

Country Report of Thailand

by

Dr. Saksit Tridech

Deputy Permanent Secretary

Ministry of Science and Technology (MOST)

Mr. Chairman

Excellencies

Distinguished Delegates

Ladies and Gentlemen:

It is a great pleasure and an honor for me to participate in this remarkable occasion - "the Ministerial Level Meeting of the Fifth Forum for Nuclear Cooperation in Asia." I am here on behalf of Thailand's Minister of Science and Technology, His Excellency Mr. Korn Thapparansi, who asked me to extend his apology to all of you since he has been recently engaged with an unavoidable urgent function.

Mr. Thapparansi also expressed his sincere appreciation for the supports of the Atomic Energy Commission of Japan and the Vietnam Atomic Energy Commission who made the occurrence of this meeting. Please allow me to thank again for their kind invitation to Thailand to take part in this notable event.

Excellencies, Ladies and Gentlemen

This year, the Ministry of Science and Technology of Thailand has launched the **Principle Strategic Plan from 2004 to 2008**. The Office of Atoms for Peace of Thailand has adopted this five-year plan to apply with its nuclear research and development policy. The plan has been stated as two magnificent goals. Separately, each goal has been served by two major strategies.

Goal

1. To develop the excellence in science and nuclear technology and let them as a part that supports the nation's competitiveness.

Strategy

1.1 To promote and progress both national and international research. Moreover, to increase the capability of technological innovation, more patent registrations must be facilitated as the national intellectual treasures.

1.2 The service of nuclear technology's efficiency must be increased in both the infrastructure and the manpower.

2. The uses of nuclear energy.

2.1 To increase the complete capability of directing, handling, inspecting and controlling the uses of nuclear energy in order to be safe from all the risks caused by nuclear and radiation.

2.2 To have the users of the nuclear energy strictly guided by the safety regulations

Contributed to the **FNCA activities**, It is an honor to the Office of Atoms for Peace of Thailand that we have had an opportunity to host

- 2004 Forum for Nuclear Cooperation in Asia's Project Leaders Meeting for Public Information of Nuclear Energy in Bangkok during October 25 to 29. The success of this meeting has been apparently a proven of virtue cooperation between us, all 9 member countries together.
- Thailand will be hosting a significant event of FNCA 2004 Workshop on Radiation Oncology in Bangkok during mid December this year.

Now I would like to draw your kind attention to our performance within a year in respect of the **Cooperation Activities under FNCA Framework**.

1. Utilization of Research Reactors.

1.1 Tc-99m Generator Production

We do owe a special thank to Kaken Co, Japan in providing us three batches of PZC materials, 5 grams each. In addition to the performance of PZC-based generator such as Mo-99 adsorption, Tc-99m elution and Mo-99 breakthrough, the experiments in 2004 was focused on quality of Tc-99m solution obtained from PZC-based generator in terms of labeling and bio-distribution test. Labeling and bio-distribution test with some radio-pharmaceutical kits were performed and the results were compared with those from Tc-99m from commercial generator.

The $^{99}\text{Mo}/^{99\text{m}}\text{Tc}$ generators using as PZC material and irradiated natural molybdenum have performed the satisfied result of the generator characteristics that could be developed as an alternative technology for $^{99}\text{Mo}/^{99\text{m}}\text{Tc}$ generator production.

1.2 Neutron Activation Analysis

The collaborative project in active at the present time is 'the Application of Instrumental Neutron Activation Analysis (INAA) for Air Pollution Study'. The work performed during 2003-2004 consists of 4 main activities.

- The sampling of airborne particulate matter or APM, which has been performed once a month since January 2003 at two sites located in Bangkok and Pathumthani where are designated as urban and suburban areas.

- The completion of the multi-elemental analysis of air filter samples collected in 2003 and of samples collected during January to August 2004.
- To conduct QA/QC experiments by analysis of two standard reference materials, NIST 1632c and NIES No.8.
- The collaboration for a joint report based on the APM data of 2002 gathered among FNCA member states and submitted by Japanese Project Leader.

