

November 24, 2010

MEMORANDUM TO: Alexander R. Klein, Chief
Fire Protection Branch
Division of Risk Assessment
Office of Nuclear Reactor Regulation

FROM: Daniel M. Frumkin, Team Leader **/RA/**
Fire Protection Branch
Division of Risk Assessment
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF OCTOBER 27, 2010, PUBLIC MEETING OF THE
NUCLEAR REGULATORY COMMISSION TO DISCUSS FIRE
PROTECTION CIRCUIT FAILURES

On October 27, 2010, the U.S. Nuclear Regulatory Commission (NRC) held a public meeting with industry stakeholders to discuss fire protection issues related to fire induced circuit failures. The main topics discussed were components classification of required for hot shutdown and/or important to safe shutdown, the use of operator manual actions, the use of fire modeling, circuit failure criteria, the use of existing 10 CFR 50, Appendix R, III.G.3 licensing basis and fire protection triennial inspection procedure IP 71111.05T.

A list of participants is included in Enclosure 1. Industry slides from the meeting are included in Enclosure 2.

The following is a breakdown of the discussion and actions from the meeting. The discussion below focuses on where there were deviations from the information presented in the slide presentations. The slide number from Enclosure 2 is provided as context for the following bullets.

General Comments

Slide 2 – The NRC staff requested clarification on the inclusion of Inspection Procedure (IP) 71111.05T, the triennial fire protection inspection procedure. NEI indicated that they want to provide input on a number of areas of concern. The NRC staff said during the meeting that since the NRC did not notice the meeting to discuss that topic that the NRC wouldn't discuss details of the procedure.

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Slide 5 – Industry representatives indicated that one change to NEI 00-01, Revision 3, was to consider heating, ventilation and air conditioning (HVAC) equipment as important to safe shutdown. Mr. Gorman stated that this change was to make NEI 00-01, consistent with Regulatory Guide (RG) 1.189, Revision 2, “Fire Protection for Nuclear Power Plants.”

Slide 6 – In response to industry oral comments to the contrary, NRC staff stated that the protection of important to safe shutdown equipment is a regulatory requirement, and failure to protect safe shutdown capability could be a violation of 10 CFR 50, Appendix R, Paragraph III.G.1. Industry stakeholders stated that operator manual actions were available, without prior NRC approval, to achieve safe shutdown for components important to safety under III.G.1.

Slide 7 – The NRC staff considered the discussion of the treatment of boiling water reactor’s (BWR’s) anticipated transient without scram (ATWS) to be beyond the scope of the current guidance as described in RG 1.189, Revision 2. The staff indicated that if licensees use NEI 00-01, Revision 3, proposed treatment of BWR ATWS, a thorough technical analysis would need to be performed on a plant specific basis and that the application of the evaluation must be consistent with a plant’s licensing basis. The NRC staff further stated that clarifications such as this, if not allowed by a plant’s licensing basis, would need to be approved in a formal manner and not based on meeting discussions.

Slide 11 – Industry representatives mentioned that risk-informed tools may also be used. Upon questions from the NRC staff the industry representatives indicated that risk-informed tools could be used to perform analyses for conditions or configurations that were beyond a plant’s licensing basis. Industry representatives indicated they would provide further information on the use of risk-informed tools outside of 10 CFR 50.48(c) – NFPA 805 and risk-informed license amendments.

Slide 12 – NRC staff indicated that use of the clarification on this slide would need to be documented. Industry stakeholders stated that they will continue to follow the NRC guidance published in Generic Letter 86-10 and in Regulatory Guide 1.189, which states that two (2) proper polarity hot shorts in ungrounded direct current (DC) circuits only need to be considered for high/low pressure interfaces components, unless the conductors are within the same multi-conductor cable.

Slides 14 to 17 – Industry representatives indicated that “latching” in the context of these slides may not need clarification. Industry representatives indicated that use of the information on slide 17 would be on a case-by-case basis, and be appropriately documented.

Slide 20 – Industry representatives stated that the current guidance in RG 1.189, Revision 2, only applies to the simplification for multiple high impedance faults (MHIFs) to 10 CFR 50, Appendix R, Paragraph III.G.3 areas. The NRC staff understands that it is an industry concern that guidance does not allow simplification for MHIF for 10 CFR 50, Appendix R, Paragraph III.G.2 areas. The NRC staff will consider revising the guidance for MHIFs to allow for the simplification during a future revision of RG 1.189.

