

Risk-Informed Process for Evaluations

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ABSTRACT

The Nuclear Regulatory Commission (NRC) approved an initiative that utilizes licensee’s previously approved risk-informed initiatives to inform licensing actions. There are several new developments that have come to fruition that makes developing such a risk-informed process for evaluations (RIPE) ripe for the undertaking. Foremost is the expanded use of risk-informed decisionmaking by both the NRC and its licensees through risk-informed applications and other initiatives. This has led to improvements in licensee’s site-specific probabilistic risk assessment (PRA) information. This information can be leveraged to support a streamlined licensing process to disposition regulatory issues. RIPE can be used to defer or eliminate compliance issues with a minimal safety impact using existing regulations. By leveraging current regulations and using risk information to identify low safety significant issues, US licensees can submit plant-specific regulatory actions for those issues that would support a streamlined review by the NRC using existing programs and processes that are consistent with Regulatory Guide 1.174, “An Approach for Using Probabilistic Risk Assessment In Risk-Informed Decisions On Plant-specific Changes to the Licensing Basis” (Agencywide Documents Access and Management System (ADAMS) Accession No. ML100910006).

Key Words: risk-informed, PRA, exemptions, license amendments, regulatory, NRC, RIPE

1 INTRODUCTION

There is substantial variability in the design, siting, and operation of nuclear power plants in the United States (US). This includes variability in various nuclear steam supply system (NSSS) vendors and designs, each with its own architecture and engineering firm and sited at various locations throughout the country (e.g., including both high and low seismicity zones). So, it is reasonable to assume that licensees or the NRC may identify issues on occasion that are not in compliance with the regulations which may be of very low safety significance. Recognizing this reality, the US Nuclear Regulatory Commission (NRC) proposed a Risk-informed Process for Evaluations (RIPE) to leverage plant-specific risk information to inform and streamline licensing requests for these low safety significant issues. The streamline process is available to licensees that have a robust PRA and a robust integrated decisionmaking panel (IDP). Both attributes are critical to ensuring the elements of risk-informed decisionmaking are supported, maintained, and routinely exercised by the licensee. This is demonstrated by a licensee that has an approved Technical Specification Task Force (TSTF) Traveler 505, “Risk Initiative 4b - Risk Informed Completion Times,” application [1] and a robust IDP, as demonstrated by an approved Title 10 of the Code of Federal Regulations (10 CFR) 50.69, “Risk-informed Categorization and Treatment of Systems, Structures and Components of Nuclear Power Plants,” [2] application or equivalent IDP. TSTF-505 or Risk Informed Completion Times uses a PRA to calculate plan-specific equipment allowed outage times for use in a licensee’s Technical Specifications. This initiative relies on a PRA of sufficient scope and quality which gives the NRC confidence in risk insights that may be obtained from that PRA. 10 CFR 50.69 is an engineering process that allows licensees to recategorize safety-related equipment using risk insights and

an IDP. The 50.69 IDP or equivalent IDP uses an NRC-approved and inspected process to evaluate deterministic and engineering attributes of the components to help inform the final categorization.

With this initiative, the safety of the nuclear fleet is further advanced by focusing the staff's and the licensee's time, attention, and resources on the issues of greater safety significance at each plant – i.e. addressing the most safety significant issues. RIPE aims to improve the overall safety of a site and the nuclear fleet, while providing an incentive to further developing and using PRA. A discussion of this effort and its status will be demonstrated in this paper.

2 BACKGROUND

Licensees and the NRC routinely identify cases where a licensee is not in compliance with the licensing basis of the plant. Licensees must then bring their facility back to compliance by addressing the identified non-compliance, either by correcting the issue or changing the licensing basis via license amendment requests, relief requests, or exemptions. However, some of these issues are of very low safety significance and the corrective actions could result in licensee and NRC resources being diverted from more safety significant issues. RIPE can be used to disposition these very low safety significant issues using existing regulations under Title 10 CFR 50.12, “Specific Exemptions,” [3] and 10 CFR 50.90, “Application for amendment of license, construction permit, or early site permit” [4]. RIPE combines a robust method to support the safety impact categorization of an issue with an NRC streamlined review process that would be commensurate with the safety significance of the issue.

