PRA Functional

Public Meeting on Probabilistic Risk Assessment Functionality and Other Specific Topics on Nuclear Energy Institute (NEI) 06-09 and its Implementation into Technical Specifications Task Force-505

October 22, 2015

U.S. Nuclear Regulatory Commission

Division of Risk Assessment

Probabilistic Licensing Assessment Branch

PRA Functional

The NRC staff seeks to ensure that PRA Functional will be used consistently during full power operation with "loss of a specified safety function or inoperability of all required trains or divisions of a system," and in a manner that maintains safety margins and defense in depth

<u>Areas Requiring Additional Clarification</u>

Guidance in TSTF-505 documents that describe and identify a) acceptable changes to the technical specifications upon loss of operability of specified system function, b) use of PRA Functional in those changes, and c) the relationship between PRA functional and the PRA models.

PRA Functional

Topics for Discussion

What Information on PRA Functional Should be Included in a Submittal

Which Safety Functions Can Credit PRA Functional

Maintaining Defense-in-Depth After Loss of Function

Maintaining Safety Margins After Loss of Function

What Information on PRA Functional Should be Included in a Submittal

SE on NEI 06-09

4.0 LIMITATIONS AND CONDITIONS

(2) The LAR will provide identification of the TS LCOs and action requirements to which the RMTS will apply, with a comparison of the TS functions to the PRA modeled functions of the SSCs subject to those LCO actions. The comparison should justify that the scope of the PRA model, including applicable success criteria such as number of SSCs required, flowrate, etc., are consistent licensing basis assumptions (i.e., 50.46 ECCS flowrates) for each of the TS requirements, or an appropriate disposition or programmatic restriction will be provided.

TSTF-505 Enclosure 1

This enclosure should provide a description of PRA functionality for each associated specified safety function that corresponds to each proposed Required Action that is applicable when all trains of equipment are inoperable as discussed in Section 2.3.1.10 of NEI 06-09. For example, the number and identity of instrumentation and control channels (or functions) required to be PRA functional is highly dependent on the specific plant and associated equipment design.

In the submittals, the disposition for loss of function "Two AFW trains inoperable" simply refers back to the information provide for LCO "one AFW inoperable." The staff was expecting a more extensive discussion about what exactly are the PRA functions being credited on loss of function.

e.g., is PRA Functional for "two auxiliary Feedwater inoperable" success in providing only the 100% instead of the possible 120% of the assumed flow, providing 50% because of degraded flow path, or providing sufficient flow from the fire protection system?

Which Safety Functions Can Credit PRA Functional

TSTF-505 Technical Analysis

10. The Traveler will not modify Required Actions for systems that do not affect CDF or LERF or for which a Risk Informed Completion Time cannot be quantitatively determined

- **Appears that some submittals are using the RICT for safety functions that do not affect CDF and LERF. Unclear what PRA Functional is for these (Iodine removal)**
- **Without a list of design basis scenarios relying on a specified safety functions coverage of the design basis is not clear**
  - **Sometimes the PRA functions may be sufficient for some PRA initiating events but insufficient for other initiating events (Ok for LOOP/LOCA not for seismic)**
  - **Sometimes the PRA Function may be sufficient for some PRA initiating events but insufficient for other design basis accident not in the PRA (Containment spray in PRA that credits sprays for heat removal to avoid core damage)**
- **The 24 hour mission time in a PRA is shorter then the time required to reach an acceptable state in the design basis (room cooling) and therefore some design basis functions may not be included in the PRA**

Maintaining Defense-in-Depth After Loss of Function

TSTF-505 Model Safety Analysis

[*LICENSEE] is proposing no changes to the design of the plant or any operating parameter, no new operating configurations, and no new changes to the design-basis in the proposed changes to the TS. The effect of the proposed changes when implemented will be that the RICT Program will allow CTs to vary based on the risk significance of the given plant configuration (i.e., the equipment out-of-service at any given time). Further, the restrictions on loss of a specified safety function or inoperability of all required trains of a system, and consideration of PRA functional conditions ensure defense-in-depth capabilities are maintained.*

When "the restrictions" mean that PRA Functional is 100% of assumed flow in the design basis instead of the normally available 130%, there is no new operating configuration. When 30% of assumed flow in the design basis, or relying of fire protection system for flow, there are new operating configurations that need to be assessed to satisfy the RG 1.174 defense-in-depth guidelines.

