Annex 3

Session Summary of
FNCA 2016 Workshop on
Radiation Safety and Radioactive Waste Management

Session I: Country Report on Nuclear/Radiological Emergency Preparedness and Response

◆ **Progress, Improvement and Future Plan over the Prior Year**

1-1) Bangladesh (Dr M. Moinul Islam, Bangladesh Atomic Energy Commission)

The country paper briefly described the policy, regulatory framework and legislation regarding nuclear/ radiological emergency. Outline of the control of occupational radiation exposure mentioned in the report. The report also includes present status and future work relating to nuclear/radiological emergency regime in the country.

1-2) China (Prof An Hongxiang, China Institute of Radiation Protection)

China has established a comprehensive legislative framework on nuclear/radiological emergency preparedness and response including laws, regulations, rules, guides and references. China has established a comprehensive organizational structure system on nuclear emergency response. A national-level nuclear emergency joint exercise named 'Shendun-2015', involved nearly 1900 persons, was conducted in June 2015. Nuclear/Radiological accident emergency exercises were conducted in several NPPs/environmental protection departments prior to this year. China has been developing *Atomic Energy Law* and *Nuclear Safety Law* since several years ago, which nuclear emergency preparedness and response are included. China established national-level specialized nuclear emergency rescue forces including technical support centers, rescue subdivisions and training bases in 2015. An onsite support team of NPP nuclear accident emergency was established by State Power Investment Corporation in 2015. It is expected that *Nuclear Safety Law* will be promulgated in 2016 or 2017. A national emergency rescue team is being constructed in 2016.

1-3) Indonesia (Mr Moch Romli, National Nuclear Energy Agency of Indonesia)

Indonesia has had policy and legal framework to regulate Nuclear Emergency Preparedness and Response, from Act level to Standard level. It contains rules and guidance for Nuclear EPR like requirements for radiation and nuclear facility, EPR Organization Structure and the function, and determine the nuclear emergency category. Nuclear emergency class in Indonesia were in the range category 2 to category 4. The highest class of nuclear emergency in Indonesia (category 2) are owned by Multi-Purpose Reactor in Serpong (30 MWt) and Research Reactor TRIGA 2000 in Bandung (2 MWt). On national scale, participating organization can be found in structure of EPR Organization. Head of National Disaster Management Agency acts as Chairman of EPR Organization, assisted by the concessioner of the facility and the Deputy of National Disaster Management Agency. Reporting is to the Nuclear Energy Regulatory

Agency (NERA/ BAPETEN). To support operations, there are the Indonesia National Army, related ministers and agencies. For the technical operator, there are Police, Firefighters, and Medical Ambulance as a first responder. For the radiological assessor, there are National Nuclear Energy Agency (NNEA/ BATAN), Nuclear Biology Chemistry Squad from Indonesia National Army, and from Meteorology and Geophysic Agency. Stakeholders have organized trainings, drills & exercises, as well asother activities related to the implementation and improvement of the EPR Program. Stakeholders have also implemented the Radiological Data Monitoring System as an early warning system. Regulatory body will develop a coordination system (i-CoNSEP) to support and facilitate the development of sustainable human resources through the provision of a National Nuclear Security and Emergency Preparedness Program.

1-4) Japan (Prof Toshiso Kosako, The University of Tokyo)

To discuss emergency preparedness, we need to understand the emergency type. There are two types of emergency, namely nuclear emergency and radiological emergency. Nuclear emergency includes Chernobyl accident (1986) and Fukushima Daiichi Nuclear Power Plant Accident (2011), etc. On the other hand, radiological emergency can be induced by mishandling of radiation, which includes Goiania accident (1987) and Thailand accident (2000).

To promote the emergency preparedness, international cooperation and guidelines are useful and important. If accident happens in nuclear power plant in some country, the country needs to inform neighbor countries that they might be affected by the accident, and needs to report to IAEA regarding the accident. In case of nuclear accident or radiological emergency, IAEA will disseminate information and offer assistance.

After the recent Fukushima accident, the following are taking place for Japan: 1) The formation change for emergency response - from the combination of MEXT-METI-NSC-Cabinet to Cabinet-NRA only (only regulation arrangement); 2) Preparation of new regulations for emergency preparedness e.g. wider range of evacuation area of UPZ (30 km) instead of EPZ (10 km); 3) Requirement for agreement on the emergency preparedness from inhabitants over a wider range. Sometimes over one million people are included; 4) The prediction system (SPEEDI) lost its importance. More emphasis on actual measurement was introduced to estimate the radiation dose for the emergency.

