PREDEC 2016

International Symposium on PREparation for DECommissioning

The Regulatory Framework Improvement for Safe Decommissioning of Nuclear Power Plants in Korea

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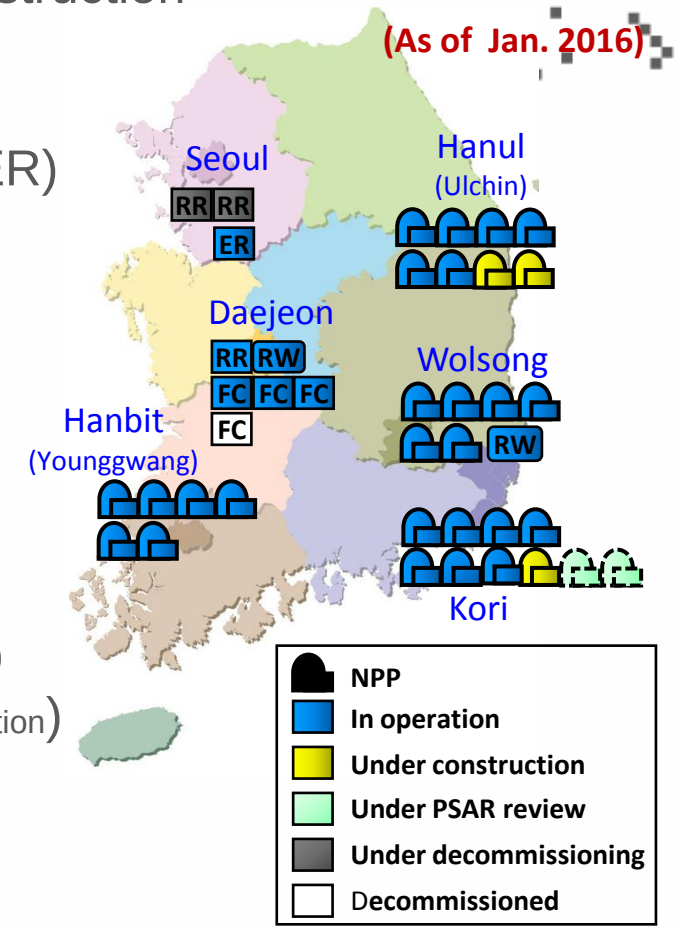
Major Nuclear Facilities

- Nuclear Power Plants (NPP)
  - 25 units in operation and 3 units under construction
  - 2 units under PSAR review for CP

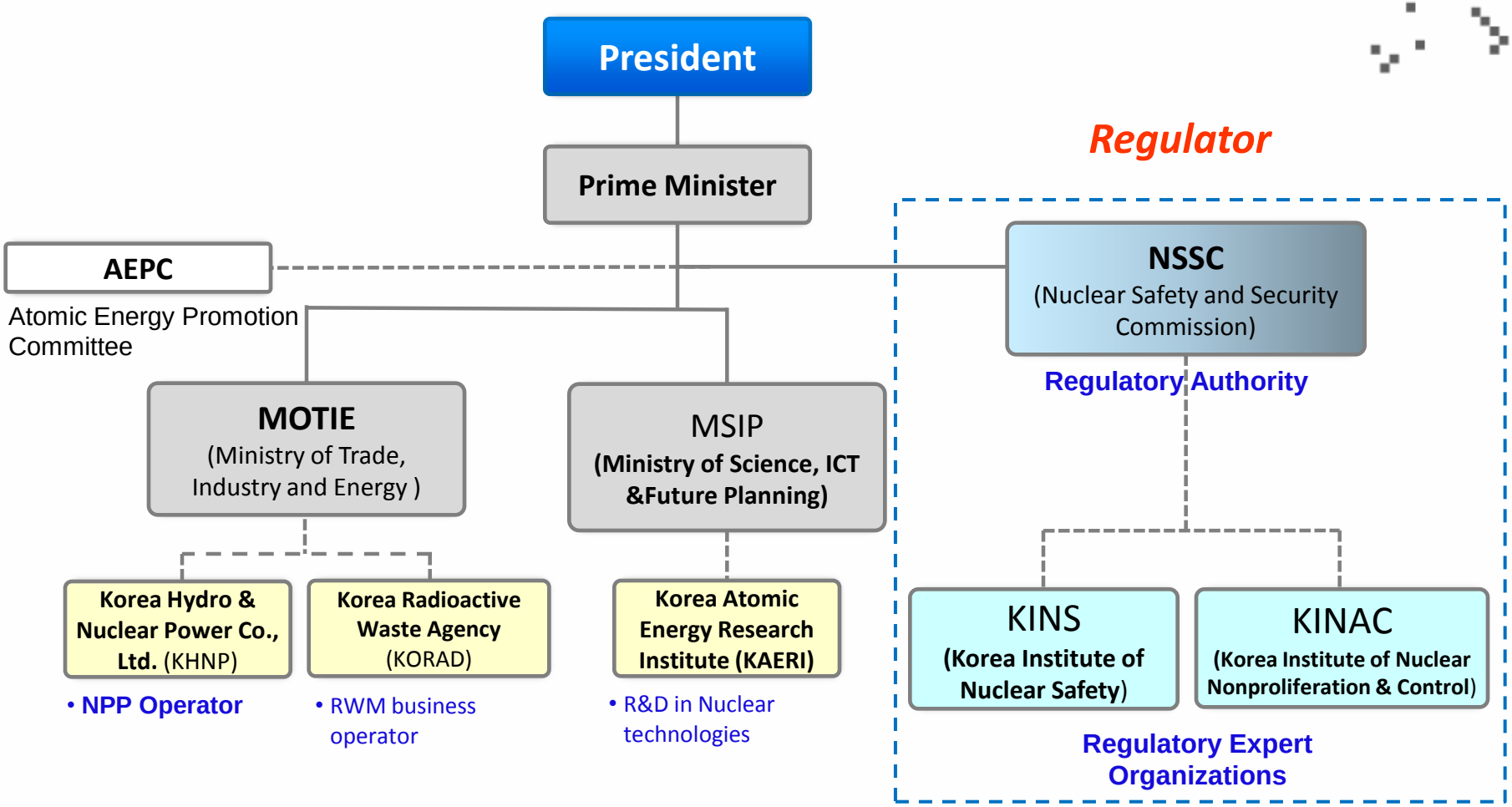
- Research Reactor (RR) / Education Reactor (ER)
  - HANARO (RR)
  - KRR 1 & 2 (RR, under decommissioning)
  - AGN (ER)

