

NUCLEAR SAFETY REGULATION AND KINS



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Korea Institute of Nuclear Safety

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PART A. NUCLEAR SAFETY REGULATION

I. KOREA'S NUCLEAR POWER PROGRAM

II. HISTORY OF SAFETY REGULATION

III. KINS AND SAFETY REGULATION

IV. ISSUES AND MEASURES

PART B. INTERNATIONAL NUCLEAR SAFETY SCHOOL OF KINS

REMARKS

1. History of nuclear use



2. Development of NPPs

- Turnkey contract (1971 ~ 1978)
 - Kori 1 & 2 (W), Wolsong 1 (AECL)
 - Localization (Non-turnkey, 1980 ~ 1986)
 - Kori 3 & 4, Hanbit 1 & 2 (W) , Hanul 1 & 2 (F)
 - Self-reliance of NPP technology (1984 ~ 1989)
 - Korean Standard Nuclear Plant (KSNP)
 - Hanbit 3 & 4, scale-down design of Palo Verde CE System-80 from 1,300 to 1,000 MWe
- ✓ *Reference design of the KEDO LWR project*

- OPR-1000 (2005)
 - Improvement of the KSNP design
 - Common radiowaste building, integrated reactor head assembly, dedicated auxiliary feed water tank, passive hydrogen recombiner

※ OPR: Optimized Power Reactor
- APR-1400, new standard design (1992 ~ 2002)
 - Advanced design features for safety and operational flexibility, and power capacity of 1400 MWe

※ APR: Advanced Power Reactor
- ✓ *Reference design of the 4 Barakah NPPs in the UAE*

□ APR and OPR

	APR-1400	OPR-1000
Design life (yrs)	60	40
Safety Seismic Earthquake (SSE, g)	0.3	0.2
Core damage frequency	10^{-5}	10^{-4}
Radiation exposure (mSv/person-yr)	20	50

- APR⁺ standard design (2007 ~ 2014)
 - Further improvement of safety features and increase of power capacity from APR-1400
 - Number of fuel assemblies from 241 to 257
 - Unique computer codes for design, and localized RCP and MMIS
 - Standard Design Approval in August 2014

□ APR⁺ and APR

	APR⁺	APR-1400
Capacity (MWe)	1500	1400
Number of safety trains	4	2
Core damage frequency (1/yr)	10⁻⁶	10 ⁻⁵
Auxiliary feed water system	Passive	Active
Construction process	Modular	Conventional

□ Nuclear facilities subject to KINS regulation

Type	Facilities	Owner
NPPs	• 24 units in operation (23 GWe) and 5 units under construction - Permanent shutdown of Kori #1 on 18 June 2017	KHNP
Fuel cycle facilities	• Fuel fabrication facilities for NPPs	KNFC
	• Research facilities for irradiated nuclear materials	KAERI
	• Spent fuel processing facilities for research	
Research & training reactors	• KJRR (under the CP review)	
	• HANARO and related facilities	
	• TRIGA Mark II, III (decommissioned)	
	• AGN-201 for education	Univ.
Repository facility	• Low and intermediate level radwaste disposal facility	KORAD
Facilities using RIs	• About 8,000 organizations in medical, industrial or academic fields	

□ NPPs at a glance



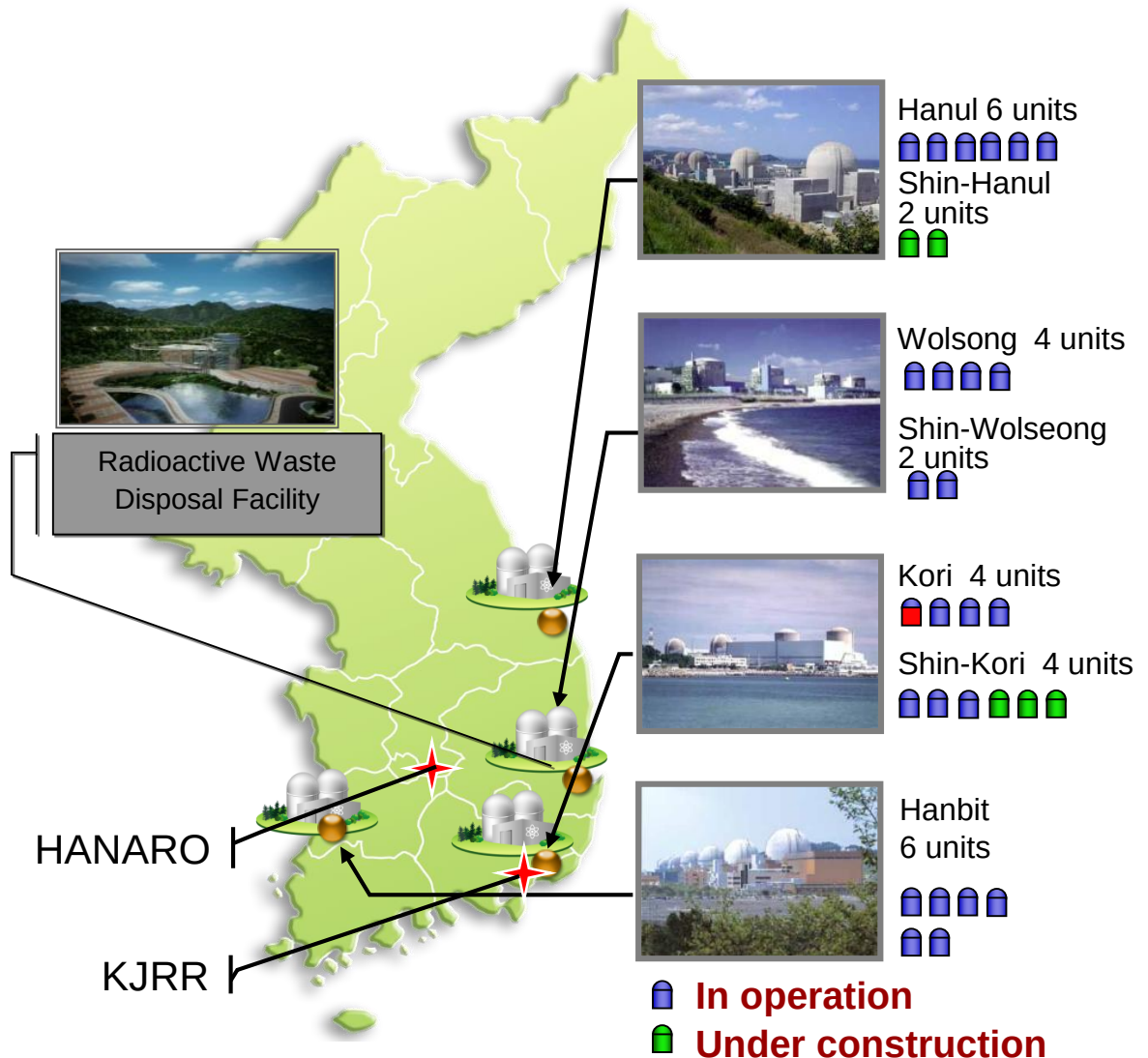
In operation
24 units
 (23GW)



Under construction
5 units
 (7 GW)



Under planning



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REMARKS

□ History timeline



- Initial stage from 1958 through 1980
 - Foundations for the peaceful use of nuclear energy and its safety control
 - Atomic Energy Act in 1958 and Office of Atomic Energy under the direct control of the President in 1959
 - First 3 NPPs of Kori unit 1 & 2 PWR and Wolsong unit 1 PHWR
 - Safety strategy of “the **initial NPPs of proven technology**” and turnkey projects
 - Vendors were responsible for schedule, inspection, startup and performance of the plants
 - Safety evaluation by Safety Review Committee, in accordance with vendor countries’ requirements, and support of the IAEA
 - Designated KAERI as expert organization in 1978
- ✓ TMI unit 2 accident in 1979

- Transitional stage from 1981 through 1989
 - Nuclear Safety Center in 1981
 - Subsidiary organization of KAERI
 - Amendment of the Rules & Regulations in 1982
 - Embrace the expanded use of nuclear energy and emphasize safety after the TMI accident
 - Atomic Energy Commission (AEC)
 - Legal hierarchy of the Act-Decrees-Regulations and 2 step licensing process of CP and OL for NPP
 - Entrust of technical regulations to the center
 - 6 more NPPs with non-turnkey basis, multipurpose research reactor, and localization of NPP and fuel
 - Regulatory competence developments; regulation requirements & guidelines, regulatory staff, resident inspector, and emergency preparedness plan
- ✓ *Chernobyl accident in 1986*

- Competency-focused stage from 1990 through 2010
- Enhancement of regulatory independence
 - Foundation of Korea Institute of Nuclear Safety (KINS) as the regulatory expert organization by the special KINS Act in 1990
 - Nuclear Safety Commission (NSC) separating the functions of AEC in 1996
- Accumulation of ample regulatory experience with the 19 new plants
 - 14 OPR-1000, 2 APR-1400, 3 PHWR plants, including 2 KEDO plants for the DPRK
- Introduction of new regulations
 - Periodic Safety Review (PSR) of a 10 year interval for operating plants in 2000
 - Standard Design Approval (SDA) in 2001
 - Continued operation after design life in 2005

- Commencement of global contributions
 - Orientation for 25 DPRK regulators in 2002
 - IAEA training courses since 2008
 - Support for global safety networks of ANNuR, ANSN and FNRBA together with the IAEA
- ✓ Attainment of a high level of regulatory competency towards nuclear safety

□ New chapter since 2011

✓ Fukushima Daiichi Accident in March 2011

- Nuclear Safety Act and NSSC (Nuclear Safety & Security Commission)
 - Further independence of administration and activities of nuclear safety regulation
 - 9 commissioners, including 4 members recommended by the National Assembly
- Expansion of the scope of regulatory oversights
 - All the organizations involved
 - Extension of emergency planning zone to 20 ~ 30 km radius from NPP
 - Formation of regional safety councils
- 24 NPPs in operation, 5 under construction and 1 in permanent shutdown, and SDA for the new design of APR⁺

- ✓ Regulatory responses to public concerns
 - Fukushima Daiichi accident in 2011
 - SBO concealment of Kori unit 1 in 2012
 - Falsification of quality verification documents in 2012

- ✓ Regulatory paradigm shift
 - From safety priority towards enhancing public confidence
 - Extension of regulatory oversight scope to all the activities involved
 - Proving regulatory leadership for nuclear safety

