FNCA Newsletter No.5

Radiation Safety & Radioactive Waste Management

March 2012

Issued by Bangladesh Atomic Energy Commission/Nuclear Safety Research Association (FNCA Secretariat, JAPAN)

Contents

The FNCA Workshop on Radiation Safety & Radioactive Waste Management (RS&RWM)

12^{st}-15^{th} December, 2011, Dhaka, Bangladesh

The FNCA 2011 Workshop on Radiation Safety and Radioactive Waste Management was held from December 12 to 15th 2011, in Dhaka, Bangladesh. This Workshop was hosted by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan and Bangladesh Atomic Energy Commission (BAEC). Fifteen representatives from ten FNCA member countries, namely Australia, Bangladesh, China, Indonesia, Japan, Kazakhstan, Malaysia, Mongolia, Thailand and Vietnam participated in the workshop.

The 2011 RS&RWM Workshop in Dhaka, Bangladesh

At Opening Session, Mr. A.S.M Firoz, Chairman of BAEC, FNCA Coordinator of Bangladesh gave the welcome speech. Finally, Prof. Toshiso Kosako, Professor of the University of Tokyo, Project Leader of Japan, delivered the opening speech and declared the workshop opened. The participants then presented their country report detailing new information for the FNCA consolidated report drafted in 2010 as well as updates on RS&RWM in their countries followed by questions and answers.

In the morning of the second day, the participants made presentation on the challenges of radiation safety and waste management issue. In the afternoon, participant discussed lesson learned from Fukushima and other Nuclear/Radiation accidents, emergency radiation monitoring and response plans. Participants from Thailand delivered a presentation referring to lesson learned from radiological accident. Prof. Toshiso Kosako explained radiation effect after the TEPCO Fukushima Daiichi NPP accident. Participants from Indonesia, Malaysia and Vietnam gave a talk on lesson learned, response and spent fuel crisis to the TEPCO Fukushima Daiichi NPP accident. Each presentation was followed by a discussion on the key points raised.

On the third day Session IV & V: Technical Tour–Case Study of Atomic Energy Research Establishment (AERE)– Participants visited 3MW MARK-II research reactor, Central Waste Processing and Storage Facility (CWPSF), Tandem Accelerator Facilities, Radio Isotope Production Laboratory (RIPL), Institute of Radiation and Polymer Technology and Secondary Standard Dosimetry Laboratory. Comments were made by member countries on improvements they could recommend to Bangladesh and also the improvements that they could make having seen the Bangladesh facilities. There were discussions about interagency co-operation between FNCA and the IAEA and recruitment and training of staff with the development in the nuclear power within the region. There was a focus on safety improvements necessary.

Fourth day started with the session VI: titled Wrap-up Discussion– Summary of Workshop and Future Proposals. All sessions were reviewed and the participants agreed that information sharing through this workshop was beneficial and fruitful. Information was exchanged with new member countries, Mongolia and Kazakhstan, bringing wider points of view. It was also stressed that sharing lessons learned from Fukushima and other nuclear accidents were meaningful and would contribute to further improvements in safety assurance in each country. The future steps and schedule for project activities 2011-2012 were discussed. Participants agreed to keep the report updated by providing new information and work together toward completion of its 2nd edition of consolidated report, which is scheduled to be released during this phase (2011-2013). Drafted Reports from Kazakhstan and Mongolia would be reflected to the existing report and uploaded on the FNCA website by the end of March 2012. The workshop minutes were drafted and agreed by all the participants.

Radio Isotope Production Laboratory

Tandem Accelerator Facilities

Topics from Participating Countries

Australia

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

Update on ANSTO Radioactive Waste Management Process and HIFAR Decommissioning

Current drum dryer operations on LLLW and future for Mo99 LLLW

ANSTO has completed commissioning of a drum dryer for the treatment of low level liquid wastes generated on site. The drum dryer units are comprised of a clam shell type heating element in which 200 L steel drums are enclosed and mounted on a flat bottom heating element. Liquid waste is fed through the lid of the drum dryer and the vapour is extracted as the waste evaporates to a dry solid under vacuum. The volume reduction achieved is approximately 94%.

Figure 1: Drum dryer units

In the past 12 months 5000 L of liquid waste has been evaporated to a dry volume of 300 L. The wastes processed using the drum dryer include low level aqueous liquid wastes generated on site, some of which contain high chloride levels. The potential corrosion risk has been addressed through the use of stainless steel drums.

The DD has also been used to dry sludges and spent resin which needs to be dried before long term storage. Around 24 drums of resin and 50 drums of concrete sludge (from Moata decommissioning) have been dried in the past 18mths. Issues identified from the commissioning process include elevated dose rates due to the concentration of activity.

The drum dryer is being investigated for the treatment of liquid waste from the secondary separation stage in Moly-99 production. This waste is very active but will decay relatively quickly as it contains mainly short lived radionuclides. The liquid waste is currently being collected/stored and will be transferred into the new B20B facility for treatment when it is operational. The drum dryer will provide a volume reduction of 80%, based on current solid loadings. The concentrated dried material in the drum will be classified as ILW and will require shielded storage pending final packaging for the repository.

B20B Waste Treatment and Conditioning upgrade projects

Segmented Gamma Scanner

A Segmented Gamma Scanner (SGS) has been installed and commissioned in the upgraded B20B waste processing facility. The device can automatically scan 200 L drums on a conveyor belt system prior to the drum being super-compacted for final packaging.

The SGS can handle drums with higher dose rates; it has a shutter which automatically adjusts to reduce the dead time of the detector and corrects the measurement accordingly. The automatic input and output conveyors reduce manual handling and dose to the operators of the SGS and increases the process throughput.

Figure 2: Segmented Gamma Scanner

Permacon Decontamination Centre

A new decontamination centre (Permacon) is being built in B20B and will be constructed of modular stainless steel panels. The structure will be comprised of separate chambers to allow the use of different decontamination techniques, such as blasting (water, grit, CO2, etc.) and acid soaking, etc. The centre is designed to enable shipping containers of material to be directly unloaded from the truck and brought into the building. The contents of the shipping container can then be placed directly into the decontamination facility for processing. This reduces the amount of handling required, as well as the amount of radioactive waste generated.

Proposed LLSW packages

As Australia does not yet have a low level waste repository, there is no Waste Acceptance Criteria for a repository. ANSTO has commenced discussions with the regulator ARPANSA to introduce a generic WAC to allow for the start of commissioning ANSTO waste. There are several options that ANSTO is investigating, but the main package will be a type A package which will hold around 1200L of waste and sealed with grout. The package will hold super-compacted 200L drums.

