Status of Assessment and Prognosis System for Nuclear Emergency Response in Korea

Seung-Young Jeong, Ph.D

k504jsy@kins.re.kr

Korea Institute of Nuclear Safety (KINS)

한국원자력안전기술원
KINS KOREA INSTITUTE OF NUCLEAR SAFETY

I. Nuclear Emergency Preparedness of Korea

Status of Nuclear Power Plant Operation in Korea

(As of March 2015)

In operation
24 units

Under construction
4 units

Under planning
8 units

1 Research reactor

Hanul 6 units

Shin-Hanul 2 units

Wolsong 4 units

Shin-Wolsong 2 units

Kori 4 units

Shin-Kori 4 units

Hanbit 6 units

In Operation

Under Construction

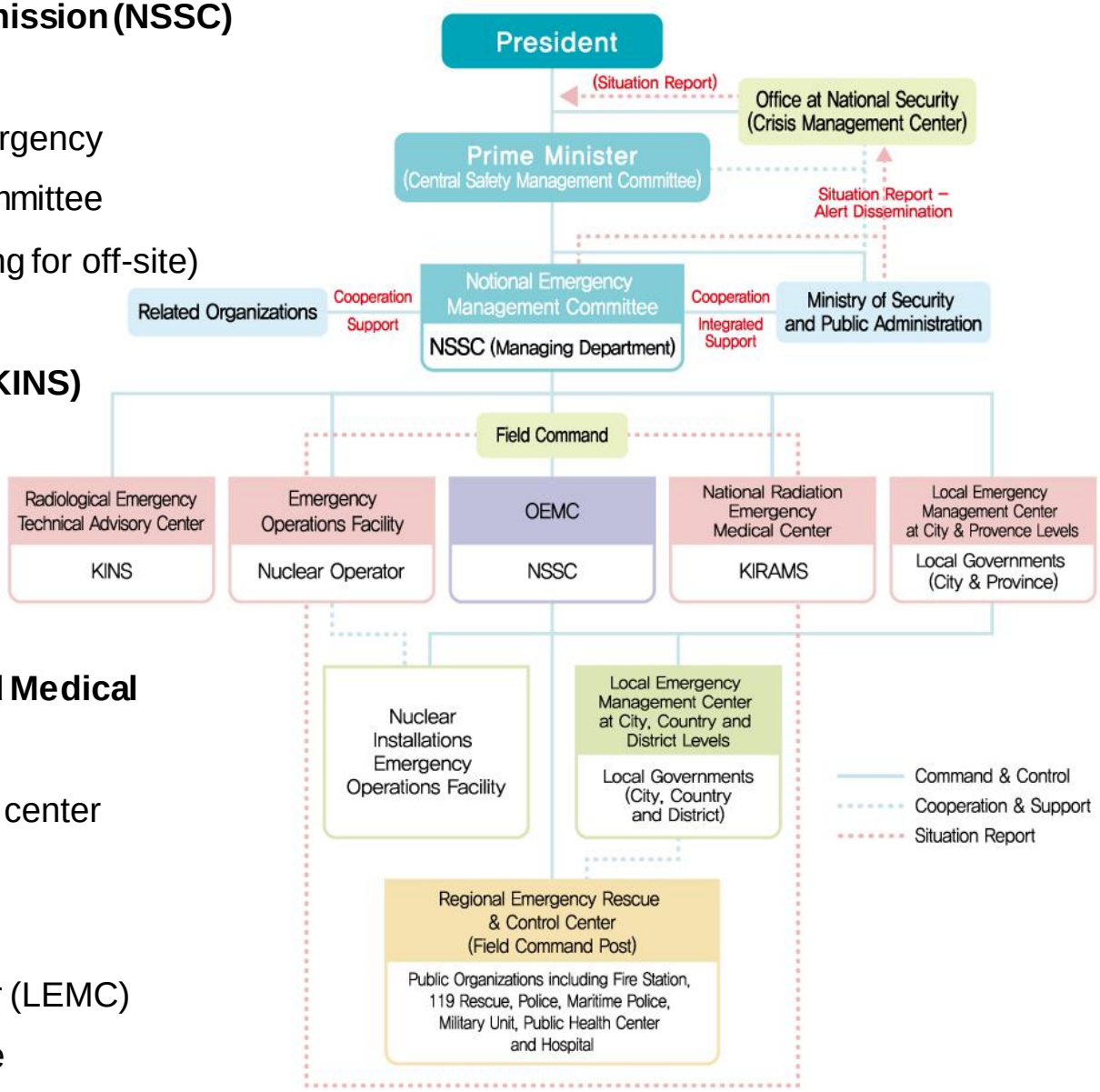
National Radiological Emergency Management Scheme

- **Nuclear Safety and Security Commission (NSSC)**
  - nuclear regulatory authority
  - national coordinating authority of emergency
  - national emergency management committee
  - chairperson of OEMC (decision making for off-site)

- **Korea Institute of Nuclear Safety (KINS)**
  - regulation on nuclear installations
  - dispatch technical advisory team
  - run technical advisory system

- **Korea Institute of Radiological and Medical Science (KIRAMS)**
  - national radiation emergency medical center

- **Local Government**
  - local emergency management center (LEMC)
  - implement countermeasure on off-site



Nuclear Emergency Response Steps in Korea

EOF (Licensee)
nergency Operation Facility

President

Prime Minister

Emergency

MCR/TSC/OSC
(Licensee)

• Emergency Report

• Emergency Report

NEMC (NSSC)
National Emergency
Management Committee

• Other Ministries Coordination
• Disaster Declaration/Cancellation

Protective Action
Measure Order

OEMC (NSSC)
Off-site Emergency Management
Center

• Dispatch

RETAC
(KINS)

• Technical Advice
• Experts Dispatch
• Run AtomCARE system

LEMC
ocal Government)

• 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)
nviron. Monitoring Center

