Add 1〜10 points in accordance with the decuple rate of reduction from the previous fiscal year for a country having declared the number of nuclear weapons. ・For a country having not declared it, add some points using the following formula: (the previous target – the latest target)÷the estimated number of nuclear weapons×10. ・Add 1 (engaging in nuclear weapons reduction over the past 5 years); add 1 (engaging in nuclear weapons reduction under legally-binding frameworks such as New Strategic Arms Reduction Treaty); add 1 (announcing further reduction plan and implementing it in 2016) ・Give a perfect score (15 points) in case of the total abolition of nuclear weapons. (not applicable to the NNWS)	0	1	2.3	1	2.2	0	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0
	B) A concrete plan for further reduction of nuclear weapons	3	0 (no announcement on a plan of nuclear weapons reduction); 1 (declaring a rough plan of nuclear weapons reduction); 2 (declaring a plan on the size of nuclear weapons reduction); 3 (declaring a concrete and detailed plan of reduction) (not applicable to the NNWS)	0	0	0	0	0	0	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0
	C) Trends on strengthening/modernizing nuclear weapons capabilities	4	0 (modernizing/reinforcing nuclear forces in a backward move toward nuclear weapons reduction; 2〜3 (modernizing/reinforcing nuclear forces which may not lead to increasing the number of nuclear weapons; 4 (not engaging in nuclear modernization/reinforcement) (not applicable to the NNWS)	2	3	2	3	3	2	3	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0
5	**Diminishing the Role and Significance of Nuclear Weapons in National Security Strategies and Policies**	**8**																																					
	A) The current status of the roles and significance of nuclear weapons	-8	-7〜-8 (judged based on the declaratory policy) (not applicable to the NNWS)	-7	-7	-7	-7	-7	-7	-7	-7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	-7
	B) Commitment to “sole purpose,” no first use, and related doctrines	3	0 (not adopting either policy); 2 (adopting a similar policy or expressing its will to adopt either policy in the future); 3 (already adopting either policy) (not applicable to the NNWS)	3	0	0	0	0	2	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0
	C) Negative security assurances	2	0 (not declaring); 1 (declaring with reservations); 2 (declaring without reservations) (not applicable to the NNWS)	2	1	1	1	1	2	0	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
	D) Signing and ratifying the protocols of the treaties on nuclear-weapon-free zones	3	Add 0.5 point for the ratification of one protocol; a country ratifying all protocols marks 3 points (not applicable to countries expect NWS)	2	2	2	2	0.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	E) Relying on extended nuclear deterrence	-5	(not applicable to the NWS and Non-NPT Parties) (applied solely to the NNWS): -5 (a country relying on the nuclear umbrella and participating in nuclear sharing); -3 (a country relying on the nuclear umbrella); 0 (a country not relying on the nuclear umbrella)	—	—	—	—	—	—	—	—	-3	0	-5	0	-3	0	0	-5	0	0	-3	0	-3	0	-5	0	0	-3	0	-3	0	0	0	0	0	-5	0	—
6	**De-alerting or Measures for Maximizing Decision Time to Authorize the Use of Nuclear Weapons**	**4**																																					
	De-alerting or measures for maximizing decision time to authorize the use of nuclear weapons	4	0〜1 (maintaining a high alert level); 2 (maintaining a certain alert level); 3 (de-alerting during peacetime); add 1 point for implementing measures for increasing the credibility of (lowered) alert status (not applicable to the NNWS)	3	2	1	2	1	3	2	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3

