COMPREHENSIVE SUMMARY OF SAFEGUARDS IN JAPAN

March 2019

(Updated in March 2021)

Japan Safeguards Office (JSGO)

Nuclear Regulation Authority

Table of Contents

1. Overview 3
2. Legal Framework to Ensure Peaceful Uses of Nuclear Energy in Japan 5
3. Organizations 7
3.1. Ministry of Foreign Affairs 7
3.2. Atomic Energy Commission 7
3.3. Nuclear Regulation Authority 8
3.3.1. Commissioners 8
3.3.2. Japan Safeguards Office (JSGO) in the Secretariat of NRA 8
3.4. Nuclear Material Control Center 8
3.5. Other Government Entities 9
3.6. Japan Atomic Energy Agency 9
3.6.1. Clean Laboratory for Environmental Analysis and Research (CLEAR) 10
3.6.2. Integrated Support Center for Nuclear Non-Proliferation and Nuclear Security (ISCN) 10
4. Safeguards Activities 11
4.1. Nuclear Facilities and LOFs under Safeguards Agreement 11
4.2. Outline of Safeguards Implementation in Japan 12
4.3. Information Processing and Provision 14
4.4. In-field Verification Activities and Associated Activities 16
4.4.1. Inspections and Design Information Examination and Verification 16
4.4.2. Rokkasho Reprocessing Plant (RRP) and Large-scale MOX Fabrication Plant (J-MOX) 17
4.4.3. Complementary Access 20
4.5. Recent Safeguards Topics 21
4.5.1. Consequences of the Great East Japan Earthquake 21
4.5.2. Fukushima Daiichi NPS 21
4.5.3. Fukushima Task Force 23
4.5.4. Safeguards Activities for Decommissioning Facilities 27
4.5.5. Consultation of Safeguards Activities under State Level Approaches for Japan 27

4.5.6. Removal of HEU and Separated Pu from Research Reactors and Critical Assemblies..28
4.6. Fact Sheet....28
5. Cooperation with the IAEA....28
5.1. Mechanism of Information Sharing and Coordination between the IAEA and Japan....28
5.2. Japan Support Programme for Agency Safeguards (JASPAS)....29
6. Capacity Building....30
6.1. Qualification and Training for NRA Safeguards Inspectors....30
6.2. Training for Designated Safeguards Inspectors in NMCC....30
6.3. Assistance in Operators' Capacity Building on Nuclear Material Accounting....30

EDITORIAL NOTE

This document has been prepared by the contributors within JSGO having necessary support from other relevant organizations, and has not been edited by the editorial staff of the Nuclear Regulation Authority.

1. Overview

Japan has been promoting the research, development, and utilization of nuclear energy exclusively for peaceful purposes since the beginning of its nuclear programme, in accordance with the Atomic Energy Basic Act enacted in 1955.

The International Atomic Energy Agency (IAEA) plays a central role in promoting the peaceful uses of nuclear energy in the world. Through close cooperation with the IAEA, Japan has contributed to the development of IAEA safeguards from its early stage while fulfilling its commitment. Examples of the initial stage of cooperation between the IAEA and Japan are the conclusion of the world's first safeguards agreement[1] with the IAEA in 1959 and the world's first safeguards transfer agreement[2] in 1963.

In 1976, the government of Japan acceded to the Treaty on Non-proliferation of Nuclear Weapons (NPT) and concluded a comprehensive safeguards agreement[3] with the IAEA in 1977. Since then, Japan has been accepting IAEA safeguards on all nuclear material within the territory of Japan. In 1972, prior to the start of implementation of full scope safeguards in Japan, Nuclear Material Control Center (NMCC), sole technical support organization in the field of safeguards in Japan, was established. Along with the expansion of its role and function, NMCC has supported the development of Japan's State System of Accounting for and Control of Nuclear Material (SSAC). In proportion to the development of nuclear fuel cycle and safeguards activities in Japan, the cooperative relationship between the IAEA and Japan has also expanded and deepened. The IAEA set up its regional office in Tokyo in 1984. Since 2005, the IAEA and Japan have jointly operated the On-site Safeguards Laboratory (OSL) at the Rokkasho Reprocessing Plant (RRP) of Japan Nuclear Fuel Limited (JNFL) in Aomori Prefecture.

Japan has actively cooperated in strengthening the effectiveness and improving the efficiency of IAEA safeguards. The government of Japan concluded the Additional Protocol [4] to the safeguards agreement with the IAEA in 1999 as the first nation operating nuclear power reactors. The IAEA secretariat, for the first time, drew the broader conclusion for Japan on the grounds that it found no indication of the diversion of nuclear material placed under safeguards and no indication of undeclared nuclear material or activities for the State as a whole during 2003 and presented its conclusion to the Board of Governors meeting in June 2004. In September 2004, the IAEA started the

[1] INFCIRC/3: AGREEMENT BETWEEN THE INTERNATIONAL ATOMIC ENERGY AGENCY AND THE GOVERNMENT OF CANADA FOR THE SUPPLY BY CANADA OF URANIUM TO THE AGENCY

[2] INFCIRC/47: THE AGREEMENT FOR THE APPLICATION OF SAFEGUARDS. BY THE AGENCY TO THE BILATERAL AGREEMENT BETWEEN. JAPAN AND THE UNITED STATES OF AMERICA

[3] INFCIRC/255: THE AGREEMENT BETWEENT THE GOVERNMENT OF JAPAN AND THE INTERNATIONAL ATOMIC ENERGY AGENCY IN IMPLEMENTATION OF ARTICLE III.1 AND 4 OF THE TREATY ON THE NON-PROLIFERATION OF NUCELAR WEAPONS

[4] INFCIRC/255/Add.1: PROTOCOL ADDITIONAL TO THE AGREEMENT BETWEENT THE GOVERNMENT OF JAPAN AND THE INTERNATIONAL ATOMIC ENERGY AGENCY IN IMPLEMENTATION OF ARTICLE III.1 AND 4 OF THE TREATY ON THE NON-PROLIFERATION OF NUCELAR WEAPONS

implementation of Integrated Safeguards in Japan as the first nation among those with extensive nuclear activities. To deal with the broad range of nuclear facilities and LOFs in Japan, the application of the Integrated Safeguards Approaches was expanded in a stepwise manner and reached full coverage of all nuclear facilities and LOFs in Japan in January 2011.

The Great East Japan Earthquake, which occurred in March 2011, greatly affected the safeguards activities at various nuclear facilities in Japan. Although safeguards implementation at most of those facilities resumed shortly, implementation of safeguards at the severely damaged Fukushima Daiichi Power Station of the Tokyo Electric Power Company remained a challenge. In April 2013, the Nuclear Regulation Authority (NRA), which had been established on the basis of the lessons learned from the accident at Fukushima Daiichi, took over regulatory responsibility for the implementation of safeguards in Japan. By the end of 2014, all the nuclear material in Fukushima Daiichi was re-verified by the IAEA, except for the material remaining in Units 1 through 3, which are inaccessible because of the high radiation dose as a result of the damage to the reactor cores. All Units 1 through 3 are, however, under IAEA surveillance and monitoring. As a result of IAEA verification activities and the evaluation of all relevant information throughout Japan, broader conclusions have successively been drawn for Japan since 2003.

In addition to the above activities, Japan has supported the IAEA in developing safeguards technology through the Japan Support Programme for Agency Safeguards (JASPAS) since 1981. In this connection, the Japan Atomic Energy Agency (JAEA) operates the Clean Laboratory for Environmental Analysis and Research (CLEAR) as a member of the IAEA safeguards network laboratories and the JAEA Integrated Support Center for Nuclear Non-proliferation and Nuclear Security (ISCN) organizes various capacity building activities for other member states personnel to enhance the functions of their SSACs. Moreover, as a member of the Asia-Pacific Safeguards Network (APSN), Japan shares its safeguards knowledge with other member states in the Asia-Pacific region.

Furthermore, Japan concluded bilateral nuclear cooperation agreements with Australia, Canada, China, the European Atomic Energy Community (EURATOM), France, India, Jordan, Kazakhstan, Republic of Korea, Russia, Turkey, United Arab Emirates, United Kingdom, United States, and Viet Nam; Japan complies with the obligations of these agreements including the control of material and other items subject to these agreements.

In summary, Japan has honored its commitments to the international community on the use of nuclear energy for exclusively peaceful purposes, has fulfilled the requirements from agreements

with the IAEA and partner States, and has actively enhanced the international non-proliferation regime.

2. Legal Framework to Ensure Peaceful Uses of Nuclear Energy in Japan

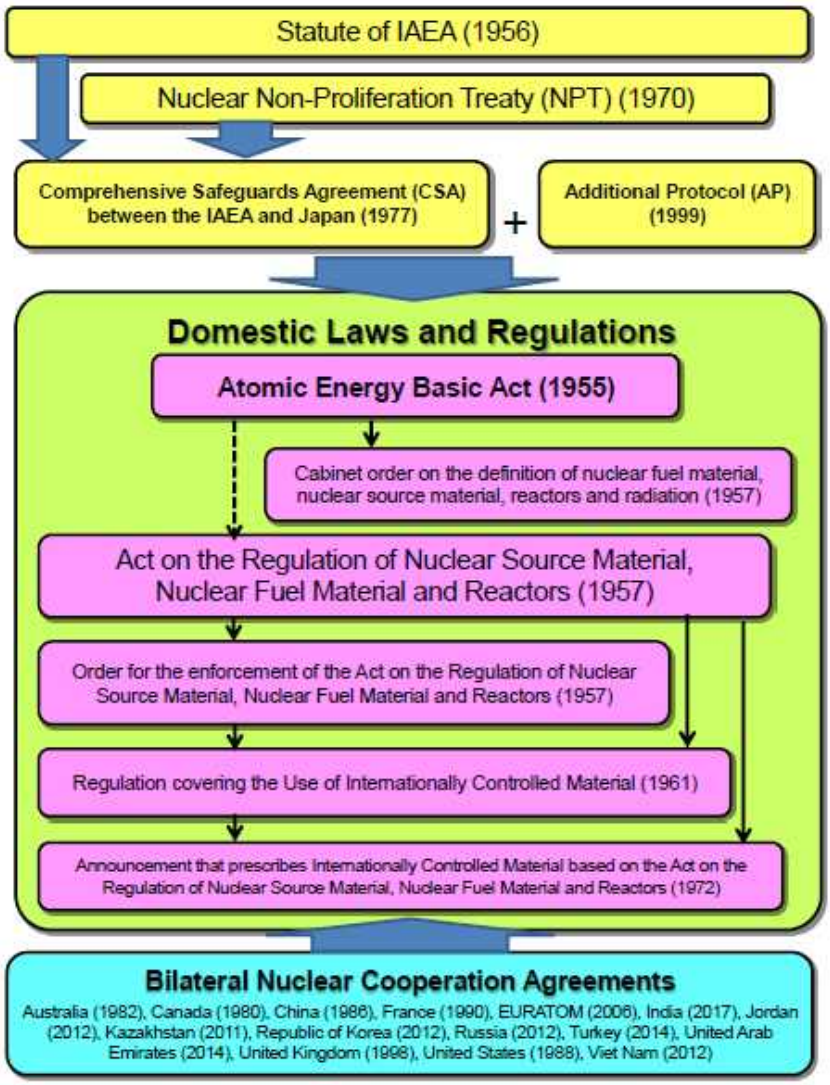
Japan's uses of nuclear energy have been exclusively for peaceful purposes. This fundamental principle is embodied in multiple layers of international agreements and domestic laws and regulations. The international and domestic legal framework includes the foundation for implementing safeguards as the measure to provide credible assurances to the international community that Japan is honoring its international commitments.

The Atomic Energy Basic Act (Act No. 186 of December 19, 1955) is at the top of the legislative framework and defines the basic philosophy for utilization of nuclear energy in Japan. Article 2 of the Atomic Energy Basic Act prescribes the basic policy of the utilization of nuclear energy as follows: "The research, development and utilization of nuclear energy shall be limited to peaceful purposes, shall aim at ensuring safety, and shall be performed independently under democratic administration, and the results obtained shall be made public so as to actively contribute to international cooperation."

This national principle is reflected in commitments with the international community. Japan has concluded bilateral nuclear cooperation agreements with thirteen nations,[5] EURATOM, and a safeguards agreement with the IAEA. The agreement with the IAEA was concluded in 1957 for the supply of uranium for the research reactor project JRR-3. Bilateral cooperation agreements provided the foundation for the implementation of international safeguards at the initial stage of Japanese nuclear development and have the potential to act as bases for safeguards implementation after the IAEA started implementation of full scope safeguards. In 1976, Japan acceded to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT). Under Article 3 of the NPT, each non-nuclear-weapon state party to the Treaty is obliged to accept international safeguards as set forth in an agreement to be negotiated and concluded with the IAEA on all nuclear material in all peaceful nuclear activities within the territory of the state, under its jurisdiction, or carried out under its control anywhere. Japan's Comprehensive Safeguards Agreement with the IAEA (INFCIRC/255) entered into effect in 1977. In 1999, two years after the Model Additional Protocol was adopted at the Board of Governors of the IAEA as a measure to increase the transparency of State nuclear related activities, Japan concluded the Additional Protocol to the safeguards agreement with the IAEA (INFCIRC/255/Add. 1) as the first country operating nuclear power reactors.

In order to honor these international commitments, Japan had to incorporate the requirements of the international agreements into domestic legislation and regulations. On the basis of the provisions

[5] Australia, Canada, China, France, India, Jordan, Kazakhstan, Republic of Korea, Russia, Turkey, United Arab Emirates, United Kingdom, United States, and Viet Nam (as of March, 2019).



