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March 29, 2004

Chief, Rules Review and Directives Branch  
Mail Stop: T6-D59  
U. S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

1/29/04  
69 FR 4322  
19

**PROJECT NUMBER: 689**

Dear Sir:

We appreciate the opportunity to provide comments on draft NUREG-1778, *Knowledge Base for Post-Fire Safe Shutdown Analysis*, as noticed in 69 FR 4322 on January 29, 2004. General comments and recommendations are noted below. More detailed comments are provided in the enclosure.

Most significantly, we believe this document is not necessary and should not be published. The principal reasons are as follows:

- The document's purpose, as a "knowledge base," serves no useful regulatory function. Portions of the document (Chapters 5, 6, and 7, and Appendices A and B), are in fact guidance documents entirely inappropriate to the stated purpose of this NUREG.
- It is largely redundant to existing staff documents such as the fire protection regulations themselves, Regulatory Guide 1.189, Generic Letter 86-10, the fire protection SDP, the Regulatory Information Summary on associated circuit inspections, and many other regulatory guidance documents over the years. At the very least, this presents a significant configuration management issue in assuring that this document remains consistent with the other documents. An expansion of Regulatory Guide 1.189 to reflect some of the information in this NUREG would serve the purpose much better.
- The one-sided regulatory view of the deterministic regulatory positions ignores industry licensing bases built up over the years that have been reviewed by NRC inspectors. It serves to prolong the debate between recent NRC and industry positions and does not contribute to the risk-informed resolution of circuit failure issues. In many cases the term "must" is used in describing licensee actions, and this is not appropriate for a NUREG.

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- The document is repetitive in many places and provides conflicting information in others.

As a whole, this document serves no useful purpose:

- If it is intended to provide information on current NRC positions for inspector background information, Regulatory Guide 1.189 is a far better vehicle for that purpose, recognizing that that regulatory guide is applicable to a licensee only when he commits to it. A Regulatory Guide is a much more appropriate vehicle for describing regulatory positions.
- If it is intended to describe current NRC positions on deterministic circuit failure analysis, those positions are completely unnecessary given that licensees have already long since developed their licensing bases in that area. It is far more appropriate for NRC to inspect plants to their licensing bases than to expect that a NUREG now provides the standard to which licensees will be held. In cases where a licensing basis is not clear, licensees should clarify it in a way that is consistent with licensee understanding of deterministic methods at the time they were originally employed; and NEI 00-01 serves this purpose well.
- If it is intended to support a risk-informed approach to circuit failure resolution, the recently-published Regulatory Information Summary 2004-03 fulfills that purpose. Furthermore, industry devoted significant efforts to developing a document to integrate deterministic and risk-informed approaches to resolution, encouraged by NRC, that staff appears to be largely ignoring. It would be easier for NRC to approve the use of NEI 00-01, with appropriate changes if necessary, in a revision to Regulatory Guide 1.189 than issue a new product.
- If it is intended to provide a background for the developing manual actions rulemaking, it seems largely redundant to the development of interim acceptance criteria and the rulemaking itself.

We therefore recommend the following actions:

1. NRC should not publish NUREG-1778 beyond its current draft form.
2. NRC should delete references to NUREG-1778 in other regulatory guidance documents (fire protection SDP, manual actions rulemaking, and inspection guidance), and instead substitute references to other appropriate guidance documents.

U.S. Nuclear Regulatory Commission

March 29, 2004

Page 3

3. NRC should summarize those portions of draft NUREG-1778 that provide useful background information (excluding Chapters 5, 6, 7, and Appendices A and B) and include them in a revision to Regulatory Guide 1.189 or a Regulatory Information Summary.
4. NRC should approve, with appropriate changes as necessary, the use of NEI 00-01 as a method for resolving circuit failure issues. As noted in a letter from John Hannon to Alex Marion dated December 16, 2002, "The proper vehicle for doing so [endorsing NEI 00-01] is a regulatory guide. If you believe that it would be useful to have NRC staff develop a regulatory guide that endorses NEI 00-01 with certain exceptions, please advise us accordingly."

Please contact me ([am@nei.org](mailto:am@nei.org) or 202-739-8080) or Fred Emerson ([fae@nei.org](mailto:fae@nei.org) or 202-739-8086) with questions about this information.

Sincerely,



Alexander Marion

Enclosure

c: Mr. John Hannon, NRC  
Mr. Sunil Weerakkody, NRC  
Mr. Mark Salley, NRC

## Industry Comments on Draft NUREG-1778

This enclosure contains detailed comments on draft NUREG-1778, *Knowledge Base for Post-Fire Safe-Shutdown Analysis*. The presentation of these comments does not change the overall industry conclusion that this document should not be published or used as a reference for other NRC guidance documents.

