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White Paper on Nuclear Energy 2020

Published in 2021 (Summary)

Japan Atomic Energy Commission (JAEC)

Preface

Purpose of the White Paper on Nuclear Energy is to update the status of the entire view of nuclear energy utilization in Japan. The White Paper has been published by the Japan Atomic Energy Commission (JAEC) every year since 1957. It consists of the Special Report and the Chapters which deal with topics laid out in the "Basic Policy for Nuclear Energy" issued by JAEC in 2017. This year, the Special Report focuses on "10 years after the Accident at TEPCO's Fukushima Daiichi Nuclear Power Station." Here the White Paper spotlights the current situation of the decommissioning of the Power Station, and recovery and reconstruction of the local community damaged by the earthquake and tsunami. It also illustrates the progress made in nuclear safety and security cultures, and reminds the important lessons learned and messages to all relevant parties concerned with nuclear energy, for the future. The Chapters contain upgraded nuclear safety based on new regulatory standard, nuclear energy application policy, international cooperation and activities, nuclear non-proliferation and international security, efforts for restoring public confidence in nuclear power generation, decommissioning of nuclear stations, radioactive waste management, applicating radioisotopes to nuclear medicine, nuclear research and development, and human resources development and education. Furthermore, the White Paper was edited in a user-friendly manner for a wide range of readers, especially for younger students.

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Chairman of JAEC
August 2021

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Special Report

10 Years after the Accident of the Tokyo Electric Power Company Holdings' Fukushima Daiichi Nuclear Power Station

1 Fukushima Today: Efforts made off the premises of FDNPS

(1) Recovery and reconstruction of Fukushima steadily moving forward

March 2021 marks ten years since the accident at TEPCO*'s Fukushima Daiichi Nuclear Power Station (FDNPS). At that time, the explosions of the reactor buildings released enormous amounts of radioactive substances mainly over north-east of Fukushima prefecture. The radiation air dose rates in various areas of the prefecture were considerably high right after the accident.

(* Tokyo Electric Power Company Holdings)

How is the situation in Fukushima today?

The air dose rates in major cities of Fukushima prefecture as of September 2020 showed much lower figures than ten years ago and, except for the close proximity of the power station, are largely on par with those in major cities abroad, such as New York, Paris and London (Figure 1).

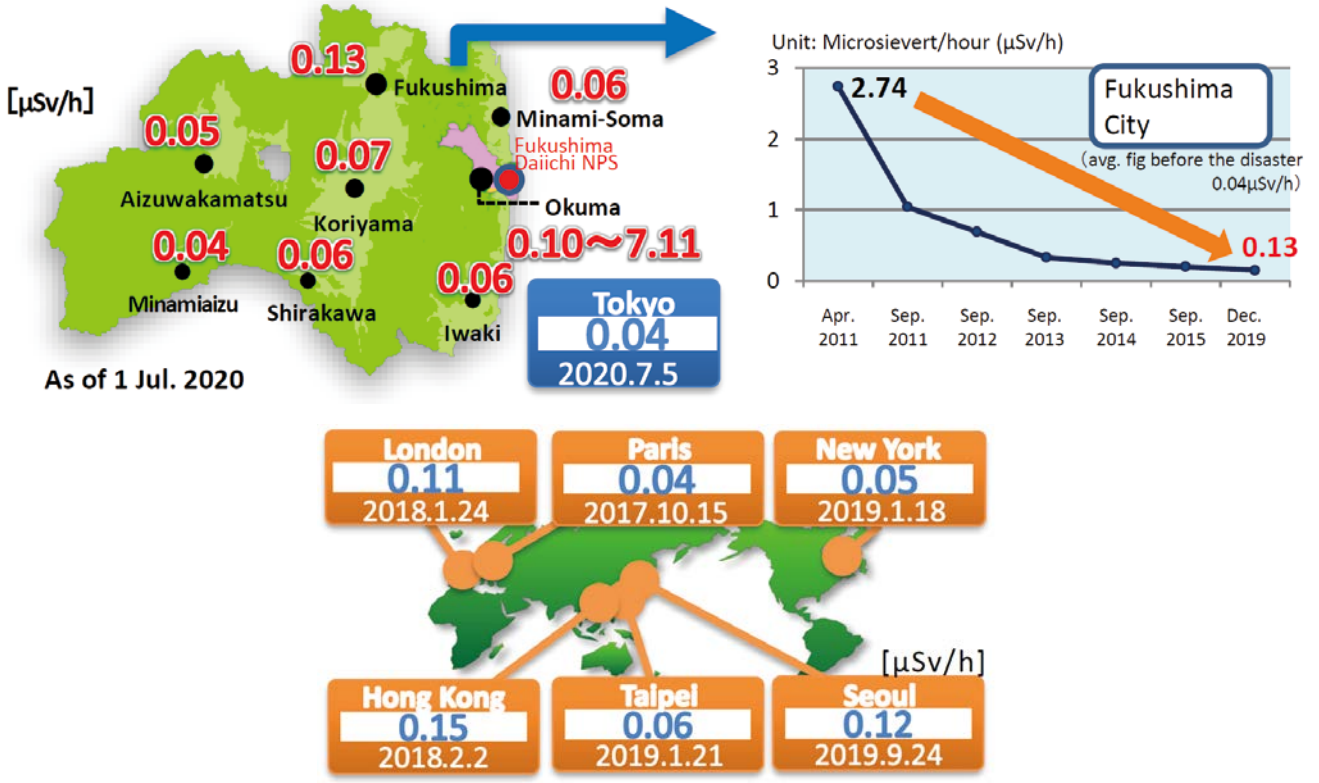


Figure 1 Air dose rates in major cities in Fukushima and overseas

Source: Fukushima Prefecture, "～Fukushima Today～Steps for Reconstruction and Revitalization in Fukushima Prefecture"

The air dose rates measured at one meter above the ground surface within an 80-km radius of the FDNPS as of October 2020 have decreased by approximately 80% compared to those in November 2011 (Figure 2).