- 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 Managment Facility (RW)
  - RI waste Managment Facility
  - Wolsong LILW Disposal Center(WLDC) : in operation since 2015



Relataed Major Ministries and Organizations



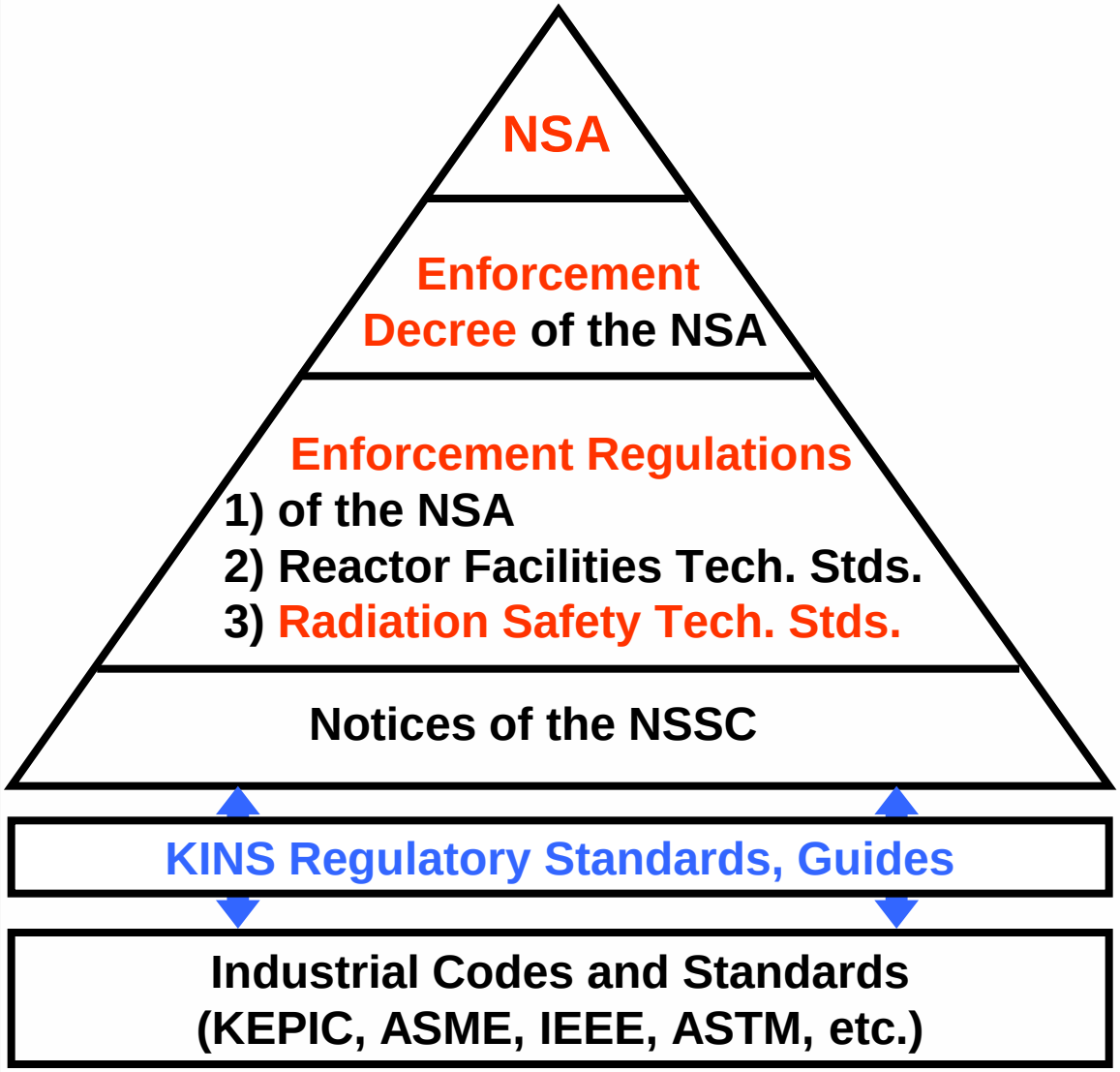
Role of Regulatory Organizations

- 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

- 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

Legal Framework for Nuclear Safey



Nuclear Safety Act (NSA) :
Basic and fundamental matters

Provisions entrusted by the NSA such as licensing procedures

- Detailed licensing procedures, standard format of document, etc
- Basic technical standards

Detailed technical standards

Regulatory guides, acceptance criteria, review process, etc.

International/domestic standards accepted by the regulatory body

Current status of Decommissioning (1)

- Improvement of regulatory framework on decommissioning
  - Revision of NSA in January 2015
  - Revision for subordinate statute of NSA
  - Technical standards and guides on safety review and inspection will be developed in a timely manner

- KHNP Kori unit 1 permanent shutdown and decommissioning
  - Kori unit 1: first commercial NPP in Korea & operation since 1978
  - Permanent shutdown on 2017 and then decommissioned

Current status of Decommissioning (2)

- KHNP's plan for Kori unit 1 decommissioning
  - Since KHNP made its final decision not to apply for the secondary continued operation of Kori unit 1, the decommissioning of Kori unit 1 is expected to shutdown permanent in 2017 and then decommission.
    - Define main task for preparation for FSD and D&D
    - Set up the fundamental strategy for decommissioning
    - Establish the R&D program for decommissioning, etc.
  - Draft decommissioning process

Current status of Decommissioning (3)

General Information of Kori unit 1

Reactor Type	PWR
Capacity	587MW
Supplier	Westinghouse
Operator	Korea Hydro & Nuclear Power Co., Ltd. (KHNP)

31 May, 1972	Acquisition of License
29 April, 1978	Start of Commercial Operation
18 June, 2007	Expiration of 30 Year Operation License
11 Dec., 2007	Acquisition of 10 Year Continued Operation License
June, 2017	Permanent Shutdown

Revision of NSA and regulations (1)

- 20 January 2015: NSA, amended and promulagted
  - Set into force 21 July 2015
- 20 July 2015: Enforcement Decree of NSA, amended and promulgated
- 21 July 2015: Enforcement Regulations of NSA, amended and promulgated
- 23 July 2015: Technical Standards for Reactor Facilities, amended and promulgated
- 23 July 2015: NSSC Notice, newly promulgated
  - Title: Standard format and content of decommissioning plan
  - Enacted: 23 July 2015

Revision of NSA and regulations (2)

- Decommissioning (Decom) means (in Definitions of NSA)
  - All actions or measures taken to exclude any facilities licensed or designate pursuant to this Act from the scope of application of this Act
  - Through removal of the facility and the site or through decontaminatin thereof
  - After permanent cessation of operation of the facilities (permanent shutdown)

- Decommissioning plan(DP) & Periodic update
  - DP shall be submitted to the regulatory body at the construction permit and operating license application stage
  - DP shall be updated every 10 years and submitted to the NSSC

Revision of NSA and regulations (3)

- Contents of Decommissioning Plan (DP)
  - Organization, human resources, cost and funding for Decom
  - Strategy, methods, and schedule for Decom
  - Design features and measures during operation for facilitating Decom
  - Measure for preventing hazards from radiation
  - Method for removing radioactive materials and contamination
  - Processing, storage and disposal of radioactive waste
  - Environmental impact assessment for radioactive materials, etc.
  - Other items stipulated by the NSSC

Revision of NSA and regulations (4)

