

December 31, 2008

MEMORANDUM TO: John A. Grobe, Chairman  
NRC Fire Protection Steering Committee

FROM: Mark A. Cunningham, Director */RA by S. Weerakkody for/*  
Division of Risk Assessment  
Office of Nuclear Reactor Regulation

SUBJECT: DETERMINE METRICS FOR MEASURING EFFECTIVENESS OF  
ONGOING FIRE PROTECTION IMPROVEMENTS

In the Staff Requirement Memorandum (SRM) SRM-071708 issued on July 29, 2008, on the July 17, 2008 Fire Protection Briefing to the Commission, the Commission directed the Nuclear Regulatory Commission (NRC) staff to provide a plan to assess the effectiveness of the ongoing improvements to the fire protection regulatory framework, using recent plant data. The Commission also stated that such a baseline could be, for example, the number and general type of all open fire protection deficiencies that were compensated and the manner of compensation used in the calendar year (CY) 2007.

Consequently, the NRC staff committed to determine a metric for measuring the effectiveness of ongoing fire protection improvements by December 31, 2008. This commitment is included as the first step of Task Number 5, "Assessing Regulatory Effectiveness," in the November 5, 2008, SECY-08-0171, "Plan for Stabilizing Fire Protection Regulatory Infrastructure." The next step of Task Number 5, "Develop Metric Monitoring Methodology," is scheduled to be completed by March 31, 2009. After developing the metric monitoring methodology, by the end of the 3<sup>rd</sup> calendar quarter of 2009, the staff expects to begin collecting plant data and monitoring.

Based on discussions among cognizant NRC staff, the NRC staff concluded that establishing and monitoring more than one metric is necessary to assess the effectiveness of the improvements of the fire protection regulatory framework. Specifically, the staff recognized that meaningful metrics should be representative of ongoing improvements in safety as well as regulatory compliance. Consequently, at this time, the staff has plans to monitor the following metrics:

- number of plant fires that occurred in prior 12 months that exceeded the 10 CFR 50.72/73 reporting threshold normalized by the number of operating reactors,
- number of plant fire protection findings identified in prior 12 months that are classified in the Reactor Oversight Process as Green, and Greater-than-Green (White/Yellow/Red) normalized by the number of operating reactors, and
- percentage of plant fire areas that rely upon compensatory measures for greater than one refueling outage (typically 18 months).

CONTACT: Daniel Frumkin, DRA/NRR  
301-415-2280

The staff believes that these metrics, when measured against appropriate baselines, constitute meaningful measurements of the effectiveness of ongoing improvements to the fire protection regulatory framework. Based on interactions with the internal and external stakeholders, the staff also believes that monitoring through the use of these metrics is practical in that the plant data necessary to establish and monitor these metrics can be collected and analyzed using an appropriate level of burden on the NRC staff and the industry.

The enclosure provides the chronology of meetings among internal NRC staff and stakeholders held by the staff to develop the metrics. The enclosure also provides a summary of the bases for selecting the above metrics for measuring regulatory effectiveness. Furthermore, it provides several other metrics considered by the staff and the staff's bases for not including them. Upon issuance of this memorandum, the step "Determine Metric" of Task 5 of the Closure Plan communicated in SECY-08-0171 will be considered complete.

Enclosure: As stated

cc: C. Lui  
M. Cunningham  
S. Magruder  
S. West  
C. Ader  
S. Weerakkody  
M. Salley  
R. Radlinski  
AFPB

The staff believes that these metrics, when measured against appropriate baselines, constitute meaningful measurements of the effectiveness of ongoing improvements to the fire protection regulatory framework. Based on interactions with the internal and external stakeholders, the staff also believes that monitoring through the use of these metrics is practical in that the plant data necessary to establish and monitor these metrics can be collected and analyzed using an appropriate level of burden on the NRC staff and the industry.

The enclosure provides the chronology of meetings among internal NRC staff and stakeholders held by the staff to develop the metrics. The enclosure also provides a summary of the bases for selecting the above metrics for measuring regulatory effectiveness. Furthermore, it provides several other metrics considered by the staff and the staff's bases for not including them. Upon issuance of this memorandum, the step "Determine Metric" of Task 5 of the Closure Plan communicated in SECY-08-0171 will be considered complete.

