UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

May 8, 2015

Mr. Joseph W. Shea
Vice President, Nuclear Licensing
Tennessee Valley Authority
1101 Market Street, LP 3D-C
Chattanooga, TN 37402-2801

SUBJECT: BROWNS FERRY NUCLEAR PLANT, UNITS 1, 2, AND 3 – AUDIT REPORT TO SUPPORT PROPOSED AMENDMENT TO TRANSITION TO THE NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 805 FIRE PROTECTION LICENSING BASIS (TAC NOS. MF1185, MF1186, AND MF1187)

Dear Mr. Shea:

A review team, consisting of U.S. Nuclear Regulatory Commission (NRC) staff and contractors, participated in a regulatory audit of the Browns Ferry Nuclear Plant, Units 1, 2, and 3. The audit took place at Tennessee Valley Authority (TVA) in Athens, Alabama, from September 9, 2013, to September 13, 2013. The regulatory audit supports the NRC staff's review of TVA's application for license amendment for Browns Ferry Nuclear Plant, Units 1, 2, and 3, to transition the plant's fire protection licensing basis to Title 10 of the *Code of Federal Regulations* Section 50.48(c), which endorses, with exceptions, the National Fire Protection Association Standard 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition.

Enclosed pleased find the NRC staff's audit report, documenting completion of the audit. The NRC staff's review of the subject application for amendment is still ongoing.

If you have any questions regarding this matter, please contact me at 301-415-1447 or Farideh.Saba@nrc.gov.

Sincerely,

Peter S. Tam for

Farideh E. Saba, Senior Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-259, 50-260, and 50-296

Enclosure:
Audit Report

cc w/enclosure: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

AUDIT REPORT BY THE OFFICE OF NUCLEAR REACTOR REGULATION

BROWNS FERRY NUCLEAR PLANT, UNITS 1, 2, AND 3

PROPOSED AMENDMENT TO TRANSITION TO THE

NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 805

DOCKET NOS. 50-259, 50-260, AND 50-296

1.0 INTRODUCTION

A review team, consisting of U.S. Nuclear Regulatory Commission (NRC) staff and contractors from the Pacific Northwest National Laboratories (PNNL) and Southwest Research Institute (SwRI)/Center for Nuclear Waste Regulatory Analyses (CNWRA) participated in a regulatory audit of the Tennessee Valley Authority (TVA, the licensee) Browns Ferry Nuclear Plant, Units 1, 2, and 3. The audit took place in TVA's offices located in Athens, Alabama, from September 9, 2013, to September 13, 2013. The regulatory audit supports the NRC staff's review of TVA's application for license amendment for Browns Ferry Nuclear Plant, Units 1, 2, and 3, to transition the plant's fire protection licensing basis to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.48(c), which endorses, with exceptions, the National Fire Protection Association Standard 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition.

2.0 AUDIT OBJECTIVE AND OUTLINE

The purpose of the audit was to gain an understanding of the information needed to support the NRC staff's licensing decision regarding the subject application for license amendment, and to develop high quality requests for additional information (RAI), as needed. The information submitted in support of the Browns Ferry application is under final review. Any additional information needed to support this review will be formally requested by the NRC staff using the NRC RAI process.

The audit team consisted of twelve NRC personnel, four PNNL personnel, and four CNWRA personnel. Attachment 1 provides the schedule of activities during the audit. Attachment 2 lists audit participants from the NRC, PNNL, CNWRA, and the licensee.

The audit team held an entrance meeting on September 9, 2013, with TVA audit participants (see Attachment 4 for participant names). During the remainder of the audit, team members met in smaller groups according to the audit plan handed out to participants (see Attachment 5). Technical discussions were focused on five major areas: fire protection engineering, safe

shutdown/circuit analyses, fire probabilistic risk assessment, fire modeling, and programmatic review. Licensee personnel conducted plant walk-downs and presentations focusing on these technical areas.

Attachment 3 is a list of documents reviewed by the NRC audit team.

Attachment 6 is a list of audit exit meeting participants.

3.0 AUDIT SUMMARY

At the conclusion of the audit, the team participated in a summary exit meeting with licensee staff and managers on September 13, 2013. The NRC staff presented a summary overview about the walk-downs, technical discussions, and other activities directly related to the audit goals and objectives.

