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Submitter Information

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General Comment

See attached file(s)

Attachments

09-01-17_NRC_NEI Industry Comments on Draft HEAF Testing Plan

09-01-17_NRC_NEI Industry Comments on Draft HEAF Testing Plan_Attachment

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NUCLEAR ENERGY INSTITUTE

September 1, 2017

Ms. Cindy Bladey
Submitted via Regulations.gov

Subject: Industry Comments on Draft Testing Plan, *High Energy Arcing Faults in Electrical Equipment, Phase 2* (82 FR 36006-36007, Docket ID NRC-2017-0168)

Project Number: 689

Dear Ms. Bladey:

The Nuclear Energy Institute (NEI)[1] is pleased to submit the attached comments regarding NRC's Draft Testing Plan, *High Energy Arcing Faults in Electrical Equipment, Phase 2*. The industry remains committed to pursuing improved Fire Probabilistic Risk Assessment (PRA) realism in cooperation with the NRC, and appreciates the opportunity to comment on this draft test plan, as it is anticipated that appropriate, focused testing could potentially improve the realism of treatment of High Energy Arcing Fault (HEAF) events.

The industry is concerned that the testing described in this draft plan would not result in measurable improvements to realism in Fire PRAs, as the tests would not be relevant to conduct of operations at nuclear power plants. Notably, it appears that physical breakers will not be used in the testing configuration, which is not representative of electrical enclosures at nuclear power plants, and therefore limits the applicability of the results. Any testing undertaken should be as representative of typical plant configurations as possible to best support application of the results to improve realism of plant Fire PRAs; specifically, events across a spectrum of likelihood should be evaluated with testing, rather than only the most severe, and lowest probability, events.

Additional detailed comments are provided in Attachment 1 to this letter. We look forward to working with the NRC on continuing to advance the state of realism in Fire PRAs. If you have any questions concerning the industry's comments on this draft testing plan, please contact me or Victoria Anderson (202-739-8101, vka@nei.org)

[1] The Nuclear Energy Institute (NEI) is the organization responsible for establishing unified industry policy on matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include all entities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel cycle facilities, nuclear materials licensees, and other organizations and entities involved in the nuclear energy industry.

Sincerely,

Pamela B. Cowan

Attachment 1 - Industry Comments on Draft HEAF Testing Plan

c: Mr. Michael Weber, RES, NRC
Mr. Michael Cheok, RES/DRA, NRC
Mr. Mark Salley, RES/DRA, NRC
Mr. Nicholas Melly, RES/DRA, NRC

Industry Comments on NRC-RES High Energy Arcing Faults in Electrical Equipment Phase 2 – Draft Test Plan

1. Section 4.1, first paragraph – the HEAF event that occurred at SONGS-2/3 was the result of incomplete breaker contact parting resulting in an extended arc at the breaker contact.
2. Section 4.3, page 11, last paragraph – the discussion states that the KEMA source is limited to 2,200 MVA but it also states that it is insufficient to deliver the current necessary to simulate events at Robinson and Diablo Canyon. From a practical standpoint, most medium voltage switchgears have ratings of 500 MVA with some having higher ratings. The design basis calculations that are necessary to demonstrate compliance with the requirements of GDC 17 must show that maximum possible fault conditions at the buses are within their MVA ratings. The discussion in the test plan raises questions as to whether the fault conditions being imposed on the equipment, when analyzed using the same methods as would be required in design basis calculation shows that the MVA being delivered is within the equipment rating. The information presented in the test plan suggests that excessive fault conditions could be imposed. Exposing equipment to such conditions would result in a test that does not reflect the conditions in the US nuclear fleet.
    a. The performance of a generator under faulted conditions is sometimes represented in a short circuit decrement curve. This curve shows a peak short circuit current and a decay that is a function of the machine sub-transient and transient reactance and their associated time constants. It is unclear if 2,200 MVA that is quoted in the test plan reflects the peak of this decrement curve or at some other point. An understanding of this behavior is critical to understanding and confirming the applicability of the test of actual plant conditions.
    b. Where in the test planning process is confirmation that the test conditions – MVA, current, and decay of any asymmetrically component is representative of the conditions in the US nuclear fleet.
3. The performance of a generator under faulted conditions as noted in comment 2a is dynamic. The information provided in Section 5 (40 kA at 480 V for 8s, and 25 kA at 4.160 kV for 4s) suggests that substantially higher fault conditions were imposed. More details regarding the imposed electrical conditions that are anticipated for this test are necessary. These parameters can be calculated consistent with that which would typically be done to demonstrate compliance with GDC 17. Such a calculation should demonstrate the peak asymmetrical current (typically at half cycle) is within the equipment rating as well as the peak MVA.
4. Section 4.4 – Test Durations – the scope of test durations inherently envelopes the case where protective devices that may be available to terminate the HEAF event have failed. It is unclear whether the scope of the test and the measuring and monitoring equipment will have sufficient time resolution to address the cases where protective devices are available to terminate the event.
    a. It is unknown whether the results of this test will lead to the imposition of a deterministic HEAF ZOI and does not allow any consideration of the availability of protective devices that would quickly terminate. Depending on design details, the tripping of breakers to terminate HEAF event could be as fast 0.08 seconds. In some

applications, given failure of the primary breaker, the backup breaker would trip within 2 seconds. The 2 second threshold is a typical criterion for the maximum allowed delay on tripping a transformer supply breaker on a 'thru-fault' condition.

b. The test plan seems to be focused on exposing the equipment to short circuit conditions that approach (and possibly exceed their rating). It is unclear how these results can be applied to cases where the actual plant conditions are such that the fault conditions are substantially less than the equipment rating. For many plants, the analysis of the medium voltage switchgear shows that the peak short circuit MVA occurs only when the EDG is paralleled for testing. In such cases, the short circuit during normal operating conditions is substantially less – resulting in notable margin the equipment rating.

5. Section 6 – The test plan indicates that the test enclosure will contain only a bus bar and no other internal features. It is unclear how the lack of a physical breaker and variability with respect to location of the actual bus bars in medium and low voltage switchgears will influence the test results. It would seem the available void space within the enclosure would affect the behavior of any transient conditions. The spacing of the bars themselves relative to the outer walls of the enclosure and any ventilation opens (louvers) could introduce additional influences that may reduce or exaggerate the consequences outside the enclosure. It is not clear how these variables can or will be considered when post-processing of the test results and developing HEAF ZOI application guidance is developed.