Chapter 3

International Cooperation on Emergency Preparedness and Human Resources Development

Study on Nuclear Safety Management in East Asian Countries Working Group

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CHAPTER 3

International Cooperation on Emergency Preparedness and Human Resources Development

1. Indonesia

1.1. National Plan for Emergency Preparedness

The basic concept of the national nuclear emergency plan in Indonesia is to ensure that the arrangements for a nuclear emergency response are available on the facility, local government, and national levels. The functions of the response are defined, including identification, notification and activation, mitigatory action, urgent protective action, protection of emergency workers and the public, and information and instruction to the public.

Figures 1, 2, and 3 show the organization of emergency response at the national, province and facility levels. The role of the technical support section in each organization is to collect information, analyze the facts, and advise the operating team and any other relevant parties. The role of the operating section is to share information and conduct necessary actions.

Figure 1: Emergency Response Organization on the National Level

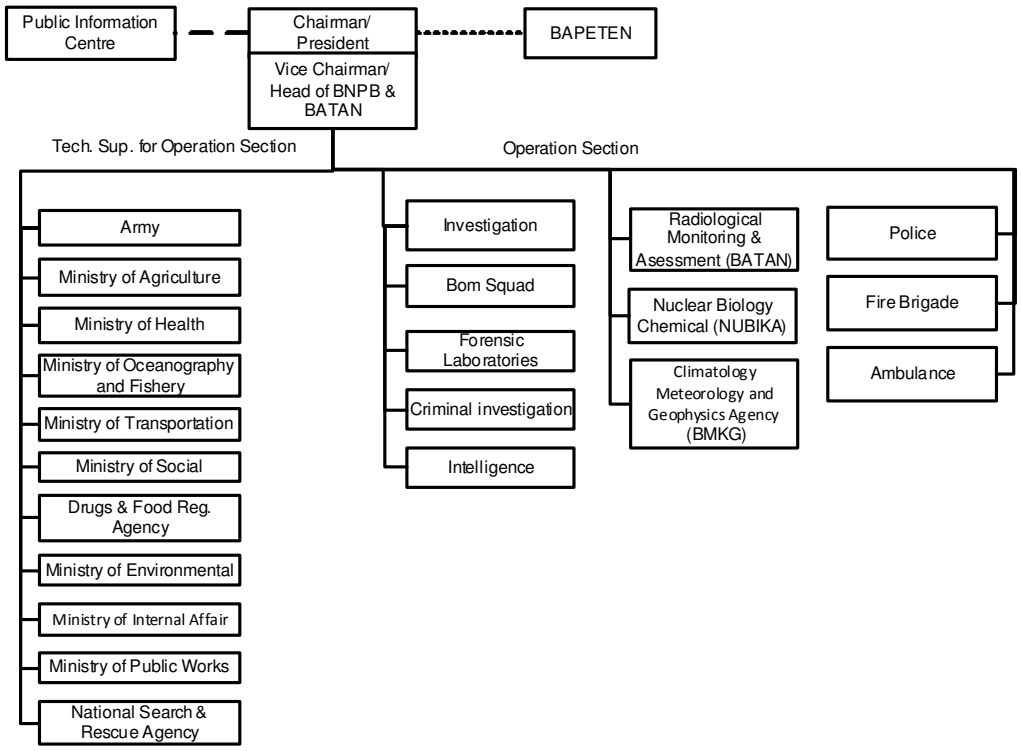


Figure 2: Emergency Response Organization on the Local Government Level

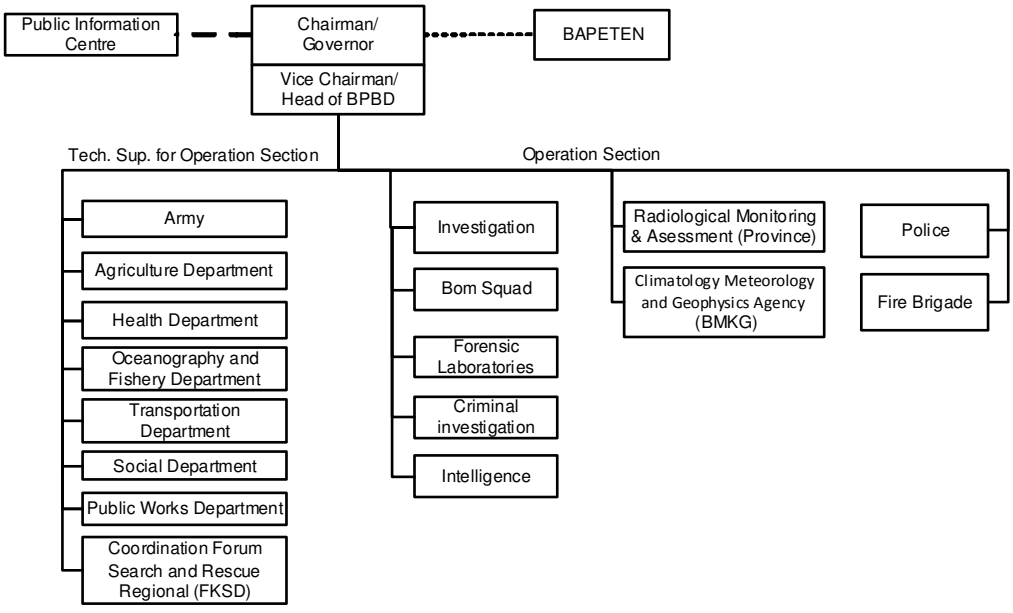
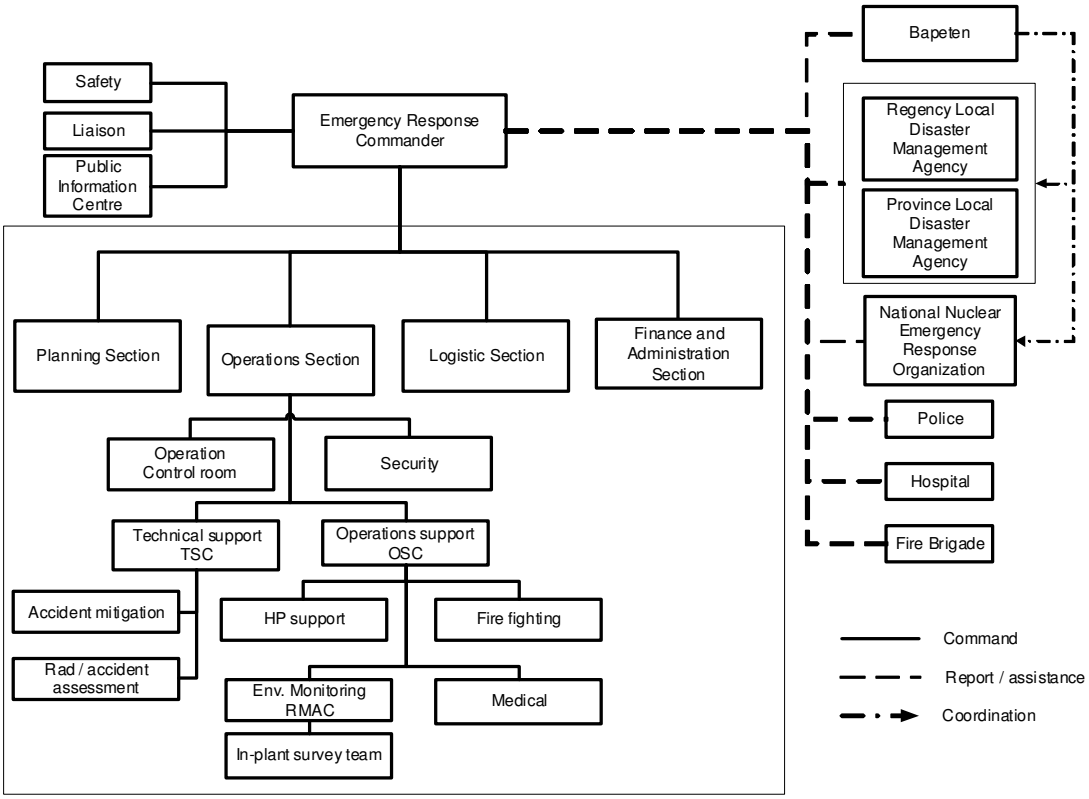


