

A Proposal to Improve Korean Nuclear Energy Legislative System

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1. Introduction

Recently Korea Atomic Energy Research Institute (KAERI) and King Abdullah City for Atomic and Renewable Energy (K.A.CARE) completed successfully the pre-project engineering (PPE) in pursuit of the construction of SMART (System-integrated Modular Advanced Reactor) and training of R&D personnel chosen from Kingdom of Saudi Arabia. As one of results, the preliminary safety analysis report (PSAR) was officially published.

During preparation of the PSAR SMART Units 1&2, one of irritating works for nuclear reactor designers was to trace the publication history of the Korean nuclear energy legislation. Especially, the follow-up of Notices of the Nuclear Safety and Security Commission (NSSC) was very annoying. This is because (1) revision of the Notices of the NSSC happens frequently, (2) numbering of the Notices of the NSSC is not categorized according to main themes or subjects, but given simply in the order of promulgation or enforcement.

This year is 60th anniversary since the nuclear energy legislation has been established in Republic of Korea. It is time to examine critically the current legislative system and to explore ways toward more beneficial and efficient improvement for nuclear reactor designers.

In the present study, characteristic of the Regulations of the NSSC and Notices of the NSSC will be reviewed in terms of "traceability." For the purpose of the comparison, characteristic of US Nuclear Regulatory Commission (NRC) Regulatory Guides (RG) will be investigated in terms of "traceability," too. Finally, a proposal to improve Korean nuclear energy legislative system will be presented for nuclear reactor designers to reduce time and costs for documentation and to promptly cope with suitable and up-to-date nuclear energy regulations.

2. Characteristic of Korean Nuclear Energy Legislation

2.1 Regulations of the NSSC

There are two Regulations of the NSSC: (1) Regulations on Technical Standards for Nuclear Reactor Facilities, Etc. and (2) Regulations on Technical Standards for Radiation Safety Control, Etc. Table 1 shows revision history of them. As shown in the table, numbering of Regulation of the NSSC seems to be

arbitrary, because it is simply given in the order of appearance. Moreover, revision number is not given so that it is not intuitive to find instantly how many times it is revised. The most frustrating problem is that there are many numberings for the same Regulation of the NSSC. Whenever the revision happens, documentation by nuclear reactor designers shall be revised, too.

2.2 Notices of the NSSC

There are 97 Notices of the NSSC and the same criticism applies as previous section: (1) Numbering of Notice of the NSSC seems to be arbitrary, because it is simply given in the order of appearance. (2) Moreover, revision number is not given so that it is not intuitive to find instantly how many times it is revised. (3) There are many numberings for the same Notice of the NSSC. Whenever the revision happens, documentation by nuclear reactor designers shall be revised, too. Table 2 shows revision history of one example Notice of the NSSC.

Table 1. History of Regulations of the NSSC

Title	Promulgation	
	No.	Year
Regulations on Technical Standards for Nuclear Reactor Facilities, Etc. ^[1]	No.22	2019
	No.17	2016
	No.15	2015
	No.13	2014
Regulations on Technical Standards for Radiation Safety Control, Etc. ^[2]	No.3	2011
	No.20	2018
	No.19	2017
	No.18	2016
	No.14	2014
	No.12	2014
	No.4	2011

Table 2. History of an Example Notice of the NSSC

Title	Promulgation	
	No.	Year
Regulation on Safety Classification and Applicable Codes and Standards for Nuclear Reactor Facilities ^[3]	No.2018-6	2018
	No.2017-21	2017
	No.2016-10	2016
	No.2014-15	2014
	No.2012-9	2012
	No.2011-9	2011
	No.2009-37	2009
	No.2008-13	2008

Table 3. Control Numbers in Notice of the NSSC

Division	Effective Control No.	Notices
Reactor	Reactor.03~Reactor.46	34
Radiation	Rad.01~ Rad.23	20
Waste	Waste.02~ Waste.28	21
Dose	Dose.01~ Dose.04	4
License	License.01~ License.09	4
Regulation	Regul.01~ Regul.05	5
Supplement	Suppl.01~ Suppl.11	9
Total		97

Table 4. US NRC Regulatory Guide

Division	Guides
1 Power Reactors	1.1~1.234
2 Research and Test Reactors	2.1~2.6
3 Fuels and Materials Facilities	3.1~3.75
4 Environmental and Siting	4.1~4.25
5 Materials and Plant Protection	5.1~5.88
6 Products	6.1~6.9
7 Transportation	7.1~7.13
8 Occupational Health	8.1~8.40
9 Antitrust and Financial Review	9.1~9.4
10 General	10.1~10.12