Note: Over the years, bilateral nuclear cooperation agreements have been concluded or amended multiple times and domestic laws and regulations have been amended. For bilateral cooperation agreements, the years of entry into force of the currently valid agreements are shown and for domestic laws and regulations, the years of original legislation are shown.

of the Atomic Energy Basic Act, the Act for the Regulation of Nuclear Source Material, Nuclear Fuel Material, and Reactors (Act No. 166 of June 10, 1957; hereinafter referred to as the "Reactor Regulation Act") was enacted as the main law for implementation of safeguards in Japan. This law restricts the use of nuclear material to the authorized licensees according to their business or purposes and obliges them to fulfill obligations from the international agreements, including setting up a proper system for accounting for and control of nuclear material at each nuclear facility and LOF, recording, reporting, and acceptance of inspections and other in-field verifications. This law also authorizes the Nuclear Regulation Authority (NRA) as the state authority to oversee the safeguards implementation in Japan and designates Nuclear Material Control Center (NMCC) as a special agency to carry out the analysis of information and other processing work and to conduct all or part of the safeguards inspections and associated work. Further details of the implementation of safeguards in Japan are prescribed by the Order for the Enforcement of the Reactor Regulation Act (Cabinet Order No. 324 of November 21, 1957); Regulation covering the Use of Internationally Controlled Material (Ministerial Ordinance No. 50 issued by Prime Minister's office on September 29, 1961); and the Announcement that prescribes Internationally Controlled Material based on the Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material, and Reactors (Announcement No. 49 issued by Prime Minister's Office on October 16, 1972).

3. Organizations

The Atomic Energy Basic Act specifies that nuclear research, development, and utilization in Japan shall be promoted, limiting these activities to peaceful purposes and making it a principle to assure their safety by making transparent the results and promoting international cooperation with a view to securing energy resources for the future, promoting science and industries, and thereby contributing to the improvement of both welfare of human society and the living standard of the people. Based on the law, the Atomic Energy Commission (AEC) was set up on 1 January 1956, to implement national policies for deliberately pursuing these goals or nuclear policies in a democratic manner.

Most of the obligations defined in the safeguards agreement, the additional protocol, and bilateral nuclear cooperation agreements are transposed into the Reactor Regulation Act and relevant regulations (see section 2 for details).

Under the Reactor Regulation Act, the Nuclear Regulation Authority (NRA) is authorized to exercise and enforce the necessary action to implement safeguards in Japan. This includes the authority to issue licenses for the handling of nuclear material in various nuclear businesses, approve accounting provisions, collect information to be provided to the IAEA, and carry out inspections and other in-field verification activities. The NRA was established in September 2012, and it became responsible for implementing safeguards in Japan since April 2013. In the NRA, the Japan Safeguards Office (JSGO) administers the duty of implementation of safeguards.

The Reactor Regulation Act also provides the legal basis where the NRA can delegate parts of its responsibility for implementing safeguards to designated organizations. Based on this legal framework, NMCC, a public interest incorporated foundation, has a substantial role in implementing safeguards in Japan as the designated organization for information processing and for implementing safeguards inspections and associated activities.

3.1. Ministry of Foreign Affairs

Ministry of Foreign Affairs (MOFA) has the responsibility for concluding international agreements and subordinate legal documents. While JSGO and NMCC have ordinary contact with IAEA inspectors, official communications are made through diplomatic channels. Together with JSGO inspectors, MOFA officials accompany IAEA inspectors during complementary accesses. The MOFA also organizes the Joint Committee Meeting, which is the supreme body to discuss safeguards issues between the IAEA and the government of Japan.

3.2. Atomic Energy Commission

The mission of the Atomic Energy Commission is to plan, deliberate, and decide on the basic policies or strategies for the promotion of research, development, and utilization of nuclear energy. From the viewpoint of peaceful uses of nuclear energy and nuclear non-proliferation, the commission has monitored the situation of nuclear activities in Japan and abroad, formulated decisions, and issued statements. In line with the principle of the Japanese government that Japan does not possess plutonium reserves whose purpose of utilization is unspecified, the commission has also issued annual reports on the status of plutonium management in Japan in order to assure the transparency of plutonium management including usage and stockpile both within and outside of Japan.

3.3. Nuclear Regulation Authority

3.3.1. Commissioners

Chairman: Dr. FUKETA Toyoshi
Commissioner: Dr. TANAKA Satoru[6]
Commissioner: Dr. YAMANAKA Shinsuke
Commissioner: Dr. BAN Nobuhiko
Commissioner: Dr. ISHIWATARI Akira

3.3.2. Japan Safeguards Office (JSGO) in the Secretariat of NRA

The main office of JSGO is located within the headquarters of the NRA in Tokyo. JSGO has a regional office in the Rokkasho Safeguards Center in Aomori Prefecture. Based on the Act for Establishment of the Nuclear Regulation Authority (Act No. 47 of 2012) and the relevant enforcement order and regulation, JSGO takes charge of affairs concerning regulations for implementing safeguards based on international commitments, and other regulations for ensuring the peaceful use of nuclear energy. JSGO's missions are as follows:

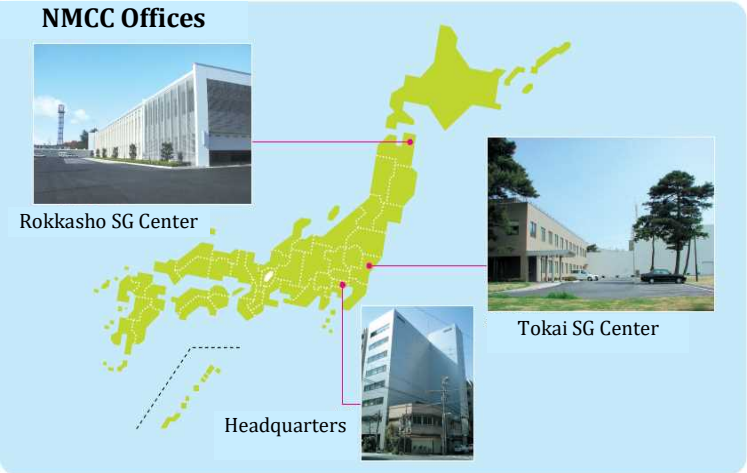
- To consolidate accountancy reports, design information, additional protocol declarations from operators and other relevant entities, and to submit them to the IAEA through MOFA;
- To coordinate various safeguards activities, including inspections, and design information examinations and verifications among the IAEA, operators, and the State Authorities (JSGO/NMCC/MOFA);
- To conduct domestic in-field verification activities mainly in conjunction with the IAEA design information verifications and complementary accesses;
- To give orders to NMCC so that it can fulfill its duty with sufficient authority;
- To share information relevant to safeguards implementation and consult with the IAEA, operators, and the State Authorities about the issues arising from the implementation of safeguards and how to resolve them; and
- To secure resource to implement safeguards, etc.

In addition, some nuclear safety inspectors in other NRA regional offices occasionally serve as safeguards inspectors to deal with complementary accesses and some short-notice inspections.

3.4. Nuclear Material Control Center

Nuclear Material Control Center (NMCC) was founded in 1972 to support the implementation of safeguards in Japan. NMCC is a non-governmental organization in the form of a public interest

[6] Commissioner Dr. Satoru Tanaka primarily oversees affairs related to safeguards.



incorporated foundation, while most of its budget comes from the government. The total budget is 3.1 billion yen (c.a. 26 million USD, 1 USD=120 yen) in Japanese fiscal year 2018. It has about 160 personnel working in three locations, i.e. the headquarters in Tokyo, two Safeguards Centers in Tokai, Ibaraki Prefecture, and Rokkasho, Aomori Prefecture. The president of NMCC is Mr. Kazuo Shimomura.

The role of NMCC has expanded in line with the development of safeguards in Japan. Under the Reactor Regulation Act, NMCC has carried out information processing since 1977 and State inspections since 1999. The detailed functions of NMCC in the Japanese SSAC are described in section 4.

3.5. Other Government Entities

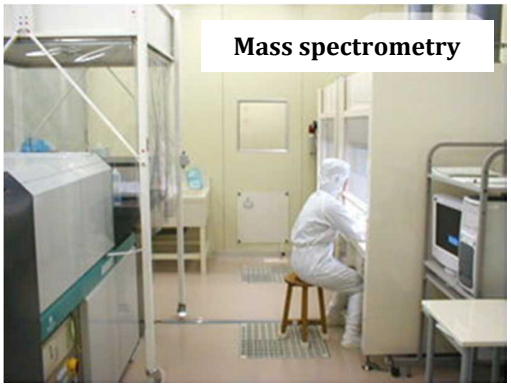
The Ministry of Economy, Trade and Industry (METI) provides trade information through MOFA as declarations under Article 2(a)(ix) of the additional protocol. METI and the Ministry of Education, Culture, Sports, Science and Technology (MEXT) provides the NRA with information on nuclear fuel cycle-related research and development activities not involving nuclear material for preparation of additional protocol declarations under Article 2(a)(i) of additional protocol. In addition, MEXT supports the activities of the Integrated Support Center for Nuclear Nonproliferation and Nuclear Security (ISCN) of the Japan Atomic Energy Agency (JAEA).

3.6. Japan Atomic Energy Agency

Japan Atomic Energy Agency (JAEA) is the integrated institute for research and development of atomic energy in Japan. JAEA has played a key role in the development of safeguards implementation in Japan along with its wide-ranging nuclear activities. It has developed various safeguards technologies for JAEA facilities based on international collaborations, such as the Hexapartite Safeguards Project, Tokai Advanced Safeguards Technology Exercise (TASTEX). In addition, unattended non-destructive assay (NDA) systems and data acquisition systems were developed in order to meet the more modern facility with many automated apparatuses. These contributed to establishing the safeguards systems for the commercial size plants in Rokkasho as Safeguards by Designn. Utilizing its technical capabilities, JAEA also contributes to the implementation of international safeguards through support of the IAEA and other member states.

3.6.1. Clean Laboratory for Environmental Analysis and Research (CLEAR)

Any nuclear facility discharges trace amounts of nuclear material no matter how leak-tight it is constructed. The environmental sample analysis method is a powerful measure in the detection of such trace amounts of nuclear material and thus was introduced to strengthen the safeguards system based on the Programme 93+2 of the IAEA. The Clean Laboratory for Environmental Analysis and Research (CLEAR) of JAEA (then JAERI) commenced operation in 2001 and became a member of the IAEA's Network Analytical Laboratories in 2003. According to requests from the IAEA, it conducts both bulk and particle analyses of environmental samples taken by IAEA inspectors all over the world and sent from the IAEA. In order to improve its capability, CLEAR continues R&D activities.



Clean Laboratory for Environmental Analysis and Research (CLEAR)
(Photo provided by JAEA)

3.6.2. Integrated Support Center for Nuclear Non-Proliferation and Nuclear Security (ISCN)

International Training Course on SSAC and Hiroshima Visit
(Photo provided by JAEA)

Human resources are a crucial component of the international safeguards system both in member states and the IAEA. In 1985, the Japan Atomic Energy Research Institute (JAERI, one of the precursors of the JAEA) organized the first regional training courses on safeguards for participants from the Asia-Pacific region. The JAERI held such courses initially in alternate shifts with Australia and continued them by varying the States to be invited, while the main focus had been placed on the Asia-Pacific regions.

According to the Japanese government announcement at the Nuclear Security Summit in Washington, DC, in April 2010, the Integrated Support Center for Nuclear Non-Proliferation and Nuclear Security (ISCN) was established under the JAEA in December 2010. Since its establishment, ISCN has actively organized various bilateral seminars and workshops, international training courses with and without focus on regions, and some training courses for IAEA personnel, such as a training course on inspection methods for reprocessing processes both at the JAEA experimental facilities and the Tokai Reprocessing Plant (TRP). In addition to the human capital development, ISCN has also been making efforts to research fundamental science and technologies that could contribute to international safeguards.