Figure 3: Emergency Response Organization on the Plant Level



The Indonesian Nuclear Agency (BATAN) is responsible for the technical operation, in cooperation with the national emergency agency. It also conducts emergency environmental monitoring based on ERMEWS information, survey and critical group dose analysis, radiological impact assessment for the short, intermediate and long terms, waste management, and medical emergencies with the health ministry. The role of BAPETEN is to control the safety and security of the emergency response, to advise the Incident Commander on decision-making in emergency responses, and to coordinate with the IAEA. There is a dispatch team (FAT) for radiological emergencies within BAPETEN and it has some experience with radiation emergency activities.

1.2. International Cooperation on Emergency Preparedness

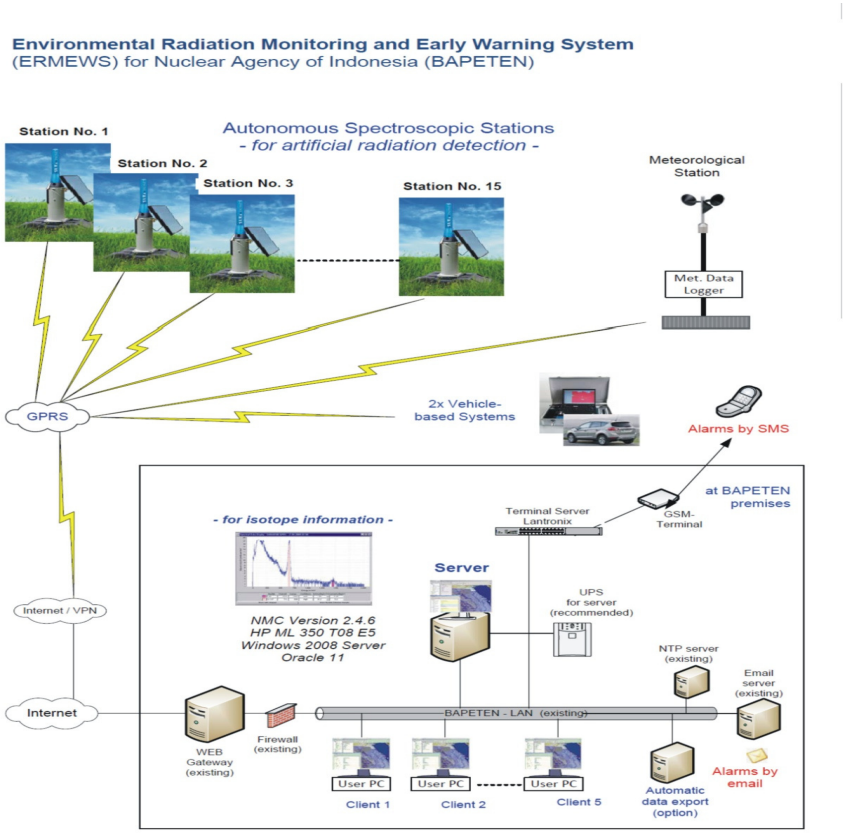
The purposes of regional cooperation in radioactive emergency are to enhance the capabilities of Indonesia in responding to and managing a radiological or nuclear emergency, and to promote a regional approach within ASEAN. Based on these objectives, Indonesia proposes two issues:

- Task 1: Installation of “state of the art” decision support capability in the national emergency centre, such as WSPEEDY, ARGOS CBRN, or RODOS, which links to regional nuclear emergency responses
- Task 2: Networking on international levels in the areas of early warning and air monitoring networks, radiological monitoring, meteorological and weather monitoring, radioactive plume dispersion modeling capabilities, and coordination in making decisions related to cross-border issues.
-