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SAFETY SCHOOL OF KINS

REMARKS

1. Regulatory infrastructure

□ Fundamentals of nuclear regulation

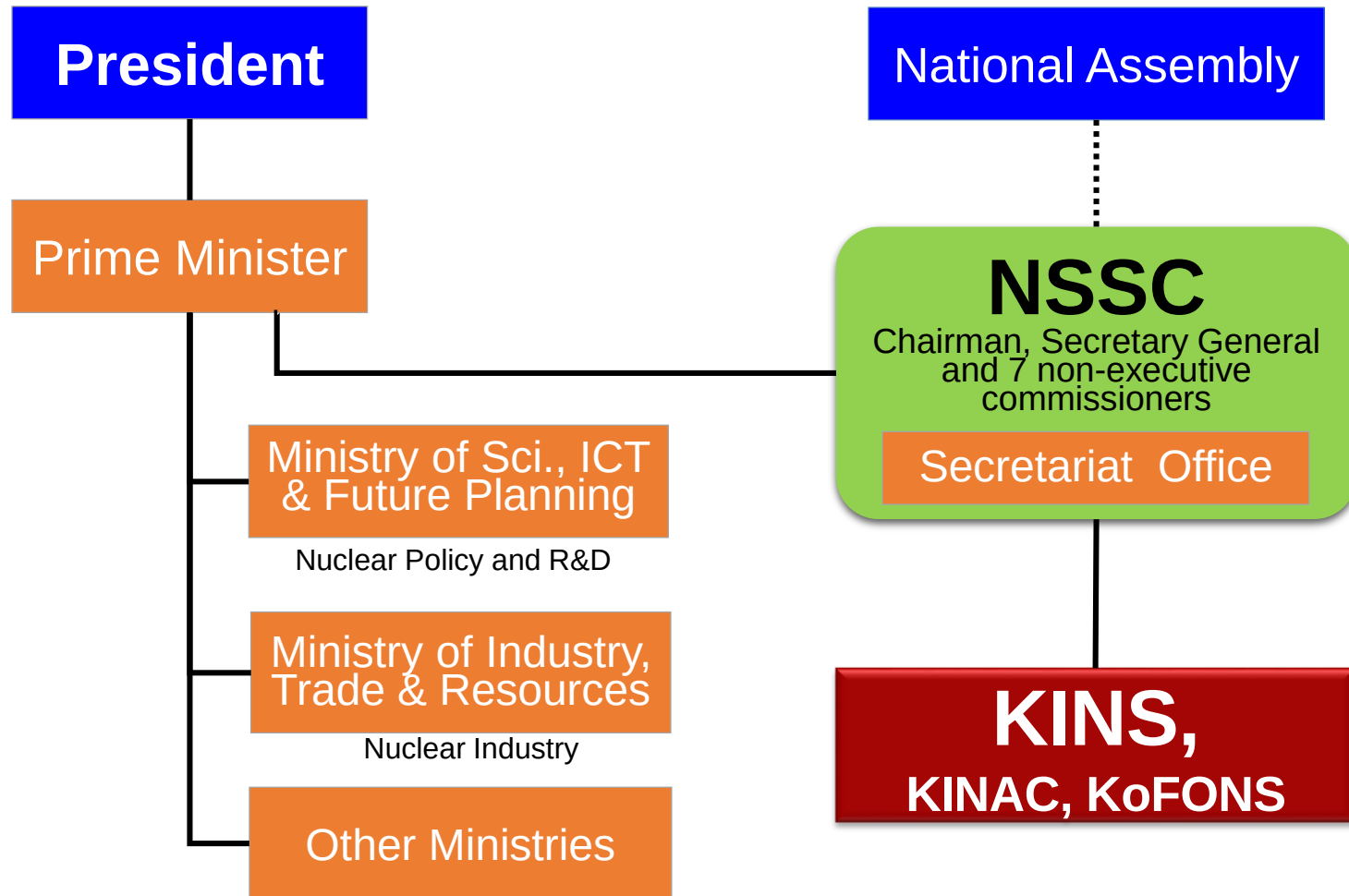
- Protect the public health and safety from radiation hazards
- Preserve the environment from any subsequent harmful effects
- The scope for nuclear facilities covers;
 - Site selection
 - Design
 - Manufacturing
 - Construction
 - Operation
 - Decommissioning

- Core values for nuclear regulation
 - **Excellence**: expertise and experience towards public confidence
 - **Independence**: safety and security in the eyes of the people
 - **Transparency**: no doubt in the process of regulatory decision making
 - **Impartiality**: objective approach in policy and decision making
 - **Reliability**: conformity of principles, and clarity and consistency

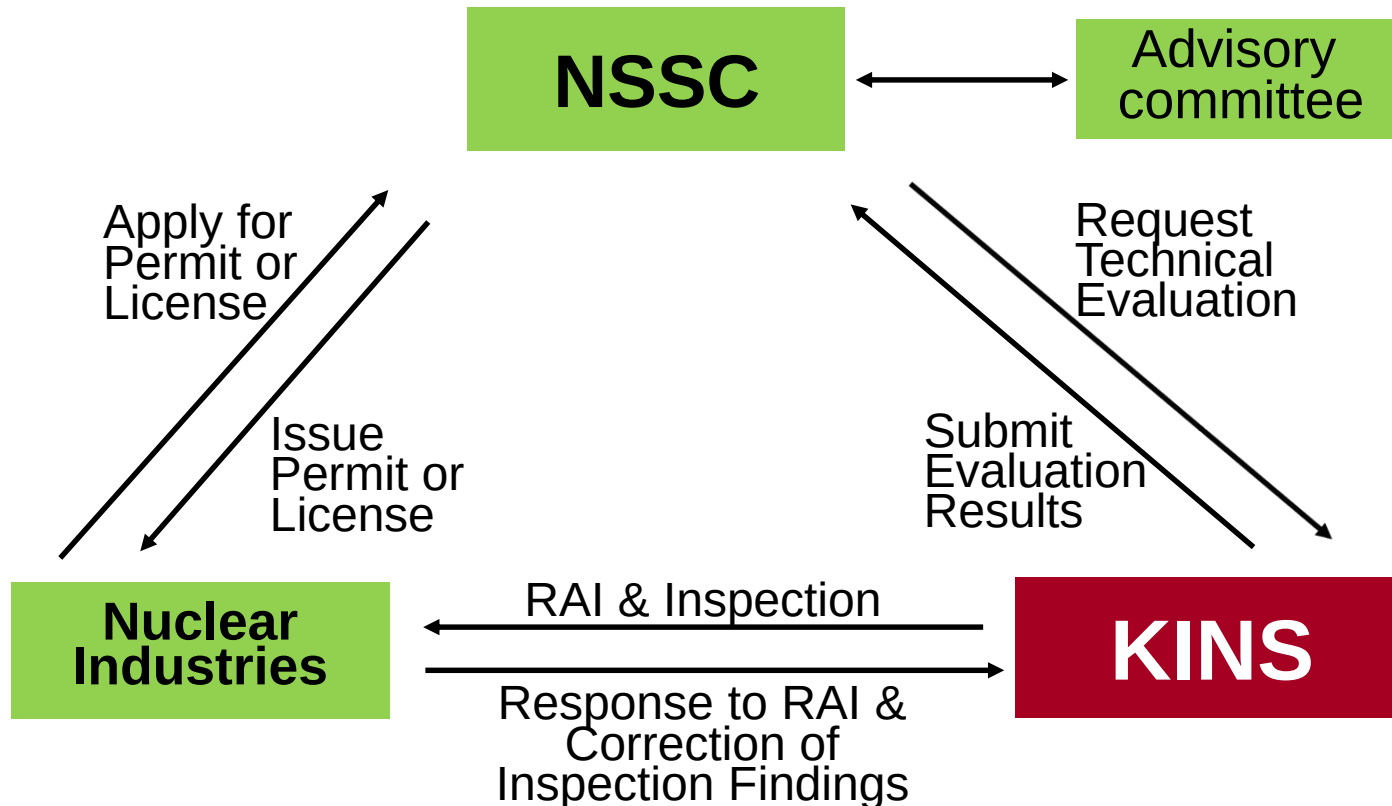
✓ Convention on Nuclear Safety, Article 8.2

“Each Contracting Party shall take the appropriate steps to **ensure an effective separation** between the functions of the regulatory body and those of any other body or organization concerned with the promotion or utilization of nuclear energy.”

□ Regulatory framework



□ Working mechanism



- Nuclear Safety & Security Commission (NSSC)
 - Regulatory authority of about 140 officials
 - Policy making, authorization, administration and enforcement actions for nuclear safety and security
- **Korea Institute of Nuclear Safety (KINS)**
 - Quasi-government, safety expert organization of about 550 staff
 - Safety review and inspection, and development of policies, rules, regulations and guidelines
 - Established in 1990 by the special KINS Act
- Korea Institute of Nuclear non-proliferation & Control (KINAC)
 - Safeguards and security expert organization from 2006
- Korea Foundation of Nuclear Safety (KoFONS)
 - Supporting organization in managing government funds for nuclear safety regulations and the relevant R&D projects

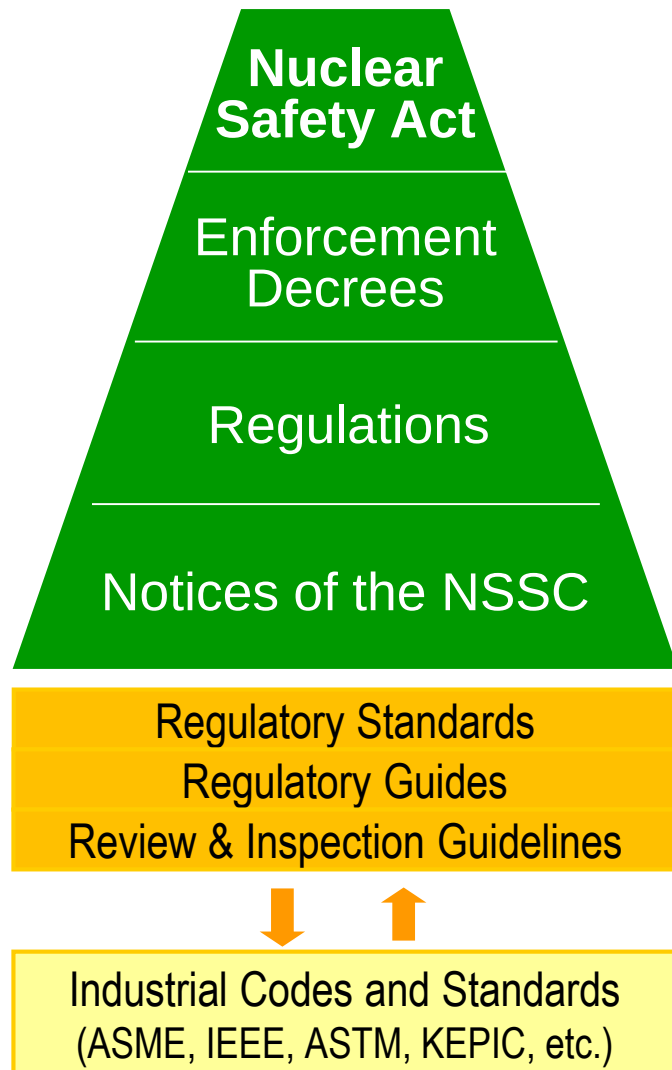
- Overview of nuclear regulation



□ Legal and policy frameworks

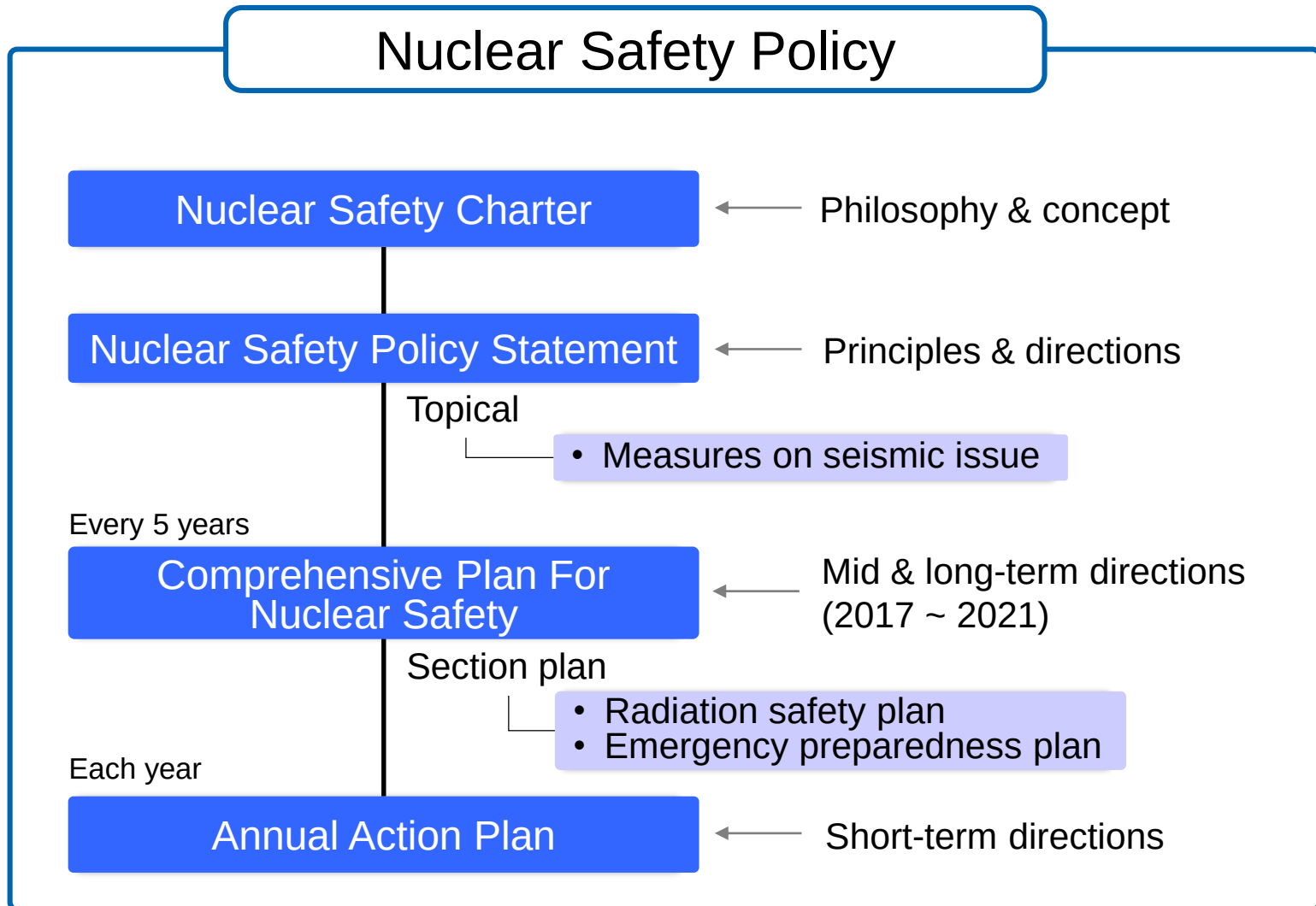
- Nuclear safety act in 2011
 - All provisions for nuclear safety regulation and radiation protection
 - Supplemented by the “Act on Physical Protection and Radiological Emergency in 2003”
 - ✓ Separated from the Atomic Energy Act since 1958
- Nuclear safety charter in 2001
 - Philosophy and concept for nuclear safety
- Nuclear safety policy statement in 1994
 - Principles and directions, emphasizing safety culture
- Comprehensive plan for nuclear safety
 - New direction of regulations and planning of its related R&D
 - Based on the Act, Art. 3 (Establishment) & 4 (Implementation)