Training on Safeguarding Reprocessing Plants
(Photo provided by JAEA)

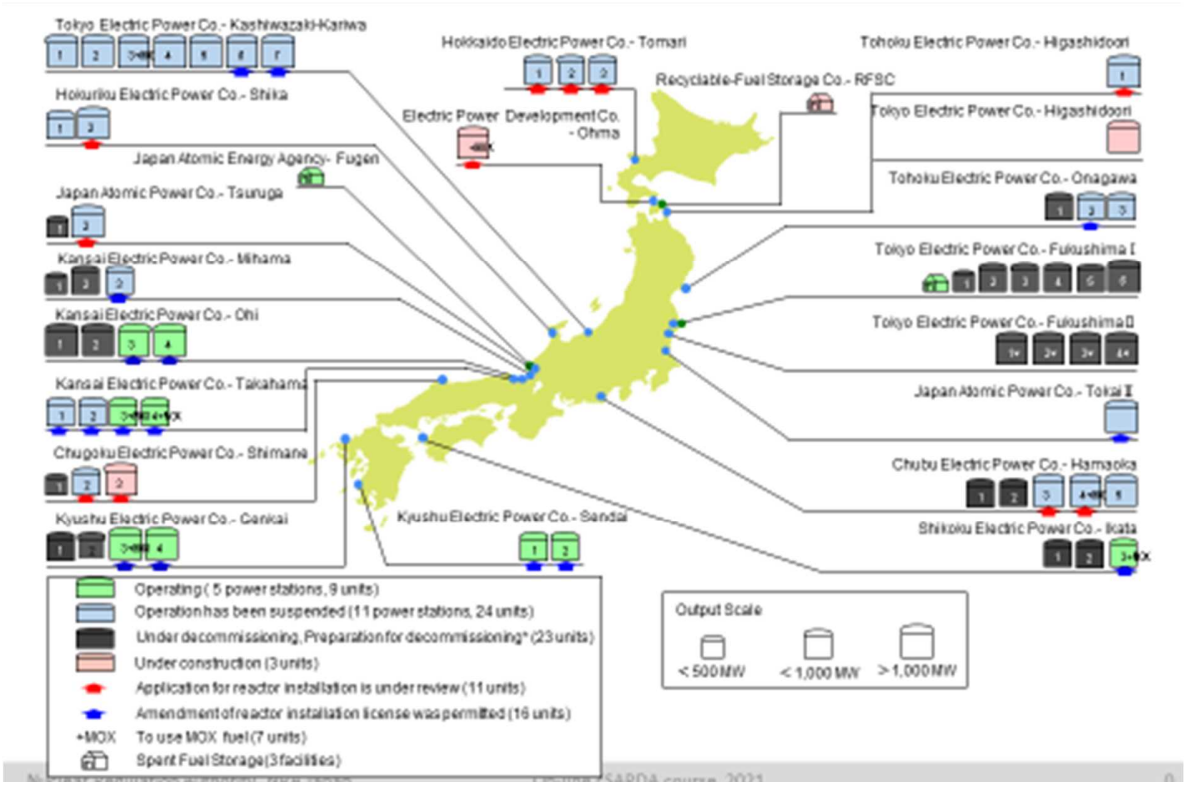
4. Safeguards Activities

4.1. Nuclear Facilities and LOFs under Safeguards Agreement

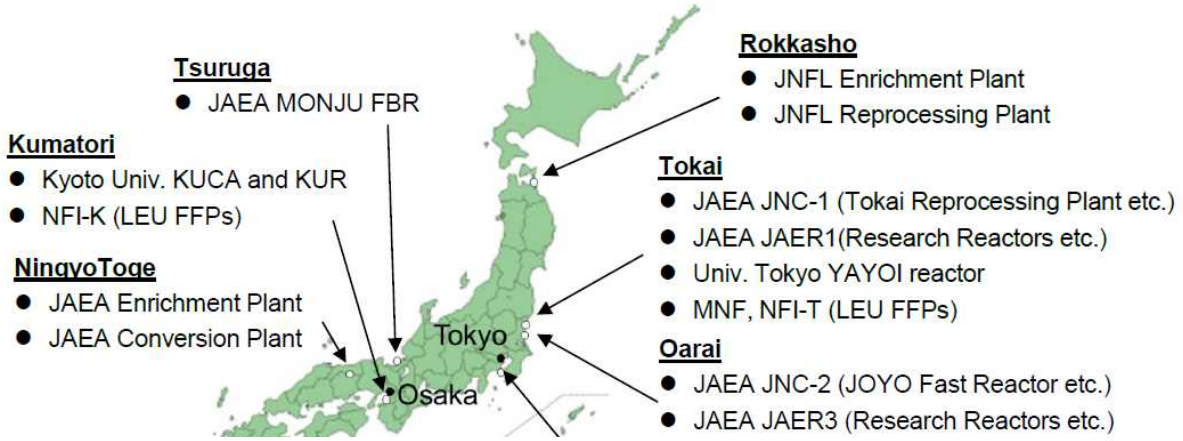
In accordance with the safeguards agreement, the NRA maintains the State System of Accounting for and Control of Nuclear Material (SSAC) that covers all nuclear material in Japan. This includes 116 nuclear facilities and 195 locations outside facilities (LOFs) as of the end of December 2017. These facilities and LOFs are subject to IAEA inspections while the frequency and intensity of inspections vary considerably.

In addition, the NRA collects information on nuclear material used by about 1,800 licensees who use a small amount of nuclear material (depleted uranium or natural uranium up to 300 grams or thorium up to 900 grams) for non-nuclear purposes, e.g. as stain for electron-microscopy. While such nuclear material is exempted from safeguards according to the provisions of the safeguards agreement, the amount of exempted nuclear material in each location is voluntarily reported to the IAEA on an annual basis.

After the Fukushima accident, the newly established NRA issued the New Safety Standards for Nuclear Power Stations and the New Regulatory Requirements for Nuclear Fuel Facilities, Research Reactors, and Nuclear Waste Storage/Disposal Facilities and requested operators to satisfy these standards and requirements. Nuclear facilities have been going through rigorous safety reviews under these standards and requirements, and most of the facilities have been put on standby. Although the operational status affects the frequency and contents of safeguards implementation, safeguards are being applied to all facilities and LOFs in Japan, including the Fukushima Daiichi Power Station. Major facilities subject to safeguards in Japan are shown below.



Operational status of Nuclear Power Plants and Spent Fuel storages in Japan
(As of 31 December 2020)



Major Facilities other than Nuclear Power Plants

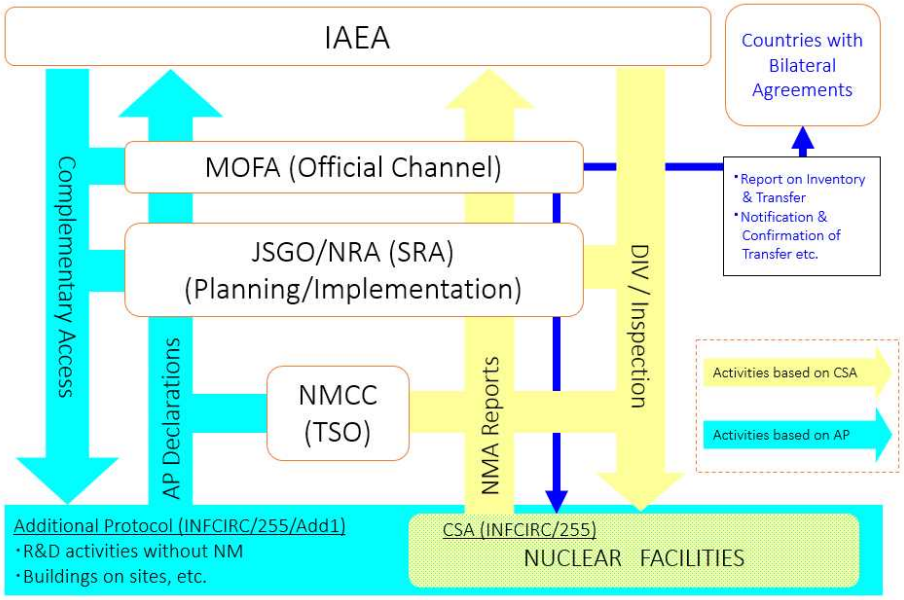
● GNF-J (LEU FFPs)

Major Facilities under Safeguards other than Nuclear Power Plants

4.2. Outline of Safeguards Implementation in Japan

In order to fulfill the requirements of the safeguards agreement and the additional protocol with the IAEA and of the bilateral nuclear cooperation agreements, the government of Japan has established

and maintained the SSAC. Operators of nuclear facilities and LOFs are obliged to establish an adequate accounting system for nuclear material and other materials subject to bilateral cooperation agreements and to provide the NRA with the necessary information under the Reactor Regulation Act. The information submitted to the NRA is forwarded to NMCC and then checked and transformed into reports with appropriate formats. Processed reports are submitted from the NRA through MOFA to the IAEA and partner States with bilateral agreements. Similarly, most of the information needed for additional protocol declarations is submitted to the NRA and then checked and translated by NMCC for submission from the NRA through MOFA to the IAEA. NMCC and JSGO conduct State inspections at facilities and LOFs in conjunction with IAEA inspections. JSGO and MOFA accompany the IAEA to facilitate smooth implementation of complementary accesses.



As the result of a rigorous evaluation based on all information obtained through safeguards implementation based on the safeguards agreement and the additional protocol, as well as other sources, the IAEA secretariat drew the first broader conclusion for Japan that all the nuclear material had remained in peaceful activities in 2003. Such broader conclusions have been drawn for successive years.

After the first broader conclusion for 2003 was drawn in June 2004, integrated safeguards started to be implemented in Japan in 2004. Integrated Safeguards refer to the optimum combination of all safeguards measures available to the IAEA under comprehensive safeguards agreements and additional protocols to achieve maximum effectiveness and efficiency in meeting the Agency´s safeguards obligations. In order to cover the wide range of nuclear activities in Japan, facility level and site level integrated safeguards approaches have been developed and implemented in a stepwise manner as shown below.

Integrated Safeguards Approaches for Facilities

2004 Light Water Reactors without MOX, Research Reactors and Critical Assemblies (RRCAs), Spent Fuel Storage Facilities

2005 Light Water Reactors with MOX, Depleted, Natural and Low Enriched Uranium Fabrication Facilities

2008 Rokkasho Reprocessing Plant

2011 Small Facilities and LOFs

Integrated Safeguards Approaches for Sites

2008 JNC-1 site (TRP, PCDF, PPFF, PFPF, CPF and R&D Facilities)

2009 JNC-4 site (Monju Fast Breeder Reactor)

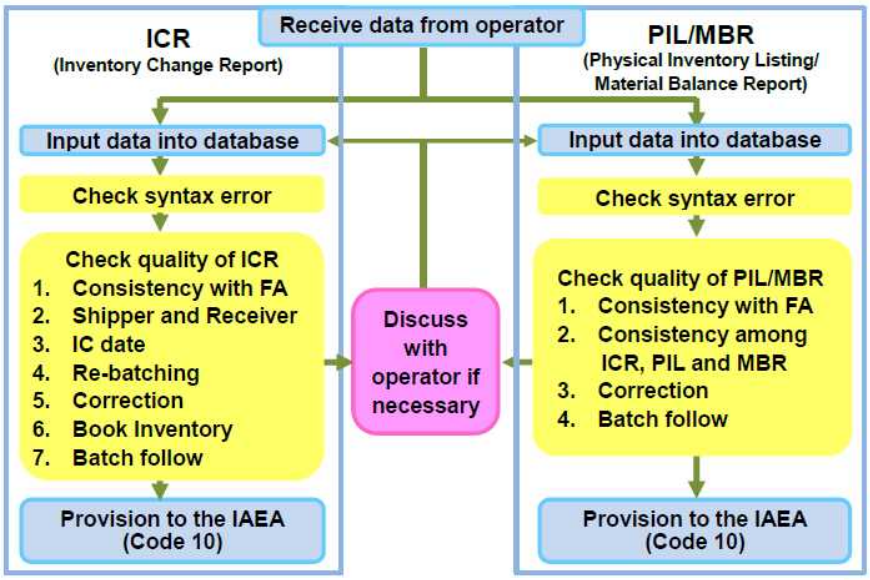
2010 JNC-2 site (Joyo Fast Reactor, Critical Assembly, etc. in Oarai of JAEA)

2011 JNFL-2 site (Rokkasho Enrichment Plant and etc.), JNC-5 (Ningyo-Toge Enrichment Plant and R&D Facilities)

As integrated safeguards approaches actively employ random inspections with short notice, integrated safeguards rehearsals were conducted during the development of the approaches and prior to their actual implementation with an aim to implement integrated safeguards in a well-organized manner. While integrated safeguards have contributed to saving IAEA in-field verification efforts especially at some facilities like LWRs and LEU Fuel Fabrication Facilities, the State and operators have to be prepared for short-notice inspections. Based on implementation experiences and change of situation, integrated safeguards approaches have been reviewed and revised as necessary.

4.3. Information Processing and Provision

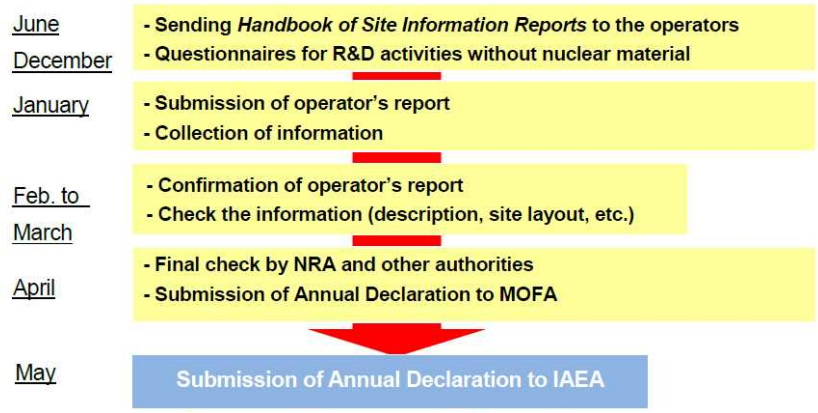
Information declared from member states is the foundation of IAEA safeguards implementation. Japan has established a strong information processing mechanism in the SSAC that enables it to handle a massive volume of information in a correct and timely manner. Such information includes nuclear material accounting reports, design information, information on international transfers, and declarations under the additional protocol. The information processing mechanism also serves as a basis for submitting necessary reports to the partners of bilateral nuclear cooperation agreements.



Processing Nuclear Material Accounting Reports to the IAEA

Based on the Reactor Regulation Act and relevant regulations, nuclear facilities and LOFs have the obligation to submit information to the NRA to fulfill the requirements of these agreements. The information submitted to the NRA is forwarded to NMCC for information processing and archiving. With the aid of sophisticated information processing systems, NMCC examines a massive amount of submitted nuclear material accounting reports (Inventory Change Report (ICR), Physical Inventory

Listing (PIL), Material Balance Report (MBR), and other reports based on bilateral nuclear cooperation agreements). Examinations are conducted from various viewpoints, including conformity with the forms and consistency with Facility Attachments, previous reports from the facility or LOF, and reports submitted from other facilities or LOFs. NMCC contacts facility operators for clarification and corrections if necessary. The detailed examination process is illustrated in the figure below. Validated data is stored in databases and then transformed into appropriate formats for submission to the IAEA (Code 10) and partner States. Information on international transfers is also submitted to the NRA and forwarded to NMCC for checking and reformatting. The NRA submits the transformed reports to the IAEA or partner States through MOFA.



