

**Thailand Country Report**  
**“Enhancement of Socio-Economic Impact of Radiation and Isotope Application and Sustainable Development and Nuclear Energy in Thailand”**  
**presented at the Ministerial Level Meeting**  
**of the 4<sup>th</sup> Forum Nuclear Cooperation in Asia**  
**3<sup>rd</sup> December 2003, Japan**

Excellencies,  
Distinguished Guests,  
Ladies and Gentlemen;

It is a great pleasure and honor for me to be here with you all for **the Ministerial Level Meeting of the Fourth Forum for Nuclear Cooperation in Asia**. On behalf of our Minister of Science and Technology, General Chetta Thanajaro, who has been pre-occupied at home, please let me extend his apologies to you. I would also like to thank the Atomic Energy Commission of Japan for their support in organizing this meeting on such an important and timely subject: **Enhancement of Socio-Economic Impact of Radiation and Isotope Application and Sustainable Development and Nuclear Energy**; as well as their kind invitation extended to Thailand to participate in the meeting.

Excellencies, Ladies and Gentlemen;

I would like to take this opportunity to briefly present to you the efforts and progresses related to peaceful utilization of atomic energy in Thailand at the current time. Since the United Nations Conference on Environment and Development (UNCED) in 1992, the world community has increasing concerns on human safety and clean environment, of which safe utilization of atomic energy is identified as a global issue. The International Atomic Energy Agency (IAEA) has then been working closely with its Member States, including Thailand, on upgrading of radiation protection infrastructure to ensure proper and timely implementation of its International Basic Safety Standards. The major recommendation given to Thailand was to urgently establish proper national infrastructure for radiation protection, of which regulatory authority was to be independently managed from the management of operators – users of radiation sources. In early 2001, one of the new Government’s major policies was to restructure the government bureaucracy to be more efficient and better meet the needs of major populace. The Government agreed later to separate the policy and planning, and safety and safeguards regulation functions of the Office of Atomic Energy for Peace (OAEP) from the promotional research and development functions. At the beginning of October 2002, the OAEP was renamed the Office of Atoms for Peace (OAP) and remains as a government bureaucrat. The promotional research and development functions will be re-organized to be a new public agency called Thailand Institute of Nuclear Technology (TINT). Meanwhile, this has been delayed, awaiting for the new legislation for establishing a new agency to be promulgated. At present, both organizations are managed under the same management arrangement of the OAP.

The present organization of OAP consists of the following four bureaux:

- Bureau of Atomic Energy Administration,
- Bureau of Radiation Safety Regulation,
- Bureau of Nuclear Safety Regulation, and
- Bureau of Technical Support for Safety Regulation.

In the meantime, OAP has also been assigned to temporarily manage research and development activities of the former OAEP as follows:

- Radioactive Waste Management Programme,
- Radio-isotopes Production Programme,
- Research Reactor and Nuclear Technology Operation Programme,
- Radiation and Nuclear Safety Programme,
- Irradiation for Agriculture Programme,
- Chemistry and Material Science Research Programme, and
- Physics and Advanced Technology Research Programme

Excellencies, Ladies and Gentlemen;

As most of you are aware, one of the major projects of OAP is the new Ongkharak Nuclear Research Center Establishment Project (ONRC), comprising of three major facilities, namely 10 Megawatt TRIGA research reactor, radioisotope and radiopharmaceutical production facility, and centralized radioactive waste processing and storage facility. Thailand has invested substantially amount of time and resources to this project, of which the contract was awarded to General Atomics (GA) of USA. While the contractor has undertaking its responsible works, OAP struggled long and hard in obtaining the Construction Permit (CP). So far, about 95% of detailed design of the buildings and systems has been completed. And we are now pleased to update you that the CP has been granted on 29<sup>th</sup> September. The construction of the major facilities is expected to take place in the near future. Hopefully, ONRC will be the major research and development center for nuclear science and technology in Thailand. It will also contribute to the close cooperation on nuclear science and technology for peace and security with the international community.

### **Socio-Economic Impact of Radiation and Radioisotopes Application**

Over 40 years, the Thai society has benefited from the safe use of radiation and radioisotopes application. This has increasingly contributed to the improvement of quality of life of the Thai people in terms of agriculture, health and medicine, industry and environment. Under the Forum for Nuclear Cooperation in Asia (FNCA), Thailand is proud that successes have been achieved in various sectors.

### **Research Reactor**

The progresses of utilization of research reactor in Thailand are as follows:

#### **Tc-99m generator**

Thailand performed the experiments for evaluation the performance of Poly Zirconium Compound (PZC) as a column packing material for  $^{99}\text{Mo}/^{99\text{m}}\text{Tc}$  generator from  $(n, \gamma)$   $^{99}\text{Mo}$ . The  $^{99}\text{Mo}/^{99\text{m}}\text{Tc}$  generator using PZC material and irradiated natural molybdenum performed the satisfied result of the generator characteristics which could be developed as an alternative technology for  $^{99}\text{Mo}/^{99\text{m}}\text{Tc}$  generator production.

