

Response to Comments on NFPA 805 FAQ 08-0050 NRC Draft Interim Position

Initial Industry Comment

The industry has reviewed the NRC's draft interim position on NFPA 805 FAQ 08-0050, Manual Non-Suppression Probability, and appreciates the opportunity to comment on this clarifying guidance. The industry further appreciates the NRC's efforts to refine the underlying data for the non-suppression curves, including removal of events that occurred in outside areas from the scope of the analysis. While the interim position presented in the draft document is an encouraging step towards advancement of fire PRA technology, the industry suggests that other events be removed from the scope of the analysis to avoid over-prediction of damage in fire PRAs.

Specifically, a number of the events in the underlying data for the non-suppression curves are considered smoldering events, or are very similar to smoldering events. For smoldering events, the original FAQ describes smoldering fires as "events...that by their nature are controllable very quickly, but for unknown reasons have a long duration time." The original FAQ further noted that "if the factors behind these types of events could be identified, they could either be eliminated from the non-suppression curves or have their duration times adjusted appropriately."

The events in question are smoke events or very small fires where no damage occurred. However, by including these events in the analysis supporting the non-suppression curves, the damage in the Fire PRAs will be over predicted, as the factors making these fires non-damaging (e.g. control of the fire early, flame did not occur) will be discounted. The industry has identified some key events that do not match the 6850 modeling and should be considered smoldering fires:

Event	Basis for Removal
554	The event involved a 95-min T/G fire resulting from dripping oil onto pipe. The dripping oil did not even show flame (note that if modeled, a 95 minute T/G fire would have burnt down the TB or more).
557	The event involved a 10-min electrical fire with no flame. With a 12 minute growth time, RPS unit should be near full fire size.
562	The 45-min oil fire involving oil soaked insulation did not affect any other equipment.
566	The event involved a 25 min oil fire with minimal damage caused by a site-glass breaking.
611	The event involved a 12-min. electrical fire with no flame reported.
642	The event involved a 45-min. electrical switchgear fire, with no major equipment damage.
662	The event involved a 60-min oil fire with no apparent damage.
668	The event involved a 217-min T/G fire with only glowing embers reported.
2124	The event involved a 60-min T/G fire with no apparent damage.
2138	The event involved a 45-min MFW Pump Oil Fire with no apparent damage and was listed as undetermined (challenging).

The industry suggests that the above events be removed from the underlying data for the non-suppression curves prior to issuance of the final version of this FAQ.

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Response:

With respect to industry's comments, criteria for challenging fires have been agreed upon for retaining events in fire PRA. The events that industry classified as "smoldering" meet these criteria. Furthermore, these fire events are consistent with NUREG/CR-6850 modeling since NUREG/CR-6850 distributions for HRR capture a range of fires, both small and large fires.

There is uncertainty in how to interpret events. As a result, we generally believe that data screening should be approached with great caution. For purposes of this FAQ, the staff is relying upon agreed-upon criteria for challenging fires. Given the current state of available event information, considerable work is probably needed to develop a robust approach that distinguishes between control and extinguishment.

Subsequent Industry Comments

1. The smoldering fire analysis is still absent. The reason (see attached) is because smoldering fires are all challenging fires and therefore must be retained in the fire PRA. Not sure if a redefining of challenging is appropriate at this point, but clearly smoldering fires are contributing to conservatism. Specifically;

Again we can point out that the NRC continues to instill conservatism in the Fire PRA methods. They suggest the "smoldering" events should not be removed from the DB, since they were fires. We are suggesting retaining the events as challenging or unknown (if they weren't controlled, they could have caused more damage), but we continue to support removing them from the non-suppression curves. In the end, whether we call them smoldering fires or something else, the events if modeled in the PRA would have burnt down the turbine building or burnt out the room where the fire occurred. In fact, since the fire brigade controlled the fires, no damage what-so-ever occurred. So we either need to insert a "control" time in the non-suppression curve, to show that the fires did not cause damage, or remove them from the non-suppression curves.