Processing of Annual AP Declaration

Declarations under the additional protocol require a broader spectrum of information beyond the actual use of nuclear material. Therefore, more ministries in the government of Japan—the Ministry of Education, Culture, Sports, Science and Technology (MEXT); the Ministry of Economy Trade and Industry (METI); and the Cabinet Office (CAO)—are involved in preparing additional protocol declarations while the NRA plays a central role in it. Some of the information for declarations is submitted on the basis of the Reactor Regulation Act and relevant regulations, but other information is collected on the basis of information obtained within the government and from open sources. Additional protocol declarations have a more qualitative nature and therefore instruction for operators is required to provide appropriate information to the IAEA. To facilitate this process and to improve the quality of declarations, NMCC issues guidance documents for operators based on the knowledge obtained from past experience. Once the information is collected, NMCC checks the conformity to the form and examines the consistency of the descriptions and site layouts. After the necessary preparation has been made, all additional protocol declarations are submitted to the IAEA through MOFA.

JSGO provides other safeguards relevant information through MOFA or directly to the IAEA. The information includes design information, mailbox data from low enriched uranium fabrication facilities and plutonium handling facilities for implementation of short notice inspections, facility operational schedules, answers to the IAEA's questions and clarifications, and State inspection relevant data. Such information is provided in a way that the IAEA and Japanese counterparts can make necessary arrangements properly. The information sharing and exchange is conducted by official correspondence, official secured emails, ordinary emails, various levels of official meetings, ad-hoc meetings, etc. At the Rokkasho Reprocessing Plant, daily meetings are held among the IAEA, JSGO, and NMCC. The Tokyo Regional Office of the IAEA greatly facilitates communication between the IAEA and JSGO/NMCC.

With the assistance of NMCC, JSGO also provides the IAEA with safeguards relevant information collected from open sources as a voluntary measure to demonstrate transparency. Safeguards relevant articles in Japanese are translated into English and provided to the IAEA. Abstracts from news articles and academic and scientific articles are provided weekly and monthly, respectively. If the Agency requests more detailed information on a particular article, then a full translation of the requested article is provided. JSGO also provides information on neptunium and americium to respond to the request from the IAEA based on the decision of its Board of Governors.

4.4. In-field Verification Activities and Associated Activities

Japan is the world largest recipient of IAEA in-field verification. The in-field verification includes various forms of inspections, design information examinations and verifications, and complementary accesses. Along with the development of the nuclear fuel cycle in Japan, these verification measures have also been developed through close collaboration with the IAEA and, in some cases, multilateral consultations.

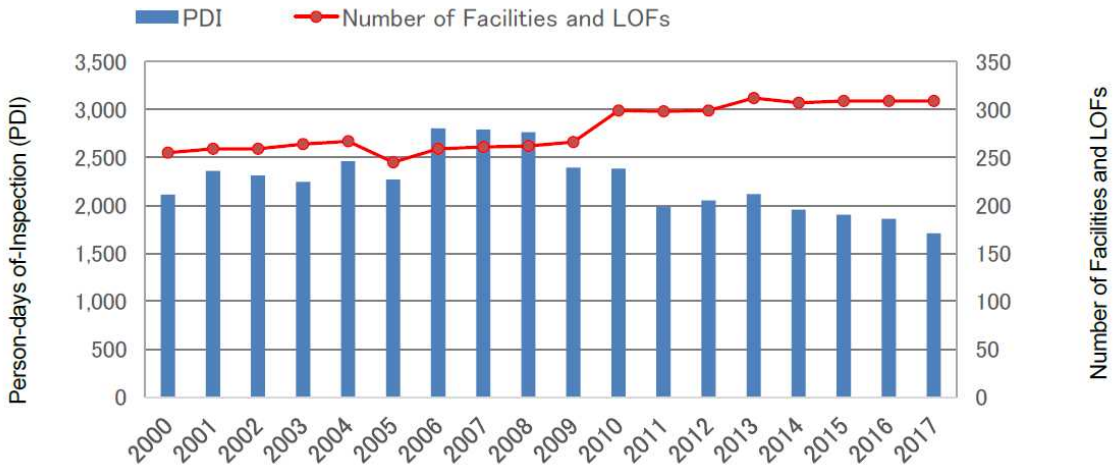
4.4.1. Inspections and Design Information Examination and Verification

In Japan, State inspections are conducted in conjunction with IAEA inspections and on some additional occasions without IAEA inspectors present. Most of these State inspections are carried out by NMCC following instructions from JSGO, and the results are reported to JSGO. The results of State inspections are provided to the IAEA as a part of the findings of the SSAC. In the case of non-routine in-field verification activities, i.e. design information examinations, design information verifications, and complementary accesses, JSGO inspectors are responsible for conducting the activities.

During the inspections of bulk handling facilities, destructive analysis (DA) samples are taken by State inspectors in parallel with the sample taking by the IAEA inspectors. Following the instructions from JSGO, the samples are analyzed and the analysis results are reported to JSGO. At the Rokkasho Reprocessing Plant (RRP), according to the sampling plan prepared by the IAEA, most of the samples are taken and transferred to the On-Site Laboratory (OSL) in RRP automatically through pneumatic transfer tubes with the Automatic Sampling Authentication System, jointly or independently analyzed by the IAEA and NMCC staff, and the obtained analytical data are evaluated independently by the IAEA and NMCC. Except samples taken at RRP, all samples taken by State inspectors are sent to the Tokai Safeguards Analytical Laboratory to be analyzed by NMCC.

In addition, NMCC conducts statistical analyses on operators' measurement errors, shipper-receiver difference (SRD), and material unaccounted for (MUF), and reports to JSGO.

Design information is examined and verified by the IAEA in cooperation with JSGO.



Trends of State Inspections Workload

The results of State inspections, Design Information Questionnaires (DIQs), and facility attachments of the Subsidiary Arrangement are archived in the NMCC database for reference and efficient implementation of in-field verification activities of NMCC and JSGO.

For gas centrifuge uranium enrichment plants, Limited Frequency Unannounced Access (LFUA) was developed through the Hexapartite Safeguards Project (HSP) in which Australia, West Germany, Japan, Netherlands, United Kingdom, United States, IAEA, and EURATOM participated and is applied to uranium enrichment plants in Japan.

The Tokai Advanced Safeguards Technology Exercise (TASTEX) project was carried out from 1978 to 1981 with the participation of France, Japan, United States, and IAEA, and the results of TASTEX were introduced into the safeguards at the Tokai Reprocessing Plant (TRP).

4.4.2. Rokkasho Reprocessing Plant (RRP) and Large-scale MOX Fabrication Plant (J-MOX)

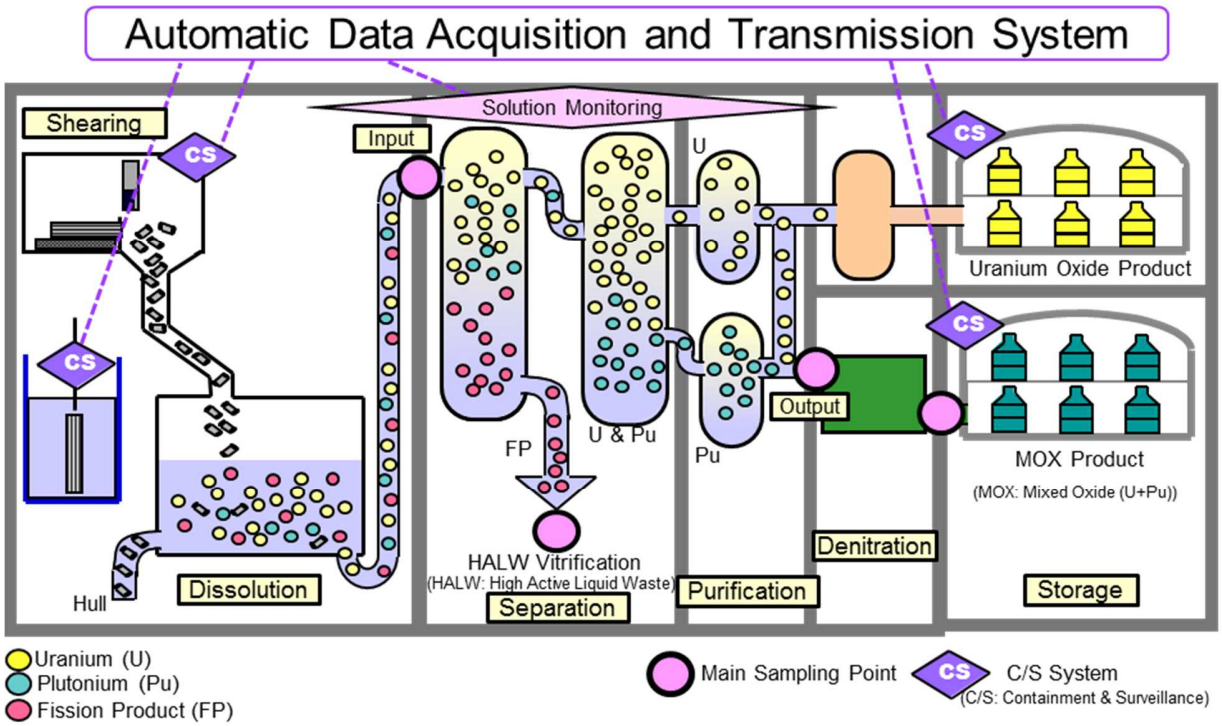
Rokkasho Reprocessing Plant in Rokkasho-mura, Aomori prefecture
(Photo provided by JNFL)

The Rokkasho Reprocessing Plant (RRP) has a much larger annual throughput of 800 tons of spent fuel, which contains about 8 tons of plutonium. In order to assist the IAEA in developing effective and efficient safeguards for large reprocessing plants, a technical forum called LASCAR (Large Scale Reprocessing Plant Safeguards) was organized with the participation of France, Germany, Japan, United Kingdom, United States, IAEA, and EURATOM from 1988 to 1992.

Based on the LASCAR forum recommendations, safeguards at the RRP were developed and implemented. Design information was provided to the IAEA from the early stage to allow for early consultation among the operator, JSGO/NMCC, and the IAEA and design information verifications (DIVs) were planned and coordinated for compatibility with the operator's schedule, which is a good practice of safeguards by design. DIVs will continue throughout the life cycle of the facility.

Highly accurate measurement of the nuclear material is pursued with sophisticated measurement systems and high precision sensors. JSGO/NMCC and the IAEA carried out the joint audit activity for improvement of RRP material accountancy. The improvement plan for the operator's Nuclear Material Accountancy system and chemical analysis performance has been reviewed. The improvement will continue by JNFL and will be followed up periodically by JSGO/IAEA even after commercial operation of RRP. Progress will be periodically checked by JSGO/IAEA at technical meetings. In addition to the conventional type of Nuclear Material Accountancy system with high accuracy, Near Real Time Accountancy (NRTA) has been adopted to improve timeliness in detection.

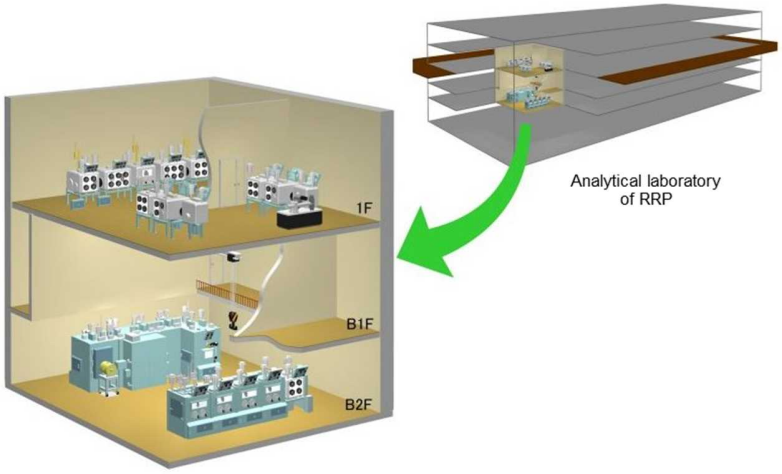
In order to meet the timeliness requirements and to provide a high level of assurance while improving efficiency, unattended verification systems combining non-destructive assays (NDA), containment, and surveillance (C/S) and process monitoring systems have been adopted. The IAEA has also authenticated information obtained from the operator-provided equipment for safeguards



Safeguards system of Rokkasho Reprocessing Plant (Provided by JNFL)

use and developed a data acquisition and transmission system together with JSGO/NMCC and the operator.

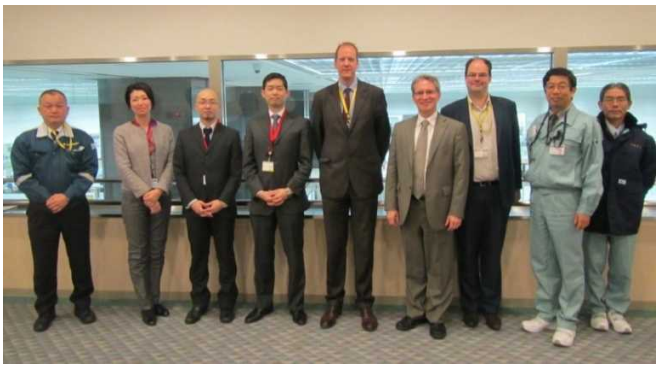
The On-Site Laboratory (OSL) enables the IAEA to conduct on-site sample verifications in an accurate and timely manner. Most of the samples are taken and sent automatically from various sampling points set by the IAEA inspectors. The samples are analyzed by the IAEA and NMCC jointly or independently.



