

## Status of Nuclear Safety Regulation Education at Universities in Korea

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### 1. Introduction

It has been revealed that one of the main causes after the Fukushima NPP accident, the main cause of the Fukushima NPP accident was the lack of independence of safety regulations and nuclear safety culture. Consequently, it has increased interest in nuclear safety regulations and safety culture increased [1]. In order to raise awareness of nuclear safety regulations, the role of relevant education and training at university education is also instrumental. In Korea, through the 2nd Comprehensive Nuclear Safety Plan (2017-2021), a systematic human resource development project was programmed from the undergraduate level of the university. Accordingly, the Nuclear Safety and Security Commission and the Korea Foundation of Nuclear Safety have initiated the 'Nuclear safety pre-training training reinforcement' project.

In line with this, to improve the awareness of nuclear safety and safety regulation, it is necessary to analyze the status of nuclear safety regulation education at universities. There have been some studies on overall nuclear education, however, analysis solely focusing on nuclear safety regulation is insufficient [2-3]. Therefore, the purpose of this study is to analyze the current state of education related to nuclear safety regulation in universities with nuclear energy-related courses in Korea. To this end, the status of nuclear safety regulation courses at universities in Korea was investigated and the nuclear safety regulation courses were analyzed.

### 2. Status of nuclear safety regulation lectures in Korea

In this section, domestic universities with the nuclear energy course were investigated and the number of courses and characteristics of nuclear safety regulation courses was analyzed.

#### 2.1 Status of nuclear energy-related universities in Korea

It has been counted that as of March 2020, there are a total of 19 universities with nuclear power-related departments in Korea. Amongst them, seven universities have nuclear power major as a department, while 10 universities have nuclear-related courses within other major faculties such as energy engineering, electrical engineering, and mechanical engineering, and two universities have nuclear power major in graduate school level.

#### 2.2 Definition of lectures related to nuclear safety regulation

To analyze the current state of nuclear safety regulation education, it is necessary to define "nuclear safety regulation". To this end, the definitions of nuclear safety regulations by the Nuclear Safety and Security Commission, the Nuclear Safety Act, and U.S. Nuclear Regulatory Commission (NRC) were investigated.

The Nuclear Safety and Security Commission defines nuclear safety regulation as the enforcement of administrative regulations in accordance with laws to protect people and nature from risk factors that may occur when using nuclear energy [4].

The Nuclear Safety Act of the Republic of Korea stipulates the main functions and roles of nuclear safety regulatory agencies as safety review and R&D activities related to approval/permission and designation for construction permit, standard design approval, etc.

U.S. NRC divided nuclear safety regulations into five major areas: (1) Development of regulations and guidelines; (2) Licensing for nuclear facilities; (3) Oversight of facilities to verify compliance with safety requirements; (4) Operational experience assessment; and (5) To support regulatory decision-making, such as research activities and risk assessment.

Considering these, in this study, nuclear safety regulation-related lectures were defined as including keywords such as safety regulation, law, regulation, policy, authorization/permission, nuclear non-proliferation, nuclear security, and safety culture in the lecture name or content.

#### 2.3 The proportion of lectures related in regulation

In this study, as of 2020, the proportion of lectures related to nuclear safety regulation among the lectures offered by 19 domestic universities operating nuclear energy-related undergraduate or graduate universities was investigated.

Figure 1 shows the number of nuclear safety regulation courses at a total of 19 universities. The average number of lectures related to safety regulations was 3.8. On average, the ratio of safety regulation lectures out of all 788 lectures (n=788) was found to be  $9.7 \pm 6.3\%$ . The number of lectures being taught was 12 as the highest and 1 as the lowest. About 8 (42%) of 19 universities have two or less nuclear safety regulation-related lectures. It is shown that universities that have a high number of nuclear safety regulation lectures offer

safety regulation content in current, existing lectures. For example, in a radioactive waste management course, the theory of safety regulation in the context of radioactive waste are taught alongside. It is unnecessary to open a new curriculum when there are Lectures on nuclear safety regulation in the existing curriculum since it is a good way to lay the foundation for students' knowledge of nuclear safety regulation.

