NEWSLETTER
Radiation Safety and Radioactive Waste Management

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FNCA 2009 – Workshop on
Radiation Safety and Radioactive Waste Management (RS & RWM)
Agust 3-7, 2009, Hanoi, Vietnam

The FNCA 2009 Workshop on Radiation Safety and Radioactive Waste Management was held from August 3rd to August 8th, 2009, in Hanoi, Vietnam. This Workshop was hosted by the Institute for Technology of Radioactive & Rare Elements (ITRRE) of Vietnam Atomic Energy Institute (VAEI), as the local host organization, and the Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan, in cooperation with Nuclear Safety Research Association (NSRA) of Japan.

Representatives from nine FNCA member countries involved in policy making, regulations, operations and R&D on radio safety and radioactive waste management attended the workshop, i.e. Australia, Bangladesh, China, Indonesia, Japan, Malaysia, The Philippines, Thailand and Vietnam.

On the first day, Session 1, the project leader of Japan, Prof. T. Kosako provided basic information and ideas of radiation protection in accordance with the recent activities in IAEA and ICRP. In session 2, the country reports were presented on the current status and progress of radiation safety and radioactive waste management activities in each FNCA country. Each country report was provided as a draft consolidated report which is expected to be finalized by March 2011.

After Session 2, a Poster/Mini-Exhibition was held to facilitate enhancement and understanding of activities in RS & RWM among FNCA countries.

On the second day, an open seminar was held as Session 3 with specific safety topics “Personal dosimeter: calibration, standardization and exposure control”. For this session, each country provided introduction and explanations on the theme of standardization to promote comprehensive understandings from different viewpoints of FNCA countries. And then Session 4 was held on the subject of Radioactive Waste Management, Theme (1) is Efforts in the field of Radioactive Waste management. In Theme (2), the status of the Japanese waste program and introduction of recent status of IAEA safety standards in the field of radioactive waste was provided as well.

On the third day, a technical visit was made to Bach Mai Hospital in Hanoi city and the Institute for Nuclear Science and Technology (INST) of VAEI to observe the status of radiation safety including training and education in exposure control and radiation source management.

On the fourth day in session 5 the theme “Preparation for Radiation Safety System and Radioactive Waste Management for first NPPs” was held as the open seminar. For this session, Vietnam regulatory and operational personnel provided information on the status of the nuclear power development in Vietnam. Following these presentations, a DVD presentation on Japan's early stages in nuclear power program development was made. Japan also presented on the radioactive waste management system for nuclear power plants. Theme (2) consisted of presentations on “Radiation Safety at Large Scale Facilities such as Accelerators, Nuclear Research Reactors, Hospitals and/or Industry”. The presentations in this session were provided by Malaysia, Australia and the Philippines.

In Session 6, a roundtable discussion on "Future cooperation with the other international programs such as IAEA/ANSN and RCA/RAS9042" was held with update reports by each country related to these programs.

The "RS&RWM 3-Year Work Plan for 2008-2010" under the FNCA framework was confirmed and discussed, and successfully concluded. The next workshop in 2010 will be held in Tokyo.

All FNCA Project Leaders recognized the high value provided by the FNCA RS&RWM Workshops. The benefits gained include information exchange and the sharing of experiences on common radiation safety and radioactive waste management issues. The Project Leaders were unanimous in their support for the FNCA RS&RWM workshops and expressed the need to sustain this cooperation to ensure that radiation safety and radioactive waste management issues are continually addressed in the region.

Participants of this Workshop expressed appreciation to the organizers, ITRRE of VAEI and MEXT, and to the cooperation of NSRA.

Topics from Participating Countries

AUSTRALIA

Mr. Lubi Dimitrovski

Waste Operations Manager
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Australia: Upgrading of ANSTO’s Intermediate Level Waste Storage Facility

ANSTO’s Waste Operations receives around 2,500 liters of intermediate level solid waste every year from activities such as radiopharmaceuticals production, site decontamination projects and decommissioning works. These wastes are stored in ANSTO's intermediate level solid waste facility in Building 27 (B27) (Figure 1). To ensure a reliable and effective facility infrastructure to cater for ANSTO's current and future ILSW management needs, B27 underwent an upgrade in 2009 with the bringing up to full operating capacity of the retrievable pits, and the clearing out and re-rationalization for use of the decay cells.

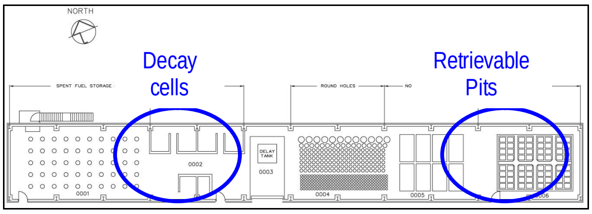

Figure 1: Intermediate level solid wastes storage facility

Retrievable pits

The eight storage pits were part of B27's eastern end extension, constructed in 1987 to allow for the safe storage and retrieval of intermediate level solid waste. Until March this year, the retrievable pits were operating at less than 70 per cent of its designed capacity. This is due partly to the limits of the overhead crane travel, as well as the absence of racks in two of the storage pits.

The process of bringing the remaining 30 per cent online involved first of all the extension of part of the eastern end wall and the overhead crane rail. This extension will enable the crane travel to reach the eight eastern-most stacks of the facility. This greater access is necessary also for the installation of the pit frames, plugs and bin guide frames. Due to the radiation shine from the intermediate level solid wastes stored in the existing pits, steel plates were placed over the pit as shielding for workers working on the crane rail and building wall. Dose rates at the walls were decreased from 80uSv/h to less than 7uSv/h after shielding afforded by the 10mm thick steel plates. A limit of 10uSv per day was set for external contractors working on the project.

The pits were carefully measured out for the design and manufacture of the pit frames, plugs and bin guide frames. Once completed, the pit frames, plugs and bin guide frames were carefully fitted into the 7.2m deep pit (Figure 2 & 3). Each pit is divided into eight stacks, and each of these stacks is now capable of holding 18 waste bins. The retrievable pits are now 55% full. The remaining capacity will cater to ANSTO's ILSW management needs for the next 12 years at the current generation rate.

