

Preliminary study on improvement plan in nuclear engineering national technical qualification exam based on NCS (National Competency Standard)

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1. Introduction

The National Competency Standard (NCS) is a set of standards that specify the capabilities required to work in an industry by defining the job requirements to perform job-related tasks effectively in specialized industrial fields. This is defined in terms of competence units, competence elements, performance indicators, knowledge, and technical attitude. The Korean government has developed and disseminated the NCS as part of a key national policy for implementing the 2013 'Creating Conditions for a Competent Society' to create conditions suitable for building a society where skills and competences are respected over personal attributes. To achieve this goal, a National Qualification Framework (NQF) is being established for systematically linking specific qualifications with diplomas, education, training, and work experience. However, although an NCS has already been developed in relation to nuclear engineering (including radiation), the development of job training curriculums and qualification processes using this NCS is problematic in the field. Moreover, this NCS was planned and established to accurately reflect the job demands in the field. However, the job analysis and demand survey for the nuclear engineering field and national qualifications were inappropriately reflected; hence, they had to be supplemented.

2. Methods and Results

This study examines the status of NCS development in the field of nuclear engineering (radiation) and its suitability to field applications and national qualifications, and finetunes NCS requirements to establish itself as a framework for the development of human resources in the nuclear engineering industry. The specific methods of performance analysis are as follows:

- Comparative analysis of the current NCS-based college major curriculum and course contents
- Analysis of arrangements, operations, utilization, and improvements in applying the national technical qualification system to unit majors (nuclear energy-related)

- Reviewing the interconnection plan between the nuclear engineering major curriculum and the NCS-based National Technical Qualification system

Accordingly, a draft NCS for jobs related to the current national technical qualification curriculum for nuclear engineering (submission criteria) is designed in this study, to establish a national technical qualification for effective operation in front-line industrial sites. The aim here is to establish a firm foundation for the framework in institutional environments.

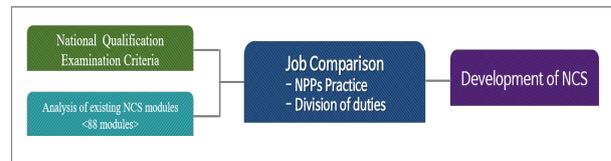


Fig 1. Procedures and methods of research

Currently, the NCS developed for the nuclear engineering field is classified into two sections, two divisions, and four groups, which include 88 units of competency. The NCS in the nuclear engineering field is divided into two major categories: 'Electrical and Electronic' and 'Environment, Energy, and Safety'. Figure 2 shows the results of an NCS review that highlights the problems associated with the national qualification.

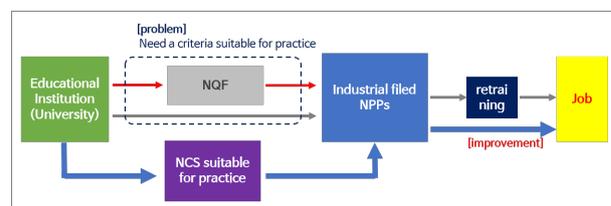


Fig 2. Problems of National Qualification Testing in Nuclear Engineering

The previously developed NCS only focuses on the operation and maintenance of nuclear power plants (NPPs), and does not properly reflect the division of work. The purpose of developing an NCS for the

national qualification (nuclear engineer) in the field of nuclear engineering is to develop a comprehensively trained workforce, which is required at this time before the development of nuclear engineering human resources. Therefore, in this study, NCS functions were developed by considering the level required by the actual job description analysis and FSAR of the nuclear power plant to resolve the mismatch between the national technical qualifications of nuclear engineers and the industrial fields. This study has developed the nuclear fundamental, nuclear fuel, and material works NCS modules for five nuclear engineer NCS jobs.

3. Results

The national technical qualification system in Korea is essentially based on the national technical qualification exam. These examination systems had the drawback that the criteria themselves did not reflect the changes in technology in the field, and were limited to the assessment of simple functional competency factors, which resulted in a significant lack of on-field skills in those who held these qualifications. Taking these into consideration, the Korean government and related agencies are gradually reorganizing and implementing the national technical qualification standards based on NCS. The system of "education-industrial field-qualification" based on the NCS is of great importance in the efficient training and utilization of human resources in the nuclear sector. The Ministry of Employment and Labor (MOE) of Korea announced and promoted the 'National Vocational Capability Standards Quality Management Innovation Plan (2019.4)' to accurately reflect the changes in education and industrial fields and to enhance their practical application. In this study, we propose the following:

First, a basic model (proposal) of NCS based on the national qualification system was developed, based on the NCS development and utilization manual and the existing NCS model. To modify the actual qualification system effectively, which requires a high level of job performance in industrial environments, the proposed national qualification system should predominantly reflect the demands of the industrial fields.

Second, it is considered that additional comments by experts in the relevant fields, as well as their review, consultation, and interviews on each sub-component of the NCS-based National Qualification Criteria (proposal) for establishing the practical fit of the qualification system will be afforded due importance in the development of the NCS.

Third, the concerted efforts of the government as well as other organizations (associations and educational institutions) are required for the effective and efficient development and establishment of the NCS for national technical qualifications. In other words, joint efforts are needed to develop learning modules and data for the NCS, increase the understanding and recognition of

needs, improve applicability in the field, and sustain the will to implement the new system.

Fourth, it is necessary to establish an information system that utilizes national job competency standard development data to effectively develop, apply, and apply the NCS-based national technical qualification processes suitable for the peculiarities of the nuclear engineering field.

Finally, the use of NCS in the national qualification verification system is becoming increasingly popular for activities such as reviewing and expanding the screening criteria. However, to establish this it is necessary to continuously review and improve the stipulations at the national level, including the improvement of learning and evaluation methods in individual majors as well as the reorganization of the NCS-based national technical qualification system.

4. Conclusions

Existing NCS related to nuclear engineering is limited in scope and confines itself to the operation and maintenance of NPPs, such as in the field of the power generation and production (thermal and hydro power plants). Therefore, there is a need for an NCS learning module to resolve the mismatches between theoretical knowledge, national qualification criteria, and job abilities required in industry. The modules developed in this study are meaningful for developing a job-based NCS that can be applied to various fields after the necessary academic qualifications.

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