1.3. Domestic Program for Human Resources Development for Radiation Monitoring

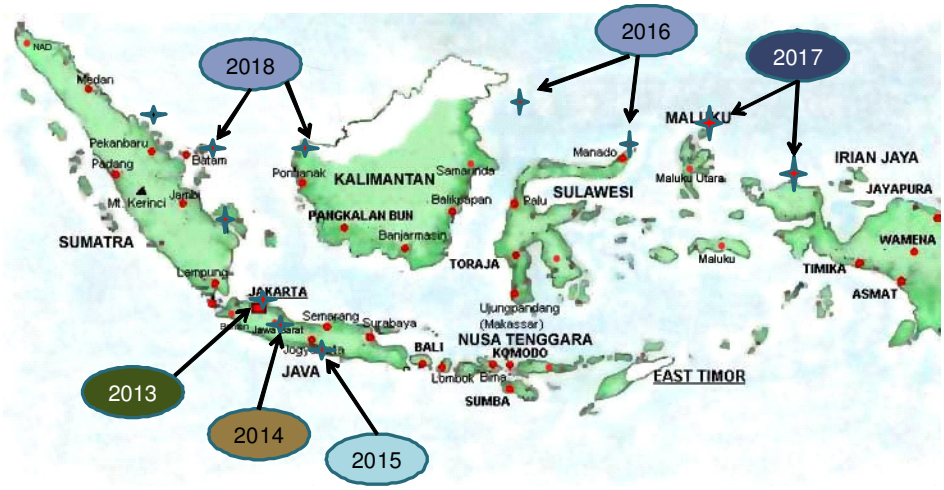
Radiation monitoring is one of the most important issues in the case of radioactive releases from nuclear facilities. The Indonesian government has established an Environmental Radiation Monitoring and Early Warning System (ERMEWS) to share hazardous information in the case of radioactive emergency. Figure 4 shows an image of ERMEWS. The main operating system and the server are in BAPETEN, the safety authority; the facilities, the sites and BAPETEN are connected by the internet.

Figure 4: How ERMEWS works in Case of Radioactive Emergency



The Indonesian government also has a program to expand the system to a nationwide level. As of 2013, the system works in a limited area near Jakarta; it will be implemented in a wider area in Java Island by 2015, and around areas in Sulawesi and Kalimantan Island by 2018. Figure 5 shows the implementation schedule for the ERMEWS system by the Indonesian government.

Figure 5: Implementation Schedule of ERMEWS system



2. Malaysia

2.1. National Plan for Emergency Preparedness

The National Security Council of the Prime Minister's Department has published Directive No. 20 – The Policy and Mechanism on National Disaster and Relief. The purpose of this Directive is to outline a policy on disaster management and relief on land, according to the level of disaster. This Directive also identifies and determines the roles and responsibilities of the various agencies involved in handling disasters, and AELB has been identified and designated as the Lead Technical Agency for Radiological and Nuclear Emergency in Malaysia. In order to handle disasters more effectively, the Disaster Management and Relief Committee (DMRC) has been established at the federal, state, and district levels, with the Deputy Prime Minister as chairman of this committee at the federal level. As the lead technical agency, AELB has prepared and documented a Radplan that outlines the procedures for radiological emergencies in Malaysia. AELB has also established a Radiological Emergency Response Center and Nuclear Emergency Team on 24-hour standby, with trained officers equipped with all necessary equipment and communication systems to respond if any emergency situations arise.

2.2. International Cooperation on Emergency Preparedness

The Fukushima Daiichi accident created a fear among the Malaysian population, even though the location of the accident is very far from Malaysia. AELB, as a nuclear regulatory body in Malaysia, took the initiative to inform the public about the situation in Fukushima Daiichi every day through mass media. AELB also alerted and activated their Nuclear Emergency Team on standby for 24 hours and monitored the level of environmental radiation exposure thorough the Environmental Radiation Monitoring System (ERMS), which has been installed at 7 locations throughout the country. Besides monitoring the environment, AELB also monitored all airplanes, vessels and passengers and randomly monitored all goods and foods coming from Japan.

Based on the experience in Malaysia during the Fukushima Daiichi accident, there is a need for the countries in this region to cooperate in radiological and nuclear emergency preparedness and response. Malaysia would like to propose cooperation in the following areas:

- Information sharing on accidents/incidents
- Exchange of emergency experts
- Providing expertise and technical assistance on preparedness and response among countries in the region
- Conducting joint training and exercises (table-top)
- Establishing the ASEAN Regional Radiological and Nuclear Emergency Preparedness and Response Hub

2.3. Domestic Program for Human Resources Development

To enhance the knowledge and skill of AELB's Nuclear Emergency Team in handling emergency situations, they always participate in any training program and exercise conducted by the National Security Council at a national level, especially those involving CBRN (chemical, biological, radiological, nuclear and explosive). This exercise normally involves all relevant agencies responsible in an emergency and first responders. AELB also periodically carries out an emergency exercise or drill with licensees to ensure their preparedness and readiness to respond in the event of a radiological emergency.

3. Philippines

3.1. National Plan for Emergency Preparedness

PNRI, the safety authority of the Philippines, serves as a lead agency in developing and updating an emergency plan—the National Radiological Emergency Preparedness and Response Plan (RADPLAN)—for all radiation-related accidents that may affect the Philippines. The RADPLAN has been set into action by the National Disaster Risk Reduction and Management Council (NRDMMC).

The purpose of the RADPLAN is to establish an organized emergency response capability for timely, coordinated action of the Philippine authorities in a peacetime radiological incident or emergency, in order to protect public health and safety. The scope of the RADPLAN includes all kinds of radiological emergencies, such as operating nuclear and radiation facilities, using and transporting radioactive materials, and accidents occurring outside of the Philippines with a significant impact on the country.

There are five types of emergencies:

- Emergencies from fixed nuclear or radiation facilities
- Emergencies occurring in the transport or loss of radioactive materials
- Emergencies from foreign sources having an environmental or health impact on Philippine territories, including the possible entry of contaminated food, scrap metals, and other materials
- Emergencies from re-entries of satellites with nuclear materials as components
- Emergencies from nuclear ships

There are also three classifications of emergencies:

- Emergency Level 1 – Alert
- Emergency Level 2 – Site Area Emergency
- Emergency Level 3 – General Emergency

The RADPLAN will be adopted under the following conditions:

- When a regional or local authority, other national organizations with jurisdiction, or the private sector requests government support in the event of a radiological emergency; or
- When government agencies must respond to meet their statutory obligations in

response to a radiological emergency.

A formal declaration will be made jointly by the Office of Civil Defense (OCD) and the PNRI in the activation of the RADPLAN, notifying concerned participating agencies and the affected local disaster coordinating councils.

