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Radiation Safety & Radioactive Waste Management

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FNCA Workshop on Radiation Safety & Radioactive Waste Management (RS&RWM) 21st-25th May, 2010, Tokyo

The FNCA 2010 Workshop on Radiation Safety and Radioactive Waste Management was held from May 21st to 25th 2010, in Tokyo, Japan. This Workshop was hosted by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan, and was attended by twenty representatives from nine FNCA member countries, namely Australia, Bangladesh, China, Indonesia, Malaysia, Philippines, Thailand, and Vietnam.

At Opening Session, Dr. Sueo Machi, FNCA Coordinator of Japan presented updates on the status of the eleven FNCA projects. Finally, Dr. Toshio Kosako, Project Leader of Japan, Professor of the University of Tokyo, delivered the opening speech and declared the workshop opened. The participants then presented their country report detailing legislative framework, and updates, and plans regarding radiation safety, followed by questions and answers.

In the morning of the second day, the participants discussed details of consolidated repot on radiation safety. In the afternoon, they made presentations on further improvements in the reliability of dosimetry, followed by discussion on calibration, exposure control and training/education. After the presentations on experiences on design and siting for LLW Facilities delivered by Participants from Thailand, Vietnam, and Indonesia, all the participants exchanged their opinions, referring to lessons learnt from radiological accident occurred in their country and predisposal management of radioactive waste.

Panel Discussion at Joint Session with AOCRP-3

On the third day, it was suggested at the session titled “Future Plan and Preparation for Round Table Discussion” that this project mainly focuses on the six theme;(1)Radioactive Waste Management and decommissioning, (2)NORM/TENORM, (3)Clearance, (4)Safety & Security, (5)Emergency, and (6)Nuclear Power Plant program. At the beginning of Joint Session with the Third Asian and Oceanic Congress on Radiation Protection (AOCRP-3), Prof. Kosako introduced activities and achievements of this project and FNCA representatives introduced current situation and activities regarding radiation safety and radioactive waste management in their countries. The participants then formed a panel to discuss variety of subjects related to radiation safety and radioactive waste management such as Radioactive Waste, NORM, Safety and Security, and Clearance.

The fourth day started with the session titled “Introduction of Japan’s Experiences”. The participants observed DVDs on “The Renaissance of Nuclear Exposure Scenarios, Clearance, Safety &Security, Emergency Preparedness, and Nuclear Power Program.Fuel”, “Core Inspection Instruments” and “SPEEDI Network System” as well as “Document of Earthquake in Kashiwazaki-Kariwa” that is a documentary made by Tokyo Electric Power Company. In the afternoon, the meeting minutes were drafted and agreed by all the participants.

FNCA RS&RWM Project Leaders

Australia

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Australian Nuclear Science & Technology Organisation (ANSTO)

Bangladesh

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Ms. Maria Visitacion B. Palattao
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Thailand

Mr. Sutat Thiangtrongjit
Director,
Radioactive Waste Management Center,
Thailand Institute of Nuclear Technology (TINT)

Vietnam

Dr. Le Ba Thuan
Director,
Institute for Technology of Radioactive and rare Elements,
Vietnam Atomic Energy Institute (VAEI)

Topics from Participating Countries

Australia

Mr. Lubi Dimitrovski
Mr. Geoff Malone
Australian Nuclear Science & Technology Organisation (ANSTO)

MOATA Reactor Dismantling

Overview

In 1961, the Australian Atomic Energy Commission acquired the 10kW Argonaut type research reactor, MOATA, which was later modified to 100kW. MOATA was used for a variety of research and industrial applications. In 1995 due to insufficient demand for its services to justify running costs, the reactor was shutdown and put into a safe state. After removing the fuel and control systems, and draining the cooling water, the facility was licensed for possession, control and decommissioning by the Australian nuclear regulator ARPANSA in 2001.

ANSTO internal approvals for dismantling were granted in January 2008. Table 1 below provides an overview of the approval and completion timeline for the project.

	Approval date*	Completion date
Phase 1: Removal of components of the reactor core	Jun 2009	Jul 2009
Phase 2: Dismantling of the concrete bioshield	Jan 2010	Sep 2010
Restoration of the site		Oct 2010
Site survey		Dec 2010
Submission to ARPANSA		Dec 2010

* Approval regulatory body = Australian Radiation Protection and Nuclear Safeguards Agency (ARPANSA)

Table 1: Timeline of project

Termination of the facility license is expected from ARPANSA in early 2011.

Project Phase 1

The dismantling operation was undertaken in two phases. The first phase of the dismantling -Preliminary Dismantling – took place during July 2009 and was undertaken entirely by ANSTO staff.

It involved removal of all the control drive hardware, support and alignment components, fuel element tanks and associated piping, 12 tonnes of nuclear grade graphite reflector from the core region and the four adjacent horizontal cavities used for experimental beam ports, and an internal lead gamma shield. Most of the work was done by hand using hand tools whilst heavy-duty hydraulic shears were used to cut the steel shafts and accessible aluminium pipework. An internal pipe cutter was used to remotely cut aluminium pipes at the bottom of the fuel tanks and a vacuum lifter was used for the vertical lifting of the graphite rods from the core region. The metal components were placed in 50mm thick steel boxes and the graphite was placed into 24 lightweight steel boxes for storage in ANSTO low level waste storage facilities.

