October 16, 2009

MEMORANDUM TO: Mark A. Cunningham, Director
Division of Risk Assessment
Office of Nuclear Reactor Regulation

FROM: Alexander R. Klein, Chief ***/RA/***
Fire Protection Branch
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SUBJECT: METRICS OF THE STABILITY OF FIRE PROTECTION REGULATORY FRAMEWORK – FIRST REPORT

In the Staff Requirements Memorandum (SRM) M080717 issued on July 29, 2008, the Commission directed the staff to evaluate the fire protection regulatory framework for nuclear power reactors. In response, the staff informed the Commission about the scope and details of Task 5 of the Fire Protection Closure Plan included in Commission Paper SECY-08-0171. Specifically, the staff informed the Commission that the staff will (a) assess the effectiveness of the ongoing stabilization of the fire protection regulatory framework, and (b) consider that the closure of the task is achieved when a monitoring process is in place and the baseline is established for a predetermined set of metrics that are representative of regulatory effectiveness.

On December 31, 2008, the Office of Nuclear Reactor Regulation's Division of Risk Assessment staff issued a memorandum that included a description of how three metrics to evaluate the fire protection regulatory framework would be tracked. The metrics described in the memorandum were as follows:

- the number of reportable power reactor fires,
- the number of power reactor fire protection inspection findings, and
- the percentage of power reactor fire areas with long-term compensatory measures in place.

This memorandum summarizes the results of the first data collection for these three metrics.

The Office of Nuclear Reactor Regulation (NRR) requested the assistance of the Office of Nuclear Regulatory Research (RES) staff who prepared an evaluation of the numbers of fires and inspection findings. The full report published by RES is in the Agencywide Document and Access Management System (ADAMS) as package accession number ML092660024.

The RES analysis resulted in the following key findings:

- There is no statistically significant trend in the number of reportable power reactor fires that meet the Nuclear Regulatory Commission's reporting threshold.

- There is a statistically significant increasing trend over the past few years in the number of power reactor green findings identified as part of the triennial fire protection inspection procedure (Inspection Procedure 71111.05T).

- The number of greater-than-green fire protection inspection findings (white violations) to support trending is insufficient (too few) to draw conclusions relating to trending.

Additional information about these findings is included in the enclosure and the RES report discussed above. There are no clear root causes contributing to the statistically significant increasing trend in the green (very low safety significance) findings. The NRC staff will continue to collect this information and monitor the trend. If the trend continues the NRC staff will develop a plan of action to more fully explore the adverse trend or address the trend or both.

Information regarding long-term compensatory measures at power reactors has been collected and future information collections are planned by NEI. A summary of the results of NEI's information collection is included in the enclosure. This information is based on an industry presentation at the 2009 NEI Fire Protection Information Forum. Based on this preliminary information, approximately 30% of plants that are maintaining their approved fire protection program by not choosing to adopt 10 CFR 50.48(c) - National Fire Protection Association Standard 805 (NFPA) 805, have long-term compensatory measures in place. On a fire-area basis, this information indicates that on average less than 2% of the nuclear power plant fire areas of plants maintaining their current fire protection programs have long term compensatory measures in place. This ranges from 0% at some facilities to 18% at one facility.

For plants transitioning to NFPA 805, open items are being considered by the staff to be equivalent to long-term compensatory measures, since they represent long-standing or other technical issues at the plant. The percentage of plant areas with open items is 33% for Harris and 75% for Oconee. Information will be collected for the remaining plants that plan to adopt NFPA 805, when they submit their license amendment request.

If there are any questions or comments, please contact Daniel Frumkin at 301-415-2280.

