



# ISCN Newsletter

(ISCN Newsletter)

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Integrated Support Center for Nuclear Nonproliferation  
and Nuclear Security (ISCN)

Integrated Support Center for Nuclear Nonproliferation  
and Nuclear Security

Japan Atomic Energy Agency (JAEA)

Japan Atomic Energy Agency

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Since the testimony of the CIA Director to the U.S. House of Representatives Intelligence Committee regarding Russia's alleged development of nuclear-based satellite destruction weapons was officially acknowledged by a senior U.S. White House official, and widely reported in the Western media, including not only the loss of functionality of communications and GPS satellites, etc., but also the impact on ground infrastructure, a The following is a summary of the report.	

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A meeting was held in Washington, D.C., USA, from March 4 to March 6, 2024, to develop a methodology for evaluating the attractiveness of nuclear and radioactive materials in a nuclear security event and to develop concepts for reducing the attractiveness of nuclear materials. A summary of the meeting is presented below.

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The operation of the CTBT radionuclide monitoring station will be outlined and some observations will be made.

## 1. Announcements

### 1-1 Greetings from the new ISCN Director

My name is Naoko Inoue, and I have been appointed as ISCN Center Director as of April 1.

Thank you for your continued understanding and support of the activities of the Integrated Support Center for Nuclear Nonproliferation and Nuclear Security (ISCN) and for reading the ISCN Newsletter.

The nuclear nonproliferation and nuclear security efforts of Japan and JAEA's predecessor organizations have been in step with the beginning of the peaceful use of nuclear energy in Japan in the 1950s, and when JAEA was established in 2005 with the merger of JAERI and the Japan Nuclear Cycle Development Institute (JNC), the NPSTC was established to bring together the technologies and knowledge of the two organizations and contribute to improving nuclear material management and strengthening the international nuclear nonproliferation regime. At the Nuclear Security Summit held in the United States in April 2010, the Japanese government announced that it would establish a support center within JAEA to strengthen nuclear security in the Asian region. The ISCN was established in December of the same year. Since then, the ISCN has incorporated the functions of the NPSTC and developed into a comprehensive research, development, and human resource development support organization for nuclear nonproliferation and nuclear security.



The peaceful use of nuclear energy, nuclear nonproliferation, and nuclear security are changing due to the Corona disaster, Russia's invasion of Ukraine, energy problems resulting from the invasion, the expansion of nuclear energy use as a solution, and the desire to develop innovative reactor technologies such as small modular reactors (SMR), etc. JAEA has also adopted a new vision Under this vision, ISCN will ensure the sustainability of the peaceful use of nuclear energy, aiming for "a world without nuclear weapons and nuclear terrorism," while flexibly responding to these changes in the environment. We will move forward with efforts to support the ubiquity of the world while responding flexibly to the changes in this environment.

We are deeply grateful to our predecessors who have worked hard over the past 70 years to create the current ISCN, the structure of the ISCN's work, and the strong partnerships with related organizations in Japan and abroad, and we will effectively utilize the technologies and knowledge that JAEA has developed to further strengthen nuclear nonproliferation, improve nuclear security, and conduct policy research and studies. We are committed to further strengthening nuclear nonproliferation, further improving nuclear security, and conducting policy research and studies. Through this newsletter, we would like to make further efforts to disseminate information on these efforts and related international trends, and we would appreciate your continued understanding and support for ISCN.

Naoko Inoue, Director, Integrated Support Center for Nuclear Nonproliferation and Nuclear Security

## 1-2 Japan Atomic Energy Agency-Recruitment of new graduates in 2025

Deadline for submission of documents: Must arrive no later than April 8, 2024 (Monday) 【Technical and research positions Must arrive no later than April 21, 2024 (Sun.)】 [Administrative positions]

ISCN is recruiting in the field of technical development related to nuclear security and radiation control, measurement and monitoring with the following job description.