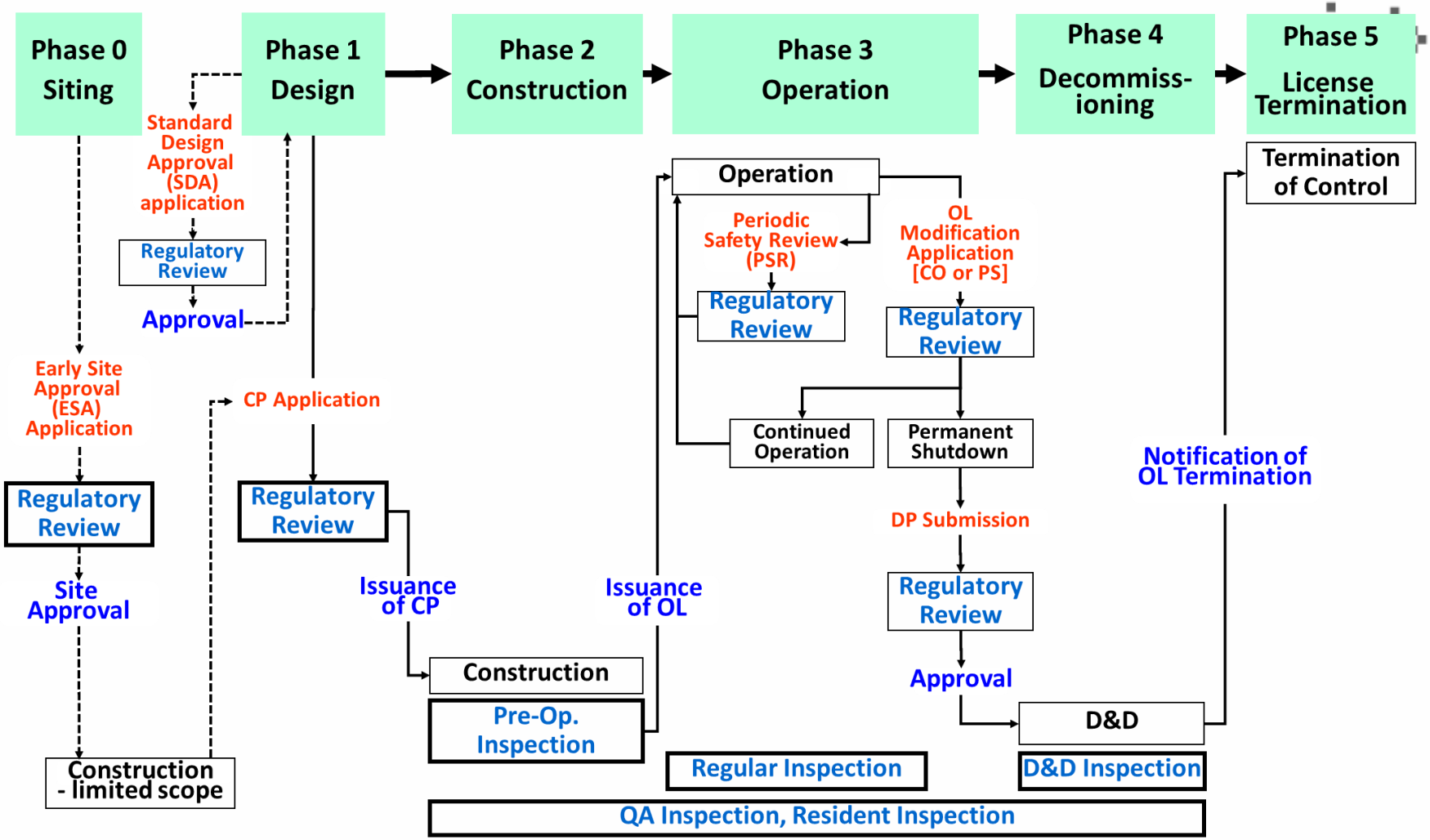
- Application for Approval of DEcommissioning
  - The licensee shall apply for approval of decommissioning withing 5 years after the date of permanent shutdown
  - In application, final decommissioning plan (FDP), QAP for decommissioning and the public consultation records shall be submitted
  - In the regulations, the draft FDP shall be provided for gathering of the public comments in decommissioning
  - NSSC decide the approval of decommissioning based on the review. The criteria are as follows;
    - Technical capability for decommissioning
    - Technical standards for FDP
    - Anticipated radiation dose during decommissioning

Revision of NSA and regulations (5)

- Reporting & Inspection
  - The licensee shall report the decommissioning status to the regulatory body by semi-annually
    - status of decom, list of decontamination and dismantling activities, status of radiation safety management, status of radioactive waste management
  - Regulatory body shall check /inspect the decommissioning status as per FDP and semiannual report
    - through document review and site check, etc.
  - At the completion of decommissioning work, the licensee shall report the completion of decommissioning activities. Regulatory body shall inspect the decommissioning completion.
    - Notification of OL termination based on the inspection results

