# Response to Public Comments on Draft Regulatory Guide DG-1359
# "Fire Protection for Nuclear Power Plants"
# Proposed Revision 4 of Regulatory Guide (RG) 1.189

On December 16, 2020, the NRC published a notice in the *Federal Register* (85 FR 73089) that Draft Regulatory Guide, DG-1359 (Proposed Revision 4 of RG 1.189), was available for public comment. The Public Comment period ended on December 31, 2020. The NRC received comments from the organizations listed below. The NRC has combined the comments and NRC staff responses in the following table.

Comments were received from the following:


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| Commenter | Section of DG-1359 | Specific Comment | NRC Resolution |
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| Nuclear Energy Institute | Section A, Page 4 (also Pages 20-21) | NUREG/CR-7135 CARMEN-FIRE is newly added to this section to discuss acceptable options for compensatory measures. This is not appropriate, as this is not an official staff position. Industry had substantial comments on NUREG/CR-7135, many of which were not resolved due to the document being a research report, and not official agency position.<br><br><u>Proposed resolution:</u><br>Remove the references to NUREG/CR-7135. | The NRC staff agrees with this comment.<br><br>The NRC staff revised DG-1359 to delete NUREG/CR-7135 CARMEN-FIRE from the guidance list in Section A (page 4), to delete the paragraph on the NUREG/CR-7135 in Section 1.5, and to delete it from the references list. |

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| Nuclear Energy Institute | Section B, Page 9 (also Ref. 27, Page 115) | The draft regulatory guide references the 2016 version of NEI 00-01, Revision 4, instead of the 2019 version.<br><br>Proposed resolution:<br>Revise to refer to the December 2019 version (ML19351D276) | The NRC staff agrees with this comment and revised DG-1359 to refer to the December 2019 version of NEI 00-04, Revision 4, in Section B (page 9) and the list of references. |
| Nuclear Energy Institute | Section 1.6.4.2, Page 25 | It is unclear what "broadened training for firefighting within buildings" is intended to convey.<br><br>Proposed resolution:<br>Revise to provide clarity to this phrase. | The NRC staff disagrees with this comment. This text was included in the initial issuance of Regulatory Guide 1.189 in 2001, and in the regulatory guide's predecessor, Branch Technical Position (BTP) CMEB 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants," published in 1981.<br><br>The NRC staff made no changes to DG-1359 as a result of this comment. |
| Nuclear Energy Institute | Section 1.7.6, Page 28 | "…document or identify items…" does not fully clarify the intent.<br><br>Proposed resolution:<br>Revise to "…identify and document items…" | The NRC staff agrees with this comment and made the suggested change to DG-1359. |

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| Nuclear Energy Institute | Section 1.8.1.2, Page 33 | This section defines "not adversely affect safe shutdown" differently than GL 86-10 and GL 88-12 did, by inserting new language about "sufficient safety margins" that did not exist in GL 86-10 and GL 88-12.<br><br>Existing licensees are bound by the meaning of the words "not adversely affect safe shutdown" that were understood at the time of their adoption of their FP license conditions, and not bound by the new words here.<br><br>Proposed resolution:<br>Revise the language to the previous version for consistency with GL 86-10 and GL 88-12. | The NRC staff partially agrees and partially disagrees with this comment. The NRC staff agrees that licensees are bound by their fire protection license condition, and not subsequent guidance that licensees have not committed to follow or have been backfitted. Regulatory Guides provide one acceptable method to meet the NRC regulations, but other methods may be proposed.<br><br>The cited text is identical to that included in Regulatory Guide 1.189 since Revision 1, which was published in 2007. The cited language has not prevented successful use of RG 1.189 by the industry and the staff.<br><br>The NRC staff made no changes to DG-1359 as a result of this comment. |
| Nuclear Energy Institute | Section 2.2.3, Page 43 | In the second paragraph, the use of the phrase "Procedures and practices" is not consistent with language used in the document.<br><br>Proposed resolution:<br>Replace with "administrative controls" | The NRC staff agrees with this comment and made the suggested change to DG-1359. |
| Nuclear Energy Institute | Section 2.4.b, Page 44 | The use of "…where systems are disarmed" is not sufficiently comprehensive.<br><br>Proposed resolution:<br>Revise to "…where systems are disarmed or impaired" | The NRC staff agrees with this comment and made the suggested change to DG-1359. |