Figure 1: Lifting graphite from reactor core

Figure 2: Lifting 50mm steel box

Figure 3: Graphite loaded lightweight box

Project Phase 2

The second phase of the project involved the dismantling of the concrete bioshield and subfloor region. This was undertaken between March and August 2010. Two fuel element storage pits, a process cooling pit and various shield guide rails in the adjacent floor were demolished and the area remediated.

The dismantling of the concrete was undertaken by a specialist concrete dismantling contractor (Cardinal Services) engaged for the project. All other aspects of the work such as site management, radiation and occupational health and safety monitoring, waste monitoring, and control of active wastes were undertaken by ANSTO staff. Wastes that meet ANSTO's release criteria were removed from site by the contractor, the majority being concrete which was subsequently recycled.

Figure 4: Truck loaded with concrete blocks

The demolition was carried out by cutting the structure into large sections of approximately one cubic metre in volume and several tonnes weight, using the diamond wire sawing (DWS) process. The cutting was guided by accurately established coring holes located throughout the concrete. The cut sections were checked locally in the containment area. Identified hot-spots were subsequently removed. After clearance from the containment area all blocks were taken to a nearby low background area for ISOCS scanning (field mounted gamma scanner) – Figure 5.

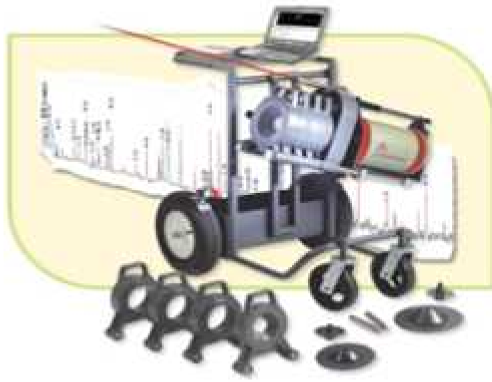


Figure 5: ISOCS Gamma Scanner

to confirm suitability for release. Only two blocks failed this scanning check, requiring the return to the containment area for removal of the contaminated material.

The cutting of the concrete had been planned based on careful characterisation to ensure only concrete at and below the release levels would be cut and removed from the structure. The more active concrete nearer to the core of the reactor on the other hand would be stored as low level solid waste. (LLSW). Approximately 500mm of concrete around the core was classified as LLSW. The inner 300mm was heavy density concrete loaded with small pieces of iron, making it unsuitable for cutting by DWS. Therefore a hydraulic hammer and a jaw-type crusher were used instead. These active concrete material (and the active sub-floor region) was then placed into 24 bins, each of 1.75m^3 and 6 tonnes capacity for storage in ANSTO's LLSW storage facility.

Site Remediation

The site was remediated by filling all the pits with compacted crushed concrete. A new load-bearing concrete flooring was poured and finished to match the existing floor structure and surfaces. A new covered service-duct was included as part of the floor restoration to allow for future use.

Figure 6: Excavated and remediated floor

Challenges of Project

One of the most challenging issues encountered in this project is associated with ANSTO's STAR Accelerator. The STAR accelerator provides Australia with one of the world's most sensitive means of monitoring Carbon-14. Located in the same building as MOATA, the risk of C-14 contamination during the removal of the 12 tonnes of irradiated graphite during the dismantling could signal the end of the STAR accelerator in this application.
However the strict control measures adhered to throughout the project ensured no C-14 contamination of the STAR accelerator or immediate surrounds. The dismantling of the MOATA reactor was undertaken within a large containment tent which enclosed the reactor and work area around it entirely. It was ventilated by a HEPA filtered exhaust system which provided approximately nine changes of air per hour, ensuring no leakage of potentially contaminated air from the demolition zone. No discharges of radioactive materials or other noxious wastes to the environment was recorded either.

Impact on Dose Rates

Doses to workers involved in the project were very low. Table X provides the actual and estimated doses for both phases of the project.

(Man- μSv)	Estimated	Actual
Collective dose in Phase 1	169	155
Individual dose in Phase 2	1500	252
Collective dose in Phase 2	10,400	1679

Table 2: Dose rates

Impact on Waste Volumes

Radioactive waste volumes generated were less than the initial forecast. Much of the concrete shielding around the reactor was found to be non-active and therefore recycled via normal industrial processes. The radioactive waste generated was managed under ANSTO's waste processes.

The wastes generated by this project include:

Waste	Weight
Graphite Moderator*	12Tonne
Low Level Solid Wastes from core region (lead & steel)*	1.5 Tonne
Heavy Density Concretes (non-activated, restricted release)	40 Tonne
Normal Density Concrete (free release)	175 Tonne
Concrete Cutting Slurries (~ 30% mass as water)*	10 Tonne
Heavy Density & normal density concretes (incl. steel inserts) (activated, low level solid waste)*	80 Tonne
Normal Density concrete from sub-floor region and fuel pits (activated and NORMs, low level solid wastes)*	20 Tonne

** materials retained by ANSTO for future disposition*

Achievements Recognised

During the Preliminary Dismantling phase of the project in July 2009, ANSTO hosted a week-long IAEA workshop on 'Planning for Dismantling of Small Nuclear Facilities' during which the overseas participants were able to witness dismantling work in progress. A short DVD of the project is available and was presented to the 2010 Annual Meeting of the IAEA's International Decommissioning Network (IDN).