Figure 2: Installation of pit guide frame

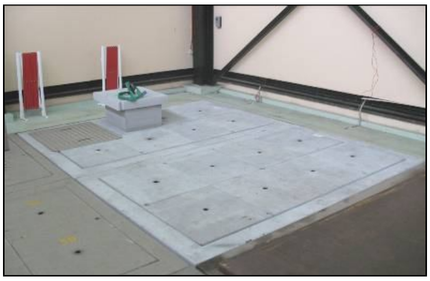

Figure 3: Fully installed pits

Decay cells

As part of ANSTO's commitment to effective utilization of resources, intermediate level solid wastes with short-lived radionuclides (half-life<2 years) are subjected to a separate processing route. Short-lived ILSW (usually from radiopharmaceutical productions) are held in interim storage in the B27 decay cells to allow for decay. Six decay cells in B27 were classified according to dose rates, ranging from 500uSv/h to 10mSv/h. A campaign was set up every two years to reclassify and move the decayed waste packages to a lower range decay cell or removed to be processed as low level solid waste.

However since commencement of operation of the Decay Cells departure from the original intended use of these cells over the years has caused several problems. Wastes with long-lived radionuclides were stored in the cells, resulting in over-spilling containment and increased dose emanation from the cells to the outside of the building. Missing and incomplete documentation of the packages also made identification the wastes impossible. Deterioration of the waste packages posed a contamination issue, a problem exacerbated by improper ‘stacking’ of the packages (Figure 4).

Figure 4: State of decay cells before clean up

A dedicated team was organized to clean up the decay cells under close monitoring by health physics surveyor. The wastes were removed from the cells, repackaged and reassigned to the proper waste storage areas (Figure 5).

Figure 5: Removal of wastes from decay cell

The cells were then decontaminated down to fixed contamination and painted over. Concrete blocks and steel plates were installed to provide additional shielding to all the cells (Figure 6).

Figure 6: Decontaminated decay cells painted after extra shielding were installed

Specially designed shielded boxes (Figure 7) will be used in the cells as secondary containment and shielding to prevent unnecessary dose to operators entering the cell when depositing the waste packages.

Figure 7: Shielded box for use inside decay cells

The waste logging and storage systems were also revised to prevent recurrence of similar problems in future.

BANGLADESH

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Standard Dosimetry in Bangladesh

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A considerable number of stakeholders around the country using the radiation measurement devices as a result of rapid increase in nuclear applications in health, industry, agriculture sectors as well as nuclear research conducted at a 3-MW TRIGA Mark II research reactor. Approximately five thousand radiation workers are now employed in different radiological/nuclear facilities in Bangladesh and eighty percent of the workers are directly involved at a diagnostic X-ray installation. To minimize the risk and avoid radiation hazards to occupational worker, public and the environment all the radiation measuring instruments must be calibrated and tested at a certain intervals (not exceeding 12 months) as per Nuclear Safety Radiation Control Act 1993 & Rules-1997. For the purpose of calibration and standardization of these radiation monitoring equipments a secondary Standard Dosimetry Laboratory (SSDL) was established at Atomic Energy Research Establishment (AERE) Savar site in 1988. This standard laboratory is traceable to Primary Standard Laboratory of National Physical Laboratory (NPL), UK.

Objectives

- To ensure that the calibration of radiation measuring equipments confirms to internationally accepted standards
- Calibration & standardization of radiation monitoring devices used in health sectors, research, industry, agriculture
- QA services in teletherapy, deep-therapy & diagnostic X-rays, fluoroscopy, medical LINACS

Recent Work

- Approximately 900 TL dosimeter and 86 radiation measuring instruments (e.g. Survey meter, pocket dosimeter) have been calibrated using SSDL facility over the last year
- Quality Assurance programme for ^{60}Co teletherapy machine used for cancer treatment are being conducted
- Participated in IAEA/WHO dose quality audit programme for radiotherapy. The observed dose variation is within IAEA acceptance limit


Secondary Standard Dosimetry Laboratory Facility at INST

Calibration Facility at SSDL

The following standard sources and equipments are available in SSDL for calibration of radiation measuring instrument:

Gamma Calibrator: OB 34, OB 85 and OB 2 Standard sealed radioactive sources are used to calibrate beta-gamma radiation survey instrument.

Beta Calibrator: Used to calibrate contamination monitoring instruments and personal dosimeters.

Neutron Calibrator: A collimated beam neutron calibrator of model OB 26(^{241}Am-Be) is used for calibration and standardization of Neutron measuring instruments.

Calibration of X-ray Machine: An X-ray machine has been provided by IAEA is now available in Secondary Standard Dosimetry Laboratory to perform calibration work for x-ray units

Strengthening of SSDL Facility

In July 2006, the Ministry approved the 'Strengthening of Secondary Standard Dosimetry Laboratory Facilities' project and provided a total amount of (~ US$ 3.2 million) to implement the project at AERE Savar. The Health Physics & Radioactive Waste Management Unit of Atomic Energy Research Establishment (AERE) has the responsibility for implementing the project. The main purposes of the strengthening of SSDL facility are:

- To enhance the existing calibration and standardization facility of radiation measuring equipments (e.g. survey meter, area monitor, pocket dosimeter etc.)
- To conduct quality assurance programs on personal dosimeters
- To facilitate the calibration work of radiation beams at different radiotherapy centers
- To improve and ensure the quality assurance programme for teletherapy, deep-therapy X-ray unit, diagnostic X-ray, brachytherapy, LINAC etc.
- To conduct R & D works on Medical Physics related field

INDONESIA

Challenges in the Implementation of the New ICRP Recommendations: Views from Indonesia

Syahrir, National Nuclear Energy Agency

Introduction

Indonesia has two independent government agencies in nuclear energy, i.e. National Nuclear Energy Agency (BATAN) and National Nuclear Energy Regulatory Agency (BAPETEN). BATAN is an operating organisation and has a role as a promoting body in nuclear technology. And BAPETEN is a regulatory authority on nuclear energy through regulation, authorization and inspection. In addition to BATAN, some medicine and industry utilize radiation sources and all of them are authorized by BAPETEN.