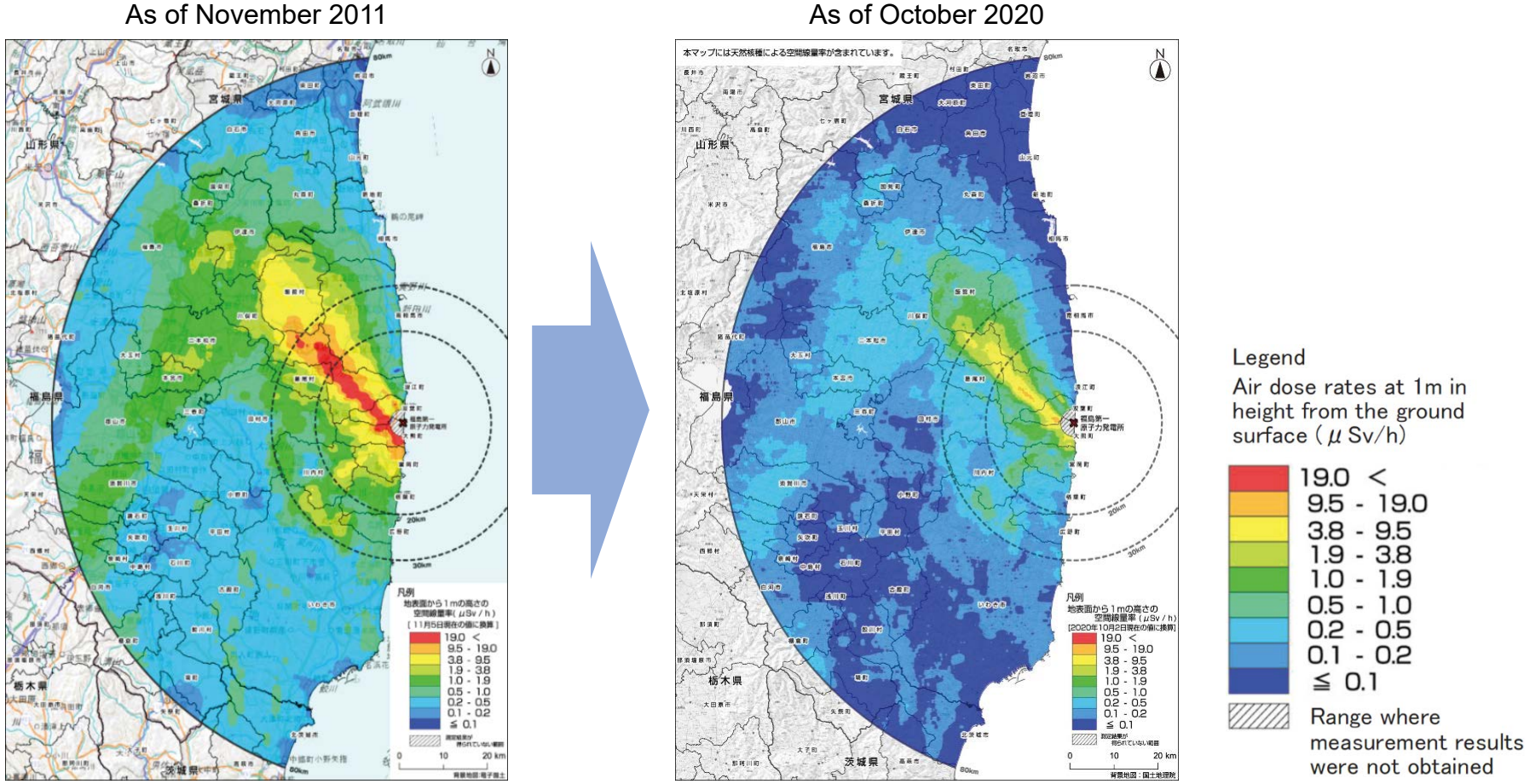


Figure 2 Decrease in air dose rates

* Measured at 1m in height from the ground surface
* The target area is divided into 250-m grid meshes and the value is calculated from the ratio of the measurement results in the central point of each grid mesh.

Source: Nuclear Regulation Authority, “Measurement Results of Monitoring by Aircraft in Fukushima Prefecture and Nearby Prefectures”

Decontamination work was completed in all 100 municipalities of eight prefectures by March 2018, except for the Restricted Area in Fukushima. By March 2020, the evacuation orders were lifted in all areas except for the Restricted Area and in several zones within the Specified Reconstruction and Revitalization Bases in the Restricted Area. Today, the lands under evacuation orders account for 2.4% of the total area of the prefecture.

The living environment for returnees to the areas where evacuation orders were lifted has greatly improved due to the accelerated efforts toward re-establishing the residents' livelihoods and social infrastructure, such as the development of reconstruction public housing, opening of stores, attracting enterprises to the industrial area, re-opening and re-establishing healthcare centers, nursing homes and welfare facilities. Education returned to normal with opening of elementary and secondary schools and newly constructed schools. Expansion of the highways and recovery of the entire JR Joban line railway are in progress (Figure 3).

