Tentative Translation

White Paper on Nuclear Energy 2009

<Outline>

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Japan Atomic Energy Commission

Cabinet Office

Foreword

The Atomic Energy Basic Act provides that research, development and utilization of nuclear energy in Japan shall be promoted only for peaceful purposes while ensuring safety, operating democratically and autonomously, making the results open to the public, and actively contributing to international cooperation. Under this principle, the promotion should aim to secure energy resources in the future, to achieve progress in the sciences and technology and the promotion of industries and thereby to contribute to the welfare of mankind and the elevation of the national standard of living. The Japan Atomic Energy Commission (JAEC), which is authorized by the law to plan, deliberate and decide on the nuclear energy policy of the State, provided its basic policy in the Framework for Nuclear Energy Policy, which has been valued by the persons involved in nuclear energy. The "White Paper on Nuclear Energy 2009" introduces to the public new moves in the research, development, and utilization of nuclear energy conducted in Japan under the Policy in 2009.

Shunsuke Kondo, Chairperson of the JAEC

1. Overview - Beginning of a New Era of Nuclear Power Utilization –

1-1 Change in government and nuclear energy policy

The new administration mentioned their nuclear energy policy in a few occasions:

- Basic Policies of “New Growth Strategy”: The government shall work on utilization of nuclear energy steadily while giving top priority to both assuring safety and obtaining public confidence.
- Bill of the Basic Act for Global Warming Countermeasures: Aiming at contributing to the reduction of greenhouse gas emissions, the Government shall promote .... measures for promoting nuclear energy utilization, while ensuring safety and gaining the understanding and confidence of the public, in particular.

JAEC believes that nuclear energy can contribute to the major policy initiative of the new government:

- The new government pledged that Japan would reduce greenhouse gas emissions by 25 percent by 2020 from 1990 levels on the condition that a fair and effective international framework in which all major economies participate is established and that all major countries set high targets.
- It announced that it would start the formulation of "Green Innovation Initiative” that strongly promotes measures to combating global warming and "Life Innovation Initiative" as strategic innovation initiatives to stimulate economic growth.
- Nuclear energy can contribute to “Green Innovation Initiative” as we can reduce greenhouse gas emissions from energy supply sector by increasing its share in the electricity supply since it enables

large-scale power generation but emits only a small amount of greenhouse gas. It can contribute to the economic growth if we can increase exports of nuclear power plant or its equipments. Nuclear energy technology can contribute to “Life Innovation” also as it can be used to promote a good health via radiation diagnosis, radiation treatment of cancer etc.

1-2 Contribution of nuclear energy to solving social issues

(1) Contribution of nuclear energy to combating global warming

Current status:

- The international community shares high expectations for nuclear power generation from the viewpoints of securing stable energy supplies and reducing greenhouse gas emissions: nuclear power generation is globally expanding in way of returning to nuclear power in western countries and starting introduction and or expansion of nuclear energy use in Middle East / Asian countries.
- In Japan the public recognition that nuclear power generation contributes to combating global warming is greatly increasing, and at present it is expected that about 110 million tons of CO2 emissions can be reduced by raising the average plant capacity factor of the fleet in operation from 60% to 80% and constructing 9 new nuclear power plants.
- Japan is promoting the activities to close nuclear fuel cycle to ensure sustainable nuclear energy utilization. Major activities for this purpose are;
  - Utilization of plutonium in light water reactors just started.
  - Safe disposal of some types of low-level radioactive waste promoted for more than ten years.
  - Commissioning of JNFL’s Rokkasho Reprocessing Plant that is at the final stage of active test.
  - Conduction of public relations activities by the government and the parties concerned in order to start the survey of sites for the geological repository of high-level radioactive waste.

