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TENNESSEE VALLEY AUTHORITY (TVA) - COMMENTS ON "PROPOSED GENERIC COMMUNICATION; POST-FIRE SAFE-SHUTDOWN CIRCUIT ANALYSIS SPURIOUS ACTUATIONS"- SUPPLEMENTAL COMMENTS (70 FR 60859 dated October 19, 2005)

This letter provides TVA's comments on NRC's proposed Generic Letter (GL) concerning "Post-Fire Safe-Shutdown Circuit Analysis Spurious Actuations." This letter supplements TVA's comments provided by letter dated December 20, 2005. TVA's specific comments are provided in the enclosure. TVA's supplemental comments are numbered 10 through 15 in the enclosure.

The subject Federal Register Notice requested comments on the proposed GL. On December 22, NRC extended the comment period to February 2, 2006.

The proposed GL would request addressees to review their fire protection programs to confirm compliance with existing applicable regulatory requirements regarding assumptions of the phrase "one-at-a-time." In general, TVA is concerned that the proposed GL does not appropriately consider regulatory precedents.

TVA appreciates the opportunity to comment. If you have any questions, please contact Rob Brown at (423) 751-7228.

Sincerely,

Glenn W. Morris  
Manager, Corporate Nuclear Licensing  
and Industry Affairs

Enclosure  
cc (Enclosure):

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## ENCLOSURE

### COMMENTS ON PROPOSED GENERIC COMMUNICATION; POST-FIRE SAFE-SHUTDOWN ANALYSIS SPURIOUS ACTUATIONS (70 FR 60859 dated October 19, 2005)

1. The proposed Generic Letter (GL) is based on the conclusion that there is "... a relatively high probability that multiple spurious actuations will occur simultaneously or in rapid succession" during a postulated fire. The conclusion is based on the results of various tests performed by Electric Power Research Institute (EPRI) and the Nuclear Energy Institute (NEI). While these tests and conclusions may be accurate for single- raceway scenarios, they do not support the fire dynamics for cable separation in multiple cable trays or conduit raceways. For example:
  - Dual trains, rather than single raceways, ensure most fire safe shutdown (FSSD) path protection. Cable for safety-related equipment is routed in separate raceways: generally separated per guidance provided in Regulatory Guide 1.75.
  - In conduit raceways assumptions are overly conservative since they are not supported by testing. The proposed GL criteria is applied equally to both conduit and cable tray raceways.
  - Fire science and dynamics are considered to show that with minimal horizontal separation, progression of fire would take several minutes.
  - Potential conservatism in how cables were placed during testing are not recognized. In the worst case of the most conservative arrangement, cables are arranged with maximum fill without concern for the worst case cable test arrangements.
2. The proposed GL is trying to achieve "low or no risk" conditions using only one aspect of the defense-in-depth FSSD program. When taken in context of a multi-faceted defense-in-depth program, accounting for the other major defense-in-depth attributes (Administrative Controls and Detection/Suppression) as defined in NUREG-0800 and Branch Technical Position 9.5.1, there appears to be no adequate technical justification for applying a conservative position for spurious actuations as outlined in the GL.
3. The clarification provided for the terms "any-and-all, one-at-a-time" negates some routing configurations previously approved by NRC and implemented by licensees. It further implies that at some point in time, NRC was aware and comfortable with how licensees applied these terms to multiple spurious actuations. These applications were consistent with the deterministic approach to Appendix R. Applying circuit analysis assumptions consistent with NRC recommendations fails to recognize the inherent conservatism in the "any-and-all, one-at-a-time" analyses. These are:
  - Full area burn-out to  $t=0$
  - The conservative requirement for 20-feet separation, the basis of which is not supported by fire dynamics; Fire dynamics supports a much lower physical separation
  - No analysis credit for low combustible loading or ignition source limitations
  - No credit for actuation of automatic/pre-action sprinkler systems
  - No credit for intervention of fire brigades
4. The proposed GL stated, "The staff found no documented evidence that it has taken positions inconsistent with this GL." This statement is inaccurate. The proposed regulatory "clarifications" conflicts with past NRC positions and/or interpretations documented in some SERs, other NRC documents, and public proceedings. The proposed GL further seems to be inconsistent with the "discussion" portion of the proposed GL which appears to acknowledge that plants have been licensed using multiple interpretations of "any-and-all, one-at-a-time." Issuing regulatory interpretations or guidance contrary to existing documentation potentially results in liabilities to the utility and the NRC.

