Annex 3

Session Summary of
FNCA 2018 Workshop on
Radiation Safety and Radioactive Waste Management

Session 2: Introduction

1) FNCA Achievements 2017-2018 (Mr Tomoaki Wada, FNCA Coordinator of Japan)

The predecessor of FNCA, namely International Conference for Nuclear Cooperation in Asia (ICNCA), was started in 1990 in order to provide the ministers for nuclear development and utilization with the platform to exchange their frank views on regional cooperation. The current FNCA started in 2000 and it now holds twelve member countries and seven projects.

In the Ministerial Level Meeting 2017, it was decided that the FNCA is going to focus on radiation utilization in the areas of environment protection, health/medicine and agriculture, and also on engagement with environment pollution directly, in addition to the technology of monitoring

As mentioned In the Coordinators Meeting held in March 2017, the Radiation Safety and Radioactive Waste Management project is continuously expected to support member countries with safety improvement related to radiation safety and radioactive management of low-level radioactive waste repositories.

Another important role of the FNCA is to cooperate closely with two human resources development programs operated by the Ministry of Education, Culture, Sports, Science and Technology of Japan (MEXT). The Nuclear Researchers Training Program and Instructors Training Program provided a variety of programs to as many as 100 Asian researchers in 2017 in total.

2) Australia's Achievements in FNCA Projects (Mr Peter McGlinn, FNCA Coordinator of Australia)

Australia's strong support to the FNCA since its inception in 2000 has been demonstrated by its leadership and sponsorship of projects of significant importance to the region, as member countries benefit from the application and continued development of nuclear science and technology. For 11 years the focus of the Nuclear Safety Culture (NSC) project was on developing a rigorous and workable nuclear safety culture across nuclear facilities operating in FNCA member countries. This was followed by six years of the Safety Management Systems (SMS) project examining, assessing and improving safety management systems in these facilities, building on the experience of the self-assessment and peer review methodology developed in the NSC project. These two projects have increased the awareness of the benefits of a strong safety culture, thereby improving safety and the image of nuclear activities, and reduced the chance of accidents in the future.

In 2017, upon the completion of the SMS project, Australia proposed a shift of focus to a topic of critical importance to the region – climate change. Each of the participating countries in the Climate Change Science project has nominated a specific area of study for their country in relation to understanding climate change science. The level of commitment of all participating countries is remarkable, with Australia's leadership providing an insight into the wide range of nuclear techniques used, and the research possible, in studying the impact of climate change.

Australia has also had significant achievements in other FNCA projects, namely the Research Reactor Utilisation (RRU) Project, and the Radiation Safety & Radioactive Waste Management (RS & RWM) project. Through the RRU project, Australia was helped improve the reliability and efficiency of Neutron Activation Analysis (NAA) at NAA facilities operating in the participating countries through the coordination and assessment of proficiency tests on sediment samples. For the sub-project on Radioisotope Production, Australia has readily provided information and updates on Australia's production of the various radioisotopes supplied into the region and beyond, including the newly established Mo-99 production facility (ANM – ANSTO Nuclear Medicine) at ANSTO's Lucas Heights campus in Sydney. Australia was proud to be the inaugural recipient of the FNCA Award for its contribution to the RRU project.

Australia, through ANSTO, has a long, broad and extensive experience in the management and safety of radioactive waste, primarily from its operations at Lucas Heights, which it has openly shared with the other participating member countries over the duration of the RS & RWM project. Areas discussed have ranged from the management of legacy waste; pre-disposal management; the Integrated Waste Management Facility; decommissioning; and the future development of the National Waste Repository. Major topics covered on all these aspects of waste management have included the importance of waste characterisation and record keeping; risk analysis when instituting change; quality control; and stakeholder involvement.

3) Project Overview and Goal (Prof Toshiso Kosako, the University of Tokyo)

The objective of the project is to enhance RS&RWM among FNCA participating countries through sharing information, knowledge and experience of existing technologies. All the FNCA member countries are participating in the project and attending the annual workshop. In the workshop, each country gives a report on the current status of their low level radioactive waste repository and exchanges information. The consolidated report on the Nuclear/Radiological Emergency Preparedness and Response was published in 2017 and shared not only among the member countries but also with other international organizations such as IAEA.

As determined in the FNCA Ministerial Level Meeting 2016, the project has been dealing with the low-level radioactive waste repository since 2017. Expected outputs are consolidated report and newsletters.