HIFAR decommissioning

Australia's first research reactor, HIFAR was operated from 1960 to 2007. The 10MW reactor utilised 25 fuel elements and was cooled and moderated by heavy water (D_2O). The reactor was shut down in 2007 following the commissioning of the replacement reactor OPAL. Staged decommissioning of HIFAR is to be carried out in the following stages:

Phase A – Closure

Phase B – Care & Maintenance

Phase C – Decommissioning

Phase D – Return to Green Field

Phase A of the decommissioning process is substantially complete. This was commenced in February 2007 with the removal of the fuel to cooling pond storage. In the first 12 months following shut down the core was fully unloaded, fuel sheared and removed, the heavy water drained, control arms removed and shift staffing ceased.

Bangladesh

Dr. Moinul Islam and Md.Abu Haydar
Bangladesh Atomic Energy Commission(BAEC)

Environmental Radiation Monitoring around the AERE Campus

Taking into account the possible impact of a powerful tsunami generated by a magnitude-9.0 earthquake out at sea slams into the Fukushima Daiichi nuclear power plant, damaging four of six reactors at the site, Bangladesh atomic energy commission took initiative to conduct an extensive background radiation survey programme in several important locations around the country.

As a part of national radiation monitoring programme gamma dose rates measured daily in ten important locations around Atomic Energy Research Establishment (AERE), Savar site. The maximum average gamma dose rates remain at (0.08-0.18)µSv/h, whilst the measured values for the surface activity were reported ranging from (0.14-0.34) Bqcm^{-2}. The background radiation survey programme has been performed by using calibrated radiation survey meter e.g, Graetz X5 DE, Serial No.: 53079, Germany, Radionuclide Identifinder (identiFINDER, Serial No: 3555 –304, Germany), Austral Rad Mini 8-in-1, Serial No-1123 and Contamination Monitor (DKS-96, No-029 2003). All the measured values were found within the range of local natural background radiation levels.

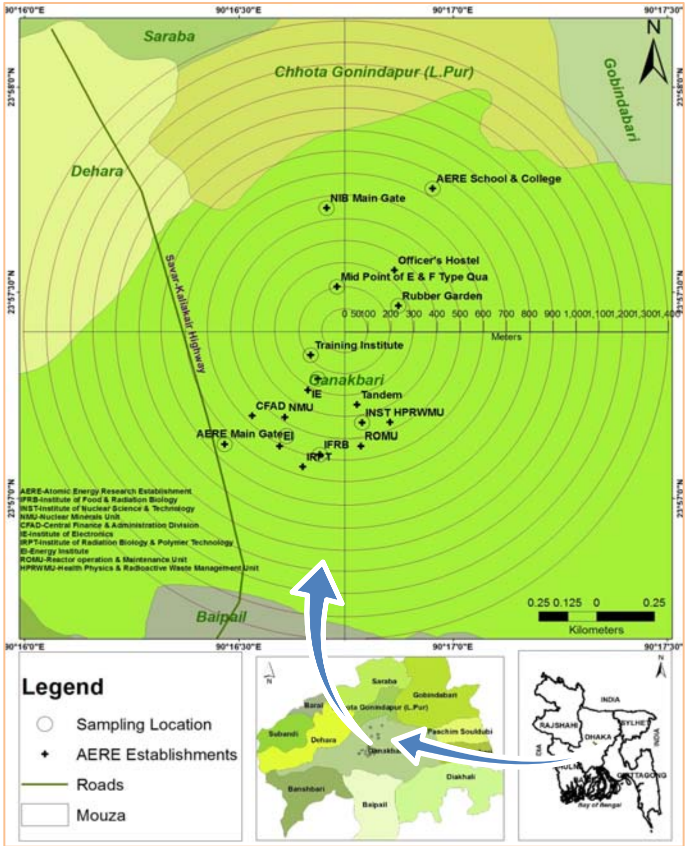


Fig 1. Map of background radiation monitoring and sampling location for the land area within 5 km of the AERE campus (courtesy: Shanjib Karmaker)

Locations	Gamma Dose Rate (µSvhr^{-1})	Surface Activity (Bqcm^{-2})
AERE Rubber Garden	0.10	0.34
AERE School & College	0.08	0.30
National Institute of Biotechnology Gate	0.07	0.14
Mid Point F & E Type Quarters	0.08	0.30
Training Institute	0.08	0.32
Cafeteria	0.07	0.14
AERE Main Gate	0.18	0.34
Mid Point of NMU, EI & SIU	0.08	0.29
Institute of Food & Radiation Biology (IFRB)	0.10	0.32
Institute of Nuclear science & Technology (INST)	0.09	0.31

Table: Gamma dose rates and surface activity at different locations around AERE Campus

In addition, different environmental samples (e.g, rainwater, lake water, grass, vegetables, fruits, soil, etc) were also collected on March 15, 2011 to till to date from in and around AERE campus. The environmental samples were analysed by using a 40% relative efficiency of HPGe detector. The gamma spectral of all of the environmental samples did not show any dominant γ -lines due to artificial radionucldes.

It is also reported that radiation levels did not exceeded the normal background limit around the country. No remarkable impact of radiation distribution was observed at any location around the country due to Fukushima Daiichi NPP accident.

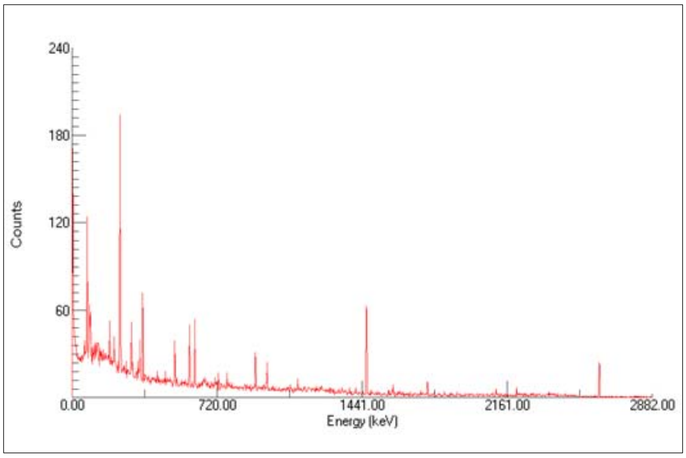


Fig 2. Analysed Gamma spectrum of an environmental sample obtained from HPGe γ spectrum detector

Japan(1)

Prof. Toshiso Kosako,
University of Tokyo,
Mr. Hiroyuki Murakami,
Japan Atomic Energy Agency

Activities of Japan Atomic Energy Agency on Human Resources Development in the fields of nuclear and radiation engineering

The history of Human Resources Development (HRD) in the field of nuclear energy in Japan was initiated at the Radio-isotope School of Japan Atomic Energy Research Institute (JAERI) in 1958. Since then, it has been carried out persistently by the Japan Atomic Energy Agency (JAEA), established by the integration of JAERI and Japan Nuclear Cycle Development Institute (JNC) in 2005, and Nuclear Human Resource Development Centre (NuHRDeC) has been taking a leading role of its activities as one of JAEA's vital missions. The HRD activities at NuHRDeC are conducted in line with governmental policy and programs, aim at comprehensive nuclear education and training. The main missions at NuHRDeC are composed of 1) Education and training for national nuclear engineers, 2) Cooperation with universities 3) International training and cooperation and 4) Activities for Japan Nuclear HRD Network.

