

Summary of “White Paper on Nuclear Energy 2016”

**September 2017
Japan Atomic Energy Commission**

Outline of “White Paper on Nuclear Energy 2016”

Background

- The White Paper on Nuclear Energy has been published on a continuous basis since the launch of the Japan Atomic Energy Committee (JAEC) in 1956 through 2010, the year before the TEPCO Fukushima nuclear power plant accident (the Fukushima accident).
- Subsequent to the 2009 edition (published in March 2010), the White Paper was suspended, as attention was focused on responses to the Fukushima accident and subsequent review and reform of the JAEC.
- The report of the Experts Committee for Review of the JAEC suggested that there was value in publishing the white paper, and the Amended Act for Establishment of JAEC clearly called for the task of "the collection of information and conducting of surveys concerning nuclear utilization."

Objectives

- The White Paper on Nuclear Energy is intended to fulfill the responsibility of the Japanese Government to the Japanese people to comprehensively and continuously provide explanation on the Government's initiatives in nuclear energy based on the lessons learned from the Fukushima accident and the changes in attitudes surrounding nuclear energy. Additionally, with attention focused from overseas on the state of nuclear energy in Japan, the White Paper is a suitable means of sharing information with the international community.
- At this time, JAEC has adopted the "Basic Policy for Nuclear Energy". The Cabinet has decided that the Government will respect this document for research, development and utilization of nuclear science and technology. It is important to present readily understandable information to the Japanese people, including the statement of "Basic Policy for Nuclear Energy".

Main Points of “White Paper on Nuclear Energy 2016”

Main Points

- JAEC intends to **fulfill its responsibility to the public by explaining**, through the white paper, the government's initiatives and the state of nuclear energy in Japan including “Basic Policy for Nuclear Energy.”
 - As the white paper is published first in seven years, JAEC intends to address **those efforts that have been implemented based on the lessons learned from the Fukushima accident** and explain not only current efforts but also **background and progress of them** so that people can see things from a broad perspective.
 - JAEC intends to explain **a whole picture of the nuclear energy use**.

- JAEC adopted **“Basic Policy for Nuclear Energy”** in July 2017, which is to indicate long-term policy directions of nuclear energy. By means of publication of the white paper and its own activities, **JAEC will proactively confirm progress of the efforts made to the matters that have been brought up in the Basic Policy and make a point on those matters from an expert’s point of view and in consideration of lessons learned internationally**. Then, JAEC will continue to play a role expected in these areas.

Main Points of “White Paper on Nuclear Energy 2016”

Structure

1. Basic Policy for Nuclear Energy

- ◆ JAEC adopted “Basic Policy for Nuclear Energy” and the Cabinet decided that the Government will respect this document in July 2017. The white paper provides explanation of the policy using data on the circumstances surrounding nuclear energy and international expertise.

2. The experience and lessons-learned from the Fukushima accident and the efforts implemented based on them

- ◆ Some organizations such as NAIIC (The Nuclear Accident Independent Investigation Commission) established by the National Diet of Japan after the Fukushima Nuclear Accident and ICANPS (the Governmental Investigation Committee) conducted the investigations concerning the Fukushima accident. The white paper describes the [reform of nuclear safety organization and systems as well as the ongoing efforts implemented based on the proposal of those organizations](#). The white paper also describes tireless efforts to improve safety that have been made by nuclear industry including nuclear operators.
- ◆ It describes the progress of recovery and reconstruction at Fukushima, and the effort made to tackle decommissioning of damaged reactors and develop counter measures to contaminated water.

3. Fixed point observations of current status and measures implemented in the research, development, and utilization of nuclear energy in Japan

- ◆ The white paper comprehensively reports on [the current activities and continuous efforts in entire areas of nuclear energy in Japan](#), which includes: ensuring peaceful uses; implementation of nuclear safety measures; rebuilding public trust; processing and disposal of radioactive wastes; developing and securing human resources; research and development; utilization of radiation; nuclear security and international approaches.

1. Changing Environment Surrounding Nuclear Energy

- A need exists to sincerely address the public distrust and anxiety about nuclear energy and **rebuild social confidence**
- A new competitive electric power market has emerged with full liberalization of the retail electricity market
- Further substantial reduction of CO2 emissions over a long term will be difficult to achieve simply by applying existing countermeasures
- Increased use of thermal power stations and introduction of a feed-in tariff (FIT) system for renewable energy have led to higher electricity tariffs, which have had a major negative impacts on people’s livelihood and economic activities



2. Fundamental issues ingrained in nuclear energy-related organizations

- 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, and they can be a problem.
- Another tendency within organizations is to lapse into **sub-optimization**. Creating a culture in which people can exchange a variety of opinions based on solid grounds, regardless of their standing inside or outside the organization, is necessary.