The consolidated report will consist of two major parts, namely general part and country specific part. In this workshop, the project will be discussing on the details of report contents to brush up their draft report.

Session 3: Country Report

1) Australia (Mr Duncan Kemp, Australian Nuclear Science and Technology Organisation

(ANSTO))

Australia is a commonwealth of 9 jurisdictions. Each has its own government, each has its own radiation protection legislation and each has its own regulator for radiation. This means that every state has its own rules and definitions for radioactivity. ARPANSA, the commonwealth regulator has established the National Directory of Radiation Protection to standardise the rules. The rules are based on the IAEA documents, and use International Best Practice as a benchmark for all radiation protection. In the past year ARPANSA has indicated that it will move to a full cost recovery model, which means that the regulator will get no funding directly from the government, but will be funded by those who have licences to use radioactivity.

The radiation safety officers within Australia, including industrial officers, revised the Australian Standard for Ionising Radiation Safety in Laboratories. This document then becomes the standard which the regulators use as a licence requirement for people working with radioactivity. This will apply to the growing private industry for radiation protection services in Australia as well as ANSTO, defence and universities.

There was an event on 22 Aug 2017 in ANSTO where a quality control technician managed to spill concentrated Mo-99 radiopharmaceutical on their hand. There was contamination through two gloves which was removed within days. The dose was 40 times the annual limit and was an INES level 3 event. The event changed the way ANSTO assesses risk. Rather than whether the risk is medium or high requiring more stringent controls, it now includes if the consequence is high – regardless of whether the likelihood is very low. This event was considered a high consequence, but low likelihood event and did not have engineering or isolation controls put on it.

Australia’s National Radioactive Waste Management Facility is in process and the seminar on Friday will describe it in detail. The process started in 1979, with the project formally started in 1992. A site was selected in 2003, however there was no community support and the legal challenges stopped the process. The process was then changed to a volunteer site being used, and after sifting through 28 nominations, there is focus on three sites at the moment, all in South Australia. ANSTO is developing its capability to condition all the waste streams so that only conditioned waste goes to the National Radioactive Waste Management Facility. ANSTO is also looking at the potential to condition the radioactive waste of other organisations for a fee. This is dependent on the development of the Waste Acceptance Criteria and ownership rules of radioactive waste.

2) Bangladesh (Dr M. Moinul Islam, Bangladesh Atomic Energy Commission (BAEC))

Presentation highlighted the sources of radioactive waste generation in the country. In Bangladesh both sealed and unsealed radioactive wastes are generated from the use of radioactive sources (RSs) in various activities which include nuclear techniques in medicine, agriculture, industry, research and education etc. The amount of waste generation from different stakeholders in the country till 2018 is shown in the presentation. Both processed and unprocessed wastes are safely stored at the Central Radioactive Waste Processing and Storage Facility (CWPSF) of HPRWMU, BAEC.

Effort has been given for the collection of meteorological data around the country, studying on hydrological parameters and computer codes (e.g, RESRAD, AMBER etc.) for dose rate evaluation of radioactive waste repository. Several challenges for establishment of radioactive waste repository in the country are also briefly addressed in the presentation.

3) China (Prof Hongxiang An, China Institute for Radiation Protection)

Low level radioactive waste (LLW) is produced during nuclear energy application and nuclear technology application in China. It is stipulated that LLW shall be disposed of in near surface repository. The regional disposal policy is implemented in China. China has two near surface repositories in operation for LLW disposal. One is named Beilong repository located in Guangdong province, the other is named Northwestern repository located in Gansu province. The repositories have licensed and operated for several years. Some LLW has been disposed in the repositories. But a lot of low level radioactive wastes are not been disposed in time while just stored on site. It is planned that five low level radioactive waste repositories will be built in the future to commensurate with the national nuclear energy programme. The siting of the LLW disposal repositories is being conducted in provinces where multiple NPPs are located. During the site selection, China faces a high degree of social sensitivities, difficulty in public acceptance and an obvious attitude of not in my backyard just like other countries.