Slide 21 – Industry representatives provided their interpretation of the application of 10 CFR 50, Appendix R, Paragraph III.G.3. The NRC staff stressed that the use of risk-assessment is not appropriate for deterministic compliance, even with III.G.3 (see comments on Slide 11). The staff further stated that licensees should make sure that their assumptions or plant

configurations have not changed in a way that invalidates the approved method of post fire safe shutdown as described in a safety evaluation report. Also, the staff indicated that new information should be considered as it becomes available, especially information related to circuit analysis and safe shutdown. Industry stakeholders stated that they understand that the licensees may apply feasible and reliable operator manual actions for mitigating risk significant multiple spurious operations scenarios for alternate and dedicated shutdown fire areas (III.G.3).

Slide 23 – The NRC staff stated that some of the information in NEI 00-01, Draft Revision 3, did not have a thorough technical basis. The staff provided the following two examples, exclusion of water hammer and crediting instrument cable shielding to prevent hot shorts. NEI 00-01, Draft Revision 3, suggests these clarifications but does not provide a robust justification. The NRC staff cautioned industry stakeholders regarding using conclusions from NEI 00-01, Draft Revision 3, without appropriate technical justification and using NEI 00-01, Draft Revision 3, outside of a plant's approved licensing basis.

It is the NRC staff position that sufficient technical information is available in Regulatory Guide 1.189, Revision 2 for licensees to address circuit failure issues. Future technical discussion on fire-induced circuit failures will occur in the context of a revision of Regulatory Guide 1.189. The NRC will consider revising Regulatory Guide 1.189, and endorse portions of NEI 00-01, as appropriate, as part of a future regulatory guide update.

This meeting did not decide any Agency or staff positions, and it did not interpret regulations other than what is currently established by guidance or staff position.

There were no questions from members of the public in attendance at the meeting.

Enclosures:
As stated

configurations have not changed in a way that invalidates the approved method of post fire safe shutdown as described in a safety evaluation report. Also, the staff indicated that new information should be considered as it becomes available, especially information related to circuit analysis and safe shutdown. Industry stakeholders stated that they understand that the licensees may apply feasible and reliable operator manual actions for mitigating risk significant multiple spurious operations scenarios for alternate and dedicated shutdown fire areas (III.G.3).

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Enclosures:
As Stated

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**NRC PUBLIC FIRE PROTECTION CIRCUIT FAILURES MEETING
LIST OF ATTENDEES**

October 27, 2010

<u>Name</u>	<u>Organization</u>	<u>Name</u>	<u>Organization</u>
Daniel Frumkin	NRR/DRA	John Butler	NEI
Harry Barrett	NRR/DRA	Tom Basso	NEI
Gary Cooper	NRR/DRA	Tom Gorman	PPL
Charles Moulton	NRR/DRA	Randy Jamison	Seabrook
Gabe Taylor	RES/DRA	Chris Pragman	Exelon
Phil Qualls	NRR/AFP	Steve Queen	Exelon
John Rogge*	Region I	Andy Ratchford	KGRS
Gerry Wiseman*	Region II	Bijan Najafi	SAIC
Norman Merriweather*	Region II	Ashley Mossa	Westinghouse
Neil O'Keefe	Region IV	Mark Jeffers	Nexus
		Jack Martin	Dominion
		Jim Limes	Nexus
		Brenda Simril	TVA
		Nancy Chapman	Bechtel Power
		Ted Koser	STARS
		Glen Stewart	Exelon
		Deann Raleigh	SCIENTECH
		Andy Ratchford	KGRS
		Mark Humphrey	Exelon
		Jack Martin*	Dominion

* Participated via phone or video conference

Slide 1

NRC Meeting
October 27, 2010
NEI 00-01 Revision 3

NEI Fire-Induced Circuit Failure Issues Task Force

Slide 2

Agenda

- Reason for Meeting
- Areas Requiring Clarifications:
 - Classification [Section 3.1 & Appendix H]
 - Required for Hot Shutdown
 - Important to Safe Shutdown Components
 - Use of Operator Manual Actions
 - Use of fire modeling
 - Circuit Failure Criteria [Section 3.5.1.1 & 3.5.1.2]
 - Two Cables – Latching/Non-Latching
 - DC Circuits
 - MHIF [Appendix B Table B1.0]
 - Use of III.G.3 Licensing Basis
- IP 71111.05T , “Fire Protection (Triennial)”
- Conclusion