- Legal framework



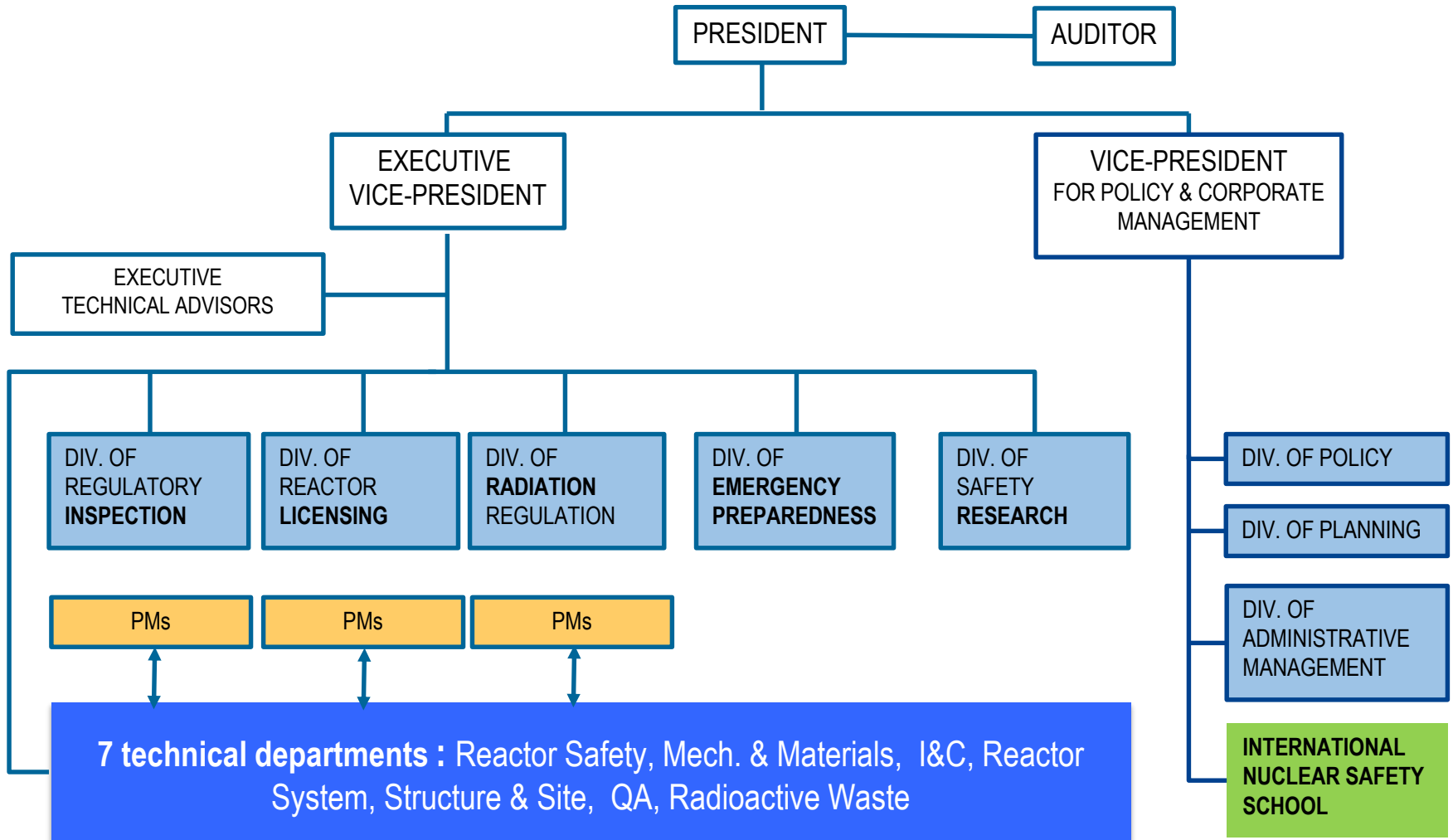
- Bases and fundamental matters regarding safety regulations
- Particulars entrusted by the Act and necessary for the enforcement of the Act
- Technical standards and particulars entrusted by the Act and the Decree
- Details on technical standards, procedures or formats as designated by the Act and relevant regulations
- Interpretation, detailed criteria, acceptable methods, conditions, and specifications of the technical standards
- Staff guidance for regulations

- Policy framework

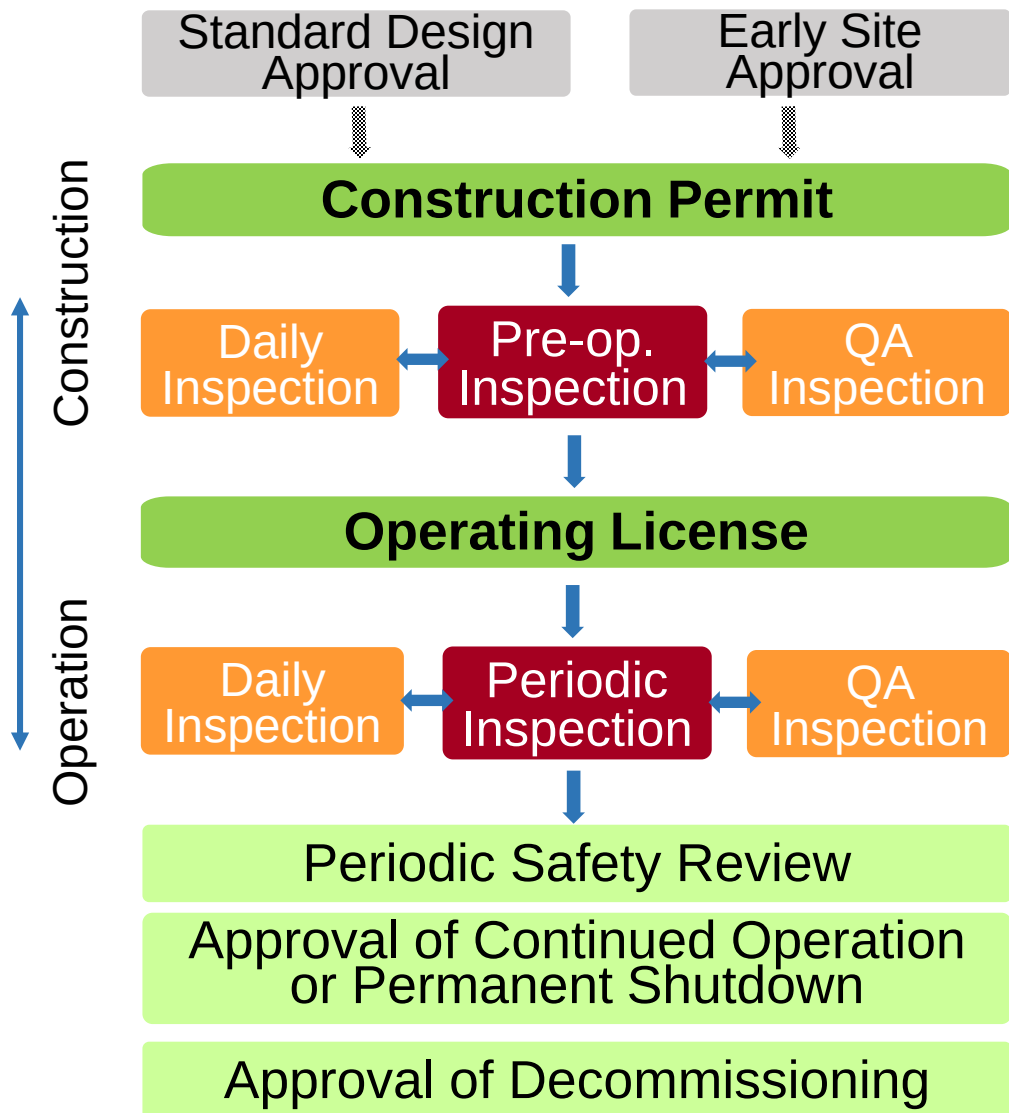


- 2nd Comprehensive Plan for Nuclear Safety
 - Policy directions
 - Impartial safety management for accident prevention
 - Transparent regulatory framework towards public confidence
 - Preparation for future regulatory capabilities
 - 7 strategic goals
 - Safety management plan and programme extended to the severe accidents of NPPs
 - Transparency with the pro-active release of information and communication
 - Safety management system for the back-end fuel cycle of nuclear industry
 - Practicality of disaster preparation, including earthquakes, and radiological emergency response
 - Reinforcement of the system for nuclear security and non-proliferation
 - Preemptive actions in responding to the environmental changes in radiation use
 - Expansion of regulatory infrastructure with R&D, human resources development, and international cooperation

- KINS organization



2. Licensing process



- SAR for standard design and preparation plan of EOP
- Site survey report with geologic survey results
- PSAR, QAP for construction, ER
- Confirm the construction, considering project milestone
- FSAR, QAP for operation, Radiological emergency plan
- Confirm the plant as licensed and/or commissioned
- Re-evaluate each NPP safety in a 10 year interval
- Extend operating period after the design life

□ **Safety review**

- **Construction Permit (CP)**

- To ensure the adequacy of plant location and design, and construction approaches in accordance with the rules & regulations, prior to the commencement of construction
- Major application documents
 - Preliminary Safety Analysis Report (PSAR),
 - Quality assurance program for design and construction
 - Environmental Report (ER)

- ✓ **Early Site Approval (ESA)**

- To allow the applicant to perform a limited civil engineering work of site preparation and power block excavation, before CP
- Site Survey Report
- Detailed Geological Survey Report

- Operating License (OL)
 - To confirm the final adequacy of plant design and operational approaches
 - Perform safety review in the same manner as that for CP
 - With some additional reviews of the operating capability and accident response ability of the applicant
 - Major application documents
 - Final Safety Analysis Report (FSAR)
 - QAP for operation
 - Technical Specifications for Operation
 - Radiological Emergency Plan
- ✓ Nuclear fuel loading and commissioning tests upon the issuance of OL

- Standard Design Approval (SDA) for NPP
 - Prior authorization of a standard NPP design for the repeated construction; *effective for 10 years*
 - Safety analysis report on the standard design
 - Preparation plan of emergency operating procedures
 - Issued for the designs of APR-1400 and APR⁺, and SMART NPP in 2001, 2014 and 2012, respectively
- Amendment of Permit or License, or SDA
 - Modification of the contents of approved documents after permit, license or approval
 - Supplementary documents to verify the adequacy

- Periodic Safety Review (PSR)
 - Comprehensive re-evaluation for the safety of each operating NPP or research reactor in a 10 year interval after the OL
 - Physical conditions, safety analysis, equipment verification, aged deterioration, safety performance, experience feedback, operating procedures