5. NRC's suggestion that a licensee's conversion to National Fire Protection Association (NFPA) 805 regulations is a relatively straightforward and inexpensive process is inaccurate. The process will most likely take three or more years at a cost that exceeds five million dollars, while exposing licensees to unknown regulatory uncertainties. For example, the development of a regular plant probabilistic risk analysis relies heavily on engineering judgement that could lead to differing professional opinions and significant cost and schedule ramifications. Similar uncertainties exist when considering fire modeling. There appears to be no single standard that contains modeling conservatisms acceptable to licensees and the NRC. Resolution of these type issues could result in significant expenditures of resources.
6. The "Backfit Analysis" portion of the draft GL contains technical omissions and general information that is inconsistent with prior NRC documentation. Specifically, the "Backfit Analysis" portion of the GL states, "These assumptions were never included in the regulations or generally adopted by the NRC." This statement is inconsistent with the information contained in the recent draft Regulatory Guide (RG), or NUREG 1778, which provides a clear definition of "any-and-all, one-at-a-time" (refer to Section 2, page 2-3) and provides a clarification of "Criteria/Assumptions" (refer to Section 6.4.6.2, "Circuit Analysis Criteria and Assumptions") which states, "...However, the analyst must consider the possibility for each spurious actuation to occur sequentially, as the fire progress, on a one-at-a-time basis." While this is recognized as a draft document, it does appear to provide a historical perspective of this topic. In comparison, the content of this document suggests that those involved in the original development and approval of licensee Fire Protection Programs at numerous facilities may have developed it.
7. Additionally, the "Backfit Analysis" discussion and other portions of the draft GL fail to include such technical issues as fire dynamics/growth, actuation of suppression systems, and separation of trained circuits. (i.e., most safety-related trained circuits have been separated in accordance with RG 1.75, and both trains must fail simultaneously to cause a problem.)
8. The failure to consider all fire protection program attributes is inconsistent with the defense-in-depth philosophy outlined in NUREG-0800 and Branch Technical Position CMEB 9.5-1, which states, "None of the echelons can be perfect or complete by itself. Each echelon should meet certain minimum requirements; however, strengthening any one can compensate in some manner for weaknesses, known or unknown, in the others." To date, there has been no "minimum requirements" established for any aspect of defense-in-depth. Establishing a single "minimum requirement" for one attribute without establishing minimum requirements for all defense-in-depth aspects is not consistent with prior regulatory guidance.

Specifically, a minimum is being established for the FSSD portion of defense-in-depth without indicating how changes to the other two portions (Administrative Controls and Detection/Suppression) could be used to offset a "weakness" in this area. One example is requiring the same assumptions for a plant with an area-wide automatic suppression versus one with limited or no automatic suppression. This is consistent with regulatory guidance in that it would appear that the "minimum requirement" for suppression is considerably less than an area-wide suppression system. However, it provides no credit for an enhanced design that includes area-wide suppression. Other specific examples are available in defense-in-depth areas such as fire brigades, administrative controls, and procedures. The draft GL should include a discussion on how the new guidance is consistent with defense-in-depth and, if necessary, establish specific guidance for "minimum requirements."

9. Application of the proposed regulatory change does not appear to include provisions for dispositioning issues which are determined to be of little or no-risk significance. Utilization of the proposed GL requirements on a piloted basis identified no applications which were not considered "green" using the NRC significance determination process which by definition is a conservative estimation of risk. Literal compliance with the draft GL requirements through either Appendix R or conversion to a licensing bases, based on NFPA 805, appears to be inconsistent with focusing resources on areas of risk significance.

10. Although NEI testing shows multiple hot shorts are possible and could exist for a period of time, it provides little data to support the "simultaneous" occurrence during onset of a fire event. The following points are based on industry testing such as EPRI/ Factory Mutual (FM), EDF, FM, and Babcox and Wilcox (B&W).
11. Thermal mass of a given raceway is a direct impact on cable failure. Raceways with a 60 percent fill can have substantial (as much as 50 degrees Fahrenheit) difference across the cross-section. This data does not support the "simultaneous" hot short assumption within a given raceway.
12. Cable failure is assumed to occur instantaneously at fire initiation even though testing supports cable "functionality" for periods of 4-9 minutes when exposed to standard test E-119 time/temperature curves or conservative fire sources such as heptane pools. In actuality, nuclear facility fires are typically slow developing electrical fires that extend beyond 4-9 minutes, and fall short of the severity of fires generated by test furnaces or heptane pools.
13. While "intra" cable simultaneous hot shorts are arguably credible based on test data, these are unlikely to occur in two different multi-conductor cables at the same time. For this to be possible, cables would essentially have to be subjected to identical thermal conditions, be in the same raceway, in the exact same raceway locations, and be in the exact plume conditions from the time of fire initiation through fire growth. Even small variations in any of these parameters would produce significant deltas between the first cable hot shorts and second cable hot shorts.
14. Fires large enough to produce cable shorts (either "intra" or "inter" cable) result in detection initiation and automatic suppression initiation in some plants well within 4-9 minutes, and have been shown to withstand conservative fire scenarios such as standard test E-119 and heptane pool fires.
15. Vertical separation within a given raceway bank (cable tray stack) would result in substantial delays between fire propagation up the stack due to the radiant energy shield effect. This delay would be further amplified by cable tray fill.