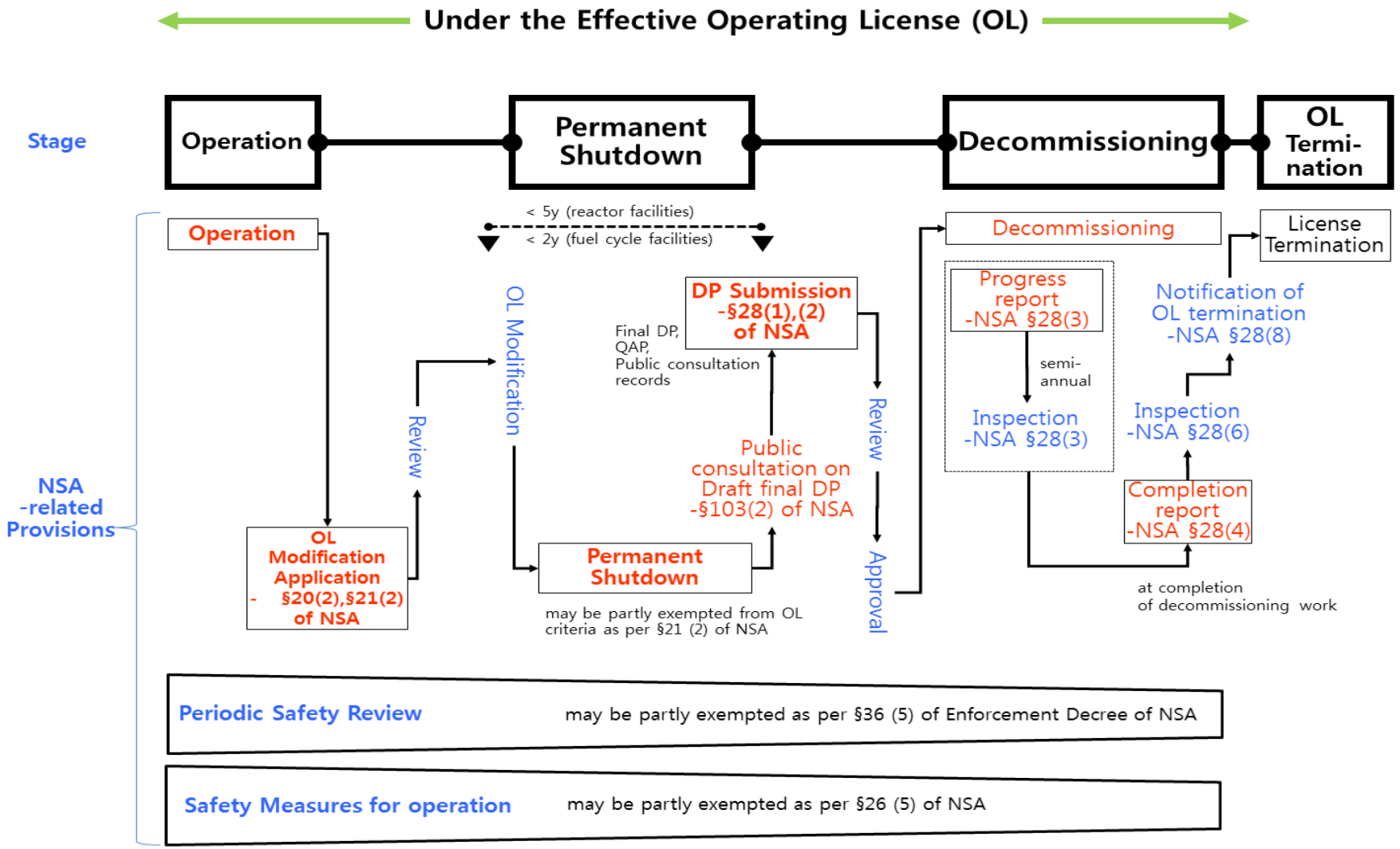
Revision of NSA and regulations (6)

