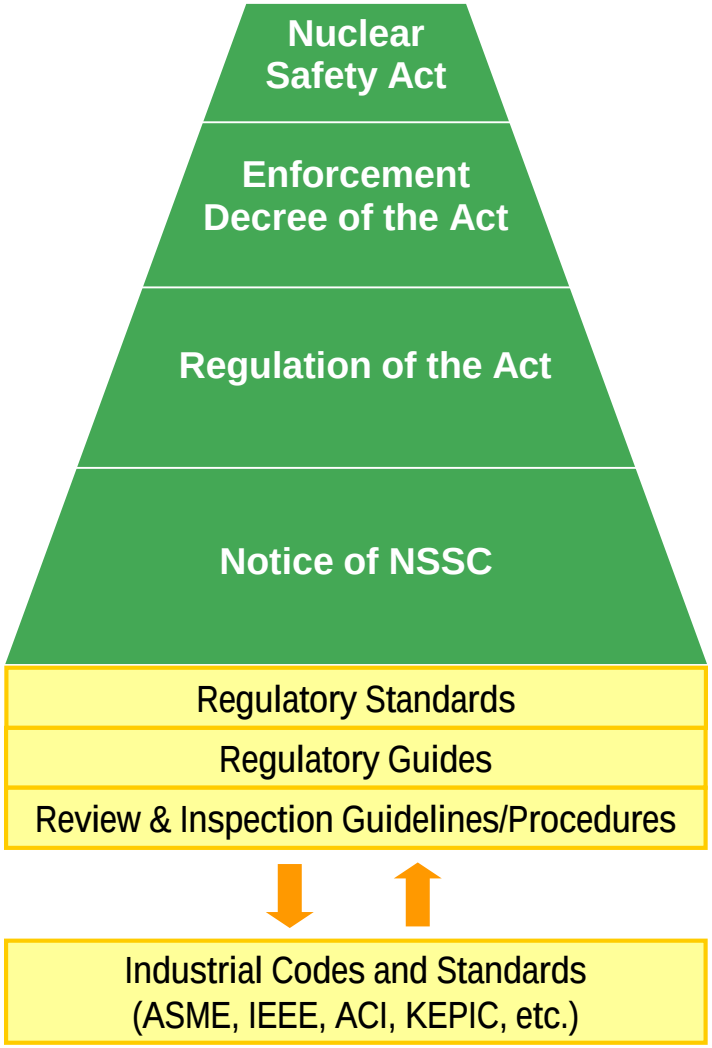
IAEA-KINS WS, 28 May, 2019, KINS

Documentation for Review and Assessment with Respect to Applicant and Regulator - Application in Korea -

Key Yong Sung
(k109sky@kins.re.kr)

Legal Hierarchy for NPP License in Korea



- The Act provides the bases and fundamental matters regarding safety regulations
- The Decree provides particulars entrusted by the Act and necessary for the enforcement of the Act
- The Regulation provides the technical standards and particulars entrusted by the Act and the Decree such as detailed legal procedures and format of documents
- The Notice provides detailed particulars for the technical standards and general design criteria
- The Regulatory Standards and Guides provide the interpretation, detailed criteria, acceptable methods, conditions, and specifications of the technical standards.
- The Review & Inspection Guidelines/Procedures provide the staff guidance in carrying out regulatory activities.
- Codes and Standards for materials, design, test, and inspection of components and equipment

Comparison with IAEA Safety Stds.

