The Fourth FNCA Meeting
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Country Report of Viet Nam

The year 2003 is a year of many remarkable events for research, development and uses of nuclear energy in Viet Nam.

In September 2003, the VAEC and IAEA have signed *The Country Programme Framework for Technical Co-operation between the VAEC and IAEA, period 2003-2008*. The areas for future cooperation between the VAEC and IAEA are as follows: Food Security; Energy Security; Management of National Water Resources and Supply of Clean Drinking Water; Strengthening of National Capability in Nuclear Science and Technology; Health Care; Industrial Applications of Nuclear Techniques; and Human Resources Development.

The Draft *Strategy for nuclear energy development in Viet Nam* is completed and being reviewed. The strategy has emphasized the socio-economic impact of nuclear technology to the country, as well as formulated a long-term programme for nuclear energy development of the country from now up to 2030.

Reports on *Pre-FS on the first NPP's construction in Viet Nam* and *Study and elucidation of seven aspects in relation to the nuclear power development in Viet Nam* are going to be completed. The study results concluded that in order to meet energy demand of the country, the first NPP should be put into commercial operation in Viet Nam by 2017-2020.

The National Assembly Standing Committee approved to formulate Draft Atomic Energy Law of Viet Nam. A Steering Committee was established. H.E. Minister of the MOST is appointed as the Chairman of the Committee.

During the 2003, Viet Nam has been participating in all FNCA projects. The results obtained from the FNCA cooperative activities have been making significant contributions to the enhancing of research, development and use of nuclear science and technology in Viet Nam. Below are some main activities being carried out under the FNCA framework.

1. Utilization of Research Reactor

1.1. ^{99m}TC Generator Production

Polymer Zirconium Compound (PZC) was successfully synthesized. As a result obtained several hundred grams of PZC sample of good quality and high Molybdenum adsorption capacity were prepared for 99mTc generator preparation. The comparison of the performance of synthesized PZC with that supplied by Kaken Co. (Japan) showed a coincided result on the Molybdenum adsorption performance.

A standard procedure for the preparation of PZC based 99mTc generator has been formulated and compiled by Prof. Le Van So . This procedure was issued by Dr. Sueo Machi and Dr. Tsuguo Genka and dispatched to FNCA's participants for standardization of experimental work.

An effective PZC column loading technique was successfully developed. This is

called a " Cold loading technique". This technique offer an opportunity to simplify the procedure of PZC based Tc-99m generator preparation and to follow suit a commonly accepted fission 99Mo and Alumina based Tc-99m generator technology.

1.2. Application of Neutron Activation Analysis

+ The air pollution study

During 2002, the airborne particulate samples were collected using two types of polycarbonate membrane filter PM2.5 and PM2.5-10 in two typical sites of industrial (Ho Chi Minh City) and rural (Dateh) regions in the south of Viet Nam. The concentration of trace elements in the samples has been determined by the k0-NAA procedure developed in Da Lat NRI. In order to check the developed k0-NAA procedure for the airborne particulate matters, two standard reference materials (SRMs) Urban Particulate NIST-1648 and Vehicle Exhaust Particulate NIES-8 were analyzed and the obtained results have been compared and interpreted in term of deviation between experimental results and the certified values.

However, the meteorological data in the sampling site of rural region (Dateh) has not been available yet. We have contacted to the meteorological agency in Viet Nam, but it was not successful. This problem will be solved in the next year because we are initiating a new national project for investigation of air pollution in Viet Nam.

+ The QA/QC

The quality management for analytical laboratories has been implemented at the Da Lat NRI. At the moment, two typical laboratories for nuclear analytical techniques (NATs), i.e. laboratories for INAA and Environmental Research-Monitoring have been selected to aim at getting the accreditation. The procedures, techniques and instructions have been documented, however they have not yet been combined in a quality manual. The laboratories are expected to receive accreditation for their quality system for compliance with the accreditation criteria of TCVN ISO/IEC 17025 national standard (equivalent to ISO/IEC 17025 international standard) in the next two years (end of 2005).

In order to evaluate uncertainties involved in analyzing a small size of sample like airborne particulate matters, a small-sized sample was analyzed repeatedly. For this purpose, 1 mg of two SRM samples (NIST 1632C and NIES No.8) was analyzed for six times. Both of the k_0-NAA and the relative methods were applied. Also, the impurities in filter papers were evaluated.

+ The development and application of ko-NAA

The analysis of airborne particulate matters by the k_0-NAA method based-on the Ko-DALAT software has been carried out.

During 2003, the k_0-NAA method including the use of Ko-DALAT software was trained for all staffs of INAA laboratory at the Da Lat NRI. Also, through an expert mission (Mr. Ho Manh Dung) invited by MINT, the k_0-NAA methodology developed at Da Lat was introduced to the NAA laboratory in MINT (Malaysia).

+ Others

The INAA technique has been applied for determination of multi-element in various sample objects such as crude oil, base rock, human hair and sediment, etc.

