Industry Feedback on RG 1.174 Revision 3

NRC Public Meeting

September 1, 2016

Overview

- Enhancement of discussion on aggregation and uncertainty
- Industry comments on draft revision of Section 2.1
- Discussion of useful material from other NRC documents
- DID examples

Enhancement of Guidance on Aggregation and Uncertainty

- Industry believes more completely addressing aggregation and uncertainty in this update is critical
  - Upcoming Seismic PRA completions
  - Ongoing difficulties associated with Fire PRA conservatism
- Minimal adjustments to language in RG 1.174 could address sufficiently
  - No policy-level decision needed
  - Sufficient time for stakeholder interactions
- Sent markup of RG 1.174 to NRC on August 9
  - Suggested added text in several sections

Enhancement of Guidance on Aggregation and Uncertainty

- Section 2.2 Evaluation of Risk Impact, Including Treatment of Uncertainties
  - "…the necessary sophistication of the evaluation, including the scope of the PRA …depends on the contribution the risk assessment makes to the integrated decision making, which depends to some extent on the magnitude of the potential risk impact"

Enhancement of Guidance on Aggregation and Uncertainty

- Section 2.4 Acceptance Guidelines
  - Adjust Figures 4 and 5 to better reflect gradation in acceptance guidelines
  - "…the guidelines are not to be interpreted as definitive. In particular, in applying these guidelines, it is important to recognize that the risk metrics calculated using PRA models are a function of the assumptions and approximations made in the development of those models. This is particularly important when the results from PRA models for multiple hazard groups are combined since the results from some hazard groups, depending on the state of practice, may be conservatively biased."
  - "As indicated by the shading on the figures, the change request will be subject to an NRC technical and management review that will become more intensive as the calculated results move closer to *[or even exceed]* the region boundaries." *(text added)*

Enhancement of Guidance on Aggregation and Uncertainty

- Section 2.5 Comparison of PRA Results with Acceptance Guidelines
  - Include discussion on conservative/bounding model treatment depending on state of the art throughout this section
  - "…approximations introduce conservative biases into the results. The degree of conservatism could in principle be explored by increasing the level of detail in the PRA model, but would typically only be necessary when the decision boundaries were challenged."

Enhancement of Guidance on Aggregation and Uncertainty

- 2.6 Integrated Decisionmaking
  - "The quantitative risk results from PRA models when supplemented by an identification of the contributors and the corresponding risk insights provide the most useful and complete characterization of the risk implications of the proposed licensing basis change."
  - "Therefore, if the risk metrics approach *[or even exceed]* the guidelines, the licensee's submittal should address the following issues *[text added]*:
    - An identification of the significant contributors to the risk metrics and an assessment of the realism with which they have been evaluated, and in particular, if some contributors are known to have been assessed conservatively."

Industry Perspective on DID in RG 1.174

- Key considerations:
  - The change does not result in a significant increase in the existing challenges to the integrity of the barriers.
  - The proposal does not significantly change the failure probability of any individual barrier.
  - The proposal does not introduce new or additional failure dependencies among barriers that significantly increase the likelihood of failure compared to the existing conditions.

Industry Comments on Draft Revision of Section 2.1

- Clearly state presumption that reasonable balance between the layers of DID exists up front.
- Reduce discussion following seven factors, as it is redundant to later discussion and gives little guidance.
- Strongly suggest using five considerations (Current factors 2-6)
  - Factor 1 as high level consideration
  - Delete factor 7
- Explicitly discuss treatment of extended time in previously analyzed configuration

Industry Comments on Draft Revision of Section 2.1

- Critical to clearly state that time in configuration change is not a change in DID
  - Common hang up in licensing application review process
- Demonstrating maintenance of a reasonable balance can be facilitated by reviewing the cutsets that contribute to the ΔCDF/LERF
  - Will generally be cutsets that have the same event combinations as in the base CDF results
    - One or more of the events will have a different probability
    - Difference will be caught in the Δfrequency
    - New and deleted cutsets can be reviewed to determine if DID has been impacted
  - The way DID is implemented is not affected since the way the systems are configured is identical
- When cutsets involve new combinations, they need to be reviewed for DID implications
- In either case, balance may change but is limited in significance by risk acceptance guidelines