BAPETEN is in the process of imposing BSS-115 to its regulation. BAPETEN and BATAN have some studies on adoption of BSS-115 and ICRP 60. Since ICRP 2005 is continuation to ICRP Publication 60 recommendations, the results of the studies are relevant to ICRP 2005. The studies concern on the implication of dose limits and the implementation of the changing parameters in ICRP Publication 60. Some thoughts on the implication of adopting ICRP 2005 to Indonesian regulation are also discuss.

Study on Dose Limits

BAPETEN has assessed the impact of applying dose limits from BSS-115 [3]. The agency reviewed personal dose records from stake holders which are reported routinely. Figure 1 show 2005 personal dose records in Industry and Research gathered by BAPETEN. Among 1447 radiation workers, about 0.8% or 11 persons received effective doses more than 20 mSv/year which came from radioisotope production as shown in Figure 2.

The personal dose records in industry and research show only a few workers reside on the third band of the projected effective dose (20 to 100 mSv/year) in Table 5 of ICRP 2005 [1]. Based on the investigation to the workers, it turns out that most of the doses relate to non-routine situation that needs additional specific measures or pre-planned protection strategy like in maintenance and non-compliance to procedures. This evidence endorses the adoption of the recommendation.

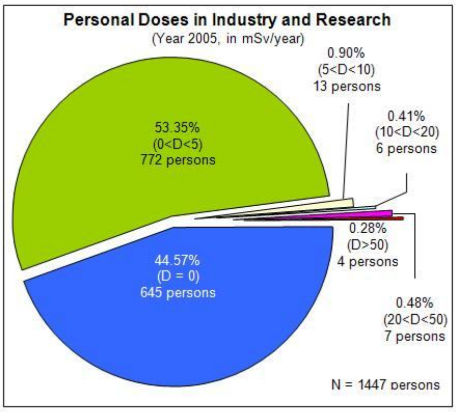

Figure 1. Personal dose in industry and research in 2005.

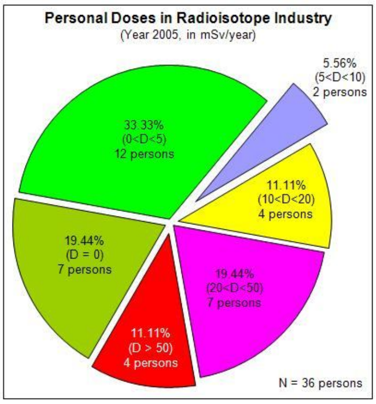

Figure 2. Personal doses in radioisotope production in 2005.

Although most of radiation protection officers in Indonesia know well on regulation related to radiation protection, according to the BAPETEN survey, many of them have never come across neither ICRP 60 nor BSS-115. Optimisation, as stated in those documents, is not as concerned as dose limitations. It would be very useful to provide them examples on optimisation for radioprotection purposes.

Assessment of Internal Radiation Dose Calculation

The calculation of effective dose or corresponding conversion coefficients for external exposure, as well as dose coefficients for internal exposure, are based on absorbed dose, weighting factors (w_R and w_T) and reference values for the human body and its organ and tissues. Internal dose calculation using ICRP 30 and 68 recommendations are compared.

The results of whole body counting system measurements to workers in Serpong Nuclear Center were used to determine their internal effective doses based on ICRP Publication 30 and 68; these publications implements ICRP 26 and ICRP 60, respectively. Three most frequent radionuclides found on workers were used in the calculation, i.e. ^{131}I, ^{137}Cs, and ^{95}Zr. The comparison calculation results for intake time t = 30 are given in Table 1.

The comparison shows that the results of intake and dose from ICRP 68 are always larger than ones from ICRP 30 for the three radionuclides. On average, the dose from ICRP 68 is 1.27 larger than those from ICRP 30. Similar results were obtained from International Internal Dose Intercomparison which is coordinated by IAEA. The comparison indicates significant differences as a result of different dosimetric parameters used such as fraction of intake, retention factor, dose conversion factors etc.

Discussion

ICRP 2005 reinforces that optimisation is probably the main tool for reducing exposure, particularly at workplace. Table 5 [1] on bands of projected effective dose is useful to reinforce optimisation by implementing dose constraints and reference levels based on representative persons:

1. dose effective to a representative persons below 0.01 mSv/yr is considered exemption, no need to control (no environmental monitoring)
2. The 20 to 100 mSv/year band to a representative person can be used to reinforce emergency situation.

The concept of intervention for existing exposure situation is used by BAPETEN to cope with TENORM in mining and industry.

By adopting the recommendations, we are abiding to dosimetric models and parameter values that the Commission recommends for determining doses. Parameters for effective dose are absorbed dose, weighting factors (w_R and w_T) and reference values for the human body and its organ and tissues. Based on the prior internal dose calculation, it seems the new weighting factors and reference values are significant their contribution to the effective dose compares to the old ICRP 26. The new dosimetric calculation results internal effective dose considerably larger than the old one, conversely its dose limit (20 mSv/year) is lower than one from ICRP 26 (50 mSv/year). The Radioisotope Production Installation in Serpong should be more wary once the recommendations imposed in Indonesia.

There should be human resources associated with calibration and personal dosimetry services develop and maintain appropriately in order to comply with international regulation. Moreover

BAPETEN shall provide standard and guidance in implementing the recommendation, especially to avoid misunderstanding among stakeholders. In this case, harmonization among stakeholders is important for its accomplishment. At least, there is same perception on the terminology and dosimetric quantities mentioned in the recommendation.

There should be program to disseminate the recommendation to the whole world which may need different approaches to accomplish it.