The Australian Institute of Project Management (AIPM) recognised the quality of management of this project with the awarding of NSW Small Project of the Year, NSW Overall Project of the Year (2010) and National Small Project of the Year (2010).

Bangladesh

Dr. Moinul Islam
Bangladesh Atomic Energy Commission(BAEC)

Physical Protection of Central Waste Processing and Storage Facility (CWPSF)

The possibilities of theft, sabotage, unauthorized access and illegal transfer of radioactive material by individual and groups has been a matter of great concern. According to IAEA resolution GC(42)/RES/12 all governments are encouraged, to take steps to ensure the existence within the territories of effective national systems of control for ensuring the safety of radiation sources and the security of radioactive materials. In order to provide high assurance that activities involving radioactive waste management do not constitute an unreasonable risk to public health and safety it is therefore important to establish and maintain a physical protection for such a system. To establish a system and to protect radiological hazard to the personnel, public and the environment, general administrative measures and technical measures have been applied for the management of radioactive sources at CWPSF AERE Savar, in the recent years. The combinations of administrative and technical measures include:

- Entries of private vehicles to CWPSF compound are limited
- The vehicles are searched and checked during the entering and leaving the facility compound
- The facility is surrounded by a fence or wall, which provides penetration delay
- The number of entries and exists to the main interim storage area have been kept minimum
- A record is maintained for all persons having access to keys
- All persons and packages entering or leaving inner areas are checked.
- The issuing of keys to facility are strictly controlled
- Access to storage facility is strictly limited
- Waste Storage areas are continuously locked and alarms activated when not occupied
- A 24-hours guarding service has been provided to CWPSF

- Patrols around the CWPSF area during all over the night are also provided

Moreover, the intrusion detection in CWPSF have been equipped with following measures: CCTV System, Homeland Surveillance Security System (IR Camera, PTZ Camera, Radiation Detector, Long range IR Illuminator), Metal Halide Security Light, Remote Key Pad, Digital Speech Dialer, Key Safe Box, High Security Pad Lock, Heavy steel door.

Figure 1: CCTV & Control Panel of Physical Security System at CWPSF

To ensure consistency with the international Basic Safety Standard and the revised code of conduct for the safety and security of radioactive sources, these security measures primarily aimed at trying to prevent the necessary level of protection against unauthorized acquisition of radioactive sources. These integrated measures involving safety arrangements, radiation protection measures and appropriate design to achieve the safety and security objectives.

Japan

(1)Prof. Toshiso Kosako, University of Tokyo, **(2)Dr. Yasushi Sato**, National Institute of Advanced Industrial Science and Technology (AIST), **(3)Dr. Toan Ngoc Tran**, Vietnam Atomic Energy Institute(VAEI), and **(4)Dr. Hideki Harano**, National Institute of Advanced Industrial Science and Technology (AIST)

Remote calibration of ionization chambers for radioactivity measurements

1. Introduction to remote calibration

The new 'e-trace' calibration technique has been developed by AIST (National Institute of Advanced Industrial Science and Technology) to rationalize traceability. The e-trace technique enables the rapid remote calibration of measurement equipment and requires minimal resources. The e-trace concept is as follows: NMIs (National Metrology Institutes) that participate in an MRA (Mutual Recognition Arrangement) or laboratories that have been accredited send transfer standards to customers. Measurement equipment in the remote location is controlled via the internet and transfer standard data are obtained. The work of authorized personnel at the remote location is monitored by video conferencing. The measurement data are analyzed by NMIs or accredited laboratories before a certificate of calibration is issued; all of the calibration methods for maintaining traceability are managed based on a quality management system.

Traceability refers to an unbroken chain; measurement equipment is calibrated by references at higher levels, with the calibration chain ending at the primary standard. E-trace has been utilized to maintain the traceability of radioactivity measurements between the primary and secondary standards in Japan since 2005.

On the other hand, many hospitals currently use radiopharmaceuticals for *in vivo* diagnostic imaging. Single photon emission computed tomography (SPECT) and positron emission tomography (PET) are useful methods for obtaining physiological information such as the presence and location of cancerous regions following the injection of a radiopharmaceutical. Ionization chambers are commonly used to measure the activity of radiopharmaceuticals and confirm that an adequate amount of radionuclide has been injected. Such ionization chambers are calibrated by accredited laboratories to maintain traceability. E-trace is now beginning to be applied to ionization chambers for working standards in work places such as research institutes and hospitals to enable rapid calibration using limited resources.

2. Remote calibration methods

There are two methods of remote calibration, involving the use of either transfer standard sources or transfer equipment.

2.1 Use of transfer standard sources

A schematic diagram of the remote calibration method based on transfer standard sources is shown in Fig. 1. AIST calibrates the standard sources before they are sent to users of ionization chambers. The sources are measured by the users' ionization chambers under remote control via the Internet, and the results are transferred back to AIST via the Internet. This method is used for nuclides that are sufficiently long-lived to be sent to users.

