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Japan's activities in technical cooperation related to the peaceful uses of nuclear energy

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I. Overview

1. As a country with scarce natural resources, Japan has attached vital importance to the peaceful uses of nuclear energy. It launched commercial uses of nuclear energy, in addition to research and development activities, at a very early stage, and has since then continuously pursued their advancement. As a result, the Japanese nuclear industry is now renowned for its highly advanced, cutting-edge technologies.

2. Science and technology are the foundations of the prosperity of Japan. Japan, both in its private and public sectors, has invested heavily in the development of advanced technologies. The ratio of expenditures in these domains to GDP is among the highest in the world.

3. Japan has conducted technical cooperation within areas including nuclear applications, nuclear safety/security, nuclear power, and safeguards, and has been sharing the benefits of these technologies with other countries through various activities, including IAEA technical cooperation.

4. Some examples of Japanese technical cooperation are outlined below.

II. Cooperation by areas

A. Nuclear applications

1. Human health

5. Nuclear applications have an important role to play in promoting human health. According to the World Health Organization (WHO), cancer is the biggest cause of death worldwide and accounted for 7.9 million deaths (around 13 per cent of all deaths) in 2007.

6. Japan has always supported the Program of Action for Cancer Therapy (PACT) of IAEA. In 2006, Japan took the initiative to establish a mechanism to address the financial difficulties which endangered PACT. Through this mechanism, Japan has contributed $345,000 to PACT. It also made available to IAEA a very prominent medical doctor to support the work undertaken within PACT.

7. Japan is also making efforts nationally to share its experience with other countries in the field of cancer therapy. Being the host country of the fourth Tokyo International Conference on African Development, Japan organized a technical tour at the beginning of 2008 for African countries. This tour enabled the participants to be familiarized with our activities in cancer radiotherapy technology development. Responding to the interest shown by the participants, the Japan International Cooperation Agency decided to hold a basic training course on radiation therapy technology, which covered topics ranging from radiation diagnosis, including positron-emission tomography, to heavy particle radiotherapy. Japan has already welcomed trainees from African countries as a follow-up to the technical tour.

8. The heavy particle cancer radiotherapy technology is a form of radiation therapy that employs accelerated beams and has comparative advantages over other forms of cancer treatment in three regards. It makes possible:

- First, the treatment of delicate parts of the body such as the head, the neck, bones and soft tissue.
- Second, the reduction of therapy duration.
- Third, the alleviation of physical burdens on patients when compared with the surgical removal of cancers.

Japan is one of the leading countries in the field of heavy particle cancer radiotherapy technology. The National Institute of Radiological Science has been promoting this technology and has also constructed the world's first heavy ion medical accelerator, known as HIMAC. Gunma University is now constructing a second one. Both the National Institute of Radiological Science and Gunma University actively welcome trainees from abroad.

9. Japan's cooperation in the field of human health is not limited to cancer therapy. Since 2005, Japan has been acting as project lead country in human health under the Regional Cooperative Agreement for Research, Development and Training in the Asia and Pacific Region (RCA), and over 300 trainees have so far participated in training courses for human health under the auspices of RCA. Those activities are closely linked to those of the Forum for Nuclear Cooperation in Asia, a framework that was initiated by Japan. A manual for trainees prepared by the Forum has, for instance, been widely used in a number of RCA training courses. This can be viewed as one example of fruitful partnership among different international forums.

10. The National Institute of Radiological Science mentioned above has an IAEA collaborating centre, which has also extended, in a structured way, assistance for IAEA research and training activities in the field of biological consequences of low-dose radiation.

2. Food and agriculture (radiation applications in the field of food and agriculture, inter alia, the sterile insect technique)

11. Japan has a unique experience with regard to the sterile insect technique. This episode dates back to 1972, when the administrative rights over Okinawa, an island in the southern part of Japan, were returned to Japan. Okinawa has a semi-tropical climate and is famous for its exotic fruits and vegetables, one of which is the bitter gourd, also known as "the king of the summer vegetables" due to its wealth in vitamin C. Once this reversion was effectuated, Okinawa was eager to make shipments of bitter gourds across the country. However, by 1972 the native melon fly had done substantial harm to bitter gourd crops, and Japan at the time had a law banning the shipment of plants affected by parasites from Okinawa to the rest of the country. In an effort to overcome this issue, the Government of Japan decided to make use of the sterile insect technique in 1975. Those efforts culminated in the eradication of the melon fly in Okinawa, ultimately allowing all people across the country to enjoy these nutrient-rich bitter gourds. Even now, in parts of Okinawa and elsewhere, Japan is working to combat and eradicate the sweet potato weevil, an insect harmful to the sweet potato, using the sterile insect technique.