JREMSC
Medical Service Center

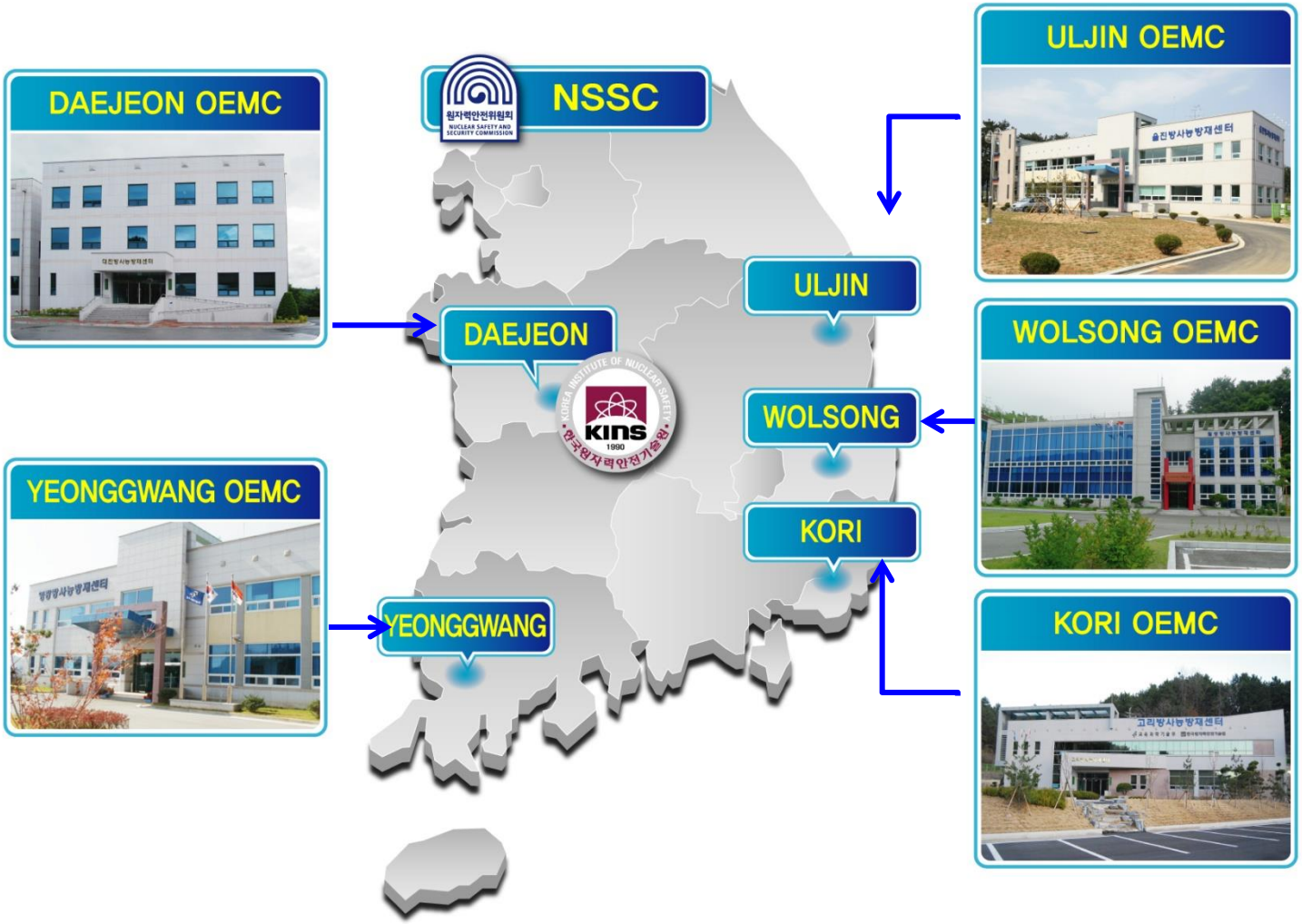
• Dispatch

REMSC
(KIRAMS)