Attachments:
1. Schedule of Activities
2. List of Audit Participants
3. List of Licensee Documents Reviewed
4. NRC NFPA 805 Audit Entrance Meeting Attendance
5. Browns Ferry Nuclear Plant Regulatory Audit Report
6. NRC NFPA 805 Audit Exit Meeting Attendance

Principal Contributor: Leslie Fields

Date: May 8, 2015

Schedule of Activities

Monday, September 9, 2013

8:15 a.m.	Audit commencement
9:30 a.m.	Audit entrance meeting Plant overview presentations and wireless access established
10:00 a.m.	Technical discussions for fire probabilistic risk assessment (FPRA), fire modeling (FM), safe shutdown (SSD), and fire protection engineering (FPE) started
1:00 p.m.	Technical sessions continue for fire modeling (FM), radioactive release, SSD, FPRA, main control room (MCR) abandonment, multiple spurious operations (MSO), recovery actions, non-power operation (NPO), nuclear safety capability assessment (NSCA), and fire protection engineering (FPE) Review of radioactive release, recovery actions, NPO, SSD, and NSCA
4:45 p.m.	Licensee wrap-up
5:15 p.m.	Adjourn

Tuesday, September 10, 2013

8:30 a.m.	Security and radiological pre-walk-down briefings
10:00 a.m.	Browns Ferry Nuclear Plant (Browns Ferry) tour/walk-down
11:30 a.m.	Audit personnel return from walk-downs by groups
12:30 p.m.	Presentations by TVA staff– Modifications MCR abandonment Self-induced station blackout elimination Browns Ferry National Fire Protection Association 805 transition fire area compartments
3:00 p.m.	Request for additional information (RAI) process discussion with Browns Ferry management
4:45 p.m.	Licensee wrap-up

Wednesday, September 11, 2013

8:00 a.m.	Delta probabilistic risk assessment presentation (PRA)
8:15 a.m.	FM and enterprise project management breakout

9:00 a.m. Site Vice President meeting

9:25 a.m. Simulator tour

10:30 a.m. Programmatic breakout

12:45 p.m. Incipient detection presentation

1:00 p.m. Combined internal breakouts of FPE, SSD, and PRA

1:55 p.m. Combined breakouts of FM and PRA

3:45 p.m. Programmatic - final draft RAIs discussion with licensee

4:45 p.m. Licensee wrap-up meeting

Thursday, September 12, 2013

8:00 a.m. Final reviews and closeout discussions

8:30 a.m. FM – final draft RAI discussion with Browns Ferry

10:30 a.m. FM RAI discussion and closeout

1:00 p.m. Remaining RAI closeouts

5:00 p.m. Licensee wrap-up meeting

5:15 p.m. Adjourn

Friday, September 13, 2013

8:00 a.m. Audit exit meeting

8:15 a.m. Audit complete

List of Audit Participants

U.S. Nuclear Regulatory Commission (NRC) Team

• Leslie Fields	NRC	Audit Team Leader
• Harold Barrett	NRC	Audit Technical Lead
• Alex Klein	NRC	Branch Chief
• Hossein Hamzehee	NRC	Branch Chief
• Jay Robinson	NRC	Request for Additional Information Lead/Programmatic
• Paul Lain	NRC	Fire Protection Engineering (FPE), Safe Shutdown (SSD)
• Stephen Dinsmore	NRC	Fire Probabilistic Risk Assessment (FPRA)
• Naeem Iqbal	NRC	Fire Modeling (FM)
• Gary Cooper	NRC	SSD/Circuit Analyses
• David Gennando	NRC	Observer
• Nicholas Melly	NRC	Observer
• Angela Wu	NRC	Observer

Pacific Northwest National Laboratory (PNNL) Team

• Steve Short	PNNL	FPRA
• Robert Layton	PNNL	FPE, SSD
• William Ivans	PNNL	FPRA
• Garill Coles	PNNL	FPRA

Center for Nuclear Waste Regulatory Analyses (CNWRA) Team

• Marc Janssen	CNWRA	FM/Lead
• Jason Huczek	CNWRA	FM
• Debashis Basu	CNWRA	FM
• Robert Fosdick	CNWRA	Programmatic

Browns Ferry Response Team

• Michael Boone	Site Engineering	Management Sponsor
• Brenda Simril	Corporate	Audit Team Leader
• Lanny Thornsberry	Corporate	Site Project Manager
• Todd Stafford	Site Engineering	Fire Protection Engineer
• Fred Ross	Corporate	Fire Protection Engineer
• Harrison Brown	Site Engineering	Fire Protection Engineer
• Larry Long	Consultant	Fire Brigade
• Liz Kleinsorg	Consultant	Fire Protection