On-Site Laboratory (OSL)
(Photos provided by JNFL)

In addition to Interim Inventory Verifications (IIV), Physical Inventory Verification (PIV), and all the other verification and monitoring measures stated above, additional assurance is provided through the implementation of Other Strategic Points for confirmation of the Operational Status (OSP-OS) on a short notice basis.

In Rokkasho-mura, a large-scale MOX fabrication plant is under construction. Necessary safeguards approach, techniques, and equipment are being developed in cooperation with the IAEA, JSGO, NMCC, JAEA, and the operator.

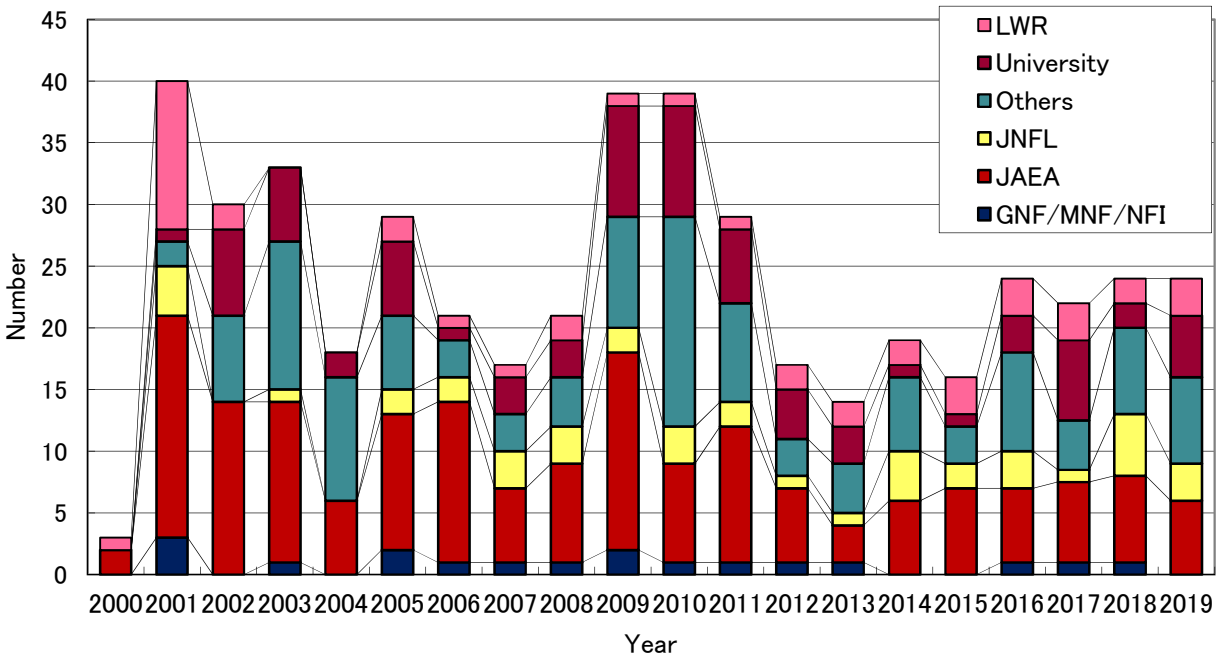


Director of SGOA, Dr. Gary Dyck, and senior officials of SGOA visited Rokkasho Reprocessing Plant (RRP) in 2015
(Photo provided by JNFL)

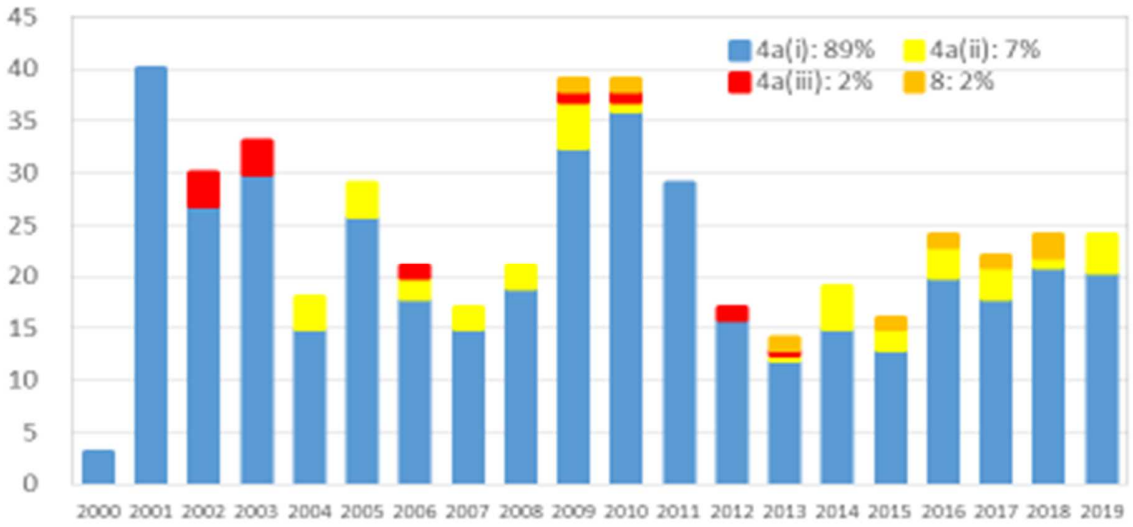
4.4.3. Complementary Access

Before the conclusion of the additional protocol, Japan proposed that the IAEA conduct implementation trials. The purpose of the implementation trials was for the State Authority, operators, the IAEA, and other States to gain experience in the additional protocol implementation, especially complementary access. The experience was useful in accelerating a common understanding of the requirements under AP, developing procedures for both the IAEA and SSAC, and identifying the scope of information related to managed access. The implementation trials were conducted from March 1998 to December 1999. The experience was compiled in the IAEA report (EPR-66) in September 2000.

In order to enable implementation of the additional protocol in Japan, the Reactor Regulation Act and relevant regulations were amended in 1999. Since the first implementation in November 2000, complementary accesses have been conducted 455 times to the end of 2018. Ninety percent of such accesses are based on Article 4a(i) to assure the absence of undeclared nuclear material and activities at sites and other locations. While complementary accesses based on Article 4a(ii) have not been conducted as frequently, recipients are less familiar with IAEA safeguards and thus require prior instruction and background information in order to carry out complementary accesses. As such complementary accesses have been conducted because of the results of previous questions and clarifications from the IAEA, the entities that received such questions or clarifications should be informed that they may be visited by the IAEA inspector afterwards. Complementary accesses based on Article 8 have been conducted at times with/without previous questions when Japan offers to provide the necessary access on a voluntary basis in a spirit of transparency.



Number of Complementary Accesses in Japan by facility types



Number of Complementary Accesses in Japan by purposes

4.5. Recent Safeguards Topics

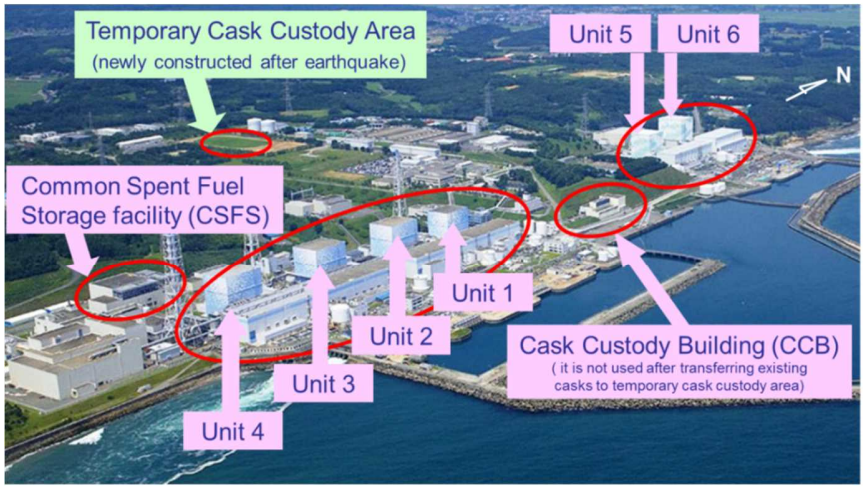
4.5.1. Consequences of the Great East Japan Earthquake

The Great East Japan Earthquake and subsequent tsunami of 11 March 2011, have had a tremendous and long lasting influence on nuclear activities in Japan in many aspects. The earthquake and subsequent tsunami led to explosions at the reactors in the Fukushima Daiichi Nuclear Power Station (NPS) of the Tokyo Electric Power Company (TEPCO) and damaged many other nuclear facilities and social infrastructures surrounding them. Rehabilitation efforts have made it possible for the IAEA to resume normal safeguards implementation at all nuclear facilities, except Fukushima Daiichi and Daini, by August 2011, and safeguards implementation at Fukushima Daini returned to normal in January 2013.

Based on the lessons learned from the accident at Fukushima Daiichi NPS, the safety review system for nuclear facilities in Japan has been greatly upgraded. The Nuclear Regulation Authority was established as the governmental institution that is solely responsible for ensuring safety in the use of nuclear energy and is independent from the promotion of the use of nuclear energy. The NRA issued the New Safety Standards for Nuclear Power Stations and the New Regulatory Requirements for Nuclear Fuel Facilities, Research Reactors, and Nuclear Waste Storage/Disposal Facilities, which are much more rigorous than the previous guidelines. Safety reviews of many nuclear facilities are ongoing based on these standards and requirements. During the period of scrutiny, the operation of many nuclear facilities was suspended and safeguards were implemented in accordance with the operational status of the facilities.

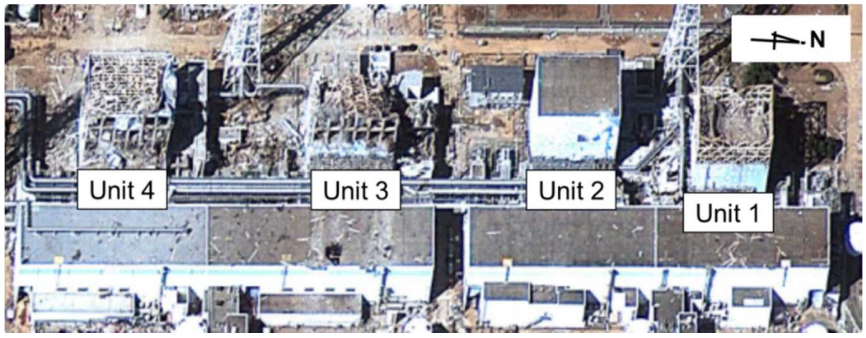
4.5.2. Fukushima Daiichi NPS

At Fukushima Daiichi, the earthquake caused the loss of all off-site electrical power, and the subsequent tsunami made all emergency diesel generators, except one in Unit 6, and most DC batteries inoperable. Thus, all units resulted in the loss of cooling functions as the ultimate heat sink. Massive damage by the tsunami and lack of necessary equipment and other resources hampered a quick recovery and eventually resulted in the severe core damage to Units 1, 2, and 3 and the



(Picture taken before the accident)

Fukushima Daiichi site before the accident
(Photo provided by TEPCO)



Damaged Reactor Units 1 through 4
(Photo provided by TEPCO)

hydrogen explosions in the reactor buildings of Units 1, 3, and 4. As a consequence, the radiation dose rate around Units 1 through 4 elevated considerably. Core fuel in Units 5 and 6 and fuel in the spent fuel ponds of Units 5, 6, and Common Spent Fuel Storage (CSFS) were intact, although cranes and the fuel-handling machine were damaged. At the Cask Custody Building (CCB), dry storage casks were submerged by the tsunami, but fuel was safely retained in the casks.

In October 2011, the IAEA, JSGO, and NMCC inspection team entered the Fukushima Daiichi site for the first time after the earthquake. Whereas the IAEA was able to verify seals at CCB and the core of Unit 6, containment and surveillance of the core at Unit 5 and the spent fuel ponds at Unit 5, Unit 6, and CSFS failed because of the malfunction of surveillance cameras resulting from the blackout. Although surveillance was re-established at the spent fuel ponds at Unit 5, Unit 6, and the CSFS using battery-operated cameras, re-verification at these locations and the core of Unit 5 was not possible, mainly because of inoperable bridge cranes.

First Inspection (Photos provided by TEPCO)

Unit	Declared Nuclear Material	
	Core	Spent Fuel Pond
1-3	Inaccessible	Inaccessible
4	(No fuel assemblies)	Inaccessible
5	C/S failed.	C/S failed.
6	C/S was maintained.	C/S failed.
CSFS		C/S failed.
CCB		At least one seal for each cask was maintained.

