ANSN Regional Workshop on Nuclear Safety Tailored for Regulator; Radiation Safety, 7 to 11 September 2015, Daejeon, Korea

Regulatory Framework on Radiation Safety in Korea

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CONTENTS

I. Introduction

II. Regulatory Framework

III. Nuclear Safety Act (NSA)

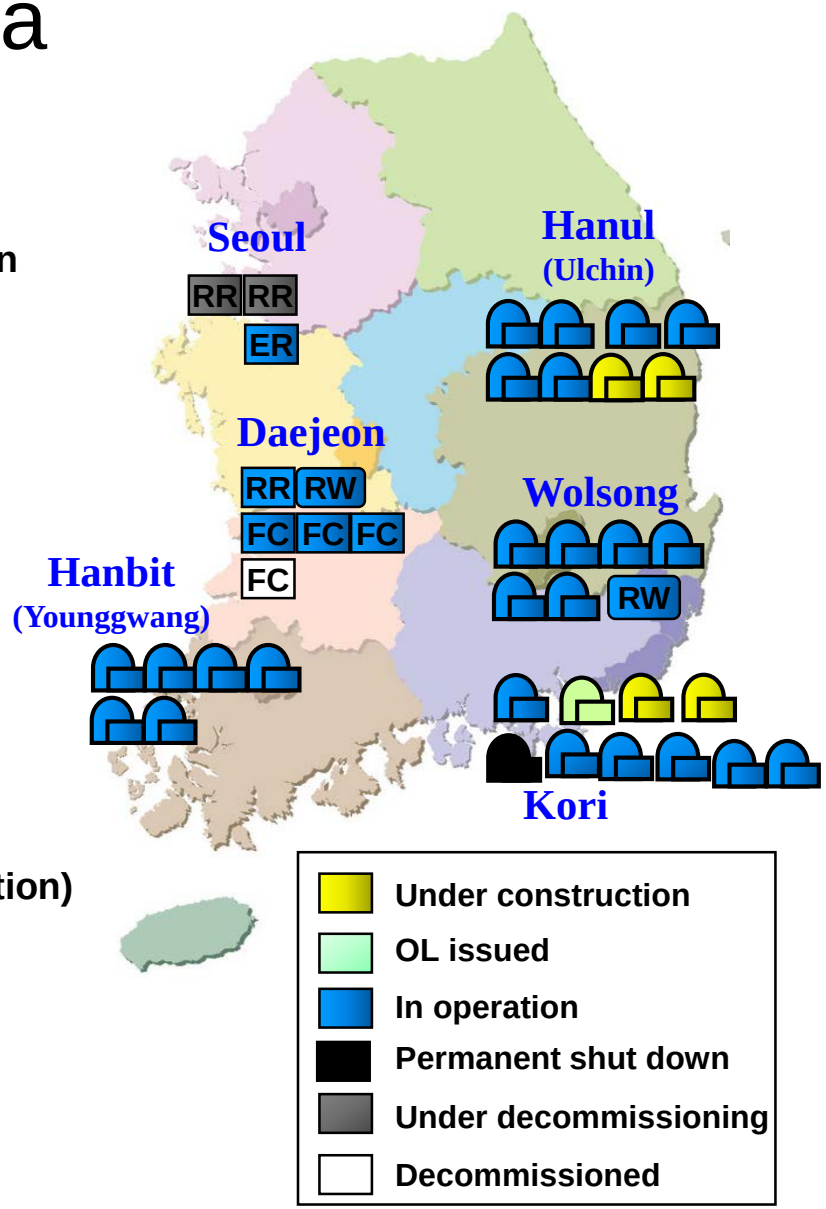
IV. Act on Physical Protection and Radiological Emergency (APPRE)

V. Act on Protective Action Guidelines against Radiation in the Natural Environment

Current Status on Nuclear & Radiation Facilities in Korea

Nuclear Facilities in Korea

- ✓ **Nuclear Power Plant (NPP)**
  - **24 units in operation and 5 units under construction**
  - **1 unit permanent shut down**
- ✓ **Research Rector (RR) / Education Reactor (ER)**
  - **HANARO (RR)**
  - **KRR 1 and 2 (RR, under decommissioning)**
  - **AGN (ER)**
- ✓ **Nuclear Fuel Cycle Facility (FC)**
  - **Fuel Fabrication Plant for NPP**
  - **Fuel Fabrication Facility for RR**
  - **Post-Irradiation Examination Facility (PIEF)**
  - **Uranium Conversion Facility (released from regulation)**
- ✓ **Radioactive Waste Management Facilities (RW)**
  - **RI Waste Management Facility**
  - **Wolsong LILW Disposal Center (WLDC)**
  - **→ in operation since 2015**



Status of RI & RG Use in Korea (as of March 2019)

Sector	Notification	License	Total	Remark
Medical	15	182	197	w/o diagnostic
Industry	5,602	1,014	6,616	Including NDT
Research	269	63	332	
Education	133	165	298	
Public	765	58	823	
Military	76	32	108	
Total	6,860	1,514	**8,374**	

Status of Registered companies treating raw materials, residues, and products (As of June 2018)

	2014	2015	2016	2017	2018
New Registration	19	6	-	16	9
Cancellation	-	1	2	-	1
Total	33	38	36	52	60

- Companies treating Raw Material (60)
  - ✓Zircon: 30, Potassium Chloride:16
  - ✓Potassium Compound:10
  - ✓Etc.(Phosphate ore, Bauxite, Monazite, silica fume): 4
- Companies treating Residues (5)

❖ Some companies has duplicated registration

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II. Regulatory Framework

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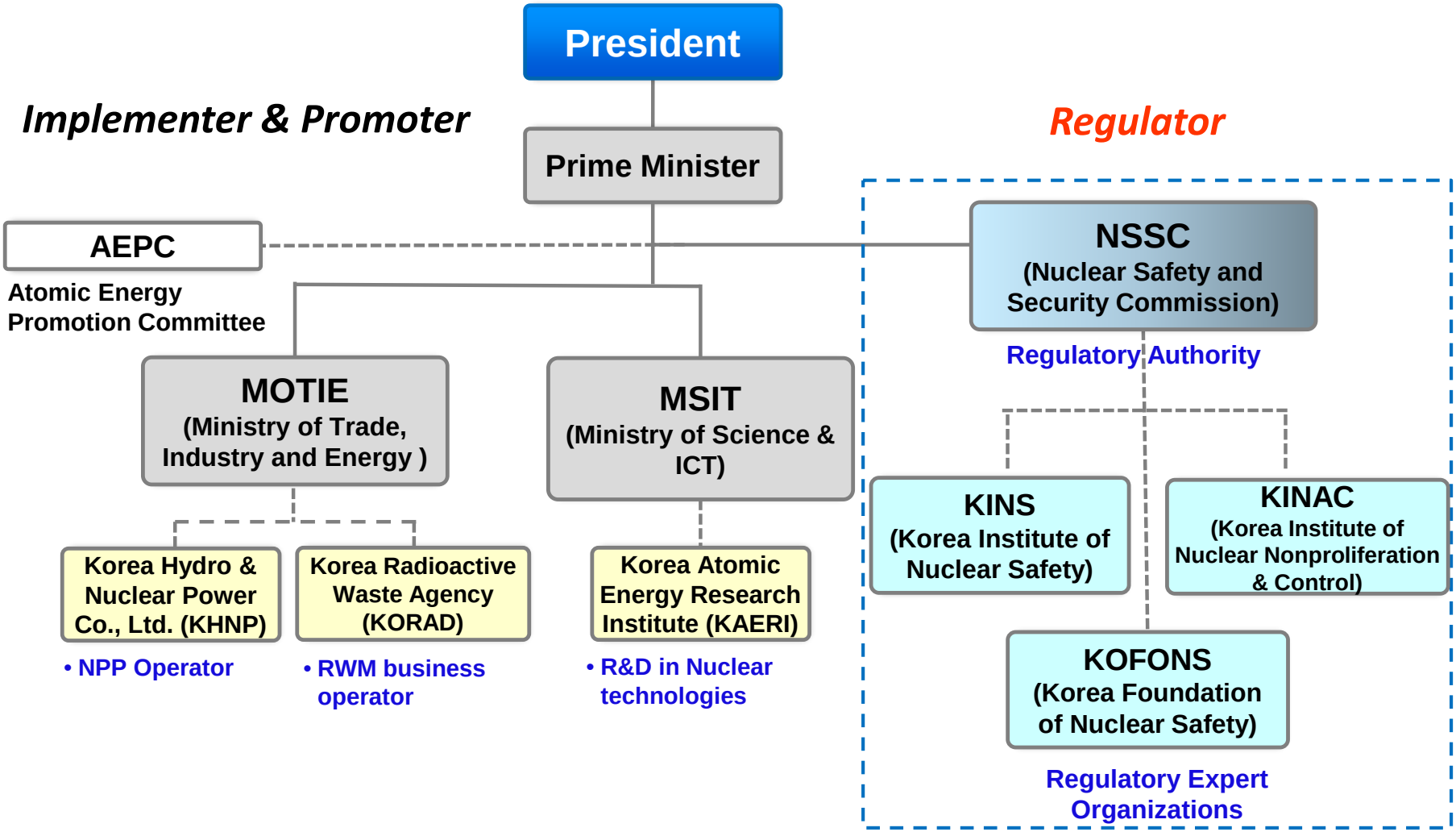
Governmental Structure of NSSC



