

April 27, 2004

Mr. Alexander Marion, Director Engineering
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1776 I Street, NW, Suite 400
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SUBJECT: STAFF REVIEW OF NEI 04-06 GUIDANCE FOR SELF-ASSESSMENT OF
CIRCUIT FAILURE ISSUES (DRAFT G)

Dear Mr. Marion:

The purpose of this letter is to communicate the staff's comments on the March 19, 2004, Draft G of NEI 04-06 "Guidance for Self-Assessment of Circuit Failure Issues." We acknowledge your effort to create this guidance document to help licensees in performing self-assessments of their associated circuit analysis prior to the NRC resuming inspections on January 1, 2005. Although the NRC does not intend to do a detailed review of NEI 04-06, the staff has identified discrepancies between your document and the Regulatory Issue Summary (RIS) 04-03 "Risk-Informed Approach for Post-Fire Safe-shutdown Associated Circuit Inspections."

Two key comments are as follows:

1. Use of the terms "Necessary," "Required," and "Associated" when discussing Post-Fire Safe-Shutdown Analysis is not consistent with the RIS or historical staff guidance. Enclosure 1 to this letter includes a detailed discussion of this comment including regulatory history.
2. Risk considerations should not be used until Phase III of NEI 04-06. The staff has included several comments relating to this point in Enclosure 2 to this letter.

Enclosure 2 also provides additional detailed comments and suggestions for the next revision of NEI 04-06. I understand that NEI has not requested us to provide regulatory approval of NEI 04-06. Notwithstanding, I believe that licensees will be best served if NEI 04-06 is consistent with the NRC generic communications and guidance documents.

The staff is willing to meet with you to discuss these comments. If you think a meeting would be beneficial, please contact my staff to set up such a meeting. If you have any questions please contact Sunil Weerakkody (415-2870), Dan Frumkin (415-2280), or Mark Salley (415-2840) of my staff.

Sincerely,

/RA/

John N. Hannon, Chief
Plant Systems Branch
Division of Systems Safety and Analysis
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Enclosures: As Stated

Use of the terms “Necessary,” “Required” and “Associated” when discussing Post-Fire Safe-Shutdown Analysis.

OVERVIEW

- 1) RIS 04-03 only applies to “associated circuits.” This is clearly communicated in the RIS. NEI 04-06 goes beyond treatment of “associated circuits.”
- 2) NEI 04-06 creates a new term, i.e. “necessary circuits.” All previous NRC (and NEI) documents speak in terms of “required” circuits.
- 3) The staff’s position regarding how to determine if a cable (circuit) is “required” or “associated” depends upon if the cable (circuit) is a part of the train of equipment that is being relied upon to achieve and maintain post-fire safe-shutdown (SSD). RIS 04-03 clearly states:

“Associated circuits are distinct from the circuits directly required for operation of post-fire safe-shutdown trains of equipment. Associated circuits are not required for post-fire safe-shutdown, but could interfere with post-fire safe-shutdown if damaged by fire. If damage to the circuits or cables under consideration would have a direct impact on the operation of equipment or systems that are relied on to perform an essential shutdown function, the circuits and cables are considered required circuits.

Further regulatory information has been summarized and may be found in Draft NUREG 1778, “Knowledge Base for Post-Fire Safe-Shutdown Analysis,” Section 6.4.5. Swapping the circuit’s function depending on if the component is expected to be “active” or “passive” at the time of SSD is not appropriate and conflicts with RIS 04-03.

BACKGROUND AND DISCUSSION

Appendix R III.G.1.a States:

One train of systems necessary to achieve and maintain hot shutdown conditions from either the control room or emergency control station(s) is free of fire damage;

As used in this context, “necessary” is referring to the complete train of equipment, i.e., mechanical equipment (pumps, valves, control air etc.) and supporting electrical equipment (cables, breakers, MCC, etc.). The circuits necessary for this complete train of equipment are identified as “shutdown circuits” in Attachment 1, page 4, to the March 22, 1982 Eisenhut clarification memo of Generic Letter 81-12.

Provide protection between the associated circuits of concern and the shutdown circuits as per Section III.G.2 of Appendix R.