- The NPT conducts practical work related to the management of nuclear materials held by JAEA, response to inspections by the International Atomic Energy Agency (IAEA) and others, protection of nuclear materials, information system security, and support for the international verification regime of the Comprehensive Test Ban Treaty (CTBT). We also conduct policy research on nuclear nonproliferation and nuclear security, and provide support for international human resource development based on our expertise.
- We will develop technologies for measuring nuclear materials necessary for strict control of nuclear materials held by JAEA, develop nuclear forensics and analysis technologies to clarify the origin and history of seized nuclear materials, and develop nuclear measurement and detection technologies using external neutron sources, as well as conduct joint research with domestic and overseas research institutes.

\*For details, please see the application guidelines below.

Employment Opportunities: <https://www.jaea.go.jp/saiyou/new/>

Application Guidelines: <https://www.jaea.go.jp/saiyou/new/115/b01.pdf>

(Technical Positions)



### 1-3 Announcement for the start of the “Basic training course on IAEA Safeguards in Japanese (e-learning)”

We are pleased to announce that a new training course, "Basic Training Course on IAEA Safeguards in Japanese (e-Learning)" was launched in March 2024 at the ISCN International Capacity-Building Support Office.

[Summary of this online course]

This course is a translation by ISCN of the e-learning content "Basic Training Course on IAEA Safeguards" published by the International Atomic Energy Agency (IAEA)<sup>1</sup> and is intended to provide basic knowledge of IAEA safeguards and an overview of resources available to enhance safeguards implementation in your country. At the end of each content section, a quiz related to the course content will allow you to test your understanding of the course, and you will receive a certificate of completion after passing all the quizzes.

[Persons eligible to participate in the course]

Those involved in or interested in nuclear energy/accounting for and control of nuclear material/safeguards

[How to take the course]

If you wish to take the course, please register at the following URL.  
We look forward to seeing many of you attending!

Course Registration: <https://forms.office.com/r/dqSpEfsp2L>

Contact: [iscn-ssacj@jaea.go.jp](mailto:iscn-ssacj@jaea.go.jp)

対象：原子力/核物質管理/計量管理/保障措置に関わる方又は保障措置に関心がある方

## 保障措置の基本 eラーニングコース

令和6年3月29日開講

受講者募集

受講無料

■コースの構成と取り扱う主な内容■  
【全講義 eラーニング形式 (所要時間：約3時間)】  
モジュール1：導入  
モジュール2：IAEA保障措置  
モジュール3：IAEAの検認活動  
モジュール4：参考情報

登録先：IEPCO

受講登録は以下URLもしくは二次元バーコードからお願いします。  
<https://forms.office.com/r/dqSpEfsp2L>

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<sup>1</sup> Please note that this translation is not an official IAEA translation and has not been reviewed or endorsed by the IAEA, which has given its consent for ISCN to translate and offer this e-learning content.

#### **1-4 Publication of a JAEA Review entitled “Research on factor analysis and technical processes for achieving denuclearization: Case studies of three former Soviet Union states (Belarus, Kazakhstan, and Ukraine)”**

The ISCN conducted the Study on Factor Analysis and Technical Processes for Denuclearization from FY 2018 to FY 2021.

We are pleased to announce the publication of "Study on Factor Analysis and Technological Processes for Achieving Denuclearization: Case Studies of Three Former Soviet Union Countries (Belarus, Kazakhstan, and Ukraine)" (JAEA Review 2023-042).

This report summarizes the denuclearization process of Belarus, Kazakhstan, and Ukraine, and the results of the analysis of the denuclearization of these countries in terms of "motivation to maintain or remove nuclear weapons," "internal and external conditions at the time of the denuclearization decision," "progress in nuclear development," "incentives for denuclearization," "international framework for denuclearization," "denuclearization methods," "verification methods for denuclearization," and "verifiers of denuclearization." The report also includes an overview of the support for denuclearization by the international community, including Japan.

The report (only in Japanese) can be accessed at the following URL.