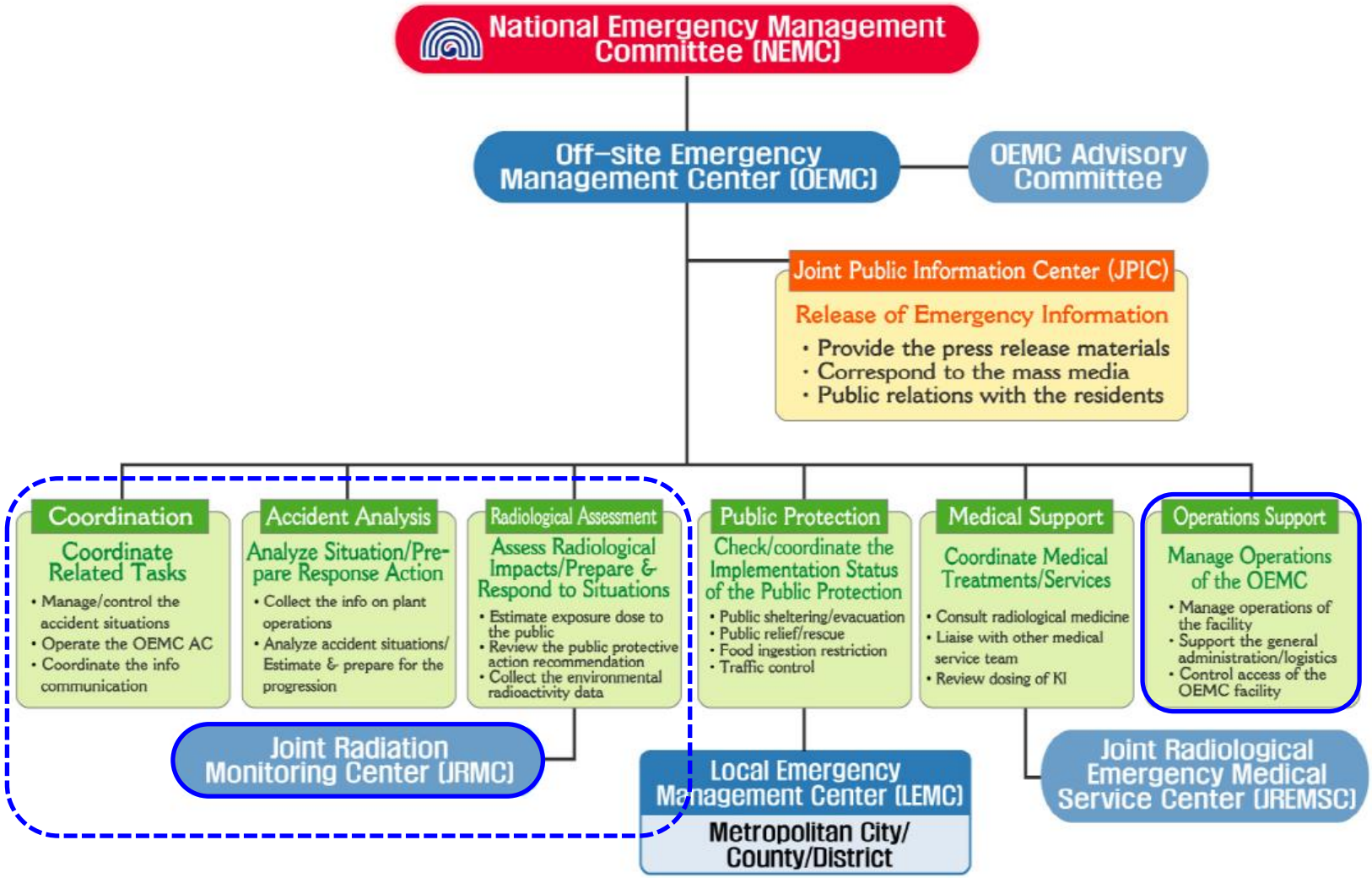
• Medical Team Dispatch

Protective Action Implementation

Off-Site Emergency Center (NSSC-OEMC)

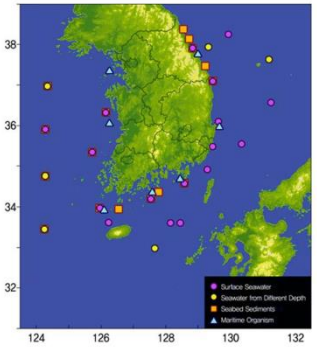


Emergency Management Center (NEMC/OEMC)



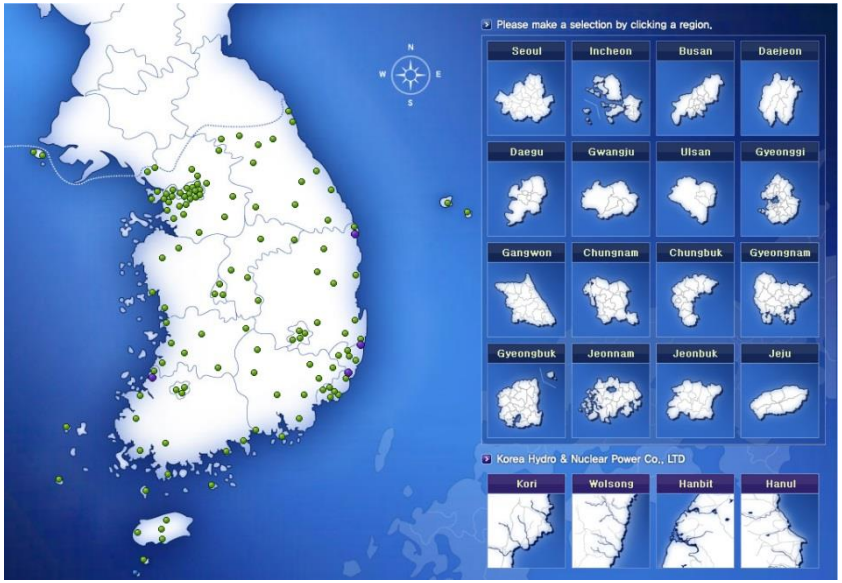
Environmental Radiation Monitoring (Normal Situation)

- **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 Stations
    (meteorological monitoring posts, remote islands, army bases)
  - Collect data from NPP sites
  - Data from local government will be collected soon



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

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



eRAD@NOW2

Joint Radiological Environmental Monitoring (Emergency Response)

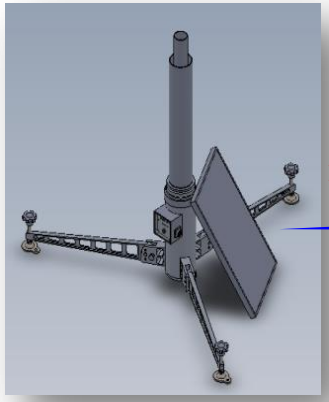
Aerial Survey

Radioactive Airborne Dust Sampling

Marine Survey

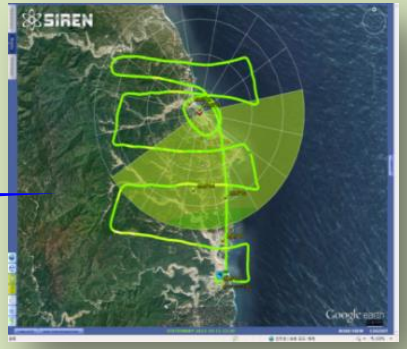
Car-borne Survey

Data/location transmission



Mobile Monitoring Post

Data/location transmission



SIREN

System for Identifying Radiation in Environments Nationwide

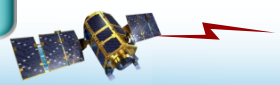
In Situ Gamma Spectroscopy

National Wide Systems (IRENet)

