A Feasibility Study of the Development Phase for the Quality Assurance of PSA Software

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1. Introduction

The Korea Atomic Energy Research Institute (KAERI) has been developed the risk assessment software for the Korean specific PSA under a National Nuclear R&D Program. Before development, the status about domestic and international related the multi units risk assessment is reviewed. And the initial phases needed to software development are also reviewed. This paper shows the investigated results of the review results for the Korean specific risk assessment software.

2. Korean Specific PSA Software

The research for the multi units risk assessment and its integrated software development is being processed at KAERI. The development methods for the common reason of fault has been researched, and it has been programmed. In this section, the necessity for the development of a Korean specific risk assessment software and the related circumstances are reviewed.

2.1 Background and Current Status

Through the previous step of Nuclear Research & Development Program, the basic techniques for a multi-unit risk assessment were secured. And partial techniques between units were secured additionally such as analysis methods of common cause.

A multi units PSA project for the Kori site was processing in industries. And projects related multi units risk was also processing in regulatory agency. With these two projects, KAERI was proposed to join these projects. At these projects, the secured techniques will be utilized.

The international technical trends about PSA are described in the report of the IAEA [1]. Especially after the Fukushima accident, the multi units risk assessment was uprisen as an important issue, and the applicable techniques in real doesn't exist all over the world. Including Korea, in major countries, PSA projects related multi units were recently processed, and a development for a related element technologies was accomplished little by little.

IAEA is processing the project for preparation of technical document about the multi units PSA methodologies. But the methodologies can be differ by country, the final result of document is difficult to be as standard guide or standard methodology.

About the standardized guidelines or methodologies for the risk, there is no standard specification. But IAEA is performing the project to create the technical documents of phase 1 PSA methodology.

Most of the intellectual property rights of domestic related risk, KAERI is in possession of the right. A number of programs were implemented for the risk assessment method of multi units, and were developed in KAERI and registered recently [2].

About the standardized guidelines or methodologies for the risk, there is no around the world. And there in no intellectual property rights to disturb the research around the world.

2.2 Scope of Research and Development

About the improvement of the existing quantification software for fault tree [3,4], the algorithm is already improved and developed.

As a subsequent research, the software for the source term conversion is being developed. Related the research, level 3 PSA analysis method reflecting the time attributes of radiation source term are included.

And later, after this year's research, the subsequent research and development will be continued. There are the integrated software development for the multi units risk assessment, software development for the risk safety goal optimal assessment, and software verification and validation for the risk safety goal optimal assessment.

As a development plan, there includes the plaform development of multi units risk model including the post-processing of multi units risk quantification. There includes also the plaform construction of risk model for the risk safety goal assessment. And finally, the optimal assessment software of risk safety goal will be developed.

About the software development process, the 7 phases are defined and should be processed sequentially. The 7 phases are as following.

- Design requirement
- Design
- Implementation
- Consolidation
- Verification test
- Installation/checkout and acceptance test
- Software verification & validation report

The 7 phases are matched the “Quality Assurance” phase for software development, and is in application at KAERI. The relation of the scope and related development phases is shown in Fig. 1.

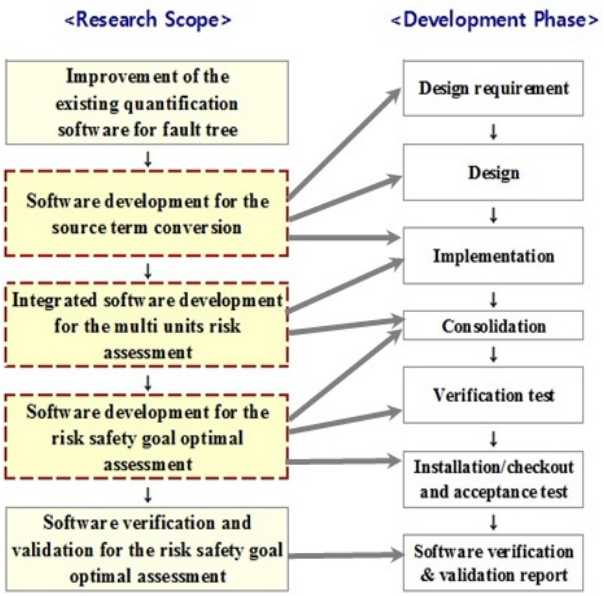

Fig. 1. The relation of the scope and development phases

With the development phases, there are some documents to be created. The documents are classified as its characteristics and checkup phases. The detailed documents are described in Table I. At first phase, the design requirements have been reviewed and the design is being applied according to the design requirements. With these, the descriptions for the requirement definition and its design are in preparation. Within the description, it is included the concept for the software, upgraded function compared the early developed software, detailed function, and etc. These documents can be a foundations for the multi units risk assessment software completed later, and utilized in next development phases.

3. Results and Conclusions

According to this analysis, detailed technical documentation will be specifically described, and the official documents for each step will also be written as a technical report. The s Subsequent documents will be written with software development. This will be a Korean specific multi units risk assessment software, and utilized in nuclear safety.

Table I: Software Development phases and Documents

Step	Development Phase	Documents
A	Design requirement	Requirement definition
B	Design	Design description
C	Implementation	Implementation report or implementation file
D	Consolidation	Consolidation report (If needed)
E	Verification test	Test plan and test results
F	Installation/checkout and acceptance Test	Installation/checkout and acceptance test (plan/results)
G	Software verification & validation report	Verification and validation description

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