Table 1. Comparison of internal dose calculation based on ICRP 30 and 68

No.	Radio-nuclide	Intake (Bq)			Dose H_E (mSv)		
		ICRP 30	ICRP 68	FK	ICRP 30	ICRP 68	FK
1.	^{131}I	61865	104771	1.69	0.54	0.80	1.48
		184237	312015	1.69	1.62	2.37	1.46
		828762	1403548	1.69	7.29	10.67	1.46
2.	^{137}Cs	3112	6104	1.96	0.03	0.03	1.00
		21700	42565	1.96	0.19	0.21	1.11
		39147	76788	1.96	0.34	0.37	1.09
3.	^{95}Zr	12527	34039	2.72	0.07	0.09	1.29
		81802	222289	2.72	0.43	0.56	1.30

Conclusions

Based on 2005 personal dose records in Industry and Research which is not much different to the other years, Indonesia may adopt new dose limits with caution on determining personal doses since the changes in parameters and reference values for the human body and its organ and tissues.
It is important to use the same understanding on relevant terminology and dosimetric quantities (representative person, existing exposure situation, effective dose, sievert, gray etc.). It needs appropriate human resources with expertise in the new dosimetric modeling for radioprotection.

Basically, no fundamental differences between ICRP 2005 and ICRP 60 so if Indonesia will leave behind ICRP 26, ICRP 2005 should be adopted.

The adoption of the new recommendation will drive the implementation of optimization more stringent. Emergency situation may be applied to a facility with projected effective dose more than 20 mSv/year. It is time for the users, especially in industry radiography and radioisotope production, to change their mind set from dose limits to radioprotection optimization principle (ALARA).

Since the recommendation relates to dosimetric models and their relevant parameters, BATAN and BAPETEN have to prepare the infrastructure and its human resources appropriately. They may need expertise from ICRP or other international organization on implementing the recommendation, especially on dosimetric issues.

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JAPAN

Radiation measuring calibration in Japan

Radiation measuring equipment has become widely used among Nuclear Power Plants, laboratories of universities or companies, or medical facilities in Japan. Especially electric personal dosimeters are widely used and necessary to have the traceability from national standard to practical measurement devices. In spite of the number of dosimeters currently-operated, calibration facilities are limited in numbers in Japan. For that reason, more efficient systems which can perform speedy calibration are needed.

In this article, the calibration devices and facilities of Fuji Electric Systems are introduced, because this company is one of the leading manufacturing company of radiation measuring products in Japan and its contents are suitable for the examples of information for the latest trend of calibration.

Fuji Electric Systems offers total radiation measuring services, such as design, manufacturing, repairing and other after-sales service at the Tokyo factory in Hino city. Also, Fuji Electric Systems has a calibration facility in the site, which provides traceability to national standards of Advanced Industrial Science and Technology (AIST).

Figure 1 Fuji Electric Systems Calibration facility building

In order to calibrate various types of Fuji Electric Systems radiation measuring equipment, the facility employs 4 kinds of calibrators with different nuclides and the intensities.

The calibrator for high level gamma-ray can be operated remotely with using ITV camera and a movable carriage, which can move an object being calibrated in 3 axis directions.

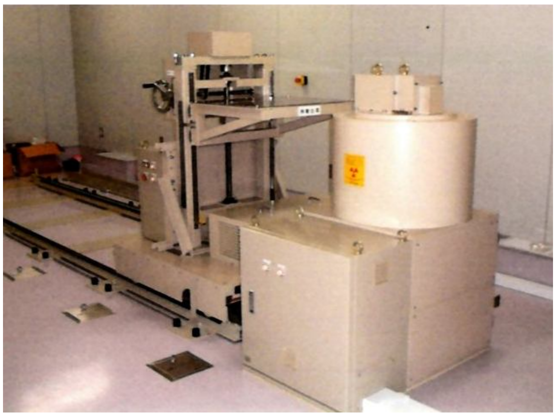

Figure 2 High level gamma-ray calibrator

8 types of radiation sources are held in the facility, which can handle a wide range of irradiation from BG level to 200mGy/h (Refer to **figure 1**). Also, a specific source can be chosen with the auto-selection system for equipment with a specified calibration manner.

The automatic control panel operates the calibrators, data collection, the organizing of calibration results, generations of calibration records, source operation records and source storage record.

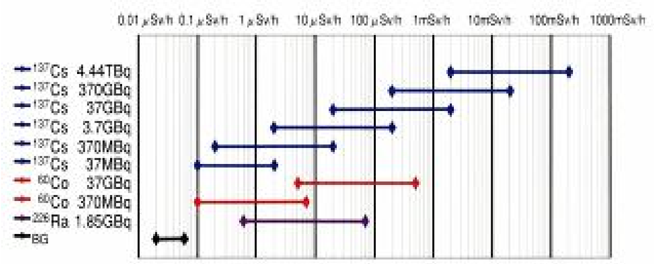

Table 1 Nuclide, intensity and irradiation dose equivalent rate range

Figure 3 Control Panel

Their middle level gamma-ray calibrator is ideal when using for personal dosimeters and environmental radiation monitors. The characteristics of this device are that it performs automated simultaneous calibration of 50 units and that only takes about 10 minutes. Neutron calibrator calibrates survey meters, neutron area monitors and dosimeters. It is equipped with an automated transportation system for personal dosimeters, which allows continuous irradiation of over 20 units.

Also, there is a small and compact-sized beta-ray calibrator which calibrates multi-ray dosimeters.

Fuji Electric Systems calibration facility offers a wide range of efficient and highly accurate calibrations for various measuring equipment utilizing the automated system.

Figure 4 Objects calibrated

Radiation Dosimetry at Malaysian Nuclear Agency

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1. Introduction

The main activities of the Secondary Standard Dosimetry Laboratory (SSDL) of the Malaysian Nuclear Agency (Nuclear Malaysia) are to maintain the reference standards i.e. secondary standards for dosimetry in radiotherapy, brachytherapy, radiation protection and radiation processing such as sterilization of medical products and food irradiation. The standards at this laboratory are maintained and reference standards calibrated against the Primary Standard Dosimetry Laboratory (PSDL) and IAEA Dosimetry Laboratory. SSDL-Nuclear Malaysia also regularly participates in international inter-comparison of radiation measurements organized by the IAEA or the Regional Metrology Organization (RMO).

2. Calibration Services

In Malaysia, radiation-measuring instruments are required to be calibrated annually. The Nuclear Malaysian is the sole provider of calibration service for all radiation measuring instruments used in Malaysia. The service offered by Nuclear Malaysia is accredited in accordance with the ISO/IEC 17025:2005 standards.