1. Education and Training for National Nuclear Engineers

Table 1 shows the annual program of national training courses conducted at NuHRDeC for nuclear engineers, RI & radiation engineers and national examinees. The total number of participants from industries, research organizations and central/local government amounts to approximately 110,000 since 1958.

Training Course for Radioisotope and Radiation Engineers		
Basic	Basic Radiation Course	15 days: once/y
Special	Radiation Safety Management Course	14 days: once/y
	Radiation Protection Basic Course	4 weeks: once/y
Legal Qualification	1st Class Radiation Protection/Supervisor Course	5 days: 8 times/y
	3rd Class Radiation Protection/Supervisor Course	2 days: 3 times/y
Training Course for Nuclear Engineers		
General Nuclear	Nuclear Beginner's Course	4 weeks: once/y
Reactor Engineering	Reactor Engineering Course	3-6 months: once/y
Special	Introductory Neutron Experiment Course	3 days: once/y
Training Course for National Examinees		
Reactor Engineering	Licensed Reactor Techniques Supervisor	10 days: twice/y
Nuclear and Radiation	Professional Engineer on Nuclear and Radiation	10 days: once/y
Special Radiation	Radiation Protection Supervisor	7 days: once/y
Special Nuclear Fuel	Nuclear Fuel Protection Supervisor	8 days: once/y

Table 1 National Training Courses

2. Cooperation with Universities

Making effective use of facilities and vast human resources at JAEA, NuHRDeC coordinates many activities with universities, for instance, dispatching of visiting professors and lecturers, accepting students for research studies, cooperation with Professional Graduate School of the University of Tokyo and promoting a remote education system, named Japan Nuclear Education Network (JNEN).

3. International training and cooperation

NuHRDeC is also focusing on the international nuclear HRD through a unique program named "Instructor Training Program (ITP)" under special budgets of the Ministry of Education, Culture, Sports and Technology (MEXT) since 1996. ITP consists of three categories; Instructor Training Course (ITC), Follow-up Training Course (FTC) and Nuclear Seminars (see Table 2). Currently, ITP is applied to various Asian countries; Bangladesh, China, Indonesia, Kazakhstan, Malaysia, Mongolia, Philippines, Sri Lanka, Thailand and Vietnam. The purpose of ITC is to develop self-sustainable instructors in Asian countries, who are expected to disseminate knowledge and technology of nuclear energy in their countries (Photos 1 and 2). FTC is combination with ITC, dispatching Japanese experts to Asian countries to give technical supports at training courses organized by local instructors.

NuHRDeC is also actively involved in the wide spectrums of cooperative activities in radiation application and nuclear power fields, under the frameworks of Forum for Nuclear Cooperation in Asia (FNCA) by Japan Atomic Energy Commission, and Asian Nuclear Safety Network (ANSN) and Asian Network for Education in Nuclear Technology (ANENT) of IAEA.

Instructor Training Program in Japan	
Reactor Engineering	8 weeks: once/y
Environmental Radiological Monitoring	6 weeks: once/y
Nuclear and Radioactive Emergency Preparedness Course	6 weeks: once/y
Follow up Training Course in Asian countries	
Reactor Engineering Course	1-2 weeks: once/y
Environmental Radiological Monitoring Course	
Nuclear and Radioactive Emergency Preparedness Course	
Nuclear Seminar in Japan	
Reactor Plant Safety Seminar	4 weeks: once/y
Administration Seminar	3 weeks: once/y
Site location for Reactor Facility Seminar	1 week: once/y
Basic Knowledge on Radiation and Emergency medicine for School Education	2 weeks: once/y

Table 2: Instructor Training Program

Photo 1: Reactor Simulator (JRR-1) Training (ITC)

Photo 2: Exercise on Environmental Radiological Monitoring (ITC)

4. Japan Nuclear HRD Network

As global expansion of nuclear power utilization, promoting further cooperation among industry, government and academia in its field has increasingly become an important aspect of HRD activities. In order to conduct and promote national and international HRD activities in strategic and integrated manner, effectively and efficiently in close collaboration with international organizations, the Japan Nuclear HRD Network (JN-HRD Net) was established in November 2010, and NuHRDeC plays an important role in hub as Secretariat of JN-HRD Net in cooperation with Japan Atomic Industrial Forum (JAIF).

5. HRD Activities after Fukushima Daiichi Nuclear Power Plant Accident

Fukushima Daiichi NPP accident in March, 2011, has brought serious impacts on various fields. But the accident made us realized that the nuclear HRD is quite important and should have high priority for keeping worldwide nuclear facilities safe and stable. HRD in the fields of radiation and nuclear safety is now much emphasized and promoted. The cooperation among Nuclear HRD related organizations in Japan and cooperation with foreign countries and international organizations are being set forward.

NuHRDeC, JAEA has conducted HRD activities for radiation workers at Fukushima nuclear power plant and decontamination workers in the area of Fukushima prefecture since August, 2011. In Japan, it is also quite important to disseminate the knowledge on radiation into ordinary people, and thus NuHRDeC is also putting emphasis on holding some basic radiation seminars for them.

Figure 3: Training for Decontamination Workers in Fukushima Prefecture

Japan(2)

Prof. Toshiso Kosako,
The University of Tokyo,
Mr. Yasushi Nakamura,
The Japan Atomic Power Company

An industry organization of electric utilities called Federation of Electric Power Companies of Japan set up an Fukushima Support Headquarter with the aim of expanding the assistance in field activities carried out in Fukushima area by electric power companies as well as addressing mid and long term technical issues such as treatment and disposal of radioactive waste generated from the Tokyo Electric Power Company(TEPCO) Fukushima Daiichi Nuclear Power Plant with a unified efforts by the industry.

Led by the Fukushima Support Headquarters, each electric company has been providing manpower assistance in Fukushima area. The electric companies are also offering supplies to Fukushima area and the TEPCO Fukushima Daiichi Nuclear Power Plant.

Main activities are as follows:

○ Manpower assistance

A large amount of radioactive materials were released inside/outside of the Fukushima Daiichi nuclear power plant immediately after the TEPCO Fukushima Daiichi Nuclear Power Plant accident. Led by the Fukushima Support Headquarters, the power companies, in collaboration with TEPCO and the central and local governments, conducted activities such as screening for radioactive contamination for workers engaged in recovery work on their way out of the NPP at a distance of more than 20 km away from the Fukushima Daiichi NPP. In addition, a body surface radioactive contamination screening for people of Fukushima prefecture was carried out in various places in Fukushima prefecture.

Since the emission of radionuclides from the Fukushima Daiichi NPP decreased, environmental radiation monitoring had been weekly conducted at about fifty locations inside the 20km No-Entry Zone. In August 2011, the residents whose houses were located within 20km No-Entry Zone were permitted to pay a temporary visit to their home, and some of them brought back their cars. In accordance with it, a radioactive contamination screening of the human body and belongings was implemented.