- The lifecycle of NPP and major regulatory activities



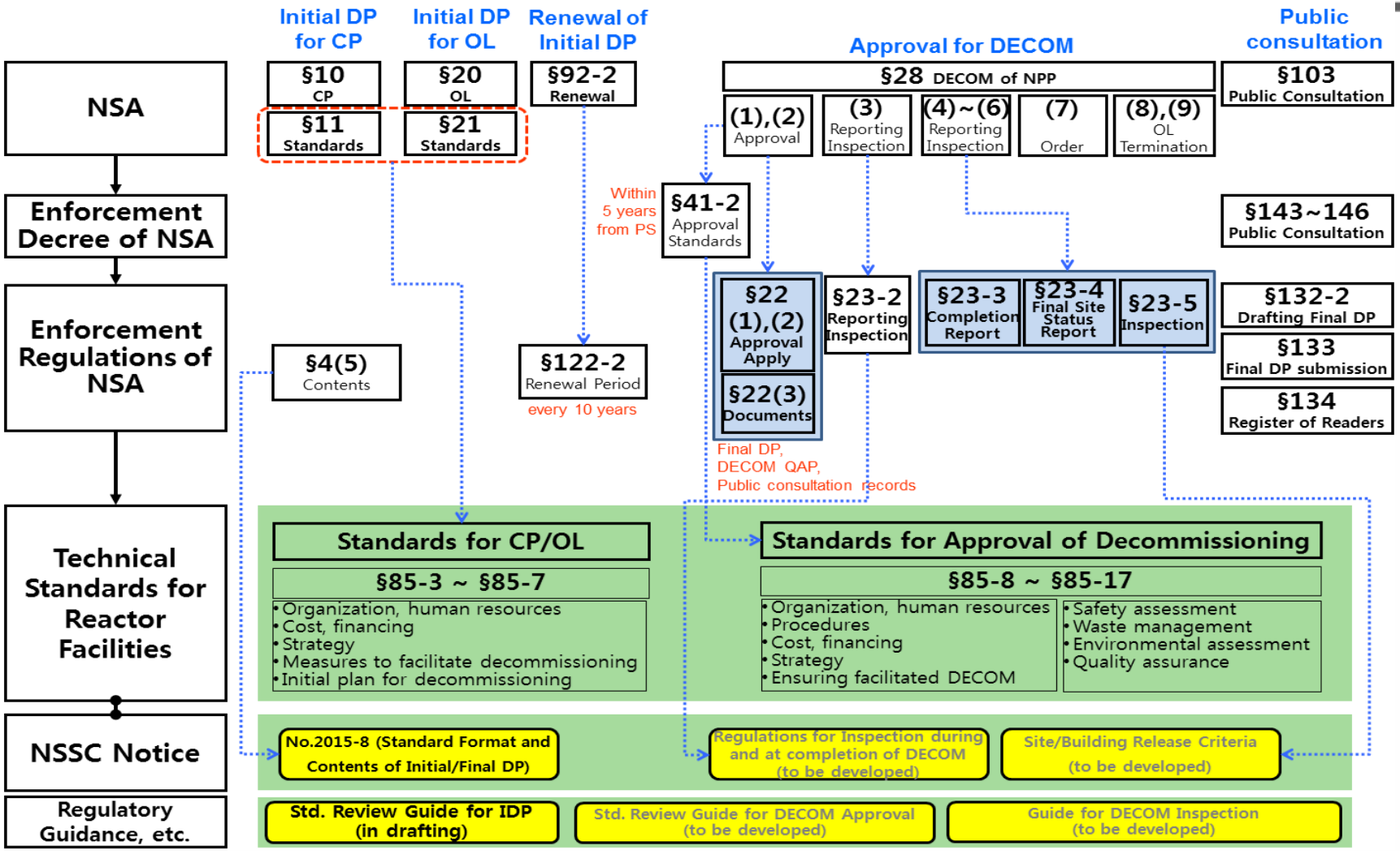
Revision of NSA and regulations (7)