Roles of Regulatory Organizations

- ✓ Nuclear Safety and Security Commission (**NSSC**)
  - **Regulatory authority** of the Korean Government
  - **Rulemaking and enforcement** on nuclear facilities and activities to ensure safety
  - Developing and implementing nuclear regulatory policies

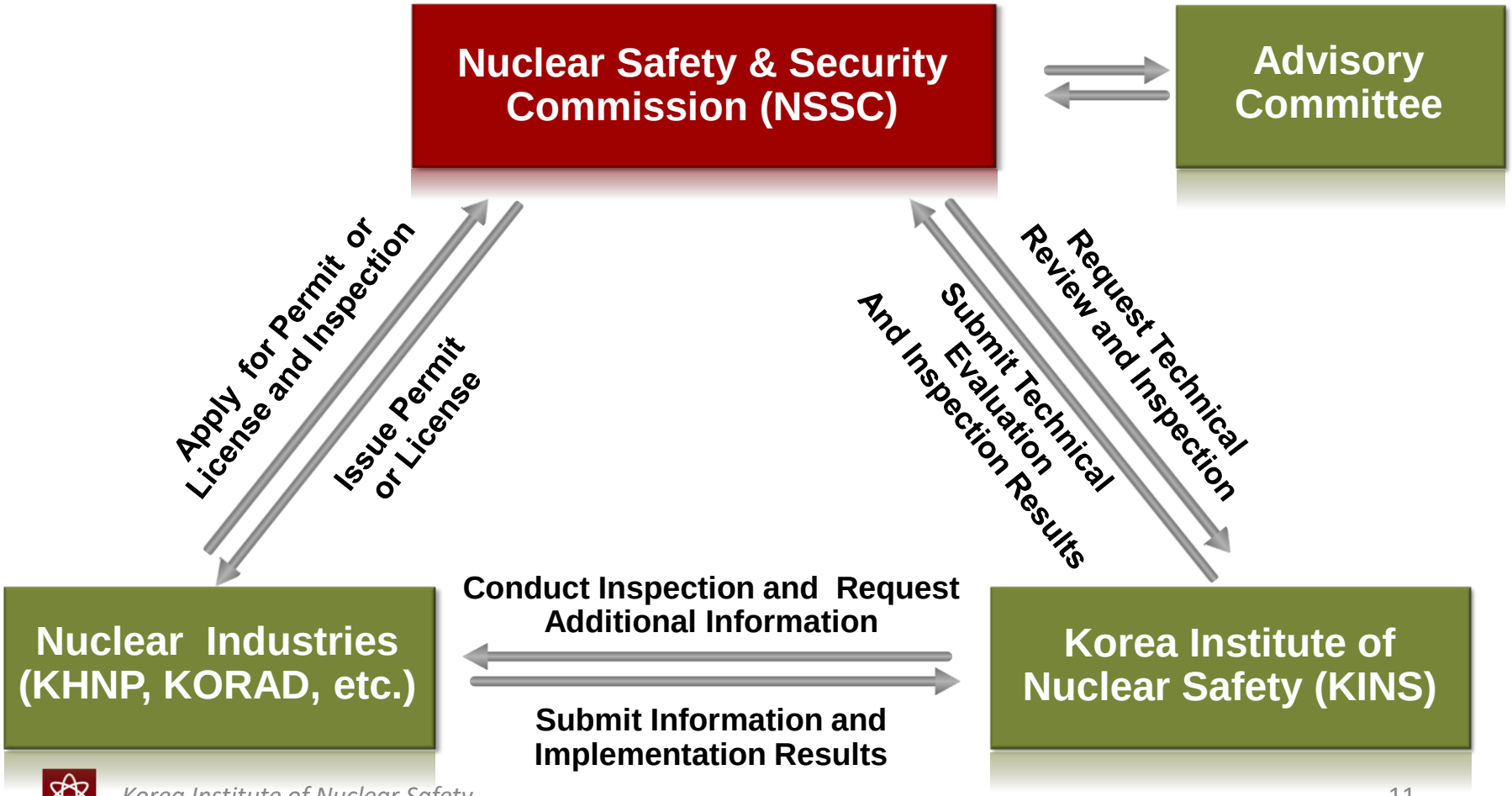
- ✓ Korea Institute of Nuclear Safety (**KINS**)
  - Regulatory expert organization
  - Carrying out functions concerning **nuclear safety review and inspection**, developing technical standards and guidelines

- ✓ Korea Institute of Nuclear Nonproliferation and Control (**KINAC**)
  - Regulatory expert organization
  - Execution of **safeguards, physical protection** and **export/import control** regarding nuclear facilities and materials

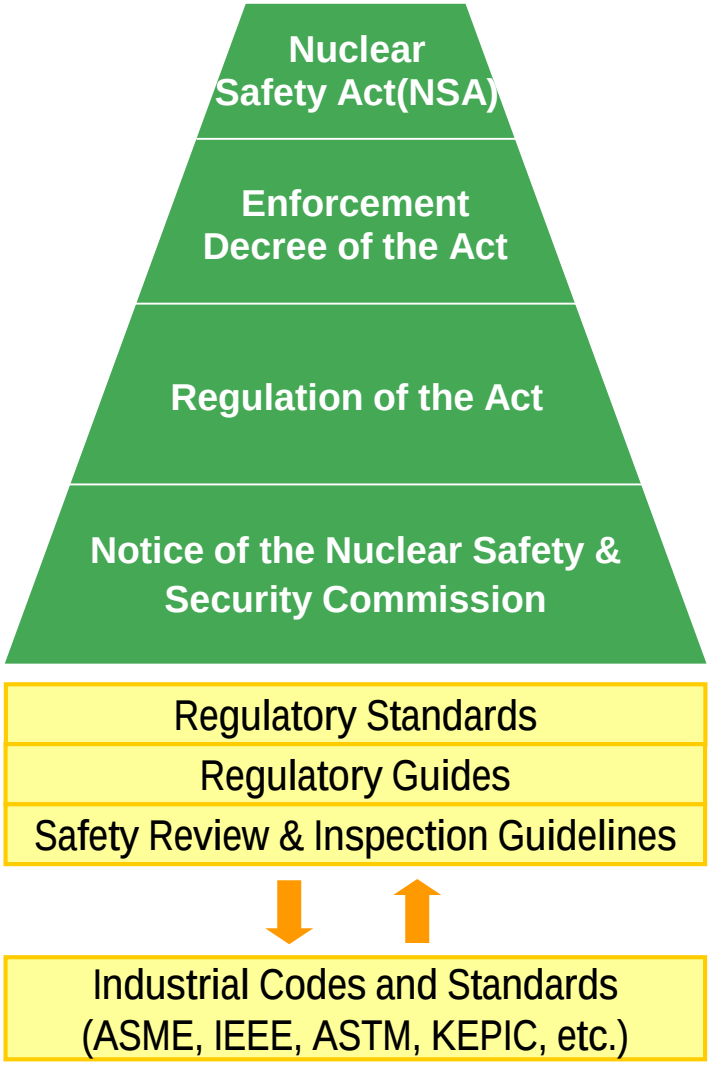
- ✓ Korea Foundation of Nuclear Safety(**KOFONS**)
  - Fund management, International Cooperation, radiation worker education,