4) Indonesia (Mr Sucipta, National Nuclear Energy Agency of Indonesia (BATAN))

In order to support and complement the radioactive waste management facilities in Indonesia, BATAN proposed a program in preparation of disposal facilities. Related to low level waste (LLW) disposal, BATAN conducted some activities, such as, 1) planning to build a demonstration disposal facility in Serpong Nuclear Area (SNA), 2) site selection and characterization in Jawa Island, and 3) identification of potential regions for disposal of NPP radioactive waste in Bangka-Belitung Islands. Demonstration disposal that will be built at Serpong Nuclear Area is Near Surface Disposal (NSD) type. The design based on the optimization between the inventory of radioactive waste and environmental geology conditions of the site. Site selection and characterization for disposal facility in Jawa island was performed based on descriptive method, desk-stop study, field investigation/survey, laboratory analyses and evaluation using geographical information system (GIS). From the activities can be obtained about 6 (six) potential site that can be continued in the next time with more detailed study to get about 3 (three) selected site. The process of identification of potential regions for disposal of NPP radioactive waste in Bangka-Belitung Islands was conducted with method that almost similar to site selection in Jawa island. The result of this activity in Bangka-Belitung islands was obtained 8 (eight) potential region and some potential site in West Bangka and South Bangka Regency.

5) Japan (Mr Tatuo Saito, Japan Atomic Energy Agency (JAEA))

As this country report of Japan, I'll introduce here 5 topics:

1. Disposal Concept of Radioactive Waste in Japan
2. Framework of the Disposal Business of JAEA
3. Conceptual Design of JAEA Disposal Facility
4. Preliminary Safety Assessment for Disposal

5. Basic Schedule and Process of the Disposal Project

In summary, I'll report as follows;

- JAEA is promoting the disposal project of LLW generated from the nuclear energy research / medical and industrial use of radioisotope in Japan.
- JAEA is preparing the siting process with transparency and impartial for the disposal project.
- JAEA has been developing the technical items to design, construct and operate disposal facilities.

6) Kazakhstan (Mr Yevgeniy Tur, National Nuclear Center (NNC) of the Republic of Kazakhstan)

Radioactive waste management in Kazakhstan is a high-priority activity due to the large amount of accumulated and permanently generated radioactive wastes of all types from low level to high-level wastes. The wastes were generated by operation of military-industrial complex, uranium and non-uranium industry, and as a result of nuclear facilities operation and isotope production application.

Currently, about 230 million tons of radioactive waste (mainly low level) with total activity of more than 295 thousand curies has been accumulated in Kazakhstan. Efforts are ongoing aimed at the wastes collection and safe storage, as well as restoration of radiation-contaminated areas.

At the present, there are several near-surface disposal sites in Kazakhstan: disposal for natural radionuclide contaminated equipment of oil and gas industry, disposal for uranium mining waste.

A project on "Republican Center for the Processing and Long-Term Storage of Radioactive Wastes and Radiation Sources" is under development. Also, it is planned to construct disposal site for nuclear testing radioactive wastes, total volume of 50.000 m3.

Under the project on "Rehabilitation of the Koshkar-ata tailing dump of radioactive and toxic wastes", feasibility study is developed, positive approval is obtained from a state expertise, design and estimate documentation is being prepared. Green zone arrangement with total area of 8.2 hectares is started in order to stabilize the microclimate, environmental and sanitary-hygienic conditions at the village located nearby the tailing dump. Moreover, planned is arrangement of green belt for 3 km.

7) Republic of Korea (Dr Hyuncheol Kim, Korea Atomic Energy Research Institute (KAERI))

In Korea, a low and intermediate level radioactive waste (LILW) disposal facility has been constructed in Dec 2014. It is planned with a total capacity of 800,000 drums (200 L), and the facility in Phase 1 was built underground, 130 meters below the sea level in the shape of 6 silos with the capacity of 100,000 drums (200 L). The surface disposal facility in Phase 2 is under construction, with the capacity of 125,000 drums (200 L). Korea Radioactive Waste Agency (KORAD) is in charge of the management of the radioactive wastes in the disposal facility. It is operating the environmental radiation survey program in order to monitor environmental radiation and radioactivity surrounding the disposal site. Now, 14,446 drums were transferred from nuclear facilities including nuclear power plants and KAERI to LILW disposal facility, and it's 14.5 % of the total capacity of the underground facility. 90,308 drums of operation radioactive wastes are temporally stored in nuclear power plants site as of it is.

8) Malaysia (Dr Norasalwa Binti Zakaria, Malaysian Nuclear Agency)

Malaysia is committed to improving the radioactive waste management facilities for safety and security purposes. This includes provision for waste treatment, storage and disposal. Borehole disposal facility is expected to start its construction next year while a national low level repository is planned to be established at the latest when the Research Reactor is decommissioned. Nevertheless, activities pertaining to repository have started back in 2005 with the conceptual design development followed by the national program on area survey and screening in 2011. Efforts towards developing the capacity and technical capability for repository is continuously taking place through training, collaboration and experts review.

