Guidance Manual for preparing Nuclear and Radiological Emergency Preparedness and Response Plan

Kabiru Muhammed[1], Prof. Seung-Young Jeong2
1.KINS-KAIST Program, Nigerian Nuclear Regulatory Authority, kabms@hotmail.com
2.Emergency preparedness and response department, Korean Institute for Nuclear Safety.
k504jsy@kins.re.kr

1 Introduction

Nuclear and Radiological Emergency Preparedness and Response Plan (NREPRP) provides the basis for a national level response to a radiation emergency in a country which is effectively integrated with an accompanying international, national and local response plans.

The NREPRP describes the capabilities, responsibilities and authorities of government agencies and a conceptual basis for integrating the activities of these agencies to protect public health and safety.

The NREPRP addresses issues related to actual or perceived radiation hazard requiring a national response in order to:

i. Provide co-ordination of a response involving multi-jurisdictions or significant national responsibilities; or
ii. Provide national support to state and local governments.

The objective of this research is to establish Guidance Manual for preparing a timely, organized and coordinated emergency response plan for Authorities/agencies to promptly and adequately determine and take actions to protect members of the public and emergency workers.

The manual will not provide sufficient details for an adequate response. This level of details is contained in standard operating procedures that are being developed based on the plan developed.

1.1 Legal Basis

Base on the data obtain from integrated planning levels and responsibility sharing, the legal document of major government agencies participating in NREPRP form the legal basis for the response plan. Also the following documents should be some international legal binding documents

i. Convention on Early Notification of a Nuclear Accident, (Legal Series No. 14, IAEA, Vienna, 1986)
ii. Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (IAEA-INFCIRC/336, IAEA, Vienna, 1986).

2 Materials

The following document where consider to form the bases for preparing this research. The IAEA EPR-Method 2003 “Emergency Preparedness and Response-Plan treaty”, the requirements of the IAEA Safety Standards, Preparedness and Response for a Nuclear or Radiological Emergency. Safety Series No.GS-R-2, 2002, and IAEA Method for Developing Arrangements for Response to a Nuclear or Radiological Emergency (IAEA – TECDOC-953) have been considered.

3 Result

3.1 Planning basis

This NREPRP recognizes the fact that practices on activities for which emergency response planning is necessary are identified here and emergency planning is different for each practice. However, practices and activities are grouped into five treat categories in accordance with IAEA EPR Methods [1] in (Table 1), each presenting common features in terms of the magnitude and timing of the hazard.

3.2 Related Plans and Documents

The response to a radiation emergency may be caused by or may involve different types of hazards, including natural, technological, biological and criminal activities. The response opt each of these hazards involves different response organization with their own response terminologies, cultures, and plans.

Consequently the plans and procedures for response to all hazards are structured into a coherent and interlocking system. Response organizations are integrated, expanded or contracted to meet the requirement of the particular emergency. The plan will produce a response plans for each identified organizations which are compatible in terms of

i. Terminology.
ii. Concept of operation.

iii. Emergency operations management.
iv. Organizational and functional description .
v. Coordination, activation and integration.
vi. Facilities, communications.
vii. Procedures, methods and equipment use for performing common and integrated task
viii. Training and exercises.
ix. Maintenance and quality assurance.

The Plan will reflect interagency relationships and a concept of operations which should be an integral part of the National Disaster Management Plan.

3.3 Participating organizations

The owner or operator of an affected facility has primary responsibility for actions within the boundaries of that facility for providing notification and advice to off-site officials and for minimizing the radiological hazard to the public and the environment as required in authorization terms and conditions and environmental impact assessment. The Emergency Manager shall come from the operator of the facility.

Local and State authorities, with the assistance of national authorities, have primary responsibility for determining and implementing any measures to protect life, property and the environment in any areas outside the boundaries of a fixed facility. In special cases such as severe transport accidents the national emergency response shall be activated to deal with protection of the public, property and the environment. Agencies' with competent manpower proximal to site shall be drafted to assist in response activities

The following organizations should be identified and participate in the NREPR (table 2)

3.4 Response organizations

Responsible organizations (or officials) that represent necessary functions to deal with nuclear and radiological emergencies will be designated according to the following organizational scheme (Figure 1). The level of the response to a specific emergency will be based on the type or amount of radioactive material involved the location of the emergency, the potential for impact on public and the size of the affected area.

3.5 Response Communication

The communication systems to be used during an emergency which are inter-compatible with those used by other response organizations such as:

a) Radio Phones
b) Fixed Telephone lines (Hot lines)
c) Mobile telephone lines (Hot lines)
d) Mobile computer system with efficient energy source
e) Mobile internet connectivity
f) Well-equipped Communication Centre with computers and internet connectivity
g) Whistles
h) Military beaglers etc.