Just look at any of the events in the table. For example, even 668 with a 217 minute T/G fire, where only glowing embers were reported. I would imagine if we modeled a 217 minute T/G fire, not only would the Turbine Building be burnt down, the 3 hour fire wall between the TB and other buildings would have been failed. We end up applying this 217 fire to the non-suppression curve, and the tail of the T/G curve ends up a factor of 4 higher for greater than 180 minute fires. In the PRA, we model that any T/G fire could have lasted that long, which is not correct. See Figure 4 below. The effects on electrical and oil fires is much smaller than T/G and only have a few percent difference.

Unless we are going to significantly change the model to something like multiple growth rates, different non-suppression curves for each HRR or fire type, or something else, we need to find a way to include these events but have the impact of the events correctly applied to the factors we develop in 6850.

We should continue to stress that whatever factors we develop, including the non-suppression curves, these should be developed in order to have our PRAs model what really happens in the plant. Judgment should be used instead of conservatism. In this case, we would like to develop non-suppression curves that represent reality, and these events are just a start to than effort.

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NRC also shares the goal that fire PRAs be realistic. It should be recognized that the goals of analysis transparency and reproducibility are also important, and some of the discussions regarding specific technical issues arise from the desire to achieve these goals.

Given the limited information provided in the EPRI Fire events database, alternative viewpoints on fire events that industry characterizes as smoldering are possible. For several events, the condition of the fire during much of the scenario is unknown, and it cannot be assumed that the fire was rapidly under control. Furthermore, even fires that are initially under control can flare up. The EPRI/NRC RES team that developed the consensus fire PRA methodology, NUREG/CR-6850 (EPRI 1011989), recognized the complexity of dealing with these issues and agreed upon an approach that they judged to be realistic, given available information.

We agree that most of the non-suppression curves are not significantly affected by the inclusion or exclusion of fires that industry [ML092030092] has characterized as being smoldering. Regarding the turbine/generator non-suppression curve, the following discussion focuses on the NEI comment on event 668.

For event 668, which was reported as an oil-soaked insulation fire with a duration of 217 minutes, the plant fire brigade was listed as the extinguishing method. The report states that plant personnel detected the fire and notes that plant personnel observed glowing embers. However, it does not indicate when this observation took place. It is equally valid to infer from the database that this observation was made relatively close to the time of detection, and that the condition of the fire is unknown later in the scenario. Thus, although this event may have been well under control prior to the full duration listed in the fire events database, the time to control cannot be determined from the available information.

Moreover, the characterization of event 668 as burning down the turbine building, if modeled, is inconsistent with the treatment in NUREG/CR-6850 (EPRI 1011989). The consensus method explicitly partitions fire events into three severity categories; namely, severe, non-severe, and catastrophic. The total T/G fire frequency is partitioned in accordance with these classifications, and specific guidance is given for the treatment of each class. Event 668 (and indeed 19 of the 20 T/G fires in the database) was classified as a “non-severe” oil fire (see Section O.2.3 of the methodology document). The method states that “In the case of the non-severe fires, damage is assumed to be limited to the T/G systems and any components in the vicinity of the T/G” without regard to fire duration. Hence, the supposition that modeling of non-severe turbine generator oil fires, even fires of long duration, could lead to the turbine building being “burnt down” is inaccurate and inconsistent with the original consensus method guidance.

It should be noted that smoldering fires can break out into an opening flaming fire at almost any time. Thus, for purposes of this interim solution, fires discussed in this response have been retained in the suppression analysis. However, recognizing that such fires do not present the same hazard as an open flaming fire of the same duration, the staff agrees that, in the longer term (beyond FAQ 50), it may be worthwhile to develop

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a technical approach to treat smoldering fires (including long- duration, oil-soaked insulation fires).

2. The duplicate events (1482 & 1483) referenced under the basis for industry average response on page 5 are incorrect. The correct duplicates are 495 & 914 per ERIN's original analysis. (Note that the data behind the curves may be impacted by this correction.)

Response:

We agree that events 1482 and 1483 are different events, despite the description in the text being the same in both events. These two events occurred at different plants and on different dates. Apparently, the text from event 1483 was erroneously copied into event 1482 in the EPRI fire events database.

We also agree that 495 and 914 are the same event. This event is an electrical fire; thus, event 914 is retained. Event 495, classified as an oil suppression event, was removed from the oil suppression curve.

The oil suppression curve was adjusted for these changes, and the change is very minor.