NUCLEAR ENERGY INSTITUTE

Anthony R. Pietrangelo
SENIOR VICE PRESIDENT
AND CHIEF NUCLEAR OFFICER

December 4, 2009

The Honorable Gregory B. Jaczko
Chairman
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Fire Probabilistic Risk Assessment

Project number: 689

Dear Chairman Jaczko:

We commend the commission for holding the November 3 briefing on the pilot program for risk-informed, performance-based fire protection under 10 CFR 50.48c (NFPA 805). This briefing helped all parties remain aware of the status of activities and issues associated with this effort. An important issue discussed by industry representatives was fire probabilistic risk assessment (PRA) and the concern that current methods do not yield realistic estimates of plant fire risk. The purpose of this letter is to further elaborate on the nature of this concern, its potential impact on licensee decisions to transition to NFPA 805, and a path forward to facilitate these decisions.

We believe that unrealistic estimates of fire risk are in part due to the fact that several fire PRA issues remain to be resolved, as demonstrated by the amount of fire research currently planned by the U.S. Nuclear Regulatory Commission. Industry, through the Electric Power Research Institute (EPRI), is also undertaking a significant amount of work to achieve better realism in fire PRA. This work is described in the fire PRA action plan, which is attached for your information. The EPRI fire PRA action plan can produce meaningful improvements that would result in greater value and acceptance of fire PRA, both for transitioning to risk-informed fire protection and other applications supported by PRA. Elements of the plan include improved data collection, methods refinement, and fire testing where appropriate.

The NRC's PRA policy statement calls for realism in PRA methods. We agree with this concept, and the NRC and industry efforts to date have strived to produce PRAs that depict a best estimate of the level of safety, and which should reflect the many improvements in fire protection implemented since the Browns Ferry fire in 1975. Fire PRAs performed to NUREG CR-6850 and the NRC responses to

1776 I Street, NW | Suite 400 | Washington, DC | 20006-3708 | P: 202.739.8081 | F: 202.533.0182 | arp@nei.org | www.nei.org

"frequently asked questions" for NFPA 805 produce results that are inconsistent with operating experience and do not depict actual plant fire risk. As an example, these methods predict that over 100 severe fires should have been observed to propagate from low voltage electrical cabinets, when in reality few such events have been observed in 3000 reactor years of U.S. plant operation. These and other such assumptions combine to produce exaggerated fire core damage frequencies. Use of these metrics could have consequences adverse to safety by wrongly shifting resources from more important safety issues, and could also undermine public confidence in the regulatory framework. We believe public understanding, transparency and the credibility of the regulator and industry are best served by presenting a realistic perspective on plant risk.

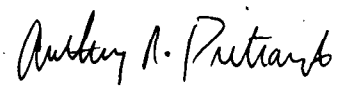
While additional research to achieve more realism is important, this alone cannot solve the problem. Commission direction on the need to adhere to the PRA policy statement is also warranted. In fact, considerable additional realism could be achieved now by adopting PRA methodology approaches that are consistent with prior practice (i.e. internal event PRAs) and the NRC PRA policy statement.

Multiple paths are available for licensees to demonstrate or achieve compliance with current regulatory interpretations of fire protection requirements. Licensee decisions to transition to 10 CFR 50.48c are enabled by efforts to produce realistic fire PRAs. Transition is a less desirable alternative if fire PRA methods produce results that are not reflective of operating experience. This will also complicate other activities that rely on PRA and diminish the importance of the realistic PRAs that have been performed for internal events

The combined fire research efforts of the NRC and industry total many millions of dollars over the next several years. This is indicative of the amount of work yet to be done to achieve realism in understanding fires and estimating fire risk. Ideally, expectations for the NFPA 805 implementation schedule would be modified to reflect this circumstance. As a minimum, we believe the NRC should recognize that preliminary and conservative fire PRA results can lead to poor decisions and must be carefully treated until better realism is attained. Commission clarification of this matter would facilitate licensee decisions to transition to NFPA 805.

We would welcome the opportunity to discuss this matter further with the commission. Please contact me if you have any questions.