There are six stages in the national response under the RADPLAN:

- Notification
- Mobilization
- Deployment
- Interventions and Recovery
- Deactivation
- Post-Accident Analysis and Evaluation

3.2. International Cooperation on Emergency Preparedness

Possible regional cooperation on emergency preparedness is as follows:

- Development and update of regulations, regulatory guides, rules of procedures, standards and criteria relative to the safety and security of radioactive materials
- Technology transfer to improve monitoring and analysis of radiation levels and other necessary equipment relevant to radiological emergency response
- The conducting of training on emergency preparedness and response
- Establishment of a Center of Excellence for Emergency Preparedness

3.3. Domestic Program for Human Resources Development

The decision to mothball the Bataan NPP in 1986 resulted in a vacuum for local expertise in the various areas of nuclear science and engineering. The government has lost the local expertise needed for the BNPP operation, either through reassignment or retirement of said personnel. (Some also became overseas workers.) Local universities have discontinued their nuclear energy engineering degree programs. Thus, current training of nuclear experts is heavily dependent on regional and international programs.

3.4. International Cooperation on Human Resources Development

The Philippines continues to avail itself of training courses and scholarships offered by the IAEA through the PNRI; the Forum for Nuclear Cooperation in Asia

through its Asian Nuclear Energy Training Program; and bilateral partners like the United States, Japan and Korea. The Philippines sits as a member of the ASEAN Sub-sector Network on Civilian Nuclear Energy, and within the ASEAN+3 (Japan, Korea and China) energy cooperation framework, the Philippines actively participates in the conduct of Nuclear Energy Human Resource Development and other technical trainings both at the senior policymaker and technical levels.

During the last quarter of 2012, the DOE and PNRI jointly collaborated with the IAEA in organizing Workshops on the Development of National Infrastructure for Nuclear Power Program and the Conduct of Self-Assessment using IAEA Specific Safety Guide No. 16: Establishing the Safety Infrastructure for Nuclear Power Program.

4. Singapore

4.1. International Cooperation on Emergency Preparedness

With the future growth of nuclear energy in the region, Singapore recognizes that it could play a role in global and regional cooperation on nuclear safety. This will facilitate the sharing of best practices in nuclear safety, emergency planning and response, human resources development, and the collective ability to respond to emergencies.

Areas of regional nuclear cooperation to which Singapore can potentially contribute

The Energy Studies Institute (ESI) is of the view that Singapore's foreseeable contribution in terms of regional and global nuclear safety cooperation will come from its emergency readiness planning, and cutting-edge research. Therefore, Singapore can potentially play an effective role in areas of regional nuclear cooperation such as emergency response, planning, and management, as well as technology development.

Current themes of nuclear-related research in Singapore

The ESI, situated at the National University of Singapore, is a think tank focusing on strategic energy research. It is currently in the process of carrying out research in three specific areas related to nuclear energy.

First, in terms of existing opportunities and challenges for regional nuclear cooperation in Europe, North America, the Middle East, Asia-Pacific, and Southeast Asia, it has looked at the various models and existing mechanisms of regional nuclear cooperation in the respective regions. It has identified the challenges that each region faces and looked at the prospects for regional nuclear cooperation in the context of the Asia-Pacific.

Second, to understand the impact of nuclear disasters/accidents (such as Three Mile Island, Chernobyl, and Fukushima), it examined the legal implications, cost, and environmental remediation of such accidents, comparing the effectiveness of the American, Soviet and Japanese governments' responses to their respective nuclear accidents, and highlighting issues that countries interested in acquiring nuclear technology should consider. It did a comparison of the American, Russian and Japanese responses to the nuclear accidents to date, identifying the costs and legal implications of nuclear accidents and the issues that any newcomer to the nuclear energy field must consider to predict nuclear accidents and how they can be prepared to deal with them.

Third, to understand the factors, conditions and actors that are able to shape public perception about nuclear energy, and the potential influence of pro- and anti-nuclear movements in Southeast Asia, ESI looked at the role of pro- and anti-nuclear energy movements and the potential role of international/regional NGOs in influencing the nuclear debate. It also identified the factors prompting such movements.

These nuclear energy-related research areas have been identified by ESI as important first steps to understand Singapore's potential role in regional nuclear cooperation.

Regional cooperation

The International Atomic Energy Agency (IAEA), Asian Nuclear Safety Network (ANSN), and ASEAN Nuclear Energy Cooperation Sub-Sector Network (NEC-SSN) play an important role in fostering regional cooperation on nuclear energy development and safety through the sharing of best practices and information exchange.

Moving forward, the IAEA could continue to implement more efficient communication systems to provide real-time information on nuclear accidents and frequent updates on the responses by affected countries to Member States.

As Southeast Asia is considering the development of nuclear energy – Vietnam, for example, is scheduled to begin nuclear plant operations in 2020 – the ANSN could focus on effective public communication of nuclear issues for a more integrated approach toward regional nuclear cooperation.

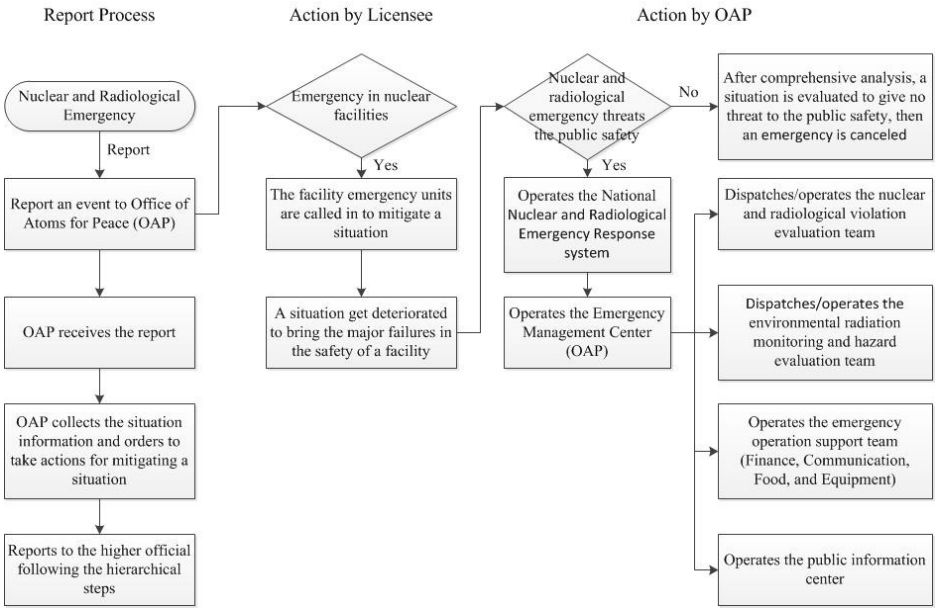
Finally, it will be useful for ASEAN NEC-SSN to cooperate on capacity building (including human resources development, education, and training) and, emergency preparedness and response plans, in order to facilitate the adoption of internationally recognised best practices and safety standards in the region.