Figure 1. Environmental Radiation Monitoring

Figure 2. Radioactive contamination screening

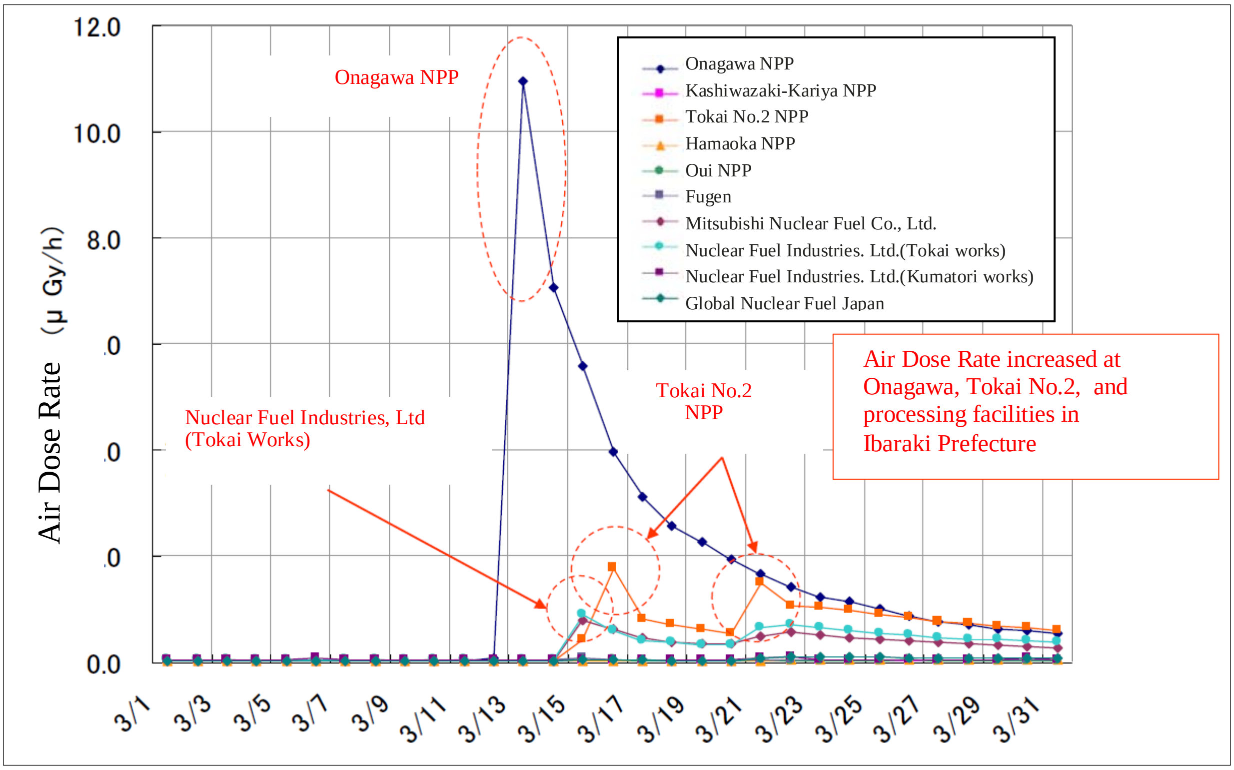
○Provision of supplies

Led by the Fukushima Support Headquarters, the power companies have been providing supplies such as radiation protection suits, masks, and radiation measuring devices for the recovery work at the Fukushima Daiichi Nuclear Power Plant.

○Influence of released radioactive materials on other nuclear power plants

Radioactive materials released from the TEPCO Fukushima Daiichi NPP were detected by nation-wide environmental monitoring. Monitoring posts showed an increase in air dose rate at Tohoku-Electric Power Co. Onagawa Nuclear Power Plant, located 100 km away from the TEPCO Fukushima Daiichi NPP, as well as at some nuclear facilities in Ibaraki prefecture such as The Japan Atomic Power Company (JAPC) Tokai No.2 Power Station.

Graph 1. Readings at Monitoring Post of Nuclear Facilities around TEPCO Fukushima Daiichi NPP after the Accident



Kazakhstan

Mr. Yuriy ALEINIKOV

National Nuclear Centre of the Republic of Kazakhstan

Treatment with Radioactive Waste. RAW Location, Transportation and Long-term storage at the Complex of Research Reactors «Baikal-1»

CRR Baikal-1 is located at the area of former Semipalatinsk Test Site, 65 km far to the South from Kurchatov.

In 1993 the Ministry of Science and New Technologies held a meeting where it was decided to setup Storage of spent Ionization Radiation Sources (IRS) on the basis of Test Bench Baikal-1 , Institute of Atomic Energy, National Nuclear Center RK (Kazakhstan).

In January, 1995 phase 1 of technological complex Baikal-1 was put into operation to store IRS and solid radioactive waste.

Activities related to RAW transportation and long-term storage are realized in compliance with the following normative legal documents on RAW treatment:

- Atomic Energy Usage Law (1997);
- Public Radiation Safety Law (1998);
- Radiation Safety Rules , NRB-99»;
- Sanitation-and-epidemiological requirements to provide radiation safety SETORB-2010»;
- Sanitary rules to treat with RAW, SPORO-97.Activities are realized according to license :
- RAW treatment, GLA # 0002458 of 29.07.2010.

RAW Acceptance and transportation are performed due to Protocol “Transfer and storing radioactive waste from RK companies and institutions to CRR Baikal-1” # 2035 of 23.11.2007.

RAW Long-term storing consists of:

- IAE auto vehicle;
- Radiation-protection chamber;
- RAW temporary storage;
- RAW long-term storage;
- Transport-and-technological system.

RAW is transported in shipping casks of special-equipped auto cars intended for regular RAW transportation. Each car has sanitary certificate. Officers of the Ministry of Internal Affairs accompany cars if required. Special Car is equipped with radiation protection –screening device, items to fix packages, enclosed van-type body, emergency set and remote jaw.

IAE vehicle to transport RAW

Loading-unloading RAW casks

Transferring party prepared and loaded RAW casks with present of IAE representative.

Measuring object	accepted level mSv/h (mR/h)
RAW packaging: **On the surface** **Against the surface 1m far**	 2,0 (200) 0,1 (10)
Special vehicle: **In any point of external surface** **2m far from any point of external surface** **In driver's cab**	 2,0 (200) 0,1 0,011 (1,1)

Accepted levels of exposure rate

Gamma- therapeutic ends and Kolos, Stebel-type facilities with high-activity IRS were accepted and disposed for long-term storing at CRR Baikal-1.