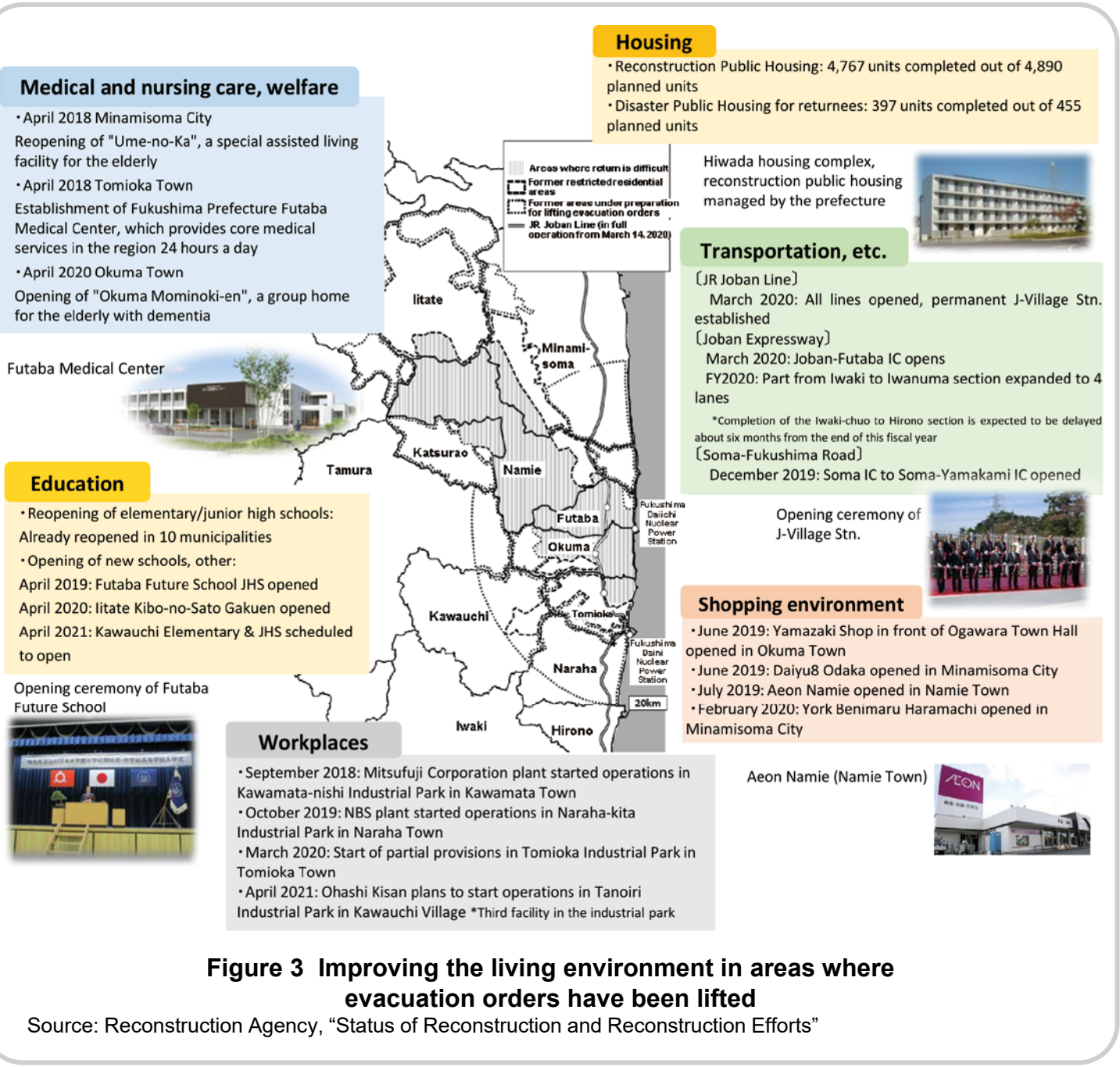


Figure 3 Improving the living environment in areas where evacuation orders have been lifted

Source: Reconstruction Agency, "Status of Reconstruction and Reconstruction Efforts"

How did the radiation affect over human health?

The Fukushima prefectural government has carried out its survey since 2011. The basic component of the survey to estimate the total external exposure doses after the first four months following the accident showed that 99.8% of the respondents received less than 5 mSv and that the maximum value was 25 mSv. Based on this result, it concluded that the radiation doses estimated so far were unlikely to cause adverse effects on human health[1]. The thyroid ultrasound examination undertaken for residents of Fukushima prefecture aged 18 years and younger (age as of March 11, 2011) has suggested no correlation between thyroid cancer cases detected through the full-scale screening and radiation exposure. According to a March 2021 report by the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR)[2], the Committee's estimates of dose and assessment of health risks implied that radiation-associated health effects were unlikely to be discernible among Fukushima residents.

What about radiation-associated effects over agricultural, forestry and fisheries products?

In April 2012, the Ministry of Health, Labour and Welfare implemented a new set of standards for managing radioactive contamination of food in the light of international standards prescribed by the Codex Alimentarious Commission[3]. The new standards were developed to achieve the world's strictest limit of radiation dosage from food namely lower than 1 mSv per year. Food items exceeding the limits are not allowed to be on the market. Owing to various efforts by all the people concerned, excluding a handful of mushrooms, wild edible plants and fisheries products, no items exceeding the limits have been found since FY2018 (Table 1).

Table 1 Results of inspections on radioactivity levels in Agricultural, Forestry and fishery products in 17 prefectures*

classification	From April 1, 2020 to January 27, 2021		
	Total number of reported samples	Number of samples above the maximum limit	Proportion of samples above the maximum limit
Rice	308,650	0	**0%**
Wheat and Barley	114	0	**0%**
Pulse	91	0	**0%**
Vegetable	3,655	0	**0%**
Fruits	844	0	**0%**
Tea (Tea infusion)	16	0	**0%**
Other cultivated plants	144	0	**0%**
Raw milk	2334	0	**0%**
Meat and Hen Eggs	18,559	0	**0%**
Mushrooms an Wild Edible Plants	5,562	82	1.5%
Fishery Products	8,953	1	0.01%

* Aomori, Iwate, Miyagi, Akita, Yamagata, Fukushima, Ibaraki, Tochigi, Gunma, Saitama, Chiba, Tokyo, Kanagawa, Niigata, Yamanashi, Nagano, and Shizuoka

Source: Created based on "Results of inspections on radioactivity levels in agricultural products," "Results of inspections on radioactivity levels in livestock products," "Results of the monitoring on radioactivity level in fishery products" by Ministry of Agriculture, Forestry and Fisheries

[1] Fukushima Medical University, "Report of the Fukushima Health Management Survey (FY2019)" (http://kenko-kanri.jp/img/report_r1.pdf)

[2] https://www.unscear.org/unscear/en/publications/2020b.html

[3] The CAC was jointly set up by the Food and Agricultural Organization of the United Nations (FAO) and the World Health Organization (WHO) in 1963. The CAC oversees the Codex Alimentarius, a set of international standards for food, to protect consumers' health and to promote fair international food trade.

The initiative of “Fukushima Innovation Coast Framework” was launched with the aim to build fresh industrial bases and hubs in Hamadori area and other parts of Fukushima. As a part of this initiative, “the Fukushima Robot Test Field” became fully operational in March 2020 (Figure 4). “The Fukushima Hydrogen Energy Research Field,” the world’s largest hydrogen production demonstrator, started production and shipment as well. The initiative promotes advanced R&D activities to help create new industries with focusing on six key sectors, i.e., i) decommissioning, ii) robotics and drones, iii) energy, environment, and recycling, vi) agroforestry and fisheries, v) medical care, and iv) aerospace.