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| Nuclear Energy Institute | Section 3.5.1.4, Page 55 | The first paragraph should specify that drills are to be conducted at least quarterly.<br><br>Proposed resolution:<br>Revise the first paragraph to read "Drills should be performed at least quarterly" | The NRC staff agrees with this comment.<br><br>The NRC staff changed the first paragraph of Section 3.5.1.4 of DG 1359 to read:<br><br>"Fire brigade drills should be performed in the plant so that the fire brigade can practice as a team. Drills should be performed at least quarterly for each shift's fire brigade. Each fire brigade member should participate in at least two drills annually that are not in the same quarter." |
| Nuclear Energy Institute | Section 3.5.1.4, Page 55 | The second paragraph should include more information on conduct of unannounced drills.<br><br>Proposed resolution:<br>"Unannounced drills should not be performed in a pattern such that the shift's fire brigade can easily determine when the drill will occur (e.g. conducting a backshift drill after each day shift drill was conducted.)" | The NRC staff agrees with this comment.<br><br>The NRC staff added the following sentence to the second paragraph of Section 3.5.1.4 of DG-1359:<br><br>"Further, unannounced drills should not be performed in a pattern such that the shift's fire brigade can easily determine when the drill will occur (e.g. conducting a backshift drill after each day shift drill was conducted.)" |
| Nuclear Energy Institute | Section 3.5.1.4, Page 55 | This section should more explicitly discuss the expectations for the drill team.<br><br>Proposed resolution:<br>At end of first sentence of the fifth paragraph, add "…to include the performance of not only the fire brigade and response, but the ability of the drill team to provide adequate simulation to elicit desired fire team response." | The NRC staff agreed with this comment.<br><br>The NRC staff added the following sentence to the second paragraph of Section 3.5.1.4 of DG-1359:<br><br>"…to include the performance of not only the fire brigade and its response, but the ability of the drill team to provide adequate simulation to elicit desired fire team response." |

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| Nuclear Energy Institute | Section 3.5.2.1.b, Page 56 | The role of offsite fire departments should be better articulated.<br><br>Proposed resolution:<br>At the end of this section, add "…available and readily accessible to the offsite fire department." | The NRC staff agrees with this comment.<br><br>The NRC staff added the following sentence to the end of Section 3.5.2.1.b of DG-1359:<br><br>"If adaptors are used, they should be available and readily accessible to the offsite fire department." |
| Nuclear Energy Institute | Section 4.1.6.2, Page 66 | The emergency lighting and portable lighting sections discuss "sealed beam" lamps. The term "sealed beam" specifically describes a specific type of incandescent lamp manufacturing technology that was predominant prior to the 1990's for automobile headlights. Retaining the term in the RG effectively prohibits modern lighting technology from being adopted. For example, "sealed beam" would not permit a replaceable halogen bulb in a reflector.<br><br>Proposed resolution:<br>The term "sealed beam" should not be used in contemporary documents/standards, and a more inclusive term should be used. | The NRC staff agrees with this comment.<br><br>The NRC staff changed the first paragraph of Section 4.1.6.2.a of DG-1359 to read:<br><br>"Fixed, self-contained lighting consisting of units with individual 8 hour minimum battery power supplies should be provided in areas needed for operation of safe shutdown equipment and for access and egress routes to these areas."<br><br>The NRC staff also changed Section 4.1.6.2.b of DG-1359 to read:<br><br>"Suitable battery-powered portable hand lights should be provided for emergency use by the fire brigade and other operations personnel required to achieve safe plant shutdown." |