Nuclear Disarmament		Maximum points	Scale of measurement	Nuclear-Weapon States					Non-NPT Parties			Non-Nuclear Weapon States																											Other
				CHN	FRA	RUS	UK	USA	IND	ISR	PAK	AUS	AUT	BEL	BRA	CAN	CHL	EGY	GER	IDN	IRN	JPN	KAZ	ROK	MEX	NED	NZL	NGA	NOR	PHL	POL	SAU	RSA	SWE	SWI	SYR	TUR	UAE	PRK
7	**CTBT**	**11**																																					
	A) Signing and ratifying the CTBT	4	0 (not signing); 2 (not ratifying); 4 (ratifying)	2	4	4	4	2	0	2	0	4	4	4	4	4	4	2	4	4	2	4	4	4	4	4	4	4	4	4	4	0	4	4	4	0	4	4	0
	B) Moratoria on nuclear test explosions pending CTBT's entry into force	3	0 (not declaring); 2 (declaring); 3 (declaring and closing the nuclear test sites) (not applicable to the NNWS)	2	3	2	2	2	2	0	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0
	C) Cooperation with the CTBTO Preparatory Commission	2	0 (no cooperation or no information); 1～2 (paying contributions, actively participating in meetings, and actively engaging in the outreach activities for the Treaty's entry into force)	1	2	2	2	2	0	1	0	2	2	2	1	2	1	0	2	0	0	2	2	2	1	2	2	0	2	2	2	0	1	2	2	0	2	2	0
	D) Contribution to the development of the CTBT verification systems	2	Add 1 point for establishing and operating the IMS; add another 1 point for participating in the discussions on enhancing the CTBT verification capabilities	1	2	2	2	2	0	2	0	2	2	2	2	2	1	0	2	2	0	2	2	2	2	2	2	1	2	1	2	0	2	2	2	0	2	0	0
	E) Nuclear testing	-3	-3 (conducting nuclear test explosions in the past 5 years);-1 (conducting nuclear tests without explosion or the status is unclear); 0 (not conducting any nuclear tests) (not applicable to the NNWS)	-1	-1	-1	-1	-1	-1	-1	-1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	-3
8	**FMCT**	**10**																																					
	A) Commitment, efforts, and proposals toward immediate commencement of negotiations on an FMCT	5	Add 1 (expressing a commitment); add 1～2 (actively engaging in the promotion of early commencement); add 1～2 (making concrete proposals on the start of negotiations)	1	4	1	3	3	1	1	1	3	3	3	3	4	2	1	3	1	1	4	1	3	1	3	3	2	3	2	2	1	3	3	3	0	1	1	0
	B) Moratoria on the production of fissile material for use in nuclear weapons	3	0 (not declaring); 1 (not declaring but not producing fissile material for nuclear weapons); 2 (declaring); 3 (declaring and taking measures for the cessation of the production as declared) (not applicable to the NNWS)	1	2	3	2	2	0	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0
	C) Contribution to the development of verification measures	2	0 (no contribution or no information); 1 (proposing a research on verification measures); 2 (engaging in R&D for verification measures)	0	1	0	1	1	0	0	0	1	1	1	0	1	0	0	1	0	0	1	0	1	0	1	1	0	1	0	0	0	0	1	0	0	0	0	0
9	**Transparency in Nuclear Forces, Fissile Material for Nuclear Weapons, and Nuclear Strategy/Doctrine**	**6**																																					
	Transparency in nuclear forces, fissile material for nuclear weapons, and nuclear strategy/doctrine	6	Add 1～2 (disclosing the nuclear strategy/doctrine); add 1～2 (disclosing the status of nuclear forces); add 1～2 (disclosing the status of fissile material usable for nuclear weapons) (not applicable to the NNWS)	1	3	2	4	5	1	0	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0
10	**Verifications of Nuclear Weapons Reductions**	**7**																																					