Regulatory Framework

❑ Interactive Mechanism for Nuclear Safety Regulation



Legal Framework for Nuclear Safety



- Nuclear Safety Act (NSA): Basic and fundamental matters (National Assembly)
- Enforcement Decree: Detailed requirements necessary for implementing basic and fundamental matters in the NSA (President)
- Regulation: Detailed licensing procedures, standard format of document, basic technical standards etc. (Prime Minister)
- Notice: Detailed technical standards (NSSC)

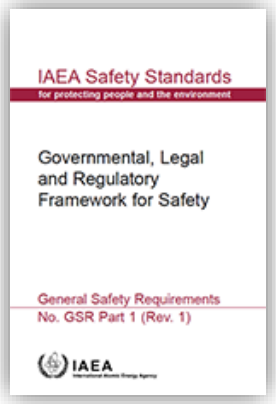
- Regulatory Standards and Guides: Interpretation, detailed criteria, acceptable methods, conditions, and specifications of the technical standards
- Safety Review & Inspection Guidelines: Staff guidance in carrying out regulatory activities

- International/domestic standards accepted by the regulatory body

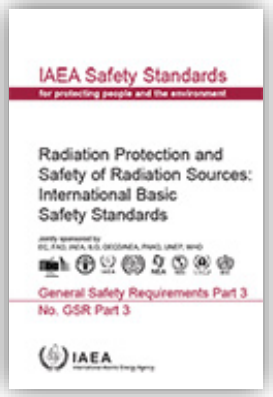
* KEPIC: Korea Electrical Power Industrial Code


Safety Fundamentals
Safety Requirements
Safety Guides
IAEA Safety Standards
for protecting people and the environment
Fundamental Safety Principles
Safety Fundamentals
No. SF-1
IAEA
IAEA Safety Standards
for protecting people and the environment
Governmental, Legal and Regulatory Framework for Safety
General Safety Requirements
No. GSR Part 1 (Rev. 1)
IAEA
IAEA Safety Standards
for protecting people and the environment
Regulations for the Safe Transport of Radioactive Material
2012 Edition
Specific Safety Requirements
No. SSR-6
IAEA
IAEA Safety Standards
for protecting people and the environment
Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards
General Safety Requirements Part 3
No. GSR Part 3
IAEA
IAEA Safety Standards
for protecting people and the environment
Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material (2012 Edition)
Specific Safety Guide
No. SSG-26
IAEA

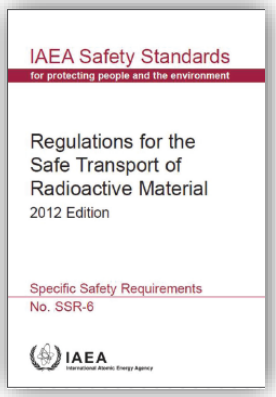
IAEA Safety Standards



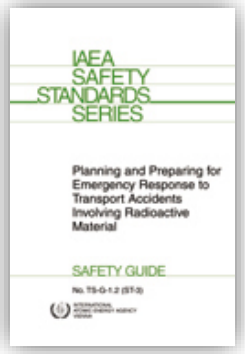
GSR Part 1

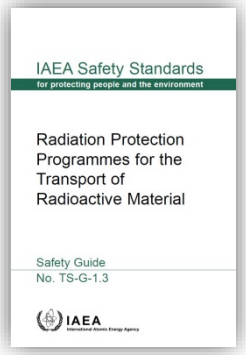


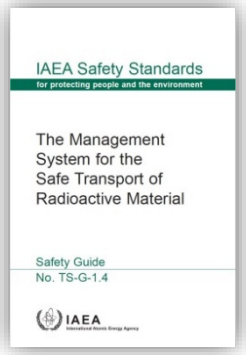
GSR Part 3

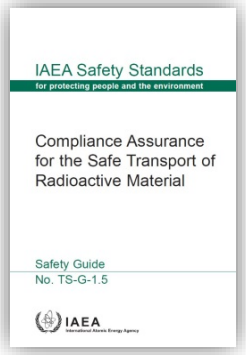


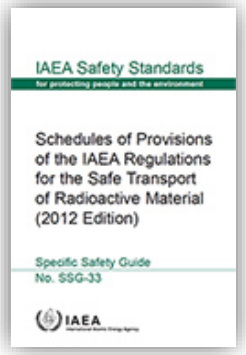
SSR 6











Guidance Documents

□ Act

- Basic principles Concerning Nuclear Safety
- Nuclear Safety Act, Act on Physical Protection and Radiological Emergency, Nuclear Liability Act, etc.

• Enforcement Decree

- Particulars Entrusted by the ACT
- Enforcement Decree of the Nuclear Safety Act and Enforcement Decrees of Other Related Acts

• Enforcement Regulation

- Regulations on Technical Standards for Nuclear Reactor Facilities, Etc.
- Regulations on Technical Standards for Radiation Safety Control, Etc.

Major Laws Concerning Nuclear Safety Regulation

Title	Major Contents	Competent Authorities	Remarks
Nuclear Safety Act(NSA)	Basic law on the nuclear safety regulations	NSSC	
Act on Physical Protection and Radiological Emergency(APPRE)	physical protection of nuclear material and nuclear facilities, and measures for preventing radiological disaster and preparing countermeasures against radiological emergency	NSSC	
Act on Protective Action Guidelines Against Radiation in the Natural Environment(APAGARNE)	Provides the matters concerning safety management of radiation encountered in environments	NSSC	

Major Laws Concerning Nuclear Safety Regulation(continued)

Title	Major Contents	Competent Authorities	Remarks
Nuclear Liability Act	Provides the procedures and the extent of compensation for any damages which an individual has suffered from a nuclear accident	NSSC	
Act on Indemnification Agreement for Nuclear Liability	Provides the Particulars on a contract between the government and the operator to make up any compensation not covered by insurance	NSSC	
Act on Establishment and Operation of the NSSC	Provides the particulars on establishment and operation of the NSSC	NSSC	
Korea Institute of Nuclear Safety Act	Provides the establishment and operation of the KINS	NSSC	

Major Laws Concerning Nuclear Safety Regulation(continued)

Title	Major contents	Competent Authorities	Remarks
Nuclear Promotion Act	Provides the particulars on research, development, production and utilization of atomic energy	Ministry of Science and ICT	Provides the particulars on promotion of atomic energy
Electricity Business Act	Provides the basic system of electricity business	Ministry of Trade, Industry and Energy	Entrusts safety regulations on installation, maintenance, repair, operation and security of nuclear reactor facilities to the NSA
Framework Act on Environmental Policy	Mother law of the environmental preservation policy	Ministry of Environment	Entrusts the measures for preventing pollution by radioactive substance to the NSA

Overall Legislative Framework for Radiation Safety

- ✓ **Nuclear safety regulation and security (NSSC)**
  - Nuclear Safety Act (NSA)
  - Act on Physical Protection and Radiological Emergency (APPRE)
  - Act on Protective Action Guidelines against Radiation in the Natural Environment

- ✓ **Other matters**
  - Medical Services Act, **Ministry of Health and Welfare**
  - Medical Devices Act, **Ministry of Food and Drug Safety**
  - Veterinarians Act, **Ministry of Agriculture, Food and Rural Affairs**
  - Etc.

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History of NSA

- Atomic Energy Law (11 March, 1958)
  - Law no. 483
  - 9 Chapters and 33 Articles
    - Organization of Atomic Energy Agency
    - Radiation Protection and Standards for RI, etc.

