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A Comparison between Maintenance Rule and Performance Monitoring for Risk-Informed Decisionmaking

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1. Introduction

The U.S. Nuclear Regulatory Commission (NRC)'s policy statement on probabilistic risk assessment (PRA) encourages greater use of this analysis technique to improve safety decisionmaking and to improve a regulatory efficiency [1]. The NRC staff's Risk-Informed Regulation Implementation Plan describes the activities now under way or planned to expand its use [2].

Based on the NRC's policy statement, several regulatory guidelines about a risk-informed decision making have been published by NRC to provide general guidance concerning approaches that the NRC has determined to be acceptable for analyzing issues associated with proposed changes to a plant's Licensing Basis (LB) and for assessing the impact of such proposed changes on a risk associated with a plant design and operation [3-7].

From Reg. guide 1.174, LB changes are expected to meet a set of key principles in implementing a risk-informed decisionmaking. One of those key principles is that "the impact of the proposed change should be monitored using performance measurement strategies."

Therefore we have studied how to undertake the performance monitoring for a risk-informed decision making. The purpose of this study is to obtain an insight to undertake a performance monitoring for a risk-informed decisionmaking.

2. Performance Monitoring for Risk-informed Decisionmaking & Maintenance Rule

In this study, we have reviewed Reg. guide 1.174, 1.175 and 1.177. Reg. guide 1.174 provides an approach for using PRA in a risk-informed decision making on plant specific changes to the LB. Reg. guide 1.175 and 1.177 are for a Risk-informed Inservice Testing (RI-IST) and Risk-informed Technical Specification (RI-TS) respectively. We also reviewed the Standard Review Plan (SRP) Ch. 19 which identifies the roles and responsibilities of organizations in the NRC that participate in risk-informed reviews of licensees' proposals for changes to the LB of nuclear power plants (NPP) [8].

All of those guidelines suggest the methods to do a performance monitoring. The program should be structured such that (1) SSCs are monitored commensurate with their safety importance, (2) feedback of information and corrective actions is accomplished in a timely manner, and (3) degradation in SSC performance is detected and corrected before a plant safety can be compromised. The staff expects that licensees will integrate, or at least coordinate, their monitoring for risk-informed changes with existing programs for monitoring equipment performance and other operating experience on their site and throughout the industry. In particular, monitoring that is performed in conformance with the Maintenance Rule (MR) can be used when the monitoring performed under the MR is sufficient for the SSCs affected by the risk-informed application. In summary, to do a performance monitoring, they recommend using the existing MR for an efficiency purpose. The MR, however, can be expanded and its performance criteria can be modified for a performance monitoring about a risk-informed decisionmaking.

To provide a mechanism for evaluating the continuing effectiveness of a licensees' maintenance program, the MR was issued by NRC on July 1991[9]. The NRC stated that it believes that the effectiveness of maintenance must be assessed on an ongoing basis in a manner which ensures that the desired result, reasonable assurance that key structures, systems, and components (SSCs) are capable of performing their intended function is consistently achieved [10]. In this study, we compared the characteristics between a performance monitoring for a risk-informed decision making with the MR to obtain an insight on how to monitor a SSC performance for a risk-informed decision making.

Table 1 describes the comparison between the MR and the performance monitoring for a risk-informed decisionmaking. From Table 1, there are several issues to cover the performance monitoring with the MR. The main differences between the performance monitoring for risk-informed decisionmaking and the MR can be categorized into three parts. First, the objectives on two sides are different. One is for maintenance effectiveness and the other is for a validation of a risk-informed decisionmaking. So the main interests are different from each other. Next, the MR uses the failure rate and the out of service (OOS) time from the existing PRA to select the reliability performance criteria (RPC) and the availability performance criteria (APC). RI-IST and RI-TS, however, use the assumed failure rate and the proposed OOS time for a PSA sensitivity analysis. It may require a modification of the performance criteria to reflect the proposed failure rate or OOS time to

adjust the MR for a performance monitoring. Finally, the MR is a continual program while the performance monitoring is completed if it can prove that there is no degradation.

3. Conclusion

The purpose of this paper was to obtain an insight to undertake a performance monitoring for risk-informed decisionmaking. Regulatory guides such as RI-IST and RI-TS state that a monitoring which is performed in conformance with the MR can be used when the monitoring performed under the MR is sufficient for the SSCs affected by a risk-informed application. We performed the comparison between the MR and the performance monitoring for the risk-informed decision making. In the future, this study is scheduled to propose a method to do the performance monitoring for a risk-informed decisionmaking in detail.

REFERENCES

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[9] USNRC, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," 10CFR50.65, July 1991.
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Table 1. MR and Performance Monitoring for Risk-Informed Decisionmaking

	MR	Performance Monitoring for Risk-Informed Decisionmaking
Objective	● To monitor the Effectiveness of Maintenance	● To monitor the SSC performance after risk-informed decisionmaking ● To verify the assumptions in the engineering analysis (PSA)
Main Interest	● MPFF (Maintenance Preventable Functional Failure) ● RMPFF (Repetitive MPFF)	● All kinds of functional failure
Use of PRA	● RPC & APC selection with the existing PSA	● PSA Sensitivity analysis with the assumed parameters (failure rate, OOS time)
Satisfactory performance	● (a)(2) status – Continuous assessment	● Completion of the performance monitoring
Dissatisfactory performance	● (a)(1) status – Corrective Action Plan (CAP) – Goal setting	● Modification of the risk-informed decisionmaking (feedback)
Data	● Previous 3 year plant operation experiences	● Plant operation experiences after the risk-informed decisionmaking