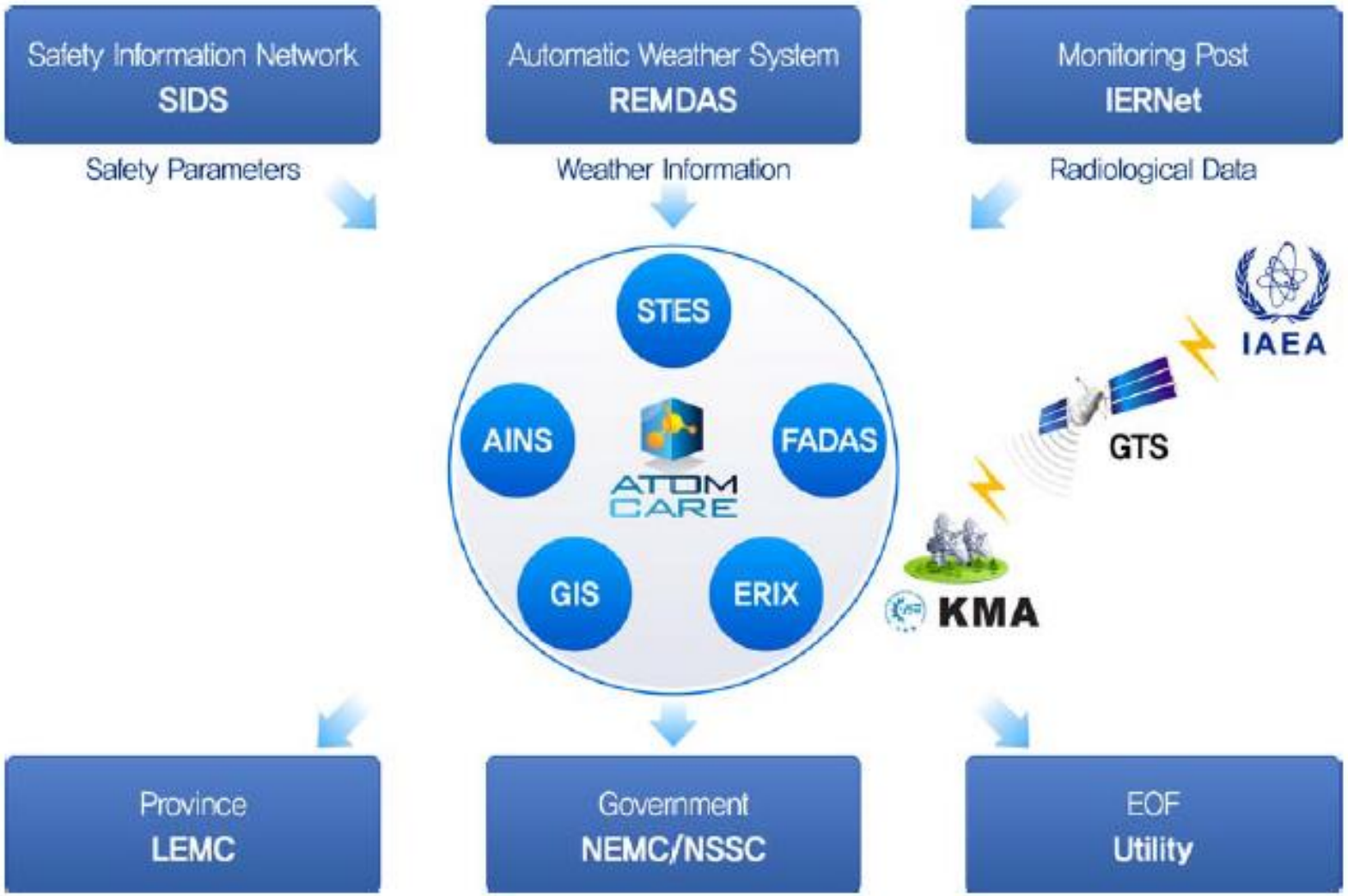
Functions of Emergency Response System - AtomCARE

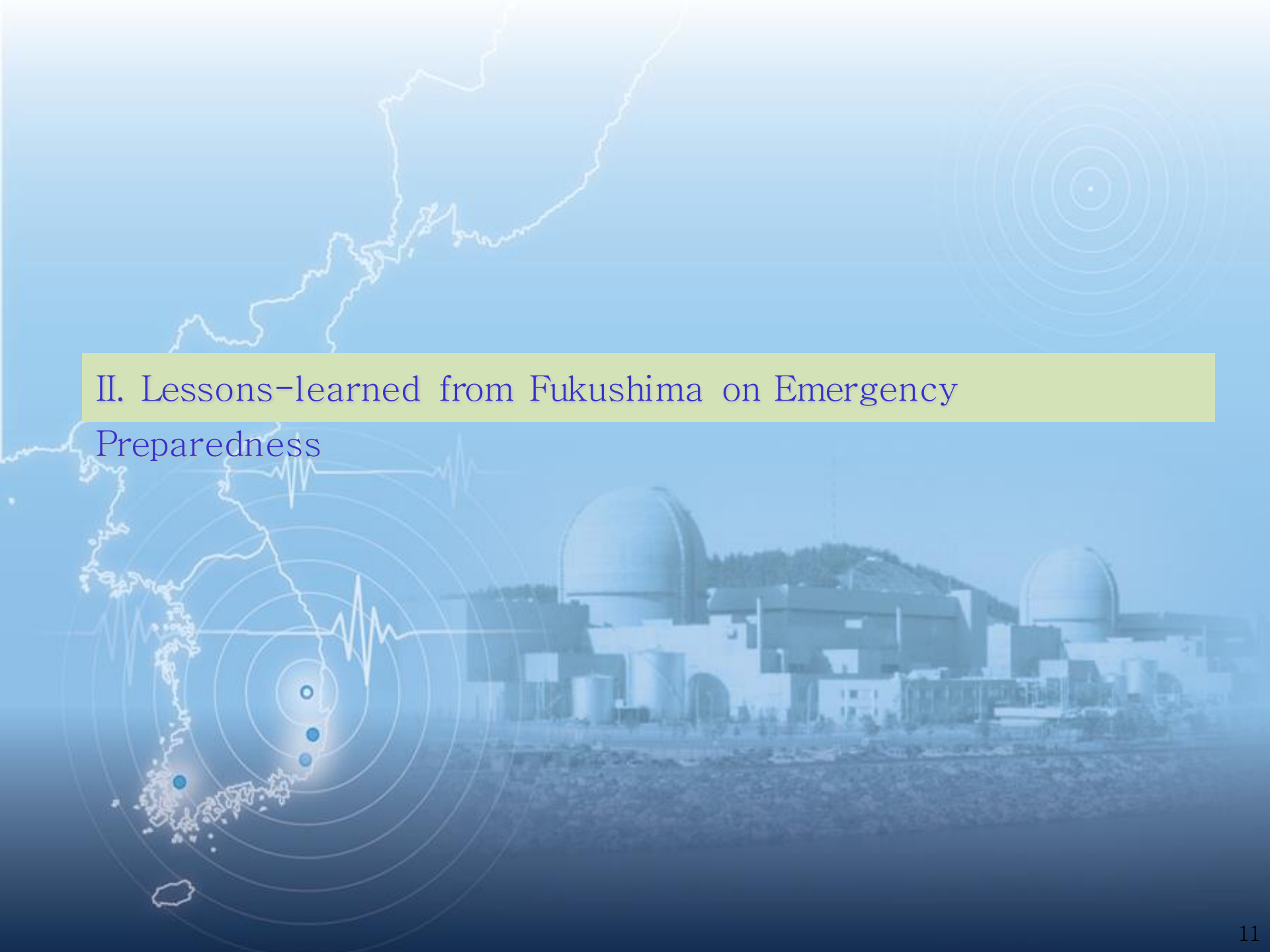
- **Diagnosis and prognosis of NPPs' accident with real-time parameters**
- **Provide recommendations for the public protective measures to government**