5. Thailand

5.1. National Plan and International Cooperation for Emergency Preparedness

The National Nuclear and Radiation Emergency Plan was endorsed on June 4, 2010, and officially enforced by the end of 2010. The purpose of the national radiological emergency response system is to prevent public disasters, mitigate disasters, provide relief after disasters, and rebuild societies after disasters. The emergency response system is led by OAP.

Figure 6: National Radiological Emergency Response System of Thailand



Policy statements for emergency preparedness are as follows:

- All organizations shall be ready for nuclear and radiological emergency situations.
- All government ministries and agencies, response organizations, and the general public shall be involved and support the National Disaster Prevention and Mitigation Plan and National Protection Plan.
- All ministries, agencies, and response organizations shall use the National Nuclear and Radiological Emergency Plan as the primary plan for a radiological emergency.
- The implementation of emergency preparedness and response shall be done by unifying and effective methods, with prompt readiness for every situation.

5.2. Domestic Program and International Cooperation for Human Resources Development

After the Fukushima accident, the government decided to extend the "Pre-Project Activities" phase for 2011-2016. Programs for human resources development will be focused in this period, and research and development programs (including education

and training) will be mainly focused on the area of non-power applications.

Under the Country Program Framework for 2006-2011, signed by the Government of Thailand and the IAEA, technical cooperation assistance shall be provided to the following sectors:

- Agriculture
- Health
- Environment
- Energy
- Science & Technology
- National Development on Nuclear Science & Technology
- Utilization of Research Reactor
- Radiation Safety and Radioactive Sources Security
- Nuclear Safety

Under the Host Government Agreement (HGA), the following efforts were made in 2009-2010:

- Regional Training Course on Basic Applications of Radiation Modification of Polymers for Agriculture (October 19-23, 2009, Bangkok)
- Workshop on Safety Assessment for Predisposal Radioactive Waste Management Facilities (ANSN) (November 23-27, 2009, Bangkok)
- Workshop on Periodic Safety Review of Research Reactors (ANSN) (November 30-December 4, 2009, Bangkok)
- FAO/IAEA Regional Training Course on Surveillance of Tephritid Fruit Flies in Support of Planning and Implementing Area-Wide Integrated Pest Management Program (January 18-22, 2010, Bangkok)
- Regional Meeting on Analysis of Non-conformities in Fulfillment of the Requirement of ISO15189 and Biosafety Training, especially for BSL3 Laboratories (November 9-13, 2009)
- Regional Workshop to Facilitate the Development and Dissemination of e-Learning Course on the Cyber Platform (May 17-20, 2010, Bangkok)
- Regional Training Course on Ventricular Function Evaluation with Fated Photon Emission Computed Tomography (SPECT) and Radionuclide Vertriculography (MUGA) (July 19-23, 2010)

- Regional Training Course on Safety Case for Predisposal Management and Centralized Storage of Radioactive Waste (November 8-12, 2010, Bangkok)
- Regional Meeting to Create a Network of Medical Professionals on Radiation Protection of Children (December 15-17, 2010, Bangkok)

6. Vietnam

6.1. National Plan for Emergency Preparedness

With the National Nuclear and Radiological Emergency Plan (NNREP), Vietnam has established a framework for radiological and nuclear emergency planning (preparedness and response), which allows for the implementation of Emergency Preparedness and Response (EPR) arrangements that are commensurate with the currently recognized threat. However, to implement a nuclear power program, Vietnam's EPR arrangements need to be upgraded to cope with the consequences of emergencies at NPPs. For the further development of the EPR arrangements, the NNREP needs to be completed, taking into account IAEA Safety Standards.

6.2. Domestic Program for Human Resources Development

In Decision No. 1558/QD-TTg on August 18, 2010, the Prime Minister approved the project "Training and Human Resource Development (HRD) for Nuclear Energy," which indicated the national direction, objectives, funds and implementation responsibilities in training and HRD for nuclear energy at the national level. This decision assigns the following responsibilities:

- MOET: overall responsibility for implementing the scheme, including the upgrading of the nuclear capability of selected universities and the VINATOM training centre
- MOIT and EVN: implementation of "Human resource training for NPP projects in Ninh Thuan" (Document No. 460/TTg-KTN)
- MOST: preparing the training needs of all other organizations (apart from EVN), as needed to support the nuclear power program.

The National Steering Committee (NSC) on human resource development

(HRD) in the field of atomic energy was established according to Decision No. 940/QD-TTG of the Prime Minister, dated June 17, 2011. The NSC is chaired by the Deputy Prime Minister of Vietnam in charge of education and training, science and technology, and social affairs. The Management Board, which is headed by the Minister of Education and Training, was also established to assist the NSC.

6.3. International Cooperation on Human Resources Development

Vietnam participates in some programs of the IAEA, RCA, and FNCA, and is involved in the Nuclear Energy Cooperation Sub-Sector Network (NEC-SSN) in the areas of legislative framework, public acceptance, and human resources development (among others). It also cooperates bilaterally with the Russian Federation, Japan, and the United States on training programs in nuclear fields. Further enhancement in the areas of Probability Safety Analysis (PSA) for nuclear safety and of Nuclear and Radiological Emergency Plans would be desirable within regional cooperation.

7. Korea

7.1. National Plan for Emergency Preparedness and Human Resources Development

The radiological emergency response scheme involves the Central Response Committee chaired by the Prime Minister, National Emergency Management Committee (NEMC), Off-site Emergency Management Center (OEMC), the Local Emergency Management Center (LEMC), the KINS-Radiological Emergency Technical Advisory Center, Korea Institute of Radiological and Medical Science (KIRAMS)-Radiological Emergency Medical Center, and KHNP-Emergency Operation Center (Table 1).

The central government has the responsibility of controlling and coordinating the countermeasures against a radiological disaster. In particular the OEMC, which consists of experts dispatched from the central government, local governments and designated administrative organizations, has responsibility of performing coordination of the management of radiological disaster and decision-making on

public protective actions (sheltering, evacuation and food restriction, Etc.). The OEMC consists of 7 actual groups including the Joint Public Information Center, which is in charge of providing accurate and unified information about radiological disasters and the OEMC Advisory Committee for the director of the OEMC.

