NUCLEAR ENERGY INSTITUTE

Use of Risk Insights to support 10 CFR 50.59 Evaluations

Industry Team Update

NRC PUBLIC MEETING
December 1, 2020

PURPOSE

- To share ideas on improvement opportunities identified with the use of NEI 96-07, rev. 1
- To provide responses to the NRC questions posed during the Oct 8th public meeting
- Discuss current status and next steps

ORIGINAL 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

Three areas identified for improvement opportunities

- 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)

INSIGHTS

- In practice, most changes that occur at a station do not result in any increase either in the frequency of occurrence of an accident (criterion i) or the likelihood of occurrence of a malfunction of an SSC important to safety (criterion ii).
- Of those that do, industry 50.59 users typically limit themselves to the examples contained in NEI 96-07 rev. 1 meant to illustrate and reinforce the guidance.

INSIGHTS

Recall NEI 96-07 Sect. 4.3.1 (criterion i)

"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."

INSIGHTS

NEI 96-07 Sect. 4.3.1 (continued)

"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."

INSIGHTS

Recall NEI 96-07 Sect. 4.3.2 (criterion ii)

“After determining the effect of the proposed activity on the important to safety SSCs, a determination is made of whether the likelihood of a malfunction of the important to safety SSCs has increased more than minimally. 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.”

INSIGHTS

NEI 96-07 Sect. 4.3.2 (continued)

"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."

INSIGHTS

NEI 96-07 Sect. 4.3.2 (continued)

“A proposed activity is considered to have a negligible effect on the likelihood of a malfunction when a change in likelihood is so small or the uncertainties in determining whether a change in likelihood has occurred are such that it cannot be reasonably concluded that the likelihood has actually changed (i.e., there is no clear trend toward increasing the likelihood). A proposed activity that has a negligible effect satisfies the minimal increase standard.”

INSIGHTS

RG 1.187

- Endorses NEI 96-07 rev. 1
  - Clarifies areas contained in sect. 4.3.5 & 4.3.8 (N/A for today's discussion)
  - States that the examples in NEI 96-07 rev. 1 are appropriate for illustrating and reinforcing the guidance but should not be considered a determination that the examples are applicable for all licensees.

APPROACH

NEI working team is taking the following approaches to help clarify industry use and guidance contained in NEI 96-07 rev. 1.

1. Reinforce to industry 50.59 users that they are not limited to the examples provided in NEI 96-07. The examples are used to illustrate and reinforce points contained in each section. Other methods, properly considered and evaluated can be used when conducting an evaluation.
   - This does not conflict with NEI 96-07, RG 1.187, or information contained in the SOC for the 50.59 rule.

APPROACH

NEI working team is taking the following approaches to help clarify guidance contained in NEI 96-07 rev. 1.

2. To address focus area #1, provide other reasonable approaches that licensees can use to determine if a change has a “no more than minimal” increase impact using available risk insights described in the applicable sections.
3. To address focus area #2, reinforce the relationship between the GDC and CLB and considerations when determining the potential impact of a change.

FOCUS AREA 1

50.59 criterion i

NEI 96-07, 4.3.1 – Does the Activity Result in More Than a Minimal Increase in the Frequency of Occurrence of an Accident?

- Example 3 uses a quantitative approach
- *"The change in frequency of occurrence of an accident is calculated to support the evaluation of the proposed activity, and one of the following criteria are met:*
  - *The increase in the pre-change accident or transient frequency does not exceed 10 percent or;*
  - *The resultant frequency of occurrence remains below 1E-6 per year or applicable plant-specific threshold."*

FOCUS AREA 1

50.59 criterion ii

NEI 96-07, 4.3.2 – Does the Activity Result in More Than a Minimal Increase in the Likelihood of Occurrence of a Malfunction of an SSC Important to Safety?

Recall Example 8 for criteria that would be “more than a minimal” increase.

“The change in likelihood of occurrence of a malfunction is calculated in support of the evaluation and increases by more than a factor of two.”

FOCUS AREA 1

Example 8

"*The change in likelihood of occurrence of a malfunction is calculated in support of the evaluation and increases by more than a factor of two.*

Note: The factor of two should be applied at the component level.

Certain changes that satisfy the factor of two limit on increasing likelihood of occurrence of malfunction may meet one of the other criteria for requiring prior NRC approval, e.g., exceed the minimal increase standard for accident/transient frequency under criterion 10 CFR 50.59(c)(2)(i). For example, a change that increases the likelihood of malfunction of an emergency diesel generator by a factor of two may cause more than a 10% increase in the frequency of station blackout."