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Enclosure 2

Slide 3

Reason for Meeting

- May 2009 – EGM 09-002
- June 2009 – NEI 00-01 Rev. 2
- Nov 2009 – RG 1.189
- Feb 2010 – MSO Workshop
- Apr 2010 – BWR MSO Workshop
- May 2, 2010 – MSO Identification
- May 13, 2010 – NEI/NRC Public Meeting
- July 2010 – MSO Resolution Workshop
- Sept 2010 – FPIF and NEI 00-01 Rev. 3 draft

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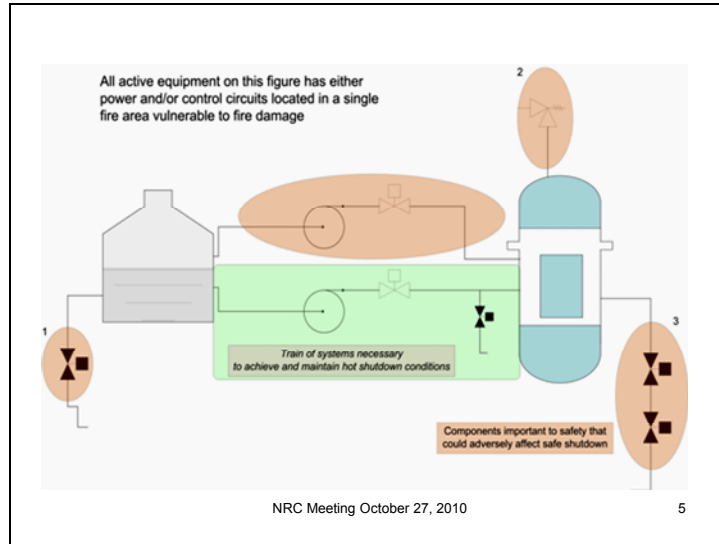
Slide 4

Reason for Meeting

- To Clarify NRC Adjustments to NEI 00-01 Revision 2 in Regulatory Guide 1.189 Revision 2.
 - To Assure Alignment between Industry & NRC.
- To Obtain NRC Concurrence on the Industry Interpretations of these adjustments.
 - Agreed upon Industry Interpretations will be included in NEI 00-01 Revision 3 and used by the Industry for Post-Fire Safe Shutdown Analysis and MSO Resolution.

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Slide 5



Slide 6

Classification (III.G.1/III.G.2)

[Section 3.1 & Appendix H]

- Classifications not applicable to III.G.3 (RG 1.189 Section 5.3.1)
- Required for Hot Shutdown
 - A component performing a post-fire safe shutdown function [i.e. achieve & maintain hot shutdown] on the success path being credited for achieving and maintaining post-fire safe shutdown in the fire area under evaluation.
 - The components required to perform these functions are classified as required for hot shutdown components. These components are necessary and sufficient to perform the required safe shutdown functions in the absence of fire damage.

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Slide 7

Classification (III.G.1/III.G.2)
[Section 3.1 & Appendix H]

- There are some exceptions to these criteria:
 - The reactivity control safe shutdown function for a BWR can be accomplished by aligning the fire safe shutdown procedures with the emergency operating procedures developed to address an ATWS condition. Through this procedural alignment, the operator manual actions, i.e. removing power to RPS or venting the instrument air header to effect the scram, used in the emergency operating procedures to address an ATWS condition may be used to accomplish the reactivity control safe shutdown function. This criteria is considered to be an exception since it allows the use of an operator manual action for accomplishing a required for hot shutdown function.
 - NRC approval of this Operator Manual Action by individual licensees is not required.
 - Use of this type of exception by PWRs is under evaluation.

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Slide 8

Classification (III.G.1/III.G.2)
[Section 3.1 & Appendix H]

- Exceptions [continued]
 - All flow diversions off of the main flow path for the systems performing the required for safe shutdown functions are initially classified as required for hot shutdown. This criterion is considered an exception since it involves consideration of fire-induced circuit damage in classifying components as required for hot shutdown. A subsequent evaluation using the criteria from Appendix H can be used to re-classify the flow diversion component as important to safe shutdown.

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Slide 9

Classification (III.G.1/III.G.2)
[Section 3.1 & Appendix H]

- Exceptions [continued]
 - All breakers for associated circuits of concern - common power supply are to be coordinated. This circuit protection function of a breaker that is powered from an electrical bus powering a required for hot shutdown component, is classified as required for hot shutdown. This criterion is considered an exception to the general classification criteria in that it involves consideration of fire damage to circuitry. In this case the fire damage is to the power cable connected to the coordinated breaker.