- Regulatory provisions applied after permanent shutdown (PS)



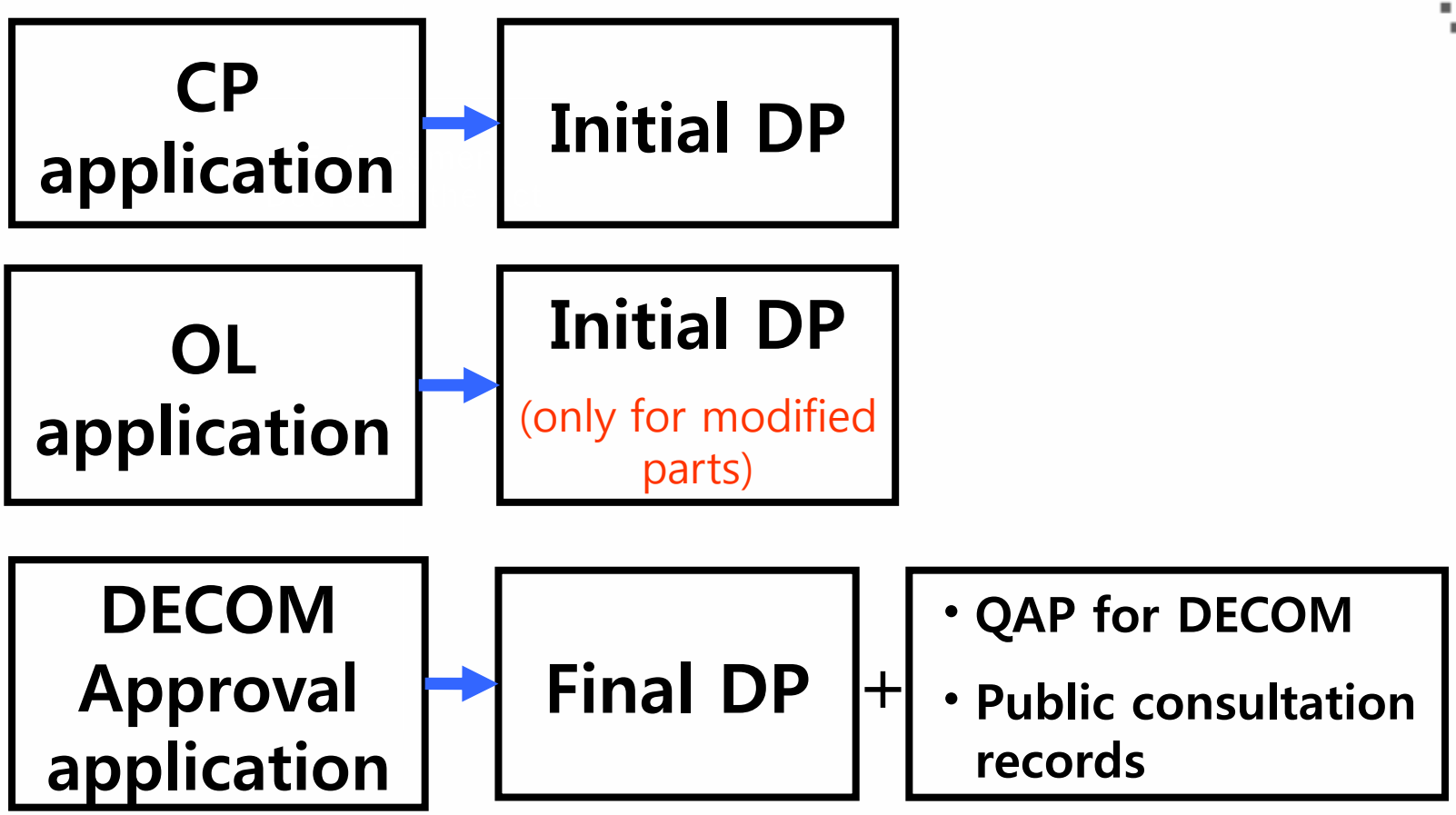
Revision of NSA and regulations (8)