3. Basic objectives and important initiatives of nuclear energy use

- Appropriate use of nuclear energy with thorough risk-management by responsible organizations is necessary.
- It is important to proceed with the use of nuclear energy with peaceful use and safety assurance as basic preconditions, winning the confidence of the people and bearing in mind both benefits and costs that nuclear technology can bring to the environment, people’s livelihood, and economic activities.

1. **Seriously reflect on the Fukushima accident and learn lessons therefrom**

- ◆ Establish a safety culture that overcomes weakness of traditional Japanese organizations and national cultures.
- ◆ Shift in safety assurance of a “culture of prevention” by promotion of risk management.

2. **Pursue nuclear energy use addressing global warming issues and people’s livelihood and the economy**

- ◆ The National Government needs to clarify the role that nuclear power generation can play over a long term and examine necessary measures therefor

3. Basic objectives and important initiatives of nuclear energy use

3. Nuclear energy *in the global context*

- ◆ Collect and share [international knowledge and experiences](#); improve international awareness

4. *Peaceful use of nuclear energy: enhancing non-proliferation and security regimes*

- ◆ Take steps to [assure the international community of Japan's peaceful use of plutonium](#); Ensure [the plutonium balance](#) and [responsible plutonium management](#); [consume plutonium in the form of MOX fuel](#) for light water reactor

5. *Rebuilding public trust, as a major precondition*

- ◆ Create an information [base for people to be able to deepen their understanding](#) of the circumstances surrounding nuclear energy use in Japan based on [scientifically accurate information and objective facts \(evidence\)](#)

6. *Steadily pursuing decommissioning and radioactive waste disposal*

- ◆ The [resolute implementation of disposal of radioactive waste](#) by the current responsible generation.

7. *Expanded use of radiation and radioisotopes*

- ◆ Develop necessary infrastructure to enable [further use of radiation and radioisotopes including the use of quantum beams](#).

8. *Strengthening the foundations for the use of nuclear energy*

- ◆ R&D institutions and nuclear industry should collaborate and develop a deep and broad knowledge base.
- ◆ [Securing qualified human resources](#) and [improving human resources development](#) including on-the-job training



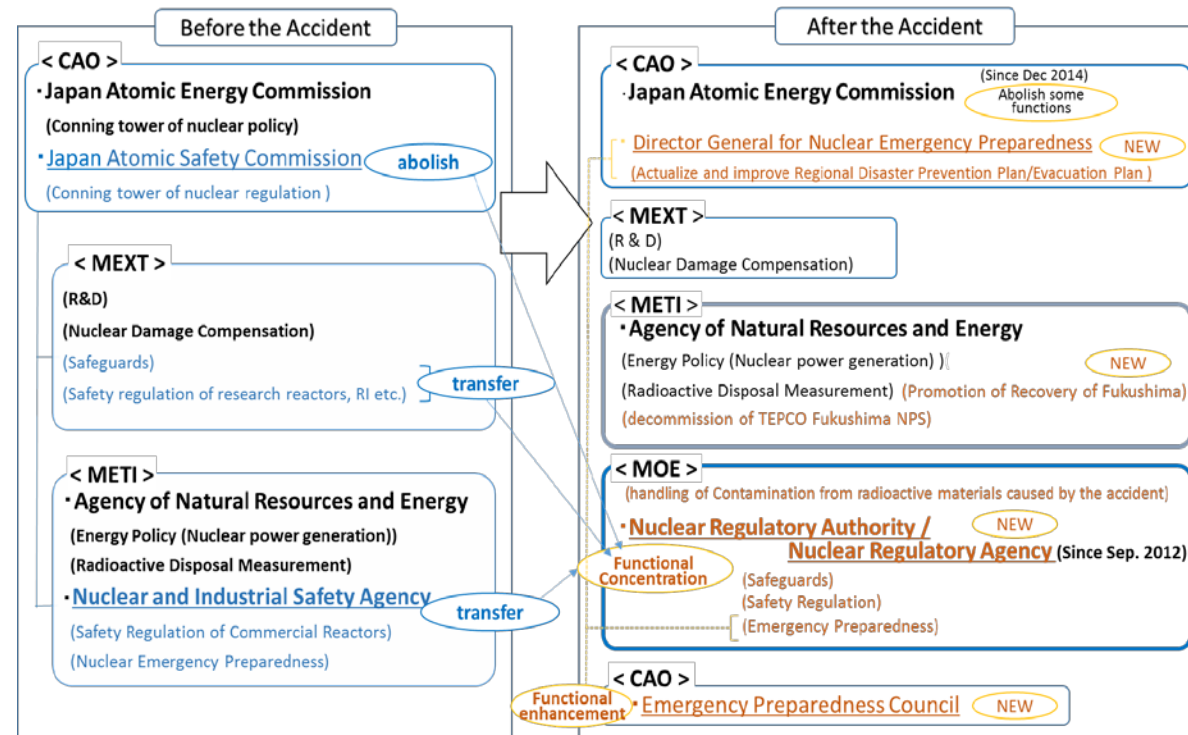
In light of the fact that the environment surrounding nuclear energy will keep changing substantially in the coming years, “Basic Policy for Nuclear Energy” is to be reviewed and revised, as necessary, basically every five years or roughly every five years