It is strongly believed that in the near future this technology will be established and utilized under the framework of the FNCA which will benefit the countries operating small research reactors to overcome the difficulties in producing  $^{99}\text{Mo}/^{99\text{m}}\text{Tc}$  generator.

### Neutron Activation Analysis (NAA)

Thailand has conducted a monitoring study of urban air pollution in downtown Bangkok to support the use of nuclear related techniques for research and monitoring studies on air pollution. OAP realizes the usefulness and advantage of using Ko method for analysis of air particulate matters. However, we are not ready to follow the recommendation made by the NAA group in the last workshop in Beijing as we do not have any software program nor expertise in the method. To enable us to further participate in this project, a special support from FNCA or some other related organization, e.g. MEXT is needed. It is considered that an expert in Ko-NAA may be invited to Thailand to conduct experiments using local facilities. As a whole, the effectiveness and capability of our facility can be evaluated before any decision is made.

### Neutron Scattering (NS)

Thailand, with the cooperation of Prof. Hasegawa of Kyoto University, had prepared samples for the study of the morphology of natural rubber under strain in natural rubber-thermoplastic elastomer (NR-TPE). Twenty - one samples were sent to JAERI for the preliminary measurement using Small Angle Neutron Scattering (SANS). Deuteration of substituted polymers might be considered to increase the contrast of pattern.

## **Agriculture**

### Mutation Breeding

Mutation breeding has been the major activity in the agricultural field. New mutant varieties of Canna and Chrysanthemum were released by Kasetsart University. Dissemination of mutation technique and nuclear technology in agriculture to the public were conducted via workshops and media, such as TV, radio, newsletters and newspapers. Research works on plant mutation breeding have been carried out by collaboration of some research institutes under the “National Framework” set up by the Sub Committee on Agricultural Applications under the Thai Atomic Energy Commission for Peace. The target crops are food crops, fruit trees, aquatic plants, vegetables and ornamentals. The objective of mutant varies, depending on the specific plants. Following the success of the First Multilateral Research Program (MRP-1), Thailand will be one of the six countries participating in the Second Multilateral Research Program (MRP-2) concerning “Insect Resistance in Orchids”.

### Bio-fertilizer

Progress activities on bio-fertilizer in Thailand included the investigation of the beneficial microorganisms in Thailand soil on leguminous plant growing area, collection and selection of effective strains for bio-fertilizer purpose. The inoculum production techniques were studied. The research program also included the production techniques for mycorrhizal fungi by studying the suitable media and carrier and using radiation to enhance growth promotion of fungi in the media.

## **Medical Use**

### Radiation Oncology

After completing the project of radiation and radioisotopes application for medical use in radiation therapy for stage IIIB cervical cancer patients, the guidebook in radiation

therapy and radiation physics for cervical cancer were established and distributed to hospitals and institutes of participating countries. The second protocol on Accelerated Hyperfractionation (AHF) for stage IIIB cervical cancer started in the year 2000 was closed at the end of 2002 and the follow-up result is being evaluated.

### **Public Information**

To enhance public information activities for nuclear energy, Thailand has been disseminating the information to the public via various means of mass communication. OAP has hired consultant companies as advisors for conducting the public relations activity starting from the year 1999 up to now. The joint survey of high school students on their understanding of radiation and its applications was also carried out. Thailand enjoys the benefit of using the information network "AsiaNNet" after it was established by FNCA. With the assistance of the FNCA and its Member States, Thailand has continued to promote the peaceful and safe uses of nuclear technology in the country.

### **Radioactive Waste Management**

The achievement of the Spent Radiation Source (SRS) Management Task Group sub-project in Thailand (August 2001) under FNCA framework was proven mutually beneficial. The project was continued in 2002 and Indonesia and Korea were the voluntary countries. An expert from Radioactive Waste Management Division, OAP was invited to present the progress of SRS Management in Thailand and the experience from the radiological accident (spent Co-60 tele-therapy source) in the Discussion/Survey Meeting on SRS Management in Korea. As for activities related to radioactive waste management in Thailand, the code of practice and the radioactive waste management regulation were drafted and proposed to the cabinet for approval and to be promulgated as a ministerial regulation. The safety awareness in radioactive waste management in the country was improved.

### **Nuclear Safety Culture**

The safety culture was recognized as one of the key factors to prevent nuclear and radiation accidents. All type of activities with respect to safety culture including awareness, commitment, motivation, supervision and responsibility have been seriously reviewed and being set as practices. Thailand expects to have more safety culture training to provoke individual awareness both users and operators and to prevent any incidents originated from nuclear facilities and radioactive materials.

### **Human-Resources Development**

Strengthening human resources is an important factor for the development of nuclear technology applications. Thailand has Bilateral Agreement between OAP and JAERI on human resources development in nuclear field. Follow-up training courses on radiation protection were conducted under this agreement. Joint training courses on nuclear and radiological emergency preparedness were proposed for the extended agreement. A survey for human resources development in nuclear field was carried out in order to identify the needs and areas of development. Thailand was also pleased to host the Workshop on FNCA Human Resources Development last October.