9) Mongolia (Ms Ariunsaikhan Ishjamts, Nuclear Energy Commission (NEC) of the Government of Mongolia)

The radiation protection infrastructures including regulatory body, legal framework, radioactive waste management of Mongolia included in the presentation. Also the Country report has included new regulations related on Radiation Safety and Radioactive Waste Management, practice of centralized long term storage facility, challenges and problems on Radioactive Waste Management, brief introduction of IAEA and European commission projects.

Mongolian government implementation follows activities such as radioactive waste storage, treatment and disposal, requiring precision high technology that ensures the reliability of the physical protection of nuclear and radioactive waste, radiation source and radioactive isotopes.

Mongolia is developing a national strategy and policy of radioactive waste management, within the scope of IAEA technical cooperation. NEC has been implementing project "Establishment of national radioactive waste management capability for Mongolia" in 2016- 2018. As a result of the project infrastructure of radioactive waste management, human resources and technical capacity is being improved.

Mongolia needs to develop safe management by establishing a predisposal process with improved technical capabilities and human resource development for ensuring safe processing (pretreatment, treatment and conditioning), storage and transport.

Regarding the cooperation with European Commission, NEC has been implementing project titled “Regulatory regime for nuclear safety and enhancing radiation safety and nuclear safeguards in Mongolia". Safety regulation of radioactive waste management is being drafted under that project.

10) The Philippines(Ms Kristine Marie Dacallo Romallosa, Philippine Nuclear Research Institute (PNRI))

The general policy in the Philippines for the management of hazardous wastes is provided for by the Republic Act 6969 “Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990”. However, it is limited in scope and is now being updated thru the House Bill on “Hazardous and Radioactive Wastes Management Act” that aims among others to develop comprehensive waste management programs. The policy on spent fuel management is also being developed thru the House Bill on “An Act Providing for a Comprehensive Nuclear Regulatory Framework”. New regulations relevant to RWM have also been developed and is now for review and publication.

The Philippine Nuclear Research Institute operates the pre-disposal facility for the management and interim storage of radioactive wastes. The country has no operating NPP and RR, thus most of the wastes are from industrial and medical uses. The strategies in the management of Category 1-5 disused sealed sources (DSRS), solid wastes, aqueous liquid wastes, and Am-241 DSRS were presented. There are about 50m3 of solid wastes, 8 m3 of liquid wastes, and about 5,200 units of DSRS.

The Philippines is also in the process of identifying a suitable disposal site for low‐level & intermediate‐level wastes. The design concept of a co-located near surface and borehole disposal facility has been developed. The design can accommodate up to 50 m3 of LLW wastes about 159,000 drums of ILW. The design accounted the existing and projected wastes including those that may arise from the decommissioning of the Philippine Research Reactor 1. The proposed site is located about 600 km North of Manila. Site investigation such as seismicity, hydrogeology, climate, & geochemistry studies have been conducted since 2004 to determine its suitability for waste repository. Initial results show that the site characteristics could be suitable as a disposal site. The safety case is now being developed and will be subject for further iteration and review. Further works needed such as completion of the safety case, public acceptance and site accessibility were also identified.

11) Thailand (Ms Nanthavan Ya-anant, Thailand Institute of Nuclear Technology (TINT))

Recently, Thailand has a drafted National Policy on Radioactive Waste Management and Spent Nuclear Fuel Management Radioactive waste and spent nuclear fuel in Thailand will be safely managed to protect human health and environment now and in the future in a sustainable and cost-effective manner. The Government will ensure that funding set aside for this purpose will be preserved for the time when it is needed The license holders, who generate, process, or possess radioactive waste, will be responsible for the safe management of radioactive waste, until the waste is accepted by the waste management organization (TINT). Ultimately, all the radioactive waste in Thailand that cannot be recycled, discharged or cleared from regulatory control will be disposed of in a licensed radioactive waste disposal facility. The Government of Thailand will investigate options for a radioactive waste disposal facility and assign the responsibility of managing such facility to one of the government agencies. Principle and Safety assessment is that a procedure for evaluating the performance of a disposal system and, as a major objective, its potential radiological impact on human health and the environment. Potential radiological impacts following closure of the repository may arise from gradual processes, such as degradation of barriers, and from discrete events that may affect the isolation of the waste. The technical acceptability of a repository will greatly depend on the waste inventory, the engineered features of the repository and the suitability of the site.