- Renewal of Atomic Energy Law (1 April, 1982)
  - Law no. 3549
  - Restructuring of Enforcement Decrees and Regulations

- Nuclear Safety Act (25 July, 2011)
  - Law no. 10911
  - 11 Chapters and 121 Articles
    - Basic principles concerning Nuclear Safety and regulation

Structure of NSA

- Chapter 1 : General Provisions
- Chapter 2 : Establishment and enforcement of Comprehensive Plan for Nuclear Safety
- Chapter 3 : Construction and operation of nuclear power reactors and related facilities
  - Section 1 : Construction of nuclear power reactors and related facilities
  - Section 2 : Operation of nuclear power reactors and related facilities
  - Section 3 : Construction and operation of nuclear research reactors, etc.
- Chapter 4 : Nuclear fuel cycle business and use of nuclear materials
  - Section 1 : Nuclear fuel cycle business
  - Section 2 : Use of nuclear materials
- Chapter 5 : Radioisotopes and Radiation Generating devices
  - ➢ Criteria for permit (license), licensing procedures, and regulatory inspection

Structure of NSA(continued)

- Chapter 6 : Disposal and Transport
- Chapter 7 : Dosimeter Reading, etc.
- Chapter 8 : License and examination
- Chapter 9 : Regulation and Supervision
- Chapter 10 : Supplementary Provisions
- Chapter 11 : Penal Provisions
- Addenda

Chapter 4 (section 2) : use of nuclear materials

□ Definitions (Article 2 of NSA)

- ‘nuclear material’ means ‘nuclear fuel material’ and ‘nuclear raw material’

- ‘nuclear fuel material’ means material capable of producing nuclear energy, such as uranium, thorium, etc., as prescribed by the Presidential Decree

- ‘nuclear raw material’ means material which is raw material for nuclear fuel material, such as uranium ore, thorium ore, etc., as prescribed by the Presidential Decree

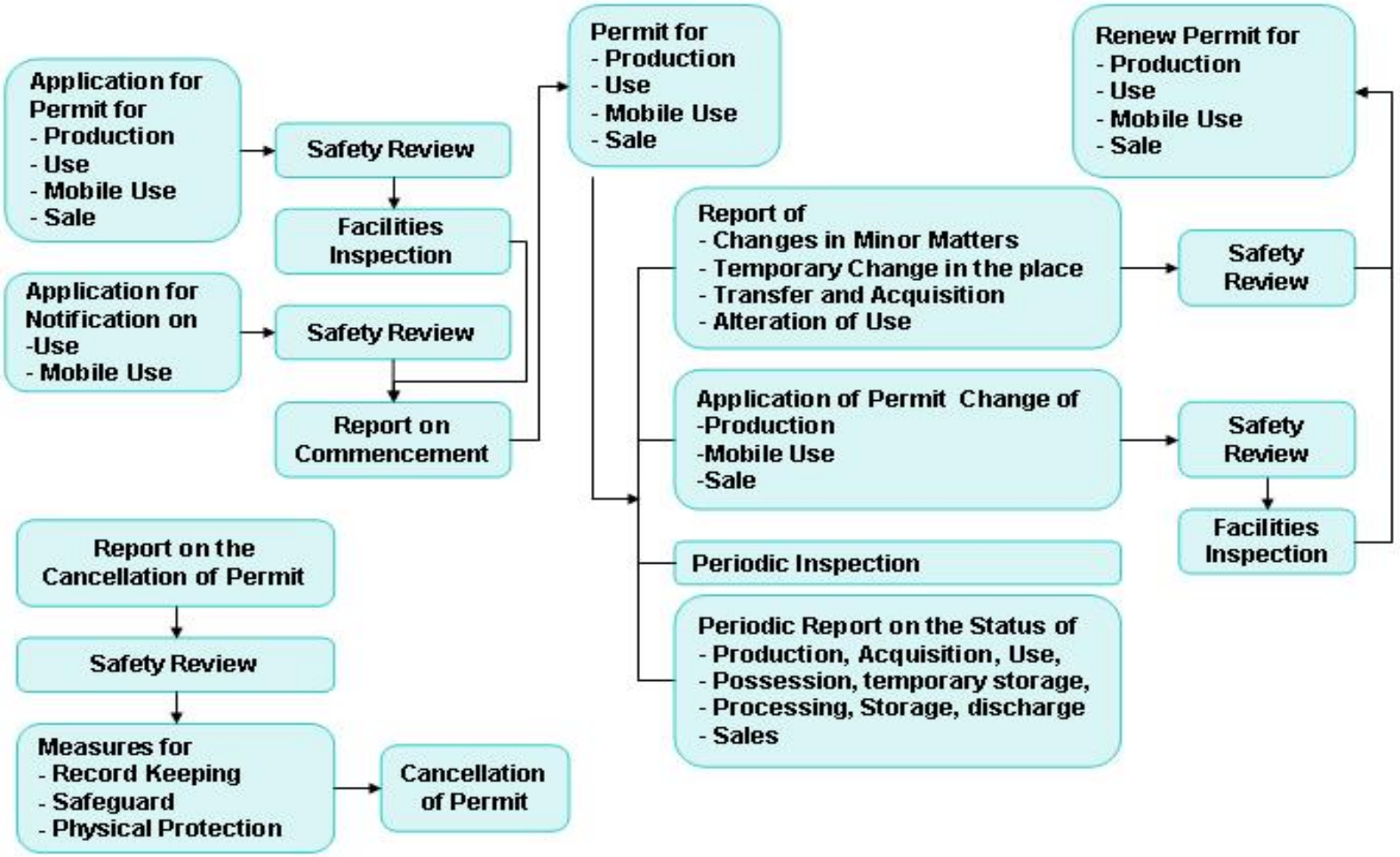
Nuclear material: Regulatory Frame

- Nuclear fuel material
  - (Article 45 of NSA) Permit for use for nuclear fuel material
    - A person, who wishes to use or possess nuclear fuel material, shall obtain the permit of the Commission
    - Exceptions : nuclear reactor operators, nuclear fuel cycle business, etc.(presidential decree)
  - (Article 47 of NSA) Inspection
    - nuclear fuel material user shall undergo the inspection of the Commission (시설검사 및 정기검사
- Nuclear raw material
  - (Article 52 of NSA) Notification of Use of Nuclear Raw Material
    - Any person, who intends to use nuclear raw material shall file a notification to the Commission
    - Exceptions: reactor installer/operator or a nuclear fuel cycle service operator, etc.(presidential decree)

Chapter 5 :Radioisotopes and Radiation Generating devices

	RI		RG
	Open source	Sealed source	
Permit	Above exemption level	Above notification level	Above notification level
Notification	N/A	- Article 65 of Regulation - Notice Rad.001 article 10.2 XRF, XRD, GC-ECD Calibration Sources: ≤40MBq & ≤500μSv/h, not in use ≤1μSv/h Integral equipment prevented from contact with radioactive materials: ≤10,000 Exemption Level & ≤10μSv/h Portable level gauge for fire extinguisher; Portable material component analyzer; and Portable density and moisture content gauge with sealed radioisotope below 100μCi of radioactivity.	**- Article 66 of Regulation** **- Notice rad.001 article 10(3)** **XRF, XRD, Accelerated ion implanting** **Self-shielded radiation generating devices: ≤170kV & ≤10μSv/h** **Baggage screening;** **Portable level gauge for fire extinguisher;** **Portable material component analyzer; and** **Portable density and moisture content gauge with sealed radioisotope below 100μCi of radioactivity.**
exemption	Notice rad.001 [table 5] Exemption amount or level	**Notice rad.007** **Conditional exemption**	**Notice rad.008 and rad.013**

Regulation of Radiation Sources



□ Permitted User : a person who has applied and been granted permit under Paragraph (1)

- to produce, sell, use (including the possessing and handling) or make a mobile-use of radioisotope or radiation generating device
- (Article 53 para 1 of NSA) Application for Permit
- (Article 56 of NSA) Inspection
  - Facility Inspection (article 85 of Enforcement Decree)
  - Periodic Inspection (article 88 of Enforcement Decree)

□ Notified User : a person who filed a notification to the Commission

- to use or make a mobile-use of sealed radioisotope, or a radiation generating device
  - the purpose of use or the quantity of which is smaller than what is prescribed by the Ordinance of the Prime Minister
- (Article 53 para 2 of NSA) Filing of notification

Large Radiation Generating Facilities

- □ Not individual source but large/complex facility
- □ Facility Inspection : inspected based on construction stage and operational condition
- □ Facilities :

- Proton accelerator(National Cancer Center)
- KAERI Proton accelerator Center at Kyeong-ju
- 3rd & 4th Generation Synchrotron (POSTEC)
- Heavy ion accelerator (IBS)
- Heavy ion therapy system (YUHS/SNUH) etc.