2.1 Therapy level dosimeters

All therapy level dosimeters from radiotherapy centres in the country are calibrated in terms of both air kerma calibration coefficient (N_K) and absorbed dose to water calibration coefficient (N_{DW}). All of them are calibrated against ^{60}Co gamma source. These calibrations are performed against secondary standard dosimeters with traceability to the IAEA standard for ^{60}Co gamma rays.

Figure 1: Calibration facilities for therapy level dosimeters

2.2 Radiation protection instruments

Radiation monitoring instruments (survey meters) are calibrated against X-rays, gamma rays, beta rays and neutron. Beside survey meters, the laboratory also calibrates its personal dosimeters such as pocket dosimeters and electronic personal dosimeters (EPDs).

Figure 2: Standardization of ^{90}Sr/^{90}Y beta sources (1.85 GBq and 74 MBq) using extrapolation chamber

Figure 3: Calibration facilities for gamma sources

Figure 4: Calibration of survey meter using x-ray machine

2.3 Beam output calibration of medical linear accelerator (linac).

Nuclear Malaysia is also provided calibration services of megavoltage X-rays beam output (i.e. 6MV and 10MV) of linear accelerator (Linac). The beam output measurements are performed by using ionization chamber immersed in water phantom of dimension 30 cm x 30 cm x 30 cm. The IAEA TRS-398 is used to determined the absorbed dose to water at specified depth e.g. 5 cm and 10 cm depth based on the energy of the megavoltage X-rays.

3. Personal Monitoring Service

Nuclear Malaysia provides personal monitoring services to all radiation workers in Malaysia. The service is based on both film and thermo luminescence dosimeter (TLD) badges. Both dosimeters are used to monitor whole body dose. TLD is also used for monitoring partial body exposure with special emphasis on finger ring dosimeter and area/environmental monitoring. The dosimeters are issued on monthly basis and the dose of personal dosimeters are processed and evaluated every month. The Harshaw 6600 Automatic TLD reader is used to evaluate personal dose equivalent of TLD badges while the extremity dosimeters are evaluated using Harshaw 5500 TLD reader. The personal monitoring service has been certified according to the Quality Management Systems MS ISO 9001:2000 since May 2003 by the local certification body i.e. SIRIM QAS International Sdn. Bhd. In addition, the E-SSDL (online service) is used to upgrade the personal monitoring service.

Figure 5: TLD readers facilities at Nuclear Malaysia

4. High Dose Dosimetry for Industrial Application

The reliability and accuracy of the dosimeter system plays a very important part of process control and quality assurance in industrial radiation processing. Nuclear Malaysia supplies ceric-cerous dosimeters to the commercial irradiation plants. These dosimeters can measure doses in the range of 5 kGy – 50 kGy.

5. International Comparison Activity

5.1 Key comparison.

APMP.RI(I)-K2:Nuclear Malaysia participated in a key comparison of air kerma standards for CCRI reference beam qualities (5 qualities) and ISO 4037 narrow spectrum series (2 qualities) in low-energy X-ray region (10kV-50kV) which commenced in the middle of September 2008. Three transfer ionization chambers {NE 2536/3 (0.3 cm^3), Exradin Magna (3.0 cm^3) and Oyogiken AE-1340C (0.24 cm^3)} were compared at seven beam qualities. The key comparison was co-ordinated by NMIJ/AIST, Japan. Ten (10) National Metrology Institutes (MNIs) were participated in this comparison.

5.2 Comparison with the IAEA.

The performance of SSDL Nuclear Malaysia therapy level dose measurements is regularly monitored through a postal TLD service provided by the IAEA. In May 2008, Nuclear Malaysia participated in IAEA/WHO TLD Postal dose quality audit for 6MV X-ray beam from medical linear accelerator (linac). The results of this inter-comparison show that the level of dose measured were within the IAEA acceptance limit.

5.3 Comparison with the National Physical Laboratory (NPL), U.K.

The National Physical Laboratory (NPL), United Kingdom provides traceability to the international measuring system for high dose measurements. High dose dosimetry quality control using dichromate transfer dosimeters supplied by the NPL were used for comparison. The comparison involved the measurement of doses within the range of 9 - 40 kGy using ^{60}Co gamma radiation. Prior to irradiation of dichromate dosimeters, ceric-cerous dosimeters were used to determine dose range of 9 – 40 kGy at Nuclear Malaysia's ^{60}Co self-shielded irradiator for high dose irradiation. After irradiation, the dichromate dosimeters were returned to the NPL for evaluation. The results of this comparison were within 3 – 6 % of the NPL's standard.

5.4 Personal dosimetry inter-comparison.

Nuclear Malaysia also participated in personal dosimetry inter-comparison programme in October 2007 organized by the Chiyoda Technol Corporation (CTC), Japan. Two radiation qualities i.e. 60kV X-ray (narrow spectrum series) and ^{137}Cs were used for the irradiation of personal dosimeters. The personal dosimeters, including glass badges supplied by CTC, were irradiated with doses of 0.3 mSv, 2 mSv and 20 mSv. Nuclear Malaysia used both TLD badge and film badge for this intercomparison programme. The results were in good agreement with deviation of less than 10%. Nine facilities from seven countries (Brazil, China, Indonesia, Korea, Malaysia, Taiwan and Vietnam) were participated in this inter-comparison.

6. Low Energy X-ray Standard (10 – 50 kV).

Secondary standard ionization chamber type M23344 (0.2 cm^3) traceable to the Physikalisch-Technische Bundesanstalt (PTB), Germany is used to established the CCRI reference beam qualities at low energy X-rays at Nuclear Malaysia.

Table 1: Characteristics of reference X-ray beams at Nuclear Malaysia.