- Continued operation
 - Extension of operating period after the design life of NPP
 - Applied, as necessary, 2 to 5 years before the end of the life for additional 10 years of operation
 - Periodic safety evaluation report, aging evaluation report of major equipment, radiological environmental report

□ Safety inspection

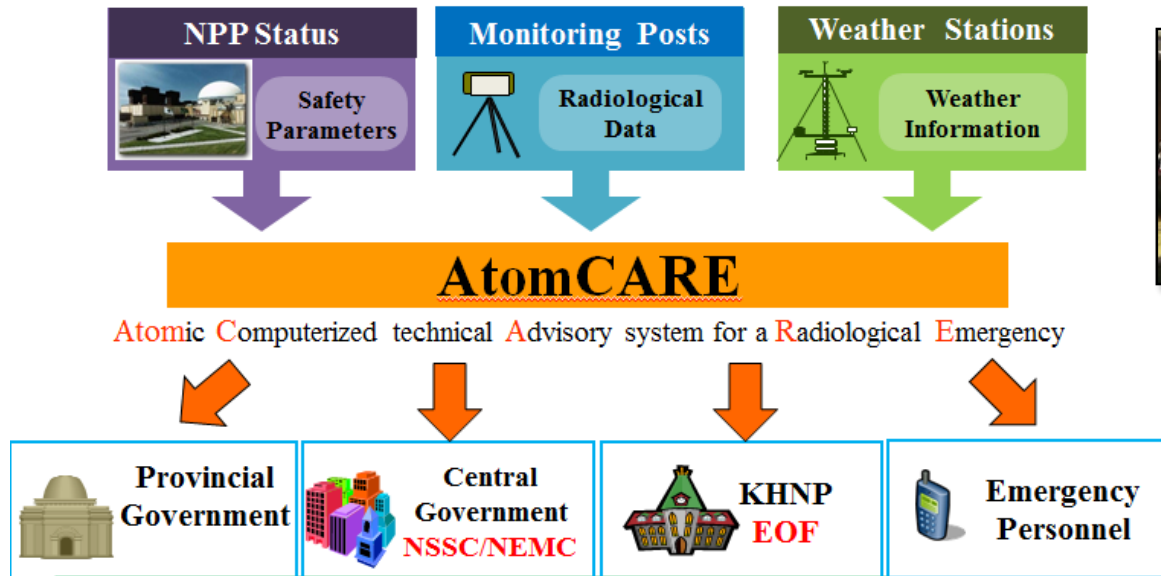
Category	Construction	Operation	Type
Planned	Quality Assurance (QA) Inspection		Regular and announced
	Pre-operational Inspection	Periodic Inspection	
	Resident Inspection		
Reactive	Special Inspection		Irregular and unannounced

- QA inspection
 - Confirm the **quality achievement of organization** involved in the design, manufacturing, construction, and operation of facilities
 - Verify the effectiveness of QA Program (QAP) and the appropriateness of applicant's QA activities
 - Performed in reference to the QAP approved by the regulatory body, in a programmatic manner, annually planned for each organization
- Pre-operational inspection
 - Confirm the adequacy of materials, components, systems and structures, as well as construction related activities, processes, procedures and personnel competence
 - Performed in compliance with safety assessment results and Safety Analysis Reports, and in reference to the project's milestones

- Periodic inspection
 - Ensure the performance of reactor facility for re-criticality after plant overhaul
 - Performed during the NPP outage period
 - For research reactor, conducted every 24 months in accordance with the standard inspection items and re-started with the approval of regulatory body
- Resident inspection
 - Monitor daily construction and operation status, and identify and respond to any activities adverse to safety
 - Operate, both NSSC and KINS, resident inspection office at each NPP site
- Special inspection
 - Initiated in response to any unexpected, unplanned or unusual situations or events, as necessary

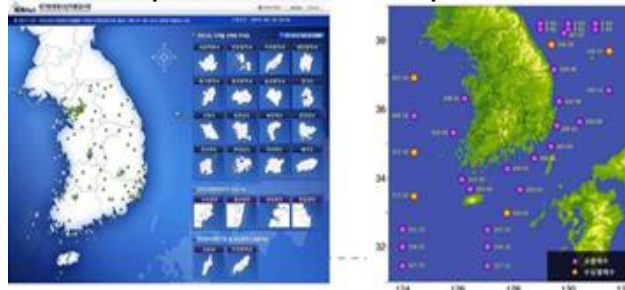
3. Safety management

- Radiological emergency preparedness and drill



- Unified Radiological Emergency Drill
- Annually organized by NSSC
- Joint Emergency Preparedness Drill in TRM framework
- TRM: Top Regulators Meeting of Korea-China-Japan

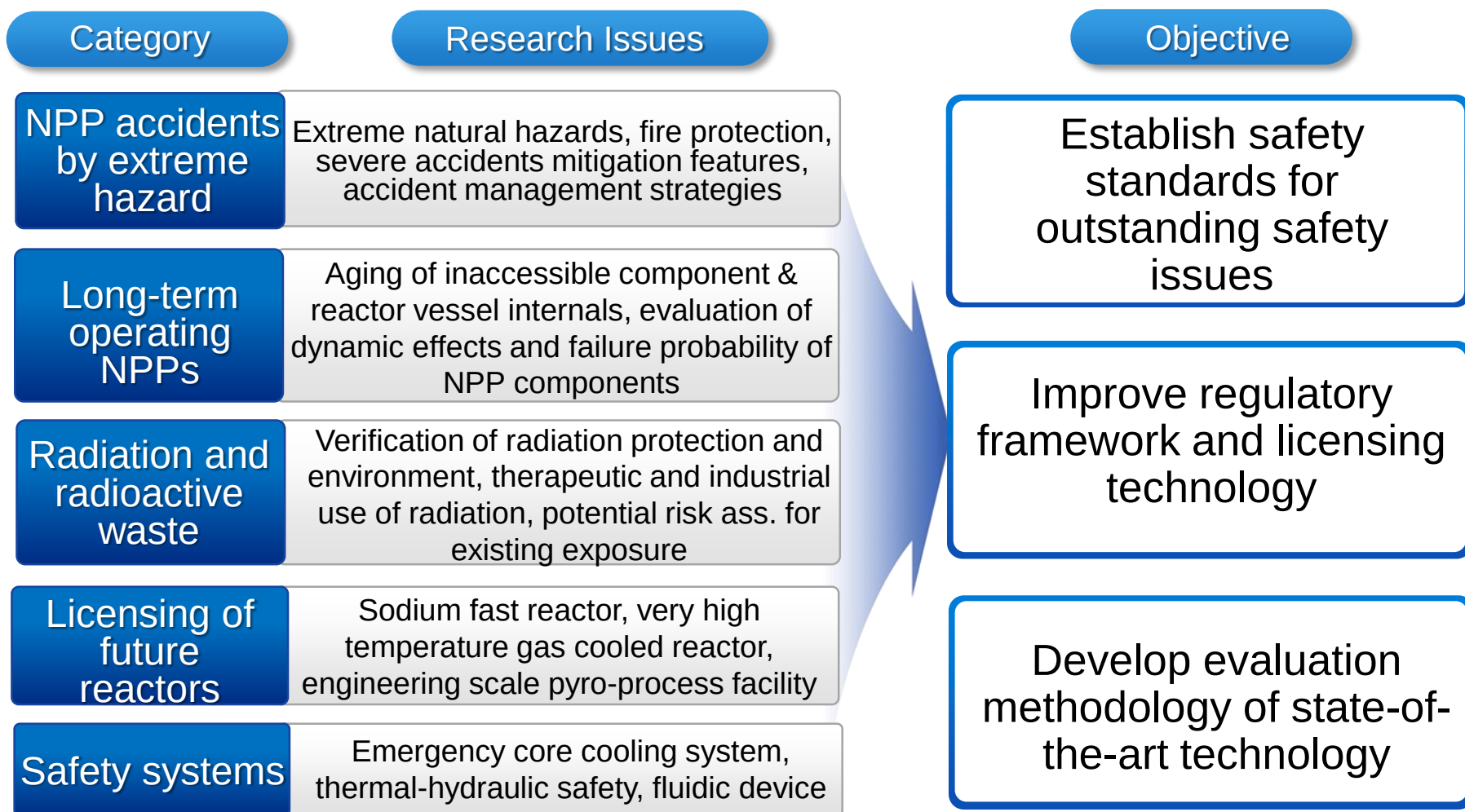
- Radiation monitoring
- Air 128, sea 21 and airport & harbor 73 posts



- **RAD**iation **SO**urce **LO**cation **T**racking



4. Regulatory research



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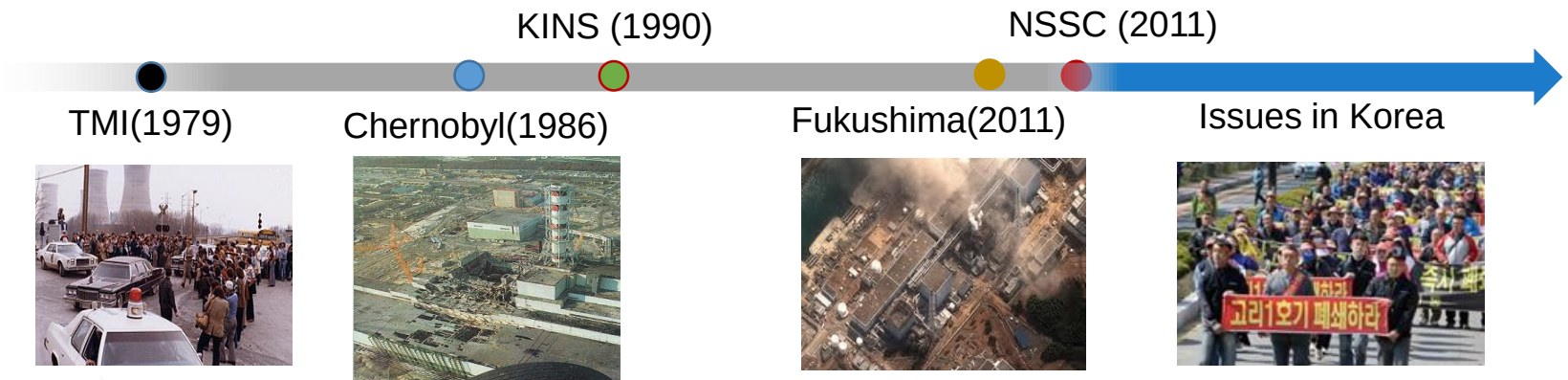
PART B. INTERNATIONAL NUCLEAR SAFETY SCHOOL OF KINS

REMARKS

□ Suwon Hwaseong fortress, Korea (1872)



- Defense in Depth (DiD)



The DiD concept remains valid, but implementation needs to be strengthened

Technical

Lessons learned from Fukushima

Reevaluate external event

Human & Organizational

Fukushima lessons + Issues in Korea

Safety culture, Quality assurance

Institutional

Fukushima lessons + Issues in Korea

Independence, Peer reviews, 3C

- Technical aspect
 - ✓ Post-Fukushima action items
 - Special inspections
 - Identified 50 action items by the Special Safety Assessment Team in 2011 and completed in 2015
 - Stress tests for operating NPPs
 - The 2 oldest NPPs of Kori 1 and Wolsong 1 since 2013
 - Covered earthquake, tsunami, loss of safety functions (SBO, LUHS), severe accidents, emergency response, human factors
 - Evaluated the coping capability of NPPs; human errors in decision-making under extreme situation; operating capability of organization, manpower and available means
 - Improved the preparations for multi-unit accident; communication system; radiation protection of workers and facilities; performance of mobile emergency equipment; earthquake-induced fire protection measures
 - ✓ All other NPPs from 2016 in order of the plant age

- Human and organizational aspect
 - ✓ Safety culture and quality assurance
 - Cultural issues in nuclear industry (2012 ~ 2013)
 - Cover-up of station blackout during the overhaul outage period at Kori 1
 - Falsified quality documents
 - Expansion of regulatory oversight scope to cover human and organizational issues
 - Vendor inspection
 - Reporting of non-compliance
 - Notification of contract
 - Equipment & material tracking system for all safety-related items
 - Regulatory oversight of licensee's safety culture