All the above communication systems should at least have a back-up (one main, one back-up) to curtail failures and system breakdown

3.6 Logistics/Resource Commitment

During response operation for an emergency, the Emergency Management Agency (EMA) should be the organization responsible for providing logistics support, for prompt procurement of needed supplies and services, possibly bypassing normal procurement arrangement. Government agencies and other Responder organizations must make available their experts and trained emergency personnel, equipment's, machinery, radiation monitoring detectors, personnel vehicles, fire-fighting trucks, military hardware, road traffic diversion facilities and any other equipment and facility belonging to them and was deemed necessary for their smooth operation and to meet their obligations.

EMA should not be expected to procure such equipment if available at the responder's office. The quantity, quality and number of the response equipment's to be deployed depend on the type of emergency at hand. The provision of logistics support and assistance EMA or any response organization should be in line with the Nationals Disaster Response Framework.

3.7 Concept of Operation

The concept of operations for a response should be designed to facilitate the delivery of co- ordinated assistance to government authorities and the private sector. The NREPP should describe the responsibility of EMA and the other government agencies that may be involved in the response.

3.8 Emergency response process

3.8.1 Notification, activation, and request for assistance Notification

The owner or operator of the facility is generally the first to become aware of a Nuclear or radiological emergency, and is responsible to respond according to an approved (by the Regulatory body) emergency plans and notify the local, regional and national authorities as applicable. The owner or operator can ask for assistance directly from National response organization.

The National response organization should be notified at their offices or via emergency telephone

numbers provided o the expected first responders in an emergency, i.e. Police and Fire Services. National response organization should make further notifications, in accordance with pre-established procedures. In these notifications, National response organization should provide the agencies called with a general assessment of the emergency including location and nature of the event, an assessment of the severity of the problem as known, a description of National response organization response, and nay follow-on actions anticipated by National response organization.

Activation

Once notified, each agency should assess the need to initiate its response based on the situation reported. A government response will begin upon receipt of notification and consists of the following steps depending on the circumstances of the emergency.

i. Alerting or activating various agency components;
ii. Activating agency emergency response teams and deploying them to the scene;
iii. Establishing bases of operation at the scene of the radiological emergency to assure that the government response components are organized and consistent; and
iv. At the national level, determining whether assistance is required and whether local or regional authorities need additional assistance.
v. At the national level whether assistance is required from international organizations such as IAEA, WHO etc.

International Co-Ordination

Although this depend on the geographic scope of nation, the NREPRP should be limited to the country and its territorial waters, it should recognized that both nuclear and radiological emergencies in other countries and domestic radiological emergencies near international borders could require international interfaces. In such cases, the Foreign Affairs department should work closely with other governmental agencies concerning any international responsibilities.

Trans-boundary nuclear or radiological emergencies

In the event of a nuclear or radiological emergency outside of a country that has a real or potential impact on it, the Foreign Affairs department should co-ordinate contacts with foreign governments except in cases where existing agreements permit direct interagency communication. When a trans-boundary nuclear or radiological emergency comes within the scope of the NREPR, the regulatory body should be the LTA. The regulatory body should the Foreign Affairs department informed of all government response activities co-ordinated in accordance with the NREPRP. [2], [3]

Domestic nuclear or radiological emergencies with trans-boundary impact

In the event of a domestic nuclear or radiological emergency with potential trans-boundary consequences, the Foreign Affairs department should co-ordinate all contacts with foreign governments and agencies except where existing agreements permit direct exchange of information. Agencies acting under such agreements should keep the Foreign Affairs department informed of consultation with foreign counterparts at all time. [2], [3]+

With respect to the responsibilities of the government under the Convention on Early Notification in the Event of a Nuclear Accident, the Regulatory body as designated Point of Contact for this convention should assure that an initial notification of the nuclear or radiological accident is made to the IAEA in Vienna and they are provided with additional technical information during the response to such an emergency. The regulator should ensure that the Foreign Affairs department is kept continuously informed of all such communications with the IAEA.

Request for radiological assistance

In the event of a nuclear or radiological emergency, which requires the activation of the NREPRP, requests for assistance from the international community are anticipated. Arrangements already exist for making such requests, particularly with the IAEA and the WHO. In order to facilitate obtaining such necessary assistance, the regulatory body should make these requests directly in keeping with established procedures and within their area of competence. The Foreign Affairs department should be kept fully informed of all requests for foreign assistance.