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| Nuclear Energy Institute | Section 5.0, Page 75 | This final paragraph of this section includes new language suggesting that there will be two redundant trains, that they will perform "the same" safe shutdown functions, and that they are only differentiated by electrical power division. That is not the case in BWRs, where ECCS system functions and capacities are very diverse, there are many possible safe shutdown success paths, and safe shutdown paths can be made from high-capacity high pressure systems, low capacity high pressure systems, low pressure systems, etc.<br><br><u>Proposed resolution:</u><br>Revise to remove the implication that there are only two paths to safely shutdown a reactor, and that those two paths must have "the same" capabilities. | The NRC staff notes the comment. However, the NRC staff disagrees with the suggested resolution. This version consolidates text that has been in Regulatory Guide 1.189 since Revision 1, published in 2007. The commenter appears to be confusing the concept of safe shutdown system "function" (for example, inventory control or process monitoring) and "capability" (for example, gallons per minute of water flow). In order to clarify the intent, the text has been changed to read:<br><br>"For the application of fire protection regulatory requirements, redundant trains of systems may be two or more similar trains of equivalent capacity in the same system powered by separate electrical divisions, or they may be two or more separate systems that achieve the same post-fire safe shutdown function." |
| Nuclear Energy Institute | Section 5.3, Page 76-77 | Substantial discussion on MSOs has been added to Section 5.3 before the fundamental concepts of safe shutdown have even been discussed. Discussing MSO before discussing fundamental safe shutdown criteria is very confusing to the reader.<br><br><u>Proposed resolution:</u><br>Move the new MSO endorsements to a suitable point after the fundamental concepts of safe shutdown have been discussed. | The NRC staff agrees with this comment and made the suggested changes to DG-1359. |

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| Nuclear Energy Institute | Section 5.3, Page 78 | There is discussion on NEI 00-01, Revision 4, Chapter 3 in conjunction with the RG as being acceptable. A lot of the detail supporting Chapter 3 is in Appendix J of NEI 00-01, Revision4, but there is no clear reference to Appendix J in this portion of the draft regulatory guide.<br><br><u>Proposed resolution:</u><br>Make a clear reference to Appendix J in conjunction with Chapter 3 as it defines important and applicable concepts such as incredible, plausible, etc. for circuit types. Recommend moving the endorsement sentence of NEI 00-01 Chapter 3 and Appendix J to the beginning of Section 5.3 because of its importance. | The NRC staff agrees with this comment.<br><br>The NRC staff added the following sentence to the beginning of Section 5.3.1 of DG-1359:<br><br>"Chapter 3 and Appendix J of NEI 00-01, Revision 4, provides an acceptable deterministic methodology for the analysis of post-fire safe-shutdown circuits, when applied in conjunction with this RG." |

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| Nuclear Energy Institute | Section 5.3, Page 78 | In Section 5.3, last paragraph, the discussion in Section 5.3 contains criteria that has been refined and changed by the NUREG/CR-7150 Vol. 3 criteria, and by the NEI 00-01, Revision 4, criteria in Chapter 3 and Appendix J, such that the stated criteria are no longer comprehensive or fully accurate.<br><br><u>Proposed resolution:</u><br>These criteria should either be removed or described as one acceptable approach, along with NEI 00-01 Chapter 3 and Appendix J as another acceptable approach.:<br>"For circuits not sealed in or latched for equipment important to safe shutdown, licensees should consider multiple fireinduced circuit failures in at least two separate cables. For circuits not sealed in or latched for equipment important to safe shutdown that involves high-low pressure interfaces, licensees should consider circuit failures in at least three cables. This applies when there are defense-indepth features, such as automatic suppression and limits on ignition sources and combustibles. When there are no defensein-depth features, the number of cables to consider should not be limited to two or three as described above. In addition, for multiconductor cables, all circuit faults that could occur within the cable should be assumed to occur. The analysis should address all circuits for which fire-induced failure could prevent safe shutdown, and appropriate protection should be provided." | The NRC staff agrees with this comment and deleted the cited criteria from DG-1359. As noted in response to the previous public comment, Chapter 3 and Appendix J of NEI 00-01, Revision 4, have been referred to in Section 5.3. |