Nuclear Safety Act

Enforcement Decree

Regulation of the Act

NSSC Notice

KINS Regulatory Guide/ Review Guide/Procedure

Industrial Codes & Standards

Safety Fundamentals

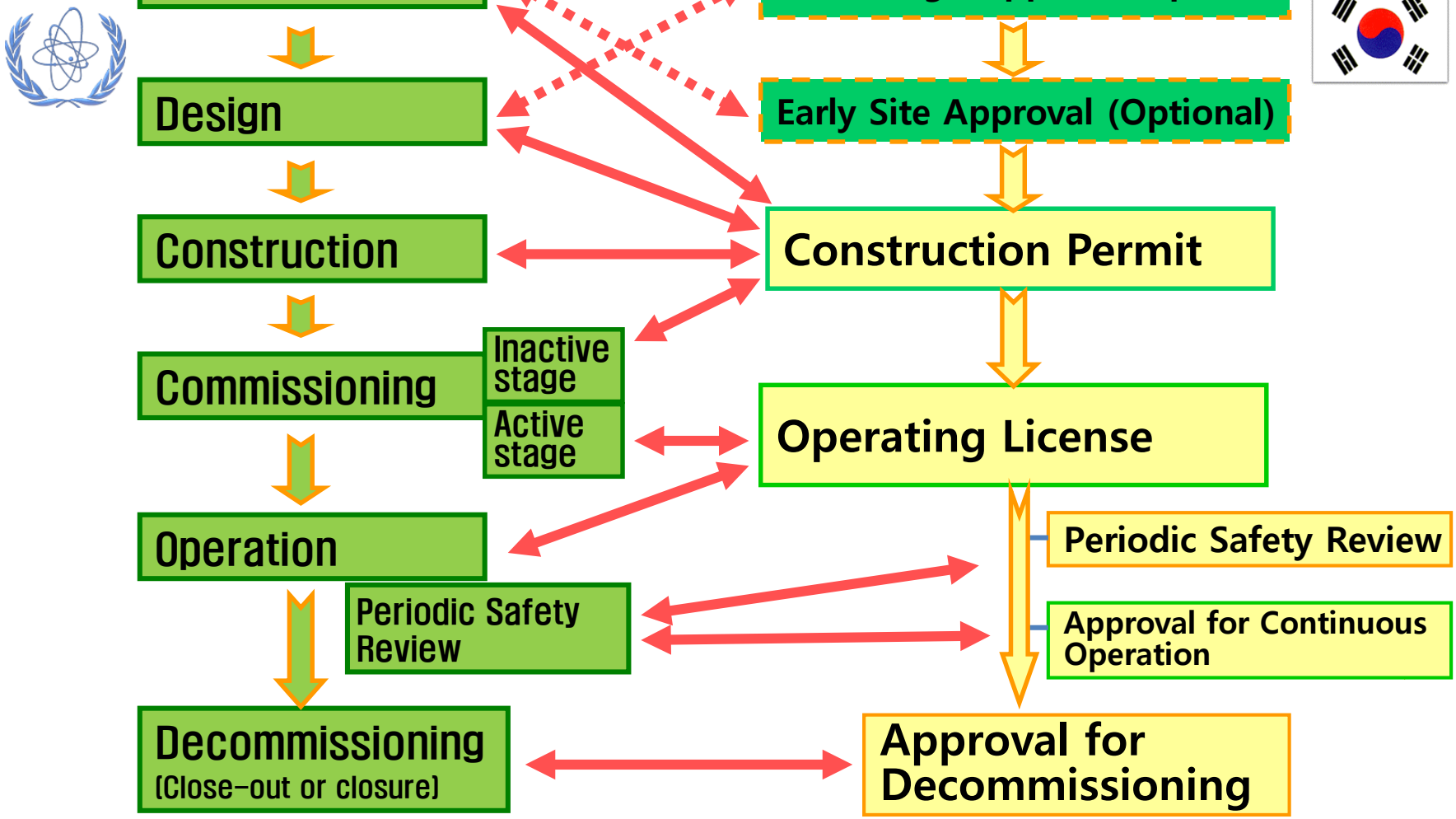
Safety Requirements

Safety Guides

IAEA Safety Standards Series

IAEA Safety Reports Series

Licensing Stages in Comparison with IAEA Standards

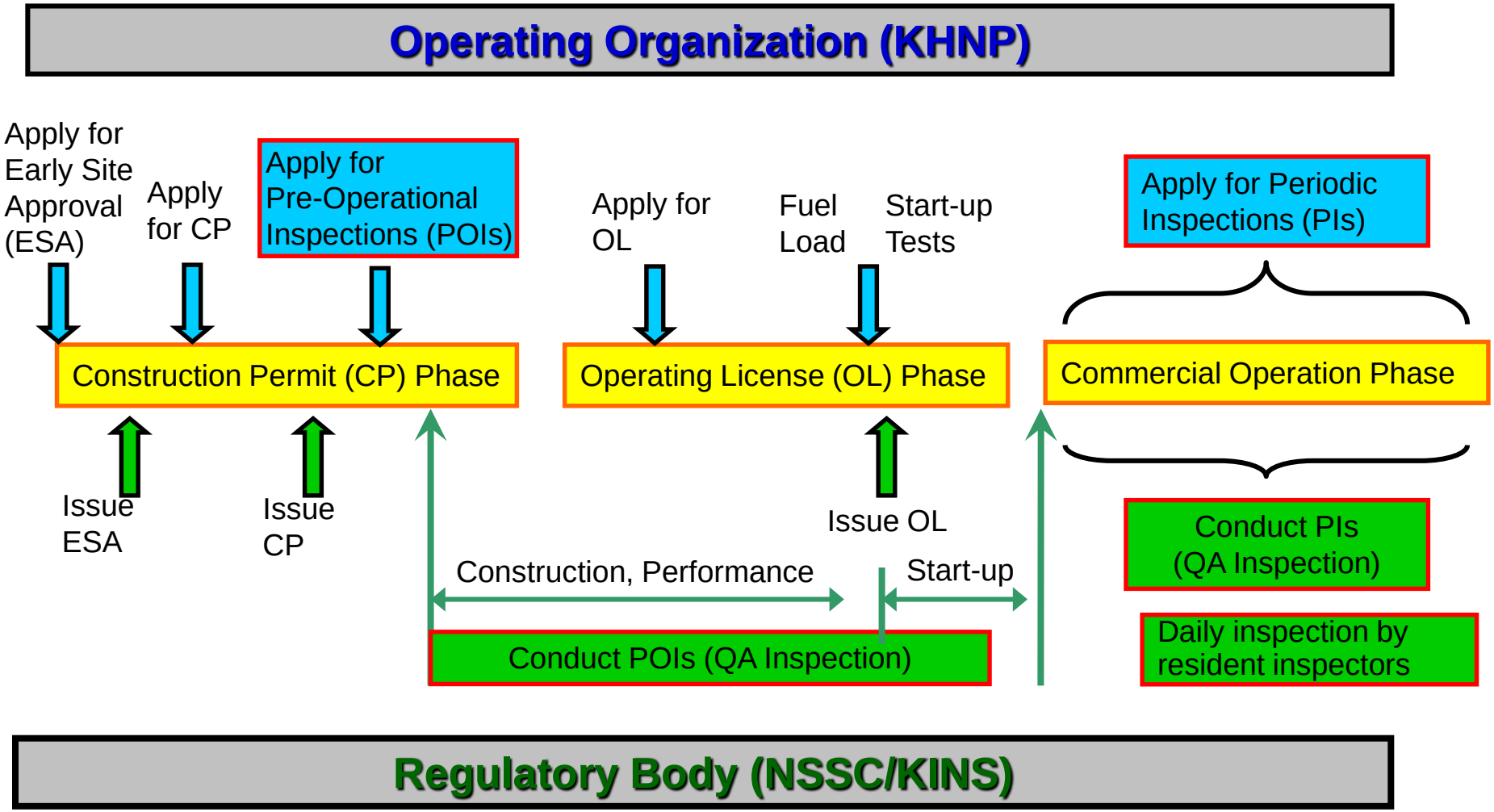


Licenses of a NPP in Korea

- **Types of Licensing**
  - **Standard Design Approval(SDA) : Optional**
  - **Early Site Approval (ESA) : Optional**
  - **Construction Permit (CP)**
  - **Operating License (OL)**

- **Other Reviews**
  - **Periodic Safety Review (PSR)**
  - **Review of Continued Operation over design life time**
  - **Standard Design Approval (SDA)**
  - **Amendment of Permit or License**
  - **Approval of Topical Report (TR)**

Licensing Stages of a NPP in Korea



Review for Construction Permit (CP)

- **Purpose**
  - to ensure that the technical standards for the location, structure, facility, and performance of NPP are met

- **Documents submitted for CP**
  - Radiation Environmental Report
  - **Preliminary Safety Analysis Report (PSAR)**
  - Quality Assurance Plan for construction
  - Description on the technical capability for nuclear plant installation

- **Docket Review**
  - to assure that the documents submitted by the applicant contain all necessary details required by Atomic Energy Act and subordinate regulations

Review for Operating License (OL)

- **Purpose**
  - to confirm that the final design of nuclear reactor described in the final safety analysis report meet the applicable standards
  - to ensure that the completed nuclear reactor can be operated as expected throughout the design life

- **Documents submitted for OL**
  - **Final Safety Analysis Report (FSAR)**
  - **Technical Specifications for Operation**