The legislation framework is based on the Nuclear Energy for Peace Act 2559 (2016) and other related regulations on Licensing of Disposal of Radioactive Waste (being drafted). The operator will use the national inventory to establish the waste acceptance criteria and design of the facility. Currently, the preparation of site selection in Thailand, we study on 1) Characteristics of acceptable site such as, -Climatic conditions (rainfall, extreme events), Geological characteristics (seismic, fault activity and erosion, hydrogeology) and Physical site characteristics (flooding, draining, landslide). 2) Social characteristics (prospects of future growth / use,)The challenge is that Thailand is a flood-prone country;

because flooding is a regular occurrence and the population and number of exposed properties continue to grow, losses from this peril will continue to rise. Siting a radioactive waste disposal facility refers to the process of selecting a suitable location that must take into account technical and other considerations. Another key factor today is public acceptance. Political factors and public concerns are also the most challenge.

12) Vietnam (Dr Minh Quang Pham, Vietnam Atomic Energy Institute (VINATOM))

Radioactive waste in Vietnam is generated by research, industry, medical applications, research reactor operation and radiopharmaceutical production. Naturally occurring radionuclides (NORM) and technologically enhanced naturally occurring radioactive materials (TENORM) are produced in Vietnam by the mining, mineral sands processing and other resources sectors. Vietnam has no nuclear power plants.

Now Vietnam is postponing the introduce the nuclear power to meet growing demand in electricity and to ensure energy security. Two Nuclear Power Plant (NPP) projects in Ninh Thuan province (Ninh Thuan 1 and Ninh Thuan 2) are under Feasibility Study (FS) phase.

So far, Vietnam has no national used radioactive sources and radioactive waste storage facility.

This presentation includes the following main contents: The Radioactive waste Management Policy; Legislation Framework; Current management of RW in Vietnam; Site selection for Low Level Radwaste Central Facility and Challenges, Plans and Proposals in RWM in Vietnam.

Session 4: Group Discussion on Consolidated Report (General Section)

1) Leading Speech (Prof Toshiso Kosako, the University of Tokyo)

Prof Kosako indicated the table of contents, which was adopted at the previous workshop to promote the following discussion.

2) Korea's Experience of LLRW Repository Design (Dr Hyuncheol Kim, KAERI)

The Korean government has strived to secure a disposal site for the safe management of radioactive waste since the early 1980s. In 1998, the "National Radioactive Waste Management Policy" was established to aim at completing the construction of a low and intermediate level radioactive waste disposal facility by 2008. But, site selection was not successful. In 2005, three cities were volunteered as a site for the disposal facility, and Gyeongju was selected the site of LILW disposal facility through residential referendum with 89.6 % of approval rating.

The low and intermediate level radioactive waste disposal has been under construction with a total capacity of 800,000 drums (200 L of drum). The 1st phase of the construction, which is underground silo disposal with 100,000 drum capacity, was completed in 2014. The 2nd phase for surface disposal with 125,000 drum capacity will be completed by 2019. Near-surface disposal is a method with a natural and artificial barrier in depth of about 30 m underground, and disposal with an artificial barrier is widely used to secure safety. The procedure for radioactive waste disposal are as follows; 1. Packaging by the waste generator, 2. Temporary storage on the site, 3. Preliminary inspection by KORAD, 3. Sea and land transport to the repository, 4. Receipt & inspection, 5. Emplacement in underground silos.

3) Malaysia's Experience of Borehole (Dr Norasalwa Binti Zakaria, Nuclear Malaysia)

A near surface repository is a large scale project encompasses elements of siting, safety case, design, stakeholder communication and etc. It certainly requires a sustainable supporting system which in case of Malaysia have been much learned through the Borehole Disposal Project. This report shared the implementation experience of the Borehole such as site characterization, safety assessment, project management and safety case development

4) Kazakhstan's experience of LLRW Management (Mr Yevgeniy Tur, NNC of the Republic of Kazakhstan)

In Kazakhstan, significant practice has been gained in rehabilitating former uranium deposits and processing enterprises with the purpose of minimizing their effect on the environment.

The relatively unsophisticated technologies and methods of restoration were applied in the arid zones of the country, where, as the basic strategy, these methods were chosen: mechanical cleansing of contaminated ground surfaces, decontamination of buildings and dismantling of constructions and their subsequent disposal, and formation of different soil covers on surfaces of the rock and poor ore dumps.