….. The application of the RICT Program places high value on key safety functions and works to ensure they remain a top priority over all plant conditions. Application of the RICT Program provides a structure to assist the operator in identifying effective compensatory actions for various plant maintenance configurations to maintain and manage acceptable risk levels.

Over-reliance on programmatic activities as compensatory measures associated with the change in the LB is avoided is a major element in RG 1.174 defense-in-depth considerations.

Maintaining Defense-in-Depth After Loss of Function

TSTF-505 Model Safety Analysis

In addition, the risk assessment for determining a RICT will adequately consider defense-in-depth quantitatively in the PRA model, and by a qualitative assessment of the specific configuration. The proposed TS changes preserve the existing balance between avoidance of core damage, avoidance of containment failure, and consequence mitigation by ensuring that CTs do not result in a loss of all these multiple barriers associated with current plant configuration. The RICT Program, in conjunction with the PRA, measures and accounts for the level of defense-in-depth on both an instantaneous and a cumulative basis. It considers plant design features, operating philosophy, and equipment capability.

Evaluations of defense-in-depth that rely on risk measurements are not generally sufficient to address RG 1.174 defense-in-depth evaluations. Depending on the difference between Operability and PRA Function on loss of function, not clear that existing defense-in-depth is preserved.

TSTF-505 Model Safety Analysis

NEI 06-09 requires that compensatory measures be initiated when the PRA calculated RMA time (RMAT) is exceeded, or for preplanned maintenance for which the RMAT is expected to be exceeded, RMAs shall be implemented at the earliest appropriate time. Therefore, quantitative risk analysis, the qualitative considerations, and the restrictions related to loss of a safety function or loss of all trains of a required system assure a reasonable balance of defense-in-depth is maintained to ensure protection of public health and safety. Thus, this proposed change meets the second key safety principle of RG 1.177 and is therefore acceptable.

Human actions to implement the compensatory measures should be demonstrated to be highly reliable. Consistent with NEI 99-02 Regulatory Assessment Performance Indicator Guideline, credited actions should be "virtually certain to be successful (i.e., probability nearly equal to 1) during accident conditions)"…

Unclear what additional "restrictions" on loss of function are being credited.

Maintaining Safety Margins after Loss of Function

TSTF-505 Model Safety Analysis

Use of the RICT Program to determine a RICT will not affect [PLANT] commitment to the codes and standards used in the design of [PLANT]. [LICENSEE] is not proposing in this application to change any quality standard, material, or operating specification. Acceptance criteria for operability of equipment are not changed. The design-basis analyses for [PLANT] remain applicable. Although [LICENSEE] will be able to have design-basis equipment out-of-service longer than the current TS allow, the actual expected increase in unavailability will be insignificant with respect to design-basis assumptions regarding accident mitigation and are addressed by the consideration of the single failure criterion in the design-basis analyses. Therefore, safety margins are maintained by the implementation of the RICT Program. Thus, this proposed change meets the third key safety principle of RG 1.177 and is therefore acceptable.

Although acceptance criteria for operability is not changed, when PRA functional is created that differs substantively from operable, a new operating envelope which makes the design basis inapplicable and which can be used for extended time is created. Safety margins that are impacted should be identified and the impact on these safety margins clarified to satisfy RG 1.174 risk-informed guidelines.

References

References

(TSTF-505 Technical Analysis) TSTF-505, Revision 1, "Provide Risk-Informed Extended Completion Times - RITSTF Initiative 4b," Technical Analysis attached to June 14, 2011, Transmittal letter (ML111650552).

(NEI 06-09) NEI 06-09 Revision 0-A, "Risk-Informed Technical Specifications Initiative 4b Risk-Managed Technical Specifications (RMTS) Guidelines," November 2006.

(Model Safety Evaluation) MODEL SAFETY EVALUATION FOR PLANT-SPECIFIC ADOPTION OF TECHNICAL SPECIFICATIONS TASK FORCE TRAVELER TSTF-505, REVISION 1, "PROVIDE RISK-INFORMED EXTENDED COMPLETION TIMES - RITSTF INITIATIVE 4B" (ML120200401)

(TSTF-505 Enclosure 1) Proposed Revision to the Model Application for TSTF-505, Revision 1, "Provide Risk-Informed Extended Completion Times - RITSTF Initiative 4b"ENCLOSURE 1 LIST OF REVISED REQUIRED ACTIONS TO CORRESPONDING PRA FUNCTIONS January 31, 2012 (ML12032A065).