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Slide 10

Classification (III.G.1/III.G.2)
[Section 3.1 & Appendix H]

- Important to Safe Shutdown
 - The components not necessary to complete the required safe shutdown functions, but which could be impacted by the fire and cause a subsequent impact to the required safe shutdown components are classified as important to safe shutdown components.

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Slide 11

Classification (III.G.1/III.G.2)

[Section 3.1, Appendix E & H]

- Important to Safe Shutdown
 - It is acceptable to use an Operator Manual Action to mitigate the effects of fire-induced damage to components classified as important to safe shutdown.
 - NRC approval of these Operator Manual Actions is not required. [NEI 00-01 Appendix E]
 - Fire Modeling may also be used to mitigate the effects of fire-induced damage to components classified as important to safe shutdown.

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Slide 12

Circuit Failure Criteria

[Section 3.5.1 & 3.5.1.1]

- The criteria apply to both Hi/Lo and non-Hi/Lo Pressure Interface Components. Additionally, for only Hi/Lo Pressure Interface Components the circuit failures described in NRC Generic Letter 86-10 Paragraph 5.3.1 apply. For non-Hi/Lo Pressure Interface Components, the circuit failures described in NRC Generic Letter 86-10 Paragraph 5.3.1 do not apply nor should the criteria presented in Section 3.5.1 be construed to require the application of the circuit failures described in NRC Generic Letter 86-10 Paragraph 5.3.1 and Regulatory Guide 1.189, Section 5.4.2, i.e. two (2) hot shorts of the proper polarity for ungrounded dc circuits and three (3) phase hot shorts for ac power feeds.

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Slide 13

Circuit Failure Criteria

[Section 3.5.1 & 3.5.1.1]

- The effect of ground fault source equivalent hot shorts on ungrounded circuits is bounded by the effect of an inter-cable hot short resulting from the interaction of a source and target conductor as depicted in Figure 3.5.1(b)(3-2) & (3-3).
 - Allows the use of running circuits in dedicated raceway with no other conductors with the potential to cause the inter-cable hot short to avoid spurious operations.

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Slide 14

Circuit Failure Criteria

[Section 3.5.1 & 3.5.1.1]

- “Seal-in or latched” as it is used in Revision 3 refers to the effect of an individual fire-induced circuit failure type. In general, fire-induced open circuits and shorts-to-ground would be classified as latched-in conditions. This is true since once a fire-induced open circuit or a short-to-ground occurs additional fire-induced damage will not alter the impact of the initial fire-induced damage on the circuit’s performance. Conversely, fire-induced hot shorts are classified as non-latching.

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Circuit Failure Criteria

[Section 3.5.1 & 3.5.1.1]

- If any aspect of the fire-induced failures required to cause the spurious operation of an important to safe shutdown component can be classified as non-sealed-in or non-latched, then the circuit failure analysis for the affected circuits is governed by the consideration of two (2) cables as outlined in NRC Regulatory Guide 1.189 Revision 2 Section 5.3.

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Latching Conditions
[The # of circuit failures is not limited]

Non-Latching Conditions
[See Note 5]

Notes:

1. The circuit diagram shows the electrical connections of the component. The fire-induced failures are shown in red. The circuit is assumed to be in a state of normal operation.
2. The circuit diagram shows the electrical connections of the component. The fire-induced failures are shown in red. The circuit is assumed to be in a state of normal operation.
3. The circuit diagram shows the electrical connections of the component. The fire-induced failures are shown in red. The circuit is assumed to be in a state of normal operation.
4. The circuit diagram shows the electrical connections of the component. The fire-induced failures are shown in red. The circuit is assumed to be in a state of normal operation.
5. The circuit diagram shows the electrical connections of the component. The fire-induced failures are shown in red. The circuit is assumed to be in a state of normal operation.