The challenge concerning radiation safety in connection with the accumulation of natural radionuclides in the environment due to the mining of hydrocarbon raw material is also very important for Kazakhstan. The huge territories are contaminated and continue to be contaminated in the process of oil field activity. However, methods for an effective and ecologically safe cleaning the radiation-hazardous sediments of the oil field equipment and disposing of the produced waste are applied now.

Low-level wastes are collected at the near disposal facilities. All disposal facilities in Kazakhstan are classified as surface and represent pits or trenches. The sides and bottom of pits are leveled and compressed. A solid layer of clay is laid on the bottom, top and sides of the pits. Observation wells are drilled to the first aquifer to monitor the possible contamination of groundwater around the disposal sites.

5) Discussion

Member countries were divided into three groups and had a discussion on what contents should be incorporated in order to improve the report. The results will be reflected to their report.

Session 5: Group Discussion on Consolidated Report (Specific Section)

Member countries were divided into three groups and had a discussion on what contents should be incorporated in order to improve the report. The results will be reflected to their report.

Session 6: Public Acceptance of Radioactive Waste

1) Thailand (Ms Nanthavan Ya-anant, TINT)

The occurrence of severe accidents in Three Mile Island, Chernobyl, and especially Fukushima, attracted the much public attention. Most of the nuclear power plants have been shut down in Japan. In many countries including Thailand, the approval of new nuclear power projects have been suspended. The development of nuclear safety goals and the content related to public acceptance are very important for the nuclear power program including radioactive waste management in the country. Public acceptance of radioactive waste is a cross theme of technology and public administration. Currently, Thailand Institute of Nuclear Technology (TINT),has the public communication project for the promotion of new nuclear research reactor and new radioactive waste management facility and public acceptance. The objective is making good communication with the public about our scientific works, nuclear technology, radiation utilization and radioactive waste management. TINT researchers try to have chance to consult at schools as well as involve in the local activities in order to talk or answer questions to get the trust from the public. Public communication is very important for public acceptance. Obligation and character for good communicator is need. Scientific education for the next generation will also play its role, which will be an important subject from now on.

2) Japan (Dr Haruyuki Ogino, CRIEPI)