Result of the First Inspection

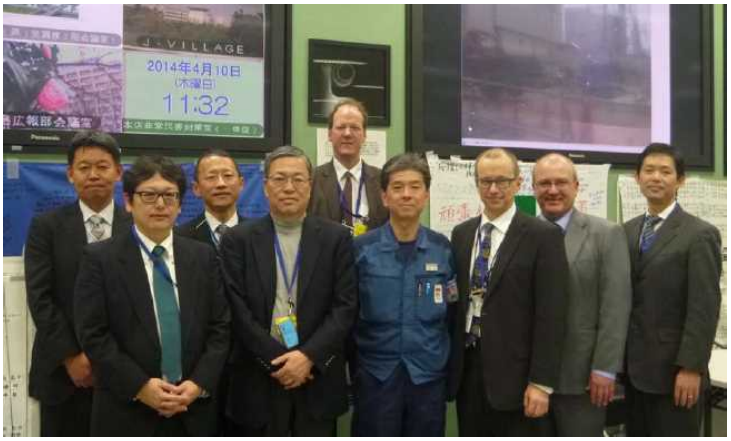
4.5.3. Fukushima Task Force

At the Joint Committee Meeting in March 2012, it was agreed to establish the Fukushima Task Force with the participation of relevant staff from the Department of Safeguards of the IAEA, JSGO, NMCC, JAEA, and TEPCO. The objective of the task force was as follows:

- Firstly, to develop a holistic approach to safeguards implementation measures being considered for the Fukushima Daiichi site;
- Secondly, to monitor the recovery of safeguards at the Fukushima Daiichi and Daini nuclear power plants, and to facilitate discussion of issues which may be of relevance to this objective;
- Thirdly, to consider possible approaches to longer-term safeguards challenges arising from the March 2011 accident.

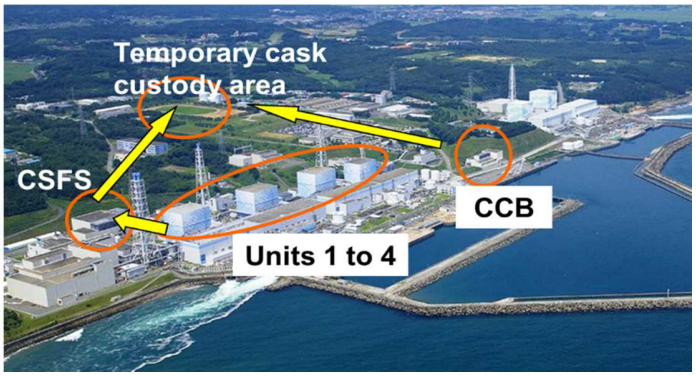
Up to March 2021, task force meetings have been held 14 times. At the meetings, updated status and recovery plans have been shared, safeguards activities carried out after the previous meeting have been reported, near-term actions have been discussed and arranged, and long-term measures have been discussed to explore the direction.

In order to keep the IAEA updated, JSGO provides the IAEA with ad-hoc information and monthly updates. In addition to in-field verification activities conducted by the IAEA

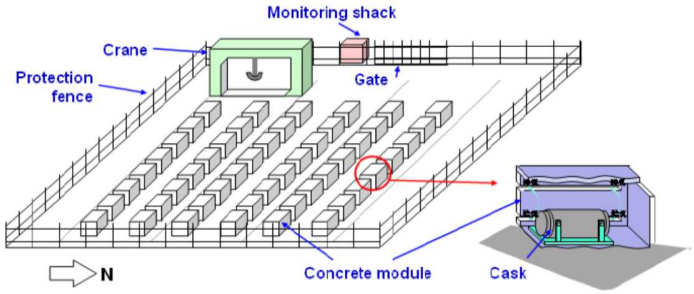


Deputy Director General, Head of Department of Safeguards of the IAEA, Dr. Tero Varjoranta visited Fukushima Daiichi NPP with senior officials of SGOA
(Photo provided by TEPCO)

inspectors, senior officials and the Fukushima Task Force members of the IAEA have also visited the site.

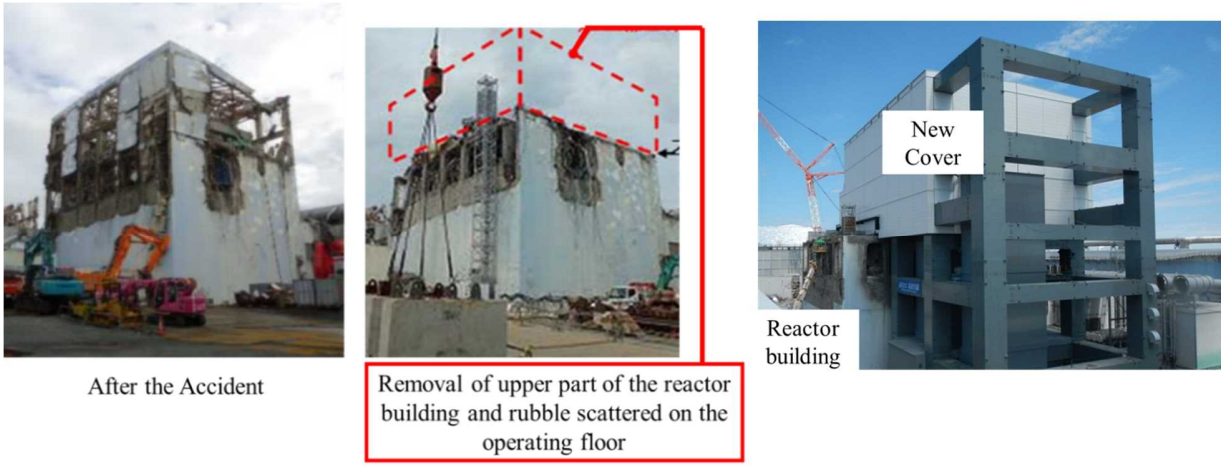


Relocation of fuel assemblies after the accident
(Photo provided by TEPCO)



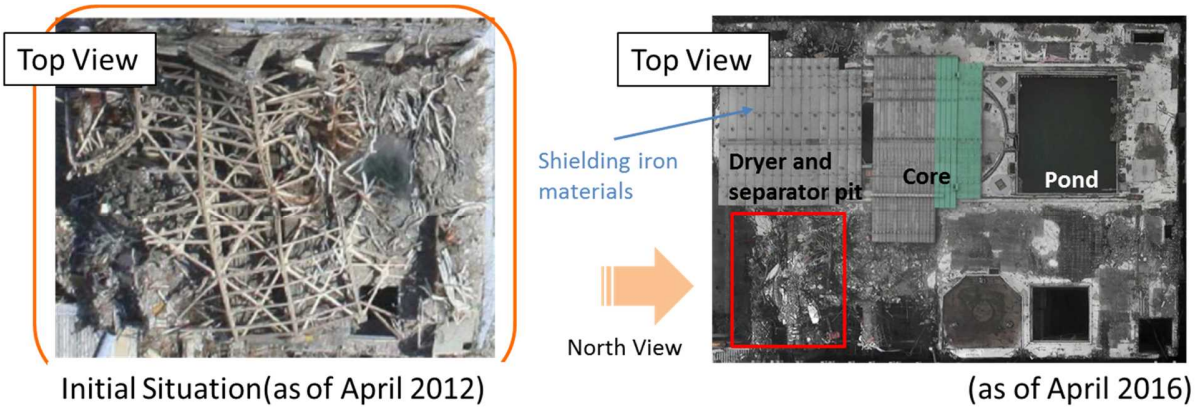
Temporary Cask Custody Area (TCCA)
(Image provided by TEPCO)

In accordance with the Mid-and-Long-Term Roadmap towards the Decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station Units 1–4, vigorous recovery activities have been conducted at the site. At CSFS, the damaged fuel handling machine was restored and re-verification of all 6,375 fuel assemblies was successfully completed in July 2012. In order to accommodate the dry casks containing the spent fuel to be relocated, the Temporary Cask Custody Area (TCCA) was constructed. The TCCA started operation in April 2013 and received all the casks stored at the damaged CCB after the soundness of these casks had been confirmed, and verification was carried out at CSFS including the use of Digital Cherenkov Viewing Device (DCVD). In June 2013, the transfer of spent fuel assemblies stored at the spent fuel pond of CSFS to TCCA started so that CSFS would be able to accommodate fuel assemblies from Units 1 through 4. After renovation of the damaged Unit 4, all fuel assemblies stored in Unit 4 were transferred to CSFS or Unit 6 from November 2013 to December 2014, and re-verification of transferred fuel was conducted at the destinations. By the end of 2014, all fuel assemblies stored in Units 4–6, CSFS, and CCB at the time of accident had been re-verified along with the necessary relocation of these assemblies.



Renovation of Unit 4 (Photos provided by TEPCO)

While all the nuclear material stored at Units 4–6, CSFS, and CCB at the time of the accident had been successfully re-verified, nuclear material in Units 1–3 remains inaccessible due to the high radiation dose rate and damage to the buildings. Toward the decommissioning of these units, damaged structure material and rubble are being removed and decontamination is ongoing at Unit 3; a similar process will start in Unit 1. The radiation level at Unit 3 is still very high as confirmed by the IAEA independent measurement conducted in conjunction with the operator's measurement activity.



Removal of rubbles at Unit 3 (Photos provided by TEPCO)

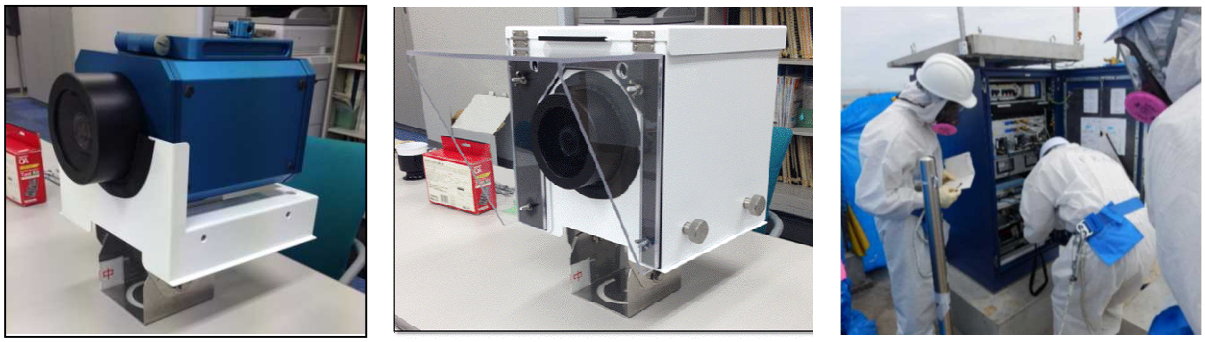
Dose reduction measures on Unit 3 operating floor such as decontamination and shielding were completed in December 2016. Construction of new building cover with FHM and crane was commenced in January 2017. This construction work has been carried out by remote-controlled crawler crane, and girder for the building cover has already been constructed on the shielded operating floor. The domed cover installation work was completed in February 2018. Once the domed cover is installed, open-air operating floor including SFP cannot be observed by the outdoor cameras. In order to monitor the Unit 3 SFP, a surveillance camera was installed within the domed cover in January 2018. Two surveillance cameras were also installed in the new trailer area of Unit 3 in September 2018 for monitoring the

Top view of Unit 3 reactor building before installation of domed cover (As of July 2017)
(Photo provided by TEPCO)

The domed cover on Unit 3 reactor building (As of March 2018)
(Photo provided by TEPCO)

transfer of currently inaccessible spent fuel assemblies of Unit 3 SFP to CSFS.

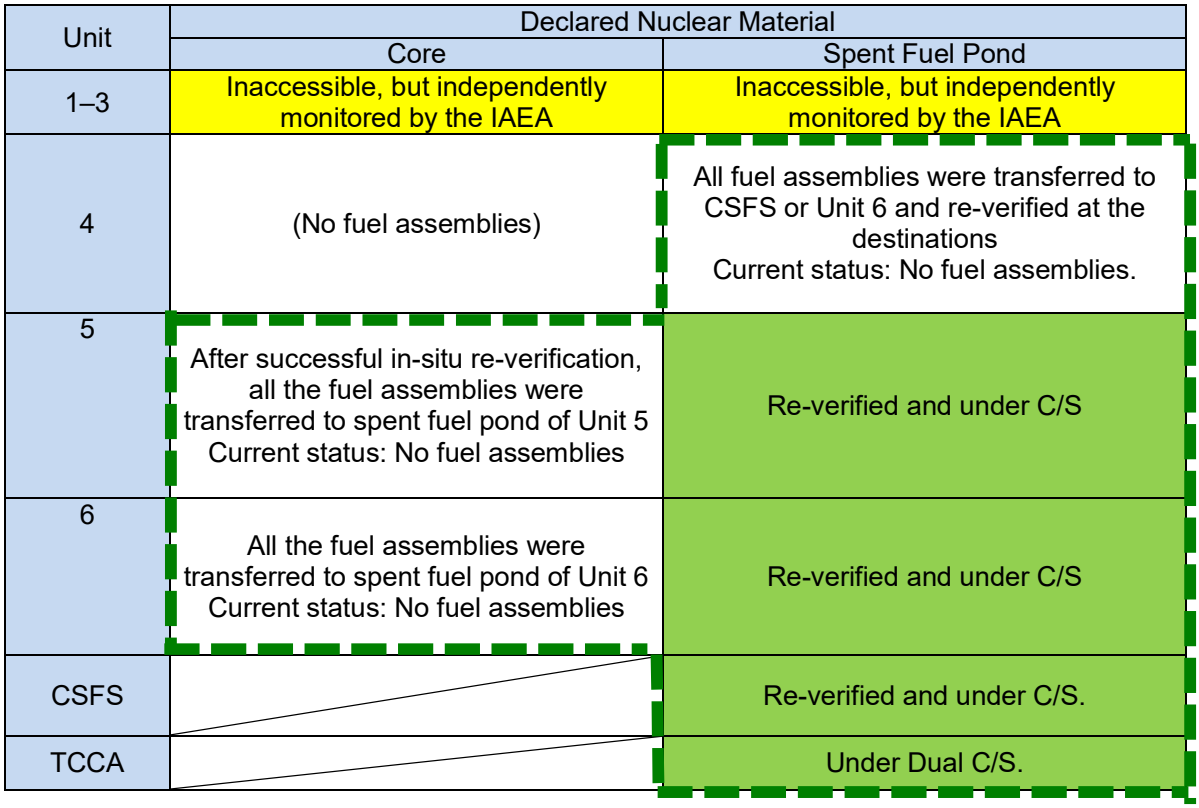
As normal safeguards measures cannot be applied at these units, special monitoring arrangements are being implemented. The IAEA has installed surveillance cameras and a multifunctional radiation monitor to independently monitor these units. In addition to continuous monitoring, the IAEA carries out a specially designed in-field activity called SNOS (Short Notice Operational Support) activities at the Fukushima Daiichi site in addition to inspection, design information verification, and complementary access. The purpose of SNOS activities is to confirm that there is no diversion of declared material and that the operator's declaration on the decommissioning status and related operations is consistent with the reality at the Fukushima Daiichi site. With short notice, the IAEA can visit key locations at the site to carry out these confirmation activities. SNOS activities have been conducted 28 times since February 2014 until March 2019. Although it is practically impossible to remove any nuclear material from Units 1–3 considering the circumstances, the IAEA independent monitoring activities provide additional confirmation to deny the possibility of removal. As cleanup and decommissioning activities on the site advance, such monitoring will be reviewed and updated based on further consultation.