URL: <http://doi.org/10.11484/jaea-review-2023-042>

## **2. Nuclear Non-proliferation and Nuclear Security Trends and Analysis**

### **2-1 Brief summary of the IAEA Director's Report on "Verification and monitoring in the Islamic Republic of Iran in light of United Nations Security Council resolution 2231 (2015)" submitted to the IAEA Board of Governors in March 2024**

This article summarizes IAEA Director's report on Iran (GOV/2024/7) submitted to the IAEA Board of Governors in March 2024. Please take a look at the original report on the following URL:

IAEA, "Verification and monitoring in the Islamic Republic of Iran in light of United Nations Security Council resolution 2231 (2015)", GOV/2024/7, 26 February 2024, <https://www.iaea.org/sites/default/files/24/03/gov2024-7.pdf>

### **2-2 Brief summary of nuclear energy, nuclear non-proliferation and nuclear security related issues in the U.S President's State of the Union on 7 March 2024**

This article summarizes nuclear energy, nuclear nonproliferation, and nuclear security-related issues appeared in the U.S. President's State of the Union on 7 March 2024. The State of the Union is available at the following URL:

White House, "2024 State of the Union", <https://www.whitehouse.gov/state-of-the-union-2024/>

### **2-3 Summary of DOE/NNSA's FY2025 Budget requests**

This article summarizes DOE/NNSA's FY 2025 Budget request submitted to the U.S. Congress in March 2024. For more details, please take a look at following NNSA's and DOE's homepage.

- NNSA, "President's Fiscal Year 2025 budget for NNSA advances ongoing modernization, strengthens response to deteriorating global environment", 11 March 2024, <https://www.energy.gov/nnsa/articles/presidents-fiscal-year-2025-budget-nnsa-advances-ongoing-modernization-strengthens>
- DOE, "Department of Energy FY 2025 Congressional Justification, National Nuclear Security Administration", DOE/CF-0202 Volume 1, March 2024, <https://www.energy.gov/sites/default/files/2024-03/doe-fy-2025-budget-vol-1-v4.pdf>



## **2-4 Brief summary of the U.S. DOE/NNSA's reports on (1)current status of ZNPP, (2) DOE/NNSA's support to nuclear facilities in Ukraine, (3)DOE/NNSA's prospects regarding its assistance to Ukraine's NPPs in 2024 (2) items of cooperation between DOE and the National Nuclear Regulatory and Inspection Agency of Ukraine (SNRIU) in 2024.**

This article summarizes (1) the current status of the Zaporizhzhia Nuclear Power Plant (ZNPP) by the DOE/NNSA, (2) Support for nuclear facilities in Ukraine, as well as (3) Items of cooperation between DOE and the SNRIU (State Nuclear Regulatory Inspectorate of Ukraine) in 2024 discussed in January 2024. News sources are available on the following NNSA's and SNRIU's URL.

- NNSA, "The State of Ukraine's Zaporizhzhya Nuclear Power Plant, A compilation of factors from credible sources", [https://www.energy.gov/sites/default/files/2024-03/ZNPP%20Factsheet%20March%202024\\_final.pdf](https://www.energy.gov/sites/default/files/2024-03/ZNPP%20Factsheet%20March%202024_final.pdf)
- NNSA, "Russia's Disregard for Nuclear Safety and Security in Ukraine", <https://www.energy.gov/sites/default/files/2023-03/NA-80%20Ukraine%20Factsheet.pdf>
- NNSA, "2023 Year in Review", <https://www.energy.gov/nnsa/articles/2023-nnsa-year-review#:~:text=You%27ll%20learn%20about%20impressive,nuclear%2Dpowered%20warships%20in%202023>
- SNRIU, "Chief State Inspector for Nuclear and Radiation Safety of Ukraine and DOE Energy Attaché at U.S. Embassy in Ukraine discussed cooperation plans for 2024," 17 January 2024, <https://snriu.gov.ua/en/news/chief-state-inspector-for-nuclear-and-radiation-safety-of-ukraine-and-attach-of-the-us-department-of-energy-in-kyiv-discussed-cooperation-plans-for-2024>