Dr. Ogino described his experience regarding public acceptance of off-site radioactive waste generated as a result of the Fukushima nuclear power plant accident and exchanged views on key elements of stakeholder involvement in decision-making procedures. Two case studies were introduced, namely, case study 1 concerning the process of finding an area within the district to temporarily store contaminated soil generated from the decontamination work in Date City, Fukushima Prefecture, and case study 2 concerning the process of assigning a disposal site for the designated waste (over 8,000 Bq/kg Cs-134 and Cs-137) in Takahagi City, Ibaraki Prefecture. In Date City (case study 1), the briefing for public hearings began in July 2011, and 83 briefings were held in the first 5 months. Local residents expressed critical views from the victim's perspective, concerns about the increasing level of radiation exposure owing to the collection of radioactive waste in a single place, and strong resistance against the location of the temporary storage site, in addition to scientific issues. Continuous efforts were made through dialogue with the local people, and the first temporary storage site was established in Date City in October 2011. A tour of the site was held for the local people who observed the decreased radiation level (e.g., from 2.5 μSv/h to 0.8 μSv/h as of July 22, 2012) owing to decontamination of the ground before construction and the shielding effect of the gravel spread over the ground (approximately 20 cm thick). The attitude of the local people changed from passive to active and showed a higher priority to protect children (e.g., school roads), which led to cooperation in finding a location for the next temporary storage site. One of the observations was that most of the early temporary storage sites were constructed in a mountainous area to keep it as far as possible from daily living environments; this is known as the issue of "Not in my back yard" (NIMBY). However, with time and as information became more widely shared, some of the later temporary storage sites were also constructed near daily living environments, which enabled the local people themselves to confirm the safety. In summary, in case study 1, the local government actively exchanged views with the local people before the construction of the storage site under the strong leadership of the mayor and with technical support from radiation protection experts. The information on safety was widely shared through several means, which led to correct understanding and accelerated the subsequent construction. The mutual trust between the local people and the government was the key. In Takahagi City (case study 2), on the other hand, the process of assigning a disposal site for the designated waste faced problems related to stakeholder involvement in decision-making procedures. As of 30 June 2018, the total amount of designated waste (e.g., incinerated ash, sewage sludge, water purification soil waste, rice straw, and compost) is more than 210,000 tons in Japan. It will be transferred to the disposal facilities to be constructed in each prefecture. On 27 September 2012, officials of the Ministry of the Environment visited Takahagi City to propose that an area of a national forest in the city could be a candidate disposal site of designated waste generated within the prefecture and put forth a tentative schedule of construction during the summer in 2013 and the start-up of operations in the spring of 2014. The mayor of Takahagi City criticized that the selection was a one-sided decision (a completely unexpected occurrence) and released an official statement of refusing its acceptance. Subsequently, an opposition movement started, subsequently supported by the collection of signatures from more than one-third of the citizens, leading to the final rejection of the proposed disposal site. Reflecting this experience, the Ministry of the Environment organized meetings with mayors of municipalities and identified key issues, such as the lack of communication between the central and local governments before presenting the proposal, the need for detailed surveys and technical assessments by experts before the selection of a site, and the necessity of taking into account the prevailing circumstances in each municipality. In summary, we learned from case study 2 that there is a need to deal with the designated waste not only in Fukushima but also in the surrounding prefectures. The experience in Takahagi City is just one example, but it led to the revision of the selection process of disposal sites in Japan. Ongoing efforts in each prefecture are being made by keeping in mind the lessons learned including establishing common understanding and conducting assessments and safety surveys by experts. Dr. Ogino further introduced his experience with the dissemination of information on radiation dose and risk, including the dose scale map of artificial radiation and natural background radiation developed by the National Institute of Radiological Sciences in Japan after the Fukushima nuclear power plant accident. Moreover, a position statement issued by the Atomic Energy Society of Japan in December 2016 was introduced; it includes an explanation on the incremental risk of cancer mortality for radiation protection purposes recommended by the International Commission on Radiological Protection (e.g., 0.5% for an effective dose of 100 mSv) and scientific findings on the calculation of the lifetime risk of cancer mortality in each prefecture in Japan (maximum, 28.3%; minimum, 23.7%; average, 25.4%). In addition to the cancer risk in Japan, Dr. Ogino introduced the calculation of lifetime risk of cancer incidence in five regions in Australia (New South Wales, South Australia, Tasmania, Victoria, and Western Australia), and emphasized the importance of recognizing that the incremental risk of radiation exposure would be added to the spontaneous cancer risk. In conclusion, Japan’s post-Fukushima efforts have demonstrated that stakeholders should be appropriately involved from the early stage of the decision-making procedures. Regarding public acceptance, the dissemination of scientific knowledge is crucial to regaining calmness, and so, equally, is trust. The experience shared in this presentation may be unique to the postaccidental situation and does not fully cover all elements. However, there will be common points that must be considered when planning radioactive waste disposal facilities under ordinary conditions in the FNCA member countries.

3) PA in Each Country

Mr Wada did public acceptance for Rokkasho facility. Meet 43 times in 2 years 1990-92. Active anti-nuclear groups produced mis-information. Needed to counter – use graphics. Womens and Mothers groups hold sway on opinion, and so need to have female representation in promoting the work as they appear more trusted. Need to get public information out quickly, and make sure it is correct. Support changed from 11% for to 40% approval in one year. This allowed for facilities to be built.

1. Australia

The key message is that radiation has benefits, but produces a by-product (waste). There is a stakeholder engagement is from Parliament, Ministers, schools and communities. The plan is to make sure that ministers, opposition is invited to make issue non-partisan and that ANSTO can provide expert non-political advice to government. ANSTO promotes events in the local community – has stalls in local fairs, sponsors local competitions (short fun runs) and have open days to invite people in. ANSTO also sends stories to traditional media and using social media to spread news about what ANSTO is doing. The important part is to understand what the message is and keep supporting that. This is supported by having a sustained long term presence in the community with education, communication and transparency. This will lead to public confidence in the institutions and leads to public acceptance. Surveys have been done, and show that most in the local community support ANSTO now. There are opposition groups in Australia, and most local governments are neutral in the proposal for a national waste disposal facility.

2. General comments

Opening of information to people to engender trust (Chernobyl vs Fukushima)

Reform of the system – agreement is easier if the system is democratic.