Characteristics of the PGNAA facility at the Da Lat reactor have been improved.

+ Future plan on NAA

The INAA technique should be applied for the solid waste samples.

The prompt gamma-ray NAA (PGA) system should be developed and applied for the practical objects.

1.3. Neutron Beam Application and Research Reactor Operation

Research of structure-properties of water-soluble copolymer for oil field application.

Structural study of TPE on the basis of NR and Methyl-methacrylate, Polyethylene and Polypropylene.

Reactor management including fuel burn-up calculation, reactor physics and thermo-hydraulic study, as well as reactor aging management.

2. Application of Radioisotopes and Radiation for Agriculture

The activities of this FNCA project have been integrated with the IAEA Project VIE/5/014: *"Mutant rice varieties for saline acid soil tolerant"*, which purpose is to further develop and extend advanced mutant varieties and mutant germplasms of rice in Viet Nam. The research activities have been being carried out at the Agricultural Genetics Institute and Cuu Long Delta Rice Research Institute.

In addition to the National training course on "Maker-assisted selection and DNA fingerprinting in rice", many training courses for extension of new varieties were held in locations, where demonstration fields for CM6, DT21, Mutant Tamthom and others have been cultivated.

Under the FNCA framework, the 2003 FNCA Workshop on Application of nuclear technique for bio-fertilizer production was successfully organized in Viet Nam, October 2003.

For the next cycle 2005-2006, an IAEA TC Project on Enhancement of Quality and Yield of Rice Mutants in Vietnam Using Nuclear and Related Techniques has been proposed.

3. Application of Radioisotopes and Radiation for Medical Use

Recently, Viet Nam has been investing to equip modern nuclear techniques and facilities to the hospitals. It may be mentioned that, considering the significant role of nuclear medicine diagnostics and radiotherapy in the national health plans, the Government of Vietnam has approved the establishment of a Medical Hi-tech Center with the provision of the first PET-Cyclotron System in the Country. In order to support to the Center, a proposed national project on *Establishment of Cyclotron Center for medical use and development of nuclear technique application* is being formulated with the participation of the VAEC, the Tran Hung Dao hospital, Institute of Physics, Ha noi University of Technology, and Ha Noi Science University. Besides, VAEC has proposed IAEA to approve a TC project on PET-Cyclotron for the cycle 2005-2006.

At present, there are on-going projects, such as: RAS/6/035: *LDR and HDR Brachytherapy in Treating Cervical Cancer*, which is being carried out at the K-Hospital and the Oncology Center in Ho Chi Minh City and two national projects: *Concurrent Chemo-Radiotherapy for Uterine Cervix Cancer* and *Concurrent Chemo-Radiotherapy for Nasophryngcal Carcinoma*.

4. Public Information of Nuclear Energy

Having perceived the extremely important role of public information and propaganda for the public acceptance and consensus to the nuclear power development, in 2003, many PI activities have been carried out in Viet Nam.

Follow-up three exhibitions on peaceful uses of nuclear energy in 2001 and 2002, the 4th exhibition on peaceful uses of nuclear power was held in Ho Chi Minh City in April 2003 with supports of the JAIF and JCI of Japan.

October 2003, the VAEC participated in the *Viet Nam Tech Mart 2003* in Ha Noi. The VAEC pavilion had received thousands visitors. Through the exhibition, VAEC has taken a good opportunity to propagate to the public the benefits of the nuclear technique applications in the fields of agriculture, industry, health care, environment protection,...

March 2003, a delegation of Steering Committee for study on Nuclear Power Development in Viet Nam has paid a visit to the nuclear installations in Korea and Japan

September 2003, a delegation of the organizations of the Communist Party of Viet Nam (CPV) visited Japan to study nuclear power development of Japan under the invitation of the Japan Atomic Industrial Forum, Inc. (JAIF).

October 2003, a delegation from MOST and VAEC paid a two-week scientific visit to France in order to study the nuclear power development and nuclear - related technologies of France.

The 2003 FNCA Public Information Project Leaders Meeting was held in Ha Noi and Ho Chi Minh City November 4-6, 2003. During the Meeting, the two seminars on Strategy on Public Information for Nuclear Power Development in Ha Noi and Application of Radiation Technology in Industry in Ho Chi Minh City were held successfully with participation of the policy makers, scientists, professors, students, and journalists and correspondents. The mass media, such as Viet Nam Television (VTV), Voice of Viet Nam (VOV) and newspapers informed of those events, including VTV's broadcasting of interview with Dr. Sueo Machi, FNCA Coordinator of Japan.

It is noted that the PI activities have contributed to increasing awareness of the public towards the necessity and benefit of the development and utilization of nuclear energy, especially, the introduction of nuclear power in Viet Nam.