Business Agent

□ Article 54 of the Nuclear Safety Act (Registration of Business Agent)

- any person who intends to do work concerning radiation safety and control, including supervising of the facilities, on behalf of users of radioisotopes and radiation generating devices, shall register his business with the Commission.

□ The businesses can fall under each of the following categories:

- Removal of radioactive contamination;
- Collection, treatment and transport of radioisotope, etc. and radioactive waste;
- Formulating a radiation safety report and safety control regulations;
- Supervising the installment of use facilities, etc.;
- Radiation safety control;
- Other business related to the safety and control of radiation and the prevention of radiation hazards as prescribed by the Ordinance of the Prime Minister

Chapter 6 : Disposal and Transport

□ Article 63: Permit for Construction and Operation of Disposal Facility, etc.

- Any person, who intends to construct and operate a storage, processing and disposal facility of radioactive wastes and accessory facility (hereinafter referred to as "disposal facility, etc.") shall obtain permit of the Commission under the conditions as prescribed by the Presidential Decree. The same shall also apply in a case where he wishes to change any permitted matters.

Standards for Permit

□ Article 64

- Technical capability necessary for the construction and operation of disposal facility, etc.
- Location, structure, equipment, and performance of disposal facility, etc. shall not be any impediment to the prevention of hazards to human body, material and the general public caused by radioactive material, etc.;
- Construction and operation of disposal facility, etc. shall prevent any harm to public health and the environment caused by radioactive material, etc.
- secure the equipment and manpower
- Post-closure control plan (within 300years)

Inspection

□ Article 65

- Pre operational Inspection
  - Article 101 of presidential decree
    - Criteria for pass
  - Article 102 of presidential decree (Time of Pre-operational inspection)
    - 1st. Stage : site & structures
    - 2nd and 3rd stages : leak tightness, strength test, chemical, NDT, equipment/system performance test
    - 4th stage :final integrated test
- Periodic Inspection
  - Article 103 of presidential decree
    - Criteria for pass
    - Period: Once a year
- Disposal Inspection
  - Article 104 of presidential decree
    - Whenever Disposal is required (ex. 5 times/year)
- QA inspection
  - Article 31 of presidential decree (*Mutatis Mutandis*)

Report on Transport

□ Article 71

□ Who shall report?

- Who intends to transport the kinds and quantities of radioactive material, etc.
  - installer/operator of the nuclear power reactor
  - Installer/operator of the nuclear research reactor
  - nuclear fuel cycle enterpriser/nuclear fuel material user/nuclear raw material user/permitted user/notified user/business agent/installer of disposal facility, etc..
- Any person, who intends to get any ship or any aircraft laden with radioactive material, etc, to enter or to sail through the Republic of Korea

Technical Standards concerning Package or Transport

- Article 72
- (1) Any transport of radioactive material, etc. by rail, road, ship or aircraft, or domestic or international mail service shall be made in conformity with the technical standards concerning package or transport prescribed by the Regulation of the Commission.

Inspection of Package or Transport

- Article 75/Article 101 of Enforcement regulation
- Periodic Inspection
  - 1. Operator of a nuclear power reactor (every year)
  - 2. Installer of a nuclear research reactor, etc. (every year)
  - 3. Nuclear fuel cycle enterpriser (every year)
  - 4. Installer of disposal facilities or a person specializing in the mobile use of radioisotopes (every year)
  - 5. Producer/seller of radioisotopes (every one or three years depends on activity etc.)

Inspection of Package or Transport

□ Individual inspection : whenever transport ‘Radioactive materials, etc. designated by article 111(2) of Enforcement Regulation’

- What are the ‘Radioactive materials, etc. designated by article 111(2) of Enforcement Regulation’?
  - 1. Transported by whom receiving Periodic Inspection
    - a. Spent nuclear fuels;
    - b. Radioactive materials, etc. of which special transport is approved
    - c. Radioactive materials, etc. to be transported of which radioactivity exceeds a 30-fold of the relevant A1 or A2 values as in accordance with regulations set by the Commission;
    - d. intermediate/low level radioactive waste larger than 1.6m^3
  - 2. Transported by others
    - a. B(U) type, B(M) type
    - b. special transport approved material

Chapter 7 : Dosimeter Reading, etc.

□ Registration (Article 78)

- A person who intends to render the dosimeter reading service shall register his service with the Nuclear Safety and Security Commission as prescribed in Articles 78 and 79 of the Nuclear Safety Act.
- Also, as prescribed by Article 14 of the Framework Act on National Standards and Article 12 of the Enforcement Decree, an institute exclusively dedicated to nationwide calibration shall be designated by the Minister of Trade, Industry and Energy.
- NSSC takes charge of the registration of a dosimeter reading service provider. The competent authority for designating the national calibration institute is the Minister of Trade, Industry and Energy (Korean Agency for Technology and Standard).

Technical abilities

□ Article 79/Article 113 (The standard for Registration) of Enforcement Regulation of the Nuclear Safety Act

- Conformity to the standards for technical personnel, facility and handling
- Ability to ensure his reading facility and equipment maintain traceability under Subparagraph 18, Article 3 of the Framework Act on National Standards;
- Ability to assess the impact of a radiation dose that naturally increases or decreases while carrying a personal dosimeter;
- Ability to read personal dose by classifying such quantities into deep doses and shallow doses as determined by the Nuclear Safety and Security Commission;
- Ability to keep the minimum measurement level of a reading system at not more than 0.1 millisivert;
- Ability to ensure security of records on personal dose

Inspection

□ Article 80 (Inspection)

- Shall be inspected the installation, operation and performance of reading facility
  - prior-to-service inspection
  - Periodic Inspection(every year)

Chapter 9 : Regulation and Supervision

□ (1) The nuclear enterpriser shall take measures falling under each of the following Subparagraphs to prevent radiation damage in accordance with the Enforcement Decree:

- 1. Measurement of radiation dose and radioactive contamination;
- 2. Medical checkup
- 3. Control of exposure; and
- 4. Measures necessary to maintain the quantity of emissions of radioactive material and the quantity of radiation exposure as low as reasonably achievable. (ALARA)

□ (2) The nuclear enterpriser shall take measures necessary to keep the radiation dose exposed to workers and other persons with frequent access prescribed by the Enforcement Decree under the dose limit prescribed by the Enforcement Decree.

□ (3) The nuclear enterpriser shall take necessary measures for health such as restrictions on access to nuclear power utilization facility, for any person suffering from radiation damage or suspected to suffer from such radiation damage.

Measurement of radiation dose and radioactive contamination;

- ✓ Pursuant to Article 91 (Measure to Prevent Radiation Damage) of the Nuclear Safety Act and Article 131 (Measurement) of the Enforcement Decree the nuclear enterpriser shall measure the exposure dose and contamination by radioactive materials and keep the records.

Medical checkup

- Article 91 of NSA/article 123 (Medical Checkup) of Enforcement Decree /article 121 of Enforcement Regulations
- nuclear enterprisers shall conduct medical checkups for their workers and the medical checkup shall be conducted during such periods as in the following subparagraphs:

- Before initially engaging in radiation work;
- Annually for those engaging in radiation work;
- When the exposure dose exceeds the dose limit.