  - Quality Assurance Plan for operation
  - Radiation Environmental Report
  - **Radiation Emergency Plan**
  - Description on the technical capability for the reactor operation
  - Description on nuclear fuel loading plan
  - Description of the technical background and verification method to be for the Emergency Operating Procedure

- **Docket Review**

Safety Analysis Reports

Chapter 1 - Introduction and General Description of Plant
Chapter 2 - Sites Characteristics
Chapter 3 - Design of Structures, Components, Equipment, and Systems
Chapter 4 - Reactor
Chapter 5 - Reactor Coolant System and Connected Systems
Chapter 6 - Engineered Safety Features
Chapter 7 - Instrumentation and Controls
Chapter 8 - Electric Power
Chapter 9 - Auxiliary Systems
Chapter 10 - Steam and Power Conversion System
Chapter 11 - Radioactive Waste Management
Chapter 12 - Radiation Protection
Chapter 13 - Conduct of Operations
Chapter 14 - Initial Test Program
Chapter 15 - Accident Analysis
Chapter 16 - Technical Specifications
Chapter 17 - Quality Assurance
Chapter 18 - Human Factors Engineering
Chapter 19 – PSA and Severe Accidents

Safety Analysis Report

KINS Implementation of R & A

- All of areas considering up-to-dated Experiences & other Factors :
  - **Based on the SRGs being periodically revised by MS procedure**
  - Proven provisions or Qualification
    - EQ, Software Quality of Safety-critical I&C Systems
  - Consideration of competence and skills and others
    - Evaluation of Technical Capability for Operation , Human Factor
  - Incorporating on the latest experience
    - Cyber Security for Digital I&C Systems
  - Independent confirmatory audit calculation
    - Uncertainty and Sensitivity Analysis, Code V & V in Safety Analysis
  - On-site verification through regulatory inspection
    - Electric System Design, ECCS Recirculation Sump Strainer, etc.