3.8.2 Emergency Management

Response to a nuclear or radiological emergency requires rapid and coordinated response. Table 4 summarizes immediate response actions for all cases. This can be accomplished through facilities using the following emergency conditions as stated in the IAEA safety requirement and guides

i. Emergency at the Nuclear Installations
ii. Other radiological emergencies
iii. Potential hazard reported

3.9 Emergency preparedness process

Emergency preparedness process includes the arrangements used to perform preparedness functions which are needed to develop and maintain capability to respond to an emergency. Response organizations

That will be responsible for all or part of the performance of these functions are identified as stated in the IAEA safety requirement and guides**.**

4 Conclusions

Base on the international safety requirement and some countries well developed NREPRP, we have drafted a guidance manual for new comer countries for easy development of their countries NREPRP. Also we have taken in to consideration lessons learn from most accident especially Fukushima accident.

5 References

1. IAEA Method for Developing Arrangements for Response to a Nuclear or Radiological Emergency, IAEA – TECDOC-953, 2003.
2. Criteria for use in Preparedness and Response for a Nuclear or Radiological Emergency, IAEA General Safety Guide No. GSG-2, 2011.
3. Preparedness and Response for a Nuclear or Radiological Emergency. IAEA Safety Series No.GS-R-2, 2002.
4. Arrangement for Preparedness for a Nuclear or Radiological Emergency, IAEA General Safety guide no. GS-G-2.1, 2007.
5. Criteria for Preparedness and Evaluation of Radiological Emergency Response Plans and Preparedness in support of NPP, NUREG-0654 FEMA-REP-1 Rev. 1, 1980.

APPENDIX

Table 1Five Categories of Nuclear and Radiation Related Threats

Threat category	Description
I	Facilities, such as nuclear power plants, for which on-site events (including very low probability events) are, postulated that could give rise to severe deterministic health effects off the site, or for which such events have occurred in similar facilities.
II	Facilities, such as some types of research reactors, for which on-site events are postulated that could give rise to doses to people off the site that warrant urgent protective actions in accordance with international standards, or for which such events have occurred in similar facilities. Threat category II (as opposed to threat category I) does not include facilities for which on-site events (including very low probability events) are postulated that could give rise to severe deterministic health effects off the site, or for which such events have occurred in similar facilities.
III	Facilities, such as industrial irradiation facilities, for which on-site events are postulated that could give rise to doses that warrant or contamination that warrants urgent protective actions on the site, or for which such events have occurred in similar facilities. Threat category III (as opposed to threat category II) does not include facilities for which events are postulated that could warrant urgent protective action off the site, or for which such events have occurred in similar facilities.
IV	Activities that could give rise to a nuclear or radiological emergency that could warrant urgent protective actions in an unforeseeable location. These include non-authorized activities such as activities relating to dangerous sources obtained illicitly. They also include transport and authorized activities involving dangerous mobile sources such as industrial radiography sources, radio-thermal generators or nuclear powered satellites. Threat category IV represents the minimum level of threat, which is assumed to apply for all States and jurisdictions.
V	Activities not normally involving sources of ionizing radiation, but which yield products with a significant likelihood6 of becoming contaminated as a result of events at facilities in threat categories I or II, including such facilities in other States, to levels necessitating prompt restrictions on products in accordance with international standards

Table 2 Response roles and responsibilities

Organizations responsible for authorizing/activating national response	
ROLES	**RESPONSIBILITY**

Response Initiator	Responsible for receiving initial notification of a potential radiological emergency, getting basic information about the emergency, providing initial advice to the caller. To also carry out initial radiological assessment. This function is operational 24 hours per day and 7 days per week. The Regulatory body should be the Point of Contact for Assistance Convention.
National Emergency Coordination	Responsible for mobilizing response agencies based on initial assessment and information received. Responsible for defining response activities and direct operations. For a major emergency coordination of operations may require the assignment of an on-scene controller.
IAEA Liaison Office and Response Support.	It is the liaison office of all nuclear matter with the IAEA. Therefore, the primary function of the NAEC in nuclear and radiological emergency is to provide a funds and mechanism for a timely, inter-agency co-ordination advice and recommendations to the NEMA. Provision of adequate support to response mission particularly as affects participation of other agencies under it as response agents.
Resource Coordinator/ Planning Function	Responsible for planning, obtaining and coordinating national resources. To establish staging area, determine what resources are necessary, request the needed assistance and integrate all assistances into the response on arrival. Responsible for developing incident action plans.
Radiological Responder and Assessor	Responsible for assessing alpha, beta, neutron and gamma emitting materials. Perform radiation surveys, perform dose assessments, control contamination, ensure radiation protection of emergency workers and formulate recommendations on protective actions. The Center maintains radiological resources, which will be available for emergency deployment and support, including assistance in decontamination and waste disposal.
Radiological Responder and Assessor	Serve as a back-up support for radiation monitoring and safety assessment of an accident situation and assist in mitigating the radiological consequences of an accident. The Center maintains radiological resources, which will be available for emergency deployment and support, including assistance in decontamination and waste disposal.
Recovery operations	In case of severe nuclear or radiological accident the Military should provide in co-ordination with EMA technical support for mitigation of the accident and recovery operations including where necessary evacuation and relocation of affected persons.
Control of illicit trafficking of nuclear and radioactive materials at the borders	Both the Customs and immigration Service should monitor, detect, and intercept any illicit trafficking of nuclear and radioactive materials at the borders. There should be contact with the Regulatory body for radiological assessment of any seized radioactive and/or nuclear materials.