- Established provisions for decommissioning regulations



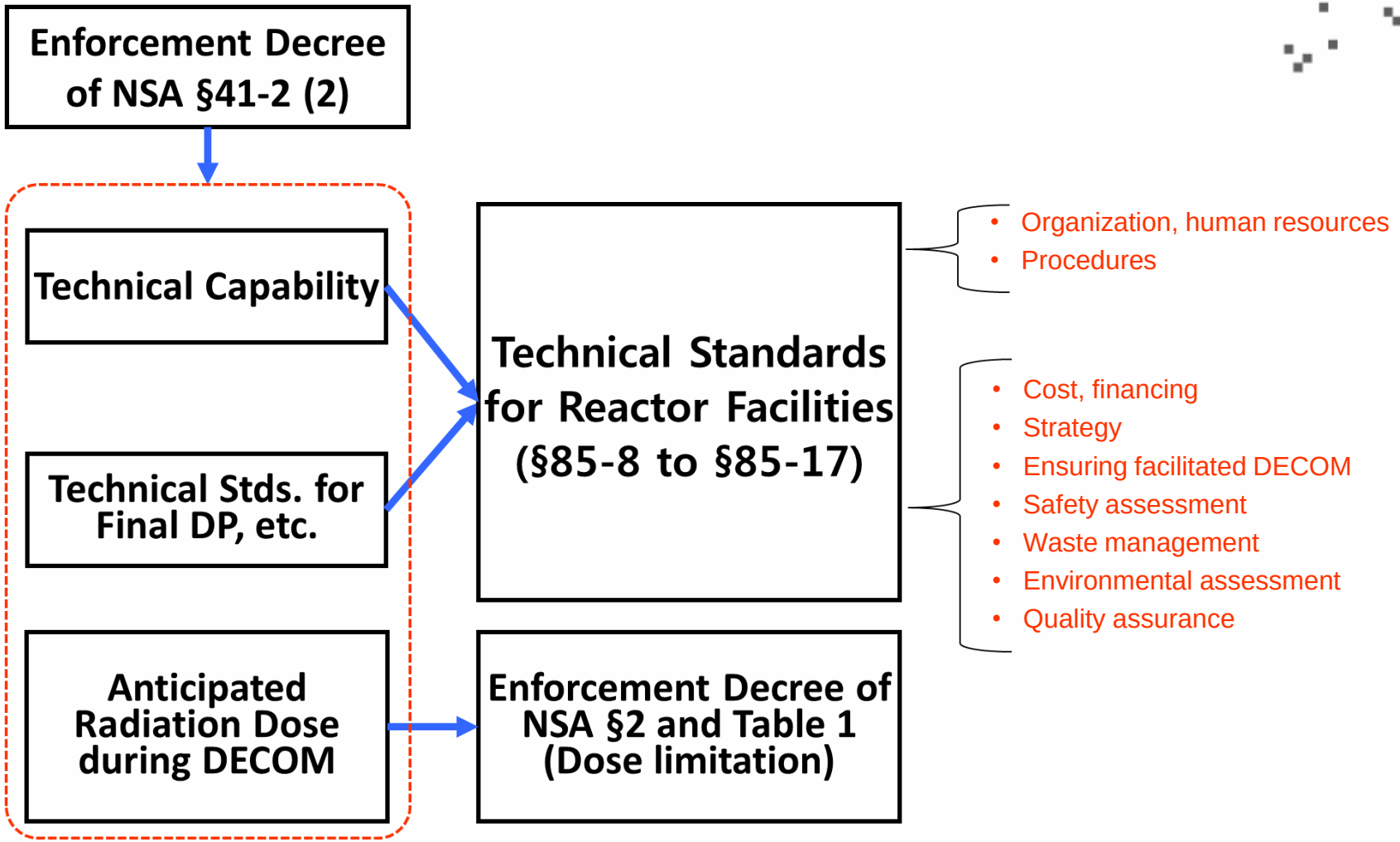
Revision of NSA and regulations (9)