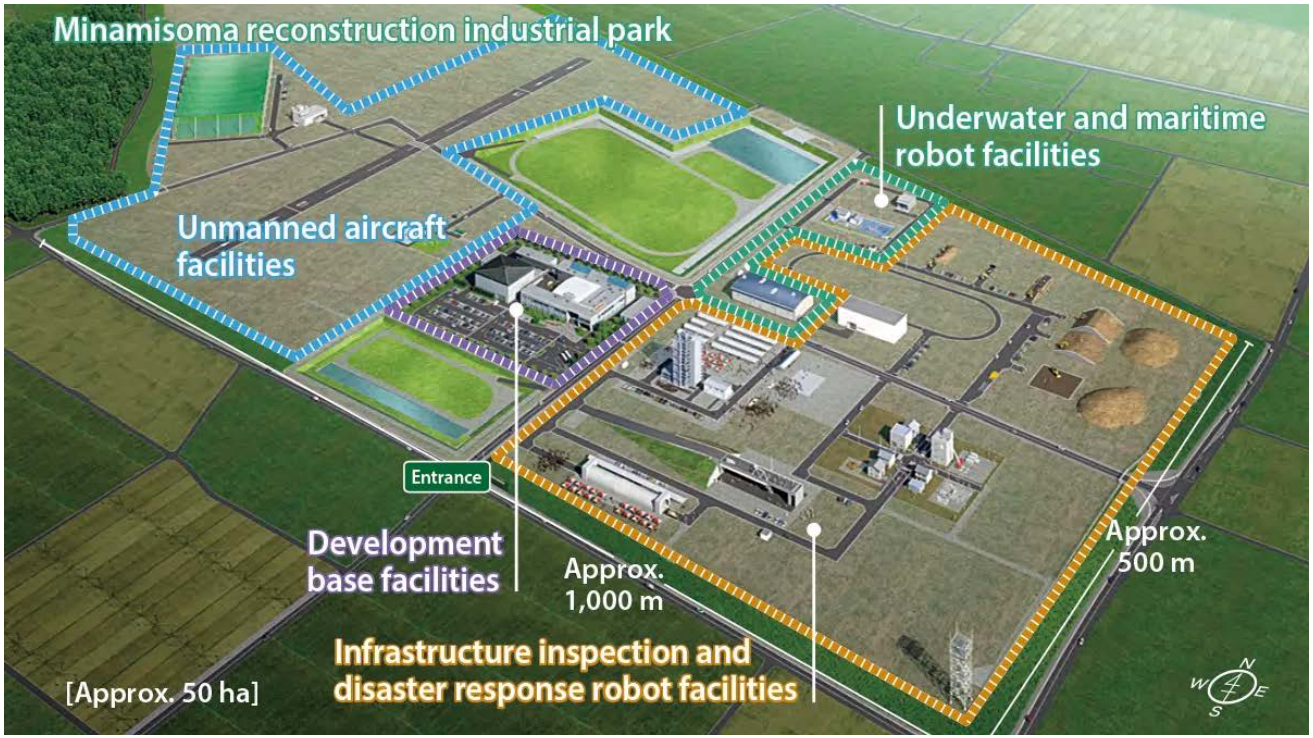


Figure 4 The layout of the Fukushima Robot Test Field

Source: METI Journal Online in the Japan Times, Fukushima after 10 years, “Fukushima faces business reconstruction, reactor decommissioning”

In addition to these projects, “an international institute for educational and research” will be established to foster innovations that will strengthen industrial competitiveness and solve problems common to the world. The research and human resources development are also indispensable for creative revitalization of Fukushima.

Even though the situation in Fukushima has dramatically changed in this way, many people around the world vividly remember what happened there ten years ago. The public image at the wake of the accident has remained unchanged since then. The first step to accelerate the rebuilding of Fukushima is to update the public image of Fukushima by providing precise data and information of Fukushima today.

(2) Recovery and Reconstruction of Fukushima is still on the way

As of March 2021, approximately 36,000 residents of Fukushima are still forced to live away from home. The government has not been able to announce a concrete plan for lifting the evacuation orders in the Restricted Area (excluding the Specified Reconstruction and Revitalization Bases).

With the lack of proper understanding as to what radioactive contamination means and the progress of decontamination work, the agriculture, forestry, fisheries, tourism and other sectors continue to suffer from ungrounded rumor and reputational damages, and this also affects other industries. Several countries and regions have still restricted their import of farm products from Fukushima (Table 2). In this context, there still exists a lingering negative reputation both in and abroad.

The market value of agricultural products in Fukushima has not recovered to the pre-disaster level. More specifically, in the 12 municipalities affected by the nuclear disaster, the areas where farming has already been resumed account for only 32% of the pre-disaster level as of the end of FY2019. In the fishery sector, the landing volume in FY2020 is still at merely 17.7% of the pre-disaster level.

While some municipalities that lifted the evacuation orders earlier have successfully received large numbers of returnees, others that lifted the orders later received fewer returnees. As a result, difficult issues such as the provision of healthcare and nursing care, as well as the obstacles in community regeneration that accompany serious depopulation and the declining birthrate and aging population are revealed.

Table 2 Status of countries and regions introduced import measures on Japanese food

(As of 28 May 2021)

Type of measures and number of countries or regions				Name of countries or regions
Introduced additional measures after the accident	**Lifted all the measures**		**40**	Canada, Myanmar, Serbia, Chile, Mexico, Peru, Guinea, New Zealand, Colombia, Malaysia, Ecuador, Vietnam, Iraq, Australia, Thailand, Bolivia, India, Kuwait, Nepal, Iran, Mauritius, Qatar, Ukraine, Pakistan, Saudi Arabia, Argentina, Turkey, New Caledonia, Brazil, Oman, Bahrain, Congo DR, Brunei, Philippines, Morocco, Egypt, Lebanon, United Arab Emirates, Israel, Singapore
	Remaining the measures	Import ban	6	China, Korea, Taiwan, Hong Kong, Macau, USA*
		Test certificate requirement	8	EU and UK**, Iceland, Liechtenstein, Norway and Switzerland (EFTA member states), French Polynesia, Russia, Indonesia
54	14			

* USA imposes import ban on the products subject to Japanese shipment restriction, at prefectural level.

** Total 27 EU member states and UK are counted in as one region, because they have introduced measures on Japanese food following the nuclear power station accident as one entity.

Source: Ministry of Agriculture, Forestry and Fisheries, “Status of countries and regions introduced import measures on Japanese food after the TEPCO’s Fukushima Daiichi Nuclear Power Station accident”

2 Fukushima Today: Efforts made on the premises of FDNPS

(1) Significant improvements of the environments in and around the NPS

Due to the high levels of radiation on the premises of FDNPS immediately after the accident, workers had to wear radiation protection suits when working on the site. Now that the average temperatures inside the reactors are stably maintained at 15 to 35 degrees Celsius and the working environment has been greatly improved, ordinary working clothes are used in about 96% of on-site areas (Figure 5).

The surrounding environments of the station have also been greatly improved (Figure 6). The concentration of radioactive materials (cesium-137) in the sea around the station is about 0.7 Bq/L as of December 2020, sufficiently lower than international quality standards for potable water. The annual dose at the site boundary has likewise fallen down to approximately 0.9 mSv per year as of July 2020. The amount of contaminated water generated per day has also been reduced to about 140 m^3 on average in 2020 by installing impermeable walls and taking other measures.