Established by the local governments concerned, the LEMC implements the OEMC's decisions concerning public protective actions.

When an accident occurs, the KHNP as an operator of nuclear installation is responsible for organizing an Emergency Operation Center and taking measures to mitigate the consequences of the accident, restore the affected installations, and protect on-site personnel.

In addition, the central government establishes the national radiological emergency medical system for the coordination and control of radiological medical services. It consists of the National Radiological Emergency Medical Service Center and the primary and secondary radiological emergency medical hospitals designated by the region. The KIRAMS established the Radiological Emergency Medical Center, operating the national radiological emergency medical system during radiological disasters.

If any accident occurs in the nuclear facilities, the operator shall immediately report the emergency situation to the NSSC and local government, in accordance with the NSSC Notice (Radiation.003, Notice on Radiological Emergency Preparedness for Nuclear Licensee).

Korea's nuclear emergency plan is based on the Act for Physical Protection and Radiological Emergency (APPRE) and the Civil Defense Act. There are 4 different plans:

- National Emergency Plan (by central government)
- Local Emergency Plan (by local government)
- Emergency Technical Advisory Center Plan (by KINS)
- Licensee's Emergency Plan (by KHNP: approved by regulatory body)

Core elements of emergency preparedness are the following:

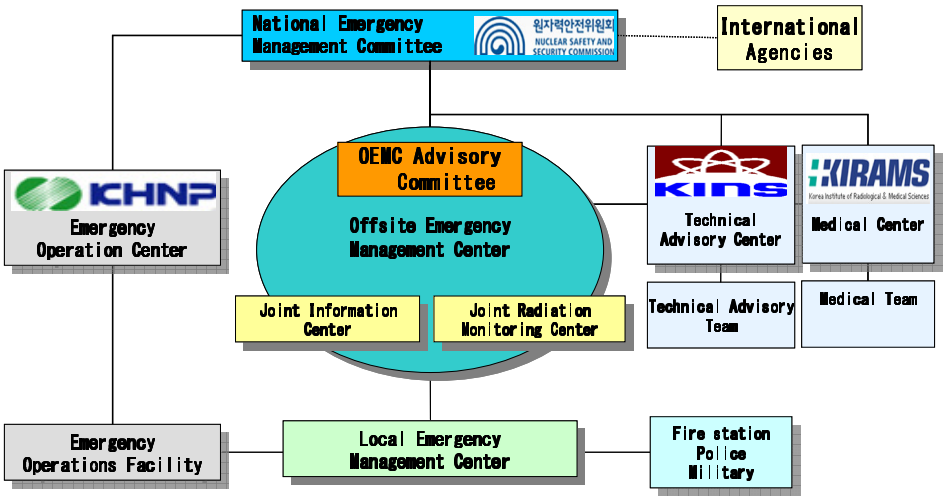
- Emergency Planning
- NSSC and local governments formulate Radiological Emergency Plans at the national and local levels, respectively.

- KINS reviews the Radiological Emergency Plan submitted by the NPP licensee as a licensing condition.
- Emergency Exercises
- NSSC, relevant central administrations, local government authorities, and NPP licensees conduct a set of emergency exercises and/or drills to demonstrate the effectiveness of EP&R.
- Emergency Training
- NSSC manages emergency training as per the APPRE.
- KINS conducts regulatory inspection of the training program in radiological emergency educational institutes.

Table 1: Types of Radiological Emergency

Class	Criteria	Response	
Alert	• Failure of sealing of radioactive container • Actual or potential degradation of plant safety • Expected release limited to a small fraction of PAG exposure levels	Others	• Activate TSC, OSC • Alert off-site emergency organizations
		KINS	• Activate Preliminary TAT
Site-area emergency	• High probability of major failures of plant functions • Need to protect the public • No expected release exceed PAG exposure levels except near site boundary	Others	• Activate EOF, LEMC • Alert NEMC
		KINS	• Activate TAT - Dispatch site TAT (plant, province/country) - Technical Advice
General emergency	• Actual or imminent substantial core degradation • Loss of containment integrity • Release can be reasonably expected to exceed PAG exposure levels	Others	• Activate NEMC
		KINS	• Maintain site area emergency status • Technical support • Recommend protective action

Figure 7: National Emergency Response Scheme



7.2. International Cooperation on Emergency Preparedness and Human Resources Development

Korea would be in a solid position as a responsible global partner by contributing to a regional/global nuclear system advancing the safe, secure, and peaceful applications of nuclear energy worldwide. The basic principle for international safety cooperation can be summarized in 3 key elements: 1) Participating in the initiatives of international organizations, which include international conventions, codes of conduct, and other proactive collaborative programs; 2) Contributing to global nuclear safety through creative partnerships with newcomers and supporting the establishment of a robust regulatory infrastructure; and 3) Exchanging information, experience, and technologies by building solid cooperative relationships with regulatory organizations worldwide. These elements will make a great contribution to the enhancement of domestic, regional, and global nuclear safety.

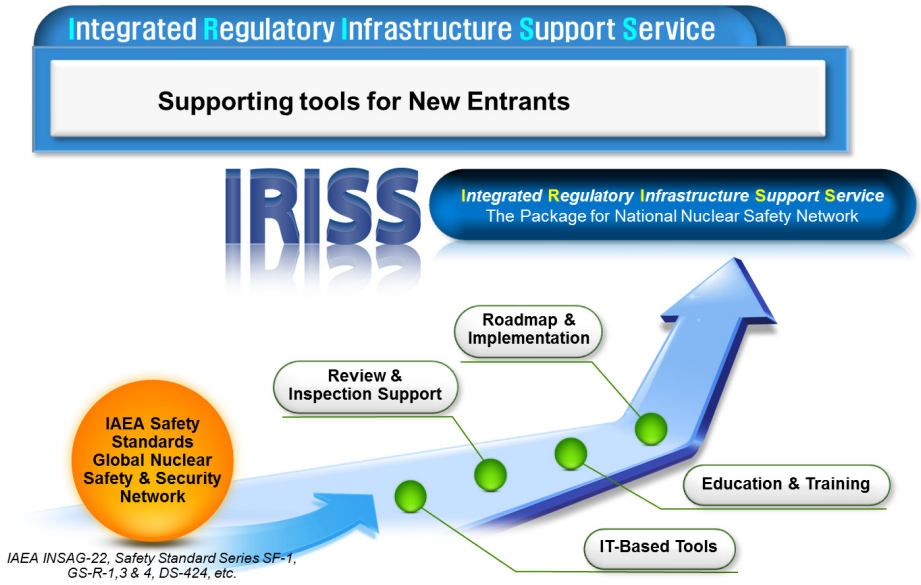
The first element, international cooperation, is shown in the active participation of Korea in a wide range of international activities that contribute to the establishment of a global nuclear safety regime. These activities include the implementation of international treaties and conventions for nuclear safety, the exchange of information on nuclear safety and regulation, cooperation in R&D on nuclear safety, and various international cooperation and supports. To achieve this

objective, Korea has been making efforts to promote the effectiveness and efficiency of nuclear safety regulation, by sharing operating and regulatory experiences and good practices through various bilateral and multilateral cooperation programs (such as the IAEA and OECD).

