Improvement on Structure of Technical Standards by Ordinance of MOST

Hyung-Joon Ahn, Sang-Kyu Ahn, Jae-Dong Koh, Jae-Myung Song, Myung-Mo Jung, and Chang-Bum Kim
Korea Institute of Nuclear Safety, 19, Kuseongdong, Yuseongku, Daejeon 305-338, Korea, ahnhj@kins.re.kr

1. Introduction

Technical standards by legal term in Korea are the mandatory requirements which are prescribed in nuclear laws and Notices of the MOST (Minister of Science and Technology).

Regulations on Technical Standards for Nuclear Reactor Facilities, etc. (Ministerial Ordinance No.31) prescribes the technical standards on the location, structure, installation, performance, operation, and quality assurance for the design, construction and operation of reactor facilities and nuclear fuel cycle facilities. Although the ordinance was wholly amended in July 2001, the technical standards by the ordinance should be improved in a way because they do not have separate and detail standards for different type of reactor, and still have some mutatis mutandis regulations and so on.

Recently, globalization for the safety standards has been pursued. In this environment, technical standards have to be improved to meet the concept of the Atomic Energy Act and the international safety level.

In this paper, the structure and components of the technical standards for reactor facilities were reviewed and evaluated comparing with foreign standards such as IAEA safety standards, and considering current regulatory position. Also, the components and contents of the new requirements were suggested.

2. Assessment of Technical Standards

2.1 Hierarchy of Laws and Technical Standards

The legal system in Korea has a hierarchy as follows[1].

- Atomic Energy Act,
- Enforcement Decree (Presidential Decree),
- Enforcement Regulation (Ministerial Ordinance),
- Regulations on Technical Standards for Nuclear Reactor Facilities, etc. (Ministerial Ordinance No.31),
- Regulations on Technical Standards for Radiation Safety Management, etc. (Ministerial Ordinance No.30),
- Notices of the MOST, and
- Safety Regulatory Guides (Safety Review Guides, Inspection Guides, Technical Guides)

Atomic Energy Act provides the bases and the fundamental matters concerning the development and utilization of atomic energy and safety regulations.

Technical standards for construction permit or operation license are prescribed mainly in the ministerial ordinances, and more detailed standards are prescribed in the Notices of the MOST. Notice is a kind of administrative regulation which prescribes the technical standards or guides on the bases of nuclear law. Safety Regulatory Guides provide acceptable methods or procedures that are applied to the implementation of the laws and regulations.

2.2 Improvement on Structure and Components of Technical Standards

Improvement on the structure of technical standards have been made based on the previous research results[2,3,4] and IAEA safety standards[5].

Technical standards by the ordinance generally correspond to the General Design Criteria of Appendix A and Quality Assurance of Appendix B to 10CFR50, and IAEA Safety Requirements. Comparing technical standards with the foreign standards, they have most of the contents of the referenced requirements, but are missing some requirements related to recently raised new issues. These factors were considered and reflected to improve the structure of the technical standards.

Table 1 shows hierarchy of the improved technical standards for reactor facilities. The structure of the technical standards was categorized into six areas: common requirements, protection by multiple fission product barriers, protection and reactivity control systems, fluid systems, radiation protection, fuel handling and storage systems, while current ordinance does not have this categorization.

Based on the improved structure, four new components of technical standards are selected: Design for Decommissioning, Aging, Severe Accident, and Severe Accident Management.

3. Selection of New Technical Standards

The components and major contents of the new technical standards are as follows, and summarized in Table 2.

3.1 Design Prepared for Decommissioning

In the design of nuclear power plants, consideration shall be given to measures facilitating the decommissioning of the plant and reducing the residual radioactive materials in order to limit the radiation exposure of the people as low as reasonably achievable, and to protect the environment against radiological contamination during decommissioning.