Agreement is easier if the people trust the government in general. If so, then they will trust the best decision will be made. This means that the government is not seen as corrupt, short-sighted, only focussed on personal gain

3. Bangladesh

To create positive image about nuclear power industry and nuclear technologies, Nuclear Industry Information Center has been established in Dhaka. The main aim of this centre is to disseminate general knowledge about nuclear energy among public. The targeted group are the citizens of the country particularly students, teachers, researchers and media persons. To achieve goal the information centre provides information by showing educational film on nuclear energy, safety model, radiation protection devices and briefing media on regular basis.

To raise awareness and to improve the understanding regarding nuclear technology among journalists and other targeted groups press conferences and seminars are also arranged. Some academic departments in the country are operating educational program in nuclear science and technology.

Since work began on the country's Nuclear Power Plant project, a number of local people, including journalists, experts, environmentalists, students and industry people from Bangladesh have visited Nuclear Industry in abroad.

Annual press tours are also conducted to various nuclear energy objects to create better understanding. Besides these visits, interaction is going on with the local population as well. Recently, a public counseling office next to the NPP construction site opened to inform local residents about each stage of construction and the operation of the station.

4. Republic of Korea

Have a civil watchdog in Korea which is independent (although funded by govt) which provides environmental radiation monitoring information to the public. They also do many of the other programs.

5. China

China thinks information disclosure is important and gains public acceptance for radioactive waste. Rules and laws are published and discussed. Public participation is required under these rules, and that the public are given environmental protection information. Exhibitions and lectures are given, there are promotions through internet and social media. Ministry of Env Protection website also promotes. There is public supervision and media scrutiny of nuclear facilities and reported. An example was the establishment of the Candu6 as aprt of the development, public consultation showed 129 responses, 117 negative. When NPP replied, all comments were accepted and project went through.

6. Indonesia

The BATAN have effort in relation to public acceptance on radioactive waste management (include disposal). BATAN conducts guidance on the implementation of radioactive waste management, which includes coaching on technical and education. Technical guidance is carried out on radioactive waste producer; and state owned enterprises, "koperasi" (community cooperation business), or private entities that cooperate with or are appointed by BATAN to manage radioactive waste. And the educative development is carried out on the community. Technical guidance on the implementation of radioactive waste management includes at least : a. training; b. socialization; c. consultation; and/or d. technical support. Initiator, in preparing EIA documents (as an example for disposal), must involve community which they are a) affected, b) environmental observer, and / or c) who are affected by any form of decision in the EIA process. So, the public acceptance will be obtained at the environmental licensing process stage. Based on the result of public acceptance survey on planning of NPP construction in Indonesia (2017), 77.53% of publics agree and 22.47% are not agree to the program. Only 38.10% from 22.47% (about 8.56%) of the public are not agree to the NPP because of the radioactive waste released from NPP.

7. Kazakhstan

Any complex or hazardous facility needs to have public hearings. This is how public acceptance is measured. Difficult to regain trust for people who see nuclear weapons testing. Need to inform on ecological safety and state control of environmental monitoring. Public awareness is through scientific meetings, round tables, seminars and others. There is work with schools and universities.

8. Malaysia

Most public consultation is only one way (putting information out). This includes putting booklets out, newspaper, tv and radio. Putting on open days and tours of facilities. Travel around Malaysia to put up exhibitions and inform as many people as possible.

Lynas (Rare Earth plant in 2014) showed that town hall sessions and open discussions failed because the protestors were not involved in the process and just shouted everything down. They did not want to listen. In the 1980s there was an Asian Rare Earth proposal which met many objections, however govt made decision to go ahead. This

9. Mongolia

98% of Mongolians are on facebook, with 50 tv channels. Example was in election there was a facebook smear saying govt was taking Japanese rad waste to Gobi desert – on election day. This may have been a factor in opposition coming to power. Govt is trying to improve public awareness and understanding of nuclear. There is work for school teachers and information being sent out. Public information strategy document for Mongolia has been prepared under the European commission project. The Executive office of Nuclear energy commission implementing research projects on public awareness for nuclear technology every year funded by governmental budget.

10. Philippines

Do regular information campaigns, travel to regions to promote nuclear and emphasise safety. Have training for school teachers and bring students in to learn. In process for disposal site, the local government was very involved, and accepted proposal, but has changed. Need to keep discussing. Need to have stakeholder management and gauge public acceptance. There was a campaign for a research reactor which worked well, and will be copied for the waste disposal facility.

11. Vietnam

Was a large program when the NPP was proposed. This included a radioactive waste repository. The local government was involved and there was good communication. This has stopped with the NPP proposal.