Enclosure: As stated

cc: C. Lui  
M. Cunningham  
S. Magruder  
S. West  
C. Ader  
S. Weerakkody  
M. Salley  
R. Radlinski  
AFPB

ADAMS Accession NO.: ML083570117

|        |                |                                 |  |  |
|--------|----------------|---------------------------------|--|--|
| OFFICE | TL:NRR/DRA/AFP | D:NRR/DRA                       |  |  |
| NAME   | DFrumkin       | SDWeerakkody for<br>MCunningham |  |  |
| DATE   | 12 / 31 /08    | 12/ 31 /08                      |  |  |

**OFFICIAL RECORD COPY**

## **Details of Establishing Metrics for Monitoring the Effectiveness of Ongoing Fire Protection Improvements**

### **PURPOSE:**

To develop metrics to monitor the effectiveness of ongoing fire protection improvements, consistent with Commission direction.

### **BACKGROUND:**

In SRM-071708, the Commission stated the following:

“The staff should also provide to the Commission a plan to assess the effectiveness of the ongoing improvements to the fire protection regulatory framework, using recent plant data to establish a baseline. Such a baseline could be, for example, the number and general type of all open fire protection deficiencies that were compensated and the manner of compensation used in CY2007.”

The NRC staff developed a plan to perform this activity as Task Number 5 of SECY-08-0171, “Plan for Stabilizing Fire Protection Regulatory Infrastructure.” On December 9 and December 15, 2008, the NRC staff held discussions with industry representatives regarding this task in order to gain industry insights such as practicality of data collection on a number of metrics which were under consideration by the NRC staff. Emails between the NRC staff and the Nuclear Energy Institute (NEI), Agencywide Documents Access and Management System (ADAMS) accession numbers ML083510279 and ML083520589, are representative of the topics discussed during these two discussions. The staff held further discussions on this topic on December 11, 2008, among the NRC Fire Protection Steering Group members. Later this topic was discussed during a December 18, 2008 public meeting of the NRC Fire Protection Steering Committee. During this meeting, all external stakeholders were provided opportunities to raise questions regarding the staff’s proposals. The agenda and slides for the December 18<sup>th</sup> meeting are in ADAMS as accession numbers ML083300582 and ML083570698, respectively.

### **BASES FOR THE PROPOSED METRICS:**

The NRC staff applied the concept of fire protection defense-in-depth in developing the fire safety related metrics for monitoring fire protection improvements. The elements of fire protection defense-in-depth are as provided in 10 CFR Part 50, Appendix R, Section II.A as follows:

- To prevent fires from starting;
- To detect rapidly, control, and extinguish promptly those fires that do occur;
- To provide protection for structures, systems, and components important to safety so that a fire that is not promptly extinguished by the fire suppression activities will not prevent the safe shutdown of the plant.

ENCLOSURE

Using the defense-in-depth information and based on discussions among staff and interested stakeholders, the NRC staff determined that one set of meaningful measurements of the effectiveness of ongoing improvements may comprise of the following:

- number of plant fires that occurred in prior 12 months that exceeded the 10 CFR 50.72/73 reporting threshold normalized by the number of operating reactors,
- number of plant fire protection findings identified in prior 12 months that are classified in the Reactor Oversight Process as Green, and Greater-than-Green (White/Yellow/Red) normalized by the number of operating reactors, and
- percentage of plant fire areas that rely upon compensatory measures for greater than one refueling outage (typically 18 months).

The bases for selecting each of these metrics are discussed in detail below.

#### Number of Plant Fires

Trending the number of plant fires that occurred during the 12 months supports tracking of the first two levels of defense-in-depth, “preventing fires” and “suppressing fires that do occur.” Where fire prevention and fire suppression is effective there would be no fires that threaten safety of the nuclear power plant. Therefore, the staff concluded that this metric is a meaningful indicator of the fire safety of plants. The 10 CFR 50.72/73 reporting criteria were chosen since these criteria have been in place for a long period of time and therefore ensure consistency among plants. Furthermore, since these fires are reportable to the NRC by current regulations, there is no additional burden on the licensees to report these fires.

