

Time of Detection Should be Zero for Manual Non-Suppression Likelihoods

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Potential Realism Improvement

The guidance in NUREG/CR-6850 Appendix P implicitly and through example directs that the detection time be subtracted from the overall time until target damage when developing the manual non-suppression probability.

Although NUREG/CR-6850 Supplement 1 (FAQ 08-0050) and NUREG 2169 remove the brigade response time from the NUREG/CR-6850 approach, the subtraction term for the detection time remains.

As a result, the risk associated with the manual non-suppression probability is artificially high.

Identification of Relevant Guidance

NUREG/CR-6850 Appendix P (pg. 8-10)

The manual suppression probability curves described in the previous section represent the suppression time of applicable fire events. As such, the curves do not account for the time to detection and the response time of the fire brigade. The time available for manual suppression is

$$t_{ms} = t_{dam} - t_{fb} - t_{det}$$

where t_{ms} is the time available for manual suppression, t_{dam} is the time to target damage, t_{fb} is the response time of the fire brigade, and t_{det} is the time to detection.

The time available for manual suppression, t_{ms} , is the input time to the manual suppression probability curves. Recall that for the case of electrical cabinet fires, if in-cabinet smoke detectors are installed in the cabinet postulated as the ignition source, the analyst should add 5 minutes to the time available for detection. This will reduce the time to detection, t_{det} , by 5 min.

Proposed Approach to Enhance Realism

The manual non-suppression probability (NSP) curves by nature of the data collection process already include the detection time in addition to the brigade response time. Once a fire event is logged in a Nuclear power plant, it is detected.

NUREG-2169 used the Updated Fire Events Database (EPRI 1025284) in the development of the NSP curves. Whether the fire is detected by a detector, plant equipment failure, or personnel, the T=0 from which the fire is detected is inherently included in the manual response time curves.

Proposed Approach to Enhance Realism - Limitation

The $T_{det}=0$ is ONLY applicable to manual NSP evaluations. The time of detection must still be developed for automatic systems.

Example

When crediting the manual suppression likelihood $T_{det}=0$.

Industry Benefit

This was not calculated during the October 2017 Workshop.
But considering an improvement to the NSP for electrical cabinets,
this may result in a 5% reduction in CDF/LERF risk.

Questions