One of the difficulties in emergency response is education. Though it is not hard to educate radiation workers, it is more challenging to educate people non-radiation workers like the firefighters and police officers that would only access the nuclear accident site at the event of an emergency response.

1-5) Kazakhstan (Mr Yevgeniy Tur, National Nuclear Center of the Republic of Kazakhstan)

The Republic of Kazakhstan is in the process of updating its regulatory base in the field of atomic energy. The updating process is far from completion. Improved version of the law "On Atomic Energy Use", the basic regulatory document in this field, has been issued in the previous year. New article on emergency preparedness and response was included in the text of the law. This article contains: requirements to develop and approve a national plan for response to nuclear and radiological accidents, conditions for implementation of this plan, and contents of the plan; requirements for operators to develop and approve their own facility's plans; requirements for operators to provide support of actions for emergency preparedness and response; requirements for authorized body to take action for notification and response in the case of transboundary accidents.

According to the article’s requirements a new document entitled "National Plan for Response to Nuclear and Radiation Accidents" was issued by our government on August 2016. The National Plan is a general document, and so development of additional practical guidelines is expected to clarify and specify the Plan's provisions.

1-6) Malaysia (Mr Nazran Bin Harun, Malaysian Nuclear Agency)

Nuclear and radiological emergency preparedness and response in Malaysia consists of policy, regulatory framework and legislation, emergency classes and condition, participating organizations, concept of operation and related activities. The National Security Council Directive No. 20 (Revised 2012) is a policy and mechanism on National Disaster and Relief Management. It is the main guideline for disaster management in Malaysia. Under the Directive No.20 (Revised 2012), National Disaster Management Agency (NADMA), a newly established agency under the Prime Minister’s Department, is responsible to lead and manage all nuclear and radiological emergency if considered disaster. The Atomic Energy Licensing Act 1984 (Act 304) is a law related with nuclear and radiological emergency which is under purview of Atomic Energy Licensing Board (AELB). Under the Directive No 20, AELB is a Lead Technical Agency for nuclear and radiological emergency whereas Malaysian Nuclear Agency is a technical support organisation.

1-7) Mongolia (Ms Navaangalsan Oyuntulkhuur, Nuclear Energy Commission of the Government of Mongolia)

Nuclear energy law has been amended and the regulatory body and other relevant organizations were restructured in Mongolia in 2015. A set of new regulations and national basic standard has been approved by the Nuclear Energy Commission in 2015-2016.

According with the Mongolian structure regarding the level of the accident, the NEC, under supervision of the State Emergency Commission (SEC), in collaboration with NEMA or other respective professional agencies, shall make the arrangements to co-ordinate the emergency response of accident. However this program is not yet fully operational.

All hazard disaster or emergency responses in Mongolia are coordinated by the National Emergency Management Agency /NEMA. The Executive office of the Nuclear Energy Commission and General Agency for Specialized Inspection (GASI) plays a role within a multiagency response in providing coordination and technical advise in the event of a nuclear and radiological emergency.

The response organization does not have sufficient personnel to perform assigned initial response actions, however some personnel has been assigned to these tasks.

The National Plan consider the arrangements for mitigation actions, however a system is not yet in place. Therefore, the National Plan urgently needs updating and the Executive office of NEC is working on drafting a new version of the state level emergency plan, which will be finalized.
Strengthening of national infrastructure for emergency preparedness and response for Mongolia is urgently needed.

1-8) Thailand (Ms Nanthavan Ya-anant, Thailand Institute of Nuclear Technology)
The emergency planning and preparedness is a part of the licensing process. All licensees are required to prepare and submit a facility emergency response plan for approval by the regulatory body. The specific regulation in the emergency preparedness and response field, which is entitled “The Act of Disaster Prevention and Mitigation” has been promulgated in 2007. At the top level, there is a national emergency plan for an integrated response to any combination of hazards. The National Nuclear andRadiological Plan (NNREP) is part of this “all hazards” plan. The Office of Atoms for Peace (OAP) acts as a National Competent Authority and Technical Support which coordinate both regulatory bodies and response organizations. The Department of Disaster Prevention and Mitigation (DDPM) is the principle government agency in national disaster prevention and mitigation which acts as the first responder and/or decision maker. Ms Ya-anant also gave the information of the related activities such as the training course for frontline officers, workshop for the trainer of radiation detection equipment on border control, and the Field Training Exercise (FTX) Megaports Initiative at Laem Chabang Port Customs, Pattaya, Thailand.

