

Development of a Guideline for the Preparation of SAR on Spent Nuclear Fuel Recycling Facilities

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1. Introduction

The development of a spent nuclear fuel recycling process in Korea necessitates revision and supplement of current nuclear safety regulations including the establishment of a guideline for the preparation of a Safety Analysis Report (SAR) on spent nuclear fuel recycling facilities. The revision tends to integrate various documents to be submitted for a nuclear fuel cycle facility license application into a SAR [1]. For this, a previous study reviewed the conventional and current approaches for the format and contents of SAR on spent nuclear fuel recycling facilities in the United States [2]. The study also investigated on the Integrated Safety Analysis (ISA) [2]. These studies expected the utilization of current ISA based approach as a reference to the development of our SAR preparation guideline. Actually, NUREG-1520 [3] was considered to be a relevant representative document for the referencing.

This paper presents a guideline that has been developed in terms of SAR framework for licensing spent nuclear fuel recycling facilities.

2. Method and Results

2.1 Identification of key references

Reviews have been made to IAEA recommendations and regulations of the United States and Korea with regard to the SAR framework as shown in Fig. 1. These have led to the identification of key aspects worth for being referenced in the formulation of the intended SAR framework, as follows:

2.1.1 IAEA NS-R-5 recommends basic concepts of As Low as Reasonably Achievable (ALARA) and defense in depth [4].

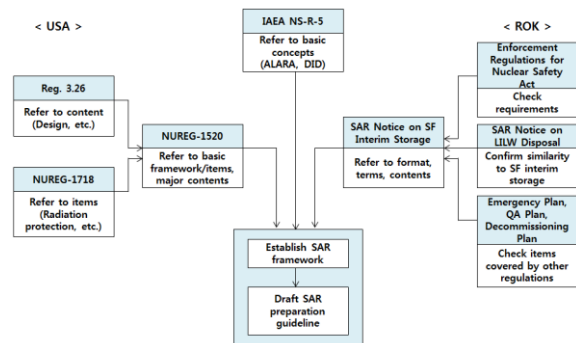


Fig. 1. Development approach for SAR framework.

2.1.2 US NUREG-1520 is, as mentioned earlier, a representative reference of current approach for SAR preparation, providing a framework, items to be covered and major contents. NUREG-1718, “Standard Review Plan for the Review of an Application for a Mixed Oxide Fuel Fabrication Facility” is similar to NUREG-1520 and provides additional information on radiation protection, etc. Regulatory Guide 3.26, “Standard Format and Content of Safety Analysis Reports for Fuel Reprocessing Plants” is conventional guide, but still useful partly in particular for building and process design, etc.

2.1.3 The Korean Nuclear Safety and Security Commission (NSSC) Notice 2015-020 [5] is another principal reference providing a type of framework, items to be covered, technical terms, and contents that are being used for nuclear fuel cycle facilities under Korean nuclear safety regulatory system. NSSC Notice 2015-018 on “Standard Format and Contents of SAR for Low and Intermediate Level Radioactive Waste Repository” is similar to the notice for the storage facilities except for items dealing with systems related to long term safety. SAR contents on nuclear power plants in the Enforcement Regulations of the Nuclear Safety Act

are also similar to the notice for the storage facilities, but focusing on specific reactor systems. On the other hand, it is confirmed that documents on emergency preparedness, decommissioning, and quality assurance have to be submitted for licensing application separately in accordance with “The Act on Measures for the Protection of Nuclear Facilities, etc. and Prevention of Radiation Disaster” and “The Nuclear Safety Act”, respectively.

2.2 Review of major components of SAR

2.2.1 Site characteristics and process. Items for site characteristics and building/process design which are included in “General Information” of NUREG-1520, are taken out to become independent major items. The reason is as follows. Site characteristics is one of the major components related to the facility safety and actually deals with a large amount of information in SAR. The same is true with building/process design. Even though building/process design can be dealt dispersedly as part of major items for ISA and safety provisions following the NUREG-1520 approach, it is thought there should be a place where all of the design information is described in an integrated way.

2.2.2 ISA. The item of ISA from NUREG-1520 is introduced with a modification of its sub-items on “Site” and “Facility” to that of “Safety Information”.

2.2.3 Items for safety provision. Items for safety provision from NUREG-1520 are introduced excluding that of emergency preparedness, decommissioning, and quality assurance which are to be dealt in other licensing documents. While, waste management is added as part of environmental protection. With the introduced items, their individual ways of description approach are rearranged to come consistently under sub-items of safety consideration, design features, operational program, and assurance of items relied on for safety (IROFS).

2.3 Establishment of framework

Based on the aforementioned review, the SAR framework is formulated in four parts as shown in Fig. 2. They are facility information (general information, site characteristics, building/process

design), ISA, safety provisions (radiation protection, criticality safety, chemical process safety, fire safety, waste management and environmental protection), and management measures.

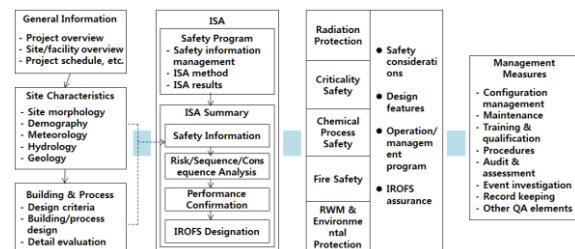


Fig. 2. The developed SAR framework.

3. Conclusions

A framework of guideline on format and contents of SAR for license application of spent nuclear fuel recycling facilities has been developed by the need for integrating various documents into a SAR, which is referring to current approaches in USA and to Korean nuclear safety regulations related to format and content of SAR, as well as taking account of specific nature of the facility. The study results are expected to serve as a useful input to the planned revision and supplement of the current Korean nuclear safety regulations for licensing spent nuclear fuel recycling facilities.

REFERENCES

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- [5] NSSC Notice 2015-020, Standard Format and contents of SAR for Spent Fuel Interim Storage Facilities (2015).