

July 1, 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
Division of Risk Assessment
Office of Nuclear Reactor Regulation

SUBJECT: COMPLETION OF REVIEW OF PAST REGULATORY INSTABILITIES
RELATED TO NUCLEAR POWER PLANT FIRE PROTECTION

Purpose:

The purpose of this memorandum is to report the completion of Task 8 on the Fire Protection Closure Plan. This plan was originally documented in Commission Paper SECY-08-0171, "Plan for Stabilizing Fire Protection Regulatory Infrastructure," and revised as part of SECY-09-0079, "Closing Fire Protection Issues-Semiannual Update."

Background:

In SECY-08-0171, the staff informed the Commission of our schedule to establish reasonable assurance that all past regulatory infrastructure instabilities are identified. As the first step in fulfilling this commitment, the staff performed a review of regulatory infrastructure issues. The Office of Nuclear Reactor Regulation (NRR), Division of Risk Assessment (DRA) staff performed this review by developing a list of issues based on DRA staff's views, sharing that list with personnel cognizant of fire protection issues throughout the U.S. Nuclear Regulatory Commission, (NRC), and requesting them to review and comment on the list. The list of issues transmitted to cognizant staff throughout NRC is included in a February 27, 2009, memorandum (Agencywide Documents Access and Management System (ADAMS), Accession Number ML090330762).

The organizations contacted included Regions I, II, III, and IV, Office of New Reactors (NRO), Office of Nuclear Reactor Regulation (NRR) and Office of Nuclear Regulatory Research (RES).

CONTACTS: Stephanie Weimer
(301)-415-3381

Daniel Frumkin
(301)-415-2280

The memorandum provided information on the historical context of various fire protection issues. It also provided DRA's preliminary views with respect to the closure status and requested the recipients to identify additional issues, which in view of the recipients have not been closed out appropriately. Specifically, DRA staff requested the recipients to (a) identify any issues that, in their perspectives, have not been adequately closed out, (b) the potential significance, and (c) any actions that NRC has implemented to date towards the closure of these issues. Each recipient provided responses to the NRR request for information. The responses are included in an April 22, 2009, memorandum (ADAMS Accession Number ML090770031).

Discussion:

NRR/DRA staff has, with the assistance of regional staff and RES staff, completed the collection of unresolved issues and documented the appropriate actions to closeout these issues.

For each identified open issue, NRR/DRA made an initial determination of the appropriate organization to address the issue. These included branches in NRR/DRA and RES/DRA. Then, DRA met with branch chiefs to estimate appropriate closure dates for the open items. Only NRR and RES had actions to closeout open issues.

Fire protection branch personnel evaluated each issue for safety significance and concluded that none of them rebut the presumption of adequate protection afforded by compliance with the Commission's regulations. These issues are outlined in Enclosure 1. Issues that are not closed have been or will be put into an existing regulatory process for future dispositioning, as explained in Enclosure 1.

A number of issues are planned to be resolved by incorporation into the next revision of Regulatory Guide 1.189, "Fire Protection for Nuclear Power Plants." A tentative date has been included in Enclosure 1 of September 2011.

Enclosure 1 to this memo includes a list of open issues with the organizations responsible for their closure and expected completion dates.

Enclosure 2 to this memo includes a list of closed issues. The full list of closed issues, with descriptions is included in the February 27, 2009, memorandum (ADAMS Accession Number ML090330762).

Conclusion:

Based on the survey results and staff review, regulatory instabilities have been identified and have either been closed or are being tracked to closure. None of the issues identified rebut the presumption of adequate protection to public safety.

Enclosures:

