

Development of Simulator Maintenance Engineer Qualification Program Draft

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1. Introduction

As of 2009, KHNP has currently seven full scope simulators that are used for training of Nuclear Power Plant (NPP) Operators. Well-trained Simulator Maintenance Engineers (SME) are required to support these simulators. These SMEs will maintain and address any issues identified or any changes required for keep up the simulator with their respective plant sites. These issues will be identified as Simulator Discrepancy Reports (DR) or Work Order (WO) by the simulator operation personnel in KHNP.

The simulator maintenance is a very complex. The simulator consists of many areas of process and requires experts in software modeling for different processes such as Neutronics, thermohydraulics, Logics, control, Electrical systems and computer systems as well as hardware subjects such as I&C, I/O, computers, etc. All these areas need experts the subject expertise need to be divided among SME's. In other word the SME's need to be trained for different expertise as well as having different level of SME's.

KHNP has seen the need to outsource the maintenance work for these complex simulators. To have one company concentrating on this work will have many benefits such as:

- Provides proper and well trained experts
- Maintains consistent support personnel
- Maintains the maintenance history for the simulator
- Coordinates and Maintains the knowledge in house
- The simulator maintenance will be consistent

In order to accomplish the goals, KEPCO RI has recognized that there is a need for a program to adequately train and qualify the SME's. KEPCO RI and GSE, which has provided 6 simulators among 7 NPP simulators in Korea, have jointly developed this Simulator Maintenance Engineer Qualification Program (SMEQP). After issue of this plan, KEPCO RI will maintain and modify as needed periodically to meet the goals and purpose of the plan.

2. The Process

KEPCO RI and GSE discussed and define the requirements and the qualifications of Level I, II, and III, SME's as well as the course subjects to be included in the SMEQP.

The following were evaluated in this process:

- The training requirements for each level was discussed and organized.
- The current GSE training outlines for SimSuite Power tool, hardware and software were reviewed and evaluated.

- The outlines were classified into the three levels of training courses for three SME levels.
- The examination were discussed and evaluated for each level that fit into the qualification process. The samples of these exams were prepared.
- Reviewed and finalized all the training materials, and a SMEQP program manual which defines the qualification criteria, course outlines, pre-requisites, and duration, qualification process, and certificate designations.

The process diagram for SMEQP Setup was made in consideration of above items. The reasons for the diagram development is to present the logic behind program establishment and to demonstrate the relationship between inputs and outputs of the program.

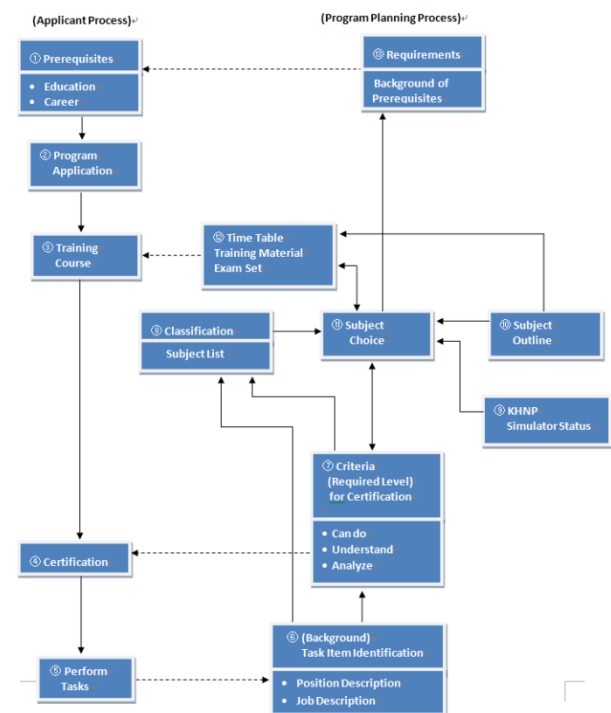


Fig. 1. Process Diagram for SMEQP Setup

2.1 Certification Program

The Certification Program was made for the establishment of engineer certification training program. The duration of program for each level shall be reasonable while not sacrificing the quality of the training. Students shall receive basic information on the subject matter and learn how to apply these skills in maintenance of the simulator.

