A-23

Reactor Safety SDP

Region III Counterpart Meeting

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Topics

- Objectives of Reactor Safety SDP
- Roles and Responsibilities
- Treatment of Concurrent Findings
- Phase 1 Screenings
- Phase 2 Evaluations
- Questions and Answers

Objectives of Reactor Safety SDP

- Characterize the significance of inspection findings in support of the Reactor Oversight Program
- Provide a basis for assessment and enforcement actions associated with inspection findings
- Provide all stakeholders an objective and common framework for communicating the safety significance of inspection findings
- Provide the staff with plant specific risk information for use in risk-informing the inspection program

Roles and Responsibilities

- Phases 1 and 2 are intended to be accomplished by the inspection staff, with the assistance of a senior reactor analyst (SRA), where necessary.

- Phase 3 is intended to be performed by a SRA or risk analyst.

Treatment of Concurrent Findings

- If the findings resulted from a common cause, then a single finding should be written and characterized for significance using a Phase 3 analysis.

- If the findings resulted from independent causes, then separate inspection findings should be written and individually characterized for significance.

Phase 1

- Prior to conducting a Phase 1 Screening, the issue should be evaluated against the criteria in IMC 0612 (formerly 0610*), Appendix B, to determine whether or not the issue is minor.

- The Phase 1 Screening Worksheet contains the decision logic used to determine if the issue can be characterized as Green without further analysis.

Phase 1

- A Phase 1 Screening can have the following outcomes.
  - Screen to IMC 0609, Appendix F, Fire Protection SDP
  - Screen to IMC 0609, Appendix G, Shutdown SDP
  - Screen to IMC 0609, Appendix H, Containment SDP
  - Screen to Phase 2
  - Screen to Phase 3
  - Screen to Green

Phase 2

- **Step 2.1 - Selection of Initiating Event Scenarios.**
  - Enter table 2, with the equipment or safety function that was assumed to be impacted by the inspection finding.
  - Determine the initiating event worksheets that must be evaluated.

Phase 2

- **Step 2.2 - Estimation of Initiating Event Likelihood**
  - Enter table 1 with the exposure time associated with the finding.
  - Determine the initiating event likelihood (IEL) for each of the initiating events identified in step 1.
  - If the finding increases the likelihood of an initiating event, increase the IEL value in accordance with the SDP usage rules.

Phase 2

Step 2.3 - Estimation of Remaining Mitigation Capability

- Step 2.3.1
  - For each of the inspection notebook worksheets identified in step 1, determine which of the safety functions are impacted by the finding.

Phase 2

Step 2.3 - Estimation of Remaining Mitigation Capability (Cont.)

- Step 2.3.2
  - Circle the sequences on each worksheet that contain one or more of the affected safety functions.
  - If the inspection finding increases the likelihood of an initiating event, circle all of the sequences on the worksheet for that particular initiating event.

Phase 2

Step 2.3 - Estimation of Remaining Mitigation Capability (Cont.)

- **Step 2.3.3**
  - For each safety function impacted by the finding, evaluate the unaffected equipment.
  - Enter Table 5, "Remaining Mitigation Capability Credit," and determine the remaining mitigation capability credit for each of these functions.

Phase 2

Step 2.3 - Estimation of Remaining Mitigation Capability (Cont.)

- **Step 2.3.4**
  - Determine if the nature of the degradation is such that an operator could recover the unavailable equipment or function in time to mitigate the assumed initiating event.
  - If the criteria for recovery credit are met, enter a recover credit of 1.

Phase 2

- **Step 2.4 - Estimation of Risk Significance of the Inspection Finding**
  - Determine the sequence risk significance for each of the sequences circled in step 3.
  - Complete table 6, "Counting Rule Worksheet." The result is the risk significance of the inspection finding based on the internal initiating events that lead to core damage.

Phase 2

- **Step 2.5 - Screening for the Potential Risk Contribution due to External Initiating Events**
  - The plant-specific SDP phase 2 worksheets do not currently include external initiating events.
  - If the phase 2 SDP result for an inspection finding represents an increase in risk of greater than 1E-7 per year, then an SRA or other NRC risk analyst should perform an analysis to estimate the increase in risk due to external initiators.