1.3 Neutron Scattering

According to the 10th FNCA Workshop on the Utilization of Research Reactors held in China in 2001, a new project of neutron scattering have started and aimed to develop “The Evaluation Technology of Natural and Synthetic Polymer Materials using Small-angle Neutron Scattering (SANS)”. Under the framework of FNCA, Thailand proposed 2 topics.

- Study of the Morphology of Natural Rubber under Strain in NR-TPE
- Study of the Structure-Morphology-Properties of thermoplastic elastomer (TPE) based on natural rubber (NR) and polyethylene (PE).

It was proposed at the expert meeting of Neutron Scattering Experiment under the 2003 Workshop, that the NR/PE samples with reinforcing agent (silica) should be studied for the project focusing on the application of the SANS for studying structure of natural and synthetic polymers. Moreover, 1-2 week workshop on experimental and analytical technique on SANS measurement for young scientists will be needed for Human Resources Development.

2. Application of Radioisotopes and Radiation for Agriculture

2.1 Mutation Breeding

Mutation breeding has become a well known technology which is being utilized by several plant breeders and ornamental plant growers in Thailand. Many new mutants of ornamental plants have been created by this technique.

- At Kasetsart University, additional 14 Canna mutants were registered and released in the early 2004.
- Six mutant varieties of chysanthemum and its original “Taihei” were transferred to Department of Agricultural Extension (DOAE) in 2003 for further multiplication and release to farmers. Now they are being grown at DOAE experimental stations in three provinces namely Chiang Mai, Lum Poon and Udonthani and they are expected to bloom in January 2005.
- At Kasetsart University, the research on banana improvement through induced mutation and *in vitro* culture has been carried out and resulted in the release of four registered banana mutants of Kluai Khai (or *Musa acuminota*) namely K.B. 1, K.B. 2, K.B. 3, and K.B. 4 respectively.

- Under the FNCA Mutation Breeding Research Project, Thailand has joined in the Sub-Project “ Insect Resistance in Orchid” together with Indonesia and Malaysia. Under this project, Malaysia will send two researchers for training in ‘Screening technique for insect resistance in orchid’ at Kasetsart University on December 6-9, 2004.

Dissemination of mutation technique and nuclear technology in agriculture to public has routinely conducted via workshops and various media.

2.2 Bio-fertilizer

Objective of the project is to select the method of useful bacteria test method for fertilizer. Major outcomes of the project are:

- New strains of micro-organisms to use as bio-fertilizer has been obtained from the selection activities.
- Increasing yield of leguminous plant by applied mycorrhiza and rhizobium. (field demonstration)
- Increasing yield of sugarcane by applied free living microorganisms.

3. Application of Radioisotopes and Radiation for Medical Care.

Radiation Oncology’s second protocol on Accelerated Hyper-fractionation (AHF) for stage IIIB Cervical Cancer was proposed and started in 2000 and ended in 2003. The purpose of this study is to increase the result of radiation treatment by changing the radiation schedule. Among 101 cases, immediate result did not show the impressive result and the radiation complication were not decreased with the new modalities.

Due to the multivariate analysis, concurrent chemoradiation showed better result in treatment of locally advanced cervical cancer and nasopharyngeal cancer, in both local control and survival. After the 10th workshop in Chiba in 2002, two new projects of concurrent chemoradiation in stage IIIB Cervical Cancer and stage III Nasopharyngeal cancer were started to evaluate the toxicity of cisplatin in Asian populations. After that, the third project of concurrent chemoradiation in locally advanced cervical cancer was started early this year while the workshop in nasopharyngeal cancer was recently held in Japan last July. As I have mentioned at the beginning, the next workshop will be held in Bangkok under the responsibility of the Thai Project Leader from Faculty of Medicine, Siriraj Hospital, Mahidol University between December 14-17 this year.