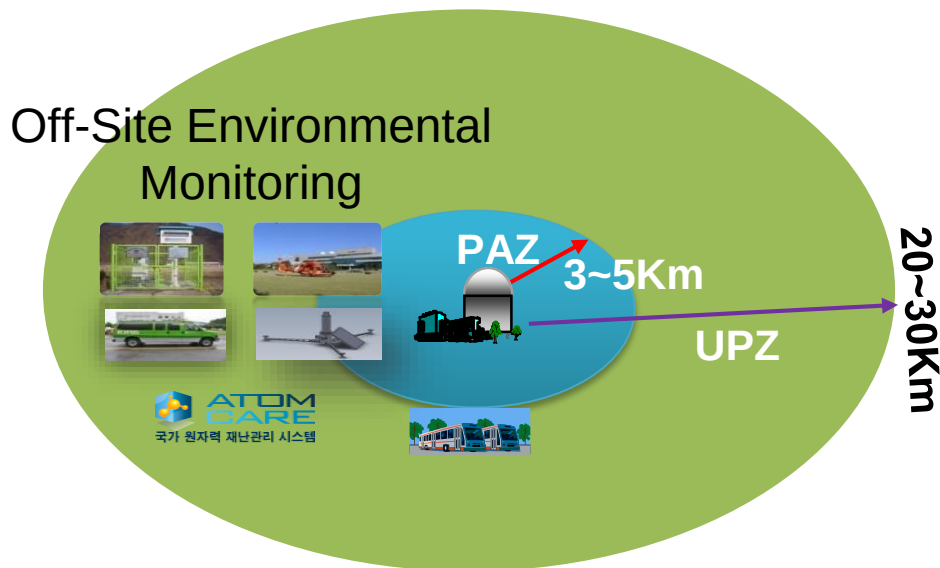
- Institutional aspect
 - Enhancement of regulatory independence
 - Nuclear Safety Act and Nuclear Safety and Security Commission (NSSC) in 2011
 - Additional safety related laws
 - Act on Safety Control of Radiation around Living Environment in 2012
 - Amendment of Nuclear Safety Act for Accident Management Program in 2015
 - Better 3Cs of Communication, Cooperation and Collaboration
 - Nuclear safety policy coordination committee between ministries
 - Regional office at each NPP site for oversight and communication
 - Regional safety council to discuss with local residents

- Openness and transparency
 - IAEA IRRS and follow-up missions in 2011 & 2014, respectively
 - Public participation in stress test and special inspections
 - Nuclear safety ombudsman for anonymous reporting
 - Disclosure of nuclear safety information to public in accordance with the Public Information Act from 2016

- Severe accident rulemaking
- Severe Accident Policy in 2001
 - Safety goal, probabilistic safety assessment, severe accident management program, measures for severe accident and mitigation
 - ✓ Implementation with the administrative orders
- Amendment of Nuclear Safety Act to cope with severe accidents in 2015
 - Accident management program for the OL application of new NPPs and within 3 years for the existing NPPs
 - Cover all accident levels including severe accident and the management measures
 - ※ *Accident management: a set of actions to prevent the escalation of accidents, to mitigate the consequence of accidents and to recover a NPP from accident conditions*
 - ✓ Issues in severe accident rulemaking
 - Extreme natural and man-made hazards, safety goal and acceptance criteria, multi-units site

□ Emergency preparedness

- New and extended radiological Emergency Planning Zone (EPZ) from May 2015



- EPZ is reorganized, dividing into PAZ and UPZ, and extended by the revised “Physical Protection and Radiological Emergency Act”

- PAZ: Precautionary Action Zone
- UPZ: Urgent Protective action Planning Zone



OEMC



LEMC



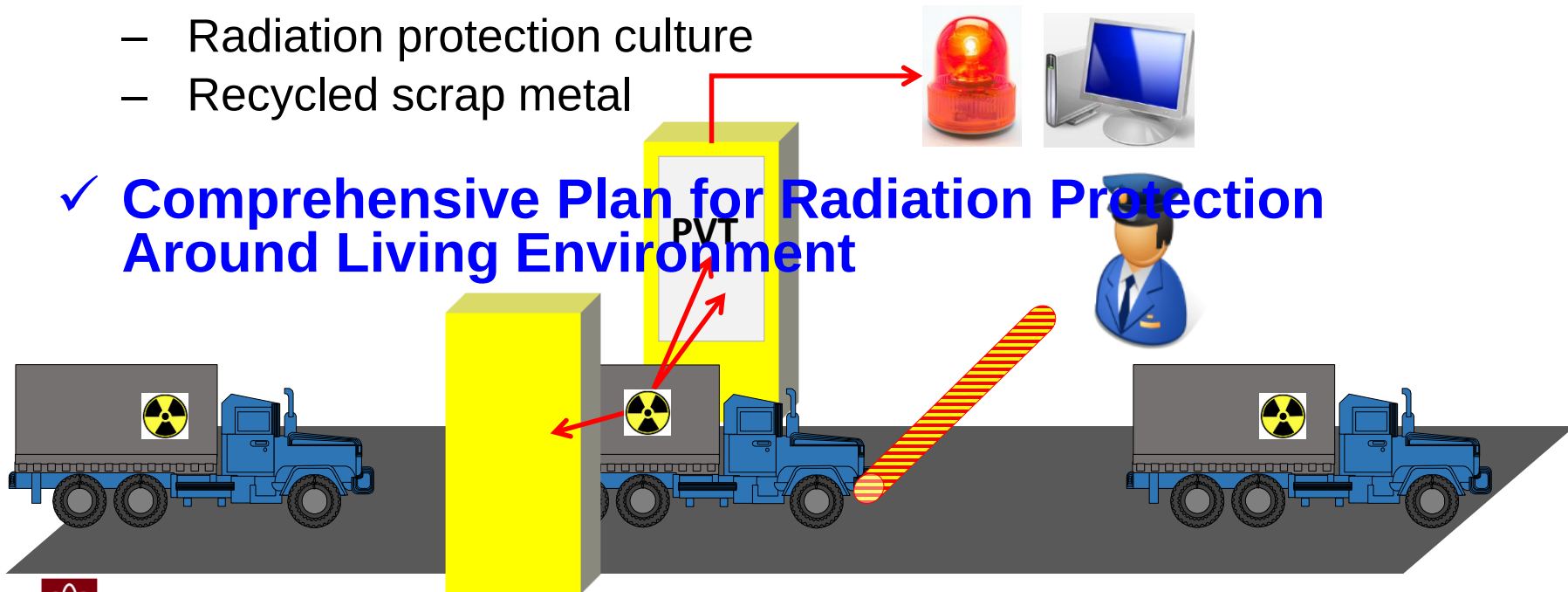
Evacuation
Center

EPZ	Before	Now
Area	7 metropolitan 8 local	8 metropolitan 21 local
Population	105,874	2,091,541

□ Radiation around living environment

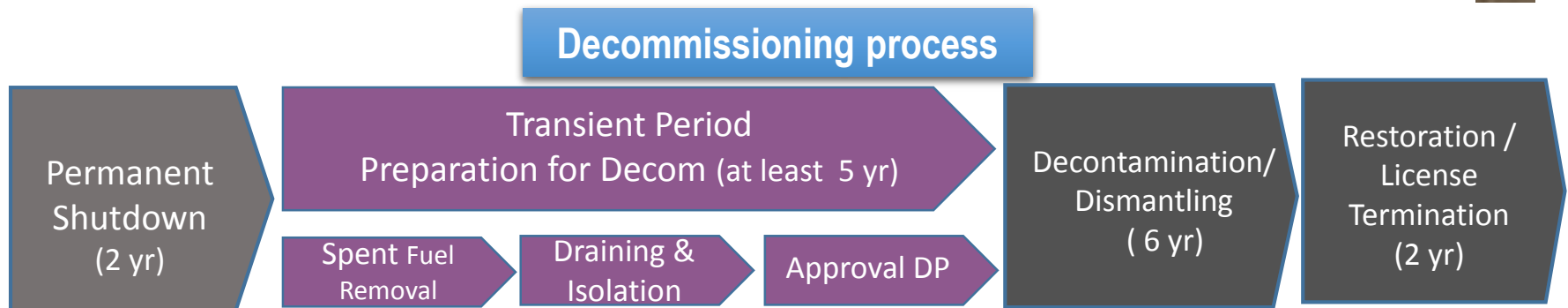
- Increasing public concerns on radiation risk
 - Naturally occurring radioactive materials
 - Increasing trend of Medical Exposures
 - Cosmic rays: management of cockpit resources
 - I-131 after thyroid therapy
 - Protection of NDT workers
 - Low dose effect
 - Radiation protection culture
 - Recycled scrap metal

✓ Comprehensive Plan for Radiation Protection Around Living Environment



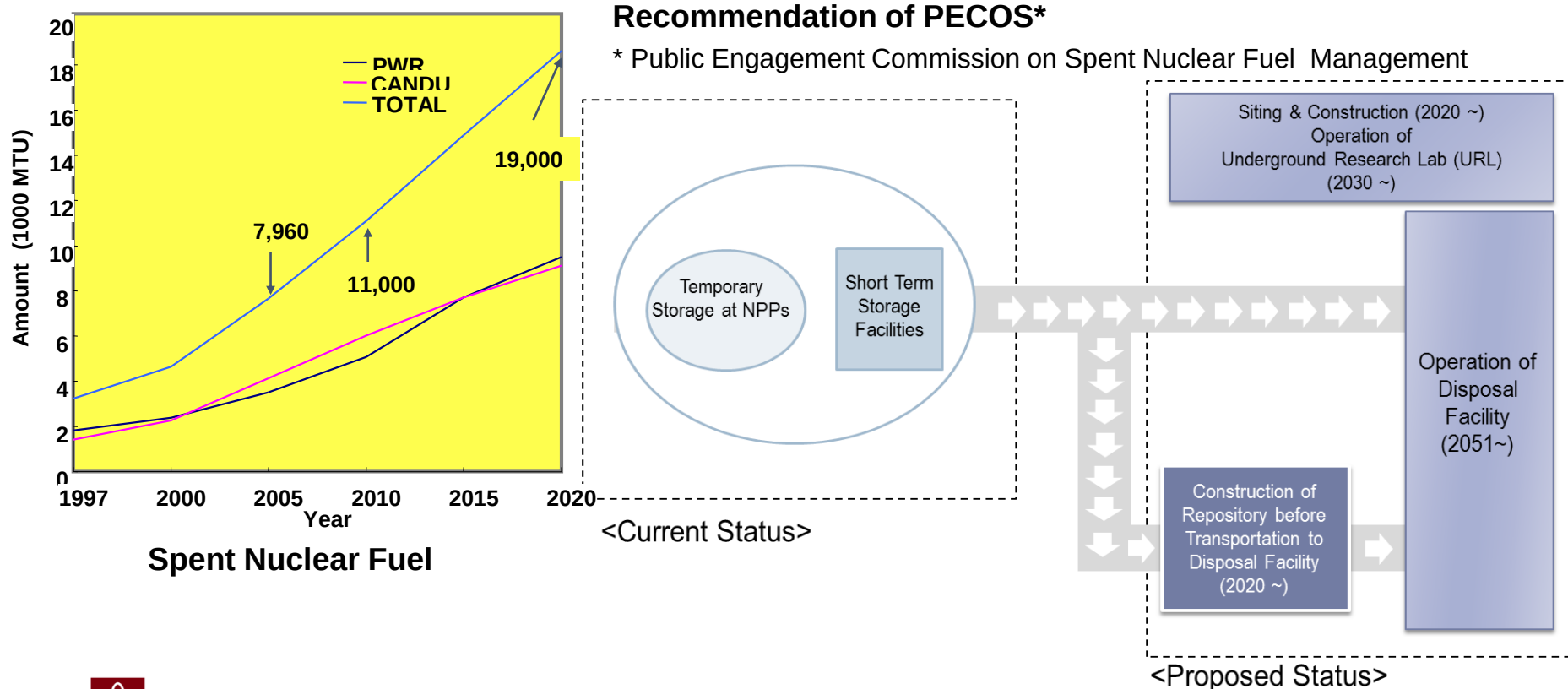
□ Decommissioning of NPP

- ① Application of the OL change for permanent shutdown
- ② Public hearing regarding the draft of decommissioning plan
- ③ Application of decommissioning approval
 - Decommissioning Plan, QAP, public hearing results
- ④ Reporting of the decommissioning and regulatory inspection
 - Status of decom., radiation safety, and waste management
- ⑤ Termination of the OL