1-9) Vietnam (Dr Pham Quang Minh, Vietnam Atomic Energy Institute)
Now in Vietnam, radiation and radioisotopes have been applied in health care, agriculture, industry, geology, mining, meteorology, hydrology, transport, construction, oil and gas industry, etc.
There is only one nuclear installation in the country - the Dalat nuclear research reactor with a capacity of 500 kW.
Vietnam is considering to introduce the nuclear power to meet growing electricity demand and to ensure energy security. Two Nuclear Power Plant (NPP) projects in Ninh Thuan province (Ninh Thuan 1 and Ninh Thuan 2) are in the Feasibility Study (FS) phase. According to the Adjusted Master Plan on National Electrical Development in period 2011-2020 to 2030, the first nuclear power plant (NPP) will be put in operation in 2028, to 2030 nuclear power generation capacity of 4,600 MW with production of about 32.5 billion kWh.
Atomic Energy Law had been approved at the twelfth National Assembly Session 3 on 3rd June 2008 and come to enforce on 1st January 2009. The Atomic Energy Law includes 11 Chapters with 93 Articles. Chapter X includes the following contents: Emergency preparedness for radiation and nuclear incidents and accidents; Compensation for damage.
VARANS have been assigned to develop the National Nuclear and Radiological Emergency Response plan. The Draft of the plan is available and is being reviewed by the relevant organizations. Decree on the establishment, organization, duties, powers and coordination mechanisms of the State Steering Committee,

Provinces and relevant Ministries on Response of Nuclear and Radiological Incidents has been developed by VARANS in 2014. The Draft of the Decree is being reviewed in 2016. It will be submitted for the Prime Minister's approval in 2017.

This presentation includes the following main content: Objectives of Nuclear Radiological Emergency Preparedness & Response; National System on Nuclear Radiological Emergency Preparedness & Response; National legislation framework; Activities concerned in recent years; Conclusion and Proposals.

Session II: Peer Review of Consolidated Report on Nuclear/Radiological Emergency Preparedness and Response

Member countries peer-reviewed the draft and set each interim goal. Each draft will be finalized after some amendments and English grammar check.

Session III: Country Report on Low/Intermediate Level Waste Disposal Facilities/Long Term Storage Facilities

◆ **Progress and Future Plan over the Prior Year**

3-1) Indonesia (Mr Moch Romli, National Nuclear Energy Agency of Indonesia)

Radioactive wastes are produced in Indonesia by nuclear and radiation facilities such as nuclear research reactors, radioisotope and radiopharmaceutical production facilities, nuclear fuel research centre, hospitals, and industries. To manage the radioactive waste generated, Indonesia has a radioactive waste treatment plant, interim storage for spent fuel, and interim storage for contaminated material and Disuses Sealed Radioactive Source Category 1-5. For disposal facility, BATAN (National Nuclear Energy Agency of Indonesia) has already designed a Near Surface Disposal facility at the Serpong site. Associated with Indonesia Projection of NPP Capacity till 2050, several potential sites have been surveyed and assessed for Near Surface Disposal (NSD) and Deep Geological Disposal (DGD). The planned timeline for Indonesia is as follows: if the first NPP is operational in 2027, the first NSD will be operational in 2067 and the first DGD in 2133.

3-2) Vietnam (Dr Pham Quang Minh, Vietnam Atomic Energy Institute)

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.

Vietnam is considering introducing nuclear power to meet the 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 in the Feasibility Study (FS) phase. According to the Adjusted Master Plan on National Electrical Development in period 2011-2020 to 2030, the first nuclear power plant (NPP) will be put into operation in 2028.

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

This presentation outlines the following: 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.

◆ **Progress and Future Plan over the Prior Year**

3-3) China (Prof An Hongxiang, China Institute of Radiation Protection)

There were 28 nuclear power reactors in operation at the end of December 2015 in China, radioactive waste storage facilities affiliated were constructed. There were 31 nuclear technology application radioactive waste storage facilities in operation, storage capacity 26547 m^3 at the end of December 2015 in China. And there were 2 LILW disposal facilities in operation. It is required by MEP that the land for radioactive waste disposal facility shall be promised and supplied by related provincial government that would like to construct NPP. According to "Twelfth-Five Year Plan" and the 2020 Future Vision on Nuclear Safety and Radioactive Pollution Protection and Control, 2~3 LILW disposal facilities will be constructed in the future.

3-4) Japan (Dr Shoji Futatsukawa, Japan Radioisotope Association (JRIA))

1. Statistics on the use of radiation

The number of users of radiation approved permission and notification by NRA including users of the approved device with certification label is about 7,000. The number of users of general permission and notification is about 2,900 and the number decreases slightly year by year. The number of hospitals and clinical laboratories approved by the Minister of Health, Labor and Welfare is about 1,250 and the number is stable every year.