Responding to the Fukushima accident and initiatives toward reconstruction and revival

- ◆ The white paper outlines results of investigations of the Fukushima accident carried out by NAIC and ICANPS. It describes **reform of nuclear safety organization and systems and the ongoing efforts implemented** based on the proposal of those organizations.

Efforts and system-reform on the nuclear safety after the accident

- In the wake of the Fukushima accident, institutions in Japan and abroad, including NAIC and ICANPS, IAEA conducted investigations and verification activities, and published numerous recommendations.
- The Government has **strengthened nuclear safety regulations and measures for nuclear emergency response** based on the recommendations of NAIC and ICANPS such as establishment of Nuclear Regulation Authority and establishment of new regulatory requirements.
- Taking into account the latest technical knowledge and trends at home and abroad, the Government worked on continuous improvement of regulation and accept IAEA's Integrated Regulatory Review Service (IRRS review).



Responding to the Fukushima accident and initiatives toward reconstruction and revival

- ◆ It describes voluntary efforts to improve safety by nuclear industry including nuclear operators.
- ◆ It describes current situation of recovery and reconstruction of Fukushima and the effort to tackle decommissioning of damaged reactors and containment and decontamination of contaminated water.

Voluntary efforts to improve safety by nuclear industry

- Based on the lessons learned from the Fukushima accident, it is necessary not only to comply with regulatory requirements, but also to **accumulate unremitting efforts to improve safety**.
- Under this awareness, nuclear industry has made efforts to improve and implement voluntary and ongoing safety improvement measures such as **setting up voluntary regulatory organizations** and **utilization of risk assessment, enhancement of their response to severe accidents**.
- The Government is **promoting voluntary improvements in nuclear power safety in the industry**, including the development of roadmaps for light-water reactor safety technologies and for human resources development.

Reconstruction and revival of Fukushima

- Fukushima Special Measures Law was amended and Fukushima Reconstruction Basic Policy was revised.
- Initiatives **to support the reconstruction of lives through safety and security measures for early return of the evacuees**, and **reconstruction of businesses and livelihoods, initiatives toward reconstruction and revival such as the Fukushima Innovation Coast scheme** have been implementing.
- **Decontamination** and **treatment of radioactive waste material**, setting up of interim storage facility have been implementing.

Decommissioning of TEPCO Fukushima nuclear plant and countermeasures to contaminated water

- “Mid-to Long-Term Roadmap for Decommissioning the TEPCO Fukushima Daiichi Nuclear Power Plant” was established by the Government and TEPCO, and then decommissioning of the TEPCO Fukushima Daiichi Nuclear Power Plant and dealing with contaminated water is being implemented.
- Based on the roadmap, **the Government takes the forefront** and implement the plan safely and steadily.

Fixed point observations of current status and measures implemented in the research, development, and utilization of nuclear energy in Japan

- ◆ It reports the current activities and continuous efforts in entire nuclear energy, which includes ensuring peaceful uses, nuclear safety measures, rebuilding public trust, processing and disposal of radioactive wastes, developing and securing human resources, research and development of nuclear energy, utilization of radiation, nuclear security, international Approaches.

