Reflections on the Discussion for the Framework of Nuclear Energy Policy

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Present Status of Nuclear Power Generation in Japan

53 operating units produce about one-third of electricity generated, contributing to

- Increase in Japan's degree of self-sufficiency in primary energy supply from 4% to 19%;
- Significant reduction in CO₂ emission/kWh, contributing to the fulfillment of Kyoto Protocol to UNFCC;
- Stability of electricity price in spite of the jump of oil price.

3 units are under construction and 8 units are in preparation for the application of construction permit in 5 to 10 years.

AEC Established the Framework for Nuclear Energy Policy

The Atomic Energy Commission established the "Framework for Nuclear Energy Policy" in October 2005 based on the deliberation at the New Nuclear Policy-Planning Council comprising of not only leading experts in the nuclear energy field but also representatives of various sectors of society, including local government, academia, industrial business, legal professions, mass media, citizen's group and nongovernmental organizations who are either positive to or critical of the promotion of nuclear energy.

Goals of Nuclear Energy Policy

Ensure the nuclear energy technology contribute to the security of our society and the sustainable development of human society in a manner that protect public health and safety and environment and provide for excellence in performance from the point of view of security, economy, sustainability, and a citizen of the world.

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Planning Basis for Nuclear Energy Policy (1)

Observation:

- Asian countries' dependence on the oil supply from the Middle East region will increase due to the continued growth in demand for fossil fuel in accordance with the rapid economic growth in Asia.
- Due to the progress in the modernization of the society, the developing countries will increase the share of natural gas in their energy supply as in the case of the developed countries.

Suggestion:

Japan should improve the self-sufficiency ratio of energy supply by increasing the use of non-fossil energy sources like renewable energy and nuclear energy as the markets for fossil energy resources will become tighter in future.

Planning Basis for Nuclear Energy Policy (2)

Observation:

The climate change is one of the most dangerous environmental problems as it affects all environmental conditions and processes related with human well-being.

Global fossil fuel use should be halved to stabilize atmospheric CO₂ concentrations below 550ppm.

Suggestion:

Japan should reduce the CO₂ emissions in 2100 to less than 50% of the current level by increasing the share of renewable energy and nuclear energy in primary energy supply while improving the efficiency of energy utilization.

Renewable Energy

- Renewable energy including hydro, solar, wind, biomass, and geothermal can play an important role in Japan's energy policy from the viewpoint of environmental protection and improvement of self-sufficiency ratio of energy.
- It is important to utilize it as much as reasonably achievable, while continuing research and development for its economy and stability of supply through technological innovations.
- The direction of future energy policy is to pursue not the utilization of nuclear energy "OR" renewable energy but the utilization of both nuclear energy "AND" renewable energy.

Planning Basis for Nuclear Energy Policy (3)

- It is reasonable to expect that the electricity demand in Japan will be stable while final energy consumption will decrease due to the progress in energy conservation and the decrease in population.
- We should prepare ourselves in terms of institutional as well as technological arrangements to be able to make the share of nuclear power in electricity generation after the year 2030 similar to or greater than the current level of 30 to 40%.

A Visual Image of Nuclear Power Generation Capacity and its Composition in This Century

(The installed capacity is assumed to saturate at 58GW for illustrative purpose.)



Nuclear Energy Policy

Short-term Objectives

- Assure the safety and security of nuclear energy generation through reducing accident risks and vulnerability to terrorist attack
- Make sure the safe disposal of radioactive wastes, especially that of high-level wastes.
- Improve the efficiency of the operation of existing plants while adding new plants.
- Use the plutonium and uranium recovered through the reprocessing of spent fuel in LWRs.

Nuclear Energy Policy

Mid-term Objectives:

prepare advanced nuclear power plant designs with improved performance that can make nuclear power competitive in the social and economic conditions in the mid century as candidates for the replacement of the retiring plants, taking into consideration the prediction that significant number of nuclear power plants in operation will start their retirement in 10 to 30 years.