12. As Japan has these experiences of its own, it is eager to cooperate with other countries struggling with similar challenges. The sterile insect technique can be of great help to livestock management in Africa, through the eradication of the tsetse fly and other harmful insects. In 2006, the Government of Japan and the United Nations extended assistance totalling $1.76 million through the Trust Fund for Human Security, to a tsetse fly eradication project in Ethiopia, implemented by IAEA in partnership with the Food and Agriculture Organization of the United Nations. (The project is entitled "Establishing a zone free of the tsetse and trypanosome problem in the Southern Rift Valley, Ethiopia, and assisting rural communities in agricultural and livestock development".) It is expected that these major threats affecting agriculture in the region will be eliminated, and that livestock, agricultural and overall development in the Southern Rift Valley of Ethiopia will be accelerated. In our view, this project merits special attention, because it exemplifies good partnership between a country, IAEA and other international organizations.

3. Water management

13. Aquatic conservation is essential in the endeavour to attain the Millennium Development Goals. IAEA has a renowned laboratory in Monaco known as the Marine Environment Laboratory, established in 1961. This laboratory has conducted research on environmental issues arising from contamination due to radioactive and non-radioactive sources. Rinnosuke Fukai, who was one of the chemists at the National Institute of Fisheries under the auspices of the Ministry of Agriculture and Forestry of Japan, joined the Monaco Laboratory in 1962. He was the Head of the Radiochemistry Section for 20 years, from 1962 to 1982, and Director from 1982 to 1986. Mr. Fukai contributed significantly to the development of the laboratory, and in particular to the development of water management technology.

14. The IAEA Monaco institute has played an important role in the protection of the marine environment in the far eastern Asian region. In 1993, it was found that liquid radioactive waste originating from dismantled nuclear submarines was dumped off the coast of Vladivostok. In 1994, Japan, the Russian Federation, the

Republic of Korea and the IAEA Monaco institute dispatched a joint mission to monitor the marine environment in the far eastern Asian region. This research ascertained that the marine environment in the region was safe. Nevertheless, as follow-up, a low-level liquid radioactive waste treatment plant was constructed with Japanese assistance, and unpurified liquid radioactive waste has never been dumped since. As an additional follow-up activity, Japan launched a project in 2003 for the dismantling of nuclear submarines in the far-east region of the Russian Federation, in partnership with the Russian Federation, Australia, New Zealand and the Republic of Korea, for the purpose of nuclear disarmament and non-proliferation in addition to marine environmental protection in this area. This project was named "Star of Hope" after the shipyard Zvezda (meaning "star" in Russian) where the project was initiated.

15. Japan hosted the 31st meeting of national RCA representatives in April 2009, which was attended by representatives from 14 countries. Extensive discussions were held on follow-up activities, and on a future medium-term strategy of RCA for the further promotion of nuclear science and technology.

B. Nuclear safety/security

16. Japan has made a number of notable contributions in the field of nuclear safety and security also.

17. After the Chernobyl accident, the Japanese regulatory body invited over 1,000 nuclear power operation trainees from Eastern European countries, China and the Russian Federation to share Japanese experiences and knowledge on nuclear power operation safety. Japan is now further expanding its activities relating to the improvement of nuclear power operation safety in the Asian region.

18. Japan has assisted the community affected by the Chernobyl accident in Ukraine through the Human Security Fund established at the United Nations, and contributed a further $2.6 million to support projects in Ukraine, Belarus and the Russian Federation in 2008. These projects provide affected communities with necessary health and environmental information.

19. Following the Chernobyl accident, Japan has contributed a total of $89 million to the Nuclear Safety Account and to the Chernobyl Shelter Fund to help enhance the safety of the Chernobyl nuclear power plant. In 2000, as the then Chair of the G-8 Nuclear Safety Working Group, Japan took leadership in shutting down the Chernobyl nuclear power plant. In 2008, as the G-8 Chair, Japan organized a pledging event for the Nuclear Safety Account in order to fill financial gaps.