Monitoring and Detection	Safety Information Display System	SIDS/POMS
	Environmental Monitoring - Domestic	IERNet/SIREN
Emergency Characterization	Accident Characterization and Source Term Evaluation	STES
	Meteorological Data Acquisition	REMDAS
Emergency Management	Dose Assessment-Domestic	FADAS
	Dose Assessment - Global	ADAMO-GR
	Protective Action Advice	GIS
Consequence Management	Emergency Response Information Exchange System (on-line)	ERIX
	Commands and Control – Video Communication System	OP Center
IAEA early Notification convention		



AtomCARE System



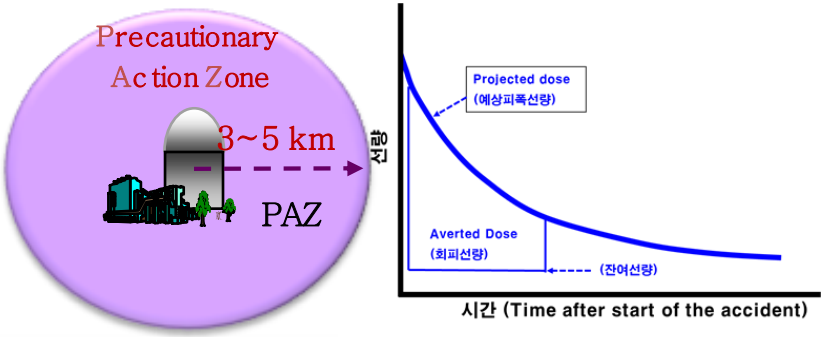


II. Lessons-learned from Fukushima on Emergency Preparedness

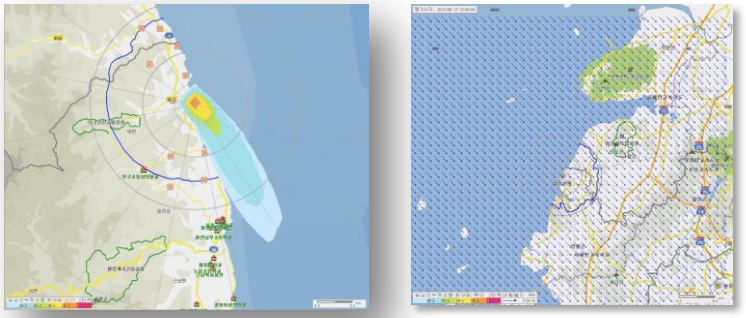
New Strategy of Emergency Management in Korea

- **Goal : Prevent occurrence of deterministic effects and reduce occurrence of stochastic effects by precautionary/urgent protective actions**

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



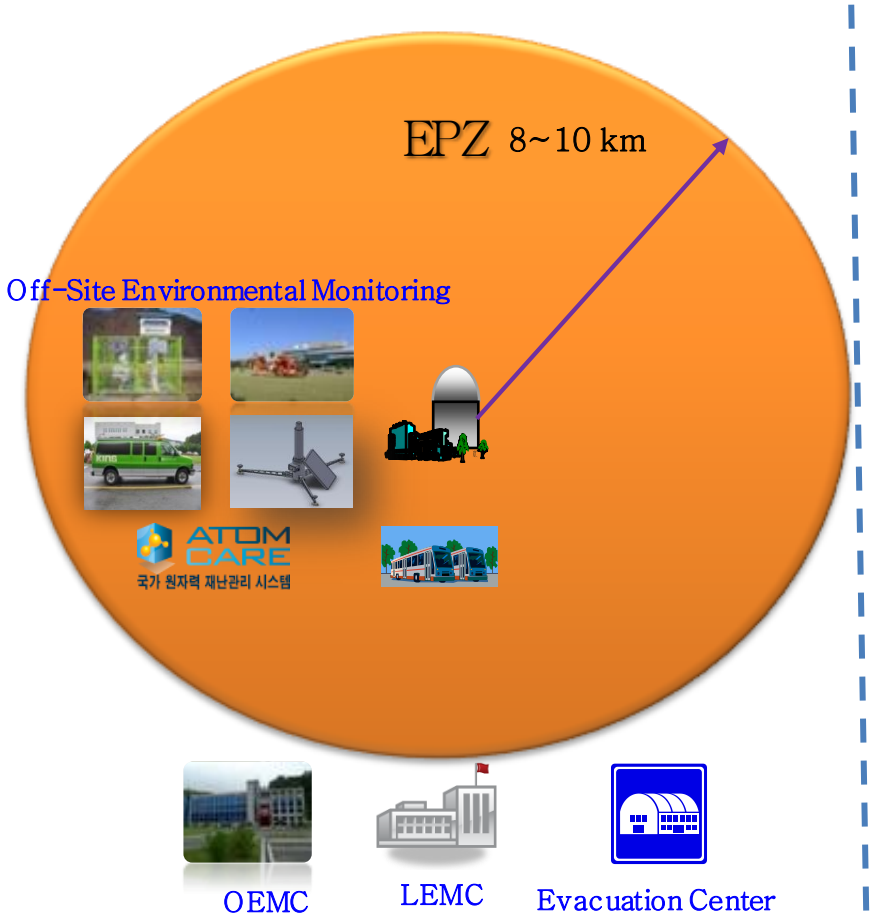
3. Based on environmental monitoring (sampling and analysis) results, to perform protective actions applying **OIL(Operational Intervention Level)**
   - to reduce stochastic effect
   - after radiological release