Sincerely,



Anthony R. Pietrangelo

Attachment

c: Commissioner Dale Klein, U.S. Nuclear Regulatory Commission
Commissioner Kristine Svinicki, U.S. Nuclear Regulatory Commission
Mr. R. William Borchardt, U.S. Nuclear Regulatory Commission
Mr. Stephen G. Burns, U.S. Nuclear Regulatory Commission
Dr. Mario V. Bonaca, Chairman, ACRS

Fire PRA Methods Development - Action Matrix (Working Draft)

Issue		Actions Taken					
No	Name	No	Date	Description	Date	Owner	Description
1	**Fire PRA Methods Improvements (Open Items or Other Issues)**						
1.1	High Energy Arcing Faults	08-0035	06/09	FAQ 0035 was generated to resolve the zone of influence of high energy arcing faults.	n/a	EPRI	Refine zone of influence and frequency of occurrence. Low priority.
1.1	Switchgear Zone of Influence	08-0000		Defines switchgear zone of influence			Refine the switchgear fire zone of influence
1.2	Oil Fires	08-0044	07/09	FAQ 0044 was developed to address feedwater pump oil fires which significantly impact one of the pilots.	07/09	EPRI	Consensus not reached as the approach was changed before finalized. A technical issue with regards to large and extremely large fires remain.
				Extend the MFW Pump Fire Size Argument to other pump types. Investigate ways to model both leaks (small, med, large) and spills (small, med, large).		PWROG	Use the existing FAQ to develop a similar argument for other pumps, such as circulating water pumps, condensate pumps, etc. Need to address both leaks and spills of a spectrum of sizes. In addition, the effects of drains should be considered in the modeling to limit sizes of fires.
				Without hot pipes in a system (such as feedwater pumps), it is more difficult to cause a pump oil or grease to ignite. Ratios may differ by service. Address standby pumps.		PWROG	Review the data to determine the likelihood of oil/grease fires for various types of equipment.
				Other non-pump related oil fires should also be addressed such as diesel fuel oil and turbine lube oil fires.		PWROG	Consider the potenital for using fixed heat release rates as opposed to pool size.
1.3	Incipient Fire Growth in Electrical Cabinets	08-0045		An alternate, easier approach is the examination of experience to determine which events grow to fully developed fire events as the physics of fire have been studied from many years and have not provided a sufficient model.		EPRI / UMD	One possible solution is to model a spectrum of loading and arrangements in cabinets and perform fire modeling to assess timing that is appropriate as opposed to current 12 minute timing. It may even be possible to use bounding load and configurations and produce better timing.
1.4	Credit for Incipient Detection	08-0046	08/09	FAQ 0046 provides modeling credit (reduced risk) when incipient detection is installed. Currently NRC allows minimal credit for configuration very similar to Harris. Other applications will be restrictive and likely unusable.	09/09	EPRI	Additional work required to address applications beyond limited scope of pilot plant
1.5	Hot Short Probabilities	08-0047	08/08	FAQ 0047 purpose is to provide additional guidance on the determination of Circuit Failure Probabilities for components with multiple electrical cables within a fire area or compartment.	08/08		Issues with the use of various datasets.

Fire PRA Methods Development - Action Matrix (Working Draft)

Issue		Actions Taken					
No	Name	No	Date	Description	Date	Owner	Description
1.6	Fire Ignition Frequency	08-0048	07/08	FAQ 0048 was developed to address fire ignition frequencies identified as inaccurate as they overestimate the fire frequencies when compared with operational experience.	09/09	None	interim resolution needs further attention to address sensitivity studies using old data
1.7	Fire Suppression Probabilities	08-0050	10/09	Development of realistic fire suppression probabilities based on Fire Events Database	08/09	EPRI	
1.8	Hot Short Duration	08-0051	11/09	Hot short duration. AC and DC circuit testing to helps identify duration.	11/09	EPRI	AC testing data is being interpreted unrealistically. DC testing is not compete.
2	**Revision of the Fire Events Database**						
2.1	Revision of FEDB database structure	1	06/09	Revise the database structure to fit the current uses in Fire PRAs such as ignition frequency, detection and suppression probability, brigade response, etc.	12/09	EPRI / RES	Working draft produced.
2.2	Collection of plant fire experience	2	01/01	Collect plant fire event experience from pilot plants, other NFPA 805 plants and those developing fire PRAs.	01/10	EPRI / RES	Develop a policy to share fire event data with the NRC RES. Make decisions on the content of the final database that will be provided.
					02/10	EPRI / RES	Need to get NEIL and individual utilities to share required information with the database development team.
					03/10	EPRI / RES	Contact pilot plants and others and request fire event information. Need to get permission from utilities who provide information to share NRC.
					04/10	EPRI / RES	Conduct workshop to provide instruction on how to use NEIL website to provide continued updates through NEIL
2.3	Classification of fire experience	3	10/09	Reclassify the existing fire experience rule set and carefully noting exceptions. Classify new events since 2000 entered from task 2.2	06/10	EPRI	Target date.
2.4	Resolution of fire experience classification issues	4	03/10	Issues of event classification that cannot be agreed upon will be submitted to special panel who will assist in final classification.	09/10	EPRI	Target date.
2.5	Completion of Fire PRA Database Revision 1	5	12/10	Complete Revision 1 of the Fire Events Database	12/10	EPRI	Target date.

