

P-111 INTEGRATED WORKSHOP #2

RISK SIGNIFICANCE OF FINDINGS AND EVENTS

Objective: The student will learn how PRA information can be used to provide insight into the risk significance of specific inspection findings or operational events. This includes Phase 2 analysis using the Significance Determination Process (SDP).

Method: Students will be given the North Anna SDP Notebook and material from the North Anna IPE Submittal to be used as an illustration of PRA information for carrying out this workshop. Only portions of the submittal useful for performing the workshop will be provided to the students in order to avoid ineffectual time looking through a large volume of material. Completion of this workshop should be expected to take approximately ½ day and will be given at the end of the P-111 course after all course modules have been presented.

Materials:

- 1) Example of an operational event and related inspection finding
- 2) North Anna SDP Notebook
- 3) Summary of Major Findings from the IPE
- 4) Functional failure summary information from the IPE
- 5) List of Initiating Events from the IPE
- 6) Success Criteria information from the IPE
- 7) Event tree information from the IPE
- 8) Plant design and Safety Injection System information from the IPE
- 9) Core damage (and dominant cut sets) results information from the IPE
- 10) Risk importance information from the IPE
- 11) List of basic events and descriptions

Instructions: By using the material provided and answering the questions in this workshop, arrive at a tentative conclusion regarding the risk-significance of the operational event and related inspection finding based on the SDP and on the PRA information provided. The conclusion ought to be considered “tentative” because in a real situation, there may be other information not provided, which could alter the conclusion reached.

Example Operational Event / Inspection Finding:

[Note: This example is based on an actual operational event and inspection finding at a power plant similar to North Anna. The facts related to the actual event have been altered somewhat for purposes of the class workshop. Nevertheless, similarity between this fictitious event and the actual event provides “realism” toward meeting the objective of this workshop.

During a test of the auxiliary feedwater system (AFW) with the plant at power (Mode 1), an operator noticed that the manual discharge valve for the turbine-driven pump, valve 1-FW-278 (refer to the simplified AFW flow diagram in Module F), is locked closed. It is required to be locked open when the plant is at power. This misalignment has existed for 48 days and violates the Technical Specification Limiting Condition of Operation of 72 hours. With the system in this condition, no flow would be available from the turbine-driven AFW pump to any of the steam generators. Upon review of the event, the NRC determined that the misalignment occurred during performance of an AFW valve operability test. The misalignment was discovered when an operator noticed the valve stem position and questioned whether the valve was in the correct position.

Questions:

(Questions 1 – 5 examine how the SDP evaluates the risk significance of the finding.)

1. Use the SDP Phase 1 screening worksheet to evaluate this finding. Explain in detail why Phase 2 analysis is or is not necessary.
2. Assume that Phase 2 analysis is required and use the SDP Worksheets in the North Anna SDP Notebook to evaluate the risk significance of this condition.
3. What is the overall “color” for this finding?
4. Which accident sequence dominates this result?
5. List any assumptions you made in doing the Phase 2 analysis and be prepared to defend these assumptions before a mock Significance Evaluation Review Panel (SERP).

(Question 6 –10 explore how the PRA results could be used to evaluate the risk significance of this finding.)

6. Looking in the PRA,
 - a) Is the equipment of interest and the function(s) that equipment performs “captured” in the PRA for the North Anna IPE?
 - b) If so, where in the materials provided did you find the relevant information?
7. Based on the modeling in the PRA, what types of failures (e.g., independent, common cause, human error, hardware failure, support system failures...) or other reasons for unavailability (e.g., test or maintenance outage) did the PRA include in considering the inoperability of the turbine-driven AFW train?
8. Which event tree sequences correspond to the dominant sequence you found in the Phase 2 SDP above? Note: Level 2 information may be included in the Level 1 event trees; any sequences that lead to core uncovering can be considered core damage sequences for this question.
9. Using the dominant sequence cut sets, along with the table of basic event probabilities, estimate the change in CDF for this sequence. With what “color” does this change in CDF correspond? Note: if you found more than one PRA sequence that corresponded with the dominant SDP sequence, use the sequence with the highest frequency to answer this question.
10. Use the importance measure information to estimate the overall impact of this condition on CDF. How does this compare with what you calculated in the question above?