1. Chapter 2: The purpose of this chapter is to define the terminology used elsewhere in NUREG-1778. A NUREG should not define terms inconsistently with recognized standards or regulatory guidance. Therefore, all definitions should be referenced to established sources. This will avoid the appearance of new interpretations being provided in this NUREG.
2. Page 2-2, definition of "any and all/one at a time:" This definition is not consistent with the longstanding industry interpretation of this term based on Generic Letter 86-10. The industry definition of this term should be included for information. See also Comment 41.
3. Page 2-12, definition of "free of fire damage:" In discussions with the BWROG several years ago, staff members agreed that this term could include the use of manual actions. This clarification should be provided.
4. Page 3-14, Section 3-5: The staff indicates that the tests did not fully evaluate the potential for fire to cause high impedance faults. In fact the results of the tests proved very useful in addressing this issue, and led to the definitive treatment of the issue in NEI 00-01 Appendix B.2.
5. Page 3-14, Footnote 9: EPRI Report 1003326 should also be referenced as well as NEI 00-01.
6. Pages 3-14 and 15: Stating the results of the EPRI expert elicitation in terms of quotes from individual experts is not appropriate, since it presents selective opinions. The results and conclusions of the report should be stated instead.
7. Pages 4-10 and 4-11: The definition of "III.G.1, III.G.2, and III.G.3 fire areas" appears to be new guidance or a new interpretation of the regulations, and is therefore inappropriate for inclusion in a "knowledge base" document. Industry understands that the III.G.1, III.G.2, and III.G.3 criteria provide successive methods for protecting necessary cables and/or equipment that are subject to fire damage, however this does not result in the narrow classification of fire areas and the NUREG describes. In practice, fire areas commonly utilize elements of more than one protection scheme (ref NEI letter

to NRC dated 1/27/04 "Comments on Draft Criteria for Determining Feasibility of Manual Actions to Achieve Post-Fire Safe Shutdown, 68 FR 66501 and 68 FR 69730")

8. Page 4-11: Referencing Revision G of the BWROG report is not appropriate. In a chapter on regulatory requirements, the appropriate reference should be a regulatory guidance document.
9. Page 4-19, Section 4.5.5, second paragraph: The use of the term "safety evaluation" in the first sentence is confusing. The term refers in this context to a licensee evaluation rather than a formal NRC safety evaluation, and should be clarified.
10. Page 4-20, Section 4.5.5, last paragraph: This paragraph provides guidance that is inappropriate for inclusion in a "knowledge base" document.
11. Chapter 5: This entire chapter provides guidance on safe shutdown analysis that is inappropriate for inclusion in a "knowledge base" document. This is especially true in the statement in Section 5.4: "The following fundamental principles and assumptions establish the 'ground rules' for performing an acceptable [emphasis added] SSA." A NUREG should not prescribe acceptable methods for safe shutdown analysis.
12. Page 5-5, Section 5.4, **Shutdown Functions, Systems and Equipment:** This section states that IN 84-09 has made in III.L applicable to all shutdown methods under III.G. This issue was discussed at length between the BWROG and the NRC, with the final resolution that an Information Notice cannot modify the scope or applicability of a Regulation (making III.L universally applicable to all III.G sections, vice just applicable to III.G.3 as currently written in the regulation). During discussions with the BWROG, NRC agreed that IN 84-09 cannot legally modify the scope of III.L to apply to more than III.G.3. This is described in NRC Letter to the BWROG dated 11/28/2000 (ML003772256)

**"Applicability of III.L. Requirements.** The staff considered whether licensees who designate SRV/LPS as a redundant means of post-fire safe shutdown need to meet the Appendix R, Section III.L requirement that "reactor coolant process variables be maintained within those predicted for a loss of normal a.c. power," and other III.L performance criteria. The staff, after consultation with OGC, concluded that III.L performance criteria are applicable only to alternative or dedicated shutdown capability, and need not be met for redundant post-fire safe shutdown capability."

