Risk Information Utilization Initiatives of Ikata Nuclear Power Plant Unit-3

Niida Satoshi[a*]
[a]Shikoku Electric Power Co.,Inc., Kagawa, Japan

Abstract: We have been implementing the Risk Informed Decision Making (RIDM) process, which is essential for risk management and based on the "The strategic and action plan for the realization of risk information utilization" (established in February 2018 and revised at 2020 and 2023). The following three examples show concrete RIDM processes in our power plants

① Risk impact assessments have been conducted by Probabilistic Risk Assessment (PRA) as necessary for failure events that occurred at our plants.

② We have been considering measures to improve nuclear safety status based on risk information which is obtained from PRA, and utilizing the information to improve operating procedures, education, and training.

③ For risk management during a scheduled outage , Established a process for senior management to validate the adequacy of risk mitigation measures based on the magnitude of risk.

Keywords: RIDM, PRA,

1. INTRODUCTION

The Ikata nuclear power station is Shikoku Electric Power's only nuclear power station and its most important power source, and even before the accident at Fukushima Daiichi Nuclear Power Station occurred, the plant has been maintained and managed with safety as the top priority.
As part of efforts to improve the safety of the Ikata Power Plant, Probabilistic Risk Assessment (PRA) has been conducted for several times and has been used for risk management of the plant.
Since February 2018, We have been promoting the RIDM process based on the “Strategic and Action Plans for the Implementation of Risk Information Utilization at Nuclear Power Plants ” [1] formulated by nuclear operators in Japan.
Among those implementing the RIDM process are the following items.

a) Determination of nonconformity level and formulation of corrective actions in nonconformity management
When a condition report (CR :Condition Report) is issued concerning equipment failures, etc., the PRA results are used to determine the level of condition affecting quality (CAQ (Condition Adverse to Quality)). In addition, by establishing a process to manage equipment failures, etc. related to PRA using EAM, it also helps to improve the reliability of the equipment failure rate for PRA at the Ikata Power Station.

b) PRA results are used to improve operating procedures and education/training

c) Safety Management during outages
For risk management during a scheduled outage, We has begun using the Shutdown PRA model, and has established a system in which the appropriateness of risk reduction measures is discussed at a meeting, depending on the magnitude of the risk. In addition, the company has disseminated risk management precautions based on PRA results prior to the start of scheduled outage .

2. RIDM Process

2.1 Determination of nonconformity level and formulation of corrective actions in nonconformity management

CR is defined as “a report that describes or suggests conditions that are different from those that should have been, actions or results that deviate from those that should have been taken, problems noticed, or improvements needed” .And CR is issued when a power plant deviates from its normal performance. For issued CR, the PRA is used to determine the level of events that are judged to be CAQs. Those judged to be CAQs proceed to the subsequent flow of corrective action implementation. (Figure 1)
These processes are centrally managed by the EAM (Enterprise Asset Management), which can be checked by anyone involved in the power plant.

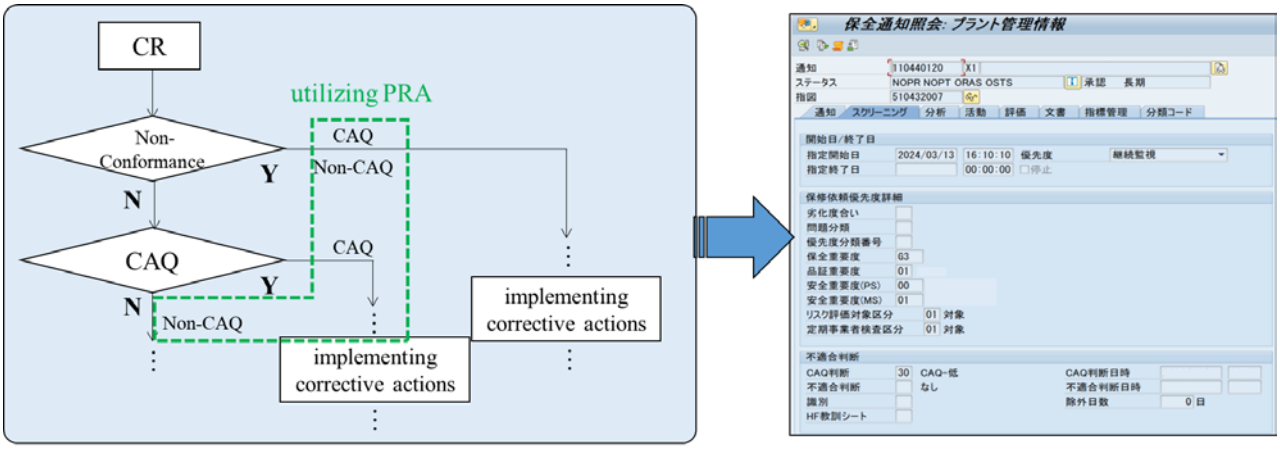


Figure.1 Implementation of corrective actions and component failure judgment by EAM※

※EAM is database that manages information including nonconformity management, security activities, repairs, etc. from action request to action completion.