Future issues:

- Electric power companies should make steady efforts to maintain / improve the capability of nuclear power generation, while placing top priority on safety, including those to resume the operation of the Kashiwazaki Kariwa nuclear power plants, extend the interval of periodic inspections under the new inspection system that should improve both safety and reliability, implement the measures against aging, construct new nuclear power stations, etc:
- Nuclear industries should make steady efforts to promote the export of nuclear power plants with a view to contributing to both economic growth of Japan and global actions to combat global warming:
- Government and industries should incessantly promote cooperation with local communities where nuclear facilities are located;
- Government and industries should cooperate to develop the next-generation light water reactors:
- The construction of the Rokkasho Reprocessing Plant (RRP) should be steadily completed, and Electric power companies should promote the construction of intermediate spent fuel storage

facilities that can cover the amount of spent fuel generated more than the capacity of the RRP:

- Government and industries should strengthen activities to create an environment for municipalities to be able to respond to the solicitation for area survey to determine a site for geological repository of high-level radioactive waste.

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Necessity for High-level Radioactive Waste Disposal and Public Hearings and Publicities

For geologic disposal, it is essential to provide opportunities where people consider it as "their own business," not as "other people's business," and to provide information politely, such as answering questions from various viewpoints, e.g., "safety", "site selection process", and "cost sharing."

Etsuko Akiba, Commissioner of the Japan Atomic Energy Commission (from Jan. 2010)

Note: The full text is on page 26, Chapter 1, White Paper on Nuclear Energy.

(2) Utilization of radiation

Current status:

- Radiation is used in various fields, including medical care, agriculture, and industry: examples are cancer therapy, medical diagnosis, improvement of plant species, radial-ply tire production, semiconductor manufacturing etc.
- In the medical field, radiation diagnosis utilizing X-ray, CT, PET, etc. and cancer therapy using X-ray, ion beams, etc. are widely conducted.
- Particularly, more than 4,800 cases of cancer treatment using heavy ion beams has been conducted in recent years and it has been proved that this treatment is effective for cancers that are difficult to treat by surgical operation or other methods.
- Radiation is being used to develop technologies and materials that contribute to the facilitation of the creation of a low carbon society, including, materials that can selectively adsorb useful resources such as uranium, a film for high-performance fuel cell, superconducting materials, etc.

Future issues:

- Government, research organizations and industries should pursue further deepening of the public understanding of safety and effectiveness of radiation for further expansion of radiation utilization.
- Operators of large scale radiation facilities should make efforts to prepare trial use programmes with a view to improving the understanding of industries on the safety and benefits of radiation applications and thus expanding the customer.
- Organizations involved in the supply of molybdenum-99 should cooperate to solve the issues of its short supply, etc.
- Government and relevant organizations should work together to develop human resources including radiation oncologists who are essential for the promotion of radiation utilization in the medical field.

- Government should implement measures to accelerate the industrial use of the most advanced radiation facilities, such as J-PARC and SPring-8, so that they may be used as bases for promoting activities concerning “Life Innovation” and “Green Innovation” initiatives.

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Utilization of Nuclear Power and Radiation as Science / Technology

Nuclear power as a science / technology has developed based on the two pillars of energy use and radiation use. For radiation use, relevant information should be made publicly available as much as possible and the risks and benefits should be properly discussed.

Tatsujiro Suzuki, Vice Chairperson of the Japan Atomic Energy Commission (from Jan. 2010)

Note: full text is on page 30, Chapter 1, White Paper on Nuclear Energy.

1-3 Rising awareness of the importance of nuclear nonproliferation and security, and need for reinforcing international activities concerning nuclear power

(1) Nuclear nonproliferation and security

Current status:

- The awareness of the importance of efforts for nuclear nonproliferation rose high owing to US President Obama's speech in Prague in April and U.N. Security Council Summit on Nuclear Nonproliferation and Disarmament convened in September, etc.
- Japan has claimed in G8 summits the importance of safe, secure and safeguarded implementation of nuclear programmes in countries embarking on nuclear power and promoted the international initiative on “3S based Nuclear Energy Infrastructure” as an essential tool to promote such capacity-building.
- Japan has developed legal systems, safeguards systems, technologies, etc., to ensure the peaceful uses of nuclear energy, and received the confidence of the international community. For nuclear security, power companies are legally required to prepare Physical Protection Program and protective measures to repel the Design Basis Threat (DBT) formulated by the Government. Regulatory authority checks the soundness of such measures taken by the relevant organizations regularly

Future issues:

- Japan should take initiative in strengthening the international nuclear nonproliferation regime, and provide financial / technical contributions to the IAEA's activities in this field.
- Efforts should be continued to contribute to the IAEA's activities of revising security guidelines, etc. and to timely update the basic nuclear security policy in Japan in accordance with the progress in these activities, so that Japan can show a good example for the world in this respect.