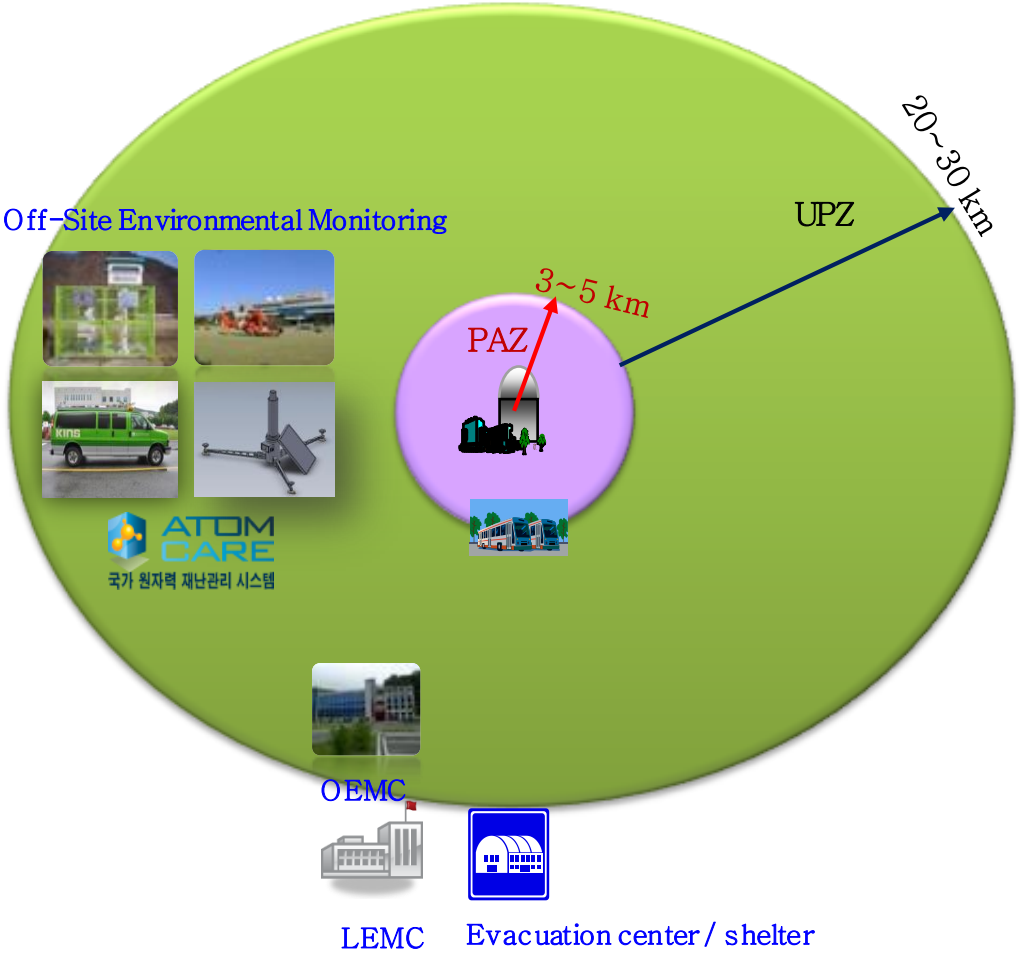
Extended Emergency Planning Zone

Act on Emergency Management change the EPZ on May, 2015

Before: EPZ 8~10 km

After: PAZ (3~5km), UPZ (20~30km)