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| Nuclear Energy Institute | Section 5.3.2, Page 82-83 | Section 5.3.2 does not explicitly include DC compound motors.<br><br>Proposed resolution:<br>Include an explicit reference to DC compound motors in Section 5.3.2. | The NRC staff agrees with this comment.<br><br>The NRC staff revised the first sentence of the last paragraph of Section 5.3.2 of DG-1359 to read:<br><br>"The electrical expert PIRT panel, as documented in NUREG/CR-7150, Volume 3, has determined that the potential for a fire to cause hot shorts on all three phases in proper sequence of an AC power circuit to cause a spurious operation of a motor or two shorts of proper polarity on a DC compound-wound motor is incredible and need not be considered in the evaluation." |
| Nuclear Energy Institute | Section 5.3.2, Page 82-83 | There is also discussion on high impact components in NUREG/CR-7150 and NEI 00-01, Revision 4, that provides more detailed guidance.<br><br>Proposed resolution:<br>Include a reference to these treatments of high impact components and circuit failure criteria as "an acceptable approach." | The NRC staff agrees with this comment.<br><br>The NRC staff revised Section 5.3.2 of DG-1359 to add the following at the end of the section:<br><br>"NUREG/CR-7150, Volume 3, also identified a set of "high impact components" whose fire-induced failure could pose a significant threat to plant safety. Appendix J of NEI 00-01, Revision 4, identifies the circuit failure criteria and provides an acceptable approach for the treatment of these high impact components." |

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| Nuclear Energy Institute | Section 5.4.3, Page 87 | The discussion on HLP circuit failures in the first paragraph of this section has not been updated to reflect the latest information available.<br><br><u>Proposed resolution:</u><br>Include updates from NUREG/CR-7150 and NEI 0001, Revision 4, based on credibility determinations on three-phase AC/DC motors and guidance in Appendix J of NEI 00-01 R4. | The NRC staff agrees with this comment.<br><br>The NRC staff revised the paragraph in Section 5.4.3.b of DG-1359 to read:<br><br>"For consideration of spurious actuations, the licensee should evaluate all possible functional failure states; that is, the component could be energized or deenergized by one or more circuit failure modes (i.e., hot shorts, open circuits, and shorts to ground). Therefore, valves could fail open or closed, pumps could fail running or not running, or electrical distribution breakers could fail open or closed. For three-phase AC circuits, the probability of getting a hot short on all three phases in the proper sequence to cause spurious actuation of a motor is considered incredible and no further evaluation is required. Similarly, for ungrounded DC circuits, two shorts of proper polarity on DC compound-wound motors is considered incredible and no further evaluation is necessary." |
| Nuclear Energy Institute | Section 5.4.3, Page 87 | There is also discussion on high impact components in NUREG/CR-7150 and NEI 00-01, Revision 4, that provides more detailed guidance.<br><br><u>Proposed resolution:</u><br>Include a reference to these treatments of high impact components and circuit failure criteria as "an acceptable approach." | The NRC staff agrees with this comment.<br><br>The NRC staff added the following to the end of Section 5.4.3.b of DG-1359:<br><br>"For high impact components, Appendix J of NEI 00-01, Revision 4, provides an acceptable approach for treatment of circuit failure criteria." |

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| Nuclear Energy Institute | Section 5.4.3, Page 87 | The Section 5.4.3 discussion on hot short duration is not consistent with DG-1359 Section 5.3, Item e.<br><br>Proposed resolution:<br>Update the second paragraph of this section to reflect 20 min/40 min AC/DC from NUREG/CR-7150 and NEI 0001, Revision 4. | The NRC staff agrees with this comment.<br><br>The NRC staff revised the sentence in Section 5.4.3.b of DG-1359 to read:<br><br>"Hot short conditions are assumed to exist for the durations outlined in Regulatory Position 5.3.1.e of this guide or until action has been taken to isolate the circuit from the fire area or other appropriate actions have been taken to negate the effects of the spurious actuation." |
| Nuclear Energy Institute | Section 5.5.2, Page 90 | This section mentions HIFs in two places. With the addition of Section 5.3.3 providing blanket endorsement of NEI 00-01 Appendix B.1 for MHIFs, it should no longer be necessary to discuss HIFs in Section 5.5.2.<br><br>Proposed resolution:<br>Remove reference to HIFs in Section 5.5.2. | The NRC staff notes the comment. However, the NRC staff disagrees with the suggested resolution.<br><br>Section 5.5.2 of DG-1359 emphasizes the requirement to compensate for spurious actuations and HIFs in alternate or dedicated procedures.<br><br>The NRC staff moved the discussion of NEI 00-01 Appendix B.1 and Kaptan cables to the end of DG-1359 Section 5.3.3. |