Security and Protection of Personnel	At the scene of a nuclear or radiological accident, the Police will carry out its traditional role in ensuring the security/protection of personnel and the public during the emergency. The Department of State Security service upon receipt of any credible or non-credible threat to commit any malevolent acts involving radioactive materials will carry out prompt investigations.
Fire Brigade, Monitoring and Decontamination	Responsible for establishing the inner cordoned area, performing search and rescue operations, triage and first aid (until relieved by emergency medical service). Dealing with conventional hazards, responder accountability, public processing, registration, monitoring and decontamination, and responder monitoring and decontamination.
Traffic control	Provide appropriate and adequate means of transport to evacuate or relocate affected individuals and communities as required. Divert traffic from accident scene.
Information Services	To support government response to a nuclear and radiological accident by: (1) providing instructions via television, to the public on protective action that are recommended by the government; (2) provide factual information to the general public on the radiological accident; (3) assist the government response by using its facilities to respond to rumours102.
Weather monitoring	To monitor and provide actual weather conditions in and around the accident scene for the assessment of the movement of airborne radioactive material. The meteorological agency will also provide weather forecasts. To collect and send samples of rainwater and exposed filters from its air pollution measuring stations for radioactivity analysis by CERT.
Curriculum Development	Ensure that radiation protection principles, safety, use of and health effects of ionizing radiation are included in the curriculum of university teaching hospitals, faculty of medicines and other related faculties of Nigerian Universities
Food Contamination Monitoring	Provide support to the primary responders in a nuclear and radiological accident in the following ways: (1) provide advice about the food products in any areas that may have been contaminated by the accident; and (2) obtain samples of food products for radioactivity measurements by CER. Also responsible for organizing efficient food and other products control at the Nigerian border crossings in co-operation with Nigeria Customs and Nigerian Immigration Service.
Communication provider	Responsible for providing national emergency call centers and hot lines. Ensuring effective communication platform during emergency.
	To assist in performing environmental impact assessment to determine extends of damage to the environment. Will also assist with its expertise to prepare recommendations regarding appropriate remedial actions.
Planning and impact of accidents on national development	Determine and advice government on matters relating to nuclear and radiological emergency planning and impact of accidents on national development and the economy.

Travel advisories to tourist	In case of severe nuclear or radiological accident in foreign country, Ministry of Tourism will provide travel advisories to tourist travelling to and from countries significantly affected by the -6+0accident.
Back-up Support	Ensure that Major Oil Companies deploy their resources to the scene of an accident providing back up support to the government team
Storage facilities at the airports	To provide temporary storage facilities at airports in case of confiscation and or detection of illicit trafficking in radioactive material. Provide logistics and ensure safety and security of the material stored.
Water Management	To monitor and provide actual water conditions in and around the accident scene for the assessment of the movement of airborne radioactive material. The Ministry will also provide forecasts on the effect of the accident on streams, rivers wells, and dams around the affected area. To collect and send samples of river water and wells from its water pollution measuring stations for radioactivity analysis by CERT.
Health Matters and Recovery	Responsible for providing or obtaining appropriate medical care for over exposed or contaminated individuals. Where a radiological accident involves the medical use of radioactive materials, the Ministry is responsible for monitoring the long-term health problems that could arise due to the radiological event.
Provision of contingency budget to mitigate accident	The Federal Ministry of Finance and Economic Planning will make available adequate contingency budget needed to efficiently mitigate the consequences of a nuclear and radiological emergency.
Coordinate contacts with foreign government and agencies	In the event of a domestic radiological emergency with potential trans-boundary consequences, the Federal Ministry of Foreign Affairs will co-ordinate all contacts with foreign government and agencies and International Organization except where existing agreements permit direct exchange of information. Agencies acting under such agreements should keep the Ministry and the relevant missions in Nigeria informed of consultations with foreign counterparts at all times. In the event of a nuclear and radiological emergency outside of Nigeria that has a real or potential impact on Nigeria, the Ministry will co-ordinate contacts with foreign governments except in cases where agreements permit direct interagency communication.
Handle all legal issues that may arise from accident	The Federal Ministry of Justice through Attorney General's office will handle all legal issues arising from a nuclear and radiological accident.
Emergency Medical Service	Responsible for providing the onsite medical response; advising medical transport and the local receiving hospital on the risk and appropriate protective actions to take and establishing a temporary morgue area.