• Andy Ratchford	Consultant	Fire Protection
• Shannon Lovvorn	Site Engineering	Nuclear Safety Capability Assessment (NSCA)/Circuit Analysis
• Doug Bucknell	Consultant	NSCA
• Don Robertson	Site Operations	Operations
• Patrick Walker	Consultant	Non-Power Operation (NPO)/Recovery Actions
• Bob Eckard	Site Engineering	NPO
• Terry Moten	Consultant	Cable Routing
• Richard Rennie	Consultant	Circuit Analysis
• JD Wolcott	Consultant	Modifications
• Dan Kearnaghan	Corporate	PRA
• Nick Lovelace	Consultant	PRA
• Dane Lovelace	Consultant	PRA
• Matt Johnson	Consultant	PRA
• Mark Schairer	Consultant	FM
• Travis Weber	Consultant	FM
• Tom Hess	Corporate	Licensing
• Michael Oliver	Site Licensing	Licensing
• Jerry Jones	Consultant	Licensing
• Pete Mazzaferro	Consultant	Project Management

Industry Representatives (None)

List of Licensee Documents Reviewed

1. MDQ0009992012000099, Rev 1 (EPM R2240-001-0002), "Verification and Validation of Fire Modeling Tools and Approaches for Use in NFPA 805 and Fire PRA Applications"
2. MDQ0009992012000101, Rev 0 (EPM R2240-001-0001), "Units 1, 2, & 3 Detailed Fire Modeling Report"
3. MDN0009992012000102, Rev 1 (EPM Report P2101-2400-0001), "Main Control Room Analysis"
4. MDQ0009992012000103, Rev 0 (EPM Project P2195, Task 001), "Multi-Compartment Fire Analysis"
5. MDQ0009992012000104, Rev 0 (EPM R2101-2020-003), "Scoping Fire Modeling Report"
6. MDN0009992013000131, Rev 0, "Risk Assessment of Fire Impact to Structural Steel Elements"
7. A limited number of photographs of walk-down areas in the RCA
8. NPG-SPP-18.4.4, Rev 0, Fire Protection Quality Assurance
9. 0-FPR-Volume 1, Part 1, Fire Protection Report, QA Record
10. 0-FPR-Volume 1, Part 2, Fire Protection Report, Fire Hazards Analysis
11. 0-FPR-Volume 1, Part 3, Fire Protection Report, Safe Shutdown Analysis
12. 0-FPR-Volume 1, Part 4, Fire Protection Report, Appendix R Safe Shutdown
13. 0-FPR-Volume 2, Fire Protection Report Volume 2
14. MDQ099920110009, Rev 1, NFPA 805 Transition - Fire Area Designation
15. BFN Audit Presentation – Control Room Abandonment
16. BFN Audit Presentation – Selected Modifications
17. BFN Audit Presentation – SISBO Elimination
18. BFN Audit Presentation – FPE – SSA Presentation 2 Fire Area Compartmentation
19. Bases for Technical Specification Section 3.2.7.2
20. Plant event reports (PERs) PER 130806, PER 141331, and PER 141331
21. MDQ0009992013000160, Rev 0 - NFPA 51B Code Compliance Evaluation
22. MDQ099920100003, Rev 1 - NFPA 10 Code Compliance Evaluation
23. MDQ099920100004, Rev 0 - NFPA 12 Code Compliance Evaluation
24. MDQ099920100005, Rev 1 - NFPA 13 - 1985 Code Compliance Evaluation
25. MDQ099920100006, Rev 1 - NFPA 14 Code Compliance Evaluation
26. MDQ099920 100007, Rev 1 - NFPA 15 - 1985 Code Compliance Evaluation
27. MDQ099920100008, Rev 1 - NFPA 20 Code Compliance Evaluation
28. MDQ099920100010, Rev 1 - NFPA 22 Code Compliance Evaluation
29. MDQ0999201000ll, Rev 1 - NFPA 24 Code Compliance Evaluation
30. MDQ099920100012, Rev 1 - NFPA 600 Code Compliance Evaluation
31. MDQ099920100013, Rev 0 - NFPA 30 Code Compliance Evaluation
32. MDQ0999201000i.4, Rev 1 - NFPA SOA Code Compliance Evaluation
33. MDQ099920100015, Rev 1 - NFPA 80 Code Compliance Evaluation
34. MDQ099920100016, Rev 1 - NFPA 90A Code Compliance Evaluation
35. MDQ099920100017, Rev 1 - NFPA 72 - 1990 Code Compliance Evaluation
36. MDQ09992011000, Rev 1 - NFPA 13 - 1987 Code Compliance Evaluation
37. MDQ099920110002, Rev 1 - NFPA 30 - 1991 Code Compliance Evaluation
38. MDQ099920110003, Rev 1 - NFPA 13 - 2002 Code Compliance Evaluation
39. MDQ099920110004, Rev 1 - NFPA 15 - 2001 Code Compliance Evaluation
40. MDQ099920110005, Rev 1 - NFPA 72 - 2002 Code Compliance Evaluation