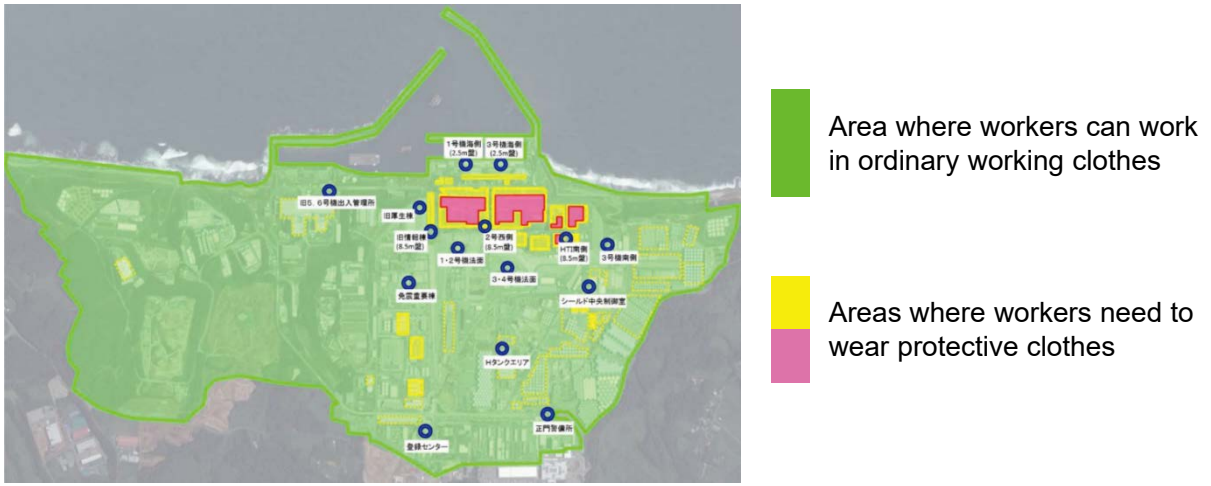
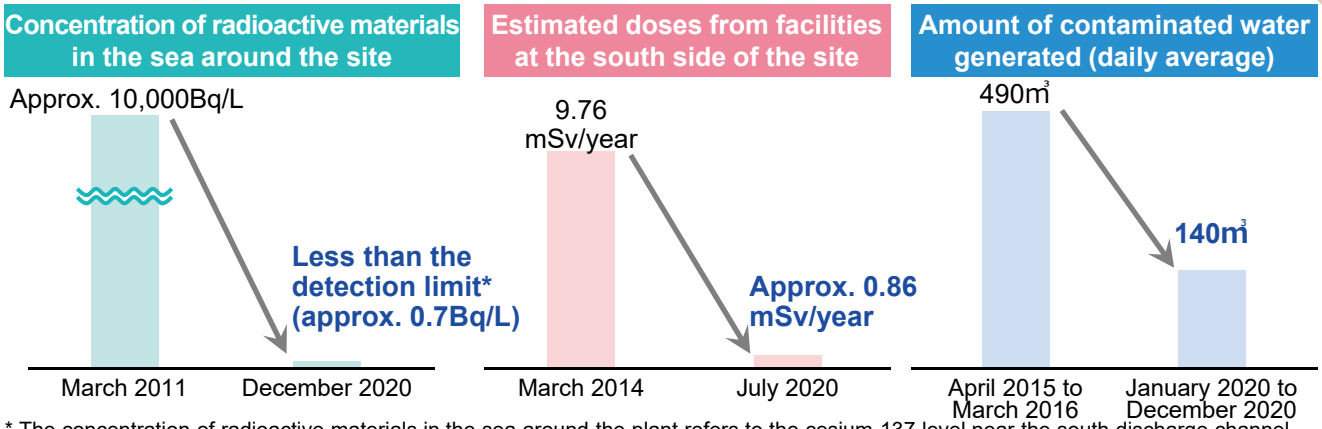


Figure 5 Improvement of working environment at FDNPS

Source: Created based on the data by Agency for Natural Resources and Energy



* The concentration of radioactive materials in the sea around the plant refers to the cesium-137 level near the south discharge channel
* The international standard for drinking water quality is 10Bq/L

Figure 6 Significant progress in management of contaminated water and in improvement of sea water quality around the FDNPS

Source: Created based on the data by Agency for Natural Resources and Energy

(2) Still a long way to go toward the completion of decommissioning

The fuel debris, stemmed from the melted fuels and materials inside the nuclear reactors, have kept high dose levels inside and in the vicinity of the Units 1 to 3. When working there, workers need to put on radiation protection suits.

Under those circumstances, there still remains much to be done for investigating and analyzing the cause of accident. The Nuclear Regulation Authority (NRA) continues its analysis of the accident while monitoring the progress made in the environment on the site and the decommissioning work. In March 2021, it released an interim report on the investigation and analysis of the accident compiling findings obtained from September 2019 to March 2021. Similarly, TEPCO is still conducting investigations and studies on the accident by identifying and working on unknown facts and outstanding uncertainties to fully understand the progression mechanism of the accident.

The government of Japan and TEPCO have joined hands in the decommissioning of FDNPS with the target completion date being 30 to 40 years. The task currently being carried out are three-fold, i.e., how to deal with contaminated water and treated water, how to remove fuel from spent fuel pools, and how to retrieve fuel debris (Figure 7). In April 2021, the government of Japan announced the Basic Policy on handling of ALPS[4]-treated water. This water meets the regulatory standards for discharge into the environment regarding nuclides other than tritium. The government of Japan is poised to proceed with concrete preparations, such as the construction of facilities for discharge and countermeasures to adverse impacts on reputation, in order to discharge ALPS-treated water into the sea approximately after two years.

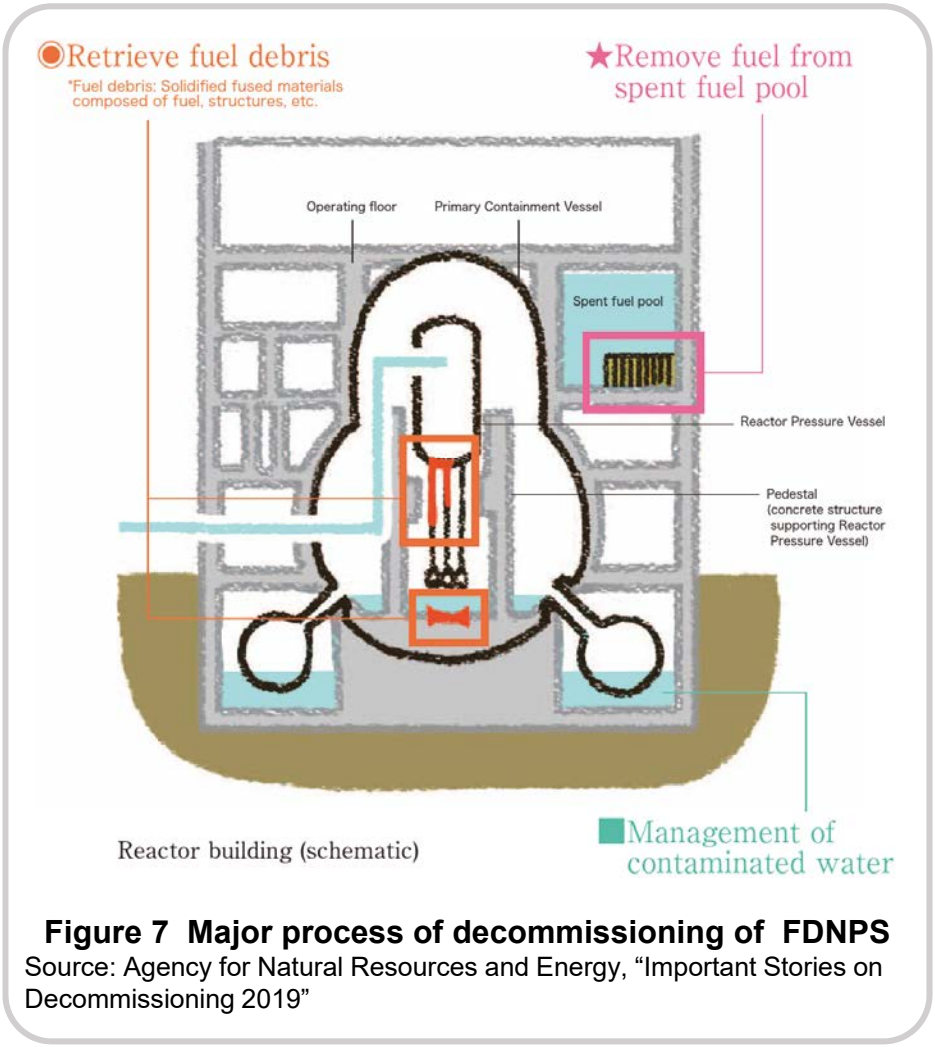


Figure 7 Major process of decommissioning of FDNPS
Source: Agency for Natural Resources and Energy, “Important Stories on Decommissioning 2019”