2.2 Use of transfer equipment

A schematic of the remote calibration method involving transfer equipment is shown in Fig. 2. The equipment involved might be an ionization chamber, which can be controlled from AIST via the Internet to calibrate radioactive sources produced at the users' site. This calibrated source is measured by users' ionization chambers and the calibration coefficients of users' ionization chambers are then calculated using the measured activity and the activity of the calibrated source. This method is used for short-lived nuclides such as ^{18}F.

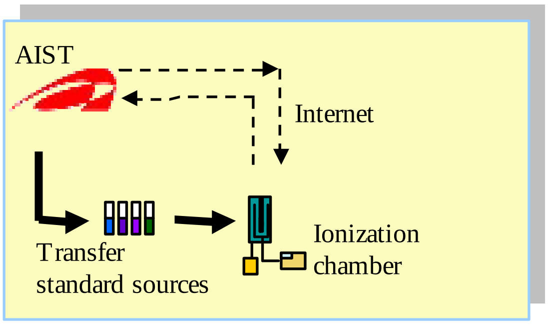


Figure 1: Remote calibration using transfer standard sources.[1)]

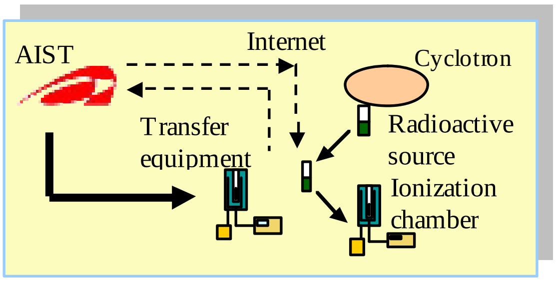


Figure 2: Remote calibration using transfer equipment.[1)]

3. Joint research with INST, Vietnam

Until now, there has been no primary standard laboratory for radioactivity in Vietnam; however, the Secondary Standard Dosimetry Laboratory (SSDL-Vietnam), belonging to the Institute of Nuclear Science & Technology (INST), has been accredited as the national standard laboratory for radiation dosimetry & radioactivity. It is essential for SSDL-Vietnam to maintain traceability to international standards through NMIs such as the NMIJ, AIST (National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology). To this end, in 2006, SSDL-Vietnam participated in an international comparison of radioactivity measurements of ^{133}Ba (APMP.RI(II)-

K2.Ba-133) organized by AIST within the framework of the Asia-Pacific Metrology Programme (APMP). Recently, AIST has supported INST with calibration of ^{131}I by the e-trace technique. AIST first sent the ^{131}I transfer standard source to INST; a researcher from AIST then travelled to INST to help SSDL-Vietnam to set up a remote calibration procedure controlled by NMIJ via the Internet. In the near future, it is expected that AIST will send a transfer standard radioisotope calibrator to INST for calibration of short-lived nuclides such as ^{18}F, used in the PET systems that are rapidly becoming widespread in Vietnam.

4. Conclusion

A new calibration technique, referred to as e-trace, has been developed by AIST and is already being partly used for traceability maintenance in Japan. It is expected that this method will allow reliable quantitative comparisons of national metrology services.

5. Acknowledgement

This work was supported by the New Energy and Industrial Technology Development Organization, project code P01029.

Reference

1. The remote calibration of radioisotope calibrators, Y. Sato et al., IFMBE proceedings, 14, pp. 1949-1952, 2006.

Korea

Dr. Chang-Lak KIM
Korea Radioactive Waste Management Corporation (KRMC)

Status of LILW Disposal Facility Construction in Korea

In December 2005, the Korean Government designated Gyeongju-city as a host city of LILW disposal site through local referendums held in regions whose local governments had applied to host disposal facility in accordance with the site selection procedures.

LILW disposal facility is being constructed in Bongil-ri, Yangbuk-myeon, Gyeongju. The official name of the disposal facility is called 'Wolsong Low and Intermediate Level Radioactive Waste Disposal Center (LILW disposal center)'. It can dispose of 800,000 drums of radioactive wastes in a site of 2,100,000 square meters. At the first stage, LILW repository of underground silo type with disposal capacity of 100,000 drums is under construction expected to be completed by the end of 2012.

The Wolsong Low and Intermediate Level Radioactive Waste Disposal Center consists of surface facilities and underground facilities. The surface facilities include a reception and inspection facility, an interim storage facility, a radioactive waste treatment building, and supporting facilities such as main control center, equipment & maintenance shop. The underground facilities consist of a construction tunnel for transport of construction equipment and materials, an operation tunnel for transport of radioactive waste, an entrance shaft for workers, and six silos for final disposal of radioactive waste. As of Dec. 31, 2010, the overall project progress rate is 72%. The facility layout of six disposal silos for the initial disposal of 100,000 drums is depicted in **Figure 1**. The engineered barrier system of the disposal silo consists of waste packages, disposal container, backfills, and a concrete silo. The conceptual drawing of the post-closure phase of disposal silo is shown in **Figure 2**.