Examples of Latched or Sealed-in & non-Latched or non-Sealed-in Conditions
Figure 3.5.1

Slide 17

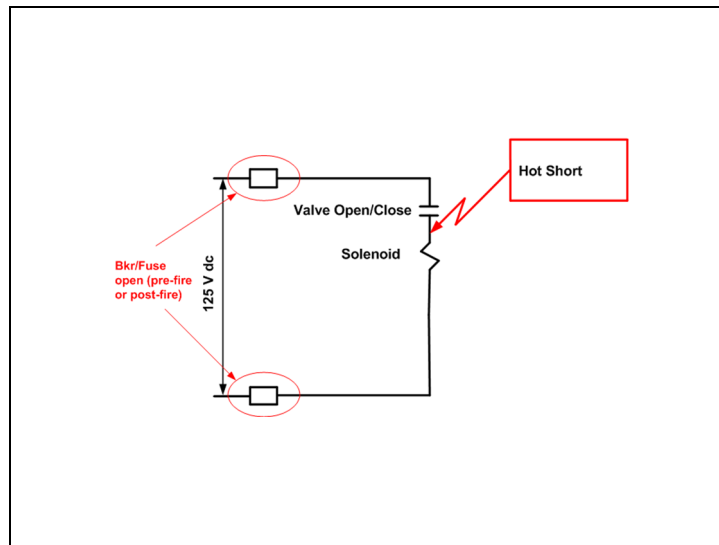
Circuit Failure Criteria

[Section 3.5.1 & 3.5.1.1]

- Example on the next slide:
 - Hot Short No. 1 (Non-Hi/Lo Interface)
 - Fuses in-place – hot short gets same consideration as Figure 3.5.2-5, i.e. assume from same source.
 - Fuses removed post-fire – for solenoids valves the effect of the hot short is reversed.
 - Fuses removed pre-operation – spurious operation prevented - equal to Figure 3.5.1(b)(3-1).

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Slide 18



Slide 19

Circuit Failure Criteria [Section 3.5.1.2]

- Required Number of Failures
- Reviewing MSOs on Generic List
 - NEI 00-01 Section 3.5.1.2
 - When reviewing the MSOs on the Generic List in Appendix G or when considering the need to add new plant specific MSOs into the list of MSOs required to be analyzed in the Plant Specific Post-Fire Safe Shutdown Analysis, if the MSO Scenario involves more than a total of four components or if the MSO scenario requires consideration of sequentially selected cable faults, i.e. involving more than four hot shorts, at a prescribed time, in a prescribed sequence in order for the postulated MSO Scenario to occur, then this is considered to be beyond the required design basis for MSOs. [Note: When considering the affects of additional non-credited loads being added onto credited electrical components, such as diesel generators and busses, it is acceptable to evaluate the condition for the four (4) worse-case loads being added.]
 - Each spuriously operated component must be as a result of a hot short on a separate conductor.
 - Some conductors may be in the same cable.

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Circuit Failure Criteria [Appendix B Table B.1-0]

- Multiple High Impedance Faults (MHIF)
 - The evaluation of MHIF's is not required for post-fire safe shutdown analysis under the requirements of Appendix R Sections III.G.1, III.G.2 or III.G.3/III.L.

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Slide 21

Use of III.G.3 Licensing Basis

- If the Licensee has a NRC SER for III.G.3, the MSO process neither applies to nor alters the licensing bases for those areas. [NEI 00-01 Appendix D] [RG 1.189, Section 5.4.1]
- The Licensee, however, should evaluate the applicable MSO's using a risk analysis to assure that a risk significant condition is not overlooked. The Licensee may use any of the available tools to disposition the MSO, including Focused-scope Fire PRA or qualitative assessments of risk without prior NRC approval.
- If the Licensee does not have a NRC SER for the III.G.3 area, the MSO's must be evaluated in a manner similar to that for a III.G.1/2 area.

Slide 22

IP 71111.05T "Fire Protection"

- Enclosure 3 - Fire Protection Program Changes
 - Establishes new requirements that conflict with GL 86-10 and 88-12
- RIS 2005-30 Post-fire SSD Circuit
 - ML092580570 – RIS 2005-30 is no longer current staff position.
- B.5.b Inspection Community of Practice
 - Hyperlink in IP

Slide 23

Conclusion

- NEI will provide minutes of this meeting to the NRC.
- The minutes of this meeting will document the clarifications agreed to in this meeting.
- The agreed upon adjustments will be included in NEI 00-01 Revision 3.
- NEI 00-01 Revision 3 will be used by the industry for post-fire safe shutdown analysis and MSO Resolution.
- NEI 00-01 Rev 3 [Draft] is out for review
- Comments are due November 5, 2010
- NEI 00-01 Rev 3 is to be issued in 2010
- NEI will issue comments on IP 71111.05T