



NUCLEAR ENERGY INSTITUTE

Use of Risk Insights to support 10 CFR 50.59 Evaluations

Industry Team Update

NRC PUBLIC MEETING
August 5, 2020



PURPOSE

- Share ideas with the NRC working team that are being considered to address the areas that were identified for opportunities to improve or clarify industry 50.59 guidance
 - Focus Area 1 - Clarifying the use of “more than minimal” as it pertains to 10 CFR 50.59
 - Focus Area 2 - Clarifying the application of GDC language contained within NEI 96-07, rev. 1
 - Focus Area 3 - Clarifying application of methods of evaluations (MOE)
- **Today’s discussion will focus on Focus Areas 1 & 2**

PROBLEM STATEMENT

NEI 96-07 rev. 1 may include self imposed limitations on the ability to fully utilize the provisions allowed by 10 CFR 50.59

PROBLEM STATEMENT

- From the 1999 50.59 Final Rule SOCs (Oct. 4, 1999)

Guidance for Frequency of Accidents

“First, the Commission had noted that the current guidance in NEI 96-07 stating: “Where a change in probability is so small or the uncertainties in determining whether a change in probability has occurred are such that it cannot be reasonably concluded that the probability has actually changed (i.e. there is no clear trend towards increasing the probability), the change need not be considered an increase in probability” satisfies the proposed NRC standard for increases in frequency of an accident. Commenters agreed with the characterization that this guidance would satisfy the rule, but also noted that the rule language provides more flexibility than is presently afforded by the NEI guidance.”

PROBLEM STATEMENT

- From the 1999 50.59 Final Rule SOCs (Oct. 4, 1999)

Guidance for Likelihood of Occurrence of Malfunction

*“First, the Commission noted that the existing guidance in NEI 96-07 “Where a change in probability is so small or the uncertainties in determining whether a change in probability has occurred are such that it cannot be reasonably concluded that the probability has actually changed (i.e. there is no clear trend towards increasing the probability), the change need not be considered an increase in probability.” Continued use of this guidance for a determination of whether criterion (i) has been met is satisfactory. Commenters agreed with this guidance, but also believe **that this does not represent the outer bound of what would be acceptable to meet the rule.** The Commission agrees with this comment.”*

FOCUS AREA # 1

Clarifying the use of “more than minimal”
as it pertains to 10 CFR 50.59

FOCUS AREA # 1

- Clarifying the use of “more than minimal” as it pertains to 10 CFR 50.59

(c)(2) A licensee shall obtain a license amendment pursuant to Sec. 50.90 prior to implementing a proposed change, test, or experiment if the change, test, or experiment would:

- (i) Result in more than a minimal increase in the frequency of occurrence of an accident previously evaluated in the final safety analysis report (as updated);
- (ii) Result in more than a minimal increase in the likelihood of occurrence of a malfunction of a structure, system, or component (SSC) important to safety previously evaluated in the final safety analysis report (as updated);

FOCUS AREA # 1

- Clarifying the use of “more than minimal” as it pertains to 10 CFR 50.59

(c)(2) A licensee shall obtain a license amendment pursuant to Sec. 50.90 prior to implementing a proposed change, test, or experiment if the change, test, or experiment would:

(iii) Result in more than a minimal increase in the consequences of an accident previously evaluated in the final safety analysis report (as updated);

(iv) Result in more than a minimal increase in the consequences of a malfunction of an SSC important to safety previously evaluated in the final safety analysis report (as updated);

FOCUS AREA # 1

- Clarifying the use of “more than minimal” as it pertains to 10 CFR 50.59
 - ◆ There appears to be opportunities to provide clarification on how to apply risk insights in support of criterion 1 & 2
 - ◆ There doesn't appear to be any immediate opportunities to provide clarification on the use of risk insights in support of criterion 3 & 4

The scope of Focus Area #1 will be limited to criterion 1 & 2

- 4.3.1 Does the activity result in a more than minimal increase in the frequency of occurrence of an accident?

Qualitative assessment of frequency (PWR examples)

- Normal ops
- Incidents of moderate frequency
- Infrequent incidents
- Limiting faults

A change from one frequency category to a more frequent category is clearly an example of a change that results in more than a minimal increase...

- 4.3.1 Does the activity result in a more than minimal increase in the frequency of occurrence of an accident?

Changes within a frequency category could also result in more than a minimal increase in the frequency of occurrence of an accident. Normally, the determination of a frequency increase is based upon a qualitative assessment using engineering evaluations consistent with the UFSAR analysis assumptions. However, a plant-specific accident frequency calculation or PRA may be used to evaluate a proposed activity in a quantitative sense. It should be emphasized that PRAs are just one of the tools for evaluating the effect of proposed activities, and their use is not required to perform 10 CFR 50.59 evaluations.

- 4.3.1 Does the activity result in a more than minimal increase in the frequency of occurrence of an accident?