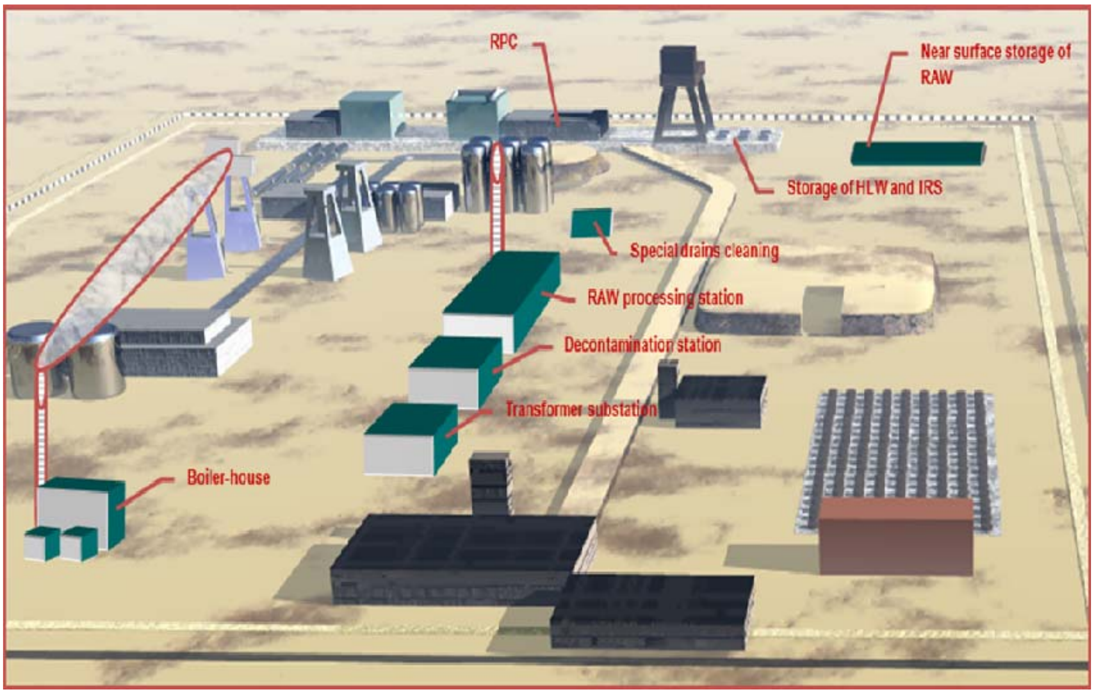
Special constructions and equipment

RAW temporary storage

Radioactive-protective chamber (RPC)

Technical characteristics of build 357:
thickness of the outer walls – 800 mm;
thickness of the inner walls - 600 mm;
thickness of reloading hatch plugs – 600 mm;
length of a big cell – 15 m;
width of a big cell - 5 m;
the construction height - 8 m.

Long-term RAW storage facility



Creation of radiation protective chamber and the long-term storage of radioactive

Project "Creation of the radiation protective chamber and the long-term storage facility of SRAW (solid radioactive wastes) at CRR "Baikal-1"" IAE NNC RK

A Feasibility Study for the project "Creation of the radiation protective chamber and the long-term storage facility of SRW (solid radioactive wastes) at CRR "Baikal-1"" IAE NNC RK is developed to increase the volume and nomenclature of RAW accepted for processing and storage. According to 2005 costs the project implementation cost is 4 320 mln. tenge.

Complex of processing and storage of radioactive wastes is supposed to be created on the basis of the existing infrastructure for radioactive and nuclear materials treatment of the Institute of Atomic Energy, National Nuclear Center of Kazakhstan ("Baikal-1" site).

Malaysia

Dr. Norasalwa Zakaria
Dr. Mohd Abd Wahab Yusof
Malaysian Nuclear Agency

Public Information and Public Acceptance Development Program For Low Level Waste Disposal

Learning from our own past experiences in managing disposal of NORM and low level radioactive waste, Malaysia recognized the need of involving the public in the course of developing a sustainable waste disposal program in Malaysia.

At times, it may be seems difficult to understand the uppermost issues and concerns of the members of the public relating to safety and radioactive waste disposal. Often, the perspective from the technical persons clashed with those of lay persons. This has led to creation of various syndromes such as NIMBY (**N**ot **I**n **M**y **B**ackyard), and BANANA (**B**uilt **A**bsolutely **N**othing **A**nywhere **N**ear **A**nyone), to name a few. Waste disposal is indeed a national issue but requires a local solution. Therefore communicating the information, the risks and the benefits to all the stakeholders are imperative as to assist them understand the overall scenario while at the same time the sensation of fear, worry and emotions are equally addressed. Public understanding and communication hold the key towards public acceptance.

In this spirit, two workshops on Public Information and Public Acceptance were organized in 2011 at national and international level with the assistance of IAEA. The details of the workshop are summarized as below.

1. **National Workshop on Public Information and Involvement in Low Level Radioactive waste Repository development, 10-12 January 2011**

   Speakers:

   i. Mr. Lumir Nachmilner from IAEA
   ii. Ms. Marie Dufkova, Public Relations Specialist from Czech Republic.
   iii. Ms. Irena Daris from ARAO, Agency for Radwaste Management Slovenia

2. **IAEA Workshop on Building Partnership in Waste Disposal Programme 31 Oct- 2 November 2011**

   Speakers:

   i. Mr. Peter Omai from IAEA
   ii. Ms. Meritxell Martell from Merience Strategic Thinking, Spain
   iii. Mr. Veijo Ryhanen, Corporate Advisor from TVO Finland

The first workshop was conducted at the national level while the second workshop was conducted at international level with participants from Egypt, Poland, Indonesia, Pakistan, Romania, South Africa, Turkey, Philippines and Malaysia. Many interesting topics were presented and discussed, among those were:

i. Challenges in public communication for radioactive waste disposal issue
ii. Concept of partnership
iii. Societal aspects in radioactive waste disposal program
iv. Understanding attitudes and relation towards acceptance
v. Siting and local/ community partnership
vi. Stakeholder involvement and disposal program
vii. Stakeholders motivation

viii. Economic incentives to support selecting site and construction of waste management facilities

Communicating the waste disposal program to the public although may look complicated and challenging, but surely is not an impossible mission. This could be achieved via several strategies that can be adopted and followed. Nevertheless, one of the important aspects in the communication is the message send to the public. Hence, this requires a communication plan to be properly designed, tailored to the target audience, including those of supporting programs such as education at school and etc.

Again, at this point, it is clearly understood that the success of Public Information and Public Acceptance in waste disposal program requires soft skill like communication. Equally important is to acknowledge values and fears in the society pertaining radioactive waste management. Only then, the conflicting interest is harmonized.

Once the conflicting interest is harmonized, the waste disposal project developer and the potential host community can work together in the spirit of partnership. The aim of partnership is to provide opportunities to help shape the project to the benefit and well being of its residents, today and in the future. It is also a platform for formal or informal arrangements for joint problem solving and a platform for discussions on how the project can contribute to the overall good of host community.