## **2-5 Allegation on development of nuclear-based ASAT weapon by Russia**

The alleged Russian development of nuclear-based Anti-Satellite Weapons was widely reported in the Western media, including not only the loss of functionality of communications and GPS satellites, etc., but also the impact on ground infrastructure, as a senior U.S. White House official officially acknowledged the CIA Director's testimony before the U.S. House Intelligence Committee regarding the alleged Russian development of nuclear-based Anti-Satellite Weapons.<sup>2</sup>

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<sup>2</sup> See, for example, EJIL blog: "Nuclear space-based ASAT weapons - A brief international legal perspective", URL: [https://www.ejiltalk.org/nuclear-space-based-asat-weapons-a-brief-international-legal-perspective/\(as of 5 March 2024\)](https://www.ejiltalk.org/nuclear-space-based-asat-weapons-a-brief-international-legal-perspective/(as%20of%205%20March%202024)) and Daryl G. Kimball ", Keeping Outer Space Nuclear Weapons Free, "Arms Control Association, 24

## 1. Facts of the case

The case originated on February 14, 2024, when the CIA Director mentioned to the U.S. House of Representatives Intelligence Committee that Russia is developing a nuclear-based Anti-Satellite Weapons (ASAT)<sup>3</sup> and that, although it is not deployed in outer space<sup>4</sup> at this time, it is in a certain degree of development. Since this statement was made in a private session of the committee, it raised a variety of speculations and was reported in the Western media as a threat by Russia against the U.S. and whether the planned weapon was a nuclear weapon or an accelerator-type weapon with strong destructive power. Furthermore, on the following day, John Kerby, the U.S. White House National Security Council (NSC) Strategic Spokesman, stated clearly that if a nuclear-based ASAT were deployed in space, it would be in violation of the Outer Space Treaty. The background to this information is the fact that both the U.S. and Russia have conducted nuclear explosion tests in space in the past, and both countries at least have the technical knowledge to conduct such nuclear explosions in space, as well as an understanding of the characteristics of nuclear explosions in space.<sup>5</sup>

## 2. From the viewpoint of international law

Thus, a senior official of the U.S. president's executive branch has made a virtually official statement confirming the view of U.S. intelligence sources that Russia is developing such a weapon, but what international law might be violated? In this regard, Kirby pointed out that, assuming this to be true, it would violate the Outer Space Treaty, although there is no clear evidence at this point. Furthermore, the EJIL (European Journal of International Law) blog analyzed the situation from the perspective of international law

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February 2023. Such an event would cause great damage, and it has been widely reported not only by the BBC and CBS, but also by the WP and NY newspapers.

<sup>3</sup> Talia M. Blatt, *Anti-Satellite Weapons and the Emerging Space Arms Race*, *The Harvard International Review*, 26.MAY 2020.

There is no treaty definition of ASAT (Anti-Satellite Weapons), and the magazine, for example, while noting that it is difficult to define, proposes the definition of "ASAT is a weapon designed to destroy or limit the function of a military satellite, for example by interfering with an enemy's military command and control. Specifically, there are two types of weapons: powered weapons (even debris can destroy the function of a satellite because objects fly at high speed in space) and non-powered weapons (such as cyber attacks that destroy satellite functions without using tangible objects). The one in question in this case is considered the latter type because it may use electromagnetic shock waves (see note below), which can be transmitted instantaneously over long distances due to the absence of atmospheric or other obstacles.

<sup>4</sup> Yuji Iwasawa, *International Law*, University of Tokyo Press, 2020, p. 245.

No agreement has been reached on the boundary between airspace and outer space, and theories have been proposed such as the boundary is unnecessary because space law is applied to outer space (functional theory), to the point where air exists, to the height where airplanes lose their buoyancy, to the height where satellites are placed in orbit, to 100 km from the sea surface, etc. However, since the PTBT, discussed below, prohibits nuclear testing continuously in the atmosphere and outer space, the "deficiency of law" problem does not arise in the application of the treaty.