Casing for XCAM for external environment and Installation of a radiation monitor
(Photos provided by NMCC)

Safeguards status at the Fukushima Daiichi site at the end of 2018 is summarized below.

At the Fukushima Daiichi site, normal safeguards are being applied to all nuclear material, except the material in Units 1–3. In addition, the IAEA has established safeguards measures to ensure that nuclear material cannot be removed from the site without the IAEA's knowledge. While maintaining the continuity of knowledge, fuel assemblies in the spent fuel ponds of Units 1-3 will be removed and re-verified after removal of rubble, decontamination, and restoration, including installation of functional fuel handling systems and the removal of core fuel debris to follow.



Safeguards Status at Fukushima Daiichi site at the end of 2018

4.5.4. Safeguards Activities for Decommissioning Facilities

Many facilities in Japan such as Tokai Reprocessing Plant and Fast Breeder Reactor Monju are undergoing decommissioning. Furthermore, it is expected that the number of decommissioning facilities continues to increase since Japan's nuclear strategic plan states the reduction of dependence on nuclear power as much as possible and many nuclear facilities are aging. Under this circumstance, JSGO closely communicates with the IAEA and provides information such as decommissioning schedule and plan in order to implement the appropriate safeguards activities for those facilities.

4.5.5. Consultation of Safeguards Activities under State Level Approaches for Japan

The IAEA Director General addressed his report on State Level Concept (SLC) at the Board of Governors in September 2013. The SLC involves giving consideration to a State as a whole, rather than focusing primarily on declared nuclear material and facilities. As of June 2018, State Level Approaches (SLA) under the SLC for 131 states were approved. The SLA for Japan was approved in September 2016 and has been implemented since January 2017. Since 2Q 2018, Japan and the IAEA have started discussions on the implementation procedures for each facility type to conduct the appropriate safeguards activities under SLA for Japan.

In 2018, JSGO and the IAEA had discussions mainly on the inspection procedures for uranium enrichment facilities, LEU FFPs, and the RRP. In 2019, the implementation procedures for JNC-1 site, LWRs, RRCAs and Small facilities/LOFs are planned to be discussed.

4.5.6. Removal of HEU and Separated Pu from Research Reactors and Critical Assemblies

At the 2010 Nuclear Security Summit in Washington, D.C., USA, it was recognized that highly enriched uranium (HEU) and separated plutonium (Pu) require special precautions and encouraged the conversion of reactors from HEU to low enriched uranium (LEU) fuel and minimization of use of HEU, where technically and economically feasible. Japan and the United States have completed the removal of all HEU and separated Pu fuels from the Fast Critical Assembly (FCA) in JAEA, in Japan. Also, the two countries are planning to remove all HEU fuels from Kyoto University Critical Assembly (KUCA) to the United States. This removal will be made possible by the conversion of KUCA from HEU to LEU fuels.

4.6. Fact Sheet

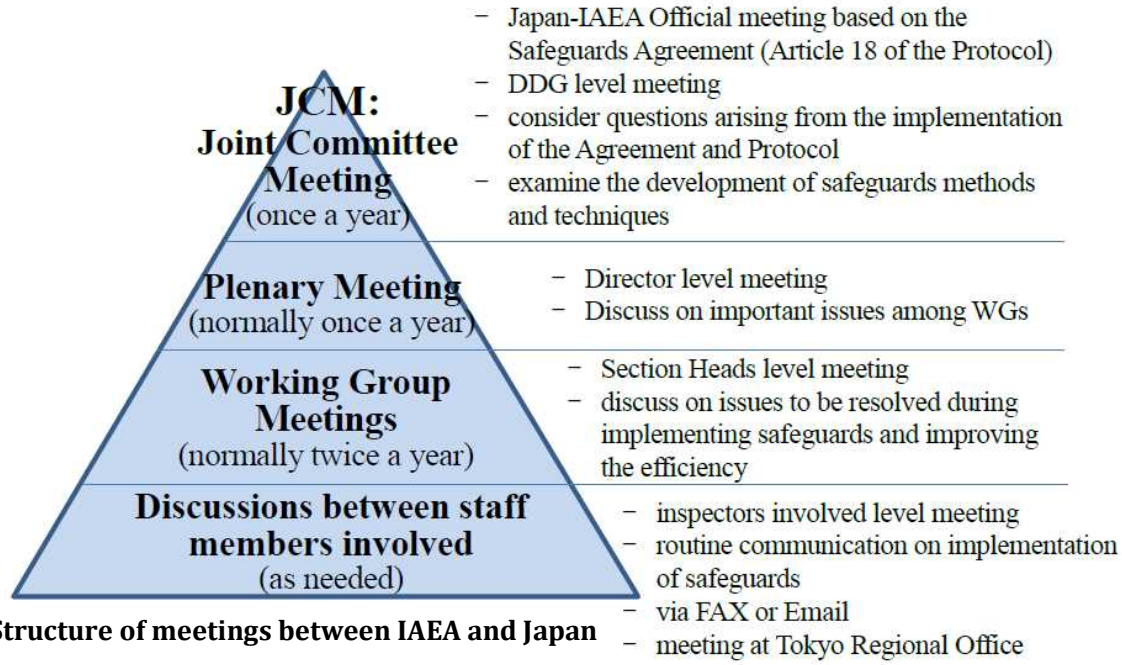
Data of annual summary on domestic safeguards activities is available in Annex.

5. Cooperation with the IAEA

5.1. Mechanism of Information Sharing and Coordination between the IAEA and Japan

Smooth implementation of safeguards has to be supported by a well-established information sharing and coordination mechanism between the IAEA and Member States. The IAEA and Japan have a communication and consultation mechanism with various layers. JSGO and NMCC have frequent contacts with operators to share the updated status of facilities and current and anticipated issues. Such information is communicated with the IAEA headquarters and/or its Tokyo Regional Office in a timely manner. Explaining and/or discussing complicated issues and face-to-face meetings are especially effective. Ad-hoc meetings are held to address topical issues and regular meetings with defined coverage are convened with senior managerial officers of the IAEA to share information and discuss issues. In 2018, 20 regular meetings were held between JSGO and IAEA. Furthermore, more than 1,500 messages were exchanged by Secure Communication System which is an encrypted E-mail exchange system. The top-level meeting is the Joint Committee Meeting (JCM), which is founded on Article 18 of the Protocol as concluded together with the safeguards agreement to amplify certain provisions of the agreement. Within the government of Japan, MOFA is in charge of JCM, and JSGO/NRA is in charge of other meetings.

Plenary meeting



Structure of meetings between IAEA and Japan

5.2. Japan Support Programme for Agency Safeguards (JASPAS)

The Japan Support Programme for Agency Safeguards (JASPAS) was established in 1981 as one of the Member State Support Programmes (MSSPs). The objective of JASPAS is to contribute to strengthening international safeguards through improvements in the effectiveness and efficiency of safeguards implementation by transferring Japanese technology and expertise to the IAEA. The scope of JASPAS includes the following:

- Development, provision, and demonstration of technology (instruments and techniques) for safeguards applications;
- Support for commercialization, procurement, and implementation of that technology;
- Training of safeguards personnel;
- Analysis of safeguards issues;
- Human resources, such as experts and consultants, to work directly with the Secretariat; and
- Recruitment and designation of Japanese attendees to international safeguards meetings.

JNC-1 Training
Provision of opportunities to visit a complex with various Pu handling facilities.
(Photo provided by JAEA)

Almost 100 tasks have been completed since its establishment, and about 20 tasks are currently active. In the 1980s and 1990s, the main focus was on the development of technology for C/S (containment and surveillance) and measurement. Since

Voluntary provision of translated Japanese news articles and scientific papers
(Photo provided by NMCC)

around 2000, the focus has shifted to the development of safeguards approaches and measurement technologies to be applied for large-scale nuclear fuel cycle facilities. Under JASPAS, assistance is provided to facilitate training for both the IAEA and Member States personnel. In particular, unique training opportunities are provided for IAEA inspectors at various nuclear fuel cycle facilities with reprocessing and Pu handling capabilities. In addition, open source information from news articles and scientific papers is provided to the IAEA beyond Japan's legal commitment with a view to increase the transparency of its nuclear activities.

6. Capacity Building

6.1. Qualification and Training for NRA Safeguards Inspectors

The NRA launched a new qualification system and training programs for NRA officials in 2018, covering five fields of expertise. The training programs consist of two parts; basic training for 6 months and proficiency training for 18 months.

For safeguards inspectors, it is required to take the basic training and the safeguards specific training for 3.5 months offered during the proficiency training. The basic training program is common for all fields of expertise. The safeguards specific training program includes nuclear fuel cycle, legal instruments, SSAC, NMAC, safeguards approaches, NDA, and in-field verifications. The qualification for safeguards inspectors is assured by specific classroom training, on-the-job training and oral examination.

6.2. Training for Designated Safeguards Inspectors in NMCC

NMCC conducts training and education courses for the employees to acquire knowledge and skills to be qualified as designated inspectors. The training program is designed in accordance with the domestic regulation required for qualification. It includes classroom training, laboratory training and an examination, and it takes 30 hours for completion. One-person inspection is permitted for the inspectors who have taken one year on-the-job training supervised by qualified inspectors. Besides these training steps, booster training programs are offered for designated inspectors.

6.3. Assistance in Operators' Capacity Building on Nuclear Material Accounting

NMCC organizes workshops for operators on preparation for accounting reports. These workshops are designed to address the various needs of operators, e.g. for reactors, bulk handling facilities, and LOFs with very small amount of nuclear material.

Workshops on Nuclear Material Accounting for Operators (Photo provided by NMCC)

In order to identify operators' measurement capabilities and improve them, comparisons of measurements results among the IAEA, NMCC, and operators are conducted.

ANNEX

The safeguards activities in Japan in 2019 are summarized in Annexes 1 and 2.

Annex 1: Safeguards Activities in Japan in 2019
Annex 2: Inventory and Inventory Changes of Nuclear Material in Japan

The safeguards related events since promulgation of Atomic Energy Basic Law in 1955 are shown in Annex 3.

Annex 3: Chronology

Safeguards Activities in Japan in 2019

Annex 1

①Summary of Safeguards Activities under the National System of Safeguards of Japan

Categories under legal system for nuclear regulation[1]	Number of facilities and LOFs[2]		Person-days of national inspection[4]			Number of actions taken based on the regulation for functioning SSAC							
						Licence granted for minor users of nuclear material[6]	Approval of accounting provisions[7]		Number of accounting reports submitted[8]				
	Total	Recipients of national inspections[3]	Total	Conducted by JSGO inspectors	Conducted by NMCC[5] inspectors		Initial approval	Amendment approval	Total	ICR	MBR	PIL	Biannual reports from minor users
Nuclear Fuel Fabrication	6 (6)	6 (6)	226 (325)	8 (13)	218 (312)	N/A	0 (3)	36 (36)	73 (80)	56 (60)	10 (10)	7 (10)	N/A
Research Reactor	22 (22)	16 (16)	131 (96)	0 (0)	131 (96)				58 (49)	13 (5)	23 (22)	22 (22)	
Power Reactor	57 (57)	54 (54)	134 (170)	4 (3)	130 (167)				160 (162)	34 (38)	63 (62)	63 (62)	
Power reactor under R&D stage	2 (2)	2 (2)	29 (39)	1 (1)	28 (38)				6 (4)	2 (0)	2 (2)	2 (2)	
Reprocessing	3 (3)	3 (3)	761 (743)	0 (1)	761 (742)				42 (46)	36 (36)	3 (5)	3 (5)	
Various users (R&D etc.)	205 (207)	29 (30)	357 (356)	5 (0)	352 (356)				759 (772)	323 (341)	217 (215)	219 (216)	
Minor Users (Nuclear Use)	10 (10)	0 (0)	– (–)	– (–)	– (–)	0 (0)	0 (0)	4 (1)	34 (34)	14 (14)	10 (10)	10 (10)	
Minor Users (Non-Nuclear Use)[6]	1,786 (1,779)	N/A[9]	N/A[9]			43 (27)	43 (27)	106 (117)	3,504 (3,490)	N/A			3,504 (3,490)
Total	2,091 (2,086)	110 (111)	1,638 (1,729)	18 (18)	1,620 (1,711)	43 (27)	43 (30)	146 (154)	4,636 (4,637)	478 (494)	328 (326)	326 (327)	3,504 (3,490)

＊ Records in 2018 are shown in parentheses for comparison.