As stated

Table of Open Issues

Table of Contents

ISSUE	LEAD ORGANIZATION	ESTIMATED COMPLETION DATE
1 Electrical Raceway Fire Barrier Systems (ERFBS)	RES/DRA/FRB	Dec-09
2 Fire Modeling User's Guide	RES/DRA/FRB	Mar-10
3 Fire Probabilistic Risk Assessment (PRA) Update	RES/DRA/FRB	Dec-10
4 Better Understanding of Electrical Cabinet Heat Release Rate	RES/DRA/FRB	Jun-11
5 Better Understanding of Smoke Damage to Control Circuits	RES/DRA/FRB	Jun-11
6 Gaseous Fire Suppressant Agents	RES/DRA/FRB	Sept-11
7 Compensatory Measures	RES/DRA/FRB	Sept-10
8 Tracking Flame Spread Rate for Electrical Cables	RES/DRA/FRB	Jun-11
9 Update IMC 0609, Appendix F – Fire SDP	NRR/DRA/APOB	Dec-09
10 Fire Induced Circuit Failures	NRR/DRA/AFPB	Jun-10
11 Operator Manual Actions	NRR/DRA/AFPB	Jun-10
12 Exemption Database	NRR/DRA/AFPB	Mar-10
13 Fire Brigade Drill Participation	NRR/DRA/AFPB	Sept-11
14 Application of Water Based Fire Suppressants to electrical fires	NRR/DRA/AFPB	Sept-11
15 Identifying and Managing Risk When Removing Safe Shutdown Equipment from Service for Maintenance	NRR/DRA/AFPB	Dec-09
16 NFPA 805, Performance-Based Standard for Fire Protection for Light-Water Reactor Electric Generating Plants	NRR/DRA/AFPB	Mar-10
17 NFPA 805 Triennial Inspection Procedures	NRR/DRA/AFPB	Dec-10
18 Define "Adverse to Safe Shutdown"	NRR/DRA/AFPB	Sept-11
19 Define "Associated Circuit"	NRR/DRA/AFPB	Sept-11

Issue 1: Electrical Raceway Fire Barrier Systems (ERFBS)

Internal stakeholders have expressed a need for documentation that the NRC is confident that ERFBS have been sufficiently reviewed. The Office of Nuclear Regulatory Research (RES) is preparing a NUREG-series report similar to the one prepared for penetration seals (NUREG-1552, "Fire Barrier Penetration Seals in Nuclear Power Plants," issued July 1996) to document the closure of ERFBS issues. This report will explore the effectiveness of ERFBS, provide information regarding the fire endurance testing of the systems, and discuss how the NRC achieved closure for open issues related to ERFBS. These barriers include, but are not limited to Thermo-Lag, Kaowool, Hemyc, and other barriers installed following Generic Letter 86-10, Supplement 1, "Fire Endurance Test Acceptance Criteria for Fire Barrier Systems Used to Separate Redundant Safe Shutdown Trains within the Same Fire Area," dated March 25, 1994.

Estimated Completion Date: December 2009

Issue 2: Fire Modeling User's Guide

Internal stakeholders have identified the need for a fire modeling user's guide to help internal and external stakeholders appropriately apply fire models. RES will develop a fire modeling user's guide to complement NUREG-1824, "Fire Model Verification and Validation." The user's guide will provide a detailed understanding of the uses and limitations of the five fire models verified and validated in NUREG-1824.

Completion date: March 2010

Issue 3: Fire Probabilistic Risk Assessment (PRA) Update

Internal stakeholders have identified the need for a fire PRA update based on the lessons learned from the implementation of NFPA 805, "Performance-Based Standard for Fire Protection for Light-Water Reactor Electric Generating Plants." RES will provide a NUREG-series report documenting errata and providing supplemental material to NUREG/CR-6850 based on lessons learned with the NFPA 805 transition process, i.e., primarily those NFPA 805 fire PRA Frequently-Asked-Questions which have reached closure.

Completion date: December 2010

Issue 4: Better Understanding of Electrical Cabinet Heat Release Rate

Internal stakeholders have expressed an interest to better understand the heat release rate of fires in electrical cabinets to improve the state of knowledge for fire PRA. Section G.3.1 of the NUREG/CR-6850 / (EPRI TR-1011989) offers an empirical fire growth model for electrical cabinet fires that is based in part on the Sandia National Laboratory (SNL) tests, tests at VTT Finland, and on traditional approaches to the

modeling of fire growth derived through testing at NIST (the "t-square" model) and as applied in prior FPRA methods such as the EPRI FPRA guide. RES is planning research to further explore the assumptions made in modeling cabinet fire growth.

Completion date: June 2011

Issue 5: Better Understanding of Smoke Damage to Control Circuits

Internal stakeholders have expressed an interest to better understand smoke damage to control circuits. RES is planning to consolidate documentation and test reports regarding smoke damage to control circuits, including extent of smoke damage. In addition, RES is planning research to fill gaps in current knowledge of smoke damage to control circuits.

Completion date: June 2011

Issue 6: Gaseous Fire Suppressant Agents

Internal stakeholders have expressed an interest in improving the state of knowledge on gaseous fire suppressant agents specifically regarding their effectiveness on deep-seated fires and gas migration. RES is preparing a NUREG-series report similar to the one prepared for penetration seals (NUREG-1552, "Fire Barrier Penetration Seals in Nuclear Power Plants," issued July 1996). This report will consolidate documentation regarding all known CO₂ and other fire suppression system gas migration occurrences and information regarding amount of gaseous agent and hold time to extinguish deep-seated cable fires.