□ Spent nuclear fuel management

- Regulatory framework for HLW geological disposal
- Safety regulation for the interim storage of spent fuel
- Regulation of VLLW clearance



□ Gyeongju earthquake

- 5.8 magnitude earthquake on 12 September 2016
 - Strongest one ever [instrumentally recorded](#) in Korean Peninsula and more than 500 aftershocks
 - Wolsong NPPs, 28 km away from the epicenter
- Safety evaluation of the NPPs
 - 0.098g of maximum peak ground acceleration at the NPP site: 0.1g of OBE (Operation Based Earthquake)
 - Manual shutdown of the 4 NPPs in accordance with the seismic response manual: resumed operations in Dec. 2016
 - No safety issues identified by the 37 inspectors for 81 days
- Post-earthquake safety measures by the NSSC
 - Improvement of earthquake response system
 - Re-evaluation of seismic performance for nuclear facilities
 - Extended research of the geological & seismological aspects in the area
 - Reinforcement of emergency response facilities

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PART B. INTERNATIONAL NUCLEAR
SAFETY SCHOOL (INSS) OF KINS

I. INSS

II. COMPETENCY-BASED HRD AND
E&T SYSTEM

III. NATIONAL LICENSE AND
QUALIFICATION MANAGEMENT

IV. FACILITIES OF INSS

REMARKS

1. INSS

- ❑ Center for building the regulatory competencies of KINS
- ❑ International partner for regulatory capacity building toward global safety harmonization
- ❑ The history

1990s

In-house training of KINS and the 1st international program for foreign regulators
E & T program in accordance with the systematic approach to training

2002

1st E & T building and training of the 25 DPRK staff as part of the KEDO project



2008

International Nuclear Safety School

- ✓ Government commitment to share Korea's 30 years of successful experience in nuclear safety (51st GC of the IAEA, 2007)
- ✓ Practical arrangement with the IAEA in 2008, which includes the IAEA training courses in Asia and Pacific region



2009

International Nuclear Safety Master's Degree Program

2014

New HRD and E&T systems in accordance with the competency-based approach

2015

Full-scope NPP simulator for staff training

CDP system to support the new HRD

The screenshot displays the KINS CDP (Competency Development Platform) system interface. It features a top navigation bar with links like '홈으로' (Home), '사이트맵' (Site Map), and '로그아웃' (Logout). The main content area is divided into several sections:

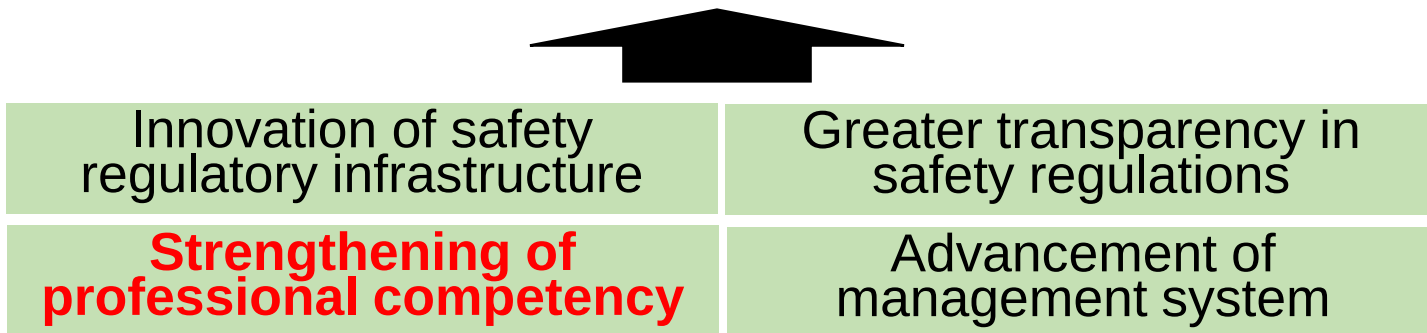
- Left Sidebar:** Contains navigation links for '학습증인과정' (Learning Certificate Course), '교육인정시간' (Education Credit Time), '시설관리' (Facility Management), '청렴교육' (Integrity Education), '수강신청' (Course Registration), '나의 교육이력' (My Education History), '나의 프로필' (My Profile), and '역량진단' (Competency Diagnosis).
- Center Panel:** Features a large image of two people looking at a tablet, with the text '직무영향을 기반으로 인재를 양성하고 확보해 나갑니다.' (We nurture and secure talent based on job impact). Below this is a '공지사항' (Notice) section with a list of announcements.
- Right Panel:** Displays '최근 교육일정' (Recent Education Schedule) and '월별 교육일정' (Monthly Education Schedule). The monthly schedule is a table showing the status of various courses across different months.

과정명	04월					05월				
	1	2	3	4	5	1	2	3	4	5
비방제요원 보...										
방사선 방호교...										
방사선 방호교...										
원자력 규제검...										
원자력 규제검...										
원자력 규제검...										
원전 재로 건...										

2. Visions and Strategies

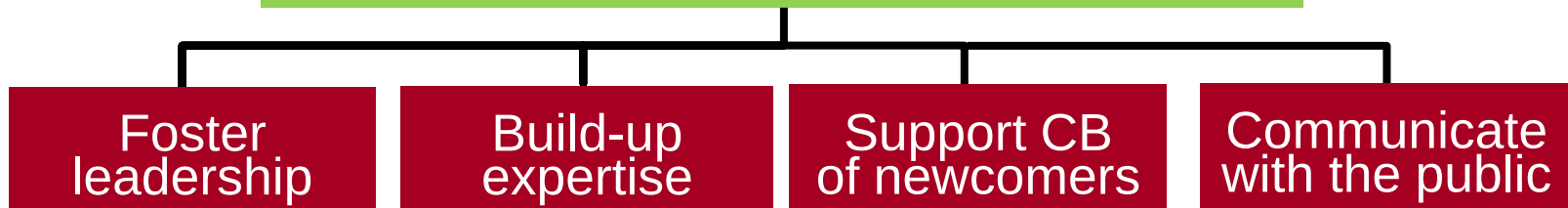
- KINS

PUBLIC CONFIDENCE with safety its top priority



- INSS

World-best Organization for E & T on Nuclear & Radiation Safety



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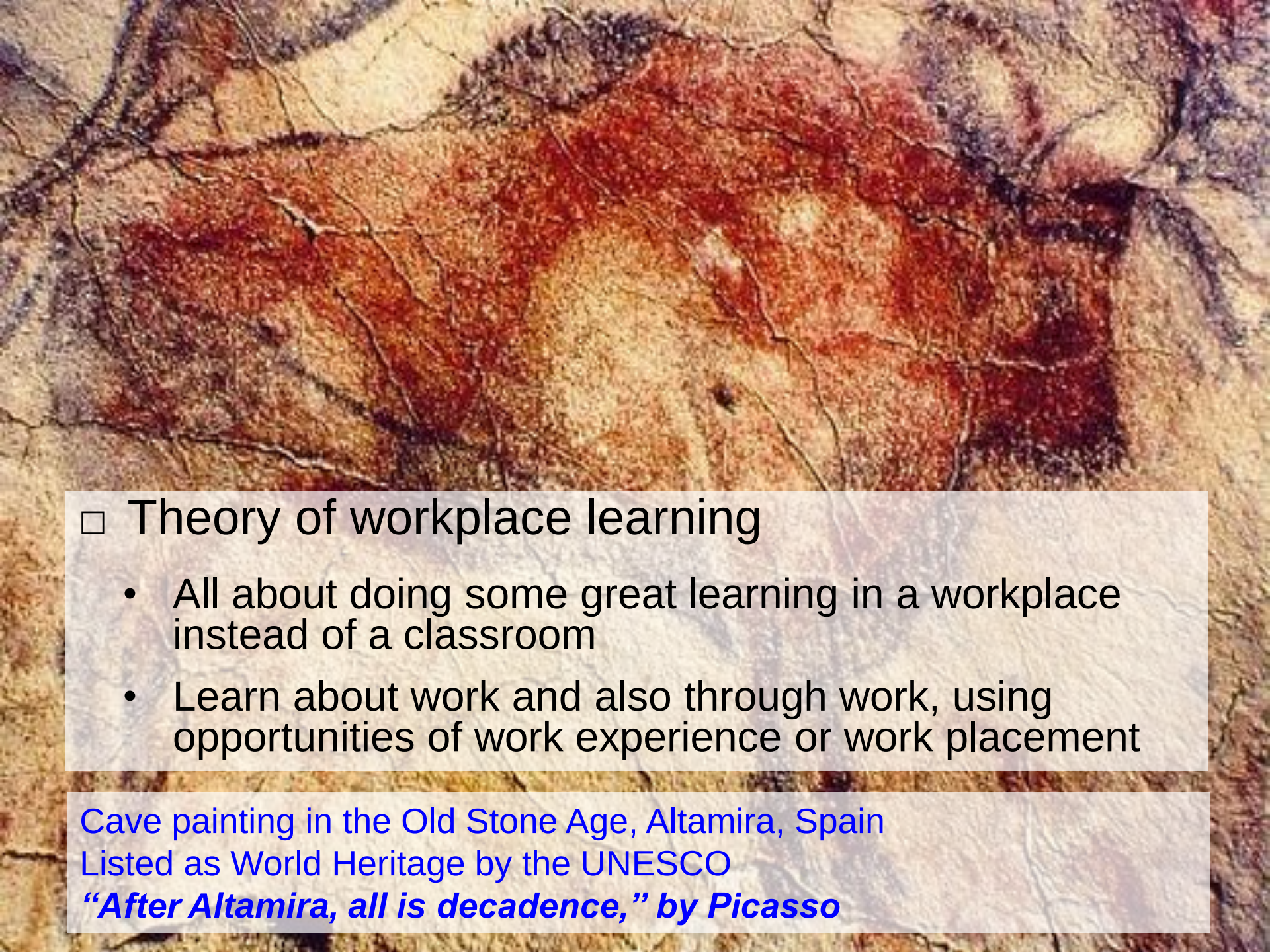
REMARKS

1. Competency-based HRD system

□ Background

- Public concerns about nuclear safety and regulatory effectiveness
 - Fukushima Daiichi accidents in March 2011
 - Issues of the SBO concealment of Kori #1 and forged certificates in 2012
 - Generation shift on a large scale
 - 170 retirees and 500 recruits from 2010 to 2020, assuming a total of 700 staff in 2020, and about 300 recruits up to now
 - Vision 2020, “PUBLIC CONFIDENCE with safety its top priority”
- ✓ **Institutional competency for regulations**