5. Radioactive Waste Management

Institute for Technology of Radioactive and Rare Elements (ITRRE) has responsibility for treatment and management all kinds of radwaste in the North of Viet Nam. At present, about 130 tons of LLRW, including uranium ores, uranium tailing, waste from monazite processing and research activities in ITRRE accumulated from 1981, have been being treated. This activity will be completed by the end of 2003 and has been kept at the ITRRE's interim storage in Phung, Ha Tay province.

In addition, many sealed sources have been being used in industries. After their expiration, they become radioactive wastes. Statistical data on the distribution of radioactive sources in Viet Nam are as follows:

There are 739 sources distributed in 17 among 39 provinces of the country classified by fields of applications as follows:

Health care:	411 sources,	(56%)

Industries:	201 sources,	(27%)
Others:	127 sources,	(17%)

Among them only 210 sources are still in use and under close management; The remaining more than 500 sources are actually expired. They are considered radwaste and kept in stores of the users. They should be collected and managed at radwaste processing facility.

With the aim of the enhancing capability on RWM, in addition to the on-going MOST project on upgrading Phung interim storage, treatment and management for all radioactive wastes in this storage, VAEC is planning to formulate a new IAEA TC project on RWM for the cycle 2005-2006.

Implementation of the 2003 FNCA plan, from 24-29 July 2003, the TENORM Task Group of FNCA had completed his mission in Viet Nam, the discussion on TENORM show that, some NORM/TENORM industries should be a target of radiation protection. But their origin of radioisotopes is natural. Therefore, the criteria or standard should be different from that of artificial source. Too strict regulation will cause much social and economical confusion.

The co-operation in the field of RWM was implemented through the exchanges of experiences, training personnel and the consultancy in setting-up the National Policy for RWM between Vietnamese experts and experts from IAEA, Japan, Korea and FNCA.

6. Human Resource Development

The crucial problems and obstacles on nuclear human resource development facing by Viet Nam are the shortage of nuclear manpower in terms of quantity and quality. There exist, at present, a *big gap* between scientific researcher generations.

Recognizing the vital importance of human resource development, the government of Viet Nam had assigned VAEC and IE to conduct studies to establish a policy and plan for preparation manpower for atomic energy development, in general, and the introduction of nuclear power in Viet Nam, in particular.

At present, VAEC has established cooperation with 4 universities (Ha Noi University of Technology, Ha Noi University of Science, Ho Chi Minh City University of Science, DaLat University) in the field of nuclear student training. Through the international cooperation channels (IAEA, RCA, FNCA, bilateral), every year, about 150-200 scientific researchers and nuclear administrators have been trained abroad.

VAEC is implementing a policy to recruit excellent students and give them favourable conditions for continuously studying at the oversea training centers.

From December 8-12, 2003 a Regional Asia Workshop on Management of Human Resources for NPP Operating Organizations (RAS-4-021) will be held in Ha Noi under co-sponsors of the VAEC and IAEA. 25 experts and participants from IAEA, China, Egypt, India, Korea, Pakistan, and Viet Nam will attend the Workshop. This is an important and useful event for Viet Nam - a developing country is considering to choose nuclear power.

7. Nuclear Safety Culture

Lectures on safety culture were presented in 10 training courses on radiation safety organized in the whole country with 450 participants in total.

Several meetings between regulators, contractors, reactor management and reactor users have been held to discuss aspects affected nuclear safety of Da Lat Nuclear Research Reactor (DNRR).

Studies on the social and human conditions of Viet Nam with respect to the management and operation of NPPs in the near future have been carried out.

The 6th FNCA Workshop on Nuclear Safety Culture was held in Da Lat, Viet Nam January 2003. The Workshop and Peer-Review were very useful for fostering and strengthening safety culture for Viet Nam.

In 2003, two Workshops on Nuclear Safety Culture were organized in Ha Noi under the framework of MOST's Project on Elucidation of 7 aspects related to the nuclear power development in Viet Nam.

8. Application of Electron Accelerator

Market survey on product types and quantities, which could be processed by gamma irradiator and by EB machine in the fields of industry and health care, has been being conducted by the Research and Development Center for Radiation Technology (VINAGAMMA). In addition, some studies on liquid materials processed by gamma and electron irradiation for development of some agricultural products such as plant promoters, protectors, etc. has been conducted under the cooperation between Viet Nam and Japan.

VAEC is considering a project on installation of EB machine at the VINAGAMMA. This plan is supported by IAEA through a TC Project in the cycle 2005-2006.

Conclusion

Nuclear science and technology has been playing a very important role and continuously making significant contribution to the socio-economic development of the countries in region.

We highly appreciate the very important role and significant contribution of the FNCA to the safe peaceful nuclear energy utilization in the world, as well as in the Asian region.

Viet Nam has the great honour to host the 5th FNCA Ministerial Level Meeting to be held in 2004. The Government of Viet Nam commits to give every necessary condition and closely cooperate with Japan and the other FNCA member countries, to ensure the fruitful success of the Meeting.