Other NRC Documents with Potential Input: LIC-504

- List of questions in Sections 2.2.1 through 2.2.3
  - Example from 2.2.1: Which of the following high level aspects of defense-in-depth is affected by the issue?
    - a) prevention of core damage
    - b) prevention of containment failure
    - c) barrier integrity (fuel cladding, reactor coolant system (RCS), containment)
    - d) emergency preparedness
    - Note: The focus will be on a), b), and c) since these are more directly amenable to risk-informed resolution.
- Discussion in Section 2.2.4
- Appendix C, Section 2.2, Defense-in-Depth

Other NRC Documents with Potential Input: SRP 19.2

- Section III.2.1.1.2
- Example: …it is proposed that consideration of DID is most relevant when:
  - The proposed change affects a method of achieving a required safety function when the level of redundancy or diversity is limited or where significant uncertainty exists
  - The proposed license amendment affects DID by introducing cross-cutting changes (e.g., administrative changes, maintenance practices) that affect multiple safety functions or cut across levels of protection
  - Changes whose effects cannot be addressed directly by the PRA, e.g., impacts the likelihood or modes of late containment failures

Discussion on Examples for DID Guidance Evaluation

- Four examples provided
- Discuss from two perspectives
  - Using current draft Section 2.1 as is
  - Using draft Section 2.1 with proposed revisions

Example 1: One-Time AOT Extension

- One-time extension of allowed outage time for Safety Related Emergency Service Water Pump and Train System from 3 days to 14 days
  - Each train is back-up by an Emergency Diesel Generator.
  - Plant has two trains of non-safety related Normal Service Water Trains which are only powered by off-site power
  - The Normal Service Water Pumps serve both Turbine Cooling loads and Essential System Loads
    - EDGs are not capable of supporting.
- Defense in Depth considerations
  - All Trains of Auxiliary Feedwater are available, to maintain Mode 3/ 4.
  - Both Trains of HPI would be available.
  - Additional Charging Pump with independent power supply (standalone Diesel) is available to support Reactor Coolant Pump Seals and limited RCS Inventory control.
  - Added DID:
    - Flex Diesel Power Pump to support the out of service ESW Pump cooling (Thus the EDG will have separate powered EDG cooling). Thus all ECCS pumps can be supported.

Example 2: TSTF-500 (DC Electrical Re-Write) Application

- TSTF-500 allows for the extension of completion times (CTs) using risk-informed methods.
  - Reviewer believed in order to request a change to the two hour CT, licensee would need to take an additional single failure (e.g. have another battery available)
  - NRC did not approve of the CT change and application was retracted
- Per RG 1.177, "System redundancy, independence, and diversity are maintained commensurate with the expected frequency and consequences of challenges to the system"
  - None of these features of the DC system were affected by the proposed increase to the CT
  - Needs to be stated clearly under Factor 3 in Section 2.1.1.2 of the draft RG
  - Additional clarity could be provided if the draft RG explained that not all seven factors apply, or are even impacted by, a specific type of risk-informed change

Example 3: CFCU AOT Extension Proposed Application

- Proposal to extend allowed outage time for one or two inoperable containment fan coil units (CFCUs) from seven to 14 days
  - Adequate defense-in-depth maintained
    - Success criteria is three of five CFCU or one of two trains of Containment Spray
    - Safety margins not affected
    - Continued monitoring under the maintenance rule program and PSEG performance and predictive monitoring programs
  - Reduce risk associated with shutting down to respond to emergent issues without significant change in at-power risk

Example 4: TSTF-505

- Allows licensees to manage tech spec allowed outage times using risk information
- Specifically allows licensees to use a risk-informed completion time for equipment that is not TS operable but is can meet PRA function success criteria
  - Condition cannot be entered voluntarily
  - Potentially reduces risk by avoiding unnecessary plant shutdowns
- Potential impact on DID, as new configuration may be permitted
  - DID review should focus on conditions were operability differs from PRA functionality