Training program consists of three levels. Simulator is very complex and requires wide range of maintenance services. These services are consequently

divided into several steps, identifying the required human resources and maintaining proper level of engineers and budget. Appropriate candidates for SME training is selected based on their expertise and level of experience (approximately 2 years between levels).

SMEQP is divided into 2 processes such as applicant process and program planning process as follows.

2.2 Applicant Process

- ① Prerequisites step is to set a minimum requirement for education, experience and expertise for each level.
- ② Program Application step is administrative procedures to apply for participation of applicants to relevant level of the program.
- ③ Training Course step is educational courses which will be conducted according to the Time Table (step 12), using appropriate training materials and evaluated by exam at the end of each course.
- ④ Certification step is to check trainees eligible to obtain the certification of higher qualification level.
- ⑤ Perform Tasks step is to practice learned skills on site. This information is inputs of job description which is the basis for establishing the program.

2.3 Program Planning Process

- ⑥ Task Item Identification step is to define task types for SMEs who are certified at certain level, identifying the type of the simulator-related task such as DR, WO, Design, Test, and Integration.
- ⑦ Criteria for Certification step is the minimum certification criteria which should be defined for each level in order to ensure that every engineer is able to gain adequate knowledge and expertise to perform job duties.
- ⑧ Subject Classification step is to classify the subjects appropriately by considering the required ability of each level and identify the target subjects of the each level. Job description, certification criteria, the difficulty of each subject, essentiality, utilizing frequency are considered at this step.
- ⑨ KHNP Simulator Status step presents the applied status of simulator Operating System (OS), simulation software used for modeling such as Core, NSSS or Instructor Station (IS) on Korean NPP simulator.
- ⑩ Subject Outline step is the training plan of the course prepared by GSE. It includes Objective, Prerequisites, Topic Outline and Duration. Subject outline is used to select the appropriate courses for each level, review the details of the course and assist in writing course training materials in the future.
- ⑪ Subject Choice step is to select courses based on the target and the training period of each level and lecturing hours for each courses. The training period of each level

is determined by taking into consideration number of courses required for each level and number of hours each course will require.

- ⑫ Schedule, Training Outline, Exam Set step is to create schedule, prepare relevant training outlines and exam sets which will be used in program courses. Depending on the nature of the course, training outlines and exam sets may be prepared by instructor. Exam will normally consist of essay questions, Q&A and problems. However, exam format will be subject to change depending on the course and time needed to complete problems (for instance, problems in Core Modeling course are very time consuming to solve, therefore exam for this course will consist of Q&A and essay questions.)
- ⑬ Background of Prerequisites for Applicants in Each Area and Level step to check whether trainees have adequate knowledge to understand the training contents of a particular level, considering required scholarship program and the history of the applicant to have the necessary knowledge drawn from the contents of subject topics on each level, used to determine the prerequisites for the program applicant.

3. Conclusions

As of 2009, KHNP has currently seven full scope simulators that are used for training of NPP Operators. Well-trained Simulator Maintenance Engineers (SME) are required to support these simulators. These SME will maintain and resolve any issues identified or any changes required for keep up the simulator with their respective plant sites. Most of all these engineers' capability to handle simulators should be evaluated and guaranteed based on some standard.

This paper is expected to be a reference for setting up the simulator maintenance engineer qualification program. It can be applied to 6 simulators except one CANDU type simulator. The contents of CANDU type simulator and newly developed simulator (OPR1000) should be added for the future.

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The determination in policy on how to operate the SMEQP in consideration of budget, capacity of facility and etc. as well as the settlement of the plan should be reviewed for application in the future.

REFERENCES

- [1] D. H. Hwang, K. H. Chung, "Simulator Maintenance Engineer Qualification Program", Technical Memo, KEPCO RI, TM.F02.P2010.030, April 28, 2010.