Enclosure:
As stated

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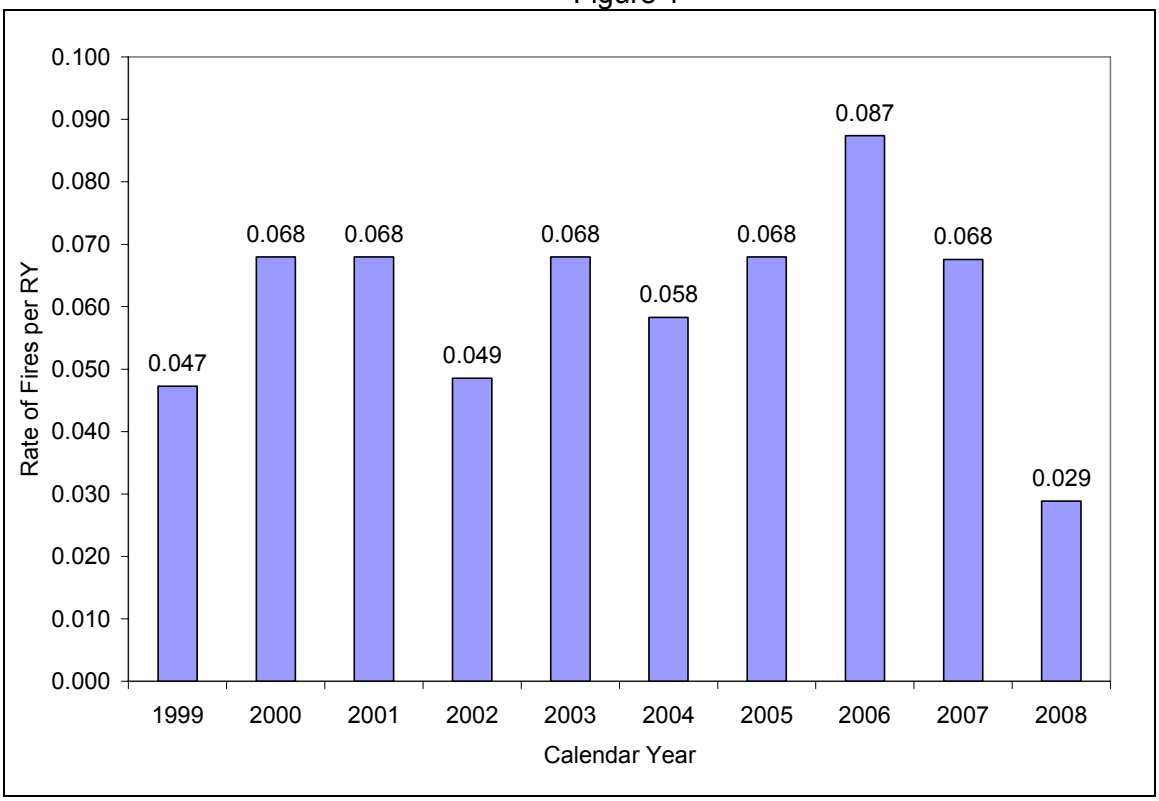
FIRE PROTECTION METRIC INFORMATION

The metrics discussed in this enclosure are as follows: the number of power reactor fires, the number of fire protection inspection findings at power reactors, and the percentage of power reactor plant areas with long-term compensatory measures in place.

Power Reactor Fires

The U.S. Nuclear Regulatory Commission's (NRC) Office of Nuclear Regulatory Research (RES) analysis concluded that there is no statistically significant trend for the fire events reported via Title 10 of the *Code of Federal Regulations* Part 50 (10 CFR) 50.72/73. RES staff evaluated the statistical significance using the Poisson-maximum-likelihood method (Poisson regression), as discussed in Section 7.2.4 of NUREG/CR-6823, "Handbook of Parameter Estimation for Probabilistic Risk Assessment." Figure 1, "Number of Reported Fires per Reactor Year," is from the RES report. .

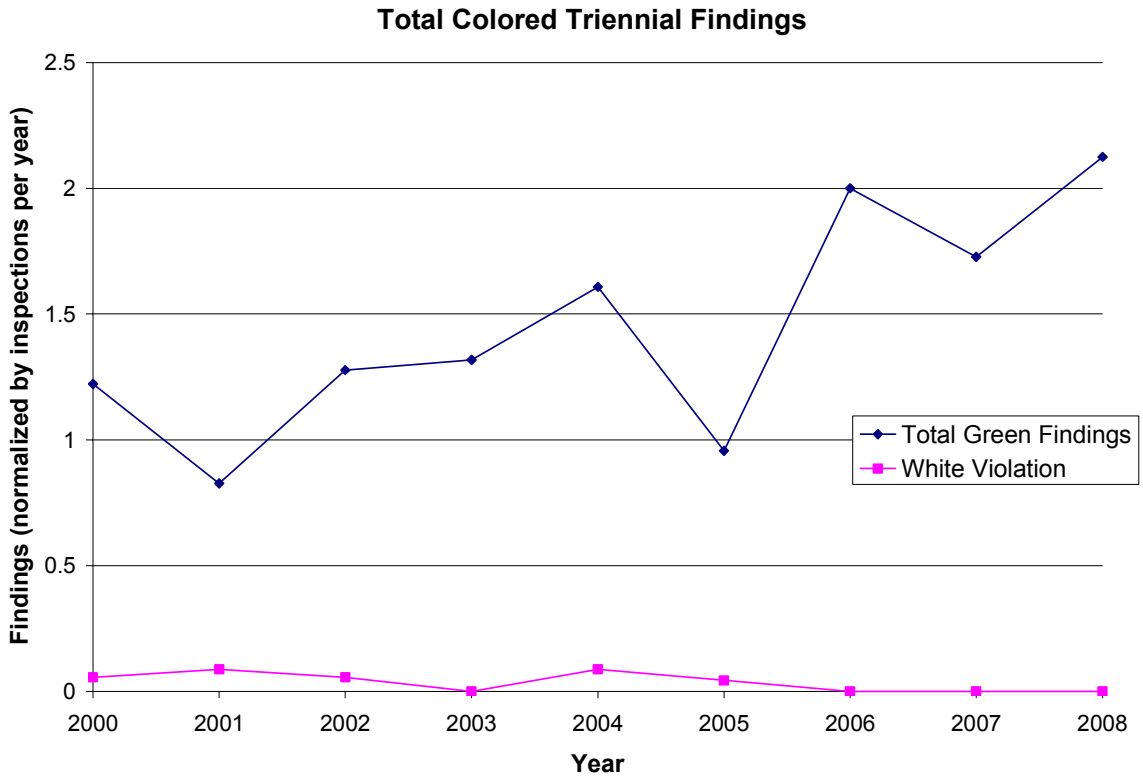
Figure 1



Power Reactor Fire Protection Findings

The RES analysis indicates that there is a statistically significant upwards trend in green findings noted during triennial fire protection inspections of power reactors. The number of other greater-than-green findings is too small to draw trending information. Figure 2, "Total Colored Triennial Findings," is based on data from the RES report.