13. Page 5-6, Section 5.4, **Use of Low Pressure Injection Systems at BWRs:** This section paraphrases portions of NRC letter to the BWROG ML003772256 incorrectly.
14. Page 5-7, Section 5.4, **Redundant vs. Alternative Shutdown Systems and Equipment:** This section discusses the "two normal safe-shutdown trains". The concept of "two shutdown trains" is not reflective of most plant designs, where numerous strategies for plant shutdown exist.
15. Page 5-8, Section 5.5: The definition of Redundant Shutdown Capability is inconsistent with past licensee practice and NRC approvals. III.G.2 criteria are applied for **necessary** circuits (not all circuits), when other mitigating options are not available.
16. Page 5-11, Section 5.7.1: This section should not appear in this NUREG since it duplicates information from the NRC documents on interim acceptance criteria for manual actions as well as the rulemaking itself.
17. Page 5-11, Section 5.7.1, last paragraph, last sentence: This NUREG should not provide any judgment on level of protection required by the regulation.
18. Page 5-11, Section 5.7.1, third paragraph: The interim acceptance criteria do not explicitly require thermal-hydraulic analyses as indicated in this paragraph. This is an example of inconsistency with other regulatory guidance.
19. Pages 5-11 through 5-13: The listing of criteria from the March 2003 inspection procedure is not as current as that in 68 FR 66501. This is an example of inconsistency with other regulatory guidance.
20. Page 5-13, Section 5.7.2: Routine operator actions that can be carried out easily should be allowable even if they are considered repairs.
21. Chapter 6: This entire chapter provides a process for safe shutdown analysis that is inappropriate for inclusion in a "knowledge base" document. The word "must" is repeatedly and inappropriately used in this chapter. Also, the term "guidance" is explicitly used on Page 6-20 to describe cable selection. A NUREG should not prescribe acceptable methods for safe shutdown analysis. This has been done in a comprehensive manner in NEI 00-01, based on existing plant licensing bases.

22. Pages 6-18 and 6-19, Section 6.4.1.3: This section restates positions from Regulatory Guide 1.189. This is unnecessary; the Reg Guide should not need restatement in a NUREG.
23. Page 6-22, last sentence: The phrase "suitably comprehensive" is stated to mean examination of "any circuit /cable in the fire area that could adversely affect the post-fire safe shutdown capability." This is inconsistent with the current RIS that provides a risk-informed approach for examining associated circuits.
24. Page 6-26: The inclusion of a section on multiple high impedance faults is inconsistent with the low priority established by NEI 00-01 and the recent RIS for these types of faults.
25. Page 6-31, first paragraph: The NRC focus on high consequence events needs also to consider the risk element. High consequence events that have an extremely low probability (such as 3-phase spurious actuations in power cable) have already been noted by staff in the recent RIS as not requiring consideration except for certain cases where this is explicitly required.
26. Page 6-31, second paragraph: The staff states that it is "imperative" to evaluate "all plant systems" to identify potential spurious components of concern. This is inconsistent with the guidance in the current RIS that would focus on spurious actuations of greater risk significance.
27. Page 6-33, first line: The expectation that the exposed cables will be damaged is not consistent with a risk-informed approach. One of the staff concerns about NEI 00-01 was that the deterministic methods were not sufficiently risk-informed by the EPRI/NEI test results, and yet no attempt has been made to apply those results here.
28. Pages 6-33 through 6-36, "Criteria/Assumptions:" Rather than constituting a "knowledge base," these criteria constitute new guidance on which circuit failures to consider that is inappropriate for this NUREG. The criteria have the general effect of promulgating new staff positions, without appropriate regulatory analysis, that were not in effect at the time that licensees developed their safe shutdown analyses. They do not consider licensee interpretations of the regulations that were based on the regulatory guidance existing at the time.

A few of these criteria are risk-informed; most are not. Many of those that are not risk-informed are inconsistent with current risk-informed criteria. One example is "There is no limit on the number of circuit/cable faults that may occur as a result of fire damage in a given fire area." Another is the criterion on open circuits.

These criteria should be removed.

29. Page 6-41, Section 6.4.7, last paragraph. Tabulation of circuit evaluations in a particular format has the general effect of promulgating a new staff position for documentation of a safe shutdown analysis.
30. Page 6-42, Section 6.4.8: Paragraphs 2 and 3 constitute introductory material that should be placed at the beginning of Chapter 6.
31. Page 6-43: Figure 6.16 is redundant to Figure 6-3, and the two are not entirely consistent.
32. Page 6-44: The information on this page is redundant to an earlier discussion of the content of Appendix R Section III.G.
33. Chapter 7: As with Chapters 5 and 6, this chapter provides new guidance rather than a "knowledge base" and is therefore inappropriate. Examples on page 7-3 include the use of "must" and "ensure."
34. Page 8-9, paragraph beginning "Before proceeding:" Likelihood estimates are correctly stated to be conditional upon cable damage. However, nowhere in NUREG-1778 is the essential point reflected that the likelihood of obtaining cable damage may be very low, or the time to achieve cable damage is likely to be long enough (at least for thermoset and armored cable) such that mitigative measures will be successful in preventing cable damage. Without this clarification, the likelihood of spurious actuations may appear to be much higher than it really is.
35. Page 8-10: Information on the NEI/EPRI cable tests is presented, and it is stated that caution must be exercised in extrapolating the results to any specific application. While the latter statement is true, it did not prevent NRC from making extensive use of the test results to define associated circuit areas of risk significance in the recent RIS.



