Korean Status on Radiation Emergency Preparedness

March 14, 2018

Korea Institute of Nuclear Safety

Overview

Radiation emergency response environment of Korea

Domestic Circumstances

- 24 reactors are operating in Korea.
- Reactors are densely located and 2.1 million people are living within the 30 Km radius of the reactors.
- In September 2016, a 5.8 magnitude earthquake occurred in Geoyngju, near a nuclear facility.

Urgent Need

Maintain top-level capabilities to respond against radiation emergency

Surrounding Circumstances

- In March 2011, the accident happened in the Fukushima Daiichi nuclear power plants.
- China is operating, planning and constructing lots of reactors alongside the Yellow Sea.
- In September 2017, NK conducted the sixth nuclear test.

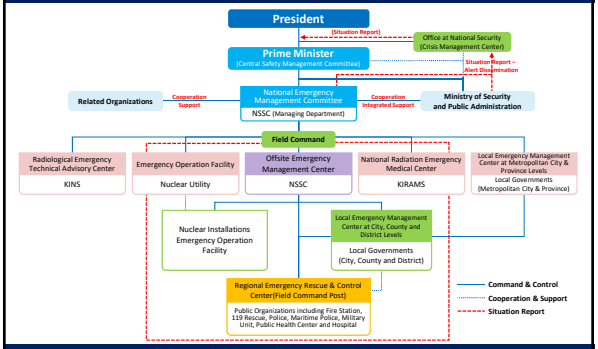
Overview

General framework and resources

- **Legal Framework**
  - Nuclear Safety Act (1958)
  - Act on Physical Protection and Radiological Emergency (2003)
  - Act on Protective Action against Radiation in Living Environment (2011)
- **Organizational Framework**
  - Technical Authorities with Nuclear Safety and Security Commission
    - Korea Institute of Nuclear Safety
    - Korea Institute of Radiological & Medical Sciences
    - Korea Foundation of Nuclear Safety
- **Human Resources**
  - Manpower for Nuclear & Radiation Safety Regulation : about 740
  - Workforce per the number of nuclear & radiation facilities : lower than the OECD average
- **Financial Resources**
  - Separated from the general national accounting to ensure independent, transparent operation (since 2015)
- **International Framework for Cooperation**
  - Leadership in the Convention on Nuclear Safety
  - Leadership in the Joint Convention on the Safety of Spent Fuel and Radioactive Waste Management

Overview

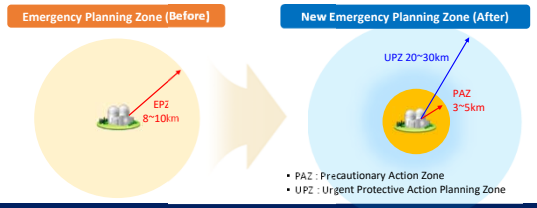
National structure for responding on radiation emergency



1. Mechanism for radiation emergency response

1-1 | National policies and strategies

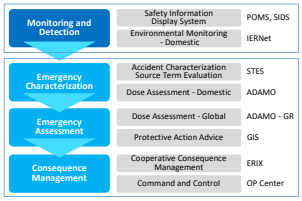
- **Re-establishment of Emergency Planning Zone in 2013**
  - It reflects recommendations from 2011 IAEA regulatory review service
  - Emergency Planning Zone (EPZ) was expanded and subdivided.
  - To prevent occurrence of deterministic effects and to reduce occurrence of stochastic effects in emergency situation
  - Establish Precautionary Action Zone (PAZ, 3 ~ 5 km)
  - Establish Urgent Protective action planning Zone (UPZ, 20 ~ 30 km)

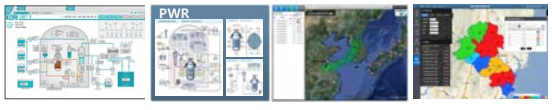


1. Mechanism for radiation emergency response

1-2 | Current system for technical assistance

- **AtomCARE system (Atomic Computerized technical Advisory system for the Radiological Emergency)**
  - To provide practical response guides in case of nuclear emergency
- **ADAMO (Accident Dose Assessment and Monitoring) module**
  - To assess accidental dose in local and global region

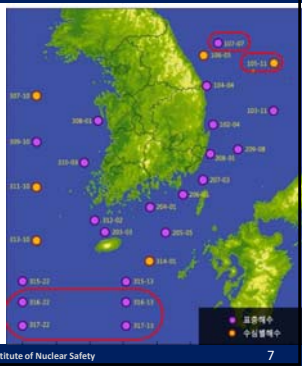




1. Mechanism for radiation emergency response

1-3 | Current system for radiation surveillance/monitoring

- **Nationwide Radioactive Environment Monitoring**
  - We are running 15 Regional Radiation Monitoring Stations (RRMS) and 160 ambient gamma dose rate monitoring posts across the nation, and release the information through a real-time radiation monitoring system on the web site (IERNet).
  - Annual radioactivity survey results for environmental samples including airborne dust, rain, soil and food are also open to the public via annual report.
  - The unmanned real-time underwater radiation monitoring system is being pre-operating along the coastal sea of Korea for early detection of any radiological leakage of radiation material into the ocean.