2.2 Improvement of operating procedures and education/training

The PRA model of the Ikata power plant reflects the latest information on plant design and operation, parameter updates, and PRA model advancement techniques obtained through reviews by international experts on a regular basis for use in RIDM. The analysis results obtained from the latest PRA model are used to improve operational procedures and to provide education for power plant personnel. Examples are shown in Table.1. [3]

Table.1 Examples of Improvements

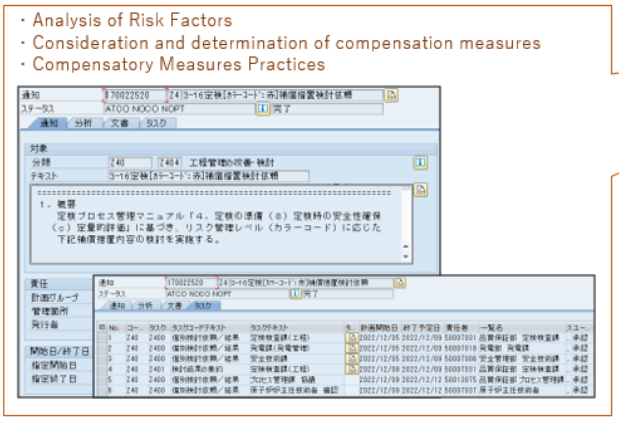
No.	classification	Additional measures	Expected effect	Events
1	RIDM	Utilization in developing education and training programs for operators and emergency response personnel	It can raise the awareness of operators and emergency response personnel and improve their ability to respond to accidents.	L1PRA L2PRA
2	Equipment measures/ Operational measures	Improved reliability of feed-and-bleed operations in primary cooling systems	Regarding feed-and-bleed, which is effective even in scenarios that lead to containment isolation failure, reliability can be expected to improve by establishing procedures for operating multiple operating methods and ensuring operational diversity.	L2PRA
3		Enhanced monitoring of residual heat removal pump RWST return valve closed status during patrol inspections	This prevents forgetting to close the return line valve from the residual heat removal pump to the fuel exchange water tank, which is an important risk factor.	L2PRA

2.3 Safety Management during periodic inspections

During periodic inspections, parameters such as reactor coolant inventory (water level), temperature, and pressure change, and the available mitigation equipment is limited because many pieces of equipment are subject to inspection in a short period of time. Therefore, the magnitude of risk changes from moment to moment. We uses PRA (CDF as a risk management indicator) to manage safety from the manufacturing formulation stage to the inspection implementation stage. (Figure.2)

First, risk management levels are established, and compensation measures are considered according to the respective management levels. In the process formulation stage, the process manager and risk assessor discuss to formulate a process that reduces the control level as much as possible. The risk assessor examines the compensation measures for the process established through this process according to the control level, and the relevant sections at the site put them into practice.

Color	compensation measures
Red	Not tolerated (tolerated if compensating measures for risk reduction are taken after deliberation and confirmation by a meeting attended by management)
Orange	In addition to the measures in the "yellow" area, the results of the study on reducing the duration will be discussed and confirmed by a meeting body attended by the executives of the Ikata Power Plant before implementation.
Yellow	The minimum risk status of various processes in the relevant section to the extent reasonably possible, and compensation measures for risk reduction, will be discussed and confirmed by a meeting body attended by senior executives of the Ikata Power Plant.
green	No special measures are required. However, when entering this area from the "yellow" area or above as a result of process adjustments or other reduction measures, measures shall be implemented to maintain those measures.



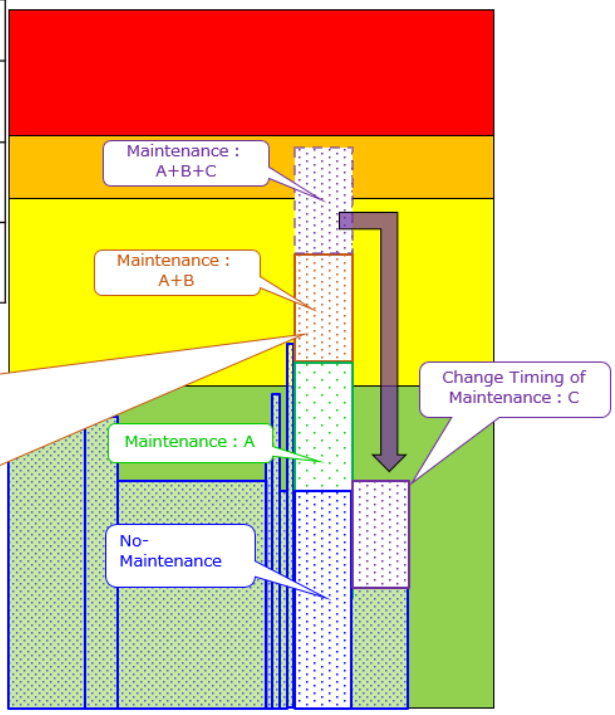


Figure.2 Safety Management Flow

3. Conclusion

We have introduced some of the RIDM processes that have been implemented at the Ikata Nuclear Power Plant. We intend to continue to expanding the scope of application of the RIDM to improve safety in the future.

Reference

[1] **https://www.fepc.or.jp/about_us/pr/oshirase/1261389_1458.html**(Accessed, May.26, 2024）

[2] **https://criepi.denken.or.jp/hokokusho/pb/reportDetail?reportNoUkCode=NR22006** (Accessed, May.26, 2024）

[3] **https://www.yonden.co.jp/energy/atom/safety/safety_improvement/20231219_assessment.html** (Accessed, May.26,2024）