36. Page 8-10: The concern about gathering data in an atypical room does not change the essential correlation of damage and damage time with temperature. The fact that some damage times were in excess of an hour had more to do with the cable material (thermoset or armored) than with underventilated conditions.
37. Page 8-10: While it is true that the control circuit used in the test may not represent all plant configurations, it was chosen to reflect a conservative but representative configuration. It should be considered fairly typical even if not fully representative. NRC considered it typical enough to consider in its associated circuit RIS the test conclusions related to current limiting devices and their impact on spurious actuations.
38. Page 8-11: The “uncertainty” of applying AC test results to DC circuits is inconsistent with statements by Sandia personnel involved in the test to the effect that the test results would not likely be significantly different for DC circuits.
39. Page 8-11, last paragraph: If combinatorial models have not been assessed for validity, then presenting a largely theoretical argument in Section 8.5.2 serves no purpose.
40. Page 8-14, Section 8.5.4, first paragraph: Measurements taken during the EPRI/NEI test indicate that there is a significant length of time before any significant insulation resistance is lost.
41. Page 8-14, Section 8.5.4, third paragraph: In this paragraph and others on later pages, NRC states that operators may be misled by erroneous instrument readings caused by fire-induced circuit malfunctions. In fact, operators are likely to recognize malfunctioning readings and will not rely on them to make decisions.
42. Page 8-17, second paragraph, third sentence: If the data on inter-cable shorting is not sufficient to provide conditional likelihoods, then why are these likelihoods to be used in the SDP?
43. Page 8-22, first full paragraph: The fact that multiple high impedance faults are almost universally considered low risk indicates that this paragraph is not necessary.
44. Page 8-23, fourth paragraph: Time is also a factor in preventing the spurious actuation in the first place.

45. Page 8-26, first sentence: The statement “The assumption of sequential faults is, in essence, the basis most commonly used for current fire safe-shutdown analyses, and is the so-called ‘any and all, one at a time’ approach....” is not true. First, the licensee interpretation of “any and all, one at a time” does not consider sequential/cumulative circuit failures because GL 86-10 did not require that. Therefore, it is not reflected in most safe shutdown analyses.
46. Page 8-27, paragraph beginning “The importance..”: As discussed in Comment 37, operators are not likely to be misled by erroneous indications. This comment also applies to Page 8-29 fourth paragraph.
47. Page 8-28, Instrument Loop Fire Testing, first bullet: The effect of thermal mass is not adequately discussed in NUREG-1778. The EPRI/NEI tests demonstrated that increased thermal mass (several cable layers in a tray) can significantly lengthen time to damage.
48. Page 8-31, first full paragraph: This paragraph is inconsistent with current risk insights to the effect that no more than two cables at a time should be considered for spurious actuations.
49. Page 8-31, Section 8.7: This section is not necessary. It has been clearly understood for several years that spurious actuations are possible.
50. Page 9-8: References to NEI 00-01 Revisions C and D should be replaced by a reference to NEI 00-01 Revision 0. This revision is substantially upgraded from Revisions C and D. Any information in the NUREG referenced to NEI 00-01 should be checked to assure that the reference still applies to Revision 0.
51. Page A-1: This Appendix provides guidance and is inappropriate for a “knowledge base” document.
52. Page A-4 and A-5, Section A.2: The methods for resolving identified vulnerabilities do not consider risk significance, and are therefore inconsistent with NEI 00-01 and the fire protection SDP currently being revised.
53. Pages A-5 and A-6, Section A.2.1: This section on operator manual actions is inconsistent with the current interim acceptance criteria. This section should be deleted.

54. Pages A-7 through A-9: The examples of “successful implementation” of circuit vulnerabilities by licensees are entirely inappropriate and should be deleted. First, the situations presented involve very plant-specific licensing bases that are not widely applicable. Secondly, the examples do not demonstrate the use of risk significance, using only deterministic assumptions and solutions. It is entirely possible that risk significance determinations could have shown that more cost-effective solutions were possible.
55. Appendix B: This appendix serves only to restate the same NRC positions on deterministic circuit analysis that led to this becoming an issue in 1997. These positions, and the industry differences with them, are well understood and do not bear repeating. Further, this appendix is entirely inconsistent with risk-informed methods for generic issue resolution. It should be deleted.