Emergency First Aid Service	Assist in rescue operations, triage and first aid (until relieved by emergency medical service). Support in establishing a temporary morgue area

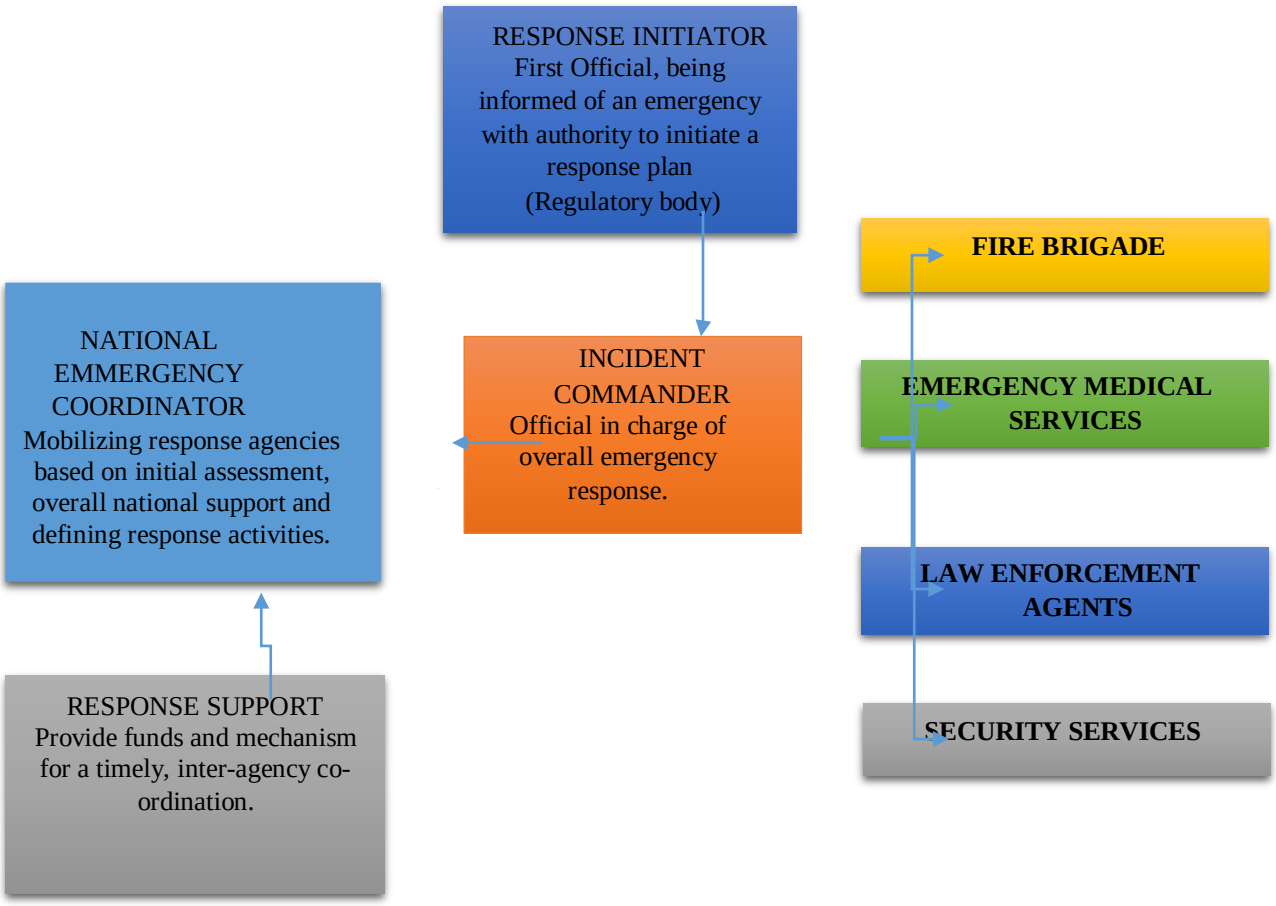

Figure 1 Generic response organization in an event of a radiological emergency