Table 5. History of Two Examples of RG

RG	Title	Revision	Year
1.29 ^[4]	Seismic Design Classification	5	2016
		4	2007
		3	1978
		2	1976
		1	1973
		0	1972
1.35 ^[5]	Inservice Inspection of UngROUTED Tendons in Prestressed Concrete Containments	W	2015
		3	1990
		2	1976
		1	1974
		0	1973

Korea Institute of Nuclear Safety (KINS) acknowledged the above problems and introduced "Control Number." Each Notice of the NSSC is categorized into one of 7 Division and unique Control Number is given to identify itself. There are 7 Division: Reactor, Radiation, Waste, Dose, License, Regulation, and Supplement. Control Number consists of title of Division, followed by a dot and 2-digit number. Table 3 shows the current Control Number system. The reason why the last digit of control number in each division is not the same as total number of Notices on the right side of the table is that abolished notices are excluded.

Even though the above system is rational, it is hardly used among nuclear reactor designers. Most of them are not even aware of the existence of Control Number. Control Number is only suggested by KINS and there is no legal basis upon it. In the main text of each Notice, Control Number is never provided.

3. Characteristic of US NRC Regulatory Guide

Each US NRC RG is categorized into one of 10 Division. RG consists of number of Division, followed by a dot and 1 to 3-digit number. Table 4 shows the current US NRC RG system. In this system, unique numbers are given according to subject of the title and numbering is not related to the order of appearance. Revision number is provided, and withdrawn information is also recorded. Table 5 shows history of two examples of RG. As shown in the table, the same numbering is referred regardless of revision number, which is very different from Korean nuclear energy legislative system.

4. A Proposal to Improve Korean Nuclear Energy Legislation

4.1 Korean Technical Standards, KTS

In section 2.1, there are two Regulations on Technical Standards. In the present study, Korean Technical Standards, *KTS* is suggested for Regulations of the NSSC. Regulations of the NSSC No.3/13/15/17/22 can be now referred to *KTS* 1.0 Rev.0/1/2/3/4 and Regulations of the NSSC No.4/12/14/18/19/20 can be now referred to *KTS* 2.0 Rev.0/1/2/3/4/5. Table 6 summarizes this suggestion.

4.2 Korean Regulatory Guides, KRG

In section 2.2, there are 7 types of Control Numbers. In the present study, Korean Regulatory Guides, *KRG* is suggested for Notices of the NSSC. Each Division title is suggested to reduce to 1 to 7 and the followed two digit numbers are suggested to remain the same. For example, Reactor.03 shall be *KRG* 1.03, Rad.05 shall be *KRG* 2.05, Waste.27 shall be *KRG* 3.27, and so on. Table 7 summarizes this suggestion.

4.3 Expected Benefits

By introducing *KTS* and *KRG*, traceability of the regulation is highly improved. It will ease the burden of the regulatory body to control and record the frequent revision of the regulation. It is also beneficial to nuclear reactor designers to reduce time and costs for documentation and to promptly cope with suitable and up-to-date nuclear energy regulations.

5. Conclusions

In this study, characteristic of Korean nuclear energy legislation was briefly reviewed and comparison was made to that of US NRC Regulatory Guide. Finally a couple of suggestions were made to improve the traceability of the Korean regulations.

Table 6. Suggestion of Korean Technical Standards

<i>Regulations of the NSSC</i>		<i>Korean Technical Standards</i>	Rev.
Title	No.		
Regulations on Technical Standards for Nuclear Reactor Facilities, Etc.	No.22	KTS 1.0	4
	No.17		3
	No.15		2
	No.13		1
	No.3		0
Regulations on Technical Standards for Radiation Safety Control, Etc.	No.20	KTS 2.0	5
	No.19		4
	No.18		3
	No.14		2
	No.12		1
	No.4		0

Table 7. Suggestion of Korean Regulatory Guides

<i>Notices of the NSSC</i>	<i>Korean Regulatory Guides</i>
Reactor.03~Reactor.46	KRG 1.03~1.46
Rad.01~ Rad.23	KRG 2.01~2.23
Waste.02~ Waste.28	KRG 3.02~3.28
Dose.01~ Dose.04	KRG 4.01~4.04
License.01~ License.09	KRG 5.01~5.09
Regul.01~ Regul.05	KRG 6.01~6.05
Suppl.01~ Suppl.11	KRG 7.01~7.11

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