Specifically 10 CFR 50.73 requires in A(2)x that fires be reported that:

- . . . posed an actual threat to the safety of the nuclear power plant or significantly hampered site personnel in the performance of duties necessary for the safe operation of the nuclear power plant . . .

The NRC will collect the information for this metric quarterly and trend it on a rolling average of 12 months using established processes and analyze and trend the data. A rolling average was chosen over the alternative of measuring the number of fires on a monthly or a quarterly basis since it normalizes the data based on plant’s outage cycles, which typically occur at the same times during the year (spring and fall).

The staff plans to begin reporting this metric in September of 2009. Historical information is available for this metric. Therefore, the staff intends to use historical data since 1997 to establish a baseline against which to measure the trend for this metric. The staff has begun collecting historical data for this metric. Based on this evaluation of the historical data and the associated trends, the staff may refine this metric, if necessary, to make it more meaningful with respect to evaluating the regulatory framework.

#### Number of Plant Fire Protection Findings

The number of fire protection findings identified in the Reactor Oversight Process (ROP) supports tracking of deficiencies relating to all three levels of defense-in-depth. Green findings, although not of low, moderate or high safety significance, are likely to indicate some weakness

in at least one level of defense-in-depth. Therefore, a lack of green findings or decreasing trend in green findings would be indicative of adequate implementation of fire protection program.

Greater than green findings are indicative of low, moderate or high safety significant findings. Therefore, they may be representative of a reduction in more than one level of defense-in-depth. A lack of a decreasing trend in greater than green findings would indicate that risk-significant configurations in the plant are being addressed and an effective fire protection program.

The NRC will collect the information for this metric quarterly on a rolling 12 month average using data collected through established NRC processes. The reason for the quarterly reporting is that this is similar to the reporting that occurs as part of the ROP. A rolling 12 months is proposed to normalize the number findings since inspections are not necessarily evenly spaced throughout the year.

The staff plans to begin reporting this metric in September of 2009. Historical information is available for this metric, and the NRC intends to use historical data from the year 2000 to establish a trend since 2000.

The NRC has begun to collect and evaluate historical data for this metric to determine the most useful data set. Based on this collection the staff expects that there will be some refinements needed, but the basic metric is not expected to change.

#### Percentage of Plant Areas that Contain Compensatory Measures for Greater than One Refueling Cycle

Licensees establish fire protection compensatory measures to compensate for fire protection deficiencies in the plant. Although compensatory measures are often allowed as part of the approved fire protection program and do not in and of themselves constitute a noncompliance, they are only implemented when there are deficiencies in the fire protection program. Therefore, the staff concluded that compensatory measures, or a metric related compensatory measures would be an indicator representative of regulatory effectiveness.

The staff chose the percentage of plant areas that contain compensatory measures since compensatory measures, such as a roving fire watch, are typically instituted by area, and, therefore, this information can be collected without imposing undue burdens to staff and licensees. To determine the percentage of fire areas, the data collector would need to know the number of fire areas in the plant. This information is retrievable from the plant's fire protection program, with minimal burden.

The staff has chosen percentage of compensatory measures in place over one refueling cycle to avoid tracking compensatory measures established to address routine maintenance work or equipment failures that are more quickly resolved and as such should not be representative of the regulatory effectiveness.

The staff plans to collect data for this metric for plants that have committed to adopt 10 CFR 50.48(c), National Fire Protection Association Standard (NFPA) 805, upon the delivery of each plant's license amendment request (LAR). Based on staff and industry guidance provided to develop LARs as well as the content of the pilot LARs on NFPA805, the number of

fire areas that rely on long-term compensatory measures as well as the projected timeline for removing those long-term compensatory measures can be gleaned from the LARs.

For the two pilot plants adopting NFPA 805, monitoring is planned to begin at the end of the 3<sup>rd</sup> calendar quarter of 2009. Twenty-one other plants are expected to submit their applications around the end of the 1<sup>st</sup> calendar quarter of 2010. Other plants that have submitted a letter of intent to adopt NFPA 805 will be submitting their applications at a later time. For these plants, collection of data will begin upon their submittal of their license amendments for NFPA 805.