	A) Acceptance and implementation of verification for nuclear weapons reduction	3	0 (not accepting or implementing); 2 (limited acceptance and implementation); 3 (accepting and implementing verification with comprehensiveness and completeness); <u>deduct 1～2 points in case of non-compliance or problems in implementation</u> (not applicable to the NNWS)	0	0	3	0	3	0	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0
	B) Engagement in research and development for verification measures of nuclear weapons reduction	1	0 (not engaging or no information); 1 (engaging in R&D)	0	1	0	1	1	0	0	0	1	0	1	1	1	1	0	1	1	0	1	1	1	1	1	0	0	1	1	1	0	0	1	1	0	1	1	0
	C) The IAEA inspections to fissile material declared as no longer required for military purposes	3	0 (not implementing), 1(limited implementation); 3 (implementing); add 1 point if a country engages in the efforts for implementing or strengthening the implementation, except in the case of already implementing (not applicable to the NNWS)	0	1	0	3	1	0	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0
11	**Irreversibility**	**7**																																					
	A) Implementing or planning dismantlement of nuclear warheads and their delivery vehicles	3	0 (not implementing or no information); 1 (perhaps implementing but not clear); 2～3 (implementing) (not applicable to the NNWS)	0	2	2	2	3	0	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0
	B) Decommissioning/conversion of nuclear weapons-related facilities	2	0 (not implementing or no information); 1 (implementing in a limited way); 2 (implementing extensively) (not applicable to the NNWS)	0	1	1	1	1	0	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0
	C) Measures for fissile material declared excess for military purposes, such as disposition or conversion to peaceful purposes	2	0 (not implementing or no information); 1 (implementing in a limited way); 2 (implementing); 3 (implementing extensively) (not applicable to the NNWS)	0	1	2	1	2	0	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0
12	**Disarmament and Non-Proliferation Education and Cooperation with Civil Society**	**4**																																					
	Disarmament and non-proliferation education and cooperation with civil society	4	Add 1 (participating in the joint statement); add 1～2 (implementing disarmament and non-proliferation education); add 1～2 (cooperating with civil society). Maximum 4 points	2	2	1	3	3	1	1	0	3	4	2	1	3	2	2	3	1	0	4	1	1	2	3	4	2	1	1	1	0	1	3	4	0	1	1	0
13	**Hiroshima Peace Memorial Ceremony**	**1**																																					
	Hiroshima Peace Memorial Ceremony	1	0 (not attending)；0.5 (not attending in 2017 but has attended at least once during the past 3 years)；1 (attending)	0	1	1	1	1	1	1	1	1	1	1	1	1	0.5	1	0.5	1	1	1	1	1	0.5	0.5	1	0.5	1	1	1	0	0.5	0.5	0	0	0	1	0
	Points			**10**	**23**	**7.8**	**25**	**16.7**	**4**	**0**	**2**	**17.5**	**30**	**13.5**	**27**	**19**	**26.5**	**17**	**14**	**24**	**15**	**23.5**	**24**	**14**	**27.5**	**15**	**30**	**23.5**	**15.5**	**27**	**12**	**13**	**25.5**	**26**	**24.5**	**8**	**8**	**22**	**-8**
	Full Points			**101**	**101**	**101**	**101**	**101**	**98**	**98**	**98**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**42**	**98**
	(%)			**9.9**	**22.8**	**7.7**	**24.8**	**16.5**	**4.1**	**0.0**	**2.0**	**41.7**	**71.4**	**32.1**	**64.3**	**45.2**	**63.1**	**40.5**	**33.3**	**57.1**	**35.7**	**56.0**	**57.1**	**33.3**	**65.5**	**35.7**	**71.4**	**56.0**	**36.9**	**64.3**	**28.6**	**31.0**	**60.7**	**61.9**	**58.3**	**19.0**	**19.0**	**52.4**	**-8.2**