➤ Thus, learning



□ Theory of workplace learning

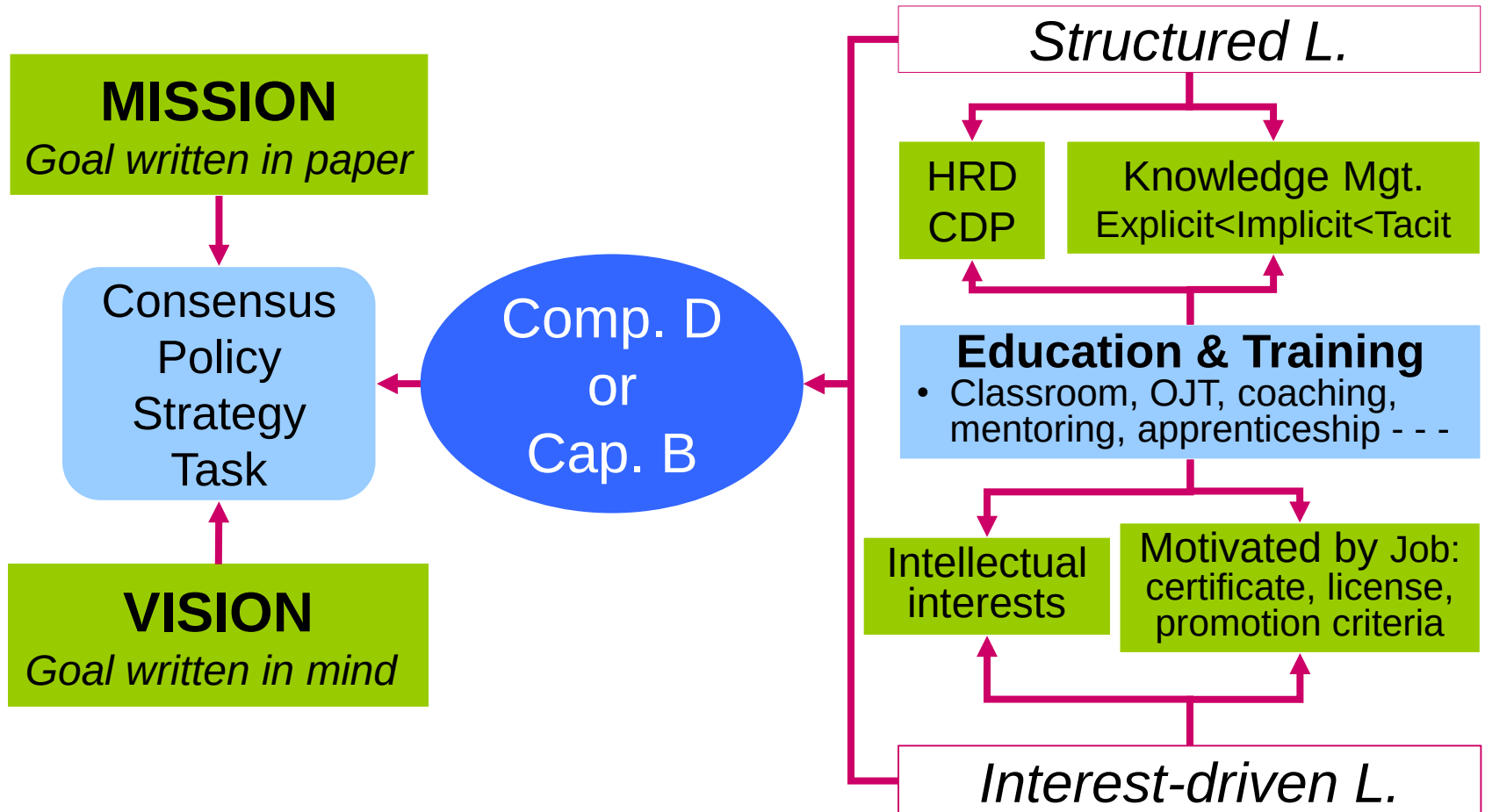
- All about doing some great learning in a workplace instead of a classroom
- Learn about work and also through work, using opportunities of work experience or work placement