Staff leveraged prior work to develop a safety impact categorization process that was demonstrated to be effective and utilized risk-informed key principles to support decisionmaking. In 2015, in the staff requirements memorandum to COMGEA-12-0001/COMWDM-12-0002 [5], the NRC's Commission directed the NRC staff to develop options for operating power reactors on “allowing licensees to propose to the NRC a prioritization of the implementation of regulatory actions as an integrated set and in a way that reflects their risk significance on a plant-specific basis.” In response to that direction, the NRC held several public meetings and industry proposed guidance on an approach to prioritize and schedule regulatory actions on a plant-specific basis. Specifically, the Nuclear Energy Institute (NEI) proposed NEI 14-10, “Guidelines for Prioritization and Scheduling Implementation” [6]. The NRC worked with industry to coordinate six demonstration pilots where licensees would use the process to prioritize several different regulatory actions. The purpose of these demonstration pilots was to evaluate how licensees could use an industry process to prioritize regulatory issues on a generic and plant-specific basis. Overall, the pilots illustrated that the process developed by NEI was effective in applying objective decisionmaking attributes to prioritize both regulatory activities and licensee initiatives on a generic and plant-specific basis. The IDP, a key aspect of the process, used rational methods that were articulated clearly in the draft NEI guidance to assess insights from PRA methods with other attributes of risk-informed decisionmaking, such as defense-in-depth and safety margins. The pilots simulated how an actual IDP would work in a plant environment. The IDP participants shared their different areas of expertise and asked challenging questions. They considered both the positive and adverse effects of the proposed issues in their deliberations. The IDPs used available risk information, such as insights from the site-specific PRA models, to facilitate risk-informing the process. Those results and NRC observations were documented in separate reports by industry and NRC [7,8].

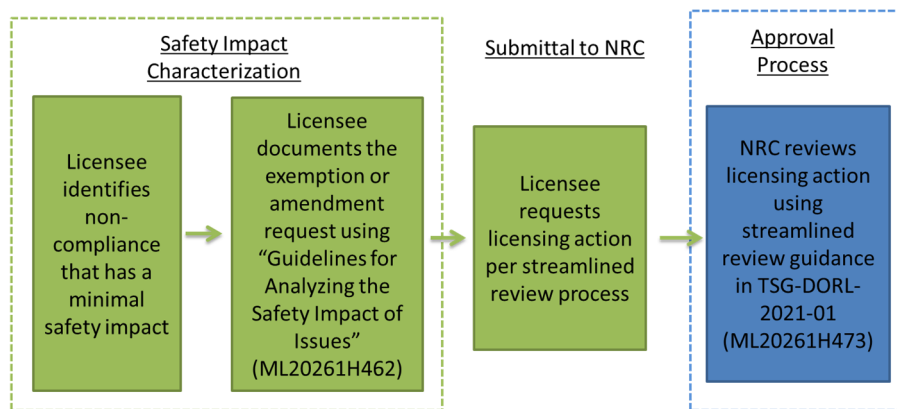
NRC staff observed the benefits of the above NEI process and modified the guidance to support safety impact categorization of issues for use in RIPE.

3 GUIDANCE OVERVIEW

RIPE uses the modified safety impact characterization guidance discussed above and an IDP to assess the significance of issues, using both quantitative and qualitative risk insights. Once the plant-specific assessment is completed, the licensee would then submit the supporting information from the IDP to the NRC for review. If specific criteria are met and the issue is appropriately characterized as very low risk, the NRC staff would complete a streamlined review of the submittal. The licensing action would use a standard template to facilitate the review and the licensee would have to provide enough information to identify the requirement they are requesting relief from and any risk mitigation actions that were put in place to ensure the public health and safety are maintained. NRC staff would then review the submittal and approve or disapprove the request. The guidance was issued and approved for use in January 2021 [9]. Figure 1 and 2 below illustrates the major parts of the process and how the process would be implemented by the NRC staff respectively.