	Nuclear Non-Proliferation	Maximum points	Scale of measurement	Nuclear-Weapon States					Non-NPT Parties			Non-Nuclear Weapon States																																Other
				CHN	FRA	RUS	UK	USA	IND	ISR	PAK	AUS	AUT	BEL	BRA	CAN	CHL	EGY	GER	IDN	IRN	JPN	KAZ	ROK	MEX	NED	NZL	NGA	NOR	PHL	POL	SAU	RSA	SWE	SWI	SYR	TUR	UAE	PRK
1	**Acceptance and Compliance with Nuclear Non-Proliferation Obligations**	**20**																																								
	A) Accession to the NPT	10	0 (not signing or declaring withdrawal); 3 (not ratifying); 10 (in force)	10	10	10	10	10	0	0	0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	0
	B) Compliance with Articles I and II of the NPT and the UNSC resolutions on non-proliferation	7	・0 (non-complying with Article I and II of the NPT); 3～4 (having not yet violated Article I and II of the NPT but displaying behaviors that raise concerns about proliferation, or not complying with the UNSC resolutions adopted for relevant nuclear issues); 5 (taking concrete measures for solving the non-compliance issue); 7 (complying). ・As for the non-NPT states (maximum 3 points) : 2 (not complying with the UNSC resolutions adopted for relevant nuclear issues); 3 (other cases)	7	7	7	7	7	2	3	2	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	4	7	7	0
	C) Nuclear-Weapon-Free Zones	3	1 (signing the NWFZ treaty); 3 (ratifying the treaty)	—	—	—	—	—	0	0	0	3	0	0	3	0	3	1	0	3	0	0	3	0	3	0	3	3	0	3	0	0	3	0	0	0	0	0	0
2	**IAEA Safeguards Applied to the NPT NNWS**	**18**																																								
	A) Signing and ratifying a Comprehensive Safeguards Agreement	4	0 (not signing); 1 (not ratifying); 4 (in force)	—	—	—	—	—	—	—	—	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0
	B) Signing and ratifying an Additional Protocol	5	0 (not signing); 1 (not ratifying); 3 (provisional application); 5 (in force)	—	—	—	—	—	—	—	—	5	5	5	0	5	5	0	5	5	3	5	5	5	5	5	5	5	5	5	5	0	5	5	5	0	5	5	0
	C) Implementation of the integrated safeguards	4	0 (not implementing); 2 (broader conclusion) 4 (implementing)	—	—	—	—	—	—	—	—	4	4	4	0	4	4	0	4	4	0	4	2	4	0	4	2	0	4	2	4	0	4	4	2	0	2	0	0
	D) Compliance with IAEA Safeguards Agreement	5	0 (not resolving the non-compliance issue); 2 (taking concrete measures for solving the non-compliance issue); 5 (complying)	—	—	—	—	—	—	—	—	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	0	5	5	0
3	**IAEA Safeguards Applied to NWS and Non-Parties to the NPT**	**7**																																							
	A) Application of the IAEA safeguards (Voluntary Offer Agreement or INFCIRC/66) to their peaceful nuclear in facilities	3	0 (not applying); 2 (applying INFCIRC/66); 3 (applying Voluntary Offer Agreement)	3	3	3	3	3	2	2	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	B) Signing, ratifying, and implementing the Additional Protocol	4	0 (not signing); 1 (not ratifying); 3 (in force); add 1 point if widely applied to peaceful nuclear activities	3	3	3	3	4	3	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	**Cooperation with the IAEA**	**4**																																							
	Cooperation with the IAEA	4	Add 1 (contributing to the development of verification technologies); add 1～2 (contributing to the universalization of the Additional Protocol); add 1 (other efforts)	1	3	2	3	3	0	0	0	3	2	3	1	3	1	0	3	1	0	3	0	3	1	3	2	1	2	1	1	0	1	2	2	0	1	1	0
5	**Implementing Appropriate Export Controls on Nuclear-Related Items and Technologies**	**15**																																							
	A) Establishment and implementation of the national control systems	5	0 (not establishing); 1 (establishing but insufficient); 2 (establishing a system to a certain degree); 3 (establishing an advanced system, including the Catch-all); add 1～2 (if continuing to implement appropriate export controls); deduct 1～2 (not adequately implementing)	3	5	4	5	5	4	5	2	5	5	5	5	5	2	2	5	1	0	5	5	5	5	5	5	1	5	3	5	1	5	5	5	0	5	3	0
	B) Requiring the conclusion of the Additional Protocol for nuclear export	2	0 (not requiring or no information); 1 (requiring for some cases); 2 (requiring)	0	0	0	0	1	0	0	0	1	1	0	0	1	1	0	1	0	0	1	0	0	1	1	1	1	1	1	1	0	0	1	0	0	1	1	0
	C) Implementation of the UNSCRs concerning North Korean and Iranian nuclear issues	3	0 (not implementing or no information); 2 (implementing); 3(actively implementing); deduct 1～3 (depending on the degree of violation)	1	3	1	3	3	2	2	2	3	3	3	2	3	2	2	3	2	2	3	2	3	3	3	3	2	3	2	2	2	3	3	3	0	2	2	0
	D) Participation in the PSI	2	0 (not participating); 1 (participating); 2 (actively participating)	0	2	2	2	2	0	1	0	2	0	2	0	2	2	0	2	0	0	2	1	2	0	2	2	0	2	1	2	1	0	1	1	0	2	1	0
	E) Civil nuclear cooperation with non-parties to the NPT	3	0 (exploring active cooperation); 1~2 (contemplating cooperation, subject to implementing additional nuclear disarmament and non-proliferation measures); 3 (showing a cautious attitude or being against it)	0	0	0	1	0	—	—	—	1	3	3	3	0	3	3	3	3	3	1	0	0	3	3	3	3	3	3	3	3	3	3	3	3	3	3	0
6	**Transparency in the Peaceful Use of Nuclear Energy**	**4**																																							
	A) Reporting on the peaceful nuclear activities	2	0 (not reporting or no information); 1 (reporting but insufficiently); 2 (reporting)	2	2	2	2	2	2	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	0	2	2	0
	B) Reporting on plutonium management	2	0 (not reporting or no information); 1 (reporting); 2 (reporting on not only plutonium but also uranium) ; add 1 (ensuring a high level of transparency in plutonium although not being obliged to report)	1	2	1	0	1	0	0	0	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0
	Points			**31**	**40**	**35**	**39**	**41**	**15**	**13**	**10**	**56**	**52**	**54**	**43**	**52**	**52**	**37**	**56**	**48**	**37**	**53**	**47**	**51**	**50**	**55**	**55**	**45**	**54**	**50**	**52**	**36**	**53**	**53**	**50**	**21**	**50**	**45**	**0**
	Full Points			**47**	**47**	**47**	**47**	**47**	**43**	**43**	**43**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**	**61**
	(%)			**66.0**	**85.1**	**74.5**	**83.0**	**87.2**	**34.9**	**30.2**	**23.3**	**91.8**	**85.2**	**88.5**	**70.5**	**85.2**	**85.2**	**60.7**	**91.8**	**78.7**	**60.7**	**86.9**	**77.0**	**83.6**	**82.0**	**90.2**	**90.2**	**73.8**	**88.5**	**82.0**	**85.2**	**59.0**	**86.9**	**86.9**	**82.0**	**34.4**	**82.0**	**73.8**	**0.0**