<sup>5</sup> Daryl G. Kimball, "U.S. Warns of New Russian ASAT Program," *Arms Control Association*, 1 March 2023 (as of 05), URL: <https://www.armscontrol.org/act/2024-03/news/us-warns-new-russian-asat-program>(as of 5 March 2024)

According to the article, the United States conducted several high-altitude nuclear tests in addition to the Starfish prime nuclear test conducted over the Pacific Ocean between 1958 and 1962, while the Soviet Union conducted a similar high-altitude nuclear test over Kazakhstan between 1961 and 1962. Both the U.S. and Russia have conducted nuclear tests in outer space.

and concluded that the Partial Test Ban Treaty<sup>6</sup> Article 1, which prohibits nuclear testing in outer space, and the Outer Space Treaty Article 4, which prohibits placing objects carrying nuclear weapons or other weapons of mass destruction into orbit around the Earth, are in violation of the Outer Space Treaty. The Russian Federation would be in violation of Article 4 of the Outer Space Treaty<sup>7</sup>, which prohibits the placing into orbit around the Earth of objects carrying nuclear weapons or other weapons of mass destruction. Russia is a state party to both treaties, which are already in effect, and the blog affirms the concerns expressed by U.S. officials and points out that the plan, if implemented, would clearly violate current international law. Note that the Comprehensive Nuclear-Test-Ban Treaty (CTBT), which is often cited in connection with nuclear test bans, is not yet in force and cannot be applied.<sup>8</sup>

### 3. Concerns about electromagnetic shock waves (EMP) from nuclear explosions in space

Finally, we will examine the background of the affirmation by Strategic Spokesman Kirby of testimony given by the CIA Director to a closed session of the Congressional Intelligence Committee that Russia is developing a nuclear-based ASAT to deter Russia. Russia is developing ASATs because they are nuclear-based and have the potential to

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<sup>6</sup> Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water (Partial Nuclear Test Ban Treaty (PTBT)), 480 UNTS 43 (adopted 5 August 1963, entered into force 10 October 1963).

Article 1 of the Treaty Banning Nuclear Weapons Tests in the Atmosphere, in Outer Space and Under Water (abbreviated as the Partial Test Ban Treaty) states, "1 Each State Party to the present Convention undertakes to prohibit, prevent and refrain from conducting, in any place under its jurisdiction or control, experimental explosions of nuclear weapons and other nuclear explosions in the following environments (2) undertake to prohibit, prevent, and refrain from carrying out

a. In the atmosphere, outside the atmosphere including outer space, and in water including territorial waters and the high seas (hereinafter abbreviated)" and is in violation of the same article because it prohibits nuclear testing in the atmosphere and outer space.

<sup>7</sup> Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (Outer Space Treaty) 1363 UNTS 22 (opened for signature 27 January 1967, entered into force 10 October 1967)

Article 4 of the Convention on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (abbreviated as the Outer Space Treaty) states that "the Parties to the Convention undertake not to place in orbit around the Earth objects carrying nuclear weapons and other weapons of mass destruction of any kind, not to place these weapons on celestial bodies, and not to place them in outer space by any other means. The Parties to the Convention undertake not to place in orbit around the earth any objects carrying nuclear weapons and other weapons of mass destruction of any kind, not to place these weapons in celestial bodies and not to place them in outer space by any other means.

The Moon and other celestial bodies shall be used by all Parties to the Convention exclusively for peaceful purposes. The establishment of military bases, military installations and defensive facilities, the testing of weapons of all types, and the conduct of military exercises on celestial bodies shall be prohibited. The use of military personnel for scientific research and other peaceful purposes shall not be prohibited. The use of all equipment or facilities necessary for the peaceful exploration of the moon or other celestial bodies shall also be prohibited. This provision is in conflict with the same Article, which provides.