2. Management of radioactive wastes and disused sealed radioactive sources

JRIA collects the radioactive wastes generated from research and industrial organizations, and hospitals and clinics after the use of unsealed radioisotopes or radiopharmaceuticals all over the country. Users categorized radioactive wastes according to materials and put them into the special container of 50L steel drum. JRIA collects the special container including radioactive wastes periodically and stores them in storage facilities at JRIA's treatment laboratory. After then, JRIA burns combustible radioactive wastes by the exclusive incinerator. These procedures reduce volume and stabilize radioactive wastes. The treated radioactive wastes are stored in storage house until disposal. Responsible for the disposal, JAEA will take care of them. However, disposal site is not determined until now. After usage of the disused sealed radioactive sources, JRIA takes back them. Many numbers of disused sealed radioactive sources return to the origin foreign manufactures by JRIA. Other not returned sources are stored in JRIA's storage facility.

3-5) Kazakhstan (Ms Aliya Izbaskhanova, National Nuclear Center of the Republic of Kazakhstan)

The report considers one of the main challenges faced by global community is the long-term storage,

disposal and utilization of radioactive wastes. The report presents the mechanisms for radioactive wastes formation and accumulation in the territory of the Republic of Kazakhstan, several
places for Ionizing radiation sources and Radioactive Waste long-term storage and disposal were chosen in Kazakhstan. They are: tailing storage facility (Stepnogorsk hydrometallurgical plant, Koshkar-Ata lake, Ul'ba metallurgical plant), radioactive waste burial site (RSE "Institute of nuclear physics", Irtysh chemical metallurgical plant), repository for radioactive waste solid and liquid long-term storage (Mangystay atomic energy combine, RRC "Baikal-1" of RSE NNC RK branch "Institute of atomic energy").
The report gives an overview of the improvement and upgrading of national regulatory and legal base for regulation and control of radioactive waste management in Kazakhstan for 2015 - 2016.

3-6) Malaysia (Mr Nazran Bin Harun, Malaysian Nuclear Agency)

In Malaysia radioactive wastes are generated from the usage of radioactive materials in industry, medical, agricultural, research and educational purposes. The safe management of radioactive waste in Malaysia is governed by the Atomic Energy Licensing (Radioactive Waste Management) Regulations 2011, which is made under the Atomic Energy Licensing Act 1984 (Act 304).
Although radioactive waste in Malaysia is not big in volume, but the safe disposal of the waste is in its agenda. Therefore, for long-term safe management of radioactive waste, Malaysia is in process of identifying the suitable disposal site in Peninsular Malaysia. Remote sensing and geographical information system (GIS) technologies were used. In 2010 to 2012, in cooperation with the International Atomic Energy Agency (IAEA) and local agencies, a model of GIS framework was developed and the output of the model has been used for site screening to identify potential areas in seven (7) states in Malaysia. There are 23 potential areas have been identified Peninsular Malaysia, however the study need to be continued to identify the suitable sites.
Malaysia is also seriously address issues related to the safe management of disused sealed radioactive sources (DSRS). As a National Radioactive Waste Management Centre, DSRS that cannot be returned to country of origin will be sent to Malaysian Nuclear Agency. For safety and security reasons, Malaysia in cooperation with IAEA is developing a borehole disposal facility.

3-7) Mongolia (Ms Navaangalsan Oyuntulkhuur, Nuclear Energy Commission of the Government of Mongolia)

Mongolia does not produce radioactive sources. The amount of the radioactive waste is relatively low and is mostly consist of spent sources from medical and industrial practices. Generation of unsealed radioactive waste material is currently not considered to be a problem, but the situation could change with the development of new phosphate, oil, gas and uranium industries in the country.
The Isotope Centre of NEC has a long term waste storage facility which provides radiation protection technical services in Mongolia. The Isotope Centres keep all the detailed information regarding the spent radiation sources and waste in both hardcopy and electronic versions. There is an IAEA Project on the

"Establishment of a National Radioactive waste management capability for Mongolia" (2016-2017).

Currently Mongolia has no national radioactive waste management strategy and her infrastructure for radioactive waste management is insufficient to cater for the expected future waste arisings. The main objective of this project is to work with the IAEA to develop a radioactive waste management (RWM) strategy and strengthen the regulatory framework to ensure the safe and efficient management of radioactive waste in Mongolia.

Mongolia faces the following issues: a lack of technical capabilities for RWM; non-existing national program for RWM; absence of waste processing infrastructure (e.g., characterization equipment and facility) and staff training for RWM etc.