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A New Trend in International society and Roles of Japan on Peaceful Use of Nuclear Energy

The situation surrounding nuclear energy issues is also greatly influenced by the changes caused by the increased leverage of emerging countries. …….. The situation surrounding nuclear energy issues is also greatly influenced by the changes caused by the increased leverage of emerging countries.

Mie Oba, Commissioner of the Japan Atomic Energy Commission (from Jan. 2010)

Note: full text is on page 34, Chapter 1, White Paper on Nuclear Energy.

(2) Strengthening international activities concerning nuclear energy

Current status:

- Japan is promoting activities in international cooperative frameworks such as the FNCA, GNEP, GIF and ITER as well as activities based on bilateral cooperative arrangements.
- Japanese enterprises also actively promote international collaborative activities.
- As global community is taking an increasing interest in the possibility of nuclear power generation in combating global warming, Japan is expected to contribute to international nuclear community lessons, not only in technological context but also in societal context, learned through construction and operation of a large fleet of nuclear power stations.

Future issues

- Japan should pursue mutual benefits with international community through positive promotion of bilateral or multilateral cooperative activities: this is the only way Japan will be known to international community as a reliable partner.
- Japan's nuclear industries should make efforts for satisfying the customer countries' needs in order to make their presence known in the international market.
- Japan should promptly create a vision of how Japan should cope with international nuclear issues and formulate and implement specific measures to embody the vision, as suggested in the Interim Report of the JAEC Advisory Committee on International Affairs.

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Thinking about International Development

International development is considered to represent the following: (i) actively providing good technologies, (ii) providing comprehensive support for infrastructure development in cooperation with the IAEA, and (iii) The State, private sector, and politics as needed promptly take coordinated actions by clarifying the division of their roles with good coordination.

Akira Omoto, Commissioner, the Japan Atomic Energy Commission (from Jan. 2010)

Note: full text is on page 36, Chapter 1, White Paper on Nuclear Energy.

1.4 Promotion of research and development and basic activities concerning nuclear energy

Current status:

- Government is promoting mid and long-term research and development activities, such as fast breeder reactor (FBR) cycle technology R&D and nuclear fusion R&D.
- Various organizations including universities, research institutions, and private sectors are conducting R&D activities for specific purposes, including basic and or exploratory researches, R&Ds that are distinctive of their missions.
- Government is funding for the construction of large scientific facilities that are necessary for promoting unique, diverse and advanced R&D activities, including J-PARC, which is now contributing not only to the increase in the availability of neutron diffraction technique to wider users including those in industries but also to the production and detection of neutrinos for curiosity driven research.
- Relevant administrative organs, higher education institutions, industry, etc. are making unique efforts for human resource development.
- Energy education including radiation utilization and nuclear energy in compulsory education is to be strengthened as the Curriculum Guidelines for elementary, junior high, and senior high schools are revised to include such direction.

Future issues

- Relevant administrative organizations and research institutions should promote effective R&D efforts, taking into consideration such recommendation made by the Advisory Committee on Research and Development as pursuance of the benefit of front-loading approach, i.e. the identification and solving of development problems during earlier phases of product development and recognition of the need for spiral approach, i. e. research - product development – prototyping - its evaluation by customers and a start of new cycle.
- Industry, universities, and government should strengthen mutual cooperation to comprehensively promote activities for developing human resources needed for sustainable development and utilization of nuclear energy, recognizing that human resources cannot be developed in a short period.
- Nuclear energy related organizations should respond to requests for cooperation from schools, providing easy-to-understand materials or opportunities for teacher training, so that compulsory education on energy and radiation under the revised Curriculum Guidelines may be conducted effectively.