Figure1: Layout of the Wolsong LILW Disposal Center

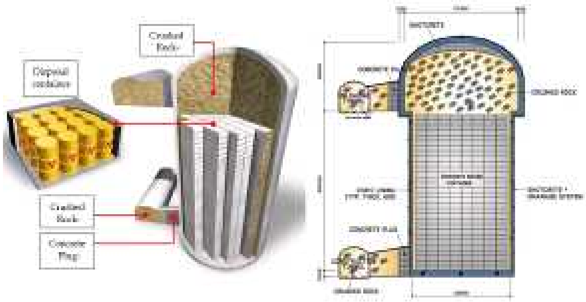


Figure 2: Concept of Disposal Silos after Closure

All nuclear power plants in Korea are located on the coast. The radioactive waste shipments therefore go by sea. KRMC has constructed and now operates the ship, 'Cheong Jung Nuri', for the transport of radioactive waste from nuclear power plants to Wolsong repository. Last year, 1,000 drums from Ulchin NPP site were transported to the Wolsong LILW disposal center.

Figure 3: Cheong Jung Nuri (Radioactive Waste Transport Ship)

At the Wolsong LILW disposal center, KRMC is building an 'Environment Friendly Complex' with the theme of nature and science (shown in Fig. 4). The environment friendly complex consists of the 'Four Season Flower Garden', Kiosk of Perception', "Dynamic Deck', 'Light Theme Park' as well as a visitor center, and open air performing theatre.

Figure 4: Layout of the Environment Friendly Complex

Malaysia

Dr. Nik Marzukee Nik Ibrahim
Dr. Mohd Abd Wahab Yusof
Malaysian Nuclear Agency

Enhancement of Safety and Security and Upgrading of Storage Facility

Most of the radioactive wastes produced in Malaysia are from small applications using radioactive material and nuclear technologies. Nuclear Malaysia maintains a solid waste processing area where solid wastes are collected, segregated, and decayed in storage where applicable. Also, a pre-treatment storage facility and an interim long term storage facility exist; designed to accommodate of 200-L waste drums package and DSRS prior to availability of a repository.

The solid waste is placed in 200-liter drums for processing (decay storage, volume reduction, etc.) before temporary storage. The current storage facility is located near the waste processing area. 2 projects for development, upgrading of facilities and enhancement of safety and security related to waste management facilities were proposed and carried out in 2010.

Perimeter Intrusion Detection System (PIDS)

Before Installation

After Installation

The system includes: double fencing which includes anti-climb feature and razor wires on top, anti-cut and vibration detectors on fences linked to central monitoring system (including intrusion alarms, intrusion alert signals, etc.). The system is also complemented by CCTV within the perimeter and the storage facility which is monitored by security personnel – enhancing safety and security especially related to DSRS.

Automated Storage Retrieval System (ASRS)

The storage facility is 15 m x 40 m in dimension and is used for storage of solid waste and DSRS. The ASRS will facilitate the movement of solid waste packages for temporary storage, decay storage, characterization and further processing for treatment and conditioning. It would allow remote operation from the control room located outside the storage facility – reducing operating doses to the workers. Further improvements are expected in the future.

Prior to Installation of ASRS

Testing and Commissioning of ASRS

The Philippines

Ms. Rhodora R. Leonin
Philippine Nuclear Research Institute
(PNRI)

Atomic Energy Week Celebration in the Philippines Features Nuclear Science and Technology Applications

The applications of nuclear science and technology in the Philippines were featured during the 38th Atomic Energy Week (AEW) celebration on December 6 to 10, 2010 at the Philippine Nuclear Research Institute (PNRI) in Diliman, Quezon City, Philippines. The theme for the celebration was "Accele rating Socio-Economic Development Through Nuclear Science and Technology".

The PNRI, which spearheaded the celebration, is a research and development institute of the Department of Science and Technology and the national authority on nuclear energy matters. PNRI Director Dr. Alumanda M. dela Rosa informed that the annual AEW celebration, as mandated under Presidential Proclamation No. 1211 in 1973, aims to generate awareness of the Filipino people on the beneficial uses of nuclear science and technology in food and agriculture, health and medicine, industry, energy, and the environment.

Representative Angelo Palmones, Vice Chairman of the Committee on Science and Technology of the House of Representatives, Philippine Congress was the keynote speaker during the AEW opening ceremonies on December 6. Congressman Palmones was represented by his Chief of Staff Dr. Florentino Tesoro. Dr. Yukiya Amano, Director General of the International Atomic Energy Agency, was the guest speaker during the closing ceremonies on December 11.

Figure 1: The 38th Atomic Energy Week(AEW) Celebration

The activities during the celebration included opening of exhibits and a press conference on December 6; technical sessions for professionals and high school students on December 7 and December 8, respectively; on-the-spot poster making and essay writing contests for high school students on December 8; and video showing and guided tours for students, teachers and the public on December 6 to 10.