For plants not intending to adopt NFPA 805 information collection will begin at the end of the 3<sup>rd</sup> calendar quarter of 2009. This is consistent with the schedule in Task Number 5, of SECY-08-0171, and also will allow licensees to find and fix fire-induced circuit issues as part of the NRC's closure of the fire-induced circuit failure issue. See SECY-08-0171, Task Number 3, for the staff schedule for fire-induced circuit failures.

The staff expects that this metric may initially show an increasing trend. This is due to the time that would elapse between the discovery of the deficiencies as part of the transition to NFPA 805 or circuit issue resolution, and the completion of corrective actions while the staff continues to monitor compensatory measures whose duration exceeds 18 months. For example, a compensatory measure implemented one year before LAR submittal would become 18 months old six months following the LAR submittal, thus causing an increase in the number of compensatory measures at that time. Although the percentage of long-term compensatory measures may increase for a short time (for about one fuel cycle), the staff expects these compensatory measures to begin trending down when the licensees begin completing corrective actions. Therefore, while the initial trending would be representative of regulatory effectiveness with respect to the combined effect of identification and resolution of deficiencies, the longer-term trending of this data will show if the licensee's corrective action programs are being effective in dispositioning the identified deficiencies..

The details regarding specifically how the NRC will collect information on the third metric, specifically "long-term" compensatory measures, i.e., those in place for more than one refueling cycle, have not been finalized. The staff intends to collect information on these long-term compensatory measures to track compensatory actions for fire protection deficiencies. Discussions continue with external stakeholders regarding the details as to what specifically to collect, how to collect the information, and on what periodicity.

There will be no effort to collect historical data for this metric, i.e., it will be strictly forward-looking after collection begins.

#### Other Proposed Metrics

In part, based on inputs provided by industry stakeholders, the staff considered a number of additional metrics to measure the effectiveness of ongoing fire protection improvements. A discussion of why these metrics were not chosen is included below.

*Licensing Actions and Exemptions –*

Industry stakeholders proposed use of the number of licensing actions and exemptions as a metric to demonstrate a stable regulatory framework. This proposal has some merit since licensing actions and exemptions may be used for a licensee to achieve compliance. But using licensing actions and exemptions does not identify fire protection deficiencies that are resolved through the use of plant modifications or other plant process changes. The long-term compensatory measure metric would provide a more accurate indication of the number of fire protection deficiencies regardless of how they are resolved, thus making the tracking of licensing actions and exemptions redundant. Furthermore, the number of licensing actions and exemptions are inadequate metrics to trend ongoing improvements because they do not represent the number of deficiencies or non-compliances existing at a plant at a given time.

*Condition Reports –*

The staff considered the number of condition reports as a metric. The staff determined that condition reports would not be an effective metric due to the plant specific variations in identifying and documenting condition reports.

*Number of Compensatory Measures –*

The staff considered number of compensatory measures in lieu of the percentage of fire areas that rely on long-term compensatory measures as a metric. The staff chose the percentage of plant fire areas that rely on long-term compensatory measures over the number of compensatory measures to accommodate (a) the wide variations in the definition of compensatory measures among licensees, and (b) the wide variation in the number of fire areas in a given plant.

**CONCLUSION**

The NRC staff has finalized the metrics that it plans to use to measure effectiveness of ongoing fire protection improvements. The NRC staff plans to refine these metrics and complete development of the monitoring methodology by March 31, 2009. After developing the metric monitoring methodology, by the end of the 3<sup>rd</sup> calendar quarter of 2009, the staff expects to begin collecting plant data and to begin monitoring. The monitoring of long-term compensatory measures for NFPA 805 plants will begin upon submission of their LARs. Twenty-one plants are expected to begin monitoring at the end of the 3<sup>rd</sup> calendar quarter of 2010. For plants not intending to adopt NFPA 805 information collection will begin at the end of the 3<sup>rd</sup> calendar quarter of 2009.