Figure 1. Risk-informed Process for Evaluations



NRC Actions

Licensee Actions

Figure 2. Implementation of the Risk-informed Process for Exemptions

3.1 Licensee Process Implementation

As discussed above, RIPE would be available to licensees that have a robust PRA and a robust integrated decisionmaking panel demonstrated by prior NRC approval of TSTF-505 and 10 CFR 50.69 applications or equivalent. The licensees would be able to use the safety impact categorization process to determine if the issue is of very low safety significance. As part of those deliberations, the IDP would evaluate any risk management actions that would be appropriate and commensurate with the risk significance of the issue. The licensee would also track the cumulative impact of the requested licensing action consistent with RG 1.174 [10]. Once the IDP is completed with their evaluation, the licensee would document their results and use them as supporting documentation for their licensing request. Figure 3 illustrates the various steps the licensee would take as part of the safety impact categorization process. That would then inform the NRC review and approval process.

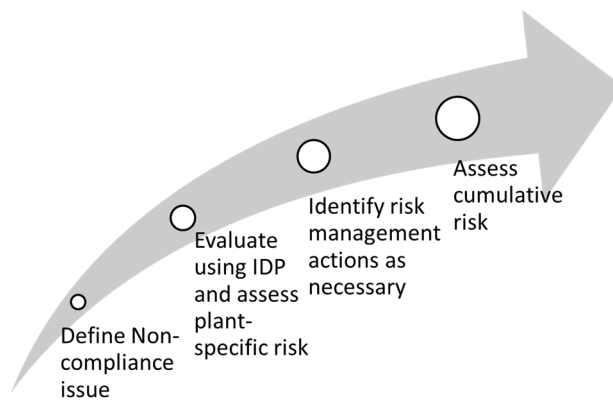


Figure 3. Licensee Actions under RIPE

3.2 NRC Process Implementation

Once the licensee submits a request using the RIPE process, NRC staff would conduct the review and approval meeting all requirements under 10 CFR 50.12 or 50.90. However, the key difference under the RIPE process is leveraging the risk-informed information provided by the licensee to conduct a review commensurate with the safety significance of the issue. The licensee would use the safety impact characterization guidance to determine the significance of the issue which would then be used to inform the resource allocation and level of NRC review. NRC internal guidance documents were developed to ensure staff have the appropriate guidance to conduct their reviews in an efficient, open, and reliable manner consistent with NRC's Principles of Good Regulation [11] using the streamlined review process [12].

3.3 Potential Benefits

The NRC routinely approves requested licensing actions; using the RIPE process would enable a more efficient review of those requests commensurate with their safety significance.

There are three major benefits of this process enhancement:

- Disposition low safety compliance issues in an efficient and predictable manner
- Focus licensee resources on the most safety significant issues
- Incentivize the further development and use of PRA and risk-informed applications

The last point is a key benefit. Incentivizing the adoption of more risk-informed initiatives increases a licensee's capability to assess their unique vulnerabilities to be able to support risk-informed decisionmaking. In doing so, the additional knowledge and risk insights reduces the uncertainties and enhances the state-of-knowledge and practice in PRA. Providing this benefit focuses staff and licensee resources on the most safety significant issues, enhances the PRA capability of the fleet, and supports resolution of very low safety significant issues commensurate with their safety significance.

4 FUTURE WORK

Once RIPE is used and exercised in streamlining evaluations, NRC staff and other interested parties would become familiar with the details of the process and begin to gain confidence that the issues being dispositioned are applicable and of very low safety significance. With this confidence and acceptance, RIPE could then be expanded to include other risk information that would still fit within the construct of the process. For example, in the areas of security and emergency preparedness and expanding the options for using RIPE with other risk-informed initiatives such as TSTF-425 "Surveillance Frequency Control Program" [13]. Those risk insights would use the same safety impact categorization process to support other streamlined reviews.

5 CONCLUSIONS

Recognizing the diverse nature of the US nuclear fleet and leveraging the work done on previous risk-informed initiatives, RIPE represents an efficient and predictable process to disposition very low safety significant issues. Relying on existing regulations and promoting the use of risk insights to inform NRC's regulatory decisions is consistent with NRC's Principles of Good Regulation and the NRC Commission's PRA Policy Statement [14]. The PRA Policy Statement states, in part, "The use of PRA technology should be increased in all regulatory matters to the extent supported by the state of the art in PRA methods and data, and in a manner that complements the NRC's deterministic approach and supports the NRC's traditional defense-in-depth philosophy." RIPE is another step forward in these efforts to leverage both risk insights and key engineering principles to support risk-informed decisionmaking.

6 ACKNOWLEDGMENTS

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7 REFERENCES

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