＊ Under some categories, there is no facility subject to safeguards inspections. In such cases, "–" are inserted in respective cells.

1 Categorized in accordance with the Law for the Regulations of Nuclear Source Material, Nuclear Fuel Material and Reactors (Nuclear Reactor Regulation Law).

2 When counting the number of facilities and LOFs, the categorization of IAEA safeguards implementation is followed. The categorization does not always correspond with the categorization of domestic regulation. Minor users are licenced to use natural and/or depleted uranium up to 300g and/or thorium up to 900g.

3 Number of facilities and LOFs where national inspections were conducted in 2019.

4 Domestic inspections are normally conducted simultenously with the IAEA inspections.

5 Nuclear Material Control Center (NMCC) is designated to carry out domestic inspections under the Nuclear Reactor Regulation Law (Art.61-23-2).

6 Only those who use Nuclear Fuel Material

7 All licencees except the category of uranium concentration shall have approved accounting provisions to account for and control internationally controled material (incl. nuclear material) properly.

8 All licencees except the category of uranium concentration shall submit accounting reports based on the requirement of the domestic regulation and accounting provisions.

9 Nuclear material is exempted from safeguards.

② Design Information Verification (DIV) and Complementary Access (CA)

Type of verifications	Number of verifications	Person-days of verifications
Design Information Verification[10]	87 (81)	93 (93)
Complementary Access[11]	24 (24)	47 (49)
Total	111 (105)	140 (142)

10 The IAEA, in co-operation with JSGO, conducts DIVs based on safeguards agreement to verify the correctness and completeness of the design information of facilities provided to the IAEA.

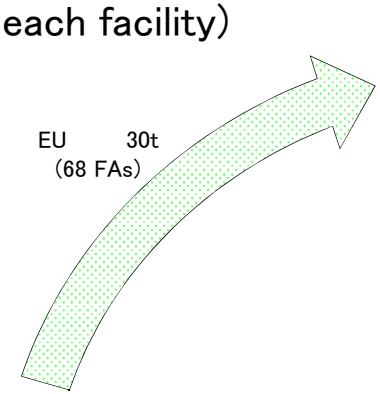
11 The IAEA conducts CAs based on additional protocol to the safeguards agreement to confirm the absense of undeclared nuclear material and activities. MOFA staff and JSGO inspectors accompany the IAEA inspectors at CAs.

Annex 2

Inventory and Inventory changes of Nuclear Material in Japan

①Major inventory and inventory changes in 2019

(Figure summarizing the results of accounting for and control of nuclear material at each facility)



Power Reactor

NU	393t
DU	3,279t
EU	17,394t
Pu	147,315kg

Research Reactor & Critical Assembly

NU	31t
DU	53t
Th	0t
EU	29t
Pu	125kg

Fast Breeder Reactor & Advanced Thermal Reactor

DU	105t
EU	8t
Pu	5,023kg

Note1: Monju (under decommissioning), Fugen (under decommissioning), and Joyo of Japan Atomic Energy Agency (JAEA)

Uranium Re-conversion & Uranium fuel fabrication

NU	91t
DU	39t
EU	1,209t

Reprocessing

NU	2t
DU	597t
EU	3,472t
Pu	30,660kg

Note2: Rokkasho Reprocessing Plant is under construction; Tokai Reprocessing Plant is under decommissioning.

MOX Fuel Fabrication

NU	20t
DU	32t
EU	26t
Pu	3,921kg

Note3: Plutonium Fuel Production Facility (PFPF), Plutonium fuel development center Plutonium Fuel Facility (PPFF) & Tokai Research and Development Facility of JAEA

Enrichment

NU	378t
DU	11,801t
EU	222t

Uranium Concentration & Conversion

NU	72t
DU	0t
EU	12t

NU: Natural Uranium
DU: Depleted Uranium
Th: Thorium
EU: Enriched Uranium
Pu: Plutonium
FAs: Number of Fuel Assemblies

- Facilities are categorized according to the stages of nuclear fuel cycle and the categorization does not correspond to regulatory categorization.
- Each category does not include associated facilities of main facilities.
- Inventory is based on the weight of elements as of 31 December 2019.
- More than 0.1kg of Pu and more than 0.1t of another elements are described.

② Nuclear Material Inventory by facility types

Categories of Nuclear Material[1] / Categories under legal system for nuclear regulation[1]	Natural uranium (t)	Depleted uranium (t)	Thorium (t)	Enriched uranium		Plutonium (kg)
				U (t)	U-235 (t)	
Nuclear Fuel Fabrication	469 (469)	11,840 (11,839)	0 (0)	1,431 (1,461)	58 (59)	– (–)
Research Reactor	31 (31)	63 (63)	0 (0)	34 (34)	2 (2)	1,842 (1,842)
Power Reactor	393 (423)	3,279 (3,233)	– (–)	17,394 (17,398)	361 (370)	147,315 (143,777)
Power Reactor under R&D stage	– (–)	95 (95)	– (–)	3 (3)	0 (0)	3,306 (3,323)
Reprocessing	2 (2)	597 (597)	0 (0)	3,472 (3,472)	33 (33)	30,660 (30,661)
Various users (R&D etc.)	121 (121)	252 (252)	5 (5)	48 (48)	1 (1)	4,002 (4,002)
Minor Users (Nuclear Use)	0 (0)	0 (0)	0 (0)			
Minor Users (Non-Nuclear Use)	0 (0)	0 (0)	0 (0)			
Total[2]	1,016 (1,046)	16,126 (16,080)	5 (5)	22,383 (22,417)	454 (465)	187,125 (183,605)

＊ Figures are based on the data as of 31 December, 2019. For comparison, corresponding data as of 31 December, 2018 are provided in parantheses below.

＊ – In the table, "–" indicates that there is no inventory, and "0" indicates that there is an inventory of less than 0.5.

1 Categorized in accordance with the Law for the Regulations of Nuclear Source Material, Nuclear Fuel Material and Reactors (Nuclear Reactor Regulation Law) and the relevant cabinet order.

2 Due to rounding, total figure may not correspond to the sum of figures above.

③ Inventory of nuclear material subject to bilateral nuclear cooperation agreements

As of 31 December 2019

Supplying Party \ Categories of Nuclear Material*	Natural Uranium (t)	Depleted Uranium (t)	Thorium (t)	Enriched Uranium		Plutonium (kg)
				U (t)	U-235 (t)	
United States of America	85 (91)	3,719 (3,696)	1 (1)	16,166 (16,192)	321 (328)	133,880 (131,819)
United Kingdom of Great Britain and Northern Ireland	13 (13)	447 (447)	0 (0)	2,333 (2,336)	46 (47)	20,150 (19,627)
France	36 (36)	6,507 (6,505)	0 (0)	6,093 (6,099)	101 (103)	59,156 (58,411)
Canada	691 (704)	5,265 (5,250)	0 (0)	5,745 (5,751)	103 (106)	54,407 (53,437)
Australia	20 (20)	1,031 (1,029)	– (–)	4,030 (4,035)	83 (85)	30,968 (30,588)
China	27 (27)	253 (253)	– (–)	277 (278)	7 (7)	2,199 (2,108)
EURATOM	49 (49)	6,509 (6,506)	0 (0)	8,135 (8,145)	178 (183)	23,037 (21,455)
Kazakhstan	– (–)	– (–)	– (–)	37 (37)	1 (1)	– (–)
Republic of Korea	– (–)	– (–)	– (–)	– (–)	– (–)	– (–)
Viet Nam	– (–)	– (–)	– (–)	– (–)	– (–)	– (–)
Jordan	– (–)	– (–)	– (–)	– (–)	– (–)	– (–)
Russia	– (–)	– (–)	– (–)	67 (67)	3 (3)	– (–)
Turkey	– (–)	– (–)	– (–)	– (–)	– (–)	– (–)
United Arab Emirates	– (–)	– (–)	– (–)	– (–)	– (–)	– (–)
India	– (–)	– (–)	– (–)	– (–)	– (–)	– (–)
IAEA	1 (1)	2 (2)	– (–)	0 (0)	0 (0)	1 (1)
Other	180 (193)	2,063 (2,051)	4 (4)	360 (360)	8 (9)	4,094 (3,965)

– This table shows the weight of nuclear material subject to each bilateral nuclear cooperation agreement or agreement on the supply of uranium from the IAEA. Multiple agreements sometimes apply to the same nuclear material. In such cases, the material is counted in multiple times.

– Records in 2018 are shown in parentheses below for comparison.

Chronology

1955 Promulgation of Atomic Energy Basic Law (came into effect on 1 Jan. 1956)
Conclusion of bilateral Nuclear Cooperation Agreement (limited on Research Reactors) with the US

1957 Promulgation of Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors
The first Japanese research reactor, JRR (Japan Research Reactor)-1, went critical
Establishment of IAEA

1958 Conclusion of bilateral nuclear cooperation agreement (comprehensive) with the US (1st)
Conclusion of bilateral nuclear cooperation agreement with the UK (1st)

1959 The world's first safeguards agreement with the IAEA on the supply of uranium from the IAEA for JRR-3 (INFCIRC/3)

1960 Conclusion of bilateral nuclear cooperation agreement with Canada (1st)

1963 Conclusion of safeguards transfer agreement (IAEA-Japan-US) (INFCIRC/47)
The first generation of nuclear power in Japan (JPDR)

1964 First inspection by IAEA to Japan

1966 Conclusion of safeguards transfer agreement (IAEA-Japan-Canada) (INFCIRC/85)

1967 Conclusion of safeguards transfer agreement (IAEA-Japan-UK) (INFCIRC/107)

1968 Conclusion of bilateral nuclear cooperation agreement with the US (2nd)
Safeguards Transfer Agreement (IAEA-Japan-USA) (INFCIRC/119)
Conclusion of bilateral nuclear cooperation agreement with the UK (2nd)
Conclusion of safeguards transfer agreement (IAEA-Japan-UK) (INFCIRC/125)

1970 NPT came into force (Japan signed in 1970 and ratified in 1976)
Establishment of Japan Safeguards Office in Science and Technology Agency

1972 Establishment of Nuclear Material Control Center
Conclusion of bilateral nuclear cooperation agreement with Australia (1st)
Conclusion of safeguards transfer agreement (IAEA-Japan-Australia) (INFCIRC/170)
Conclusion of bilateral nuclear cooperation agreement with France (1st)
Conclusion of safeguards transfer agreement (IAEA-Japan-France) (INFCIRC/171)

1973 Amendment of bilateral Nuclear Cooperation Agreement with the US (2nd)

1977 Conclusion of comprehensive safeguards agreement between the IAEA and Japan (INFCIRC/255)
NMCC was designated as the Designated Information Processing Organization

1978 Start of TASTEX (Tokai Advanced Safeguards Technology Exercise) (until 1981)

1980 Amendment of bilateral Nuclear Cooperation Agreement with Canada
Start of HSP (Hexapartite Safeguards Project) (until 1983)

1981 Establishment of JASPAS (Japan Support Programme for Agency Safeguards)

1982 Conclusion of bilateral nuclear cooperation agreement with Australia (2nd)
Termination of safeguards Transfer Agreement (IAEA-Japan-Australia) (INFCIRC/170)

1984 Establishment of IAEA Office at Tokyo (later called "Tokyo Regional Office)

1985 The first regional training course on SSAC by Japan

1986 Conclusion of bilateral nuclear cooperation agreement with China

1988 Conclusion of bilateral nuclear cooperation agreement with the US (3rd)
Termination of safeguards Transfer Agreement (IAEA-Japan-USA) (INFCIRC/119)
Start of LASCAR (Large Scale Reprocessing Plant Safeguards) (until 1992)

1990	Amendment of bilateral Nuclear Cooperation Agreement with France
1992	Start of ITAP (Information Treatment Assistance Programme) (until 1998)
1998	Additional Protocol Implementation Trial (Mar. 98 – Dec. 99) Conclusion of bilateral nuclear cooperation agreement with the UK (3rd) Termination of safeguards Transfer Agreement (IAEA-Japan-UK) (INFCIRC/125)
1999	Amendment of the Reactor Regulation Act and relevant regulations to accommodate the acceptance of Additional Protocol Additional Protocol (INFCIRC/255/Add.1) came into effect (in December) NMCC was designated as the Designated Organization Implementing Safeguards Inspections
2000	Initial Additional Protocol declaration (in June) The first Complementary Access in Japan (in November)
2004	The first Broader Conclusion (for 2003) drawn for Japan Start of implementation of Integrated Safeguards Start of joint operation of On-Site Laboratory in Rokkasho Reprocessing Plant
2006	Conclusion of bilateral nuclear cooperation agreement with EURATOM
2011	Full implementation of Integrated Safeguards Approaches for all sites, facilities and LOFs in Japan Conclusion of bilateral nuclear cooperation agreement with Kazakhstan
2012	Conclusion of bilateral nuclear cooperation agreement with the Republic of Korea Conclusion of bilateral nuclear cooperation agreement with Viet Nam Conclusion of bilateral nuclear cooperation agreement with Jordan Conclusion of bilateral nuclear cooperation agreement with Russia
2014	Conclusion of bilateral nuclear cooperation agreement with Turkey Conclusion of bilateral nuclear cooperation agreement with the United Arab Emirates
2016	Approval of State-level approach for Japan
2017	Conclusion of bilateral nuclear cooperation agreement with India