Constant potential (kV)	10*	25**	30**	50**	50**
Added filter (mmAl)	0	0.3	0.13	1.0	3.5
HVL (mmAl)	1.039	0.243	0.170	1.030	2.283
Air kerma rate 100cm, 10mA (mGy/min)	17.1	37.3	115.5	50.4	13.2

* Inherence filtration : 1 mm Be + 3 mm Al

** Inherence filtration : 4 mm Be + 3 mm Al.

7. Quality System and Laboratory Accreditation

Nuclear Malaysia currently maintains certification of Quality Management Systems MS ISO 9001:2000 and the Laboratory Accreditation Scheme of Malaysia (SAMM), which meet the requirements of MS ISO/IEC 17025:2005. Compliance Assessment for ISO/IEC 17025:2005 was carried on 13 June 2008 by technical assessors from Department of Standards Malaysia (DSM). Whereas compliance audit for ISO 9001:2000 was carried out on 12 February 2008 by auditors from SIRIM QAS International Sdn. Bhd.

8. Calibration and Measurement Capabilities (CMCs).

Nuclear Malaysia's Calibration and Measurement Capabilities (CMCs) have been approved and published in Appendix C of the Bureau International des Poids at Mesures (BIPM) Key Comparison Database (KCDB) since 11 September 2008. Nuclear Malaysia's CMCs include 15 calibration services:

c. APM-RAD-MNA-1001: Air kerma rate, ^{60}Co (radiation therapy)

d. APM-RAD-MNA-1002: Air kerma rate, ^{137}Cs (radiation protection)

e. APM-RAD-MNA-1003: Air kerma rate, ^{60}Co (radiation protection)

f. APM-RAD-MNA-1004: Air kerma rate, CCRI X-ray beams, 100kV-250kV(radiation therapy)

g. APM-RAD-MNA-1005: Air kerma rate, CCRI X-ray beams, 20kV-50kV (radiation therapy)

h. APM-RAD-MNA-1006:Air kerma rate, 40kV-250kV, ISO-4037 narrow spectra series (radiation protection).

i. APM-RAD-MNA-1007: Ambient dose equivalent rate, ^{60}Co (radiation protection)

viii. APM-RAD-MNA-1008: Ambient dose equivalent rate, ^{137}Cs (radiation protection).

j. APM-RAD-MNA-1009: Ambient dose equivalent rate, ^{137}Cs (radiation protection)

k. APM-RAD-MNA-1010: Ambient dose equivalent rate, ^{137}Cs (radiation protection)

l. APM-RAD-MNA-1011: Personal dose equivalent rate penetrating, ^{137}Cs

m. APM-RAD-MNA-1012: Personal dose equivalent rate penetrating, ^{60}Co

n. APM-RAD-MNA-1013: Absorbed dose rate to tissue, $^{90}Sr/^{90}Y$

xiv. APM-RAD-MNA-1014: Absorbed dose rate to tissue, $^{90}Sr/^{90}Y$

xv. APM-RAD-MNA-1015: Absorbed dose rate to water, ^{60}Co (radiation therapy)

Additional information can be found at: http://kcdb.bipm.org/appendixC/RI/MY/RI_MY.pdf

9. Recalibration of the Secondary Standard Ionisation Chamber

The soft X-ray ionization type M23344 (0.2 cm^3) was calibrated at the Physikalisch-Technische Bundesanstalt (PTB), Germany using radiation qualities according to CCRI (10 kV – 50 kV) and ISO 4037 narrow spectrum series radiation qualities (15 kV, 20 kV, 25kV, 30kV & 40 kV).

10. Future Plan

i. Nuclear Malaysia plan to construct three more irradiation rooms for X-ray and protection level gamma sources as well as gamma cell for high dose dosimetry activities. The additional irradiation rooms are needed to cater the demand of the calibration service of radiation monitoring instruments and high dose dosimeters as well as to upgrade the radiation standards in the future.

ii. A proposal to purchase a new ^{60}Co self-shielded irradiator for high dose dosimetry applications with activity of ^{60}Co source of about 889TBq @ 24kCi.

iii. Malaysian Nuclear Agency / Australian Nuclear Science & Technology Organisation (ANSTO) high dose dosimetry intercomparison using ceric-cerous dosimeters. This intercomparison will involve dose measurements of 20 kGy, 25 kGy and 30 kGy of ^{60}Co gamma beam.

PHILIPPINES

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PHILIPPINE ASSOCIATION FOR RADIATION PROTECTION (PARP) HOLDS 13TH BIENNIAL CONVENTION

International Radiation Protection (IRPA) held its 13th Biennial Convention last October 2-4, 2009 in Puerto Princesa City, island of Palawan.. The theme of the Convention-Strengthening Radiation Protection Worldwide - The Philippine Challenges" fittingly underscored the role.

The Philippine Association for Radiation Protection (PARP), an associate society of the of PARP in its commitment to better enhance the practice of radiation protection and safety in the Philippines. Young professionals and practitioners from regulatory bodies, organizations, suppliers and members of the public gathered together to learn, share experiences, and discuss radiation protection issues and challenges in Philippine setting.

Scientific lectures in the areas of nuclear power; Philippine contributions on strengthening the safety and security of radioactive sources worldwide; global threat reduction initiative; national challenges and situation in dealing with radiation in pediatric health care; optimization of protection of patients in radiation therapy; and cargo inspection using x-ray imaging technology. were given during the Convention by international experts from the Australian Nuclear Safety Organization and US Department of Energy as well as by local experts.

The Convention also had the election of the key officers who will hold office for the next couple of years. A Fellowship Night and an Educational Tour added greater experiences to the participants who traveled from Metro Manila to see the beautiful and serene, nature sanctuary of the world in the chosen venue (Palawan).

The PARP is a professional society which draws membership from users of radiation and radioactive materials in the different peaceful applications in medicine, industry, research, education and training in the Philippines. The PARP was organized in 1961 to seek solutions to improve radiation protection for the benefit of the Filipinos and the environment. Over the years, the Association primarily gives trainings and seminars to concerned sectors, with emphasis on safety and protection against the hazards of radiation. The PARP collaborates closely with the Philippine Nuclear Research Institute, the Department of Health and other professional societies, and with IRPA, to implement plans and objectives aimed towards attainment of its goals and objectives.