Completion date: September 2011

Issue 7: Compensatory Measures

Internal stakeholders have expressed an interest in consolidating documentation regarding the usage of compensatory measures. RES will consolidate this information and will provide information regarding available alternative technologies for implementing fire protection compensatory measures. RES will document this information in a NUREG-series report.

Completion date: September 2010

Issue 8: Tracking Flame Spread Rate for Electrical Cables

Internal stakeholders identified the need for a better understanding of flame spread rates for fires in electrical cables to improve the state of knowledge for fire PRA. RES is currently performing testing at NIST and will issue the results in a NUREG-series report. The report should consolidate documentation and tests regarding flame spread information for electrical cables.

Completion date: June 2011

Issue 9: Update Inspection Manual Chapter 0609, Appendix F, Fire Protection Significance Determination Process

Internal stakeholders identified four issues with Inspection Manual Chapter (IMC) 0609, Appendix F, the Fire Protection Significance Determination Process, to be resolved. IMC 0609, Appendix F, does not provide sufficient guidance to inspectors for evaluating:

- findings in multiple fire areas,
- risk significance for identified fire brigade issues,
- findings involving control room evacuation, and
- findings related to fire brigade performance deficiencies.

NRR/DRA currently has ownership over IMC 0609, Appendix F, and also has the responsibility to assist the regional stakeholders in resolving fire protection significance determination process issues. DRA is currently working with Regions on the Partnering Initiative on Risk Tools. Through this project IMC 0609, Appendix F will be evaluated and these issues will be considered.

Plan Completion date: December 2009

Issue 10: Fire Induced Circuit Failures

Internal stakeholders have expressed the need to develop a process for resolving fire-induced circuit failure issues. NRR is developing and validating a predictable, efficient, and effective process to resolve issues associated with possible fire-induced circuit failures at plants not transitioning to NFPA 805. This issue is being tracked as Task 3 in SECY 08-0701, "Plan for Stabilizing Fire Protection Regulatory Infrastructure."

Completion date: June 2010

Issue 11: Operator Manual Actions

Internal stakeholders have expressed a need to have a process to identify and evaluate operator manual actions. Additional background information can be found in SECY 08-0701, "Plan for Stabilizing Fire Protection Regulatory Infrastructure." Licensees were supposed to have completed their modifications or submitted information for NRC acceptance by March 6, 2009, the date that the enforcement

discretion expired. In response to SECY 08-0701, NRR is currently reviewing applications. Closure is achieved when the NRC has reasonable assurance that the regulatory infrastructure is in place based on licensee requests for license amendments, exemptions, or licensee completion of plant modifications.

Completion date: June 2010

Issue 12: Exemption Database

Internal stakeholders have expressed a need to locate all fire protection exemptions and create a database for all these and future exemptions. The GAO Report 08-747, "Nuclear Safety: NRC's Oversight of Fire Protection at U.S. Commercial Nuclear Reactor Units Could Be Strengthened," June 2008, included a recommendation to, "develop a central database for tracking the status of exemptions." NRR/DRA is developing a centralized database of fire protection exemptions for operating nuclear reactors. Closure will be achieved when the exemption database is established and procedures/plans are in place for periodic updating of the database. This issue is being tracked in SECY 08-0701, "Plan for Stabilizing Fire Protection Regulatory Infrastructure" and additional background information can be found there.

Completion date: March 2010

Issue 13: Fire Brigade Drill Participation

Internal stakeholders have expressed a need for guidance to evaluate participation requirements for fire brigade drills to address the lack of detail in current participation requirements. Currently, the regulation lacks specific requirements for what counts as fire brigade training in drills. It has been documented that members of the fire brigade receive credit for training without actual participation. NRR plans to provide guidance in its next revision of Regulatory Guide 1.189, "Fire Protection for Nuclear Power Stations," regarding this issue.

Completion date: September 2011

Issue 14: Application of Water Based Fire Suppressants to Electrical Fires

Internal stakeholders have identified a need to outline appropriate conditions to use water based fire suppressants on electrical fires to address recent incidents where water was not used and the fire continued to burn. NRR plans to update the Regulatory Guide 1.189, to outline guidelines for fire brigades to apply water based fire suppressants to electrical fires.