ENCLOSURE 1

Other NRC documents such as Information Notice 84-09 provide this guidance for "Identification of Safe Shutdown Systems and Components." "This situation should not have occurred since identification of required safe shutdown systems for each fire area of the plant is a logical starting point for reassessment of areas where redundant trains are located."

Further, Information Notice 99-17, states the following describing the NRC and Industry efforts to move toward a solution: "The discussions focused on safety, technical and regulatory issues, the assumptions that go into circuit analysis, and the terminology used to discuss circuit analysis."

The BWR Owners Group "Guidance for BWR Post Fire Safe Shutdown Analysis" uses the terms "cables required for safe shutdown" throughout, For example section 1.3.4 states, "By assuring the availability of the cables required for the safe shutdown . . ."

NEI 00-01 uses similar language, in section 1.3.2.5 "Using information on the physical routing of the required cables and physical location of all safe shutdown equipment, . . ."

The NRC also standardized on this language. Draft NUREG 1778, provides a definition for "Required Circuits and Cables" and RIS 2004-03 explicitly states: "If damage to the circuits or cables under consideration would have a direct impact on the operation of equipment or system that are relied on to perform an essential shutdown function, the circuits and cables are considered "required circuits." These redundant train protection and alternative shutdown capability independence criteria for such required post-fire safe-shutdown circuits are not effected by this RIS."

CONCLUSION

NEI 04-06 should be revised to have the definitions match the established NRC definitions. NEI should only apply the RIS 2004-03 guidance to associated circuits as is clearly stated in the RIS. Whether a component is active or passive is not necessarily a criteria for determining if a component is "associated."

Many instances of the above comments are expounded upon in Enclosure 2.

Specific Comments in NEI 04-06, Draft G

The comments are labeled by Section, page number, then the line on the page. Following each comment is a number that denotes the type of comment. The categories are:

- 1 - This notes a particularly useful feature in NEI 04-06.
- 2 - A significant comment.
- 3 - An editorial comment.

Section 1

Section 1, page 1, line 4—Suggest that RIS 04-03 be referenced in the Introduction. Category 3

Section 2

Section 2, page 2, line 3—Add “associated circuit” between the words, “risk-significant” and “spurious operation.” Category 3

Section 2, page 2, line 4—Do not introduce the new definition “necessary” This change introduces unnecessary confusion. Please use the current NRC terminology. Use the term “Required.” Category 2

Section 2, page 2, footer 1—In the staff’s position, the use of necessary is not consistent with 10CFR50 Appendix R, with respect to the definition of required circuit. Category 2

Section 3

Section 3.1, page 3, line 4—Revise the phrase, “based on risk significance,” to read, “based on possible consequences from fire induced losses of SSCs for SSD.” Category 2

Section 3.2, page 3, line 9—Phase I is too early for risk considerations. Category 2

Section 3.2, page 3, line 10, et. al.—Change “necessary” to “required” throughout. Category 2

Section 3.2, page 3, line 12—“Credible” should be replaced with “potential.” Credible implies risk insights, the risk insights should not come in to play this early in the process. Category 2

Section 3.2, page 3, line 14—Change sentence to read, “Identify all cables in those fire areas, using cable route drawings or databases. Category 2

Section 3.3, page 3, line 20—Add “all” between “in” and “single.” Category 2

Section 3.3, page 3, line 21—Add “Cable to cable interactions for,” prior to Circuits. Category 2

Section 3.3, page 3, line 22— Revise c. to read, “Up to two cables containing associated circuits shall be evaluated per scenario.” Category 2

Section 3.4, page 3, line 23—Phase III is where risk considerations should enter the process, not in Phase I. Category 2

Section 3.4, page 3, line 25—Delete the screening discussion from this section, end the sentence with the words, “of interest.” This is because not being able to develop a fire scenario does not effect compliance. Category 2

Section 3.4, page 3, line 23—NEI 04-06’s use of a likelihood measure at this step appears appropriate. Category 1

Section 4

Section 4, page 5, line 1—“Appendix R Terminology” all definitions should be consistent with NUREG-1778. Category 2

Section 4.2, page 5, line 21—Revise Bin 1 to read, “Bin 1 - Areas where inspection should focus. Items may have high risk significance; however, plant-specific information may still have a role in determining the final risk significance.” Category 2