<sup>8</sup> Comprehensive Nuclear-Test-Ban Treaty (adopted as UNGA Res 50/245 (17 September 1996) UN Doc A/RES/50/245) 35 ILM 1439 (CTBT).

Article 4, paragraph 11 of the Convention states that "The High Contracting Parties undertake to cooperate with the Organization and other States Parties in improving the verification system and examining the potential verification capabilities of additional surveillance technologies (including electromagnetic shock wave surveillance and satellite surveillance) in order to develop specific measures to enhance the effectiveness of such surveillance. (The adoption of this technology into the international surveillance system was postponed.

generate EMPs.<sup>9</sup> EMPs are powerful pulses of electromagnetic radiation that can damage and destroy electronic equipment and are generated by large solar flares, electromagnetic pulse bombs, and nuclear explosions at altitudes of 30 to 400 km above the Earth. Because of its powerful pulsed electromagnetic waves, an EMP can damage and destroy not only communications and GPS, but also electronic equipment on the ground, potentially disabling critical infrastructure such as communications and power using electronic equipment.

Although details on the status of Russia's ASAT development have not been disclosed as intelligence information, the U.S. government has clearly warned that conducting this test would violate international law, without denying it, so we can assume that there is some movement on the Russian side. In other words, with the recent deterioration of the international situation, such as Russia's invasion of Ukraine, an attack by a high-altitude nuclear explosion electromagnetic shock wave (HEMP) becomes a realistic threat if a nuclear explosion is forced in outer space. Specific damages include: (1) damage or destruction of power supply infrastructure such as power plants and transmission systems; (2) physical destruction of electronic devices, components, or transformers used in electronic equipment due to high voltage; (3) damage to information and communication systems, transportation and transport systems such as railroads, airlines, ships, and buses, financial and banking systems, medical systems, water and sewage systems, building and facility maintenance systems (electricity, water, sewage, elevators, etc.), and other infrastructure that uses power and communications equipment are also foreseen to be damaged or destroyed.<sup>10</sup> Because of the instantaneous and massive destruction of infrastructure, this alleged Russian development of nuclear-based ASATs is an aspect of strong concern.

Report: Yasuhito Fukui, Management and Policy Research Office

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<sup>9</sup> What is an Electromagnetic Pulse, Mechanisms, Principles, and Countermeasures for Damage Caused by HEMP and Other Electromagnetic Pulses, Beyond Our Planet, NTT, 2022.  
URL: <https://www.rd.ntt/se/media/article/0036.html>(as of 06 March 2024)

<sup>10</sup> *ibid.*

### 3. ISCN's Activities Reports

#### 3-1 Meeting with the U.S. on Goal 9

As part of the MEXT Nuclear Security Subsidy Program, joint research on the development of methods for evaluating the attractiveness of nuclear and radioactive materials in nuclear security events and the development of concepts for reducing the attractiveness of nuclear materials is being conducted by the U.S. Department of Energy's National Nuclear Security Administration (DOE/NNSA) and the U.S. National Laboratories and the U.S.-Japan Government Nuclear Security Working Group Goal 9 (Joint Research on Management of Highly Enriched Uranium and Plutonium: Reducing the Attractiveness of Nuclear Materials) is being conducted as<sup>11</sup>. A meeting pertaining to it was held in Washington, D.C., U.S.A., from March 4-6, 2024, with eight participants from NNSA, Sandia National Laboratories, and Oak Ridge National Laboratory, in addition to ISCN.

The first day of the meeting was devoted to discussions on nuclear and radioactive material theft. First, a presentation was made on the research currently being conducted by ISCN on Nuclear Material Accountancy and Control (NMAC) for nuclear security. He reported on the results of the evaluation of the material balance associated with measurement errors and the use of the Goal 9 theft study as the basis for determining the amount of nuclear material stolen by an insider for the purpose of RDD (Radioactive Dispersal Device). The Goal9 team also reported that the Goal9 team in Japan and the U.S. had been working together for a long time. In addition, the Japan-U.S. Goal9 team will participate in the International Conference on Nuclear Security (ICONS) 2024 hosted by the International Atomic Energy Agency and present a paper mainly on probability evaluation among Goal9 theft studies. We confirmed the content of the paper and discussed how to proceed. We are also planning to outreach Goal9 plagiarism research at conferences in the nuclear security field, and discussed how to proceed with the outreach.