Completion date: September 2011

Issue 15: Identifying and Managing Risk When Removing Safe Shutdown Equipment from Service for Maintenance

Internal stakeholders have expressed a need to identify and manage risk when safe shutdown equipment is removed from service for maintenance purposes. NRC fire protection requirements allow reliance on a single train of equipment to achieve a safe shutdown condition following a fire in any fire area. If equipment from that single train is removed from service, some increased risk is incurred and must be managed. DRA is currently working with Regions on the Partnering Initiative on Risk Tools. Through this project this issue will be considered.

Plan Completion date: December 2009

Issue 16: NFPA 805, Performance-Based Standard for Fire Protection for Light-Water Reactor Electric Generating Plants

Internal stakeholders have expressed a need to develop and validate regulatory processes for NFPA 805, "Performance-Based Standard for Fire Protection for Light-Water Reactor Electric Generating Plants," transitioning plants. NRR is developing and validating regulatory processes that facilitate predictable, efficient, and effective transition of operating nuclear power plants to NRC's risk-informed and performance-based fire protection requirements. Pilot plant SERs will be issued.

Completion date: March 2010

Issue 17: NFPA 805 Triennial Inspection Procedures

Internal stakeholders have expressed a need for training on inspection procedures that address new requirements for plants transitioning to NFPA 805, "Performance-Based Standard for Fire Protection for Light-Water Reactor Electric Generating Plants." NRR is developing and conducting training modules and materials for inspection personnel related to the fire protection program in support of Inspection Manual Chapter 1245, "Qualification Program for the Office of Nuclear Reactor Regulation."

RES will prepare training materials using NUREG/CR-6850 and NUREG-1824 for regional and resident inspectors who perform fire protection inspections under the Reactor Oversight Process. These products will be used in training sessions for regional and resident inspectors. Training will focus on ensuring that inspectors have the skills and knowledge to conduct inspections and assessments of plant transitions to the NFPA 805 licensing basis.

Completion date: December 2010

Issue 18: Define "Adverse to Safe Shutdown"

Internal stakeholders have expressed an interest in having this term defined. NRR plans to provide guidance in its next revision of Regulatory Guide 1.189, "Fire Protection for Nuclear Power Stations," regarding this issue.

Completion Date: September 2011

Issue 19: Define "Associated Circuit"

Internal stakeholders have expressed an interest in having this term defined. NRR will assure that the term is appropriately defined in the next revision of Regulatory Guide 1.189, "Fire Protection for Nuclear Power Stations."

Completion Date: September 2011

Table of Closed Issues

ISSUE		REFERENCE
1.	Penetration Seal Combustibility	RG 1.189 Rev 1
2.	Penetration Seals	RG 1.189 Rev 1
3.	Using open flame to check for leaks in Penetration Seals	BTP APCS 9.5-1 pg 6
4.	Fire Dampers	RG 1.189 Rev 1
5.	Emergency Lighting	RG 1.189 Rev 1
6.	RCP Oil Collection Systems	10 CFR Part 50 Appendix R
7.	Standard License Condition Fire Protection of out Tech Specs	GL 86-10, GL 88-12
8.	Thermolag Fire Barriers	IN 95-27, RG 1.189
9.	How to Test an ERFBS	GL 86-10 Supplement 1, RG 1.189
10.	Ampacity Derating of ERFBS	IN 92-46, RG 1.189
11.	Fire Protection for License Renewal	RG 1.189 Rev 1

M. Cunningham
Conclusion:

- 2 -

Based on the survey results and staff review, regulatory instabilities have been identified and have either been closed or are being tracked to closure. None of the issues identified rebut the presumption of adequate protection to public safety.

Enclosures
As stated

DISTRIBUTION:

AFPB	NRO/SFPB	RES/FRB	DRoberts, RGN I
KKennedy, RGN II	KWest, RGN III	RCaniano, RGN IV	CAder
CLui	SMagruder	MGalloway	SWeerakkody
JRogge, RGN I	RNease, RGN II	RDaley, RGN III	NO'Keefe, RGN IV
JDowns	GGulla	GMizuno	

ADAMS Package Accession No. ML091750453

ADAMS Memo Accession No. ML091690226

ADAMS Background Info No. ML090330762

ADAMS Background Info No. ML090770031

OFFICE	NRR/DRA/AFPB	NRR/DRA/AFPB	NRR/DRA/APOB	RES/DRA/FRB
NAME	SWeimer	DFrumkin	MFranovich	MSalley
DATE	06 / 22 /09	06 / 23 /09	06 / 23 /09	06 / 29 /09
OFFICE	NRR/DRA/AFPB	DD:NRR/DRA		
NAME	AKlein	SWeerakkody		
DATE	06 / 26 /09	07/ 01 /09		

OFFICIAL RECORD COPY