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| Nuclear Energy Institute | Section 6.1.1.3, Page 92 | This section calls for detection in containment, however it provides no exception for plants with inerted containments. This puts this section in direct conflict with section 3.1.i, which says that detection is only required in noninerted containments.<br><br>Proposed resolution:<br>Clarify that this is for noninerted containments only. | The NRC staff notes the comment. However, the NRC staff disagrees with the suggested resolution. DG-1359 Section 3.1.i clearly states that the detection requirements are only for noninerted containments and cites Regulatory Position 6.1.1.3 for the relevant guidance.<br><br>Further, this text was included since the initial issuance of Regulatory Guide 1.189 in 2001.<br><br>The NRC staff made no changes to DG-1359 as a result of this comment. |

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| Nuclear Energy Institute | Table of Contents, Section 1.8.3, Appendix A | Section 1.8.3 refers to Appendix A, which has been removed from DG-1359.<br>Appendix A contains important information on engineering evaluations to demonstrate equivalency and situations that are "adequate for the hazard" that are very important concepts with origin in GL 86-10.<br><br><u>Proposed resolution:</u><br>Retain the relevant information in Appendix A to avoid potential misinterpretation of this guidance in the future. | The NRC staff notes the comment. However, the NRC staff disagrees with the suggested resolution.<br><br>The information contained in the previous Appendix A consisted of material from items 1, 4, and 5 of Enclosure 1, "Interpretations of Appendix R," to Generic Letter 86-10. Based on NRC's guidance for development of regulatory guides, Appendix A was removed because of is redundancy to Generic Letter 86-10. The NRC staff continues to consider this information as valid guidance.<br><br>As a result, the NRC staff added a reference to Enclosure 1 of Generic Letter 86-10 to Section 1.8.3 of DG-1359. The NRC staff also deleted the last sentence of Section 1.8.3 of DG-1359 to remove the erroneous reference to Appendix A and made editorial corrections to the table of contents. |

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| Michael Keller | General | Unclear how this guide can be applicable to passively safe advanced reactors.<br><br>The guide should state that it is limited to those water cooled reactors that employ active measures (e.g. pumping water, electrical power) to protect the public from hazardous radiation.<br><br>Applicability to passively fail safe advanced reactors should be along the lines of reliance on passive protection measures and automatic mitigation measures.<br><br>For advanced reactors, the extent of the guide should also be limited to areas housing Safety-Related equipment, including structures and equipment that protect Safety-Related equipment.<br><br>Some form of general statement should be included on expectations for fire protection measures associated with passively safe advanced reactors. The statement might merely note that the matter needs further review. | The NRC staff partially agrees and partially disagrees with this comment.<br><br>The staff agrees that not all fire protection regulations or guidance applies to all possible nuclear power plant designs. This is described in the "Applicability" section of part A of DG-1359: "Since not all of the fire protection regulations promulgated by the NRC apply to all plants, licensees should refer to their plant specific licensing bases to determine the applicability of a specific regulation to their plant."<br><br>Guidance for all possible plant designs is beyond the scope of DG-1363. Applicability of or exemption from particular regulations for "passive fail safe advanced reactors" would be reviewed by the NRC staff during the licensing review stage on a case-by-case basis depending on the design.<br><br>The NRC staff made no changes to DG-1359 as a result of this comment. |