Figure 2



The increasing trend may exist due to changes in (a) licensee fire protection capability, or (b) the implementation of the fire protection inspection program, or both. For example, the triennial fire protection inspection procedure (Inspection Procedure 71111.05T) has been revised several times during the period 2000-2008. It is possible that the observed increasing trend is the result of a more focused inspection process due to these revisions. An increase may also be due to inspectors applying information relating to common findings shared during region inspector counterpart teleconferences that could not have been done as easily during the early cycles of the triennial inspection procedure. Another possible explanation could be related to the hiatus on inspection and enforcement on fire-induced circuit failures and operator manual actions. Conversely, it may be that the increasing trend is due to worsening licensee performance.

The increasing trend relates to findings that are identified as green, and therefore of very low to low safety significance. The NRC staff will continue to collect this information and monitor the trend. If the trend continues the NRC staff will develop a plan of action to more fully explore the adverse trend or address the trend or both.

Long Term Compensatory Measures

Long term compensatory measure data is being generated for two classes of plants: those that are maintaining their approved fire protection programs and those adopting 10 CFR 50.48(c) – National Fire Protection Association Standard 805 (NFPA 805).

Plants Maintaining their Approved Fire Protection Programs

NEI is collecting information regarding long term compensatory measures at these plants (see Agencywide Document and Access Management System (ADAMS) accession number ML090710298).

NEI presented the information on long-term compensatory measures at the 2009 Fire Protection Information Forum in Savannah, Georgia. The information below is based on that presentation. The NRC staff considers the NEI information as preliminary, since the staff did not interact with NEI staff regarding the questions that were asked of industry and assumptions made by industry stakeholders when NEI collected the information. The NRC staff will work with NEI to further understand the basis for this information.

In the data presented during the forum, the plant names and characteristics are masked. NEI simply provided a summary of the collected information from 33 sites. These sites represent the 53 units that are currently not adopting NFPA 805. Of these sites, 23 stated that they have no long term compensatory measures in place. The slide below is from the NEI presentation.

Data Gathered in Support of Development of Fire Protection Metrics

- **Number of Fire Areas**
- **Number of Long Term (> 18 months) Compensatory Actions**
  - **There are 65 sites with licensed reactors:**
  - **33 that are not Transitioning to NFPA 805**
  - **< 1.65% of Identified Fire Areas have Long Term Actions**

Plant	#FAs	# LTC	Plant	#FQs	# LTC	Plant	#FAs	# LTC	Plant	#FAs	# LTC	Plant	#FAs	# LTC
A	137	11	H	57	4	O	162	0	V	47	0	CC	152	4
B	200	0	I	11	2	P	172	0	W	26	0	DD	152	0
C	150	3	J	25	0	Q	32	0	X	62	0	EE	118	0
D	42	0	K	30	2	R	15	0	Y	41	1	FF	80	0
E	55	0	L	58	0	S	144	0	Z	58	0	GG	109	2
F	36	0	M	92	1	T	138	0	AA	90	0			
G	34	1	N	15	0	U	57	0	BB	66	0			4

According to the information that NEI presented at the forum, there are 2,663 fire areas at the 33 sites. Ten sites have long term compensatory measures out of 33 sites. This equates to approximately 30% of the sites having long term compensatory measures in place. There were 31 fire areas with compensatory measures in place. Fewer than 2% of the fire areas have long term compensatory measures. Plant "I" has about 18% of its plant fire areas with long term compensatory measures in place, the highest percentage among plants maintaining their approved fire protection program.

Since this is the single point of data, no trend can be established. In six months additional data will be available for analysis.

NFPA 805 Plants

For the NFPA 805 plants, tracking plant fire areas with open items is being used as a surrogate for compensatory measure information. Information for areas that are non-compliant is listed in each licensee's license amendment request. As of June 30, 2009, two plants had submitted their license amendments, Sheron Harris Nuclear Power Plant and Oconee Nuclear Power Plant.

The information from the license amendments is listed below. These are the number of fire areas at each plant that have non-compliances. As with the long-term compensatory measures listed above, this is a single data point so trending is not possible.

Plant	Type	Number of Units	Number of Fire/Analysis Areas	Areas with 805 Open Items	Percentage	Reference
Harris	PWR	1	54	18	33%	ML083510192
Oconee	PWR	3	16	12	75%	ML083120362

There are 30 additional sites that are adopting NFPA 805. These 30 sites will report their areas with open items at the time that they submit their NFPA 805 license amendment for review. At that time, additional data will be available for analysis.