Mongolia's future plan:

- The first phase, conducted under this project will be to establish a waste characterization facility in Mongolia
- Establishment of a regulatory framework for waste management activities. (The regulations to be developed by 2017.)
- Development of a national waste management strategy. The regulation for the classification of radioactive sources will be developed in 2016-2017.
- Develop the waste management plan based on the waste inventory and storage requirements.
- Methodology of radioactive waste characterization to be developed in 2016-2017
- Characterization equipment to be installed in 2017.
- Improvement to the infrastructure of the radioactive waste storage facility
- Expert mission for the review of the national waste management program and strengthening of activities of the waste managment facility.
- To train the relevant staff of the Isotope Center (IC) and to conduct training course for the users on classification of RadWaste.

3-8) Thailand (Ms Nanthavan Ya-anant, Thailand Institute of Nuclear Technology)

The progress on radioactive waste management in Thailand was presented, on the conditioning operation of disused sealed radioactive source (DSRS) Cat.1-3 and its long-term storage facility. The roles and function of the Thailand Institute of Nuclear Technology (TINT) and the radioactive waste management center and its infrastructure were described. The main source of waste came from medicine, industry, research and education as well as consumer products. The progress of management of disused sealed radioactive source was also given in detail. A total of 372 sources were recovered from different devices in Thailand and safely conditioned into four capsules and stored in four packages at the long term storage facility at the TINT Ongkharak site. The dismantled and conditioned sources include gamma and neutron sources: 32 Cs-137 (592mCi total activity); 151 Co-60(97mCi total activity); 1 Am-241(285 mCi); 10 Am/Be and 2 Ra/Be (853mCi total activity), 2 Kr-85 (210 mCi) and consumer products; 165 Am-241 and 9 Ra-226 from smoke and lighting preventers devices.

Session IV: Special Lecture

4-1) Current Situation of Fukushima Dai-ichi NPP (Prof Toshiso Kosako, The University of Tokyo)

Two categories of emergency was defined- Nuclear emergency and Radiological emergency. Under Nuclear emergencies from the time of the Windscale (UK) reactor fire accident (1957) to the Fukushima-daiichi NPP core meltdown (2011) accident, we have experienced several severe NPP accidents including the Three Mile Island and Chernobyl accidents. Photos and data reviewed the detail of the Fukushima accident. Serious release of radioactivity from NPP caused vast land contamination through the flow of radiation plume. Food contamination and the confusion faced by the evacuated inhabitants were explained.

Now five years have passed. The present situation of the Fukushima NPP and its surroundings are summarized as follows.

(1) On-site: 7,000 radiation workers had been engaged in the decommissioning of the damaged reactor with the use of robot technology.

(2) A new Nuclear Regulation Authority (NRA) was formed and the review of NPPs using renewed safety regulations is continuing.

(3) Off-site: The clean-up activities are continuing over the vast contaminated area. However the plans for the recovered residue are not so clear due to the lack of agreement on the siting and design of the repository.

(4) The emergency preparedness plans were updated to include a wider evacuation zone of inhabitants (from EPZ 10km to UPZ 30km).

(5) The health effects of radiation workers and public are not yet determined. In particular the health effect, thyroid damage, physiological effect on the public are still under contention.

(6) In the political and economic arena, the energy policy including "for and against" NPP operation, and the burden on governmental budget (more than 200 Billion USD) are still in discussion.

4-2) Activities of Japan Radioisotope Association (JRIA) (Dr Shoji Futatsukawa, Japan Radioisotope Association (JRIA))

Japan Radioisotope Association (JRIA) is a public and nonprofit organization by memberships. JRIA strives to disseminate knowledge and technology, promote the utilization of radioisotopes and radiopharmaceuticals, and ensure their safe use throughout Japan. JRIA has established an integrated system from supply of radioisotopes and radiopharmaceuticals through to their disposal, in compliance with all relevant acts and regulations. JRIA aims to promote the beneficial use of radioisotopes and radiopharmaceuticals, and contribute to the development of science and technology, as well as helping to create a better quality of life. JRIA imports, manufactures and transports radioisotopes and radioactive products in a safe and secure manner, making use of advanced expertise and technologies derived from its accumulated experience in handling radioisotopes, gained over the past 60 years.

JRIA has been working in Komagome Site in Tokyo since 1951. The building including radiation facilities and equipment are superannuated. So JRIA makes the decision of construction the new radiation laboratory in another site. The new radiation laboratory named Kawasaki Technological Development Center is been constructing at King Skyfront in Kawasaki City, western area in Tokyo metropolitan. The JRIA's business concerning radioisotope-handling except training program will be started at the New Radiation Laboratory from 2018.