41. CDQ0260940034, Rev 3 - Documentation for Architectural Doors and Hardware
42. MDQ0009992012000109, Rev 0 - Shutdown Board Rooms 2A and 2B Effect of Fire
43. MDQ00099920 12000112, Rev 0 - Evaluation of Seismic Gaps Between Buildings
44. MDQ0009992012000113, Rev 0 - Fire Area 16 Fire Barrier Wall Opening Evaluation
45. MDQ0009992012000114, Rev 0 - Fire Area 16 Fire Damper Evaluation
46. MDQ0100930090, Rev 1 - Effect of Fire on Embedded Conduits Serving Equipment
47. MDQ0100940033, Rev 1 - Appendix R - Welded Plate Penetration Evaluation
48. MDQ0100950053, Rev 0 - Thermo-Lag 330-1 Engineering Evaluations
49. MDQ0100980006, Rev 3 - Engineering Evaluation of Penetration Seals
50. MDQ110020050013, Rev 2 - TVA BFN Rx Bldg Thermolag 330-1 Fire Endurance
51. MDQ2303880380, Rev 0 - FHA for Structural-Supporting Steel in U2 Rx Bldg
52. MDQ2303880381, Rev 1 - FHA for the Structural Steel on El 593 of Ctrl Building
53. MDN0026920065, Rev 0011 - Selection, Location, and Spacing of Fire Detection
54. RIMS B22 911004 003 - Engineering evaluations of the bus duct penetrations
55. RIMS B22 911104 201 - Engineering evaluation for unprotected openings in 1-hr floor ceiling
56. SL-010944, Rev 0 - Fire Protection Engineering evaluation for the Intake
57. EDQ099920110010, Rev 1 - NFPA 805 NSCA
58. EDQ0009992011000004, Rev 1 - NFPA 805 Associated Circuit Analysis Common Enclosure
59. EDQ0009992011000005, Rev 0 - NFPA 805 Sense line Evaluation
60. EPM-DP-EP-004, Rev 2 - Post Fire Safe Shutdown Cable Identification
61. MDQ0009992012000108, Rev 1 - NFPA 805 Operator Feasibility Analysis
62. TVA005-PI-004, Rev 4 - NSCA Fire Area Review
63. Detection and C02 Drawings
64. Appendix R and NFPA 805 Barrier Drawings
65. HVAC Drawings
66. Cable Spreading Rm A Pre-Action Fire Sprinkler System - MDQ0026920499, Rev 2
67. Cable Spreading Rm B Pre-Action Fire Sprinkler System - MDQ0026920205, Rev 4
68. Fire Area Designation - MDQ099920110009, Rev 1
69. Fire Protection Report, Volume 1, Part 1
70. Intake Pumping Station Pre-Action Fire Sprinkler System MDQ0026810018, Rev 1
71. NFPA 72 - 1990 Code Compliance Evaluation - MDQ099920100017 R0001
72. NFPA 72- 2002 Code Compliance Evaluation - MDQ099920110005 R0001
73. U1 Battery Rm Pre-Action Fire Sprinkler System - MDQ1026880313, Rev 2
74. Ul Rx Bldg Pre-Action Fire Sprinkler Systems - MDQ102620030064, Rev 3
75. U2 Battery Rm Pre-Action Fire Sprinkler System - MDQ2026880314, Rev 2
76. U2 HPCI Rm Pre-Action Fire Sprinkler System - MDQ2026920202, Rev 1
77. U2 Rx Bldg Ele 565 Pre-Action Fire Sprinkler System - MDQ2026880316, Rev 3
78. U2 Rx Bldg Ele 593 Pre-Action Fire Sprinkler System - MDQ2026880317, Rev 3
79. U2 Rx Bldg Ele 621 Pre-Action Fire Sprinkler System - MDQ2026880318, Rev 6
80. U3 Battery Rm Pre-Action Fire Sprinkler System - MDQ3026880315, Rev 2
81. U3 HPCI Rm and Rx Bldg Be 565 Pre-Action Fire Sprinkler System - MDQ3026
82. U3 Rx Bldg Ele 593 Pre-Action Fire Sprinkler System - MDQ3026930082
83. U3 Rx Bldg Ele 621.25, 639 Pre-Action Fire Sprinkler System - MDQ3026930050
84. MDQ0026900075, Rev 1 - Fire Pump Capability to meet Fire and RSW loads
85. Electrical one-line drawings
86. EDQ099920110010 R-1 (APP A)
87. EDQ099920110010 R4 (APP N-05)
88. EDQ099920110010 R4 (APP B)