The Director-general of the International Atomic Energy Agency, Dr. Yukiya Amano gives the certificate of recognition to Justen Paul Tolentino of St. Stephem High School for winning the first place in the on-the spot making contest during the 38th Atomic Energy Week (AEW) celebration at the Philippine Nuclear Research Institute (PNRI)- Department of Science and Technology (DOST) . DG Amano, who was the guest speaker at the closing ceremony of AEW on December 10, is joined by PNRI Director Dr. Alumanda M. Dela Rosa and Deputy Director Dr. Corazon C. Bernido (second from right and extreme right, respectively).)
DG Amano also visited the DOST, the Department of Foreign Affairs, the Department of Health and the Department of Energy in his three-day visit to the Philippines.

Mutant ornamental plants developed by PNRI, the PVP carrageenan hydrogel dressing for burns and wounds, irradiated beehives and other products of nuclear science and technology applications were exhibited at the PNRI lobby during the week-long celebration.

More than 300 professionals and students participated in the technical sessions held on December 7 and December 8 at the PNRI Auditorium. The topics discussed on December 7 were: "Local Availability of Technecium-99m (Tc99m) for Enhanced Nuclear Medicine Applications thru the Setting-up of the PNRI Tc99m Generator Facility"; "Biofertilizers", "Prospects of Radiation Processing Applications by Gamma and Electron Beam in the Philippines" and "Using Isotopic and Radiotracer Techniques in the Management of Coastal Resources in the Philippines". The topics presented during the technical session for high school students on December 8 were: Nuclear Power for Electricity; Applications of Nuclear Science and Technology in Agriculture; Radiation Processing Applications; and Isotopic Techniques for Environmental Investigations.

A total of 71 high school students from public and private secondary schools participated in the on-the-spot essay writing and poster making contests. The Office of the Mayor of Quezon City sponsored the contests.

The poster that won the first place in the on-the spot poster making contest on December 8, 2010 during the 38th AEW celebration at the PNRI.

Thailand

Mr. Sutat Thiangtrongjit
Ms. Nanthavan Ya-anant
Thailand Institute of Nuclear Technology (TINT)

Safety Case and Safety Assessment for Predisposal Management of Radioactive Waste

The IAEA Regional Training Course (RTC) on "Safety Case for Predisposal Management and Centralized Storage of Radioactive Waste" was held from November 8-12, 2010, at Grand Millennium Sukhumvit hotel, Bangkok. The RTC was held within the framework of the Technical Cooperation (TC) Programme, Asia Division, under TC Project RAS9056, and was organized by the IAEA in cooperation with the Government of Thailand through the Thailand Institute for Nuclear Technology (TINT).

The workshop was attended by approximately 30 scientific, technical and regulatory personnel from Afghanistan, Bangladesh, China, Indonesia, Iran, Malaysia, Myanmar, Oman, Pakistan, the Philippines, Sri Lanka, Thailand, and Vietnam who are involved in development and review of safety assessments.

Predisposal Facilities in Thailand

The TINT Facility safety assessment was used as the basis for group exercises throughout the week. The focus of the workshop was on the implementation of a systematic methodology for development and review of the safety case and supporting safety assessment and its role in the licensing of a facility, with group exercises being conducted on the following topical areas: System Description (e.g., facilities, activities and waste); Scenario Analysis (e.g., definition and screening of scenarios and assessment of impacts); and Results and Safety Elements (e.g., conclusions about regulatory compliance, engineered and administrative safety features, and modifications to improve safety).

Workshop Performed

The participants took part actively in the workshop with the following first steps to prepare a safety assessment:

- Defining the assessment context for the safety assessment;
- Providing a description of the site, facilities and of all relevant activities the safety assessment needs to address;

Defining waste streams and providing data (inventories, throughput rates, activity concentration etc.) required for the quantitative assessments.

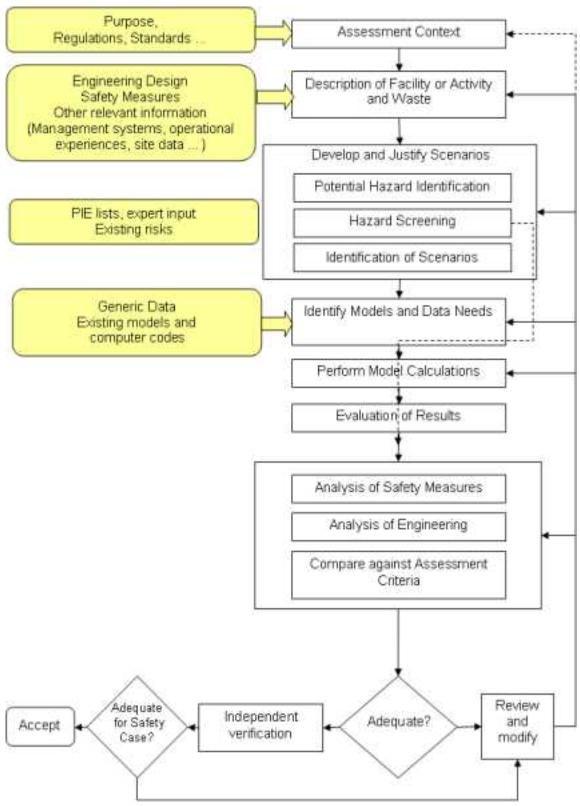


Figure 1: The Safety Assessment Process for Predisposal Waste Management

Work done:

The workshop covered the development and review of the safety case and supporting safety assessment,

and its role in communicating to the regulatory body the safety of predisposal waste management facilities and activities. The workshop was introduced with a series of presentations on IAEA safety standards, methodology and tools, and international activities related to the safety case and supporting safety assessment for predisposal management of radioactive waste. In particular, GSR Parts 4 and 5, the guidance provided in DS 284 and the practical application of the SAFRAN software tool.