20. With regard to Asia, Japan, in cooperation with IAEA, has been highlighting issues relating to nuclear safety infrastructure in Asia since 1990. Notably, the Asian Nuclear Safety Network was established in collaboration with IAEA and like-minded IAEA member States, with a view to sharing nuclear safety information and facilitating human development for nuclear safety in the region. High expectations have been placed on the Network, as a nuclear safety network model.

21. Following the earthquake that hit the Niigata Prefecture, Japan, in July 2007, Japan learned numerous lessons with regard to the improvement of seismic safety in nuclear power plants. Bearing in mind that some earthquake-prone countries are now initiating nuclear power programmes, Japan has invited IAEA missions and has held workshops in order to share its experiences and lessons learned with regard to

seismic safety. IAEA, with Japan's full cooperation, has also established an international nuclear seismic safety centre in Vienna. These initiatives will contribute to the improvement of seismic safety of nuclear power plants globally.

22. Japan has made substantial efforts to help enhance nuclear security in Kazakhstan, both bilaterally and in collaboration with IAEA. In response to requests by the Public Health Committee of Kazakhstan, Japan implemented, in full cooperation with the Medical Department of Nagasaki University, a variety of measures to mitigate the suffering of those who had been exposed to nuclear radiation in the area surrounding the nuclear test site in Semipalatinsk, Kazakhstan, set up during the Soviet era. In 1999, Japan provided a remote diagnostic system to Semipalatinsk Medical University and radiation measurement devices to the Semipalatinsk Research Institute of Radiology and Environment.

C. Nuclear energy

23. Since the Chernobyl accident two decades ago, the nuclear industry has faced numerous challenges. Japan has vigorously continued its research and development activities on nuclear power, while maintaining a high level of safety. Consequently, cutting-edge technology for light-water reactors has been developed. Japanese industry, for example, plays a vital role in providing large components for nuclear reactors such as pressure vessels.

24. In 1999, Japan established the Forum for Nuclear Cooperation in Asia to facilitate nuclear cooperation in Asia. The Government of Japan has worked to contribute to pre-feasibility studies for the introduction of nuclear power in Viet Nam.

25. Japan has contributed over $800,000 towards IAEA nuclear infrastructure development activities. In August 2008, Japanese experts were made available to IAEA for the purpose of nuclear infrastructure development.

26. Japan aims to develop a nuclear fuel cycle centring on light-water reactors. To complete this cycle, Japan has made strenuous efforts in research and development, with fast-breeder development at the cornerstone. Overcoming the sodium leakage accident in 1995, the "Monju" prototype fast-breeder reactor is expected to resume operation soon. Japan has been sharing research results and data acquired from its research and development activities, including those relating to the Monju reactor and the experimental fast reactor known as "Joyo", with member States at various IAEA meetings.

27. In the field of fusion energy research, Japan participates in the ITER project, contributing to it in terms of financing, of providing research devices and of dispatching researchers and engineers.

D. Safeguards technology

28. Japan is equipped with one of the largest and the most complex nuclear fuel cycles in the world, and has gained substantial experience in relation to safeguards. Japan virtually represents a large-scale experimental field for safeguards technology. The Rokkasho Reprocessing Plant has, for instance, been placed under a "continuous safeguarding system", which was jointly developed by Japan and IAEA. In addition, the construction of the MOX fuel fabrication plant (J-MOX) will

be guided by the concept of “safeguards by design”. This plant is expected to offer one of the models for random interim inspection and remote verification.

29. Japan has also been trying to improve the efficiency of safeguards, while maintaining their effectiveness, by using the latest advanced technology and statistical approaches. In fact, the integrated safeguards approach employed at one of the Japan Atomic Energy Agency’s nuclear facility complexes is expected to reduce the human resources necessary for inspections by 30 per cent. This new approach will soon be widely used across Japan.

30. Japan has an impeccable record in satisfying the highest standard of IAEA safeguards and enjoys the confidence extended to it by the international community. Japan and IAEA have together expanded the frontiers of safeguards technology. Japan is intent on continuing to play a leading role in this field.

III. Conclusion

31. Japan has a wide range of nuclear technologies for peaceful purposes and is ready to cooperate, with both developing and developed countries, in diverse areas such as nuclear applications, nuclear safety/security, nuclear power, and safeguards, among others.

32. Japanese technologies are still relatively unknown among the States parties to the Non-Proliferation Treaty and are not being utilized in line with their full potential. It is in the interest of all States parties to make further use of these technological resources.