Nuclear Security		Maximum points	Scale of measurement	Nuclear-Weapon States					Non-NPT Parties			Non-Nuclear Weapon States																													Other
				CHN	FRA	RUS	UK	USA	IND	ISR	PAK	AUS	AUT	BEL	BRA	CAN	CHL	EGY	GER	IDN	IRN	JPN	KAZ	ROK	MEX	NED	NZL	NGA	NOR	PHL	POL	SAU	RSA	SWE	SWI	SYR	TUR	UAE	PRK
1	**The Amount of Fissile Material Usable for Weapons**	**-16**																																					
	The amount of fissile material usable for weapons	-16	Firstly, -3 (if possessing fissile material usable for nuclear weapons). Then, deduct if: ・HEU: -5 (>100t) ; -4 (>20t); -3 (>10t); -2 (>1t); -1 (possessing less than 1t) ・Weapon-grade Pu: -5 (>100t); -4 (>20t); -3 (>10t); -2 (>1t); -1 (possessing less than 1t) ・Reactor-grade Pu: -3 (>10t); -2 (>1t); -1 (possessing less than 1t)	-10	-12	-16	-12	-15	-8	-5	-6	-4	0	-5	0	-5	0	0	-7	0	-4	-8	-6	0	0	-4	0	-4	-4	0	0	0	-4	0	-4	-4	0	0	-5
2	**Status of Accession to Nuclear Security and Safety-Related Conventions, Participation in Nuclear Security Related Initiatives, and Application to Domestic Systems**	**21**																																					
	A) Convention on the Physical Protection of Nuclear Material and the 2005 Amendment to the Convention	3	0 (not signing the Treaty); 1 (not ratifying the Treaty); 2 (Treaty in force, not ratifying the Amendment); 3 (both the Treaty and Amendment in force)	3	3	3	3	3	3	3	3	3	3	3	2	3	3	1	3	3	0	3	3	3	3	3	3	3	3	2	3	3	2	3	3	0	3	3	0
	B) International Convention for the Suppression of Acts of Nuclear Terrorism	2	0 (not signing); 1 (not ratifying); 2 (in force)	2	2	2	2	2	2	1	0	2	2	2	2	2	2	1	2	2	0	2	2	2	2	2	2	2	2	1	2	2	2	2	2	1	2	2	0
	C) Convention on Nuclear Safety	2	0 (not signing); 1 (not ratifying); 2 (in force)	2	2	2	2	2	2	1	2	2	2	2	2	2	2	1	2	2	0	2	2	2	2	2	0	2	2	1	2	2	2	2	2	2	2	2	0
	D) Convention on Early Notification of a Nuclear Accident	2	0 (not signing); 1 (not ratifying); 2 (in force)	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	1
	E) Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management	2	0 (not signing); 1 (not ratifying); 2 (in force)	2	2	2	2	2	0	0	0	2	2	2	2	2	2	0	2	2	0	2	2	2	0	2	0	2	2	1	2	2	2	2	2	0	0	2	0
	F) Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency	2	0 (not signing); 1 (not ratifying); 2 (in force)	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	1
	G) INFCIRC/225/Rev.5	4	0 (not applying or no information); 2 (applying to the national implementation system); 4 (applying and implementing adequately)	2	2	2	2	2	2	2	2	2	0	2	2	2	2	0	2	2	2	2	2	2	2	2	2	2	0	2	2	2	2	2	2	0	2	2	0
	H) Enactment of laws and establishment of regulations for the national implementation	4	0 (not establishing domestic laws and regulations and the national implementation system); 1～2 (establishing them but insufficiently); 4 (establishing appropriately)	4	4	4	4	4	4	4	4	4	4	4	4	4	3	2	4	4	3	4	4	4	4	4	4	4	2	3	3	2	4	4	4	2	4	2	1
3	**Efforts to Maintain and Improve the Highest Level of Nuclear Security**	**20**																																					
	A) Minimization of HEU and Plutonium stockpile in civilian use	4	0 (no effort or no information); 1 (limited efforts); 3 (active efforts); add 1 (committed to further enhancement)	4	4	4	3	4	4	4	0	4	4	4	4	4	3	0	3	4	0	3	4	4	4	4	3	3	4	3	4	0	4	4	4	0	3	4	0
	B) Prevention of illicit trafficking	5	0 (not implementing or no information); 2 (limited implementation); 4 (active implementation); add 1 (committed to further enhancement)	4	4	4	4	5	5	4	5	4	4	4	4	5	4	2	4	4	2	4	2	4	4	2	2	2	4	5	4	2	4	4	4	0	2	4	0
