

**FAQ Number** 18-0014

**FAQ Revision** 0 (Draft B)

**FAQ Title** The time to Detection is Zero for Manual Non-Suppression  
Probability (NSP) Calculations

Plant: Various

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**Purpose of FAQ:**

This FAQ provides an interpretation of when to begin crediting the empirically based manual Non-Suppression Probability (NSP) curves to align with the data used to develop the curves.

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**Relevant NRC document(s):**

NUREG/CR-6850

NUREG/CR-6850 Supplement 1 (FAQ 08-0050)

NUREG 2169

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**Details:**

**NRC document needing interpretation (include document number and title, section, paragraph, and line numbers as applicable):**

See list of relevant NRC documents

**Circumstances requiring interpretation or new guidance:**

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.

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**Detail contentious points if licensee and NRC have not reached consensus on the facts and circumstances:**

None.

**Potentially relevant existing FAQ numbers:**

FAQ 08-0050, “Manual Non-Suppression Probability”

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**Response Section:**

**Proposed resolution of FAQ and the basis for the proposal:**

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 (i.e. the NSP curve begins).

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. Incipient detector excluded, the vast majority of the fires are not detected using traditional fire detectors (e.g. heat sensors).

Detection (T=0), in the context of this FAQ, is considered the point at which operations logs that something has happened. This does not mean that it is initially known that a fire has occurred. But, it corresponds to the start of the time used to determine event duration. This is the point at which the NSP curve begins. The fire will be controlled or extinguished within x amount of time from detection at the confidence calculated using the NSP curves.

This timeline illustrates the sequence of events:

- Time = -y Fire Starts
- Time = 0 Fire is Detected (i.e. operations logged the event)
- Time = x Fire is controlled or extinguished

In Fire PRA, the NSP curves are used to prevent damage beyond the initial zone-of-influence (ZOI) of the fire source. For high-energy-arcing faults (HEAF) events, the initial ZOI for target damage is applied at T=0.

For example, if the fire source is an electrical cabinet, the fire might be in the incipient stage for an extended period. Detection will most likely occur due to equipment damage manifesting through main control board indication changes or a passer by detecting the fire. In any case, the

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timeclock for controlling the fire from expanding beyond the initial ZOI begins when initially logged by operations (i.e. detected).

It is not realistic to require heat detector actuation prior to crediting the NSP curves. Using current Fire PRA methods and approaches, fire scenarios often postulate cable tray damage before heat detection, which is not in line with reality or experience.

The T=0 point for the NSP curves should be the point of operations logging the event which is inherently part of the data collection process.

**If appropriate, provide proposed rewording of guidance for inclusion in the next Revision:**

The following are proposed revisions to NUREG 2169:

The time of detection for manual NSP curves,  $T_{det}$ , is considered zero ( $T_{det}=0$ ). The time of detection,  $T_{det}$ , for other automatic suppression systems must still be calculated.  $T_{det}=0$  is only applicable to the empirically based manual NSP curves which already include the detection time in the data.