Chapter 2 Basic activities pertaining to the use of nuclear energy

- Nuclear safety measures
- Nuclear security
- Ensuring peaceful use
- Treatment and disposal of radioactive wastes
- Securing and Training of nuclear energy human resources
- Coexistence of the public and local communities with nuclear energy

Chapter 3 Utilization of nuclear energy and radiation

- Current status and efforts on nuclear power generation
- Nuclear fuel cycling
- Current status and efforts on radiation utilization

Chapter 4 Nuclear energy research and development

- R & D for safety improvement and decommissioning of TEPCO Fukushima nuclear power plant
- Basic and fundamental R&D
- Utilization of research reactors
- Building a thick knowledge base

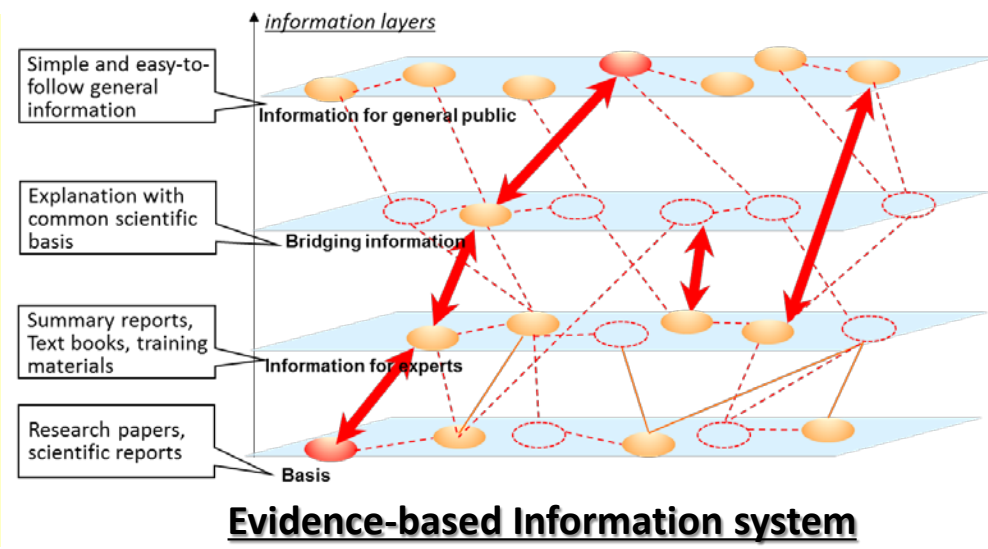
Chapter 5 International initiatives

- international cooperation
- Maintaining and strengthening nuclear disarmament and nonproliferation regimes
- International use of nuclear energy and industry trends

Fixed point observations of current status and measures implemented in the research, development, and utilization of nuclear energy in Japan

Coexistence of the public and local communities with nuclear energy (Chapter 2)

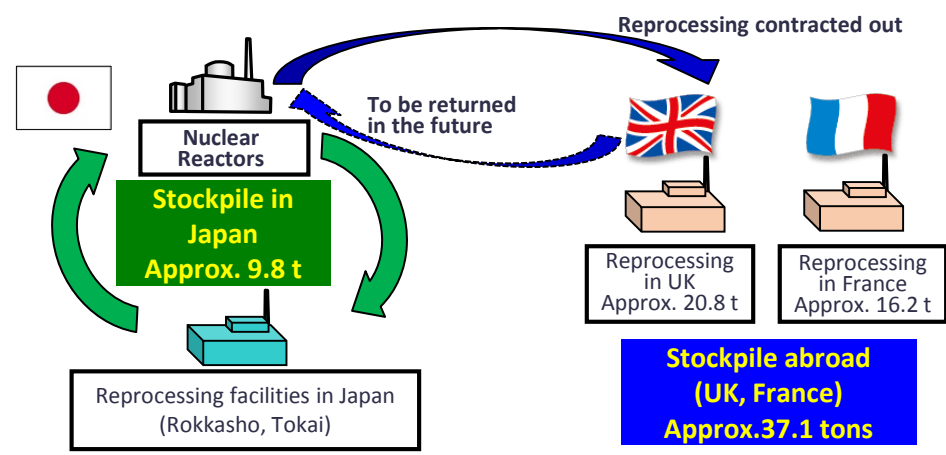
- It is essential to sincerely face up to the public distrust and anxiety and **continue more efforts to mitigate such concerns.**
- The Government and nuclear operators have participated in town hall style meetings and fostered open dialogs and exchanges of information with communities where power plants are located as well as with the communities that consume the electric power those plants generate.
- JAEC identified the need to build information systems based on scientific understanding (evidence) that **enables anyone with nuclear energy-related questions to independently find explanations and answers to help them develop a deeper understanding.**



Ensuring peaceful use (Chapter 2,5)

- Japan ensures **the peaceful use of nuclear energy through strict application of the IAEA safeguards and strengthened transparency in the use of plutonium.**
- In view of increasing worldwide concerns about Japan's plutonium stockpile, JAEC believes that the steady consumption of plutonium in the form of MOX fuel for light water reactors is currently the only practical way of using plutonium.