Section 4.2, page 5, line 6—Revise Bin 3 to read, “Bin- 3 Areas where inspections should not focus. There is ample evidence that the items in this bin will be of low risk significance.” Category 2

Section 4.2, page 5, line 28—Revise this line to read, “Only Bin 1 items for associated circuits will be assessed using this guideline.” Category 2

Section 4.4, page 6, line 4—add reference to NUREG 1778. Category 3

Section 4.5, page 6, line 11, line 14, and section 4.8, page 6, line 28—Revise to remove redundancy. Use revised version from page 6, line 14. Category 2

Section 4.5, page 6, line 14—Delete “without ground” from this definition. Category 2

Section 4.6, page 6, line 23—Use NUREG 1778’s definition of Circuit Analysis. Category 2

Section 4.19 and Section 4.20, page 8—Use NUREG 1778 definitions of Intra-Cable and Inter-Cable Faults. Category 2

Section 4.23, page 9, lines 9 and 10—Delete “Necessary” and replace with the NUREG 1778 definition of required circuits. Category 2

Section 4.29, page 10, line 6—Delete the single spurious assumption. This assumption is not validated and is likely false based on the NEI testing. Category 2

Section 4.34, page 10, line 24—Delete the note about thermoset is usually IEEE 383 rated. Category 2

Section 5

Section 5.1, page 12, line 22—Delete the words, “. . . unless it can be shown that loss of the circuit can be mitigate by a manual action or other means.” Category 2

Section 5.1, page 12, lines 25 through 28—Delete these lines. This active or passive discussion is incorrect. Remove all other references of this difference throughout the document. Category 2

Section 5.2, page 12, line 35—Delete the last sentence regarding passive components failing in normal position. Also delete portion on page 13 as well. Category 2

Section 5.3, page 13, line 13—Replace “. . . used to . . .” on this line with “. . . one not required for safe shutdown but could. . .” Category 2

Section 5.4, page 13, line 18—The section, from line 18 to the bottom of the page, is redundant to the definitions, pick one location for this text. Category 3

Section 5.4, page 14, line 26—Delete the section in parentheses, this conflicts with the RIS. Category 2

Section 5.4, page 14, line 35 and line 36—Repeating values from the SDP may be problematic, since SDP values may change. Reference the SDP. Category 3

Section 5.4, page 15, lines 24 to 36—These lines conflict with the RIS. The RIS assumes that the right pairs fault. Category 2

Section 5.6.1, page 16, line 27—revise the first bullet to read, “No more than two cables should be analyzed for each scenario . . .” Category 2

Section 5.6.1, page 16, line 35—Revise this line to read, “Inter-cable shorts between thermoplastic cables.” Category 2

Section 5.6.2, page 17, line 5—Revise the bullet to read, “Configurations involving three or more cables.” Category 2

Section 5.6.2, page 17, line 10—Provide the basis that AOV and PORV control circuits spurious operations will not impact safe shutdown. Category 2

Section 5.6.2, page 17, line 20—Revise this line to read “. . . operation of a reversing DC motor . . .” Category 2

Section 6

Section 6.1.1.1, page 18, line 13—provide basis for the statement that reads, “even though the PRA did not show these areas as important.” Category 2

Section 6.1.1.2, page 18, line 20—The NRC is providing inspection guidance for manual actions. This guidance may be added to Appendix R. Category 2

Section 6.1.1.2, page 18, line 20—This section accepts manual actions in lieu of protection. This will be OK if the proposed rulemaking passes. If not, the option will not meet regulatory requirements. Category 2

Section 6.1.1.2, page 18, line 27 and line 32–“Feasibility criteria” should be replaced with “acceptance criteria.” Category 3

Section 6.1.2, page 19, line 4–The list of licensing basis documents should include the “approved fire protection plan” which consists of the submittals referenced in the operating license condition; “design criteria,” “system description,” and “calculations.” Category 3

Section 6.1.2, page 19, line 14–Incorrectly implies that the RIS’ consideration of more than one hot short is beyond licensing basis. The Sam Collins letter in 1997 and various meetings discussed this issue. There are very few (perhaps 2) times that this was included in a safety evaluation. Category 2

Section 6.1.3 Replace “necessary” with “required” Category 2

Section 6.2.1.1, page 20, line 6–Delete “regardless of whether the circuits are considered “necessary” or “associated”. Category 2