The IAEA workshop on building partnership concluded with a mock up of public communication session with the participants role play as the Greenpeace activists, local community, waste disposal agency representative and technical experts. It appears to be a very effective way of applying the knowledge gained throughout the workshop. A successful program on partnership enables real progress to take place while reducing the amount of time spends, saving costs and other resources.

The Philippines

Ms. Maria V. B. Palattao
Mr. Carl M. Nohay
Philippine Nuclear Research Institute
(PNRI)

Challenges of Site Investigation for the Co-location of a Deep Borehole and Near Surface Radioactive Waste Facilities in the Philippines

The Philippines has been undertaking a radioactive waste repository project designed for its radioactive waste generated throughout the years. The repository will accommodate mostly low level radioactive waste from the various non-power applications of radioactive materials. High active radioactive sources including radium needles are also present in the inventory but cannot go into the surface repository for technical reasons. Additional source of waste will be from the ongoing decommissioning of the Philippine Research Reactor. The reactor waste is expected to be mostly low level and will be accommodated in the near surface facility. Initially, the site is being evaluated for a near-surface facility (NSF) only. However, to optimize resources and take advantage of the benefits provided by shared infrastructures and R&D work, notwithstanding the current program and volume of waste produced in the country, the co-location of two disposal concepts is being explored.

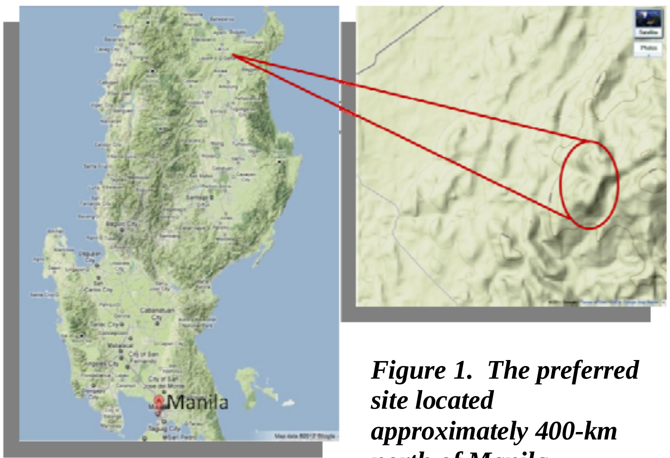


Figure 1. The preferred site located approximately 400-km north of Manila

Figure 1 shows the preferred site selected for the co-location project. The site is a public domain, permanent forest with no tenurial application and is situated approximately 400-km north of Manila. Project site is underlain by andesitic volcanic rocks and has about 34 hectares of potential land use development. Preliminary safety assessment indicated no major obstacles that will support the continuous investigation of the site.

The next step of the investigation program involved finding monolithic bedrock at the site to co-locate the deep borehole facility. The location of the monolith should be contained within the same general vicinity or footprint of the NSF. At the same time, care must be taken that one facility should not affect the other as far as potential discharges occur into the far future. This proved to be a challenge as all the previous boreholes that have been drilled so far have revealed fractured bedrock. This has also been observed in the general vicinity where landslide scars abound and is indicative of weak bedrock. Given these conditions, an application of a 2-dimensional electrical resistivity survey involving two almost parallel 1-km long electrical resistivity lines (Lines 1 and 2) was undertaken. The aim of the study was to verify geological structures and lithological profiles of the site. The 2 resistivity lines are a combination of 20 individual electrical resistivity lines conducted at 205 meters surface length to cover the displacement of data analysis at every edge of the profile. Both lines traversed the undulating to plateau-peak and side slope terrain where the vaults are to be constructed. Refer to Figures 2 and 3. Results of the survey ware analyzed using 2-D Wenner Inversion Technique. Geological fractures were identified by the vertical resistivity layers and locations with higher resistivity profile with no suspected geological fractures were considered for the purpose. No evidence of fault or displacement was detected along the 2 lines.

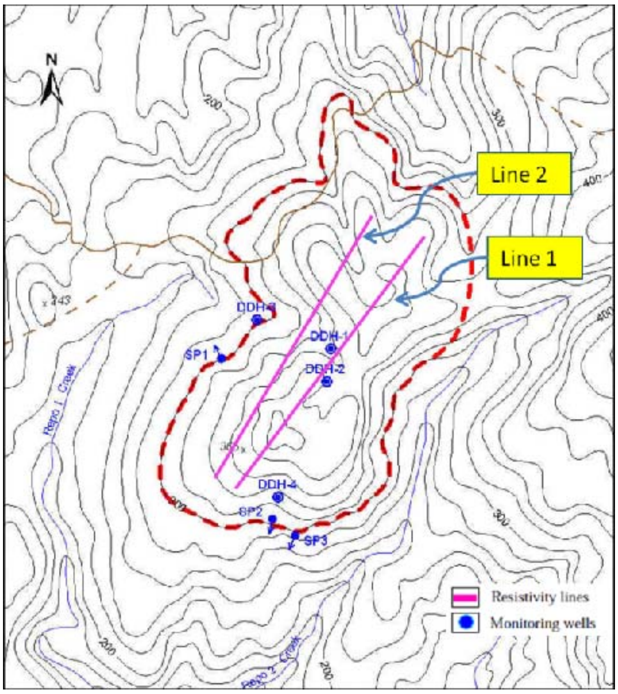


Figure 2. Layout of the 2-resistivity lines

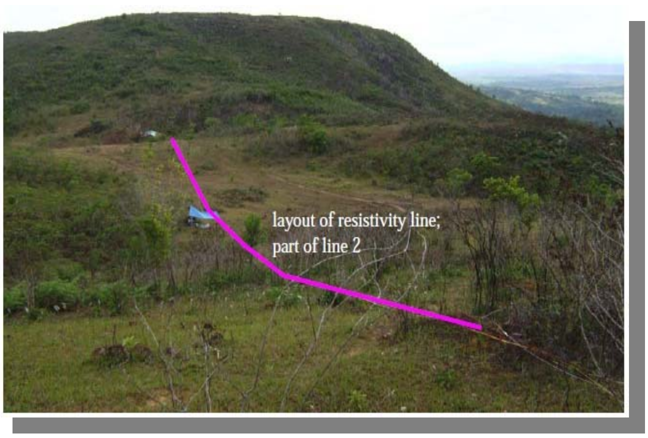


Figure 3. Part of the electrical resistivity of Line 2.

In parallel with the on-going technical investigations, efforts need to be escalated to address the societal impact of the project. The Philippines with a relatively small nuclear program has been faced with the same issues and problems besetting radioactive waste repository projects. Added to this problem is the recent Fukushima-Daichii NPP incident. Although the community hosting the preferred site provided its initial consent and support, this does not necessarily translate to outright and smooth approval of the project. Different perceptions and anxieties are again experienced from the local government and members of the general public towards the continuous evaluation and investigation of the site. A step up approach in doing a more aggressive awareness seminars, coordination and interaction should be pursued in all sectors of society starting from the grassroots to the higher echelons of the government. The extent of the program and the availability of resources, not only financial but also on the design of public acceptance program including the choice of experienced and appropriate speakers, are challenges that need full support for the project to see the light in the near future.