Reasonable engineering practices, engineering judgment and PRA techniques, as appropriate, should be used in determining whether the frequency of occurrence of an accident would more than minimally increase as a result of implementing a proposed activity. A large body of knowledge has been developed in the area of accident frequency and risk significant sequences through plant-specific and generic studies. This knowledge, where applicable, should be used in determining what constitutes more than a minimal increase in the frequency of occurrence of an accident previously evaluated in the UFSAR.

- 4.3.2 Does the activity result in a more than minimal increase in the likelihood of occurrence of a malfunction of an SSC important to safety?

Qualitative engineering judgment and/or an industry precedent is typically used to determine if there is more than a minimal increase in the likelihood of occurrence of a malfunction. An appropriate calculation can be used to demonstrate the change in likelihood in a quantitative sense, if available and practical. The effect of a proposed activity on the likelihood of malfunction must be discernable and attributable to the proposed activity in order to exceed the more than minimal increase standard.

- 4.3.3 Does the Activity Result in More Than a Minimal Increase in the Consequences of an Accident?

The evaluation should determine the dose that would likely result from accidents associated with the proposed activity. If a proposed activity would result in more than a minimal increase in dose from the existing calculated dose for any accident, then the activity would require prior NRC approval. Where a change in consequences is so small or the uncertainties in determining whether a change in consequences has occurred are such that it cannot be reasonably concluded that the consequences have actually changed (i.e., there is no clear trend toward increasing the consequences), the change need not be considered an increase in consequences.

- 4.3.3 Does the Activity Result in More Than a Minimal Increase in the Consequences of an Accident?

An increase in consequences from a proposed activity is defined to be no more than minimal if the increase (1) is less than or equal to 10 percent of the difference between the current calculated dose value and the regulatory guideline value (10 CFR 100 or GDC 19, as applicable), and (2) the increased dose does not exceed the current SRP guideline value for the particular design basis event. The current calculated dose values are those documented in the most up-to-date analyses of record. This approach establishes the current SRP guideline values as a basis for minimal increases for all facilities, not just those that were specifically licensed against those guidelines.

- 4.3.3 Does the Activity Result in More Than a Minimal Increase in the Consequences of an Accident?

For some licensees the current calculated dose consequences may already be in excess of the SRP guidelines for some events. In such cases, minimal increase is defined as less than or equal to 0.1 rem.

- 4.3.4 Does the Activity Result in More Than a Minimal Increase in the Consequences of a Malfunction?

In determining if there is more than a minimal increase in consequences, the first step is to determine which malfunctions evaluated in the UFSAR have their radiological consequences affected as a result of the proposed activity. The next step is to determine if the proposed activity does, in fact, increase the radiological consequences and, if so, are they more than minimally increased. The guidance for determining whether a proposed activity results in more than a minimal increase in the consequences of a malfunction is the same as that for accidents. Refer to Section 4.3.3.

FOCUS AREA # 1

- Clarifying the use of “more than minimal” as it pertains to 10 CFR 50.59
 - ◆ There appears to be opportunities to provide clarification on how to apply risk insights in support of criterion 1 & 2
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The scope of Focus Area #1 will be limited to criterion 1 & 2

FOCUS AREA # 1

Approach

- In support of criterion 1 & 2, utilize PRA techniques to establish quantitative calculations to demonstrate that a change is “not more than minimal”
 - Criterion 1 – only vary accident initiation rate
 - Criterion 2 – only vary SSC reliability

FOCUS AREA # 1

Approach

- The output of this calculation will be based on an indicator more directly linked to overall plant safety such as;
 - Change in core damage frequency shown to be “not more than minimal”
 - Other criteria based upon risk insights and shown to be “not more than minimal”
 - Negligible change in accident initiation rate or SSC reliability

FOCUS AREA # 1

Benefits

- Uses PRA and risk insights (i.e. safety focused) but remains deterministic by limiting the assessment to variations in accident initiation frequency (criterion #1) and SSC reliability (criterion #2). This would include the selection of final acceptance criteria
 - These variations will not be offset by any changes in mitigative capability in an effort to manage overall risk
- Simplifies evaluations thus improving overall efficiency & consistency in application
- Easily inspectable

FOCUS AREA # 1

Challenges

- 1999 SOC- references that RG 1.174 was for the NRC use in reviewing and approving changes to the licensing basis, not for changes being made under 50.59. Use of PRA in 50.59 may need fundamental changes to the rule to provide a coherent set of requirements based on the scope of 50.59 and RG 1.174
- *However, the commission acknowledged that it may be possible to develop more guidance that could be used in a quantitative sense to judge minimal increases*

FOCUS AREA # 1

Strategy

- Engaged members of the industry 50.59 community for considerations
- Engaged with members of the industry PRA community for insights and considerations
- Continue to develop approaches on application
- Identify examples that fully exercise approaches
- Consider other approaches not yet identified

FOCUS AREA # 1

Summary

- NEI 96-07 rev. 1 Section 4.3.1 & 4.3.2 already allows for use of PRA techniques and calculational methods for quantitative approaches to determine if a change has a more than minimal increase
- There are methods that can be used that do not conflict with the 1999 SOC

FOCUS AREA # 2

Clarifying the application of GDC language
contained within NEI 96-07, rev. 1

FOCUS AREA # 2

- Clarifying the application of GDC language contained within NEI 96-07, rev. 1
 - Section 4.3.1 - Although this criterion allows minimal increases, licensees must still meet applicable regulatory requirements and other acceptance criteria to which they are committed (such as contained in regulatory guides and nationally recognized industry consensus standards, e.g., the ASME B&PV Code and IEEE standards). Further, departures from the design, fabrication, construction, testing and performance standards as outlined in the General Design Criteria (Appendix A to Part 50) are not compatible with a “no more than minimal increase” standard.

