Development of regulatory requirements for the deep geological disposal in South Korea

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Introduction of Research Project

- **Project Name** : Development of regulatory requirements for the deep geological disposal system
- **Purpose** : Establishment of regulatory basis for the disposal of High-level Radioactive waste
- **Period** : 2021~2029 (3 Phases)
- **Overview** : Developing regulatory requirements appropriate to South Korea spent nuclear fuel management and disposal system in order to develop a final deep geological disposal facility

Research Roadmap for 1 Phase (2021~2023)

Items	2021	2022	2023
Safety Requirements and Compliance Criteria	Establishment of a regulatory basis	Development of detailed requirements/compliance criteria for natural barrier(~'25) (Geology, Hydrogeology, geochemistry, surface environment, etc.)	
	Development of site development requirements/compliance criteria		Development detailed requirements/compliance criteria for engineering barrier (~'26) (Structures, Disposal container, Buffer, Backfill, etc.)
	Development of basic requirements for safety case	Development of disposal system component requirements/compliance criteria	
			Development of URL requirements/compliance criteria(~'24)
Regulatory Guidance	Establishment of basic strategy for safety regulations	Development of regulatory guidance for site development	
		Development of regulatory guidance for natural barrier(~'25)	
	Establishment of safety verification/basic regulatory guidance		Development of regulatory guidance for URL(~'25)
R&D Regulatory Support	Establishment of R&D regulatory support system(Technology certification program, etc.)		
		Regulatory support for South Korea deep geological disposal R&D(Technology certification, etc., ~'29)	

Research contents of site development

- **Purpose** : Developing step-by-step regulatory elements for site development of deep geological disposal facility
- **Contents**

① Development of requirements/compliance criteria for site development : Detailed regulatory requirements for each stage and criteria to satisfy for each requirements

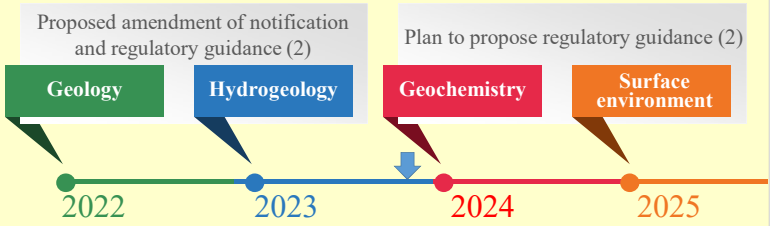
② Development of regulatory guidance for site development : Regulatory guidance that can be applied to reviewing

Development of requirements for Site Development

Case Study	Reviewing prior Research	Categorizing Site Development Stages
IAEA SSG-14 "Geological Disposal Facilities for Radioactive Waste"	• Generic level reference • Categorized in 4 phases: Conceptualization and planning phase, Area study phase, Site study phase, Site selection	◈Site development stage classification and requirements(draft) 1. Site development system • Objective and logical system, Scientific criteria for excluding site, Overall schedule and estimated costs 2. Site basic survey • National area survey plan, Screening criteria(considered conceptualized deep disposal system shall be prepared.) 3. Detailed Site survey • Detailed site survey plan, Criteria for candidate site 4. Site Characterization Development • Information that has a major impact on Safety 5. Site management • Maintain, create, or preserve site environment for safe construction, operation, closure
IAEA TRS-177 "Site Selection Factors for Repositories of Solid High-Level and Alpha-Bearing Wastes in Geological Formations"	• Referring to international guidance when developing regulatory requirements for site development • Referring to the provisions for repository sites from the IAEA	
USA/Sweden regulatory requirements and guidance (10CFR60/63, SSMFS 2008:21)	• Referring to actual regulation cases and requirements • Comparison with South Korea requirements for site development	

Development of requirements for Natural barrier

- **Aim** : Identifying any necessary improvements or implications for the safety regulations of South Korea's natural barriers for deep geological disposal by comprehensively reviewing IAEA standards, foreign safety regulations, and domestic research results.



- **Case study** : Contents related to natural barriers (IAEA SSR-5, SSG-14, 23, 31, GSG-3.4, 10CFR60, 63, SSMFS 2008:21, STUK/Y/4/2018, REDOC-1.2.1 etc.) → Comparison of the regulation (South Korea)
- **Focus** : Safety functions (ability to inhibit the migration of nuclides)
- **Implications** : In conformity with the standards stipulated by the IAEA, regulatory element finds application in the majority of nations. Nonetheless, it is substantiated that each regulatory element is distinct, due to the DGD stages and environment (Geological properties, …)

Conclusions

Draft regulatory requirements of both site development and natural barrier for deep geological disposal are proposed. This work highlights the importance of a comprehensive regulatory framework for the safe and secure management of high-level radioactive waste and provides insights for policymakers and practitioners who are interested in developing regulatory frameworks.

Acknowledgement

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