Acknowledgment:

This project is being carried out with technical assistance from the International Atomic Energy Agency (IAEA).

Thailand

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Safe Management of Radioactive Waste from the Maintenance of the Thai Research Reactor

Introduction

The Thai Research Reactor, TRR-1/M1 has been used for radio-isotope production, gem colorization, and other research and development at the Thailand Institute of Nuclear Technology (TINT).

The TRR-1/M1 pool is located in the reactor building. The pool is rectangular in shape and divided into two sections by means of a removable watertight aluminum gate. The main experimental section is 3.2 m long, 3.5 m wide and 8.5 m deep (as referred by "small-section"). The second section is 5.5 m long, 3.5 m wide and 8.5 m deep (as referred by "large-section"). The photo of the TRR-1/M1 (when it was operated) is shown in Figure 1.

In the early 2012, the "small-section" pool was scheduled during the mid of February until the mid of March for the maintenance by cleaning the pool surface (as shown in Figure 2), and re-painting the wall, included removing foreign objects and highly activated materials from the pool.

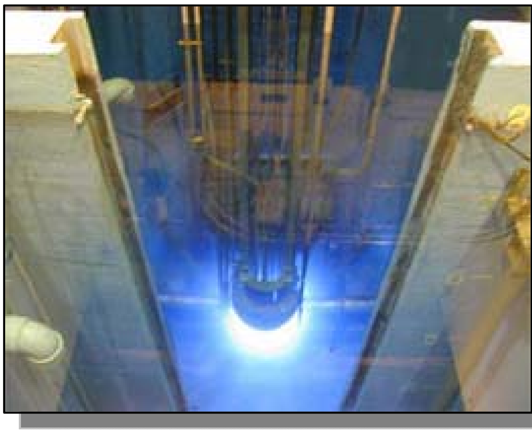

Fig.1 View of the TRR-1/M1 on operation

Fig.2 Cleaning the pool surface complex

During typical operation, the reactor core is positioned in the small-section which is the main experimental area. There are a number of fixed irradiation facilities in the small- section. These include thermal column, void tank and neutron beam ports. The thermal column is a pile of graphite blocks enclosed in aluminum housing. The void tank is simply an aluminum structure with two irradiation facilities. Four neutron beams are attached to the void tank and go through the pool walls. The materials of these facilities are constantly activated during typical irradiation. Most of the irradiation facilities are made from high purity aluminum alloy with few small parts (bolts and nuts) made from stainless steel. The over view of Thai Research Reactor TRR-1/M1 system is shown in Figure 3.

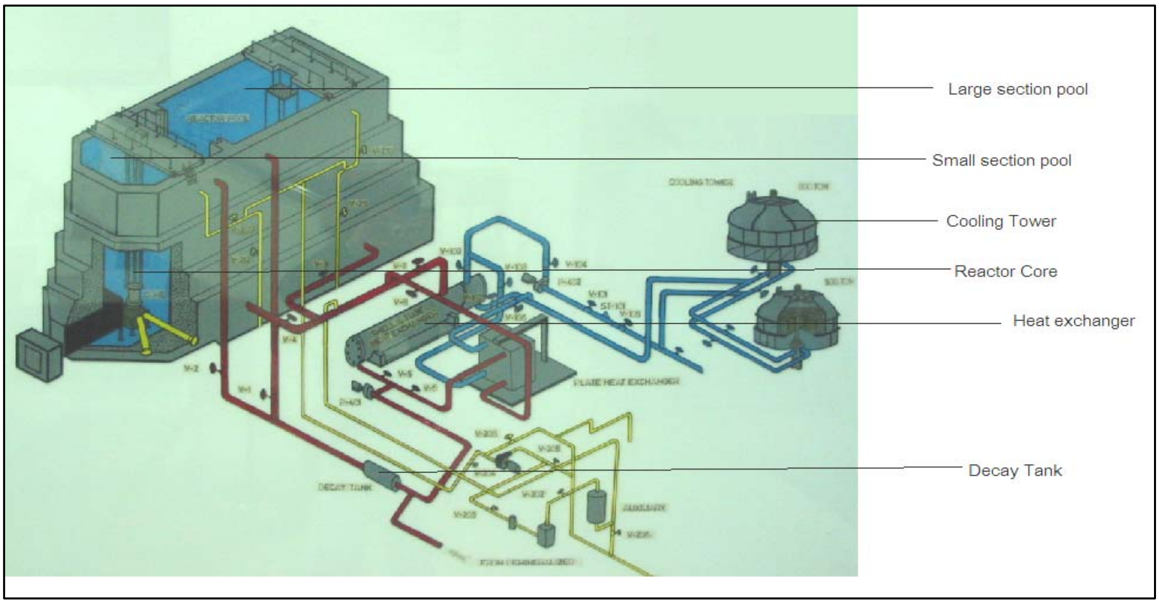

Fig.3 Overview of Thai Research Reactor TRR-1/M1 system

Management of Radioactive Waste from the Maintenance of TRR-1/M1

The Radioactive Waste Management Center (WMC) is in charge of safe managing of radioactive wastes which generated during the maintenance operation. The project policy is to minimize the radioactive waste by appropriate measures and good planning. These measures include:

- Reusing personal protective clothing as much as possible
- Segregating non-radioactive waste from radioactive waste
- Optimizing work plan and activities in terms of radioactive waste generation
- Controlling spread of contamination by contamination monitoring measures

Radioactive Waste from the activation products in the pool

The measured dose rate shows high radiation field in the in-pool area. There are two main hotspots (as shown in Figure 4) which have radiation dose of approximately 20 R/hr. These hotspots are from the bolts and nuts which align the void tank and neutron beams in their designed positions. It is believed that the bolts and nuts are made from stainless steel. Those 4 sets of bolts and nut were removed and became radioactive wastes. The instrument identified that Co-60 is the main nuclide in those activated parts (SS). Those high activity parts were taken into a lead container and placed into concrete shielded container (200 L drum) as shown in Figure 5, and then transported to the storage facility at Radioactive Waste Management Center (WMC). The waste streams from the whole maintenance project are estimated, and radioactive waste management activities are performed as described in Table1(page 21 and 22).