[4] A multi-nuclide removal system which removes various radioactive materials from contaminated water.

3 Efforts in the areas of organizational culture and frameworks

(1) Improvements made based on recommendations and lessons raised by accident investigation commissions

Prior to the accident, the Nuclear and Industrial Safety Agency, the former nuclear safety regulator, was put under the command of the Ministry of Economy, Trade and Industry (METI), which itself promoted nuclear power "utilization". This governmental structure, as it has been pointed out, did not secure the independence of the agency as a regulator and, combined with the lack of expertise, did not allow the agency to fulfill its missions of supervising and ensuring nuclear safety. To remedy the situation, the government reconsidered the ideal state of regulations as well as the relevant systems and established the Nuclear Regulation Authority (NRA) as an affiliated agent of the Ministry of Environment and its supporting secretariat in September 2012 (Figure 8), based on decisions to separate the regulation and the utilization of nuclear energy and to consolidate all the work related to nuclear safety regulations.

Mission
Our fundamental mission is to protect the general public and the environment through rigorous and reliable regulations of nuclear activities.

Guiding Principles for activities
We in the NRA and its supporting Secretariat shall perform our duties diligently acting in accordance with the following principles.
(1) Independent Decision Making
(2) Effective Actions
(3) Open and Transparent Organization
(4) Improvement and Commitment
(5) Emergency Response

Figure 8 NRA's core values and principles
Source: Created based on the website of NRA

In the effort to reinforce the safety standards, new standards took effect in 2013, including a strict application of Defense-in-Depth, more rigorous safety measures against natural disasters, e.g., tornados, forest fires, and newly introduced countermeasures against severe accidents and terrorism such as an intentional aircraft crash. The government also introduced the operation of a nuclear regulatory inspection program in April 2020 after revisiting the previous inspection system with reference to the Reactor Oversight Process (ROP) of the U.S. Nuclear Regulatory Commission (NRC). The current program provides clearer definitions of primary responsibilities of operators for securing nuclear safety and, comprehensively supervises and assesses safety activities of business operators.

At the same time, the operators are also moving forward on voluntary safety improvements. The Japan Nuclear Safety Institute (JANSI) and the Atomic Energy Association (ATENA) were established in 2012 and 2018 respectively. JANSI is the self-regulatory organization in the nuclear industry, and ATENA is aimed to formulate effective measures while engaging in a continuing dialogue with regulators and others. It also encourages nuclear operators to incorporate these measures into their actual site operations. In 2014, the Nuclear Risk Research Center (NRRC) was set up inside the Central Research Institute of Electric Power Industry. The Center is expected to play a central role in developing and employing state-of-the-art methods of Probabilistic Risk Assessment (PRA) and other risk management approaches.

The government has conducted reviews on nuclear emergency preparedness. As a result, the newly-established Nuclear Emergency Preparedness Commission is mandated to take charge of risk management under normal circumstances, while the Nuclear Emergency Response Headquarters will lead the response activities in the case of an emergency.

(2) Issues remaining to be addressed

The NRA of Japan accepted an Integrated Regulatory Review Service (IRRS) mission dispatched by the International Atomic Energy Agency (IAEA) in 2016, followed by an IRRS follow-up mission in January 2020, which reviewed the status and progress of responding to the issues identified by the first IRRS mission. The follow-up mission[5] found that of the thirteen recommendations and thirteen suggestions in 2016, which were related to management systems and organizational structures had not been fully addressed, leaving Japan to continue its efforts for improving those areas.

The new regulatory standards include unparalleled safety requirements for existing reactors and are thus regarded as the world's highest standards. On the other hand, some are concerned that such a high level of strictness may easily lead to a new safety myth in which people may complacently think that as long as a station satisfies the standards, it is perfectly safe. All people concerned need to remain engaged in improving nuclear safety and promoting a culture of safe practices by learning from the latest scientific findings in the world and by understanding and utilizing risk-related information.

It is easy to say that we must put lessons learned into practice, but in actuality, it is easy to forget what happened in the past as we constantly encounter new things and new events in our day-to-day lives. Over time, important lessons may slip from our minds, and these lessons forgotten may increase the risk of repeating the same mistakes. Nuclear energy-related organizations including the government and operators, and also the public as a whole, are therefore called on to keep the memory of the accident alive in order to continue to remember the lessons we've learned.

[5] Integrated Regulatory Review Service (IRRS) Follow-up Report to Japan (https://www.nsr.go.jp/data/000305662.pdf)

4 JAEC's position

The Japan Atomic Energy Commission (JAEC) compiled and issued the Basic Policy for Nuclear Energy in 2017, in the view of drastically changed environment following the accident at FDNPS. The Basic Policy points out fundamental issues ingrained in nuclear energy-related organizations, as shown in Figure 9, and notes that a wider use of nuclear energy in Japan will definitely require solving those issues.

The JAEC has explored over the last decade since the FDNPS accident and put together what all people concerned with nuclear energy must never forget and what they need to tackle in a collaborative manner. We must work on nuclear energy use with keeping the following firmly in our minds.

- ✧ The unique mindset and groupthink in Japan, the pressure to conform tacitly or forcibly to the opinion of the majority, and the tendency to maintain the status quo are all very strong.
- ✧ Another tendency within organizations is to lapse into sub-optimization. As a result of the sub-optimization of information sharing in terms of the contents and scope, truly needed information does not get appropriately shared.

Figure 9 Fundamental issues ingrained in nuclear energy-related organizations

Source: Created based on "Basic Policy for Nuclear Energy" by AEC

(1) All people concerned with nuclear energy must never forget the following.

- There still remain people displaced from home because of the accident and evacuation orders have not yet been lifted in some areas.
- Negative reputation resulting from the accident still remains, inflicting suffering to the people of Fukushima.
- We have to remember the memories of and the lessons learned from the nuclear disaster so as not to repeat any similar accident to take place again.
- It is a never ending journey of securing safety and building trust and confidence of the public.