Conclusion

The TINT Facility test case was successful in illustrating and reinforcing the concepts of safety case and safety assessment, and the SAFRAN software tool was seen as beneficial to countries in developing their own safety assessments.

The participants expressed an interest in further guidance (DS284) and training on methodology and practical application of the SAFRAN software related to the development and review of the safety case and supporting safety assessment, as well as related international activities.

Vietnam

Dr. Le Ba Thuan
Mr. PHAM Quang Minh
Vietnam Atomic Energy Institutes
(VAEI)

Results of radioactive waste management in Vietnam recently

On November 25th, 2009, at the 6th Session, the 12th National Assembly of Vietnam approved the investment policy on the construction of the first Nuclear Power Plant in Ninh Thuan province. Under the project's roadmap, the construction of Ninh Thuan 1 Nuclear Power Plant will begin in 2014 and this first Nuclear Power Plant will be put into commercial operation in 2020.

On June 23rd, 2010, the Prime Minister of Vietnam approved the orientations for planning development of nuclear power up to the year 2030. According to this plan, in Vietnam, eight 8,000 MW units will be installed in 2025 and is ready to develop up to 14 units with a total capacity from 15,000 to 16,000 MW in 2030. From now till 2030, the development of nuclear power can be divided into three stages. In the first stage (from now till 2015), the investment project will have been approved and the construction timing of the first Nuclear Power Plant will also been prepared. In the second stage (from 2015 to 2020), the construction of Ninh Thuan 1 Nuclear Power Plant will have been completed and its first units will have been put into commercial operation. The third stage (from 2020 to 2030) will continue developing other Nuclear Power Plants under the project's roadmap.

According to the evaluation of IAEA experts, up to now, Vietnam has completed one of three main Milestones in the development of a National Infrastructure of Nuclear Power and prepared for the second milestone: put Nuclear Power Plant out to contract. Management and treatment of radioactive waste is one of nineteen infrastructure issues which are necessary to be prepared and completed.

This report gives some obtained results in the field of management and treatment of radioactive waste in Vietnam recently.

1. Material facilities and devices:

Institute for Technology of Radioactive and Rare Element (ITRRE) has researched on management and treatment of radioactive waste in the North area of Vietnam. In 2007, ITRRE was helped with project VIE3/005 "Upgrading capacity of Waste Processing and an Interim Storage facility for Low and Intermediate level radioactive Waste" by IAEA for upgrading an interim storage for management and treatment of radioactive waste in Phung base. From 2008 to 2010, ITRRE had received devices supplied by the project and put them into operation for the research on management and treatment of radioactive waste.

Figure1: Some devices of VIE3/005

From 2009 to 2010, some interim radioactive waste storages in ITRRE, Institute for Nuclear Science and Technology (INST), Nuclear Research Institute (NRI) under Vietnam Atomic Energy Institute (VAEI)) had been upgraded, met the regulated technology standards. Besides, the radioactive source storage of Geophysics Institute (under Ministry of Resource and Environment) in Luong Son, Hoa Binh province was also upgraded and expanded in 2010.

Figure 2: On-site upgraded Phung's storage of radioactive waste at ITRRE

2. Training activities:

Vietnam Agency for Radiation and Nuclear Safety (VARANS) and VAEI have held many basic and advanced courses of safety, emergency response and handling for radiation and nuclear incidents for hundreds of scientific personnel who come from many units operating in the radiation field in Vietnam. Vietnam has built state-level projects on upgrading infrastructure for radioactive waste management in order to prepare infrastructure, study policies and management technology of radioactive waste from Nuclear Power Plants of other countries such as Russia, Japan, and France. Recently, Vietnam has been helped with training manpower by above countries to have enough capacity for receiving advanced technology and be ready for safety management of radioactive waste from the 1st Nuclear Power Plants in Vietnam.

Figure 3: Practice of emergency response

3. Law and regulation documents:

From 2009 to 2010, many law and regulation documents relating to management of radioactive waste were issued such as:

- Decision of Prime Minister

-Decision 2376/QD-TTg on Planning Orientation for Storage, Disposal Sites of Radioactive Waste up to 2030 with Vision up to 2050.

-Decision 1636/QD-TTg on Planning on National Network of Environmental Monitoring and Radioactive Warning up to 2020.

- MOST Circular

-QCVN 5: 2010. National technical regulation on Radiation protection

- Exemption from requirements of notification and licensing

- QCVN 6: 2010 National technical regulation on radiation protection

- Categorization and classification of radioactive sources

- Circular guiding security assurance for radioactive sources.

- Circular guiding specialized inspection on nuclear and radiation safety.