Control of exposure

□ Article 91(para1) 3 and Article 91(para2)

- The nuclear enterpriser shall take measures necessary to keep the radiation dose exposed to workers and other persons with frequent access prescribed by the Enforcement Decree under the dose limit prescribed by the Enforcement Decree.

Definitions

- ✓ "radiation worker" means a person who is engaged in the work which is exposed or feared to be exposed to radiation while working on operation, utilization, or preservation of the nuclear power utilization facility or on usage, treatment, storage, conservation, processing, discharge, disposal, transport, control, or decontamination of radioactive materials, etc.

- ✓ "person with frequent access" means a person other than the radiation worker, who frequently visits the radiation control area on business (excluding those who make a temporary visit to such area);

Dose Limits (1/3)

- Since 2003, the dose limits recommended in ICRP 60 and the IAEA BSS(1996) have been fully implemented.
- The NSA and its Enforcement Decree provide for the legal limits to be applied for occupationally exposed workers.
- These limits comply fully with IAEA GSR Part 3(2014) except for the more restrictive and newly established dose limit on the lens of the eye.

Dose Limits (2/3)

Classification		Radiation Worker	Persons with Frequent Access and Persons Engaging in Transport	Public
1. Effective Dose Limit		100 millisieverts in a 5 year period not exceeding 50 millisieverts per annum	6 millisieverts per annum	1 millisievert per annum
2. Equivalent Dose Limit	Lens of the eyes	150 millisieverts per annum	15 millisieverts per annum	15 millisieverts per annum
	Hands, Feet and Skin	500 millisieverts per annum	50 millisieverts per annum	50 millisiverts per annum

Dose Limit

1. "In a 5 year period" in the table above means the respective five-year periods starting from a certain year (e.g. 1998 - 2002).
2. The effective dose of the personnel of occasional access in the table was revised from 12 mSv per annum to 6mSv per annum on April 12, 2016 and the revised dose limit will be effective from January 1, 2017.
3. In the case of the general public, a value in excess of one millisievert can be accepted for a single year to the extent that the dose does not exceed one millisievert per annum on a five-year average.
4. Dose limits as separately determined and publicly notified by the Commission shall apply to radiation workers who are confirmed to be pregnant and those who use radioisotopes, etc. on a limited or temporary basis among the general public.

Dose Limits (3/3)

- Special arrangements are made for the pregnant and breast feeding women. From the notification of pregnancy until the “delivery”, a limit of 2 mSv, equivalent dose to the surface of the lower part of the abdomen, is prescribed and additional measures have to be taken by the employer in order to reduce as far as possible the radiological risks for the women and the foetus.
- People below 18 years are not allowed to handle radioactive sources except for trainees under the supervision of a certified training instructor and provided with an authorization from NSSC.

ALARA

- ✓ Paragraph 1 of Article 91 (Measure to Prevent Radiation Damage) of the Nuclear Safety Act and Article 134 (Measure for Reduction of Exposure) of the Decree provide that the nuclear enterpriser shall implement the following measures to limit the radiation workers, other persons with frequent access to the facility and residents in its vicinity are exposed to.

- Protective measures in conformity with the characteristic of the radiation work;
- Radiation shields and the proper layout of other equipment;
- The use of material and apparatuses which have the effect of reducing the dose;
- Securing sufficient work space.

Measure for health

- ✓ Article 91 para 3/Article 135 (Measure for Victims to Radiation Injury) of Enforcement Decree
- ✓ The Nuclear enterpriser shall take health safety measures and other necessary measures including
- reducing the access hour,
- declaring the radiation control area off-limits or
- transferring his employees to tasks which are considered less likely to expose employees to radiation when radiation workers suffer radiation injury.

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APPRE

- APPRE
  - stipulates the system of managing radiological emergency
  - legislated in May 2003 and came into force in February 2004,
  - stipulates overall radiological emergency management affairs including:
  - prevention of, preparedness for, and response to radiological emergency; radiological emergency medical treatment; and international cooperation

- ‘Framework Act on Civil Defense’ and ‘Basic Act of Disasters and Safety Control’
  - which stipulate the system of national response against disasters of various kinds

APPRE

□ contains the following:

- the emergency planning zone and general provisions,
- the duties and organization of emergency preparedness organizations,
- the criteria for announcement of radiological emergency,
- the emergency response facilities,
- the response activities for emergency, and
- the maintenance and management of emergency response capabilities.

Revision of APPRE

□ revised in May 2014

- to divide the Emergency Planning Zone (EPZ) into the Precautionary Action Zone (PAZ) and the Urgent Protective Action Planning Zone (UPZ).

□ incorporate IAEA standards

- which recommends designating the PAZ up to 3~5 km from the plant and the UPZ within 20~30 km radius of a damaged NPPs to ensure effective emergency response in case of radiological emergency.

National Radiological Emergency Plan

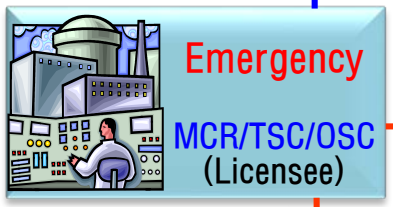
- Pursuant to APPRE, the NSSC formulates a National Radiological Emergency Plan every five years

- which is interlinked with Basic Plan for National Safety Management established based on the Basic Act of Disasters and Safety Control.

Nuclear Emergency Response Steps in Korea

President

Prime Minister



• Emergency Report

NEMC (NSSC)
National Emergency
Management Committee

• Other Ministries Coordination
• Disaster Declaration/Cancellation

• Emergency Report

Protective Action
Measure Order

OEMC (NSSC)
Off-site Emergency Management Center

• Dispatch

RETAC
(KINS)

• Technical Advice
• Experts Dispatch
• Run AtomCARE system

• Dispatch

Site-area Emergency & General Emergency Management
Decision of Protective Action

• Direct Sheltering/Evacuation

OEMCAC
Advise Committee

JPIC
Joint Public
information Center

JRMC
(Civil, Official. Military)
Environ. Monitoring Center

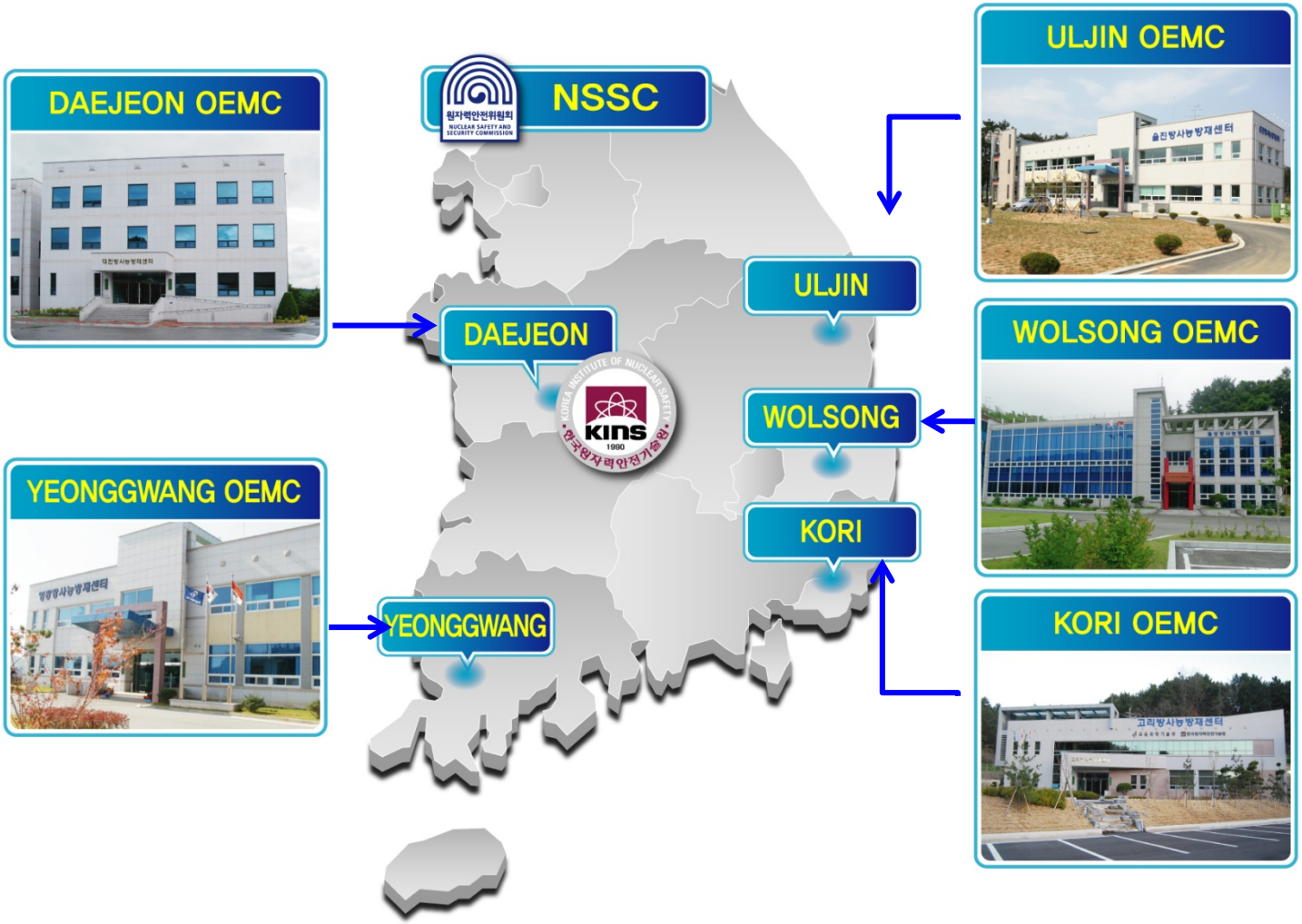
REMSC
(KIRAMS)

