Driving factors and action plans for sustainable promotion of nuclear energy[1]

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Thank you, Mr. Chairman.

Excellencies, Ladies and Gentlemen, it is a pleasure for me to have this opportunity of expressing my view on driving factors and action plans for sustainable promotion of nuclear energy.

Japan's 53 nuclear power plants supply about a third of the country's electricity, becoming a safe, reliable, and competitive energy source. Nuclear power contributes to the energy security: Japan's degree of self-sufficiency in primary energy supply is about 20%, of which 16% comes from nuclear power. Nuclear power is considered as a practical and effective mean to cope with the Kyoto Protocol in the electricity generation sector, who is continuing construction of three nuclear power units and preparing to build seven additional ones, though more than ten years will be taken before the completion of the latter.

The Japan Atomic Energy Commission (AEC) believes that we are at the break of dawn for nuclear power to become a major player in the world and is asking relevant government organizations and industries to pursue coordinated strategic efforts, sharing a vision that safe, economical, and reliable nuclear energy technology will contribute as a mainstay of electricity and heat generation technology, fostering economic growth, providing security and fuel diversity, and enhancing environmental quality in many parts of the world.

To put it concretely, the AEC has recommended actions across three different time frames; short term, mid-term and long-term. Although existing nuclear power plants are recognized as a safe, reliable and competitive power source in many countries, various actions are taken rightfully to improve their performance, utilize the plutonium recovered from the spent fuel by reprocessing, securing adequate interim storage capacity for spent fuel waiting for the reprocessing, and search the site for geological disposal of vitrified high-level radioactive wastes from the reprocessing. The time frame of these actions is short term as they aim at using existing assets as efficiently as possible.

Examples of actions taken or to be taken for the improvement of the performance of existing plants are as follows;

(1) Develop and apply advanced technologies for the output increase of existing units, their longer-term reliable operation, and their economical dismantling and the management of radioactive waste generated in the process:

[1] A keynote talk for the Round Table on Driving factors for nuclear industry strategies and choices and Governance of the nuclear industry, IAEA International Ministerial Conference "Nuclear Power for the 21st Century", Paris, 21-22 March 2005.

(2) Develop and implement technologies for high burn-up fuel:
(3) Improve the economy of operation, employing risk-informed maintenance and accountability-conscious quality management system so as to maintain a high level of safety and public acceptance:
(4) Improve the economy of the operation of fuel cycle facilities and reduce the amount of wastes generated in these facilities.

These actions should be promoted continuously with toughness, resolution, and the consideration to details as they would directly impact the performance of existing assets. Although major investment for these activities should come from plant operators, government should support the R&D of generic nature to ensure that a broad range of technologies that promise to enhance the long-term performance of existing facilities are developed.

At the same time it is imperative for government to facilitate the mutual understanding on the health and safety aspect of high-level radioactive waste disposal between residents living in potential areas for the site and the organization to carry out the disposal activity as the difficulty in the determination of the site is a major source of uncertainty in the promotion of nuclear energy supply.

Mr. chairman, in the age of technological innovation, the competitive operation of current design units and facilities does by no means guarantee the adoption of the facilities of the same design as existing ones for their replacement or the addition of new units. In addition, the deregulation of electricity market has altered the financial landscape for utilities, which are no longer guaranteed a fixed return on investment. Therefore it is essential for nuclear power plant suppliers to pursue the improvement of the performance of current designs incessantly if they want to win new orders of construction in tomorrow's market. As the time-frame for actions to be taken for this purpose should continue for 20 to 40 years, we call them as mid-term actions. These actions should aim at;

(1) Reducing capital cost by shortening licensing and construction time through standardization of design, developing modular cost-effective construction technologies;
(2) Improving robustness in maintaining safety and reliability by adoption of passive safety features, enhancing easiness of inspection, and minimizing environmental impact by reducing volume of radioactive waste during both operation and decommissioning of the facilities;
(3) Improving human consciousness by pursuing low occupational exposure; low work-load in operation, maintenance, and emergency situation; and low man-power need for inspection and maintenance.

The size of the improved plants to be pursued should be larger than or equal to the maximum of the current plants. Nonetheless, due consideration should be devoted to possible existence of a niche market for medium size plants due to the grid capacity for some utilities if the improvement of current medium size plants will result in competitive ones.

Obviously these improvements can be successfully realized only by qualified suppliers of nuclear equipment and components and architect engineering organizations with the personnel, skill, and experience in nuclear design, engineering, and construction; and the continuity of plant construction programs provides an environment conducive to the promotion of these improvement. Although private sectors should be responsible for this continuous improvement, government funding for the development and transfer of relevant

generic technology platforms in a timely fashion will both stimulate and leverage much larger private sector investment for these actions. Therefore government should identify and characterize good elements of the technology platforms related to the improvement mentioned above through constant collaborative planning with industry, being mindful of the importance of maintaining such innovation for the sound development of nuclear power supply capacity.

Mr. Chairman, we should take it for granted in the strategic planning for future that over the long-term, not just new but truly radical new energy technologies may appear and address effectively the challenges of air pollution, climate change and energy supply insecurity while expanding energy service availability to all on the globe. Therefore the goal of long-term actions for nuclear industry should be to develop innovative nuclear energy supply systems which can compete in such new energy market from social acceptability as well as safety, economy, and environmental protection viewpoint.

Actions to be taken to attain this goal should aim at developing nuclear energy systems which can provide (1) manageable nuclear waste, effective fuel utilization, and increased environmental benefits, consistent with such national goal of pursuing zero emission society through reducing, reusing and recycling of wastes; (2) competitive economics; (3) enhanced safety and reliability performance consistent with the requirement of neighbor friendliness; and (4) sufficient security in terms of proliferation resistance and physical protection.

Government should carry out long-term R&D activities aiming at developing these systems as a part of portfolio of the R&D for pursuing the sustainable development of mankind. It is clear that such international cooperation as activities within the framework of the GIF is quite beneficial since we can enjoy the benefits derived from such economies of scale and of specialization as the joint use of test facilities, sharing of information and results, and the pooling of resource, efforts and experience.

In conclusion, Mr. Chairman, it is a must for us nuclear community to strategically adapt our nuclear energy systems to a new paradigm to be emerged in future if we want nuclear energy to survive as expected in our vision. The AEC is recommending actions across three different time frames; short term, mid-term and long-term for the continuous adaptation in this respect. We should recognize that although there are two primary gateways to control the development and flow of technology from either a push or pull standpoint, the growing universality of technology now makes successful innovation much more frequently driven by the pull of technology which is basically the pull of human needs, of which hierarchy was given by Maslow[2] in his Ladder of needs, than it is technological push. Therefore I would like to finish my talk by stressing that we should make the process of R&D for this adaptation more transparent to the public and get its feedback on the direction of the R&D so as to maintain and strengthen the public acceptance of the products.

[2] Maslow, A. H. (1970). Motivation and Personality (2nd ed.). New York: Harper and Row.