4. Public Information of Nuclear Energy.

OAP has arranged many PI activities through the year 2004 to deliver the nuclear knowledge to Thai people who are still lack of the mutual understanding about the benefit of the nuclear energy. Furthermore, this year is the **42nd Anniversary** of the Thai Research Reactor 1’s criticality. In this regard, OAP held the Open House at the

end of October, during the time of 2004 FNCA Project Leader Meeting of Public Information. Many activities were arranged including “Nuclear Quiz” and the essay writing competition on the theme of “Nuclear for better health and food safety” which was the highlight of this event, as well as many exhibitions and games which brought the visitors lots of nuclear understanding. There were around 542 spectators participated in this activity.

Nowadays, all of the countries in the world are facing the oil crisis, and Thailand as well. So it is possible that there might be a consideration about the alternative energy resources policy. And if it is so in Thailand, the Public Relations section must handle a harder role than the present days especially in the issues of benefit and safety of nuclear energy.

5. Radioactive Waste Management

The discussion and survey meeting on NORM/TENORM was held in Bangkok in August 2004 under TENORM task group of the FNCA on Radioactive Waste Management. The status of NORM and TENORM in Thailand and Japan were discussed on relevant issues and how to cooperate TENORM issues among the FNCA countries. OAP continued to consolidate its Radioactive Waste Management program including radium sources conditioning operation, development of a quality assurance (QA) system, and progress in the siting activity of a disposal facility for radioactive waste.

6. Nuclear Safety Culture

Many activities were carried out during the year 2004. Significant progress has been made in the achievement of greater independence of regulatory activities. The passage of the law to finalize the separation of the operating and R&D units from OAP is expected in due time. Activities to foster the Safety Culture to the operating organization were initiated. Those mentioned activities included the making of questionnaires for the operating organization staff to check their ideas of safety and how to improve the Safety Culture in their unit, the training topic on Safety Culture during the Nuclear Safety Refresher Training Workshop and during the Reactor Operators Training Course organized by OAP, updating of Safety Analysis Report (SAR) for TRR-1/M1 research reactor, the self-assessment of Nuclear Safety and Safety Culture of TRR-1/M1 research reactor facility.

A continuous improvement of Nuclear Safety Culture is one of the country policies related to utilization and application of nuclear energy. In addition, Thailand also has the policy to maintain close contact with other FNCA countries, the IAEA, and other countries carrying out related nuclear activities.

7. Human Resources Development

Human Resources Development in nuclear field is depending on the demand on the usage of nuclear applications. Among all nuclear applications, medical and industrial utilization of nuclear energy is the most successful and well known applications in the country. Since nuclear power is not planned for Thailand in the near future, human resources in nuclear power development is limited. Human resource of medical professional in nuclear field is recognized to be necessary for the safety in medical exposure control. While human resources in radiation safety are the key for occupation control in industry and research, human resources in research and development in nuclear applications and reactor utilization are also important for the country development.

8. Industrial Application of Electron Accelerator

Development of Low-Energy Electron Beam Facilities for research and application in Thailand includes:

- The Generation of a femto-second (<100 fsec) electron beam from thermionic rf-gun and a 30 MeV linac for research at the Fast Neutron Research Facility (FNRF) of Chiang Mai University. It is aimed to produce femtosecond electron pulses using a combination of S-band thermionic rf-gun and an alpha-magnet as the magnetic bunch compressor. A specially designed rf-gun has been constructed to obtain the optimum beam characteristics for best bunch compression. This rf-gun, an alpha-magnet and a 30 MeV linac include 5-MW microwave systems for the rf-gun and the linac as well as the beam transport line have been installed and the system is now being commissioned to generate femtosecond electron bunches.
- The development of a prototype 10 MeV, 1.5kW linac for industrial application. A revised proposal was submitted to the Ministry of Science and Technology through the National Science and Technology Development Agency in July 2004 requesting funding to build a 10 MeV, 2 kW linear electron accelerator for research in Material and Food irradiations.
- The development of a pulsed 300 keV electron accelerator for research. A proposal to build a pulsed 300 keV electron accelerator is being revised and will be submitted to the National Research Council in September 2004.

Excellencies, Ladies and Gentlemen

In conclusion, I would like to express our sincere gratitude to all who sacrifice their endeavors to the success of this FNCA meeting. Please accept our assurance of our cooperation under the FNCA framework continuously in the future. Thank you for your kind attention.