3.2 Aging

Appropriate margins shall be provided in the design for all structures, systems and components important to safety so as to take into account relevant ageing and wear-out mechanisms and potential age related degradation, in order to ensure the capability of the structure, system or component to perform the necessary safety function throughout its design life. Ageing and wear-out effects in all normal operating conditions, testing, maintenance, maintenance outages, and plant states in a PIE(Postulated Initiating Events) and post-PIE shall also be taken into account. Provision shall also be made for monitoring, testing, sampling and inspection, to assess ageing mechanisms predicted at the design stage and to identify unanticipated behavior or degradation that may occur in service.

3.3 Severe Accident

A comprehensive and systematic evaluation shall be performed for identifying the postulated initiating events which have the potential to cause severe accidents and the important accident sequences resulting from those initiating events, and the events or accident sequences to be considered in the design shall be identified.

Reasonable steps shall be taken to have no serious radiological consequences for severe accidents considered in the design, to extremely reduce the likelihood of any severe accident which could have serious radiological consequences, and to reasonably mitigate consequences of severe accidents if occurred.

3.4 Severe Accident Management

The operating organization shall establish and implement a severe accident management program needed to prevent severe accidents, to terminate accident sequence, and to mitigate the consequences of severe accidents.

The severe accident management program shall include an accident management strategy, availability and performance analysis of instrument & control and information supporting systems, responsibility of organization and decision making, guidelines and procedures of the severe accident management, and training and its implementation system.

4. Conclusion

In order to improve the structure of technical standards by ordinance of MOST, the followings are suggested.

- Technical standards on the structure, installation, performance were categorized into six areas depending on the technical subjects.
- Four new components of the technical standards are proposed: Design for Decommissioning, Aging, Severe Accident, and Severe Accident Management, and major contents of the components were prepared.

It is expected the results would be reflected to the future amendment of ministerial ordinance through regulatory direction and active discussion.

Table 1. Hierarchy of Improved Technical Standards

Tech. Std.	Areas	Components	Status
Location(7)	-	"Geological Features and Earthquakes", etc.	Ordinance
Structure, Installations, and Performance (41)	Common Require-ments(18)	"Safety Classes and Standards", etc "Design for Decommissioning" "Aging" "Severe Accident"	Ordinance <u>New</u> <u>New</u> <u>New</u>
"	Protection by Multiple Fission Product Barriers(12)	"Reactor Design", "Reactor Coolant Pressure Boundary", "Reactor Coolant System", etc.	Ordinance
"	Protection and Reactivity Control Systems(4)	"Protection System ", "Reactivity Control System", etc.	Ordinance
"	Fluid Systems(4)	"Residual Heat Removal System", etc.	Ordinance
"	Radiation Protection(2)	"Radiation Protection Provisions", etc.	Ordinance
"	Fuel Handling and Storage Systems(1)	"Fuel Handling and Storage Facilities"	Ordinance
Operation (17)	-	"Operating Organization", etc. "Severe Accident Management"	Ordinance <u>New</u>
Quality Assurance (18)	-	"Organization for Quality Assurance", etc.	Ordinance

( ): Number of Requirements
Ordinance: Regulations on Technical Standards for Nuclear Reactor Facilities, etc.

Table 2. Components and Contents of New Standards

Components	Contents	References
Design Prepared for Decommissioning	facilitate the decommissioning and reducing the residual radioactive materials	TECDOC 801, NS-R-1
Aging	provide appropriate margins taking into account ageing	NS-R-1
Severe Accident	Evaluate and identify the postulated initiating events which cause severe accidents	TECDOC 801, NS-R-1
Severe Accident Management	establish and implement a severe accident management program	INSAG3, GL 88-20

REFERENCES

[1] Nuclear Laws of the Republic of Korea, Korea Institute of Nuclear Safety, 2004.
[2] KINS/GR-174 Development of General Safety Criteria for Korean Next Generation Reactor, KINS, Feb. 1999.
[3] KINS/RR-107 Assessment on Nuclear Safety and Regulatory Technical Requirements, Korea Institute of Nuclear Safety, February 2002.
[4] KINS/ER-030 Vol.5 Development of Technical Standards, Korea Institute of Nuclear Safety, December 2004.
[5] IAEA Safety Requirement NS-R-1 Safety of Nuclear Power Plants:Design, IAEA, 2000.