## **Industrial Application**

### **Application of Low Energy Electron Accelerator**

The main subject of the year 2002 workshop is on liquid system irradiation. Although Thailand has no electron accelerator to undertake research or development on radiation technology, most of the experiment can be done by Co-60 gamma irradiation. Current status on radiation treatment of liquid samples in Thailand is in laboratory scale, market trial scale and commercial scale. The main purpose is to upgrade and add value to natural agricultural and marine originated products. Thailand participates in this project through the Bilateral Agreement between OAP and JAERI and MEXT Program. Numbers of our scientists have had opportunity to experience the use of electron accelerator at Takasaki Radiation Chemistry Research Establishment (TRCRE) in executing their experiments in comparison with gamma irradiation.

## **Strengthening Linkage Between National Research Sectors and End-users, Including Industry**

The success of nuclear science and technology development cannot be achieved only in the laboratory. Its results should be extended to the end-users, generating productive output and outcome to the society. To enable this, linkage between various organizations should be encouraged to have very closed-link, between R&D organizations and educational institutes and industry. Also, demonstration and transfer of technology should be arranged for the potential clients or end-users to ensure them of the technology benefits in increasing the quality of their products and services.

OAP has a plan to establish a Business Development Unit (BDU) to serve as a bridge between the research and development arm of the newly established Thailand Institute of Nuclear Technology (TINT) and potential end-users. This is an important task for establishing and maintaining self-reliance and sustainability. In preparation, business planning for this unit is underway. A training course on leadership for about 50 scientists and engineers was conducted using local lecturers. Business planning and good management and marketing practices for staffs from across the technical, scientific and administrative sides will be conducted in the first quarter of 2004. The experience of the self-reliant institutes will be of great uses to institutes that have not yet achieved self-reliance. Assistance under this Forum for Nuclear Cooperation in Asia is required.

## **Strengthening Regional Cooperation**

Clearly, appropriate mechanisms are needed to help FNCA member countries respond effectively to the growing demands of nuclear related technology application. But how quickly such mechanisms are formed and how well they perform will depend, to a large extent, on the individual circumstances of each country, its strength and weaknesses. We are gathering here to combine our diverse strengths to meet the challenges facing our region. In line with FNCA's theme, I would like to emphasize that strong partnership is vital in order to achieve the goals of "achieving stability, security and prosperity for our region" we set out amidst the rapidly changing international environment. Further strengthening effective mechanisms of cooperation, through FNCA, IAEA/RCA or Scientist Exchange Programs of Japan, will also of great help, not only to facilitate better regional cooperation and investment, but also to protect our societies against threats to

their security, while preparing them to benefit fully from the sustainable development and nuclear energy.

### **Sustainable Development and Nuclear Energy**

The reorganization of national infrastructure is considered strategic for sustainable development. The OAP's roles in policy coordination and strategic plan development for peaceful utilization of atomic energy in Thailand will be strengthened to support the development for national and international peace and security and for national socio-economic development. The single regulatory role is to be also strengthened to ensure reducing risks and increasing benefits of nuclear technology application in the country. However, further strengthening OAP's roles both on internationally accepted standards and measures are to be incorporated in management strategy of OAP. Revision of the present Atomic Energy for Peace Act (1962) is required to incorporate new major elements to facilitate flexibility and effectiveness of the Act for OAP to enforce both national compliance of the NPT regime and safe regulations in compliance with the international standards and measures set out by the IAEA.

Likewise, in terms of research and development, and utilization of nuclear technology, the new Thailand Institute of Nuclear Technology (TINT) is considered strategic. TINT will be established with corporate-like management arrangement from which its businesses are carried out with partners from both public and private sectors. The current Ministerial Policy calls for TINT to redirect its mission to support export of agricultural produce through irradiation and development of Small and Medium Enterprises (SMEs). Its main research tools are research reactors and irradiation facilities.

**Nuclear Power:** Utilization of atomic energy for electricity generation has been proven to be an essential source of primary energy to secure sustainable electricity production all over the world. For Thailand, as it is well recognized that energy is one of the important factors for economic development of the country, a feasibility study of nuclear power plants was conducted years ago. As a result, the study outcome showed that it was untimely yet for Thailand to launch the nuclear power program due to inappropriate economical situation and the higher cost both for construction and operation. However, nuclear power remains an option for future energy development in Thailand and the public consent is required. In order to be prepared, OAP and the Electricity Generating Authority of Thailand (EGAT) has cooperated in launching periodically a number of PI and PA programs on nuclear related technology application as well as nuclear power to the public.

### **Conclusion**

Excellencies, Ladies and Gentlemen;

We reaffirms the primacy of the FNCA cooperation system, and confides that it offers the potential for real gains for all societies and economies, particularly developing countries, through the reform and improvement of agriculture, health and medicine, industry and environment. Thailand gives our strong and consistent support for continuing the valuable work done under the FNCA programs.

Thank you for your attention.