FOCUS AREA 1

NEI 96-07 Sect. 4.3.2

"The term "malfunction of an SSC important to safety" refers to the failure of SSCs to perform their intended design functions…After determining the effect of the proposed activity on the important to safety SSCs, a determination is made of whether the likelihood of a malfunction of the important to safety SSCs has increased more than minimally...The effect of a proposed activity on the likelihood of malfunction must be discernable and attributable to the proposed activity… A proposed activity is considered to have a negligible effect on the likelihood of a malfunction when a change in likelihood is so small or the uncertainties in determining whether a change in likelihood has occurred are such that it cannot be reasonably concluded that the likelihood has actually changed…A proposed activity that has a negligible effect satisfies the minimal increase standard."

FOCUS AREA 1

Potential Approach #1 (assesses criterion ii)

- Assessing system functional level impact
  - Quantitative approach that calculates the likelihood of occurrence of a malfunction at the system functional level associated with the design bases function
    - If specific criteria are met, the impact of the change would be negligible (i.e., no more than minimal)

We are currently working through this approach to determine how to best apply it using appropriate criteria

FOCUS AREA 1

Potential Approach # 2 (assesses criterion i & ii)

- Use of PRA techniques to help inform if a change has “no more than a minimal” increase either in the frequency of occurrence of an accident (criterion i) or the likelihood of occurrence of a malfunction of an SSC important to safety (criterion ii).
  - *Assessment limited to variations in accident initiation frequency (criterion i) or SSC reliability (criterion ii)*

FOCUS AREA 1

Potential Approach # 2 (assesses criterion i & ii)

- Ground Rules
  - Does not conflict with 1999 SOC or require further rulemaking
  - Insights from risk evaluations could be used to judge “minimal” increases
  - RG 1.174 risk thresholds should not be used as the basis for the 50.59 evaluation

FOCUS AREA 1

Potential Approach # 2 (assesses criterion i & ii)

- Application
  - Limited to application of criterion i & ii independently
  - Use of station PRA (e.g., internal events model)
  - Approach continues to be deterministic

Continuing discussions between the NEI 50.59 working team and PRA community on potential paths.

Responses to NRC Questions from the Oct 8th Public Meeting

NRC QUESTIONS

Focus Area #1 “More than Minimal” (Page 7)

- What is meant by “Other criteria based upon risk insights…”?
  - As described earlier
    - System functional level impact assessment (criterion ii)
    - PRA techniques limited to variations in accident initiation frequency (criterion i) or SSC reliability (criterion ii)

NRC QUESTIONS

Focus Area #2 “GDC language” (page 8)

- How would the use of PRA tools [techniques] ensure continued alignment with the licensing bases?
  - Use of PRA would only inform the determination if a change has a “more than minimal” impact (criterion i & ii). The evaluation of the proposed change would still need to ensure that regulatory requirements described in the CLB continue to be met.
- What criteria would be used to ensure changes to structures, systems, and components (SSCs), processes, and procedures remain consistent with the licensing bases?
  - The process will still require an evaluation to ensure all regulatory requirements are met. No different than today.

NRC QUESTIONS

Focus Area #2 “GDC language” (page 9)

- What measures would be used to preserve the design aspects of the licensing bases, such as ASME codes, vendor design standard, etc.?
  - No difference than how it is done today.
- What criteria would be used to define the terminology presented in the licensing bases associated with some of the GDCs, such as:
  - “appropriate margin” or “sufficient margin;”
  - “extremely low probability;” and
  - “acceptably low levels?”
    - Next Slides

GENERAL DESIGN CRITERIA

- General Design Criteria establish minimum requirements for the principal design criteria for water-cooled nuclear power plants similar in design and location to plants for which construction permits have been issued by the Commission.
- The principal design criteria establish the necessary design, fabrication, construction, testing, and performance requirements for structures, systems, and components important to safety; that is, structures, systems, and components that provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the public.

GENERAL DESIGN CRITERIA

- GDC are not directly applicable to operating requirements
- Many principle design criteria requirements are embedded in plant technical specifications. Those can not be changed without submitting a license amendment request.
- Some requirements are included in codes and standards, licensee committed regulatory guides, etc. Again, those requirements must continue to be met unless prior NRC approval for the change is obtained for those changed under 50.59.
- For cases where there is a relationship between the change and principle design criteria as described in the CLB (assuming the change does not result in a “more than minimal increase”), licensees must demonstrate that the impact of the change does not impact the minimum performance standards contained in the GDC. *(Addresses focus area #2)*

NEXT STEPS

- Share insights from our assessment and use of examples with industry 50.59 practitioners
- Continue to develop an approach that establishes criteria that can be used to determine if a system functional level impact results in a negligible impact (i.e. “no more than minimal” increase…) (criterion ii)
- Continuing discussions between the NEI 50.59 working team and PRA community on potential paths on the use of PRA techniques and criteria that could be used to determine if a proposed activity results in a “no more than minimal” increase…(criterion i & ii)

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
October	Public meeting – Staff feedback from Aug meeting/ NEI present insights from focus area 3
December	Public meeting – Staff feedback from Oct meeting/ discuss proposed solutions/products
December →	Prepare products for delivery (e.g., training, industry workshops)