(2) All people concerned with nuclear energy must redouble their effort and collaboratively tackle the following.

- Recovery and reconstruction of Fukushima until such a moment when the people of Fukushima regain pride and confidence in their homeland.
- Ensuring safety and rebuilding trust.
- Solving the fundamental issues ingrained in nuclear energy-related organizations.
- Keeping the memories and lessons associated with the FDNPS disaster and pass them on to future generations.
- Reinforcing their capacity to provide the necessary support to ensure that future generations can acquire scientifically accurate knowledge about nuclear energy and radiation, which enables them to evaluate the significance of nuclear energy and radiation in the society.

Summary

Chapters 1 to 8

Current status and efforts
related to the nuclear utilization in Japan

Chapter 1 "Steady recovery and reconstruction of Fukushima, and seamless safety improvement with lessons learned"

➢ Efforts toward the reconstruction/revitalization of Fukushima

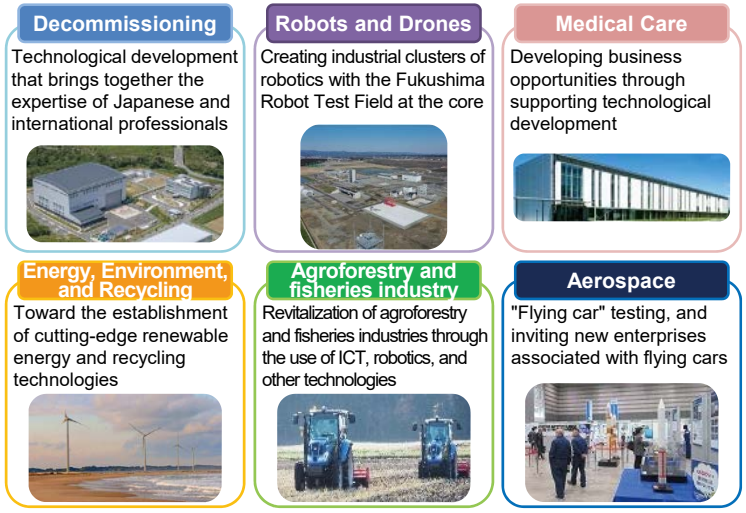
- ✓ Efforts include lifting evacuation orders, inspecting radioactive materials in food, eliminating negative reputational impact, processing and disposing removed soil and specified wastes, and promoting the initiative of "Fukushima Innovation Coast Framework" for creating new industries.

➢ Seamless safety improvement with serious lessons learned

- ✓ In April 2020, the implementation of the nuclear regulatory inspection program started.
- ✓ The Secretariat of the Nuclear Regulatory Authority (NRA) and the nuclear industry have technical view exchange sessions to discuss how to manage the aging of nuclear energy-related facilities.

➢ Countermeasures against nuclear disasters

- ✓ The Cabinet Office announced in June 2020 a basic policy on protective actions in responding to nuclear disaster under the COVID-19 pandemic.



6 Major Projects of Fukushima Innovation Coast Framework

Chapter 2 "Nuclear energy use addressing global warming issues and providing cost-effective electricity for national economy"

➢ Utilization of nuclear energy

- ✓ Utilization of nuclear energy is to be promoted by extending the lifetime of existing reactors and taking other actions as a means to respond to global warming, ensure a stable supply of energy, improve economic efficiency of power supply, and serve other purposes, all the while ensuring safety as a prerequisite condition.
- ✓ The Green Growth Strategy Through Achieving Carbon Neutrality in 2050 formulated in December 2020 states that nuclear energy can provide carbon-free electricity in a stable manner and presents goals and schedule regarding small modular reactors (SMRs), high-temperature gas reactors, and nuclear fusion.
- ✓ As of March 2021, 16 power reactors have received permission for the alteration of the reactor installment license, nine of which are already back in operation.

➢ Efforts concerning the nuclear fuel cycle

- ✓ After confirming the conformity with the new regulatory standards, NRA approved the amendment of the Business Permit to the business of the Rokkasho Reprocessing Plant operated by Japan Nuclear Fuel Limited (JNFL) in July 2020, JNFL's MOX Fuel Fabrication Plant in December 2020, and the Recyclable-Fuel Storage Center (interim storage facility for spent nuclear fuel in Mutsu City, Aomori) run by Recyclable Fuel Storage Company in November 2020.

Chapter 3 "Efforts at home and abroad in the global context"

➢ Trends in international organizations and nuclear superpowers

- ✓ The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) mentioned in its report issued in March 2021 that radiation-associated health effects in Fukushima residents resulting from the FDNPS accident are unlikely to be discernible.
- ✓ OECD/NEA issued in June 2020 a policy paper on roles played by nuclear energy in the post-COVID-19 society.
- ✓ U.S. President Biden, incumbent since January 2021, has decided to make use of nuclear energy technology as part of countermeasures against climate change.

➢ Engagement in and collaboration with international organizations, and promotion of bilateral and multilateral collaboration

- ✓ At the IAEA General Conference held in September 2020, Minister of State for Science and Technology Policy, Mr. INOUE Shinji, made a statement as the head of delegation of Japan, explaining Japan's actions including the state of study regarding how to handle ALPS-treated water and Japan's contributions to the Peaceful Uses Initiative.
- ✓ The Ministerial Level Meeting of the Forum for Nuclear Cooperation in Asia (FNCA) held in December 2020 focused on nuclear-related activities under the COVID-19 pandemic (including possible future cooperation between FNCA and IAEA in the area of medical care) and was concluded by adopting a joint communique.

Chapter 4 "Peaceful use of nuclear energy, nuclear non-proliferation, and nuclear security"

➢ Promoting the peaceful use of nuclear energy

- ✓ Peaceful use of nuclear energy of Japan is assured by implementing IAEA's stringent safeguards and other relevant regulations. In 2021, after verifying the appropriate plutonium use plans developed by nuclear plant operators, permission for mid-term implementation plans of Nuclear Reprocessing Organization of Japan was granted.
- ✓ The total volume of separated plutonium held by Japan as of the end of 2020 is approximately 46.1 tons in aggregate both within and outside of Japan.

The Status of Separated Plutonium Management

			As of the end of 2020
Total			Approx. 46.1t
	Held in Japan		Approx. 8.9t
	Held abroad	(Total)	Approx. 37.2t
		Breakdown: U.K.	Approx. 21.8t
		Breakdown: France	Approx. 15.4t

➢ Ensuring nuclear security

- ✓ Nuclear security is ensured by providing nuclear material protection based on the Reactor Regulation Act, which promotes a culture of nuclear security practices, and carrying forward programs to reinforce nuclear security controls (e.g., issuing a corrective action order to TEPCO in April 2021 in response to the security problem found at Kashiwazaki-Kariwa NPS).