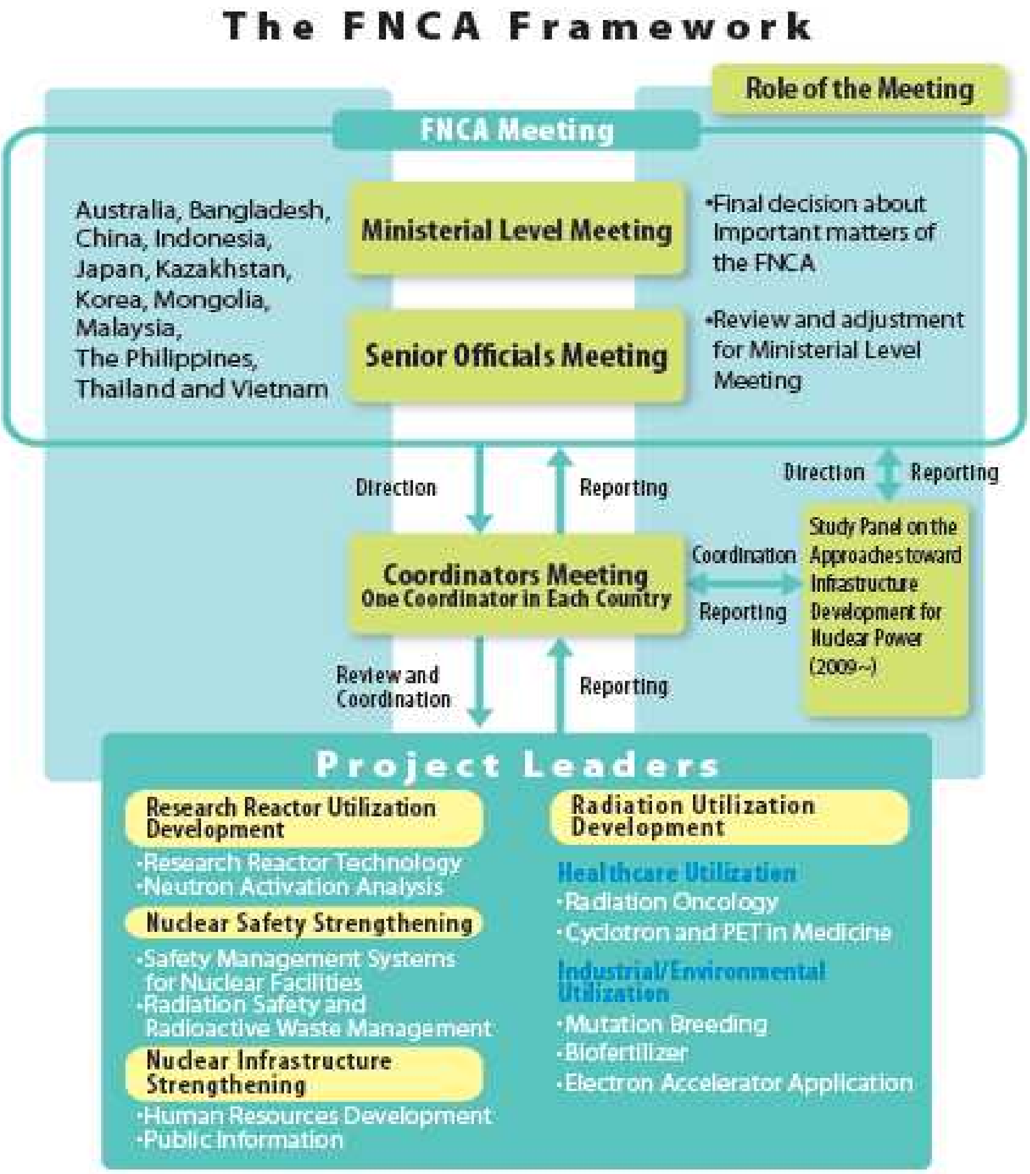
- Circular guiding nuclear and radiation measurements and development, management of the network of environmental monitoring and radioactive warning.

Under the project's roadmap, up to the year 2013, Vietnam will have reached the second milestone in the development program of nuclear power, so there is some work relating to management and treatment of radioactive waste which has to be done in the future.

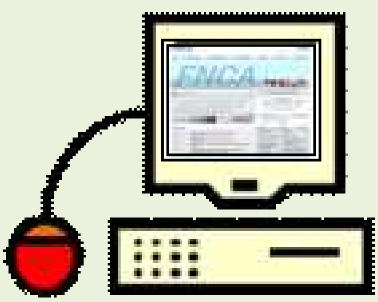
VARANS has to complete the documents guiding the implementation of laws and decrees relating to radioactive waste such as management of artificial radioactive waste, management of NORM and TENORM.

Vietnam has built state-level projects on upgrading infrastructure for radioactive waste management in order to prepare infrastructure, study policy and management technology of radioactive waste from Nuclear Power Plants of other countries such as Russia, Japan, France and train human resource to have enough capacity for receiving advanced technology and be ready for safety management of radioactive waste from the 1st Nuclear Power Plants in Vietnam.

FNCA Framework*



*As of JFY 2010



FNCA Consolidated reports on RS&RWM and Task Group Reports are available on FNCA Website.
[URL]: http://www.fnca.mext.go.jp/english/rwm/e_projectreview.html