• Medical Team Dispatch

• Dispatch

JREMSC
Medical Service Center

Off-Site Emergency Center (NSSC-OEMC)



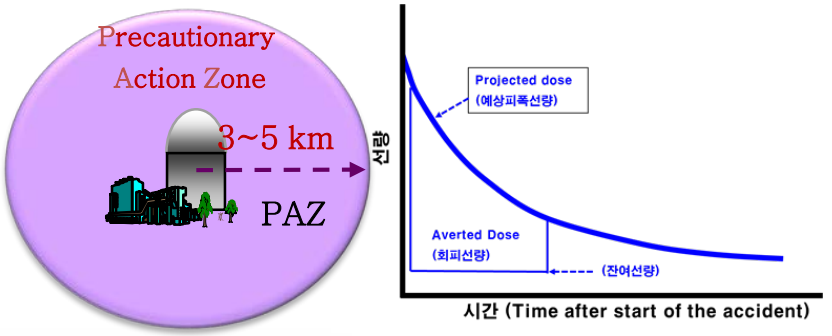
Radiological Emergency Technical Advisory Center (KINS-RETAC)

- Technical Advice on Emergency Management
- Off-Site Radiological Monitoring and Evaluation Support
- Makes recommendation for emergency response measures
- Operates the Nuclear Emergency Management System (AtomCARE)

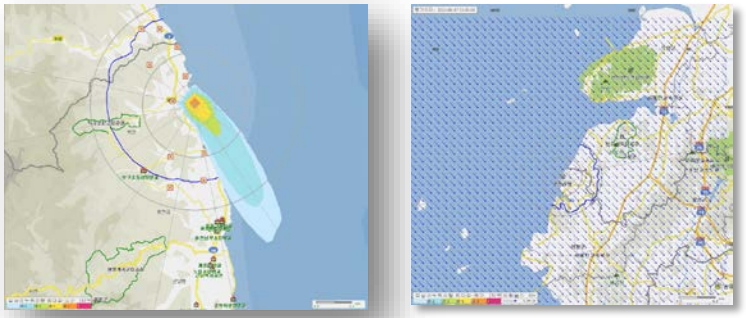
New Strategy of Emergency Management in Korea

- Goal of Emergency Management: To prevent occurrence of deterministic effects, to reduce occurrence of stochastic effects in population to the extent practicable

1. Establish **precautionary action zone (PAZ)** in advance and do precautionary urgent protective actions **(EAL, General Emergency)**
   - to prevent the deterministic effects



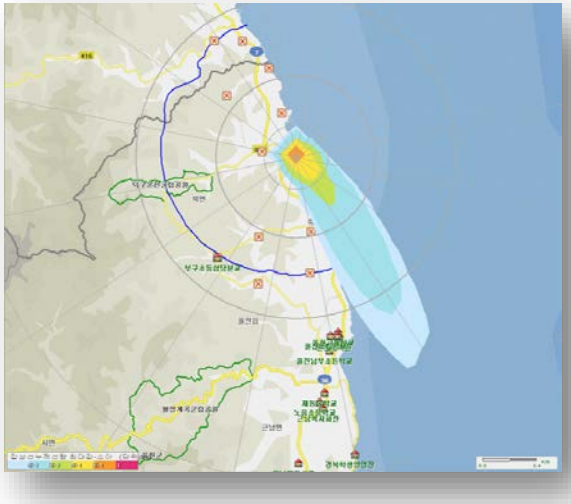
2. From (projected) dose assessment result, to perform protective actions in accordance with **GIL (Generic Intervention Level)**
   - to reduce stochastic effect
   - before radiological release



3. Based on environmental monitoring (sampling and analysis) results, to perform protective actions applying **OIL(Operational Intervention Level)**
   - to reduce stochastic effect
   - after radiological release

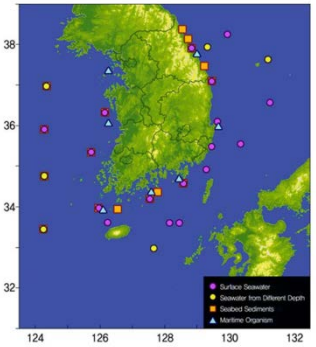
Strengthen Emergency Training & Exercise

- Unified Emergency Exercise
  - The NSSC conducts a national level radiological emergency exercise involving the central administrative agencies once a year (1/5yr →→1/1yr)
- Integrated Emergency Exercise
  - The metropolitan and local government conduct a radiological emergency exercise every two years (1/4yr →→1/2yr)
  - (New) Each local government conducts the public protective exercise once a year
- On-site Emergency Exercise
  - Two units perform once every year
- Drill : Participation of each on-site emergency organization
  - One unit or Two units perform once every quarter



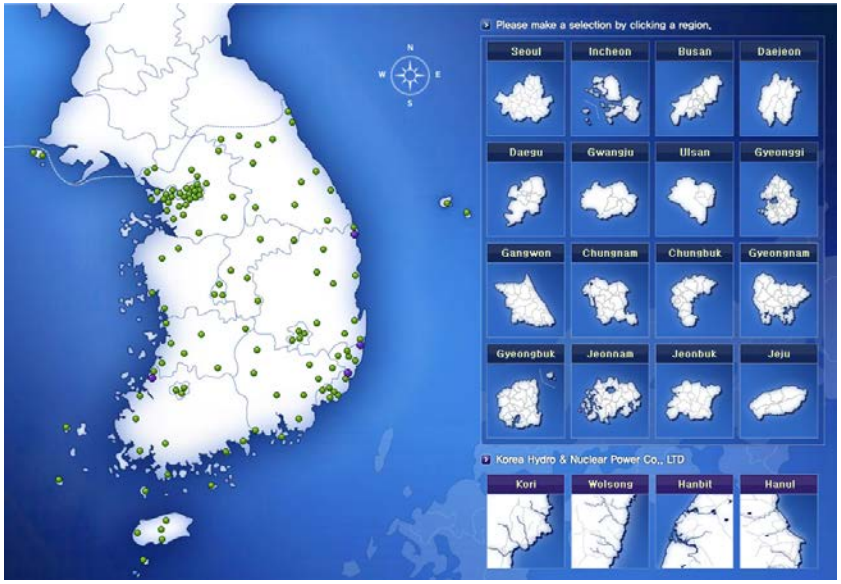
Increasing Environmental Radiation Monitoring Stations