➢ Maintaining and strengthening nuclear disarmament and non-proliferation frameworks

- ✓ As the only country to have experienced the use of atomic bombs in war, Japan has engaged actively in efforts toward nuclear disarmament and non-proliferation on the basis of the Nuclear Non-Proliferation Treaty, such as submission of a resolution on the elimination of nuclear weapons to the U.N. General Assembly, and worked hard to mediate among countries with different stances with respect to the Treaty on the Prohibition of Nuclear Weapons and other agenda.

Chapter 5 “Rebuilding public trust and confidence as a precondition for using nuclear energy”

➢ Toward rebuilding of public trust in nuclear energy use

- ✓ An environment in which each and every Japanese citizen can deepen their understanding on topics concerning nuclear energy needs to be provided through the building of an information system which provides scientifically accurate information and objective facts and evidence.

➢ Efforts to enhance information sharing and communication by nuclear energy-related organizations

- ✓ Information provision initiatives include hosting symposiums on energy policies, organizing nationwide interactive seminars, distributing timely articles on websites, and operating hands-on information centers.
- ✓ View exchange sessions are held on the theme of the handling of treated water from the FDNPS inviting a wide spectrum of stakeholders including the local government and authorities (e.g., “Meetings for Hearing Opinions”).

Dialogue-Based Meetings on Final Disposal of High-Level Radioactive Waste

➢ Coexistence with the local communities at nuclear plant locations

- ✓ In March 2021, the Act on Special Measures concerning Development of Areas around Nuclear Power Plants and Other Facilities was extended for ten years for supporting the development of disaster management infrastructure.

Chapter 6 “Decommissioning of nuclear stations and the radioactive waste management”

➢ Decommissioning of FDNPS

- ✓ With a view to a completion in 30 to 40 years’ time, the government and TEPCO are currently carrying out the decommissioning work steadily including the management of contaminated water and treated water, removal of fuel from spent fuel pools, and retrieval of fuel debris. In April 2021, the government published the Basic Policy on the handling of ALPS-treated water.

➢ Decommissioning of nuclear power stations and nuclear-related research centers

- ✓ In May 2020, TEPCO submitted applications for approval on the decommissioning plan for Units 1 to 4 at Fukushima Daini NPS.
- ✓ As of the end of March 2021, the decommissioning process of 14 commercial power reactors and 15 research and development facilities are underway.

➢ Management of radioactive wastes

- ✓ Literature surveys on Suttsu Town and Kamoenai Village in Hokkaido started in November 2020 for site selection of a final disposal facility for high-level radioactive wastes.
- ✓ Discussions are being held toward a development of regulations concerning mid-depth storage, disposal of uranium waste and so forth, while low-level radioactive wastes are properly classified and disposed of in trenches and pits.

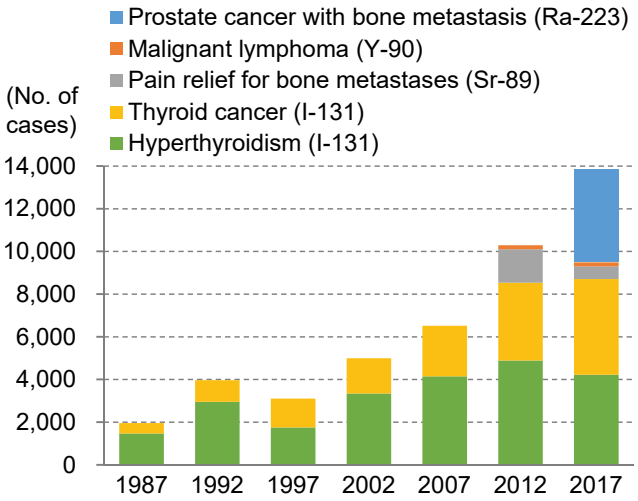
Chapter 7 "Promoting the utilization of radiation and radioisotopes"

➢ Making use of radiation and radioisotopes in various fields

- ✓ Utilization of radiation and radioisotopes (RIs) is an essential technology which supports society in a wide range of sectors from the industry to agriculture and medical care.
- ✓ The technology is used for both diagnosis and treatment in the medical field. In June 2020, Japan's health insurance was applied to cover accelerator-based Boron Neutron Capture Therapy (BNCT) for select tumors. Research on cancer treatment using alpha emitter RI-based pharmaceuticals is also underway.
- ✓ In the area of science and technology, radiation and RIs are relevant to various disciplines, such as material science and life science, and have applications such as to the structural analysis of materials.

➢ Setting a stage for radiation use

- ✓ The government revised relevant regulations in March and April 2020 to align with international standards, so as to ensure the safe and appropriate use of radiation and RIs. Therein, the dose limitations to the lens of the eye were lowered.



Growth in the annual number of nuclear medicine treatments using unsealed RIs

Chapter 8 "Strengthening the foundation for using nuclear energy"

➢ Promoting research, development and innovation

- ✓ An initiative, Nuclear Energy X Innovation Promotion (NEXIP), was launched jointly by The Ministry of Education, Culture, Sports, Science and Technology (MEXT) and the Ministry of Economy, Trade and Industry (METI) in 2019 with the purpose of promoting the seamless innovation from basic research to commercialization, is proceeding.
- ✓ Japan has continuously been promoting R&D on higher safety of light water reactors, on innovative reactors such as high temperature gas reactors, fast reactors and small modular reactors, and on nuclear fusion. In September 2020, the government selected the reactor type of a new research and test reactor to be installed at the Monju site.

➢ Strengthening foundational facilities

- ✓ The government is striving for ensuring compatibility of foundational facilities indispensable for R&D and human resources development with the new regulatory standards, in view of the aging of the facilities.

➢ Securing and fostering human resources

- ✓ Being aware that Japan needs to secure and nurture human resources for both the promotion of nuclear energy use and its controlled safety, the government, research institutes, universities and other stakeholders are collaboratively carrying forward a variety of efforts (e.g., training sessions, visiting lessons, and hands-on training using actual reactors).

Useful Information

Commissioners of JAEC (as of Aug. 2021)

Dr. UESAKA, Mitsuru
Chairman

Mr. SANO, Toshio
Commissioner

Dr. NAKANISHI, Tomoko M.
Commissioner

JAEC Website

http://www.aec.go.jp/jicst/NC/eng/index.htm

Decisions of JAEC

“White Paper on Nuclear Energy”
http://www.aec.go.jp/jicst/NC/about/hakusho/index_e.htm

“Basic Policy for Nuclear Energy” July 2017
http://www.aec.go.jp/jicst/NC/about/kettei/kettei170720_e.pdf

“Plutonium Utilization in Japan“ October 2017
http://www.aec.go.jp/jicst/NC/about/kettei/kettei171003_e.pdf

“Basic Policy for Nuclear Research and Development (R&D)” June 2018
http://www.aec.go.jp/jicst/NC/about/kettei/180612_e.pdf