Phase 2

- **Step 2.6 - Screening for the Potential Risk Contribution due to LERF**
  - If any of the sequence results are greater than 1E-7 per year <u>and</u> involve any of the sequence types listed below, then the finding should be screened for its LERF contribution using IMC 0609, Appendix H.
    - ISLOCA, transients (includes SBO scenarios), or small LOCAs for all reactor containment types
    - ATWS for BWR mark I and II reactor containment types
    - SGTRs for all PWR reactor containment types

Site Specific Risk-Informed Inspection Notebook Usage Rules

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Exposure Time

The exposure time used in determining the Initiating Event Likelihood (IEL) should correspond to the time period that the condition being assessed is reasonably known to have existed. If the inception of the condition is unknown, then an exposure time of one-half of the time period since the last successful demonstration of the component or function ($t/2$) should be used.

Site Specific Risk-Informed Inspection Notebook Usage Rules

Finding (Not Involving a Support System) that Increases the Likelihood of an IE

If the amount of increase in the frequency of the initiating event due to the inspection finding is not known, increase the IEL for the applicable initiating event by one order of magnitude. If specific information exists that indicates the IEL should be increased by more than one order of magnitude, consult with the regional SRA to determine the appropriate IEL.

Site Specific Risk-Informed Inspection Notebook Usage Rules

Finding (Normally Cross-tied Support System) that Increases the Likelihood of an IE

For inspection findings that involve the unavailability of one train of a multi-train, normally cross-tied support system that increases the likelihood of an initiating event, increase the IEL by one order of magnitude for the associated special initiator.

Site Specific Risk-Informed Inspection Notebook Usage Rules

Finding (Normally Running Components of a Split Train Support System) that Increases the Likelihood of an IE and the Impact on Mitigating System Capability Can Be Explicitly Determined

For findings that involve the unavailability of a normally running component of a split train support system that increases the likelihood of an IE, increase the IEL by one order of magnitude for the associated special initiator. In addition, determine the impact on the mitigation capability of the supported systems and evaluate each of the worksheets directed by Table 2 for the unavailability of the affected supported systems.

Site Specific Risk-Informed Inspection Notebook Usage Rules

Finding (Normally Standby Components of a Split Train Support System) that Increases the Likelihood of an IE and the Impact on Mitigating System Capability Can Be Explicitly Determined

For findings that involve the unavailability of a normally standby component of a split train support system that increases the likelihood of an IE, increase the IEL by two orders of magnitude for the associated special initiator. In addition, determine the impact on the mitigation capability of the supported systems and evaluate each of the worksheets directed by Table 2 for the unavailability of the affected supported systems.

Site Specific Risk-Informed Inspection Notebook Usage Rules

Finding Involving Emergency Diesel Generators

For findings that involve the unavailability of EDGs, increase the IEL by two orders of magnitude for the LEAC special initiator, if applicable at the affected plant. In addition, determine the impact on mitigation capability of the supported systems and evaluate the LOOP worksheet accounting for the unavailability of the EDG and the affected supported systems.

Site Specific Risk-Informed Inspection Notebook Usage Rules

Finding Involving Safety-Related Battery Chargers

Inspection findings that involve the unavailability of a battery charger for a safety-related DC bus should be treated in the same fashion as a finding that increases the likelihood of the loss of DC bus special initiator.

Site Specific Risk-Informed Inspection Notebook Usage Rules

Finding that Degrades Mitigation Capability and Does Not Reduce Remaining Mitigation Capability Credit to a Value Less Than Full Mitigation Credit

For inspection findings that involve the unavailability of mitigating system equipment, such that sufficient mitigation capability remains to receive full mitigation credit for the affected safety function, solve all of the worksheet sequences that contain the safety function giving full mitigation credit.

Site Specific Risk-Informed Inspection Notebook Usage Rules

Finding (Normally Split Train Support System) that Does Not Increase the Likelihood of an IE and the Impact on Mitigating System Capability Can Be Explicitly Determined

For findings that involve the unavailability of one train of a normally split train support system that does not increase the likelihood of an IE, determine the impact on the mitigation capability of the supported systems and evaluate each of the worksheets directed by Table 2 for the unavailability of the affected supported systems.

Site Specific Risk-Informed Inspection Notebook Usage Rules

Finding Involving a Loss of Redundancy of Equipment

When an inspection finding reduces the remaining mitigation capability such that the total available equipment train(s) is less than 2 times the equipment train(s) that is required to fulfill the safety function, the remaining mitigation capability credit should not exceed the credit for one train.