With respect to the second element, regional cooperation with newcomers who have a keen interest in the development of nuclear energy, Korea has been willing to develop concrete plans to assist them. The strategy for supporting newcomers can be implemented in a variety of ways. The first is to install regional safety networks in order to enhance effectiveness and efficiency through cooperation. The ANSN is a good example of regional cooperation. Second, the Integrated Regulatory Infrastructure Support Service (IRISS), consisting of IT-based tools, has been introduced for package-type support complying with customized programs of differentiated content for each state's need (as shown in Figure 8). The IRISS, developed by KINS, is an advisory package providing guidance and consultation on the establishment of a firm regulatory infrastructure and the enhancement of a regulatory body's competency. Finally, the training and education of regulatory staffs in the region through the International Nuclear Safety School (INSS) of KINS can provide, in an effective and efficient manner, the sharing of Korean experience and expertise accumulated during their development of nuclear energy with newcomers from the Asian and African regions.

With plenty of regulatory experience, KINS is actively developing programs to support the establishment of regulatory infrastructures in new entrant countries interested in the construction of new nuclear power plants, and is particularly contributing to the establishment of the global nuclear safety regime by leading regional nuclear safety networks.

Figure 8: Structure of the IRISS



Since 2008, Korea has participated in the Northeast Asian Top Regulators' Meeting on Nuclear Safety (TRM), which was established by Japan, China, and Korea to enhance regional cooperation on nuclear safety in Northeast Asia.

8. Japan

8.1. National Plan for Emergency Preparedness

In Japan, in light of the Three Mile Island (TMI) accident in 1979, the now-defunct Nuclear Safety Commission developed nuclear emergency preparedness guidelines, which was revised 14 times by 2010. Today, new safety regulator Nuclear Regulation Authority has implemented new emergency preparedness guidelines called the Nuclear Emergency Response Guidelines, based on the lessons learned from the Fukushima accident. This section provides an overview of Japan's structure for nuclear emergency preparedness and the Nuclear Emergency Response Guidelines currently in effect.

The nuclear emergency response measures in ordinary times are executed in accordance with the Nuclear Emergency Response Guidelines, which have been

established by the Nuclear Regulation Authority under the Act on Special Measures Concerning Nuclear Emergency Preparedness. Since wide-ranging government agencies and ministries are involved in this process, the Nuclear Emergency Preparedness Council, formed within the Cabinet, serves as the overall coordinating body. The Nuclear Regulation Authority plays the key role in emergency preparedness in framework by providing specialized and technical knowledge of nuclear safety.

In the event of a nuclear emergency, the Nuclear Emergency Response Headquarters is set up within the Cabinet to comprehensively coordinate central government agencies and local governments.

Figure 9: Organization of Nuclear Emergency Preparedness

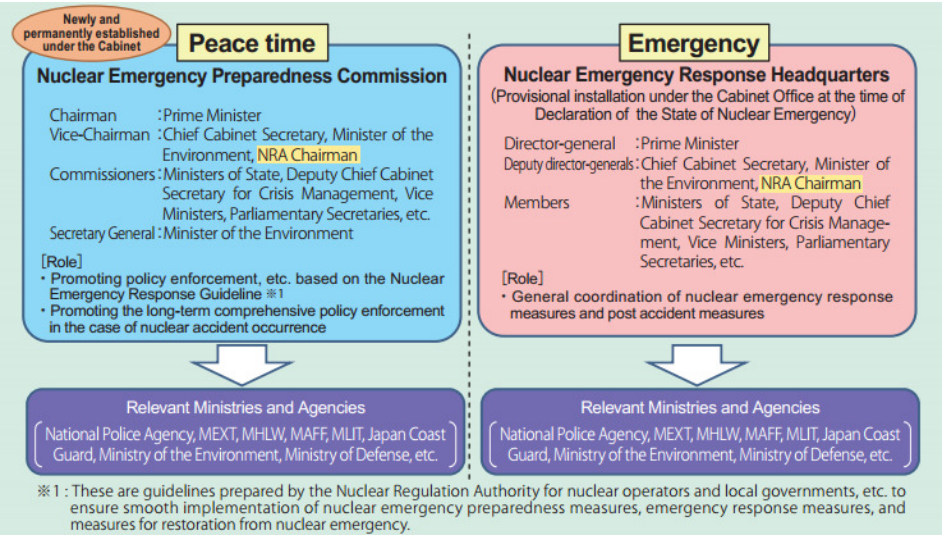
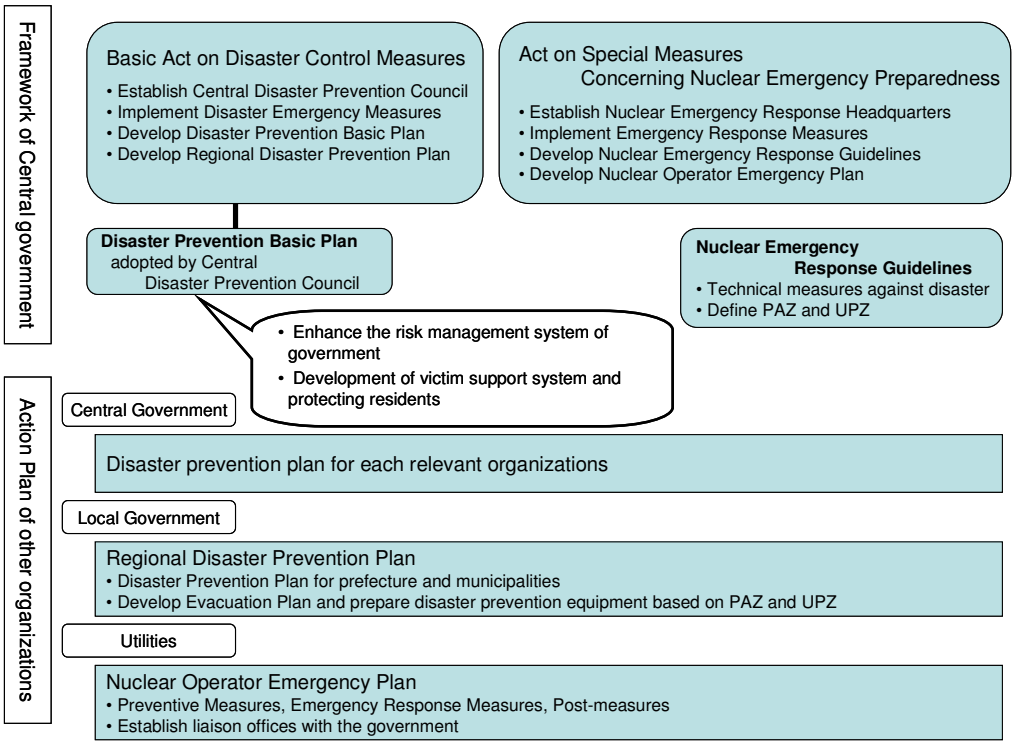