Section 6.2.1.1, page 20, line 7–The discussion of limiting analysis to component combinations that could result in loss of key safety functions . . . , is useful. Category 1

Section 6.2.1.1, page 20, line 7–PRA insights are not appropriate during Phase I. Category 2

Section 6.2.1.1, page 20, line 8–Revise line to read, “. . . maloperation or prevent operation could result . . .” Category 2

Section 6.2.1.1, page 20, line 9–Delete “but are not limited to.” Category 3

Section 6.2.1.1, page 20, line 12–Manual actions should not be singled out. Category 2

Section 6.2.1.1, page 20, line 12–This paragraph is pending rulemaking. Put it into context. Category 2

Section 6.2.1.1, page 20, line 13–The word “feasibility” should be replaced with “acceptability.” Category 3

Section 6.2.1.1, page 20, line 19–Change words, “manual actions,” to “Appendix R Provisions.” Category 2

Section 6.2.1.1, page 20, line 21–States, “that the assessment is not expected to involve all potentially risk-significant sequences,” why not? Category 2

Section 6.2.1.1, page 20, line 21–Risk significance should not be considered until the later phases. Category 2

Section 6.2.1.1, page 20, line 21–Why not? The design should have already considered this. Category 2

Section 6.2.1.2, page 20, line 25—Move entire section on risk insights to Phase 3. There are limited comments on this section, the risk related comments are mostly provided in the later phases, not on this section since the staff believes that using risk at this point is premature. Category 2

Section 6.2.1.2.1, page 20, line 34—Does not require shutdown margins to be maintained. This does not satisfy III.G requirements to achieve and maintain hot shutdown conditions (a condition defined by tech specs). Category 2

Section 6.2.1.2.1, page 20, line 28—Expected surviving systems and trains does not mean compliance is met, but this will be of value for the SDP. Category 3

Section 6.2.1.2.1, page 21, line 6—Revise line to read, “. . . beyond the current NRC reviewed and approved design basis . . .” Category 2

Section 6.2.1.2.1, page 21, line 11—NEI 04-06 to accept feed and bleed as an acceptable method. Category 2

Section 6.2.1.2.1.1, page 21, line 19—In reactivity control does not meet requirements to achieve and maintain hot shutdown because it is “most likely” not risk significant. What is meant by the well-defined term “most likely?” Category 2

Section 6.2.1.2.1.1, page 22, line 21—In reactor pressure control again places compliance on a “core damage” criteria vice on III.G/III.L criteria and again uses the “most likely” term. Category 2

Section 6.2.1.2.1.1, page 22, line 30—RIS uses value of 20 minutes for PORV to remain energized and open. Category 2

Section 6.2.1.2.1.1, page 22, line 38—Revise sentence to read, “. . . hot shorted to ground in 20 minutes.” Category 2

Section 6.2.1.2.1.1, page 23, line 3—The spurious injection section implies that the only concerns of spurious injection deal with the PORV. Other issues not address concern spurious start of the protected pump without having the proper system conditions. If the pump starts with no suction/discharge or min flow capability (fire affected) the protected pump may become damaged and unrecoverable. If the system needs keep fill capability, which may be affected, and the pump starts water hammer is a concern. Category 2

Section 6.2.1.2.1.1, page 23, line 30—More than this is required. Category 2

Section 6.2.1.2.1.1, page 23, line 31—States that spurious operations of process monitoring instrumentation is not considered risk significant. Lack of adequate and reliable indications contributed to the risk during the Browns Ferry fire and the Three Mile Island accident. Category 2

Section 6.2.1.2.1.1, page 25, line 40 (last line)—Define TAF. Define acronyms throughout at first usage. Category 3

Section 6.2.1.2.1.2, page 26, line 9–The pressure control systems section assumes that a hot short will last no more than 10 minutes. There is insufficient data to support a 10 minute duration from the very limited tests and configurations. The RIS uses a value of 20 minutes. Category 2

Section 6.2.1.2.1.2, page 26, line 18–Momentary core uncover needs an exemption under some conditions. Category 2

