

KNF-
ENG-08

Criticality Analysis for Radioactive Facility

NUCLEAR FUEL DESIGN DEPT. Janghwan Lim
T. 042-868-1408 E. jhlim@knfc.co.kr

All facilities that handle radioactive materials must maintain subcriticality in accordance with nuclear-related laws and regulations for safety. Therefore, it is necessary to limit the form of all related facilities, and the amount handled and uranium enrichment, arrangement, amount handled, and uranium enrichment of all related facilities, and to prove through reliable analysis methods that subcriticality is maintained by using neutron absorbers, etc. Typically it is a technique for analyzing and evaluating using commercial codes(MCNP, SCALE, etc) that utilize the Monte Carlo methodology.

● Necessity

- Nuclear criticality analysis is required for safety evaluation & licensing of radioactive material handling facilities, spent nuclear fuel transportation casks and storage pool etc.

● Technology Composition

- Benchmarking: Determine the Upper Subcritical Limit
 - Using NUREG/CR-6361, OECD/NEA Handbook
- Criticality Analysis: Use SCALE KENO
 - Results of Radioactive Facilities Criticality Analysis

Description

● Background

- The Article 36(Criteria for Permits, etc) Paragraph 1 subparagraph 2 of the Nuclear Safety Act, and the Article 90(Fuel Storage Facility) & Article 91(Fuel handling Devices, etc) of regulation of the Nuclear Safety and Security Commission on Technical Standards for Nuclear Reactor Facilities, regulate that the subcriticality condition must be maintained during handling radioactive materials or making changes in facilities

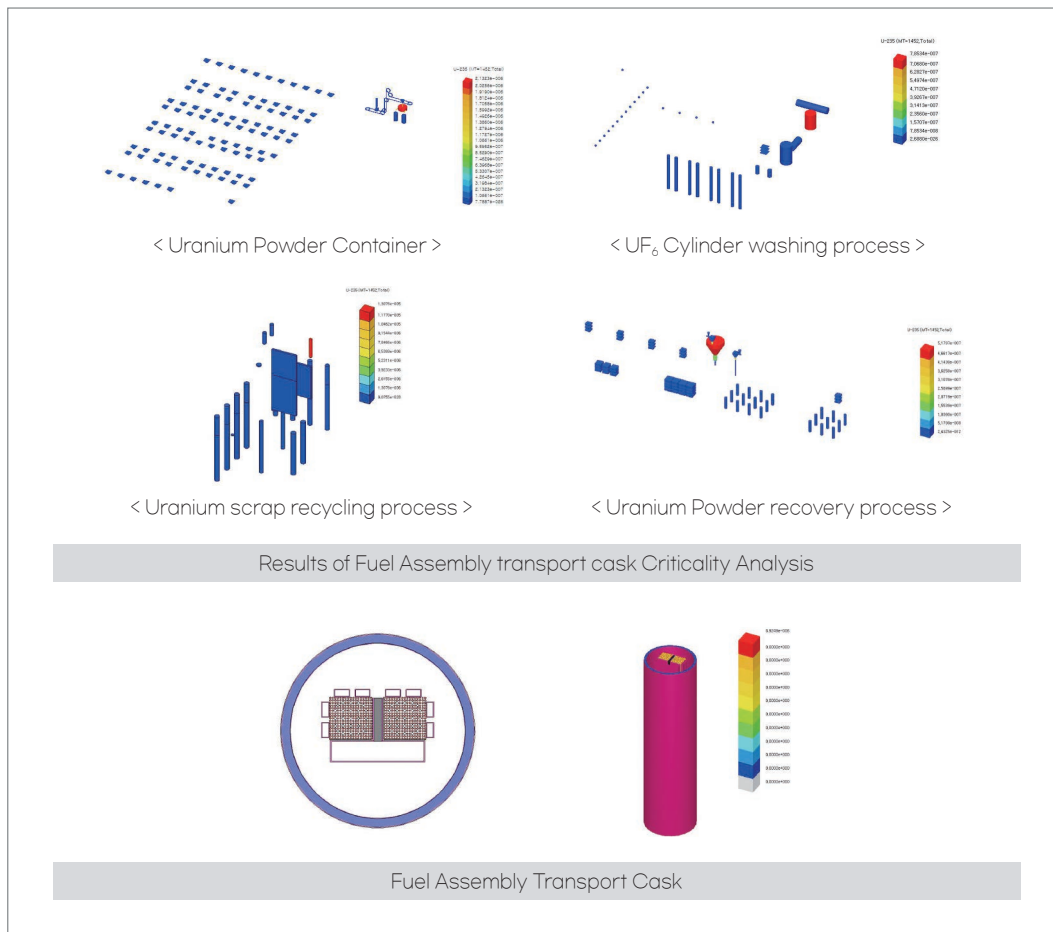
Distinctiveness

● Characteristic

- Provide the best results using the latest analysis codes

● Benefit

- Save outsourcing service cost by performing the critical analysis in-house and provide manpower supporting licensing
- Secure the validity of the project and increase the possibility to obtain license by improving radioactive facility, equipment, nuclear fuel(spent fuel included) criticality analysis capability



Technology Readiness Level (TRL)

Actual system proven through operation

Business Model

- Technology Transfer
- Licensing
- Joint Search
- Service Execution**
- Others

- Improve customer satisfaction and reliability by performing the critical analysis safety evaluation objectively and accurately

- UF₆ cylinder washing & waste liquor treatment equipment in radioactive waste management facility
- Install Rod scanner
- Develop localization of main process of reconversion
- Build/Install uranium scrap recycling process
- Fuel Assembly transport cask
- Demolish UO₂-Gd₂O₃ pellet & powder storage demolish
- Improve powder recovery process facility(under licensing review)

Experience

● **Ongoing**

- Change of emergency generator operating condition (under licensing review)
- Uranium recovery process from NaDU scrap(performing analysis)
- Integrity Inspection equipment for Spent Nuclear Fuel(performing analysis)

● **Obtain Licensing**

- Uranium purification process
- Uranium powder precleaning facility

Deliverables

- Criticality Safety Analysis and Support for Licensing