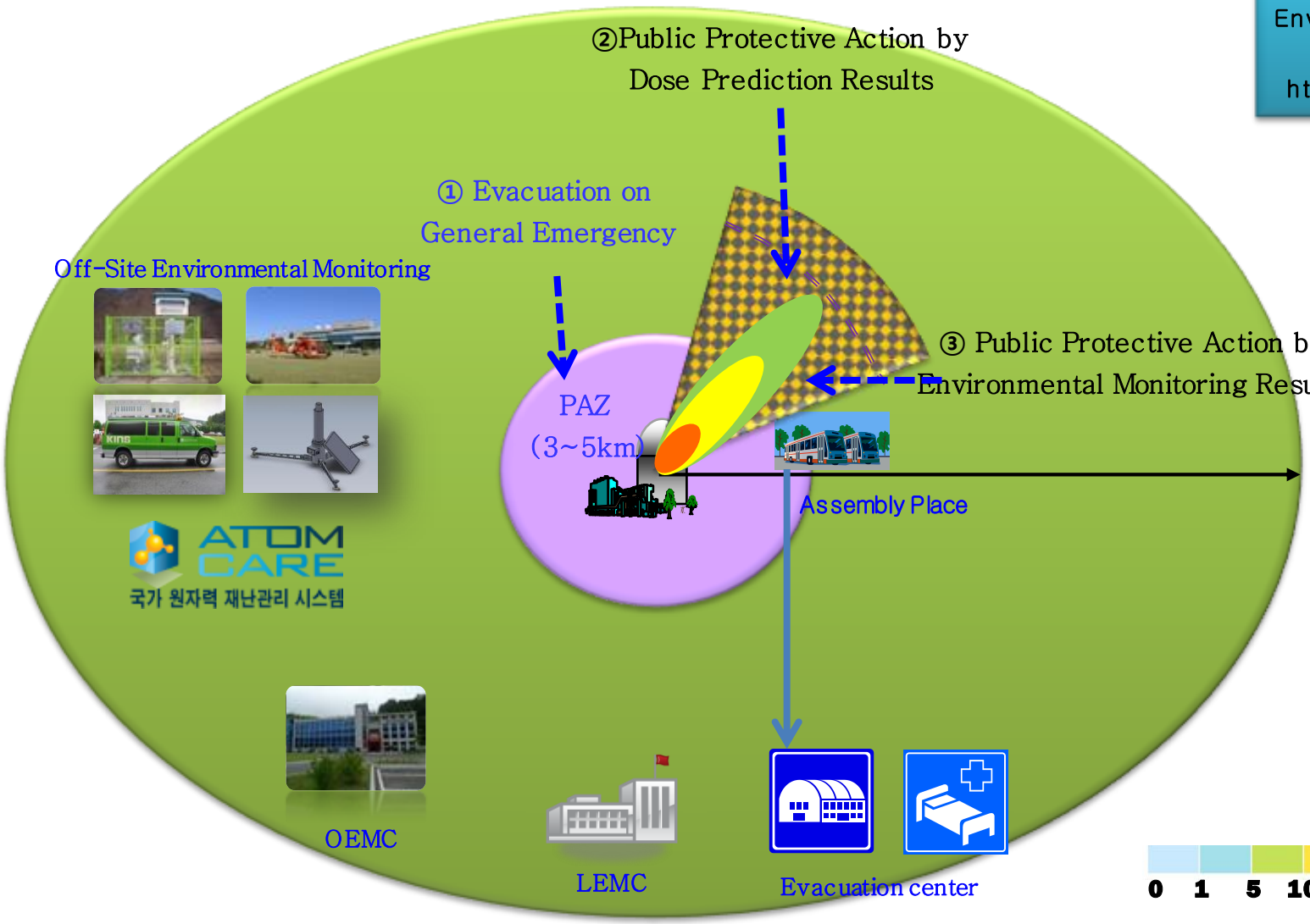




New Emergency Planning Zone (May, 2015)

