Implementation for the Reliability Management System of the Emergency Diesel Generator at the Framatome-type Nuclear Power Plant

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1. Introduction

It is very important to ensure high reliability on an EDG (Emergency Diesel Generator). Because an EDG in a nuclear power plant is an emergency electric power supply facility, the EDG system must be able to get to the degree of the rated frequency and rated voltage within restricted time if a loss of offsite power occurs, and then an emergency electric power can be supplied to the safety-related systems.

Currently, the EDG reliability management system has been developed and applied to the nuclear power plants such as Kori 1,2,3,4 units and Ulchin 3,4 units in order to ensure and monitor the reliability of the emergency electric power supply system. Now, a software program which will be utilized at the Framatome-type Nuclear Power Plant is being developed.

The reliability management system monitors and analyzes EDG reliability periodically and it also performs proper measurement for the maintenance works so that an EDG ensures and preserves a target reliability. So to speak, the reliability management system is a software system which manages and uses all information related to reliability.

2. Reliability management system constitution

This system is composed of the database system and the user interface. The database system integrates the data related to the EDG, and stores and manages the integrated data. User interface is available for the user to input and output data for the analysis.

This system has been developed available on the Intranet so that users login through a Web, and then input and search data, analyze a transition. So, it allows for the user to execute this system conveniently. This system had been classified into three modules on the basis of their functions.

2.1 Reliability data monitor module

The reliability monitor module monitors the EDG reliability. This module is composed of two modules, that is, the reliability data input module and the reliability evaluation module which is divided into the target reliability monitor module and the test period determination module.

The data input module is to input data that is necessary to evaluate and calculate the reliability. The data is containing the information such as whether it is valid or not, whether movement/load is put in EDG or not and whether operation is success or not. This module has been designed to manage information which was added new as well as previous test management register information written out manually.

The reliability evaluation module calculates the number of test failure at the twenty-five valid tests like figure 1 on the basis of data which had been obtained from the reliability data module. On the basis of the evaluation result, the test period will be determined.

[Figure 1] Determine the period of the test in the reliability evaluation

In the target reliability monitor, it evaluates whether the number of failures on the valid test exceed three or four times which were the default value of the trigger. It provides users with measures according to the surplus degree. Also, it makes for user to fulfill the measures so that the target reliability can be reestablished.

2.2 Performance monitor module

This module is composed of the data input module and the performance value analysis module. The data input module input and manages data which can be selected as performance monitor variables in order to evaluate and monitor the performance of the EDG. The Performance variables analysis module graph transitions on change of each variable with data input from the data input module.

[Figure 2] Transitions of performance variables analysis

2.3 System management module

The system management module is composed of user management and authorization, generator/unit management and inspection information management. The user management module includes the security function for the individual user's authority.

The inspection information management module is necessary to monitor the performance of the reliability program on EDG and supports for performance monitoring. In other words, we have made the reliability monitoring module for the effective utilization.

Figure 3 shows the screen of managing each item in the inspection information management module. It can manage the inspection information on the performance monitor module for the group of Diesel Generators individually.

[Figure 3] Inspection variables management

4. Conclusion

In this paper, we have described the result of developing the reliability management system which supports for general data management and reliability monitoring. It can also analyze and monitor the transition of performance changes about Framatome-type EDG.

Currently, this system is managing data about periodical test and operational variables at Ulchin 3,4 and Kori 1,2,3,4 units. In addition, it can be used to enhance the reliability of EDG systems more positively through the performance analysis.

If data about reliability on EDG can be accumulated and this system is used efficiently, it is assured that this system help to do enhance the reliability of the EDG systems at Nuclear Power Plants.

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