- **Collects Environmental Radiation Levels (National Wide & Marine)**
  - Real time monitoring of nationwide environmental radiation levels
  - 1 Central Monitoring Station / 14 Regional Monitoring Stations (CAMSNet)
  - 113 Unmanned Monitoring Posts
  - 3 Xenon Monitoring Station
    (meteorological monitoring posts, remote islands, army bases)



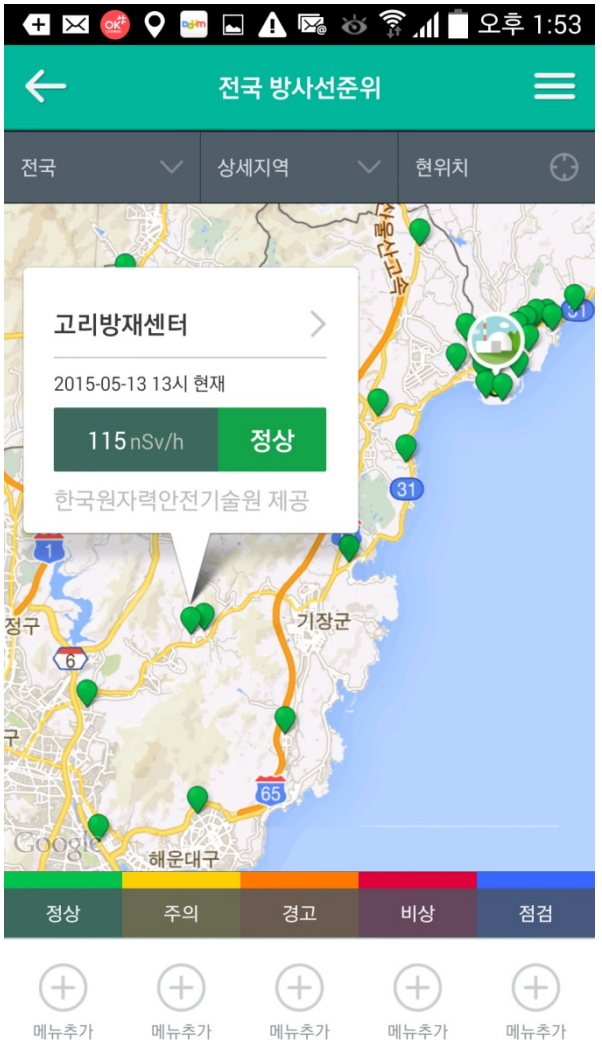
- **Detects any Abnormal Variations in Environmental Radiation Levels**
- **Open to public using web & mobile phone application**

http://IERNet.kins.re.kr/



Environmental Monitoring Results Open to Public

- Environmental monitoring Information open to mobile phone application
- eRAD@NOW2



I. Introduction

II. Regulatory Framework

III. Nuclear Safety Act (NSA)

IV. Act on Physical Protection and Radiological Emergency (APPRE)

V. Act on Protective Action Guidelines against Radiation in the Natural Environment(APRNE)

Act on Protective Action Guidelines against Radiation in the Natural Environment(APRNE)

- Back Ground

  - ‘pseudo healthy mat’ event in 2007
  - limitation of NSA
    - Monazite vs. nuclear fuel material
  - legislation of new law
  - Enacted in 2012

Structure of APRNE

- Chapter I General Provisions
- Chapter II Establishment, etc. of Comprehensive Plans for
- Protection from Radiation in the Natural Environment
- Chapter III Management of Raw Materials, Residues, and Products
- Chapter IV Installation and Operation of Radiation and Radioactivity Monitors
- Chapter V Supplementary Provisions
- Chapter VI Penal Provisions

Act on Protective Action Guidelines against Radiation in the Natural Environment

- Purpose:

- To prescribe those matters concerning safety management of radiation encountered in environments, thereby protecting the public health and the environment and improving quality of life while contributing to public safety.

Act on Protective Action Guidelines against Radiation in the Natural Environment

- Scope

- radiation emitted from natural nuclides contained in raw materials, residues, and products:

  - ❖ radiation managed in accordance with the Nuclear Safety Act shall be excluded

- cosmic radiation
- terrestrial radiation
- recycled scrap metal

Act on Protective Action Guidelines against Radiation in the Natural Environment

□ Comprehensive Plan

- NSSC shall formulate the comprehensive plan on five year basis

- Cooperate with related central government agencies

- the plan includes policy goal and basic direction, environmental protection, current status and forecast of safety management, related R&D, investigation and analysis of raw material, residues and product, treatment or recycling of residues, establishment of safety management system of cosmic radiation and terrestrial radiation etc.

Act on Protective Action Guidelines against Radiation in the Natural Environment

- Management of Raw materials, Residues, and Products

- Registration of Handlers of Raw materials or Residues

- Succession to the Status of Handlers

- Management of Export or Import of Raw materials or Residues

- Recording and Maintaining of current status of distribution

- Treatment, Disposal or Recycling of Residues

Act on Protective Action Guidelines against Radiation in the Natural Environment

- Management of Raw materials, Residues, and Products (continue)

  - matters to be observed in handling and managing raw materials and residues
  - Safety standards for Products
  - measures against nonconforming products
  - order for disposal of defective products
  - safety management etc. of Cosmic radiation

Control of Occupational Exposure by Air Crew

- ✓ no domestic regulatory system that covers all categories of existing exposure situations provided by IAEA GSR Part 3. Also, there is no regulation that controls the concentration of radon at the workplace, but the Ministry of Environment is making efforts to formulate a comprehensive plan to control radon.

- ✓ Article 18 (Safety Management of Space Radiation) of the Act on Protective Action Guidelines against Radiation in the Natural Environment,
- ✓ air transportation business operator shall assess the exposure dose of aircrew on international flights by each air route and their annual exposure dose in order to control their occupational exposure.
  - ➢ Article 4 of “Notice of the MOLIT 2013-391” (Safety Control Regulation of Cosmic Radiation for Crew) provides that the dose limit of crews shall be 20 mSv per annum.
  - ➢ An air transportation business operator shall annually report to the Minister of Land, Infrastructure and Transport records of exposure dose of its crew and keep the records more than five years. In accordance with Article 10 (Safety Measures, etc. for Crew) of Enforcement Decree of the Act on Protective Action Guidelines against Radiation in the Natural Environment, the business operator shall provide information about occupation exposure to the crew and the Minister of Land, Infrastructure and Transport checks the implementation of measures taken by the business operator.

- Installation and Operation of Radiation and Radioactivity Monitors

- Installation of Monitors at Airports and Harbors

  - NSSC shall install monitors at Airports and Harbors for the purpose of safety management of radiation in

  1) natural radionuclides contained in raw materials, residues, and products
  2) recycled scrap metal

- Installation of Monitors by Handlers of Recycled Scrap Metal

  - who sells or uses recycled scrap metal shall install and operate monitors

Measures against suspicious materials

□ Detection and Analysis of Suspicious Materials

- Monitor operators shall report the suspicious material to the NSSC
- NSSC shall investigate and analyze

□ Measures against Suspicious Materials

- In any of the following cases
  - 1. monitor detects raw materials or residues whose export or import has not been reported
  - 2. results of investigation and analysis products containing suspicious materials fail to meet safety standards
  - 3. monitor detects suspicious materials contained within recycled scrap metal.
- NSSC may order complementation, return, or collection of suspicious materials, or may undertake relevant measures independently:

Supplementary Provisions

□ Investigation and Analysis of the Actual State

- NSSC shall establish and implement annual investigation plans for inspecting actual state of safety management of radiation in the natural environment,

□ Report and Inspection

- If deemed necessary for the enforcement of this Act, the NSSC may order report on necessary matters or to submit data.

Always we keep watching our Atomic Power

Thank You

KINS 한국원자력안전기술원
KOREA INSTITUTE OF NUCLEAR SAFETY