- Documentation to be submitted for decommissioning



Revision of NSA and regulations (10)

- Criteria for approval of decommissioning



Revision of NSA and regulations (11)

- Contents of decommissioning plan

Enforcement Regulations of NSA §4 (5)

1. Organization, human resources, cost and funding for decommissioning
2. Strategy, methods, and schedule for decommissioning
3. Design features for facilitating decommissioning → Measures to be taken for construction and operation
4. Measure for preventing hazards from radiation
5. Method for removing radioactive materials and contamination therefrom
6. Processing, storage and disposal of radioactive waste
7. Environmental impact assessment for radioactive materials, etc. and measures thereon
8. Other items stipulated by the NSSC

NSSC Notice No. 2015-8 → **Standard Format and Content of Decommissioning Plan**

Comparison with IAEA report –DP contents

IAEA SRS No. 45 (2005)	NSSC Notice No. 2015-8 (2015)
1. Introduction	**1. Overview of DP**
2. Facility Description	
3. Decommissioning Strategy	**4. Strategy and Methodology for DECOM**
4. Project Management	**2. Project Management (Organization and Human resources)**
5. Decommissioning Activities	**8. Decontamination and Dismantling Activities**
6. Surveillance and Maintenance	*contained in #8, #10, etc.*
7. Waste Management	**9. Radioactive Waste Management**
8. Cost Estimate and Funding Mechanisms	**2. Project Management (Cost and Funding)**
9. Safety Assessment	**6. Safety Assessment**
10. Environmental Assessment	**10. Environmental Impact Assessment**
11. Health and Safety	**7. Radiation Protection**
12. Quality Assurance	*to be submitted as a separate documentation*
13. Emergency Planning	*『Act on Physical Protection and Radiological Emergency』 is applied.*
14. Physical Security and Safeguards	
15. Final Radiation Survey	*contained in #6, #10, etc.*
-	**Fire protection, etc.**

Revision of NSA and regulations (12)

- Reporting & Inspection requirements

Reporting DECOM Status
Enforcement Regulations of NSA §23-1(1)

Semi-annually

- Status of DECOM per facility
- List of decontamination and dismantling activities
- Status of radiation safety management
- Status of RWM

DECOM Status Inspection as per
- DP
- Semiannual Report

Reporting Completion of DECOM Activities
Enforcement Regulations of NSA §23-3 & §23-4

at Completion of DECOM work

DECOM Completion Report

- Strategy and list of DECOM activities
- Status of facilities and site before/after DECOM
- Final status of radiological conditions of facilities/site and radioactive waste management
- Radiation dose exposed to DECOM workers
- Abnormal events occurred during DECOM

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Final Site Status Report

- Plan to reuse residual site
- Plan, method and result of final radiological status survey

DECOM Completion Inspection as per
- DP
- DECOM Completion Report
- Final Site Status Report

Comparison with IAEA report –Decom completion report

IAEA SRS No. 45 (2005)	Enforcement Regulations of NSA
Facility description	**Status of facilities and site before/after DECOM**
Decommissioning objectives	**Strategy and list of DECOM activities**
Decommissioning activities	
Waste volumes	• **Final status of radiological conditions of facilities/site and radioactive waste management** • **Plan, method and result of final radiological status survey**
Remaining entities	
Final radiological status	
Site release	**Plan to reuse residual site**
Release criteria	
Personnel doses	**Radiation dose exposed to DECOM workers**
Abnormal occurrences and incidents	**Abnormal events occurred during DECOM**
Lessons learned	*General matters*
References	
Appendices	

Concluding remarks

- Korean has been recently improving legal framework for decommissioning of major nuclear installations by amending Nuclear Safety Act and relevant

- Basic set of regulations has been developed, and KINS will be developing detailed safety review and inspection guides and procedures, subsequently.

Thanks for your attention!