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Way to tackle human resources development problems affects the future of Japan

It is an important choice of Japan's growth strategy to position human resources development activities as an important element of Japan's nuclear value chain and make a significant investment in related high-level education so that such education may serve as a factor for Japan to be respected in the international community.

Shunsuke Kondo, Chairperson of the Japan Atomic Energy Commission (from Jan. 2004)

Note: full text is on page 41, Chapter 1, White Paper on Nuclear Energy.

Conclusion

- The situation surrounding nuclear energy policy is changing substantially at home and abroad, as seen in the increasing expectation for nuclear power generation and expanding utilization of radiation.
- Japan has the technology and experience of nuclear power generation on a large scale. Government, industries and academia should pursue innovation of technologies and systems concerned, while ensuring safety for the purpose of ensuring that people at home and abroad can enjoy the benefits of nuclear energy, including the improvement of the quality of their life through the effective use of radiation without feeling unrest
- The JAEC will strive to realize nuclear energy utilization in accordance with the aim provided by the Atomic Energy Basic Act, evaluating not only the benefits of nuclear energy utilization but also its costs and risks, and selecting the most effective actions through a fair and transparent decision-making process involving citizens to obtain trust from the public.

2. Strengthening the Basic Activities for Research, Development and Utilization of Nuclear Energy

2-1 Assurance of safety

2-2 Ensuring peaceful uses

2-3 Treatment and disposal of radioactive wastes

2-4 Developing and securing human resources

2-5 Coexistence of nuclear energy and people / local communities

3. Steady Promotion of Utilization of Nuclear Energy

3-1 Utilization of energy

3-2 Utilization of radiation

4. Promotion of Research and Development of Nuclear Energy

5. Promotion of International Approaches

5-1 International cooperation

5-2 Maintaining and strengthening the nuclear nonproliferation regime

5-3 International development of the nuclear industry

6. Improvement of Evaluation of Activities for Research, Development and Utilization of Nuclear Energy

Reference Materials

1 Nuclear administration system of Japan

2 Decisions of the Japan Atomic Energy Commission, etc.

3 FY2009 Budget Sheet concerning Nuclear Energy

4 Other

5 Basic Policies on Nuclear Energy around the World and Status of Nuclear Power Generation

Major actions of the JAEC in 2009

(1) Major decisions and views (Jan. - Dec. 2009)

- Examination of the compensation system for nuclear damage (View)
- Validity of the intended use in the plutonium use plan announced by power companies, etc. (View)
- Plan concerning nuclear research, development, and utilization (Decision)
- Nuclear test of North Korea (View)
- Basic policy concerning the estimation of FY2010 expenses related to nuclear energy (Decision)
- Evaluation of the basic concepts of projects concerning energy use provided in the Framework for Nuclear Energy Policy (Decision)
- Appropriateness of the plan to use the plutonium to be recovered in the FY2009 announced by power companies, etc. (View)
- FY2010 budget for execution of nuclear energy policy (Decision)
- On the way to evaluate the policies concerning both "utilization of radiation" and "development and securing of human resources" provided in the Framework for Nuclear Energy Policy (Decision)
- Evaluation of the basic policies concerning to the promotion of nuclear research and development provided in the Framework for Nuclear Energy Policy (Decision)
- Estimation of FY2010 expenses related to nuclear energy policy (Decision)

(2) Reports (Jan. - Dec.2009)

- Evaluation of the basic policies concerning nuclear fusion R&D provided in the Framework for Nuclear Energy Policy etc: Advisory Committee on Nuclear Fusion
- Current status of partitioning and transmutation technology R&D and its future direction: Partitioning and Transmutation Technology Review Meeting
- Evaluation of the basic policies concerning utilization of nuclear energy provided in the Framework for Nuclear Energy Policy: Policy Evaluation Committee
- Evaluation of the basic policies concerning nuclear research and development provided in the Framework for Nuclear Energy Policy: Advisory Committee on Research and Development
- Interim Report on the basic policies concerning international affairs related with nuclear energy: Advisory Committee on International Affairs