Section 6.2.1.3, page 30, line 29–NEI 04-06 states that it is not necessary to examine spurious signals from fires in cabinets because the wires are single wires. In reality the wires typically come in singly at the bottom (or top) but as they traverse through the cabinet they are bundled together with tie wraps. These bundles should be treated as multi conductor cables without a jacket rather than dismissed based on NO test supporting data. Category 2

Section 6.3, page 31, line, 10–The statement regarding the actual determination of risk being in Phase III is telling. It further points to removing risk discussion from Phase I. Category 2

Section 6.3.1, page 31, line 15–Discussion of first hour events should be in Phase III, rather than Phase II. Category 2

Section 6.3.1, page 31, line 17–The bin discussions should parallel the RIS exactly. Where is the discussion of DC circuits in bin 1? Category 2

Section 6.3.1, page 31, line 24–Revise line to read, “Inter-cable failures possible between two thermoplastic cables.” Category 2

Section 6.3.2, page 32, line 7–The cable selection illustration only applies to associated circuits. Required circuits are not governed by this cable selection rule. Category 2

Section 6.3.2, page 32, lines 16 and 18–Add the word “simultaneously” to the end of the line. Category 3

Section 6.3.3, page 32, line 22, and page 33, line, 4–Damage threshold information should reference the fire SDP or use entire table from fire SDP. The single point is not as useful as the full SDP tables. Category 2

Section 6.3.5, page 33, line 15–This section’s risk information should not be used in the process until Phase III. Category 2

Section 6.4.1, page 34, line 32–Although the fire SDP only analyzes one fire area at a time, the SDP may be applied multiple times for each fire area. Any number of source target pairs may be considered for each room. Category 2

Section 6.4.2, page 37, lines 1, 2 and 6–Implies that most plants have one spurious operation in their licensing basis. The staff is only aware of a few plants that have this assumption in their licensing basis. Category 2

Section 6.4.2, page 37, line 15–Licensee’s choosing to classify items as beyond their current licensing basis should be prepared to defend this classification to the NRC. Category 3

Section 6.4.2, page 37, line 23—Issues within licensing basis, “NEI 00-01 can be used to support exemptions or deviations in areas where plant configuration clearly . . .” This is not true. Exemptions must meet 10 CFR 50.12 not a document that the NRC would not endorse. Category 2

Section 6.4.2, page 38, line 1 to 38—Issues beyond licensing basis incorrectly concludes that two spurious actuations are beyond licensing basis and then concludes that “The licensee remains in compliance with his own licensing basis and there is no significant safety benefit to be gained in pursuing additional corrective action; therefore, the health and safety of the public are preserved. The staff disagrees with this position. See 3/11/97 letter to Beedle from Collins. Category 2

Section 6.4.2, page 38, line 18—Exemptions and deviations are required where a plant is not in compliance with the rule. When licensees do not understand the rule or have differences with the staff, licensees should contact the staff to clarify their understanding of the rule, and then submit licensing actions as appropriate if the licensee is out of compliance. Category 2

Section 6.4.2, page 38, page 23—The term “long standing licensing basis” is confusing. Either a configuration is within the licensing basis or it isn’t. The age of the licensing basis is not relevant. If the licensee misunderstood their licensing basis for many years, this does not change the licensing basis. Category 2

Appendix A, page 43, Figure A-1—Replace “Necessary” with “Required” throughout. Category 2

Appendix A, page 43, Figure A-1, Phase II—Box beginning with, “Develop credible fire scenarios.” This box involves a violation and should be listed as such. Category 2

Appendix A, page 44, line 18—Replace, “multiple operators,” with, “manual actions.” Category 2

Appendix A, page 49, line 18—Explain why AOV and PORV circuits are considered Bin 2. Category 2

Appendix A, page 49, line 26, why assume no more than 4 spurious actuations. This is not in the RIS. Category 2

Appendix A, page 49—Line following the figure, why only 4 conductor to conductor shorts? Category 2

Appendix A, section A-4—Line 22, discussion of beyond licensing basis does not relate to risk significance and should be deleted. Category 2

Appendix B, Table B-1, B-2, B-3, and 5-4—Throughout, discussion of “active,” “necessary,” and “passive” are not consistent with the staff position. References to active and passive should be deleted. There are only associated circuits (which could operate or maloperate equipment not in the required train that could adversely affect the required train) and the required circuits (those circuits that affect the required train equipment). Category 2