THAILAND

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Thailand Test Case : Safety Assessment for Predisposal Radioactive Waste Management Facilities in Bangkok, Thailand

Background:

Thailand proposed to be a Test Case of IAEA International Project on SADRWMS (Safety Assessment Driving Radioactive Waste Management Solutions), at the 5th Plenary Meeting on the IAEA International Project on SADRWMS in Croatia, 23-27 June 2008.

Purpose

The Chatuchak waste processing and waste storage facilities have been chosen as a test case for the SAFRAN software within the framework of the SADRWMS project. This test case related activities consisting in:

- Defining the assessment context for the safety assessment;
- Description of the site, facilities and of all relevant activities the safety assessment needs to address;
- Define waste streams and provide data (inventories, throughputs, activity concentration etc.) required for the quantitative assessments.

Chemical Precipitation System

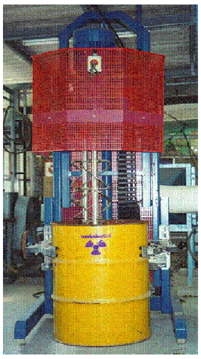
Radioactive Liquid Waste Treatment Facilities

Retention Pool

SADRWMS Project objective

Methodology implemented in software tool;

- to visibly, systematically and logically address pre-disposal radioactive waste management projects in a structured way
- to establish a traceable and transparent record of the safety basis for decisions on proposed waste management solutions.



Site Information and Current Situation

- Site history
- Description of the existing facilities and their current condition to the extent relevant for the planned facilities or activities
- Reasons for and objectives of the planned activities or facilities

Classes of facilities

- Waste Management facility
- Waste producer
- The specific type of waste management facilities are defined by the activities going on in the facility

Description of Planned Activities

- Overview of the activities / facilities
- In case of complex and extended programmes, definition of individual tasks for which detailed planning and safety assessments are performed
- Identification of interdepencies between the various activities and
- Tentative schedule for the various activities

Types of activities

- Pretreatment
- Treatment
- Conditioning
- Storage

Safety Assessment types

- Normal operation and accidents
- Impact on workers and members of the public
- Impact outside and inside the facilities

Storage — Storage No.2

Disused Sealed Sources — Treated Wastes In Drum Storage

Storage Facilities

Scenario Development and Assessment of Impacts

- System performance (doses and other impacts to workers and to the public) under normal conditions
- Potential impacts (all relevant external and internal hazards) from all relevant events and processes
- Non-radiological risks
- Environmental impacts (radiological and non-radiological)

Scenario Development Normal Operations

- Addressing all conditions under which systems and equipment are being operated as expected
- Basic assumption for this assessment: no internal or external challenges outside the normal operation envelopes for all phases of

operation

Primary Assessment Goal:

Do doses and discharges meet criteria?

Anticipated Operational Occurrences and Accidents

- anticipated operational occurrences (expected at least once in the lifetime of the facility)
- accidents within the envelope of the conservative accceptance criteria for design basis accidents
- accidents exceeding these criteria but not causing severe damage and releases
- accidents with severe damage and releases (severe accidents)

Assessment Context

- Basic radiation protection principles:
  - Justification
  - dose limitation
  - optimization
- National regulatory criteria
- Internationally accepted standards and conventions
- Further criteria (e.g. non-radiological impacts, conventional safety)

Use of Safety Assessment Results Design

- Identifying required and most cost effective improvements or upgrading in waste management facilities
- Building confidence that the designed system is robust and will meet safety requirements
- Demonstrating the quality and reliability of the analysis used to evaluate performance of the pre-disposal system.

Viet Nam

Mr. Nguyen Ba Tien
Director
Center for Radio Waste Management
ITRRE - VAEC

The Management of radioactive waste in Vietnam

Vietnam has been intensively preparing for the first project of nuclear power plant, which is planned to be in commercial operation by 2020. Following the introduction of the IAEA and the world general trend in production of electricity, the VAEI and Vietnam Agency for Radiation and Nuclear Safety (VARANS) have co-coordinated to realize matters concerning the radioactive waste management such as estimation of the actuality of radioactive waste, building up a nuclear law, infrastructure preparation, staff training, studies on radioactive waste treatment and storage.

The actual situation of radioactive waste and the management of them in Vietnam

In Vietnam, though the activities relating to the use of radioactive materials is still limited, there has been a remarkable amount of radioactive wastes to be stored. Based on the present means of estimation and classification, most of radioactive wastes in Vietnam are in low and medium levels.

<u>Radioactive wastes from Dalat Institute for Nuclear Research (DINR)</u>

Dalat Institute for Nuclear Research is one of a few establishments that produce radioactive materials in Vietnam. These radioactive materials, which are produced from the research reactor and from isotope preparation laboratories, are in liquid and solid states. The liquid wastes which have a total amount of about 5 – 15 m^3 per month, almost contains ^{131}I, ^{51}Cr, ^{60}Co, ^{139}Ce, ^{134}Cs, ^{54}Mn with total radioactivity of 3.7-37 KBq/L. They are collected into reservoirs and treated by ion exchange method, then concreted on an equipped technology line (imported from Russia). The solid wastes produced from activities of Dalat nuclear reactor have been stored in the provisional storage at the DINR. In 1997, IAEA supported the DINR to strengthen infrastructure for the radioactive waste management with an equipment system of radioactivity measurement, radioactive waste classification, a press can reduce the volume of compressed material from 3 to 10 times, and a storage of 750 m^3 capacity comprising 8 underground concrete trenches that have a capacity of $94m^3$ each, a depth of 4 meters and walls of 40 cm thick.

Radioactive wastes from the ITRRE

The ITRRE has been functioned to study the technology for processing radioactive and rare elements. The following main activities conducted by the ITRRE have produced a lot of radioactive wastes:

- Studying on processing uranium ores in laboratory scale and semi-pilot scale to establish the capability of preparation of uranium from different domestic ores/sources.
- Processing monazite to obtain rare earth elements released large an amount of the high radioactivity wastes containing thorium and radium.

These wastes were all treated, conditioned and sealed in 645 steel barrels having capacity of 200 liters each, which were stored in the precariously storage at Phung establishment in Hanoi.