Total stockpile held in Japan and abroad: approx. 46.9 t



Stockpile abroad (UK, France) Approx. 37.1 tons

<As of end 2016>

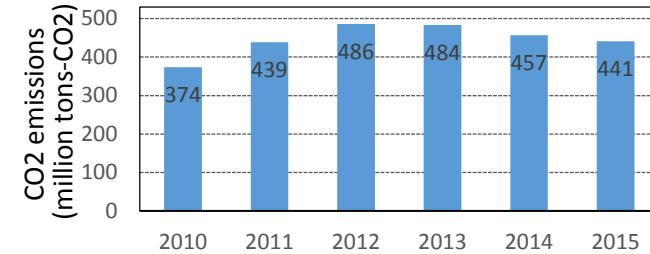
Fixed point observations of current status and measures implemented in the research, development, and utilization of nuclear energy in Japan

Utilization of nuclear energy (Chapter 3)

- Efforts need to be made to resolve the following issues that Japan faces:
 - At 94.4%, Japan's dependence on overseas resources is one of the highest among industrialized nations
 - Burden on the public has increased in the form of higher electricity rates due to greater reliance on thermal power generation using imported fossil fuels to replace nuclear power as well as the introduction of the feed-in tariff system for renewable energy
 - Efforts must be made to reduce greenhouse gas emissions to deal with the problem of global warming

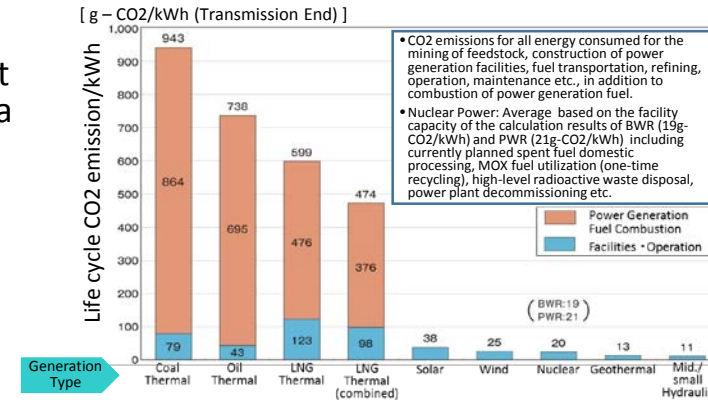
◆ **Approx. 457 million tons (40% of the total) of electricity originated CO2 emissions** (as of FY 2014)

Source: ELCS' preliminary data from 39 member companies in 2015



◆ **Nuclear power plant emits little CO2 on a lifecycle basis**

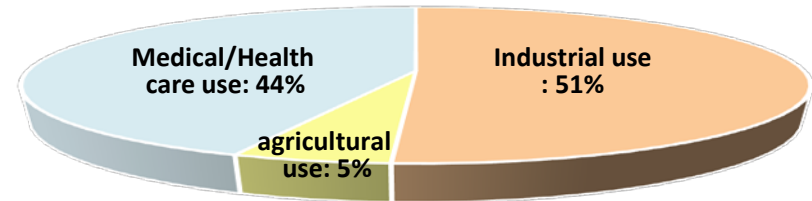
Source: "Nuclear Energy Charts 2016" - Japan Atomic Energy Relations Organization



Utilization of radiation (Chapter 3)

- **It is used in a wide variety of fields** such as advanced science and technology, medicine, industry and agriculture.
- About 4 trillion yen of economic scale

Market Size of Radiation Utilization in FY2015 ¥4,370 billion



Building a thick knowledge base (Chapter 4)

- The industry sector is a primary leader that introduces new technology into the market. the research facilities and universities lead creation of new knowledge and value necessary for technology creation. It is **vital to develop connections and partnerships between them.**
- Sufficient effort on cross-sectional and cross-organizational cooperation has not made in the nuclear field of Japan, and scientific knowledge exists for each organization.
- JAEC has pointed out the need for a network that crosses industry and research institutions and universities, and for the **establishment of a broad knowledge base.**