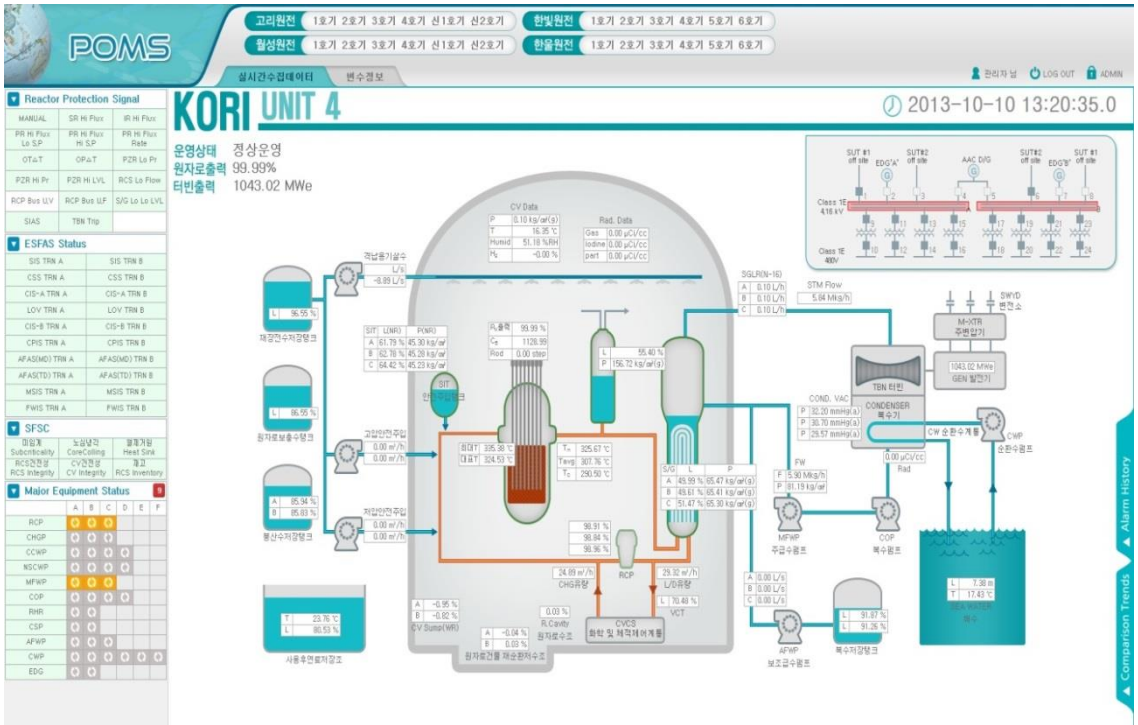
- Response stage

National
Environmental Monitoring
(IERNet)
http://iernet.kins.re.kr/



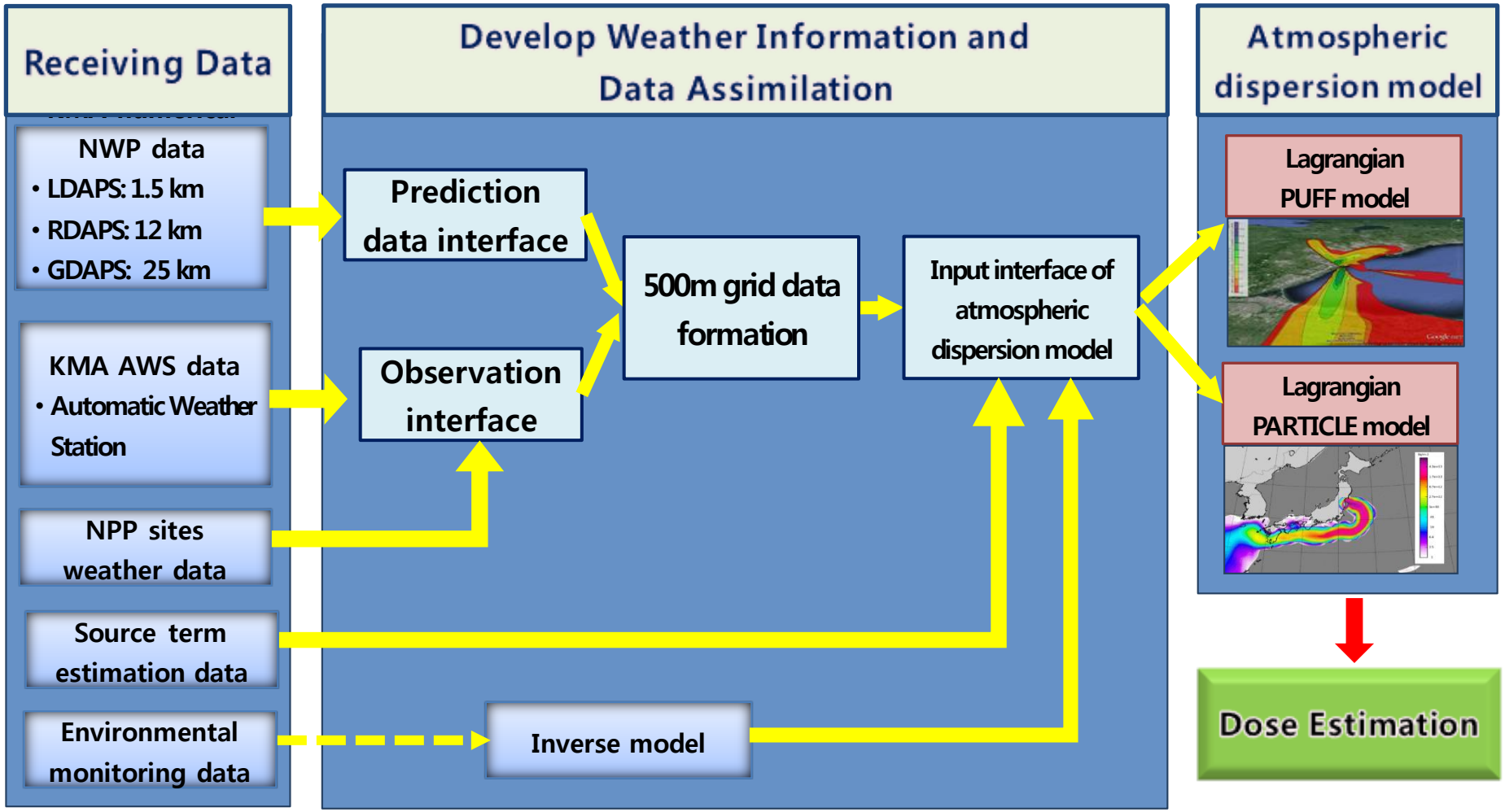
Development of Plant Operation Monitoring System (POMS)

- Restructure of the NPP's information transmission system
  - singles transmission through dual channel, redundancy, supply by mobile-power
- Development of plant operation monitoring system using real-time parameters (SIDS → POMS)
  - alarm on abnormal signal, understanding situation, diagnosis, and aid mitigation action
- Collecting signals : primary system, SG, emergency core coolant system, containment, spent fuel pool, radiation monitoring, power system, significant alarm, meteorological data, engineering safety feature actuation signal, major equipment signal, feed-water flow, etc.



Development of New Dose Assessment System (ADAMO)

- New Dose Assessment System (ADAMO : Accident Dose Assessment and Monitoring) uses massive amount of NWP and observation data (REMDAS + FADAS)
- The result covers the Korean Peninsula, East Asia, and Global Region



Unified Emergency Exercise & Three Country Drill

- Kori Unified Emergency Exercise & Three Country Drill (Nov. 20. 2014)
  - National level nuclear emergency exercise performed involving the central government, local government, public, two units of Kori nuclear power (1/5y → 1/1y)
  - Japan and China dispatched the liaison officers and observers to Kori for the joint emergency preparedness drill of three country TRM (practice the quick information exchange and cooperation in accident situation. TRM drill will be continued.
- Integrated emergency exercise (local governmental level) strengthen 1/4y → 1/2y
- Local government exercise implementation of public protective action every year

Lessons Learned from Fukushima of Korea-on site

Accident Scenario	Major Items of Improvement	
Occurrence of Earthquake	• Installing an Automatic Seismic Trip System	• Completed by 2013 - Installed at 20 units (as of 2013.4)
Occurrence of Tsunami	• Extension of Sea Wall Height for Kori NPPs	• Completed in 2012
Station Blackout	• Stand-by Unit of a Mobile Electricity Generating Vehicle	• Completed by 2014 - Installed at Wolseong & Kori site (as of 2013.4)
Loss of Cooling of Reactor and SFP	• Installing Conduits for Injecting from External Water Sources • Ensuring Coolability When Loss of the Cooling Function of SFP Occurs	• Completed by 2015 - Installation under way at Kori Unit 1&2 • Completed in 2012
Hydrogen Explosion	• Installing Passive Hydrogen Removal Equipment (PARs)	• Completed by 2013 - Installed at 8 units including Kori Unit 1
Containment Pressurization & Release of Radioactive Material	• Installing Containment Building Filtered Ventilation or Depression Systems • Securing Additional Radiological Protection Equipment for Residents	• Completed by 2015 - Installation under way at Wolseong Unit 1 • Completed in 2012
Multi units accident	• Construct Seismic Free ERC (on-site EOF)	• Completed by 2019

Radiation Monitoring Posts at International Airport & Seaports

53 monitoring units are installed at 11 major ports (March 2015)

Incheon : 5

Incheon Airport : 5

Pyeongtaek : 6

Kunsan : 3

Mokpo : 3

Pohang : 1

Busan : 17

Ulsan : 4

Kwangyang : 7

Jinhae: 1

Masan : 1

Summary

- **Set-up the new strategy and Implementation for reflecting Fukushima lessons learned is in progressed as planned in Korea**
- **To optimize the emergency preparedness and response of nuclear facilities, law and criteria is revised in Korea**
- **Urgent protective action will be implemented through knowledge and upgraded technical advice system in an accident**
- **Korea has established the national-wide environmental monitors and the joint environmental monitoring team for accident response.**
- **The lessons learned from Fukushima will be continuously applied**
- **International cooperation is the key essential for better emergency preparedness and response**

KINS
RETAC

Thank you for your attention!