Nuclear Energy Policy

Long-term Objectives

- Develop fast reactors and advanced fuel cycle technologies, aiming at their commercial introduction at around 2050.
- Characteristics of fast reactors and it fuel cycle systems to be pursued:
 - Enhanced safety and reliability performance consistent with the requirement of neighbor friendliness;
 - Sufficient security in terms of proliferation resistance and physical protection; and
 - Manageable nuclear waste, effective fuel utilization, and increased environmental benefits, consistent with such national goal of pursuing "recycling based society" through reducing, reusing, and recycling of wastes.

The Japanese Strategy of Nuclear Fuel Materials Management in the First Half of this Century

- Japan pursue a recycling option for management of nuclear fuel materials.
- Spent fuel is reprocessed by the Purex process, which separates uranium and plutonium, and directs remaining transuranics to vitrified waste, along with all the fission products.
- The uranium is stored for eventual reuse. The plutonium is used to fabricate mixed oxide (MOX) fuel for LWRs. Spent MOX fuel will not be reprocessed for the time being as the reprocessing capacity available is limited.

Advantages and Disadvantages of the Recycling Approach

Advantages:

- The approach helps significantly reduce the volume of spent nuclear fuel, as well as the high level wastes to be disposed of.
- It can help manage the accumulation of plutonium.
- **It can improve the utilization of natural uranium around 15%.**
- It is a good precursor for the closed fuel cycle based on fast reactors to be established in the latter half of this century.

Disadvantages:

- It results in an economic penalty over the no-recycle option: the increases in cost of electricity is about 10%.
- The existence of the facility to separate pure plutonium is considered by some to increase a proliferation risk.
- Some claims that the use of various processes will increase radioactivity release.

Issues in Fuel Cycle Debate

- Should we accept the claim that various delays in the activities and cost over-run suggests that to close fuel cycles in consistent with the requirement to reduce their risks to an acceptable level is difficult to realize and uneconomical even if it realize as compared with the strategy to dispose the spent fuel as waste?
- How do we evaluate the values of various activities toward the achievement of the nuclear fuel cycles up to now and diverse societal assets accumulated with this such as technologies, relationships of trust with communities, various international agreements, etc. as resources to be preserved for future?

Review Conclusion

- Pursue the recycling of fuel materials through reprocessing from the viewpoint of utilizing nuclear power as a long-term and major method of power generation
- Be flexible in realization of activities planned through rigorous risk assessment and management
- Review the policy as the things being changed.

Multilateral Approaches to the Nuclear Fuel Cycle

- Dr. El Baradei, Director General of the IAEA proposed the establishment of a new system to maintain and strengthen the international nuclear non-proliferation regimes.
- Japan should cooperate with the IAEA to realize multilateral schemes that can reduce unnecessary incentive for states to have national enrichment and reprocessing facilities, by providing not only her ideas and experiences but also her technologies and capabilities of activities if they are appropriate, to devise and implement an equitable, adequate and achievable framework to assure the supply of nuclear energy services to international community.

Concluding Remarks (1)

- Economy, environment and security are the core of the energy problem and thus energy policy.
- There are dilemma in energy policy such as cost reduction versus environmental protection and nuclear energy production versus nuclear risk reduction.
- It is desirable to expand the use of nuclear energy by rectifying the defects and improving the competitiveness of the technologies as we are definitely required to increase carbon-free energy supply to stabilize atmospheric CO₂ concentration.

Concluding Remarks (2)

As technologies can generally changed only slowly and at considerable cost, the social rate of return of the investment into nuclear energy R&D to the world as a whole is higher than to the individual countries. Co-ordination of research activities beyond national prestige to reduce the duplication of effort at the world level must be an absolute priority and world nuclear community should pursue coordination of efforts in research and development needed to realize the required technological innovations in a timely manner. Japan is determined to enjoy the benefit of nuclear energy while contributing to this kind of efforts as well as their coordination for the benefit of global community.