Cave painting in the Old Stone Age, Altamira, Spain

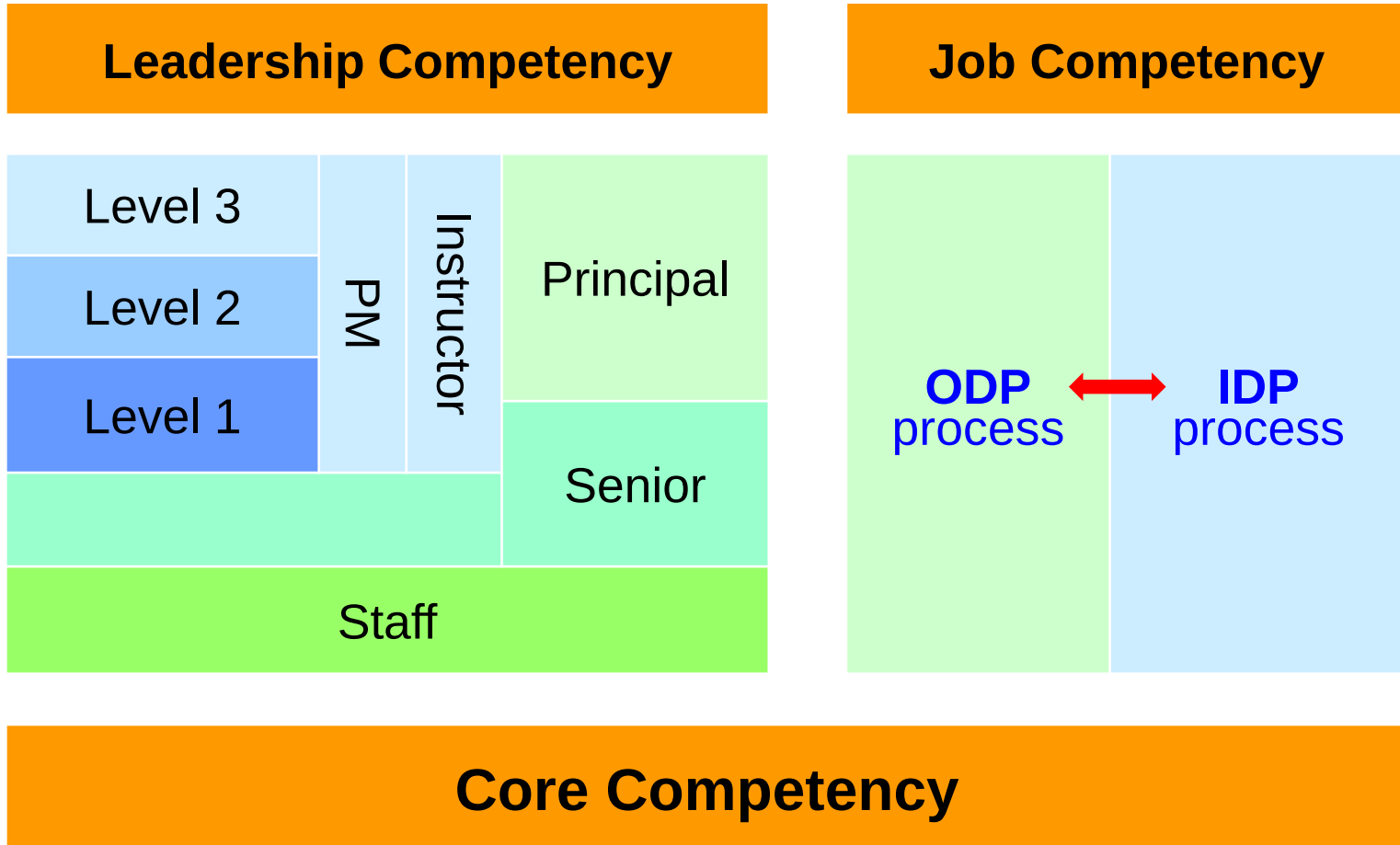
Listed as World Heritage by the UNESCO

“After Altamira, all is decadence,” by Picasso

- Learning mechanism in organization
- Goals and approaches



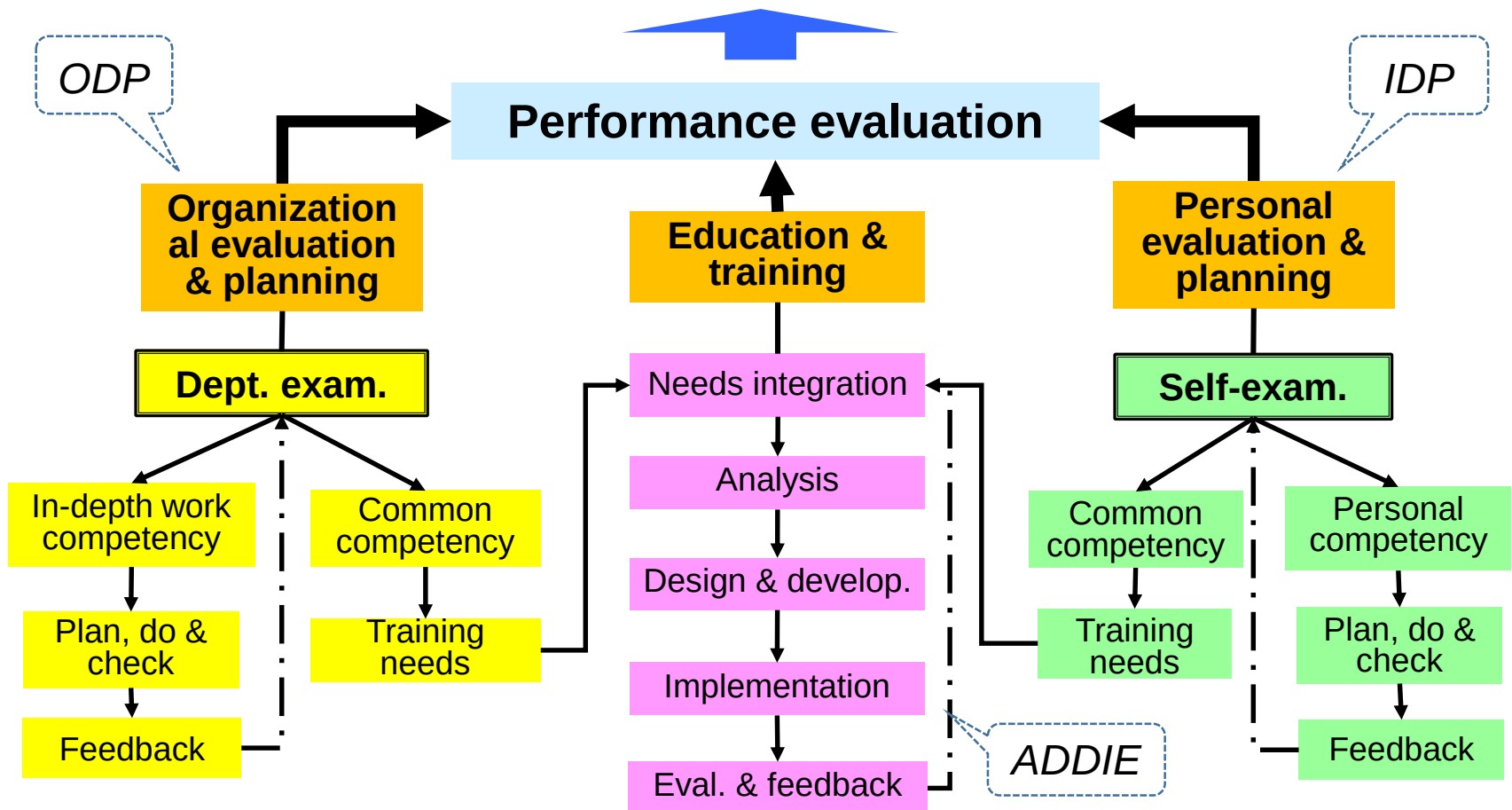
□ Model of institutional competency



✓ ODP: Organizational Development Plan, IDP: Individual Development Plan

□ Process to strengthen job competency

INSTITUTIONAL COMPETENCY



□ Infrastructure for the institutional competency

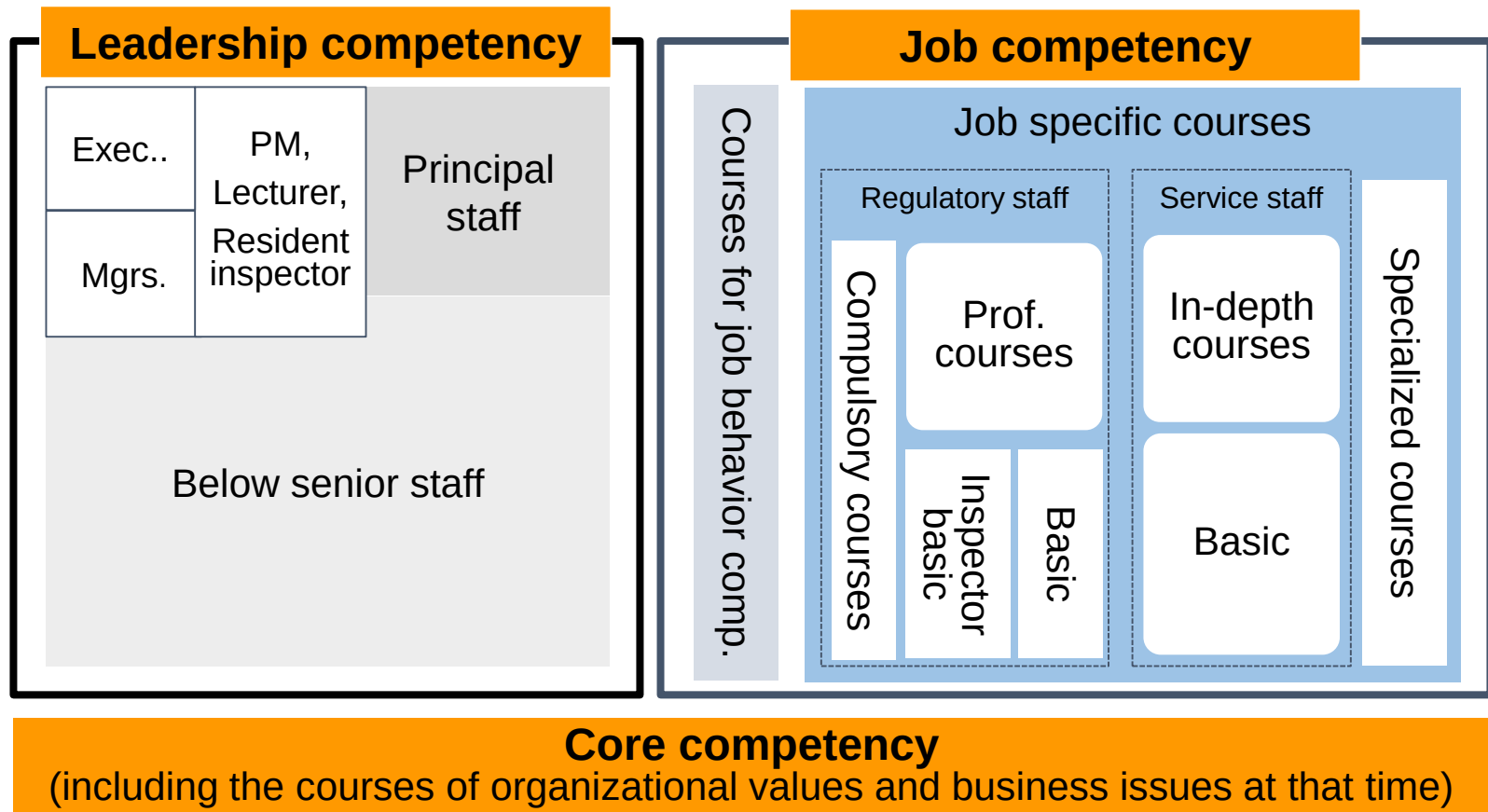
- Developed in 2014 after re-analyzing the entire jobs of KINS to identify the competency indicators (goals)
 - Coupled with the annual performance evaluation systems of the unit organization and individual staff, and the career development program of staff
 - Include the competencies diagnostic elements for unit organization and individual to identify any gaps
 - Present a typical career map for each area of expertise
 - Equipped with the re-designed E & T curriculum to support the competency development of the staff
- ✓ *Supported by the IT system*

2. E&T programs



A. In-house program

- Consist of courses to enhance the competencies of staff



- Courses for core competency
 - Foster better organizational culture that characterize the nature of nuclear safety regulations
 - Build the essential/fundamental behavioral standards to realize organizational values
 - Designed for the entire staff members
 - Focus on the subjects:
 - Understanding of core values, collaboration and knowledge sharing, ethical decision making, and current management issues

- Courses for leadership competency
 - Develop key leadership capabilities
 - Demonstrate leadership impact within the organization
 - Designed for all levels or positions of staff of executives, managers, employees and new recruits
 - Focus on the subjects:
 - Planning, creativity, interpersonal relationship, communication, problem solving, project management, customer satisfaction, ethics management

□ Courses for job competency

- Develop technical or role-specific competencies
 - Enable the organization to perform its mission more effectively
- Mostly developed upon demand, annually, for the areas of professional expertise and managerial services
- Focus on the job behavior or professional competencies, which are necessary for staff in performing their jobs
 - In-depth professional courses upon demand
 - Compulsory courses of the radiation protection & emergency preparedness, and regulatory inspector
 - Basic courses for inspector, job skill, document writing, coordination and integration, and regulatory staff basic
 - Specialized courses utilizing outside organizations
 - Courses for policy decision-makers, professional courses for experts, expert exchanges with international regulators, and expert dispatches to the IAEA and NEA/OECD

□ Diagram of the E & T system

	Core comp. courses		Leadership comp. courses		Job comp. courses				
	Org. value	B. issues	Essential	Optional	Job behavior	Job specific		Specialized	
Exe.			Executives						
Mgr	Ethical decision making Collaboration and knowledge sharing Course for core value	Consilience E & T Governmental policy and compulsory	Managers basic	Special for leadership Strategy Dev. Coaching Performance HRM Facilitations	Job skill Document writing Coordination and integration Conceptual thinking, customer-oriented, relationship construction, global mind, etc.	Compulsory Inspector basic Regulatory staff basic Regulatory staff professional Managerial service staff basic	Managerial service staff in-depth	Resident inspector Instructor PM	
Prn			Promoted to principal	Prob. solving H. relationship Mentoring					
Snr			Promoted to senior	Followership					
Stf									
Courses for new recruits									

B. International program

- Courses for regional networks with the IAEA
 - Basic professional training, nuclear safety regulation, siting evaluation, regulatory control, safety review and assessment, radiological and nuclear emergencies
 - About 90 member countries of ANSN, ASEAN, ANNuR and FNRBA
 - Courses of the bilateral cooperation
 - NPP licensing, inspection of radioactive sources & radiation facilities, QA or pre-operational inspection for NPP under construction
 - Saudi Arabia/K.A.CARE, UAE/FANR, Egypt/NRRA, Jordan/JNRC, Czech/KNA, Vietnam/VARANS
- ✓ **About 300 foreign trainees, annually**

- International nuclear and radiation safety MS degree program
- Educate international young generation, aiming at strengthening global nuclear safety
- 3 semesters program
 - Operated jointly with Korea Advanced Institute of Science & Technology (KAIST), a research-focused university
 - Offer a full scholarship to 10 ~ 15 students per batch
- Started from 2009 and 10th batch from August 2018
 - KAIST is responsible for basic theory and fundamental research
 - KINS delivers curricular on safety regulation and conveys regulatory practices through OJT
- ✓ A total of 90 graduates up to now, and currently 10 students from 10 countries of Asia, Arabia and Africa

C. Community partner program

- ❑ Courses for safety management personnel and university students
 - Share safety knowledge and experience
 - Fire-fighter, radiological warfare soldier, civil radiation monitoring group
 - ❑ Safety experience courses
 - Provide the public with the opportunity of understanding nuclear safety regulation
 - Children, parents, teachers, opinion leaders from various social communities
- ✓ Annually, 7,000 ~ 10,000 participants

CONTENTS

PART A. NUCLEAR SAFETY REGULATION

PART B. INTERNATIONAL NUCLEAR
SAFETY SCHOOL OF KINS

I. INSS

II. COMPETENCY-BASED HRD AND
E&T SYSTEM

III. NATIONAL LICENSE AND
QUALIFICATION MANAGEMENT

IV. FACILITIES OF INSS

REMARKS

- Management of licenses and qualifications
 - National examinations for nuclear related individual licenses and qualifications
 - 7 Licenses
 - Reactor Operator (RO), Senior Reactor Operator (SRO), nuclear fuel material handler, senior nuclear fuel material handler, radioisotope handler, senior radioisotope handler, special license for medical radioisotope handler
 - 3 Qualifications
 - Professional engineer of radiation management, engineer of nuclear power, professional engineer of nuclear power
- ✓ More than 20 times of examination, annually, and about 3,500 applicants and 18 % of the successful

- Refresher training for ROs and SROs
 - Update the safety related knowledge and experience, and renew the attitude of mind for safety culture
 - Period and contents
 - 5 day training at a 3 year term, which is composed of both classroom and simulator practice courses
 - Regulatory policy, safety related rules and regulations, safety culture, operational experience, severe accidents, and other basic competence related
 - Number of recipients and training
 - Annually, about 600 recipients and 30 times of training
 - ✓ About 3,400 RO or SRO licensees, in total and gradual increase of the new holders with the new NPPs

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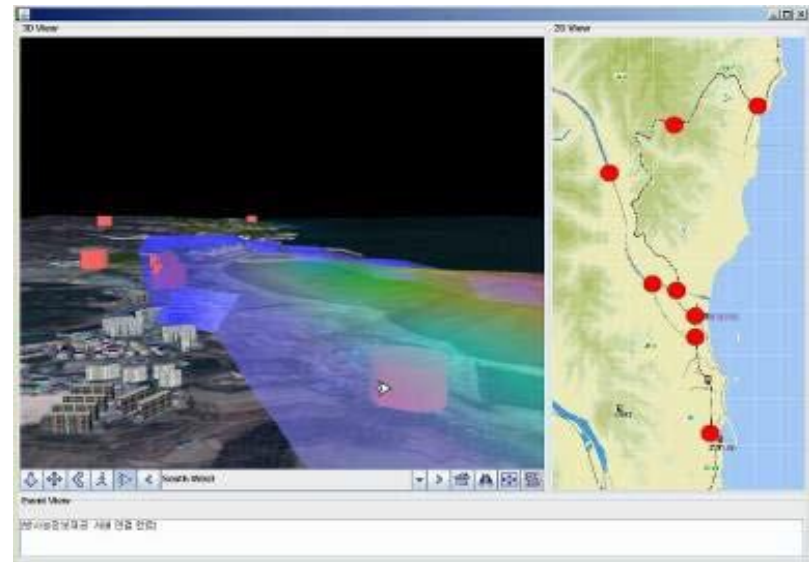
1. Training aid tools

□ Full scope simulator of NPP

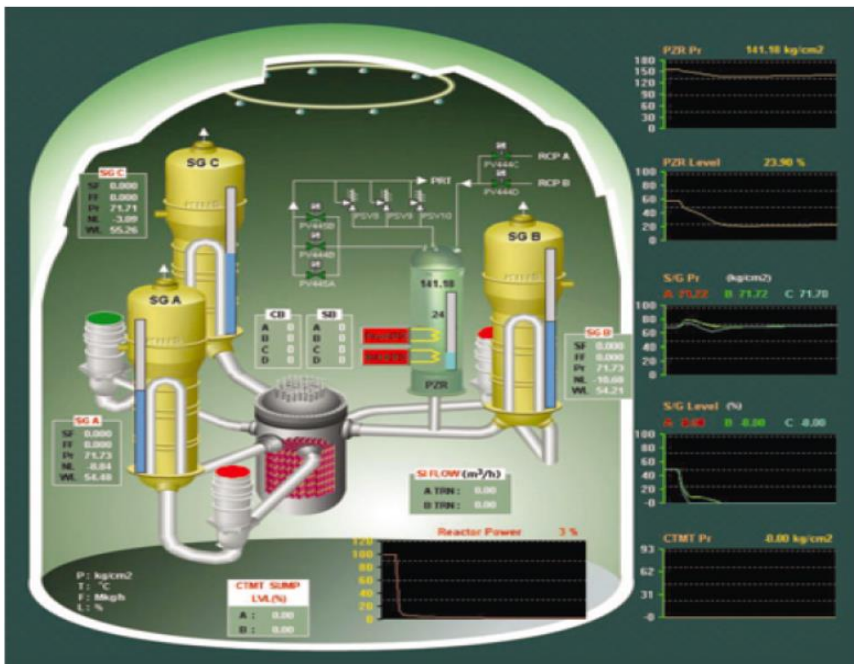
- Reference plant: APR-1400, Korea's Advanced Power Reactor of 1400 MWe capacity
- Used for staff training and transient analysis of NPP



- ❑ Simulator for radiological emergency preparedness
- Calculate and display the radioactive plume and dose level in a postulated accident on a 3-D map



- e-FAST (electronic Functional Analysis and Simulation Tool)
 - NPP analyzer for interactive simulation
 - Normal and transient analysis



- 3-D virtual reality NPP
 - Model NPP components in 3-D
 - Navigate assembling and disassembling of components



2. Buildings and rooms



1st Building (2002)

- Auditorium
- Dormitory



2nd Building (2012)

- Lecture & seminar rooms
- Computer lab
- Training Aid Tools



3rd Building (2014)

- Simulator

Lecture & conference rooms



Dormitory room



Rad. protection practice room



CONTENTS

PART A. NUCLEAR SAFETY REGULATION

PART B. INTERNATIONAL NUCLEAR
SAFETY SCHOOL OF KINS

REMARKS

✓ Paradigm shift of safety regulation, towards public confidence beyond nuclear safety itself

- Build up further the regulatory competency
- Far more openness and transparency in nuclear safety regulation

✓ Global safety harmonization with KINS

- Increase the INSS activities of international cooperation
- Share safety practical knowledge and experience

Always we keep watching
our Atomic Power



Thank You



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KOREA INSTITUTE OF NUCLEAR SAFETY