Figure 10 shows Japan's institutional framework for nuclear emergency response. The Act on Special Measures Concerning Nuclear Emergency Preparedness, a law specifically designed for nuclear emergency management, defines the basic framework for emergency preparedness and identifies what kind of guidelines and plans should be formulated. The national and local governments and operators are required to set up their own emergency response plans in accordance with the Nuclear Emergency Response Guidelines in place under this law.

Figure 10: Japan's Framework of Nuclear Emergency Preparedness Plan



The Nuclear Emergency Response Guidelines were established on October 31, 2012. After a revision on January 30, 2013, another revision was drafted and is under debate now.

The key elements of the Guidelines are as follows:

- Principles of nuclear emergency response
  - Basic concepts of radiation protection measures
- Issues concerning precautions against nuclear emergency
  - Predefining the Emergency Action Level (EAL), which is the basis for decision making in emergency situations, and the Operational Intervention Level (OIL) regarding air dose rates
  - Predefining the Precautionary Action Zone (PAZ, an approximately 5-km radius zone around the facility) and the Urgent Protective Action Planning Zone (UPZ, an approximately 30-km radius zone around the facility), where preparations, such as being ready for evacuation, have been made
  - Making preparations, such as providing information, performing monitoring, establishing a structure for radiation emergency medicine, and conducting

education and drills

- Issues concerning quick emergency response
  - Performing emergency monitoring to quickly ascertain the situation
  - Immediately providing accurate information to local residents
  - Implementing appropriate protective measures according to EAL/OIL
- Issues concerning nuclear emergency measures over the medium to long term
  - Evaluating the long-term health and environmental effects of radiation
  - Implementing decontamination measures to minimize the impact

The Guidelines have been developed by fully reviewing traditional emergency preparedness guidelines. There is a notable difference from the traditional one, which defined only the Emergency Planning Zone (EPZ), a 5-km radius zone around the nuclear power plant, as the area where preparations for evacuation and other actions should be made in case of a nuclear emergency. The new version has expanded the area where preparedness is required, defining two additional zones: PAZ within a 5-km radius and UPZ within a 30-km radius.

The Precautionary Action Zone (PAZ) is an area where precautionary protective actions, such as immediate evacuation based on the EAL, should be taken even before the stage of releasing radioactive material to the environment, in order to avoid effects of radiation exposure from a rapidly developing nuclear accident. Since IAEA standards specify that the maximum radius of the PAZ should be 3-5 km from the nuclear facility, the Guidelines stipulate that the general size of the PAZ should be "an approximately 5-km radius of the nuclear facility."

The Urgent Protective Action Planning Zone (UPZ) is an area where emergency protective actions are in place based on the EAL and OIL in order to minimize the risk of stochastic effects. Since IAEA standards specify that the maximum radius of the UPZ should be 5-30 km from the nuclear facility, the Guidelines stipulate that the general size of the UPZ should be "an approximately 30-km radius of the nuclear facility."

As a safeguard against radiation exposure, the Guidelines require prior distribution of stable iodine to people in the PAZ and the stockpiling of the pills by local governments outside the PAZ. As of May 2013, the draft revision of the Guidelines is in the public comment process. With respect to the prior distribution of

stable iodine to people in the PAZ, the revision states that briefing by doctors in advance and appropriate preliminary studies on side effects and allergies should precede the distribution. It further requires that the decision on stable iodine prophylaxis should be made by the Nuclear Regulation Authority and that the Nuclear Emergency Response Headquarters or the local government should issue orders in accordance with the decision.

8.2. Situation of Human Resources Development

Many nuclear-related departments have been established at universities across Japan to nurture excellent nuclear engineers to meet the advancement of nuclear development. In the 1980s, when many nuclear power stations were built, a substantial number of such departments existed, with 10 university departments and 11 graduate courses dedicated to nuclear studies. The number then began falling and the downward trend in academia continued until around 2004, pushing the number down to 1 university department and 4 graduate courses by 2004. However, with the recent renewed awareness of the importance of nuclear energy, the number has increased to 3 university departments and 8 graduate courses as of 2012. Nevertheless, much fewer students are interested in studying in nuclear-related departments today because of the increased public distrust in nuclear energy induced by the Fukushima accident and the announcement of the policy of moving away from nuclear power by the administration led by the Democratic Party of Japan. This is a crisis situation if Japan intends to continue developing outstanding nuclear engineers who could contribute to the nuclear industry at home and even abroad.

The Nuclear Science and Technology Committee of the Council for Science and Technology, the Ministry of Education, Culture, Sports, Science and Technology, addressed the situation by compiling a report titled “Current State and Challenges for Basic/Fundamental R&D on Nuclear Power” on May 29, 2012. It draws up the policy of continuing the enhancement of efforts toward basic and fundamental R&D and human resources development needed for decontamination, reactor decommissioning, improved safety at nuclear facilities, and radioactive waste management, regardless of Japan’s direction of nuclear use.