Radioactive wastes from activities of exploitation and processing of ores/minerals (Naturally Occurring Radioactive Materials, NORM)

The industries that have produced NORM comprise exploitation and processing of coastal mineral sand, and fossil coal; oil and gas exploitation.

Radioactive wastes from public health

The use of radioactive materials for diagnosis and therapy in nuclear medicine has produced a considerable amount of radioactive wastes. These radioactive materials were mainly short term isotopes such as ^{131}I, ^{99m}Tc, ^{32}P, etc. The management and treatment of these wastes were rather simple. They were stored and isolated for a certain period of time to lower their radioactivity to acceptable limits. After that they were treated as other normal/non-radioactive medical wastes.

The radioactive objects that were most concerned were the sealed sources used for malignant growths and tumors that have initial radioactivity of 8000-12000 Ci. These sources were mainly ^{60}Co, ^{137}Cs. There were also small sealed sources used for contact therapy such as Ra and Co needles. In principle, such sources like the used radium do not produce other radioactive materials during operation, but they became radioactive sources/wastes themselves when being disposed. They were very dangerous due to their high radioactivity. These sources and some other expired sealed sources were stabilized and stored at Dalat Nuclear Research Institute thanks to the help of IAEA.

Radioactive wastes from industry and research activities

Fig 1. On-site storage at DNRR

Recently, the sealed radioactive sources have been imported to Vietnam to use in several of non-radioactive industrial branches such as cement, paper, brewing, glass, geology, explore, etc. The number of these radioactive sources has not been exactly reckoned up so far.

In the judgment of Vietnam Agency for Radiation and Nuclear Safety, most of radioactive sources in Vietnam were ranked as low radioactivity, and the radioactive sources used in health care and industries were almost short or medium lived. However, among them there were Co and Ra sources that had high radio-activities and relatively long half life. Most of these radioactive sources (801 units) were kept at the storages of users, where security conditions were not good and the risk of the source- loss have been always an implicit threat, while there were 122 units that were kept at the specialized storage of the Institute for Global Physics at Luong Son, Hoa Binh.

The legal documents concerning the radiation safety and the radioactive waste management in Vietnam

* Lately, Vietnam has made efforts in the field of radiation safety and radioactive waste management. That was showed in the series of legal documents built up and promulgated as follows:

1. The Ordinance on Radiation Safety and Control, 1996;
2. The decree 50/1998/NĐ dated on July 16th, 1998 by the Government determined in detail the implement of The Ordinance on Radiation Safety and Control;
3. The resolution 155/1999/QĐ-TT signed on April 16th, 1999 by the Prime Minister on the promulgation of regulations of deleterious wastes;
4. The resolution 2575/1999/QĐ-BYT signed on August 27th, 1999 by the Minister of Health;
5. The joint circular 2237/1999/TTLT/BKHCNMT-BYT signed on December 28th, 1999 by the Ministry of Science, Technology and Environment and the Ministry of Health, instruction for implement of radiation safety in health care;
6. The decree 19/2001/N§-CP promulgated on May 11th, 2001 by the Government on pecuniary penalty in the domain of radiation safety and control;
7. The law of atomic energy 18/2008/QH12 promulgated on June 6th, 2008.

* Some rules relating to radiation safety and radioactive waste management have been promulgated. They are *Ionize radiation safety for using X-ray in public health-care* (TCVN 6561, 1999); *Dose limits for the public and staffs working in radiation exposure* (TCVN 6866, 2001); *Safety for transportation of radioactive wastes* (TCVN 6867-1, 2001); *Radioactive management* (TCVN 6868, 2001); *General regulations for irradiation in health-care*; *Regulation for exception, declaration, registration and license in the field of radiation safety* (TCVN 6870, 2001).

However, there have been neither overall legal regulations nor a government's synchronous system for controlling radioactive wastes. There have not been R&D establishments of radioactive waste to play a role of technique consultants in this field.

Invitation to AOCRP-3

The Third Asian and Oceanic Congress on Radiation Protection (AOCRP-3) is a congress for radiation protection held every four years under Asian and Oceanic Association for Radiation Protection (AOARP). The AOARP is a regional association of International Radiation Protection Association (IRPA).
http://www.aocrp-3.org/home.html

[Date] May 24-28, 2010 [Place] Tower Hall Funabori, Tokyo, JAPAN
[Highlight]
AOARP & **FNCA-RS&RWM** Joint Session May 24, 13:40-15:30
"Present Activities of Radiation Protection Societies in Asian and Oceanic countries"
13:40-13:45 Purpose of this session
13:45-14:50 Reports from participant countries
14:50-15:30 Panel discussion

Refresher Courses May 24-27, 9:30-10:20
RC-1: Radiation protection system -history of dose constraints and limits-
RF-2: New radiological data from UNSCEAR
RF-3: Definition of various radiological units and its future
RF-4: Radiological protection in medical fields
RF-5: Radiological protection for non-human species
RF-6: Concept of radioactive waste management
RF-7: Radiation safety (management and monitoring) around NPP
RF-8: Control of radon, space radiation, aircraft exposure, and NORM
RF-9: Radiation education to public and stakeholder involvements into decision making

Luncheon Seminars 12:10□13:30
LS-1: NORM/TENORM management and its discussion points
LS-2: Newest knowledge on radiological biological effects
LS-3: RWM and clearance system adopted in real sites
LS-4: Nuclear safety culture and human development in Radiation Protection field
LS-5: Development of PHITS and its application
LS-6: IAEA and OECD/NEA activity and their future scopes

Oral Presentation Sessions
OP-1 Radon OP-2 Emergency Preparedness and Response
OP-3 Radiation measurement OP-4 Radiation control and management
OP-5 Radioactive waste management OP-6 NORM/TENORM
OP-7 Dosimetry OP-8 Standard, criteria and regulation
OP-9 Exposure to medical radiation OP-10 Health effects of ionizing radiation
OP-11 Environmental radioactivity
OP-12 Radiological protection as part of the global nuclear expansion

IAEA Special session WHO Special session IRPA Special session ICRP Special Session

International Panel Discussion and Poster session