Regulatory Review & Assessment Process

- R & A is performed to confirm the compliance with regulatory requirements and associated acceptance criteria
  - Safety Review Guideline/Procedure are used

    (KINS Internal Guidelines)
    - necessary for effective review and assessment of the application documents submitted by applicant
    - NSSC approves the KINS Rules for Entrusted Regulatory Activities developed in accordance with Article 311 (Approval of Activities) of Enforcement Decree
    - Administrative procedures(MS) for conducting the technical activities

Review Guidelines and Procedures

- **KINS has developed and used the Guidelines/ Procedures**
  - **Review and Assessment Guidelines**
    - Safety Review Guidelines for PWR
    - Safety Review Guidelines for Periodic Safety Review of PWR
    - Safety Review Guidelines for Periodic Safety Review of PHWR
    - Safety Review Guidelines for Continued Operation of PWR
    - Safety Review Guidelines for Continued Operation f PHWR
  - **R & A Procedures [Nuclear Power Reactor and Related Facilities] : MS document**
    - Licensing Review Procedure
    - License Amendment Review Procedure
    - Periodic Safety Review Procedure
    - Topical Report Review Procedure

Regulatory Guidelines for Safety Review

- KINS Safety Review Guidelines (SRGs) for safety analysis report of NPPs
  - KINS SRGs are almost identical with Standard Review Plan (US SRP in NUREG-0800, …) of US NRC.
  - KINS SRGs provide the staff guidance and review procedures in view of the related technical areas.
  - KINS SRGs are not requirements, but the operator is expected to evaluate the facility as recommended by the SRGs.
    - This evaluation must include an 'identification and description of all differences in design features, analytical techniques add procedural measures' proposed for the facility and those corresponding features in the SRGs.

Chapters of SRG

- KINS SRG chapters are identical with the corresponding chapters in SAR

- Ch.1, Introduction and Interfaces
- Ch.2, Sites Characteristics and Site Parameters
- Ch.3, Design of Structures, Components, Equipment, and Systems
- Ch.4, Reactor
- Ch.5, Reactor Coolant System and Connected Systems
- Ch.6, Engineered Safety Features
- Ch.7, Instrumentation and Controls
- Ch.8, Electric Power
- Ch.9, Auxiliary Systems
- Ch.10, Steam and Power Conversion System
- Ch.11, Radioactive Waste Management
- Ch.12, Radiation Protection
- Ch.13, Conduct of Operations
- Ch.14, Initial Test Program
- Ch.15, Accident Analysis
- Ch.16, Technical Specifications
- Ch.17, Quality Assurance
- Ch.18, Human Factors Engineering
- Ch.19, PSA and Severe Accidents

Contents of SRG(SRP)

- Responsibilities of staff reviewers (Review responsibility)
- Matters that are reviewed (Area of review)
- Regulations and acceptance criteria necessary for the review (Acceptance Criteria)
- How the review is accomplished (Review Procedure)
- Conclusions that are appropriate (Evaluation Findings)
- Implementation requirements (Implementation)
- Information about regulatory matters (References)

Licensing Review Procedure for Nuclear Power Reactors and related facilities Contents

1. Objective
2. Scope of Application
3. Applicable References
4. General Aspects
   - 4.1 Glossary (definitions)
   - 4.2 Responsibilities
   - 4.3 Documents to be reviewed
   - 4.4 Review standards
5. Implementation Procedures
   - 5.1 Receipt of application and establishment of review plan
   - 5.2 Performance of safety review
   - 5.3 Submission of safety review results
   - 5.4 Preparation and distribution of final safety review report
   - 5.5 Management of follow-up actions
   - 5.6 Record keeping and technical support, etc.
6. Attachments
   - 6.1 Flowchart of review process for licensing NPP
   - 6.2 Ulchin Units 5 & 6 operating license review report(example)

Summary

- Licensing Documents in Korea
  - CP: PSAR, QAP,..
  - OL: FSAR, QAP, T/S
- Documents for Regulatory Review & Assessment
  - Safety Review Guideline (Technical)
  - Review Procedure (Process)