Fire PRA Methods Development - Action Matrix (Working Draft)

Issue		Actions Taken					
No	Name	No	Date	Description	Date	Owner	Description
2.6	Completion of Fire PRA Database Revision 2 - Component based fire frequencies	6	12/11	Revise the Fire Events Database (Revision 2) to be component based as opposed to plant area based		PWROG / BWROG	Scope of work developed. Initial draft produced. Component counts should include some categorization of items such as: standby and operation pumps, pump / motor sizes, eletrcial cabinet service, ventilation and motors, etc.
3	**Resolution of Other PRA and Fire Growth Issues**						
3.1	Peak heat release data review and analysis, testing plan if warranted	3.1.1		Collection and analysis of experimental heat release data and the analysis which resulted in the heat release rates used in the PRAs.	3/10	EPRI	Draft of analytical method developed.
		3.1.2		Testing program for heat release rates from various types of electrical cabinets.	12/11	EPRI	
3.2	Control Room Modeling and Treatment in the Fire PRA	3.2		Main control board fire events and probability of abandonment. This does not include how to treat or model control room abandonment.	3/10	EPRI / Others	Draft available for review
3.3	Human Reliability Methods (HRA) methods and performance shaping factors for fire PRAs	3.3		Draft EPRI/NRC Report Developed	4/10	NRC / EPRI	Implement Draft Report, Provide Comments, and Revise method as appropriate.
3.4	DC Circuits Hot Short Probability and Duration	3.4.1		DC Circuit Testing underway	12/10	NRC / EPRI	Need to post-process data into DC Circuit HS Probabiltiy and Duration Curves.
		3.4.2		Post-DC Circuit Testing Review needed	12/10	NRC / EPRI	Extend the lessons learned into AC Circuit HS recommendations. May include modification to the existing HS probability and duration, or identification of additional testing.
3.5	Control versus suppression of fire events and how to model in the Fire PRA	3.5.1		Short Term Action would be to develop a recommended approach for non-suppression curves, based on a combined	2/10	BWROG / GEH	Action assigned to BWROG.
		3.5.2		Long Term Action would be to Modify the Control of Fires Model based on actual Fires. Likely would take several years of data collection at a minimum.	3/11	EPRI	Long term action that will be closed following completion of revised FEDB
3.6	Ignition frequency treatment of standby components	3.6		Review of Fires for vatious components, and determine a ratio for Standby versus Running Component Fires. Would require some data collection on percentage of components running.		BWROG / GEH	This action could be completed following the FEDB

Fire PRA Methods Development - Action Matrix (Working Draft)

Issue		Actions Taken					
No	Name	No	Date	Description	Date	Owner	Description
3.7	Fire growth and propagation investigation and conclusions from data	3.7.2		Fire propagation between cabinets - Issued Documented in Draft EPRI Report (GEH Author).		BWROG / GEH	Obtain Industry and NRC Review and Comments.
		3.7.3		Fire Propagation from a Sealed, but not well-sealed Low Voltage Cabinet. MCC fires was original in FAQ 043, but removed in the final version (0.2 probability of propagation from the cabinet).		BWROG / GEH	Develop an argument for a probability for propagation, given HRR, Cabinet type, etc.
3.8	Incipient detection testing	3.8		Testing program to determine the efficacy of incipient detection systems in various uses			Large cost item which has been scoped. Will need significant funding if this is to be implemented
3.9	Hot Short Probabilities	3.9		Revise HS probabilities for AC circuits, given the Carol Fire Test Results.			Data is available, but has never been processed to update the existing EPRI data. Would likely want to wait until the DC testing is complete, just in case the DC tests provide additional information.
3.10	Transient Fire HRR	3.10		Revise the Transient Fire HRR			Analysis may be needed to develop a more accurate HRR estimate for fires in various plant areas. Existing fires do not appear to support the 320 kW HRR used for the 98%, but it would seem that the HRR would vary based on the transients being handled.
4	**Resolution of Peer Review, Request for Additional Information (RAI) and Safety Evaluation Report (SER) Issues**						
4.1	Results Comparison	4.1		Empirical data collection and comparison with PRA result		PWROG / BWROG	
4.2	Update of the Fire PRA Section of the Standard, given lessons learned from the initial peer reviews.	4.2		Initial Inquiries submitted. RG 1.200 comments were reviewed by the ASME CNRM, and some standard changes are in process.		BWROG / GEH	Additional comment collection is needed to improve the existing standard.
4.3	Additional Peer Review Guidance.	4.3		Additional Peer Review Guidance is needed to ensure lessons learned are quickly fed to the peer review teams.		BWROG / GEH	Provide a power point training package for Fire PRA peer review teams.