Fig 4. Two hot spots in the reactor pool

Fig 5. Activated Parts (SS) in shielded container and storage at WMC

Table 1 Waste Streams and Radioactive Waste Management

Waste Stream	Source	Radioactive Constituents	Volume or Weight	Characterization Method	Packaging	Treatment or disposition Method
Upper Fraction Pool Water	Draining of reactor Pool	None Background)	60 m-3	-Pool Chemistry data -Radiological analysis by gamma spectrometer (MCA) and gross alpha/beta by gas proportional counter	None	Release to environment after retention pool
Bottom third of pool water	After 4 sets of bolts + nuts removal	Co-60 + others	30 m-3	-Pool Chemistry data -Radiological analysis by gamma spectrometer (MCA) and gross alpha/beta by gas proportional counter	Drain through Underground Tank (WMC facility)	If less than discharge limit then release/ If above discharge limits treat in WMC treatment facility
Residual Pool Water	Final rinse of pool	Co-60 + others	10 m-3	-Radiological analysis by gamma spectrometer (MCA) and gross alpha/beta by gas proportional counter	Drain through Underground Tank (WMC treatment facility)	If less than discharge limit then release/ If above discharge limits, treat in WMC
Ion Exchange Resins	Pool water cleanup	Co-60 potentially high dose rate	50 liter	Radionuclide analysis by gamma spectrometer (MCA)	Plastic bag and place into 200 L drum	Storage and Hold for conditioning
Pre-filter	Pre-filter for filtering of pool water before Ion Exchange	Co-60 potentially high dose rate	< 1 kg Appropx2' x 2'	GM meter and Identifier	1 Plastic Bags and place into 200 liter	Placed in drum and stored at WMC

	Resins				drum.	
Activated Parts (SS)	Replacement of 4 sets of activated bolts and nuts	Co-60, significant activity high dose 20-30 R/hr	< 500g total	GM meter and Identifier	lead shielded containers	over-packed by concrete shielded container 200 L-drum stored at WMC
Degraded washers (corroded)	Replacement of activated bolts and nuts	Co-60, significant activity 20 R/hr	< 500g total	GM meter and Identifier	lead shielded containers	over-packed by concrete shielded container 200 L-drum stored at WMC
Various Equipment & Contaminated metal	Wet/dry vacuum Bolt catcher Small tools Other support items	Co-60, activity 50000 cpm 1000 times of background	1 drums	GM meter and surface contamination Monitor	Plastic Bag and place into 200 liter drum.	Storage at WMC / or decontaminate some tools
Sludge	From draining of pool sludge may accumulate at bottom	Co-60 + others	1 drums	Radionuclide analysis by gamma spectrometer (MCA)	Plastic Bag and place into 200 liter	stored at WMC/ Hold for conditioning
PPE	Disposable PPE worn during decontamination operations	VLLW	1 drum	Health Physics to assign value	Plastic Bags(20L) and then in drum	Incineration Hold ashes for conditioning
Contamination control waste	Plastic sheeting, step off pads ect.	VLLW	1 drum	Health Physics to assign value	Plastic Bags and then in drum	Incineration Hold ashes for conditioning
Filter and Flame	Air Filter at Reactor Building	VLLW	1-2 drums	GM meter and Surface Contamination Monitor	11Plastic Bags and then in drum	Incineration/ Compaction

Conclusion

The management of radioactive waste is one of important activities of the maintenance project. The project policy on minimization of waste is the best strategy for waste management. Appropriate measures were planned by Planning and Support Supervisor before the operations. All could not be successful without the cooperation of Reactor Operation team, Radiation Safety team and Radioactive Waste Management team.

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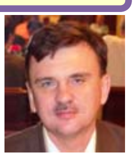

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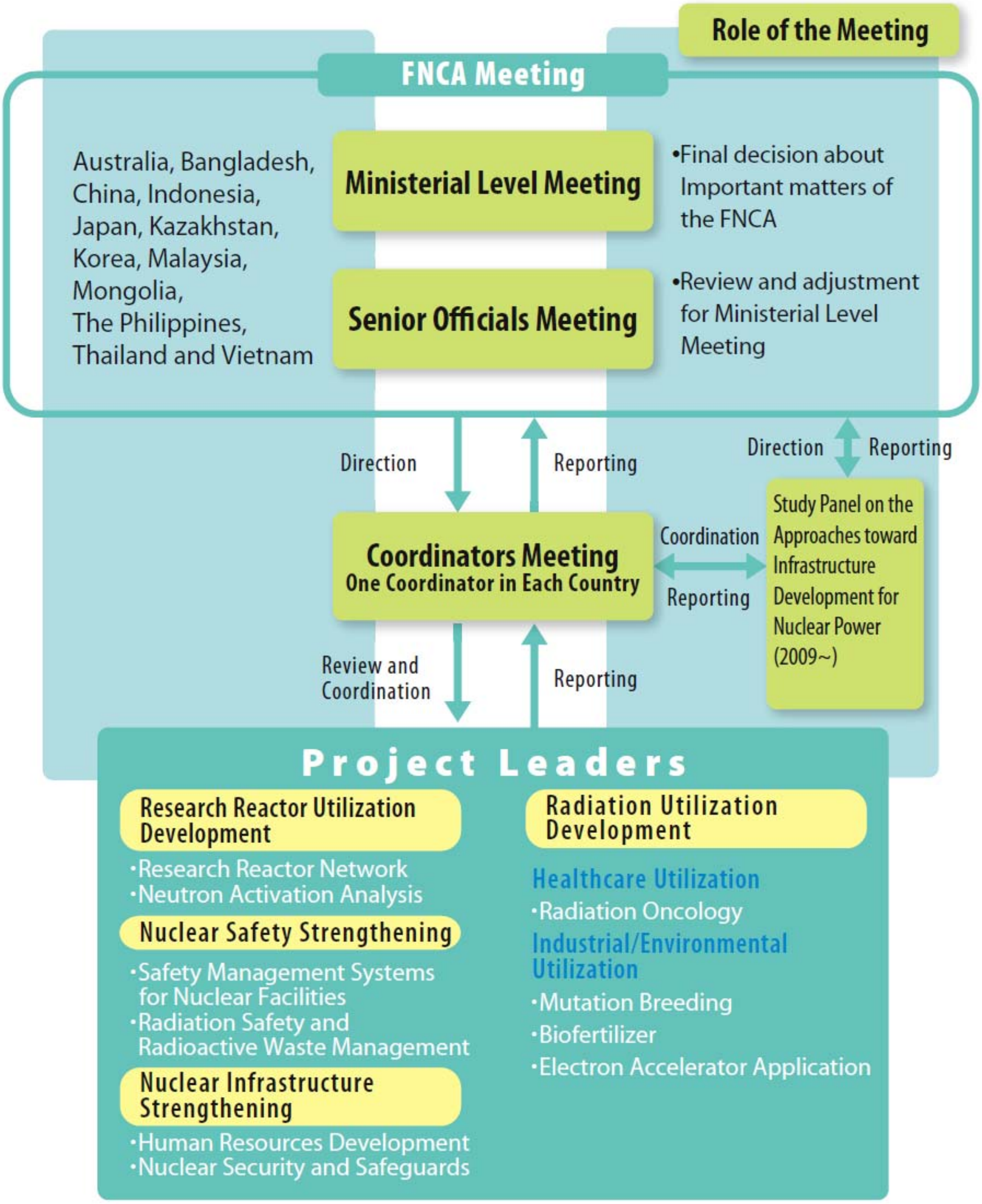
The FNCA Framework



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