FOCUS AREA # 2

- Clarifying the application of GDC language contained within NEI 96-07, rev. 1
 - Section 4.3.2 - Although this criterion allows minimal increases, licensees must still meet applicable regulatory requirements and other acceptance criteria to which they are committed (such as contained in regulatory guides and nationally recognized industry consensus standards, e.g., the ASME B&PV Code and IEEE standards). Further, departures from the design, fabrication, construction, testing and performance standards as outlined in the General Design Criteria (Appendix A to Part 50) are not compatible with a “no more than minimal increase” standard.

FOCUS AREA # 2

- Clarifying the application of GDC language contained within NEI 96-07, rev. 1
 - From the 1999 SOC- *Although the final rule allows minimal increases, licensees still must meet applicable regulatory limits and other acceptance criteria to which they are committed (such as are contained in Regulatory Guides and nationally recognized industry consensus standards, e.g., the ASME B&PV Code and IEEE Standards). Further, departures from the design, fabrication, construction, testing, and performance requirements as outlined in the General Design Criteria (appendix A to part 50) are not compatible with a "no more than minimal increase" standard. Because the "no more than minimal" standard allows for there to be some increase compared to the current requirement, which would have required any increase to be submitted for prior staff review.*

FOCUS AREA # 2

- Clarifying the application of GDC language contained within NEI 96-07, rev. 1
 - The General Design Criteria are part of the license application process embodied in 10 CFR 50.34(a)(3)(i). That regulation states the purpose of the General Design Criteria:
 - The principal design criteria for the facility Appendix A, General Design Criteria for Nuclear Power Plants, establishes minimum requirements for the principal design criteria for watercooled nuclear power plants similar in design and location to plants for which construction permits have previously been issued by the Commission and provides guidance to applicants for construction permits in establishing principal design criteria for other types of nuclear power units.

FOCUS AREA # 2

- Clarifying the application of GDC language contained within NEI 96-07, rev. 1
 - PRA tools may be appropriately used to justify acceptance of proposed changes while remaining consistent with the GDCs
 - Some GDCs have absolute requirements (e.g. GDC-19) whereas others have flexibility in their requirements (e.g. “designed with appropriate margin,” “appropriate controls,” “high probability”)

FOCUS AREA # 2

■ Example #1

- GDC-2 discusses the design basis for the specified SSCs shall reflect “the importance of the safety functions to be performed”
 - ◆ Risk values may be appropriate to quantify the importance of the safety functions to be performed
 - ◆ This approach is consistent with the Vogtle TRME SE, which states: “Based on its review of the submittals and supplements, the NRC staff finds that the proposed change continues to meet the regulations because the design basis for the SSCs impacted by the proposed change will reflect the importance of the safety functions to be performed by those SSCs in accordance with the GDC, and, therefore, there is reasonable assurance that, subsequent to the proposed change, necessary safety related SSCs will continue to be available to perform their safety functions, as reflected in UFSAR Section 3.5, during and following a tornado event at VEGP Units 1 and 2.”

FOCUS AREA # 2

- Example #2
 - GDC-19 requires personnel to receive radiation exposure less than 5 rem whole body for the duration of the accident
 - ◆ Risk values would not be appropriate to show that this GDC is met

FOCUS AREA # 2

Summary

- PRA tools may be appropriately used to justify acceptance of proposed changes while remaining consistent with the GDCs
- This may not be the case for some GDCs having absolute requirements (e.g. GDC-19)

OVERALL SUMMARY

- Consistent with the 1999 SOC, we have identified areas where we can provide the industry clarification on how to use PRA and quantitative techniques when assessing “more than a minimal” increases for criterion 1 & 2
 - No immediate opportunities identified for criterion 3 & 4
- We see opportunities to clarify NEI 96-07 guidance on how to meet GDC
 - Use of PRA tools to ensure that the intent of certain GDCs are still met
- We look forward to the continuing dialog with the NRC

NEXT STEPS / SCHEDULE

June	Public meeting – kick off/overview of focus areas
August	Public meeting – Staff feedback from June meeting/ NEI present insights from focus area #1 & #2
September	* Public meeting – Staff feedback from Aug meeting/ NEI present insights from focus area #3
October	* Public meeting – Staff feedback from Sept meeting/ discuss proposed products
November	Review/prepare products
December	Prepare products for delivery (e.g., training, industry workshops)

* *potential to combine meetings*