On the second day, the participants discussed sabotage of nuclear facilities. The United States proposed a new Malicious Act Tree<sup>12</sup> specifically for sabotage, and the Japanese side generally agreed. The Japanese side generally agreed with the proposal. Equipment Failure (RD-EF), Dispersal by External Means (RD-DbE), It was agreed to start the evaluation with RD-EF for light water reactors first. He also introduced the software PathTrace developed by Sandia National Laboratories, which is a tool for quantitative analysis of vulnerability of nuclear facilities to terrorist acts and contributes to security improvement by calculating the probability of interception and detection of multiple attack paths and generating an adversary sequence diagram. It contributes to security improvement by calculating the probability of interception and detection of multiple attack paths and generating an adversary sequence diagram. The U.S. side is willing to use this software to evaluate the probability of success for various adversary scenarios,

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<sup>11</sup> Ministry of Foreign Affairs of Japan, "U.S.-Japan Nuclear Security Working Group (NSWG)," November 21, 2023, [https://www.mofa.go.jp/mofaj/dns/n\\_s\\_ne/page4\\_002303.html](https://www.mofa.go.jp/mofaj/dns/n_s_ne/page4_002303.html)

<sup>12</sup> Illegal acts that pose a nuclear security threat to nuclear fuel cycle facilities are referred to as Malicious Acts and are systematically illustrated in the Malicious Act Tree.

and the Japanese side generally agreed to use PathTrace, subject to some conditions. The Japanese side also discussed how to apply a statistical model called the Rasch model to evaluate the probability of sabotage when the event tree of sabotage is wide-ranging.

On the third day, we continued our discussion on sabotage. However, since a model of an actual LWR in use cannot be used from the viewpoint of nuclear material protection, it is necessary to use a virtual LWR that has been designed in as much detail as possible. Since the U.S. has such a virtual LWR model, it was agreed that Goal9 would use it to proceed with the analysis. The U.S. side also proposed to use the MELCOR/SOARCA code for sabotage analysis. The reason was that there were already examples of analyses using MELCOR/SOARCA to evaluate source terms during severe accidents involving the dispersal of significant radioactive materials, and that using them for sabotage would be cost-effective. The Japanese side agreed with this. Finally, quantification of the results of sabotage events and future plans were discussed.

Report: Shiba, Technology Development Promotion Office

## 4. Column

### 4-1 Operation of CTBT Radionuclide Monitoring Station - Way to certification of the upgraded automatic unit for Noble Gas Acquisition

The CTBT prohibits the experimental detonation of nuclear weapons and other nuclear explosions in any space, including outer space, in the atmosphere, underwater, and underground, and establishes a system to verify compliance by member states, etc. The CTBT establishes an international monitoring system consisting of certified monitoring stations for the detection of nuclear tests (seismic, radionuclide, The CTBT provides for the establishment of an international monitoring system consisting of four types of certified monitoring stations (seismic, radionuclide, underwater sonic, and micro-pressure vibration) for the purpose of detecting nuclear tests.

The CTBT Technical Cooperation Office of ISCN operates two CTBT radionuclide monitoring stations, Okinawa Station (RN37, Onna-mura, Kunigami-gun, Okinawa Prefecture) and Takasaki Station (RN38, Takasaki City, Gunma Prefecture). Particulate radionuclides are measured at RN37, and particulate radionuclides and radioactive noble gases are measured at RN38. The author has been involved in this work since April 2021, and performs necessary work as a station operator under the guidance of the station manager for the stable operation of both stations.