Site Specific Risk-Informed Inspection Notebook Usage Rules

Finding Involving Equipment that Impact Operator Action Credit

When evaluating inspection findings that impact safety functions involving mitigating equipment and operator action, the remaining mitigation credit should correspond to the equipment or operator action credit, whichever is most limiting.

Site Specific Risk-Informed Inspection Notebook Usage Rules

Treatment of Shared Systems Between Units

When evaluating inspection findings that involve systems that impact multiple units, the inspection finding should be evaluated for each unit separately.

Site Specific Risk-Informed Inspection Notebook Usage Rules

Counting Rule

Every 3 affected accident sequences that have the same order of magnitude of risk, as determined by the addition of the initiating event likelihood and the remaining mitigation capability, constitute one equivalent sequence which is more risk significant by one order of magnitude. This rule is applied in a cascading fashion.

Phase 2 Exercise No. 1

- Consider a hypothetical inspection finding that involves the failure of the licensee to identify a 180 degree circumferential crack on a weld on a 2 inch line connected to the reactor coolant system.
- Evidence of the crack remained unidentified for four months.
- The inspectors determined that a small loss of coolant accident would result if this weld failed.

Phase 2 Exercise No. 1 Cont.

- Assume that recovery credit is <u>not</u> appropriate for the circumstances surrounding this hypothetical finding.
- The generic PWR risk-informed inspection notebook will be used for this exercise.

Phase 2 Exercise No. 2

- While performing a complete system walkdown of the high head safety injection (HHSI) system, an inspector identified that a normally locked open manual valve in the discharge flow path of one train was closed.
- The valve position for this valve was not indicated in the control room. This valve was also not in the flow path during quarterly surveillance testing of the system.

Phase 2 Exercise No. 2 Cont.

- It was subsequently determined that the valve had been out of position since maintenance was last performed on the system ten months prior.
- The inspectors determined that the criteria for crediting operator recovery of the HHSI train were satisfied and that credit for recovery of the train was appropriate.
- The generic PWR risk-informed inspection notebook will be used for this exercise.

Phase 2 Exercise No. 3

- The "A" instrument air (IA) compressor seized shortly after it was started for periodic rotation of the operating equipment.
- It was subsequently determined that the compressor seized because of improperly performed preventive maintenance which had been conducted two days prior.
- The IA system is a normally cross-tied support system.

Phase 2 Exercise No. 3 Cont.

- The inspectors determined that the criteria for crediting operator recovery of the IA compressor were not satisfied and that credit for recovery of the compressor was not appropriate.
- Use the generic BWR risk-informed inspection notebook for this exercise.

Phase 2 Exercise No. 4

- Consider a hypothetical inspection finding that involves the unavailability of the "B" component cooling water (CCW) pump for 2 days.
- At Saint Lucie, the CCW system is a split train support system.
- Assume that recovery credit is appropriate for the circumstances surrounding this hypothetical finding.

Phase 2 Exercise No. 4 Cont.

- The Saint Lucie Nuclear Power Plant Unit 1 Risk-Informed Inspection Notebook will be used for this exercise.

Phase 2 Exercise No. 5

- During an 18-month surveillance test, the 24 hour endurance run, the "B" diesel generator catastrophically failed 1.5 hours into the test.
- It was subsequently determined that the diesel generator failed because of improperly performed maintenance during the last overhaul of the diesel which had been performed during the last refueling outage.
- The "B" diesel generator successfully completed a 24 hour endurance run 18 months prior.

Phase 2 Exercise No. 5 Cont.

- However, the monthly surveillance tests did not demonstrate that the "B" diesel generator would successfully perform its safety function for its mission time of 24 hours.
- The inspectors determined that the criteria for crediting operator recovery of the "B" diesel generator was not appropriate.
- Use the Generic PWR Risk-Informed Inspection Notebook for this exercise.

Phase 2 Exercise No. 6

- Consider a hypothetical inspection finding that involves the unavailability of the “A” train safety-related battery charger for 1 day.
- For this exercise assume no spare battery chargers are available.

Phase 2 Exercise No. 6 Cont.

- Assume that recovery credit is appropriate for the circumstances surrounding this hypothetical finding.
- The Saint Lucie Nuclear Power Plant Unit 1 Risk-Informed Inspection Notebook will be used for this exercise.