1. Mechanism for radiation emergency response

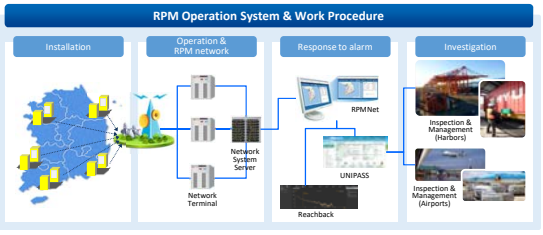
1-4 | Laboratory capacity

Nuclear Safety & Security Commission (KINS & 15 RRMs)		Ministry of Environment (5 National Institutes of Environmental Research)	Ministry of Oceans and Fisheries	Ministry of Food and Drug Safety (incl. 6 Local Laboratories)
• Environmental Radioactivity Survey in the Republic of Korea • Airborne Dust, Water (River & Sea), Foodstuffs, Soil, Pine Tree Needles, etc.	 Regional Radiation Monitoring Station (RRMS) 	• Radioactivity Concentration in River Water	• Radioactivity Monitoring for Seawater, Sediment, Shellfish at 32 Coastal Stations	• Radioactivity Concentration of Imported Foodstuffs & Food in the market 

1. Mechanism for radiation emergency response

1-5 | Monitoring of consumer products

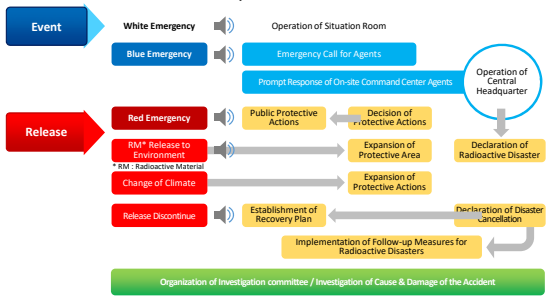
- **The regulatory body has installed and has been operating RPM (Radiation Portal Monitor) at major international harbors & airports since 2012**
  - Blocking of illegal radioactive material
  - Flow checking of naturally occurring radioactive material (NORM)



2. Enabling environment in place for management of radiation emergency

2-1 | Outline of response plan on Emergency

- **Outlines of Radioactive Disaster Response**



2. Enabling environment in place for management of radiation emergency

2-2 | Radiation emergency response drills

- **Drills to ensure abilities to cope with disasters are conducted more than 170 times a year by government agencies, municipalities, military, police, and general residents.**
  - 2017 Radiological Emergency Exercises : total 106 times

Total	Unified Emergency Exercise [1]	Integrated Emergency Exercise [2]	On-site Emergency Exercises [3]	Drills [4]	Public Protective Exercise [2]	Intensive Radiation Emergency Medical Training [5]
106	1	1	12	57	29	6

1) by central government agencies 2) by local governments 3) by the emergency departments of the nuclear operators
4) by each emergency department of the nuclear operators 5) by Korea Institute of Radiological & Medical Science

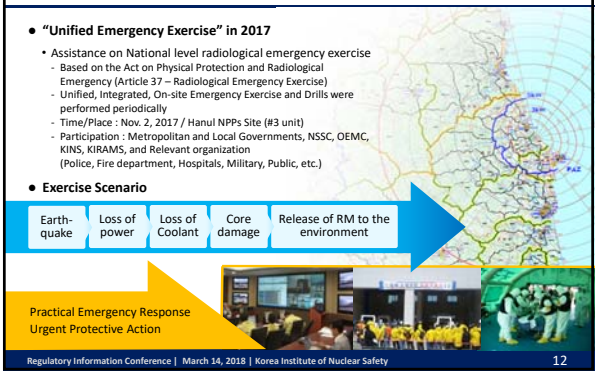
  - 2017 Radiological Counter-terrorism & Physical Protection Exercises : total 63 times

Total	Full Scale Force-on-Force Exercise	Partial Force-on-Force Exercise	Joint Civil Society-Government-Military Radiological Counter-terrorism Drill
63	20	40	3

2. Enabling environment in place for management of radiation emergency

2-2 | Radiation emergency response drills (continued)

- **"Unified Emergency Exercise" in 2017**
  - Assistance on National level radiological emergency exercise
    - Based on the Act on Physical Protection and Radiological Emergency (Article 37 – Radiological Emergency Exercise)
    - Unified, Integrated, On-site Emergency Exercise and Drills were performed periodically
    - Time/Place : Nov. 2, 2017 / Hanul NPPs Site (#3 unit)
    - Participation : Metropolitan and Local Governments, NSSC, OEMC, KINS, KIRAMS, and Relevant organization (Police, Fire department, Hospitals, Military, Public, etc.)
- **Exercise Scenario**



2. Enabling environment in place for management of radiation emergency

2-2 | Radiation emergency response drills (continued)

- **Actions and Communication in the Field Command**

2. Enabling environment in place for management of radiation emergency

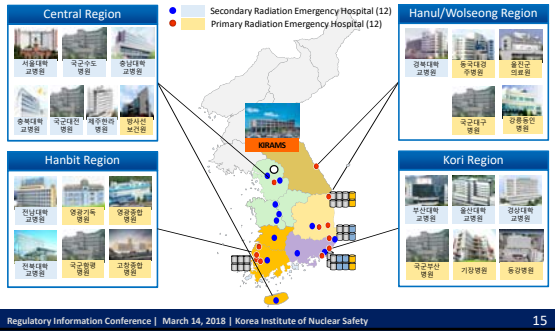
2-2 | Radiation emergency response drills (continued)

- **Emergency Response Actions by the Utility**

2. Enabling environment in place for management of radiation emergency

2-3 | Medical Assistance

- **National Radiation Emergency Medical Network**



Recap of our emergency preparedness

We have made a practical program for EPR, but key challenges are mounting up:

- The earthquake of magnitude 5.8, which occurred in September 2017 and was the highest one ever recorded in Korea, ignited agitation over national preparedness against radiological emergencies due to densely located NPPs.
- It is asked to do impact assessments assuming an accident in the multi-unit sites, and to reflect the results in the emergency preparedness system.
- There has been a growing need to establish a joint emergency response framework with the states in Northeast Asia, such as China and Japan.

Thank you