As of 2020, the four universities participating in the 'Nuclear safety pre-training training reinforcement' project conducted by the Nuclear Safety and Security Commission offered 8.5 safety regulation lectures on average. Other 15 universities not participating in this project offered 2.6 lectures on average. It was observed that universities participating in the project offered about 3 times more safety regulation lectures than universities not participating in the project. It showed that support for nuclear safety regulation lectures directly increases the number of safety regulation lectures.

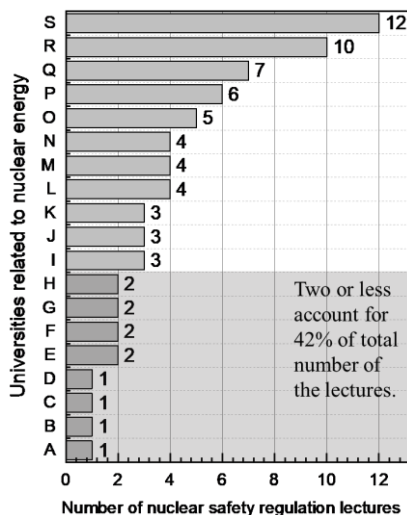


Fig. 1. Number of nuclear safety regulation lectures in university related to nuclear power in Korea

#### 2.4 Analysis of nuclear safety regulation courses

Figure 2 shows the ratio of classes of specific subjects in nuclear safety regulation lectures among the lectures of nuclear power-related universities in Korea. All lectures related to nuclear safety regulation were divided into four fields. The first is nuclear safety regulation, the second is radiation safety regulation, the third is nuclear security and the fourth is nuclear law/policy. The highest number of lectures belonged to the Nuclear safety regulation (49%) and the lowest number of courses on nuclear security was delivered although nuclear non-proliferation and nuclear security are also important parts of nuclear safety regulation. It shows that a small number of schools provide nuclear security-related education. It is observed that nuclear non-proliferation and nuclear security educations are generally carried out in type of vocational training rather than university education.

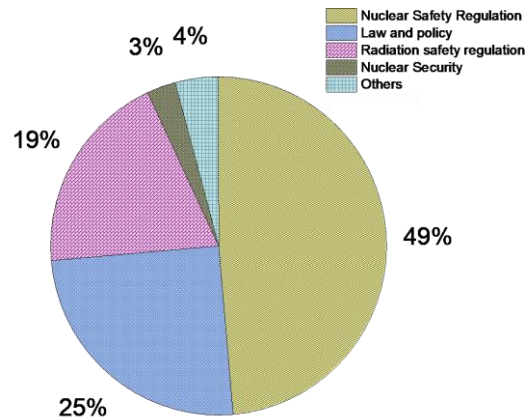


Fig. 2. The Proportion of lectures on nuclear safety regulation at nuclear-related universities in Korea

Currently, it is judged that the lectures centered on promotion of nuclear technology occupy a large part of the nuclear energy-related universities in Korea, and there are relatively few lectures and practice programs pertinent to the nuclear safety regulation. To lay the foundation of knowledge on the nuclear safety regulation and nurture a safety culture, it is necessary to deal with nuclear safety regulation in the existing curriculum and increase the number of specialized nuclear safety regulation courses.

### 3. Conclusions

In this study, the status of nuclear safety regulation education at universities in Korea were investigated and the characteristics of nuclear safety regulation lectures were analyzed. A survey was conducted on 19 domestic nuclear energy-related universities. It shows that the number of courses related to nuclear safety regulation is 3.8, which is  $9.7 \pm 6.3\%$  of the total number of lectures. A characteristic of universities that operate the relatively large number of nuclear safety regulation lectures is that they include nuclear safety regulation content in existing lectures to teach nuclear safety regulation. The proportion of nuclear safety regulation lectures was 49% as the highest, 3% as the lowest. It is judged that this study can be used for research on improvement of nuclear safety regulation education in the future.

### REFERENCES

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