

Summary Tabletop Pilot Results from Utility 1

Several sensitivities were performed using the actual Fire PRA models for two plants. For the sensitivities multiple cases were run for each plant to compare the results. The cases were based on the following options:

FAQ Current PRA	<p>For this case, FAQ 08-0046 was used to address in-cabinet incipient. Credit was given to preventing the fire from damaging the source. The significant parameters used are as follows:</p> <table border="1"> <thead> <tr> <th colspan="2">Base</th> </tr> </thead> <tbody> <tr> <td>α, Incipient Fraction</td> <td>1.0E-02</td> </tr> <tr> <td>β, Incipient Reliability</td> <td>1.0E-02</td> </tr> <tr> <td>γ, Incipient Response</td> <td>1.0E-02</td> </tr> <tr> <td>δ, Incipient Prevention</td> <td>1.0E-01</td> </tr> </tbody> </table>	Base		α, Incipient Fraction	1.0E-02	β, Incipient Reliability	1.0E-02	γ, Incipient Response	1.0E-02	δ, Incipient Prevention	1.0E-01		
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2180	<p>For this case the latest or "Pre-Publication" (post comment) version of NUREG-2180 was used to address both in-cabinet and area wide incipient detection as applicable. The significant parameters used are as follows:</p> <table border="1"> <thead> <tr> <th colspan="2">Base</th> </tr> </thead> <tbody> <tr> <td>Alpha (α) - Incipient Stage</td> <td>2.8E-01</td> </tr> <tr> <td>Beta (β) - System Det & Rel</td> <td>3.6E-03</td> </tr> <tr> <td>Tau (τ) - System Effectiveness</td> <td>1.9E-02</td> </tr> <tr> <td>Mu (μ) - MCR Response</td> <td>1.0E-04</td> </tr> <tr> <td>Xi (ξ) - Operator Response</td> <td>4.6E-04</td> </tr> </tbody> </table>	Base		Alpha (α) - Incipient Stage	2.8E-01	Beta (β) - System Det & Rel	3.6E-03	Tau (τ) - System Effectiveness	1.9E-02	Mu (μ) - MCR Response	1.0E-04	Xi (ξ) - Operator Response	4.6E-04
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6850	<p>This case uses the NUREG/CR-6850 NSP event tree and credits 5 minutes for In-Cabinet incipient detection. This is the same credit as conventional in-cabinet detection would get.</p>												
None	<p>This case did not give any credit for incipient detection.</p>												

It is noted that for all methods except the latest NUREG-2180, there is a path that credits incipient detection preventing a fire from developing beyond ignition.

In-Cabinet:

PLANT	Comp A	Comp B	Comp C	Comp D	Comp E
Current CDF (FAQ)	1.45E-06	2.70E-07	6.26E-07	2.00E-07	2.66E-06
2180	1.57E-06	3.17E-07	1.18E-06	2.34E-07	1.58E-05
6850	1.76E-06	3.82E-07	1.90E-06	2.91E-07	3.92E-05
None	1.84E-06	4.44E-07	2.51E-06	3.42E-07	5.69E-05

Based on these sensitivities there is significant impact based on the time-to-damage especially if fire prevention can be credited. The amount of benefit from incipient is also dependent on the extent and importance of the secondary targets.

Area Wide:

Several cases were run to determine the potential impact if area-wide detection credit was applied. Note that there is currently no industry approved method to credit area-wide incipient detection in Fire PRA.

PLANT	Compartment CDF
Current PRA (no area wide credit)	4.95E-06
2180	3.59E-06
6850	NA (no in-cabinet)

Marginal improvement with NUREG-2180 over no credit. Note that the compartment evaluated has minimal hot gas layer potential.