	C) Acceptance of international nuclear security review missions	2	0 (not accepting or no information); 1 (accepting); 2 (actively accepting)	2	2	0	2	2	0	0	0	2	0	0	0	2	2	2	1	2	2	2	2	1	2	2	2	2	2	2	1	0	0	2	2	0	2	1	0
	D) Technology development ―nuclear forensics	2	0 (not implementing or no information); 1 (implementing); 2 (actively implementing)	1	2	2	2	2	0	2	1	2	0	1	0	2	1	0	1	0	0	2	0	2	0	2	0	0	1	0	0	0	1	2	2	0	2	0	0
	E) Capacity building and support activities	2	0 (not implementing or no information); 1 (implementing); 2 (actively implementing)	1	2	1	2	2	1	0	1	1	1	0	1	1	1	1	2	1	0	2	1	2	0	2	0	0	1	1	0	1	1	2	1	0	0	0	0
	F) IAEA Nuclear Security Plan and Nuclear Security Fund	2	0 (no effort or information); 1 (participating); 2 (actively participating)	2	2	2	2	2	2	1	1	1	1	2	0	2	0	0	2	0	1	2	1	2	0	2	2	0	2	0	0	0	0	2	1	0	1	1	0
	G) Participation in international efforts	3	0 (not participating); 1 (participating in a few frameworks); 2 (participating in many or all frameworks); add 1 (if contributing actively)	2	3	3	3	3	1	1	1	3	1	3	1	3	1	0	3	0	0	3	3	3	3	3	3	1	3	3	3	1	1	3	3	0	1	1	0
	Points			**25**	**26**	**19**	**25**	**24**	**22**	**22**	**18**	**32**	**28**	**28**	**28**	**33**	**30**	**14**	**28**	**30**	**10**	**29**	**26**	**37**	**30**	**32**	**27**	**23**	**28**	**28**	**30**	**21**	**25**	**38**	**32**	**3**	**28**	**28**	**-2**
	Full Poins			**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**	**41**
	(%)			**61.0**	**63.4**	**46.3**	**61.0**	**58.5**	**53.7**	**53.7**	**43.9**	**78.0**	**68.3**	**68.3**	**68.3**	**80.5**	**73.2**	**34.1**	**68.3**	**73.2**	**24.4**	**70.7**	**63.4**	**90.2**	**73.2**	**78.0**	**65.9**	**56.1**	**68.3**	**68.3**	**73.2**	**51.2**	**61.0**	**92.7**	**78.0**	**7.3**	**68.3**	**68.3**	**-4.9**

I congratulate the Hiroshima Prefecture on the publication of its 2018 Report. In the current international climate, it is increasingly necessary to find and support constructive solutions for the achievement of the total elimination of nuclear weapons as the only guarantee against their use. The Report provides a comprehensive view of the current status of such efforts and is a valuable tool for nuclear disarmament and non-proliferation experts. This objective Report deserves the attention of world leaders and common citizens alike.

Sergio Duarte

President of Pugwash Conferences on Science and World Affairs;
Former UN High Representative for Disarmament Affairs

The Hiroshima Report is unique for two reasons: First, its distinctive approach methodically throws into stark relief the progress – or lack thereof – made in nuclear disarmament, non-proliferation and security; and second, it is produced by the descendants of those who suffered the first use of nuclear weapons in war, providing a singular perspective and demonstrating once again Hiroshima's enduring commitment to ensuring this tragedy is never repeated.

Izumi Nakamitsu

United Nations High Representative for Disarmament Affairs

The latest Hiroshima Report is an important document that should be read by everyone in international security, especially those specializing in nuclear security. It is a cogent and measured assessment analysis.

William J. Perry

Former U.S. Secretary of Defense

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