Okinawa Station (RN37)



Takasaki Station (RN38)

The Radionuclide Aerosol Sampler Analyzer (RASA) is used to measure particulate nuclides, and the Swedish Automatic Unit for Noble Gas Acquisition (SAUNA) is used to measure radioactive noble gases. Both instruments are fully automated and operate 24 hours a day, 365 days a year to collect samples, identify radionuclides in the samples, and measure atmospheric concentrations of the radionuclides. Data on atmospheric concentrations of radionuclides and the status of the equipment are automatically and regularly transmitted to the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) in Vienna.

As long as the equipment is operating smoothly, observations are carried out fully automatically and without any problems. In reality, however, various malfunctions occur due to the aging of the equipment itself or malfunctions of its components. Each time a problem occurs, we communicate with the manufacturer of the equipment and the CTBTO staff in charge, and solve the problem with the cooperation of the local operators to whom we outsource the work of the observatories. Thanks to everyone's

cooperation, both observatories boast a high data acquisition rate that meets the CTBTO's technical requirements.

As I continued to gain experience in the station operation while dealing with equipment that malfunctioned at whim in this manner, I had the task of upgrading RN38's noble gas instrument SAUNA in May 2023. It was a unique opportunity for me to witness the exciting task of updating the instrument. There was a sense of anticipation that I would be able to conduct observations with a more powerful and stable instrument.

The work took place over a period of 12 days. My role was to help the manufacturer's technicians from Sweden to make sure that the work went smoothly, and in no time at all the new equipment was being replaced by two technicians.

After all the equipment was assembled, various checks and adjustments were made, and finally the device was completed. The manufacturer's engineers left for home with smiles on their faces, along with a lucky "Takasaki Dharma fan" that I gave them as a gift to celebrate the completion of the device.



A lucky Takasaki Dharma fan

After the upgrade of SAUNA, the system operated smoothly...but there were a series of initial problems with the pumps and software, and we were forced to deal with them each time. Currently, the homework items assigned to the OIST have been resolved and we are approaching re-certification.

If the CTBTO's conditions are met, the company will be re-certified and officially put into operation, but this will require stable operation for a while, which is expected to take several more months. We would like to make steady progress, following Dharma's example of falling down seven times and rising up eight times.

Personally, although it contradicts my initial expectations, I am finding enjoyment in solving the problems. With each glitch, I seem to become more familiar with the equipment and more attached to it (the image of a handful of my own children?). (Image of a handful of children?).



Although it takes a lot of effort to put the new equipment into operation, we will continue to work hard, believing that we will be very happy when the equipment is re-certified and put back into normal operation.

Report: Shinichi Sakurai, CTBT Technical Cooperation Office

editorial postscript

March 8 is the International Women's Day, which was designated by the United Nations as a day to celebrate the wonderful achievements and courageous actions of women. In my personal experience, the status of women has already improved to an extent that is incomparable to when I was younger. When I first entered the science field in high school, there were only five female students out of 48 in my physics class, and we could not even form a volleyball team, which interfered with physical education classes and class matches. I was shocked to be greeted by a life-size poster of a woman in a swimsuit in the student room of a university laboratory. Smoking in the lab was still commonplace. The presence of women in laboratories was not expected. When my generation was a student, the percentage of women began to increase due to policies such as the emphasis on graduate school. The real pioneers were the women of the generation much older than mine, and I would like to express my sincere respect for their hard work. However, in my generation, women were still increasing mainly in biology, agriculture, and architecture, and there were still very few women in physics and engineering (especially in graduate school). I took up the challenge because of my competitive and daredevil nature, but I was desperate just to continue. The years passed by and I realized that the situation regarding diversity was changing at a tremendous pace. In the science and physics class at my child's high school, girls make up almost half of the class. More and more girls are deciding that science is the way to go when they consider their future career. When I see so many girls in the physics class at school events, I can hardly contain my joy and excitement. By the time my children's generation reaches my age, the percentage of women in technical research fields will have risen without difficulty. I sincerely hope that the situation will be such that men and women will be able to shine equally, without the need for awareness-raising such as on International Women's Day.

(A.F.)

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