89. EDQ099920110010 R.+ (APP N-06)
90. EDQ099920110010 R...J (APP C)
91. EDQ099920110010 R4 (APP N-07)
92. EDQ099920110010 R4 (APP D)
93. EDQ099920110010 R...J (APP N-08)
94. EDQ099920110010 R4 (APP E)
95. EDQ099920110010 R4 (APP N-09)
96. EDQ099920110010 R4 (APP F)
97. EDQ099920110010 R-1 (APP N-10)
98. EDQ099920110010 R4 (APP G)
99. EDQ099920110010 R4 (APP N-11)
100. EDQ099920110010 R4 (APP H)
101. EDQ099920110010 R4 (APP N-12)
102. EDQ099920110010 R4 (APP I)
103. EDQ099920110010 R4 (APP N-13)
104. EDQ099920110010 R-+ (APP J)
105. EDQ099920110010 R...J (APP N-14)
106. EDQ099920110010 R4 (APP K)
107. EDQ099920110010 R4 (APP N-15)
108. EDQ099920110010 R4 (APP I)
109. EDQ099920110010 R4 (APP N-16)
110. EDQ099920110010 R4 (APP M)
111. EDQ099920110010 R4 (APP N-17)
112. EDQ099920110010 R4 (APP N-01-01)
113. EDQ099920110010 R-I (APP N-18)
114. EDQ099920110010 R4 (APP N-01-02)
115. EDQ099920110010 R4 (APP N-19)
116. EDQ099920110010 R4 (APP N-01-04)
117. EDQ099920110010 R4 (APP N-21)
118. EDQ099920110010 R4 (APP N-01-05)
119. EDQ099920110010 R4 (APP N-22)
120. EDQ099920110010 R4 (APP N-01-06)
121. EDQ099920110010 R4 (APP N-23)
122. EDQ099920110010 R4 (APP N-02-01) .
123. EDQ099920110010 R4 (APP N-24)
124. EDQ099920110010 R4 (APP N-02-02)
125. EDQ099920110010 R-1 (APP N-25-1)
126. EDQ099920110010 R4 (APP N-02-03)
127. EDQ099920110010 R4 (APP N-25-2)
128. EDQ099920110010 R4 (APP N-02-0-1)
129. EDQ099920110010 R4 (APP N-25-3)
130. EDQ099920110010 R4 (APP N-02-05)
131. EDQ099920110010 R4 (APP N-26)
132. EOQ099920110010 R4 (APP N-02-06)
133. EDQ099920110010 R4 (APP N-27)
134. EDQ099920110010 R4 (APP N-03-01)
135. EDQ099920110010 R4 (APP N-REFUEL)
136. EDQ099920110010 R4 (APP N-03-02)

137. EDQ099920110010 R4 (APP N-SWITCH)
138. EDQ099920110010 R4 (APP N-03-03)
139. EDQ099920110010 R4 (APP N-YARO)
140. EDQ099920110010 R4 (APP N-03-04)
141. EDQ099920110010 R4 (main body-text)
142. EDQ099920110010 R4 (APP N-04)
143. EDQ099920110010 R4 (APP N-01-03)
144. EDQ099920110010 R4 (APP N-20)
145. NDQ099920100002 Rev 0 - MSO Review
146. 6d Thermal Hydraulic
147. MDQ09992012000094 RI NFPA-805 NPSH, Containment Parameters, and Areva Fuel PCT Analysis
148. MDQ0009992012000108, Rev 2 - NFPA 805 Operator Action Feasibility Analysis
149. MDQ099920110009, Rev 1 - Fire Area Designation
150. EDQ0009992012000115, NPO Calc - Main Body
151. Att. A - Model Description
152. Att. B - PINCH POINT MATRIX
153. Att. C- NPO SSEL 12-13-12
154. Att. D - Analysis Area Summaries
155. Att. F - Performance Goal Logic Diagrams
156. Att. G - System Logic Diagrams
157. Att. H - SAFE REPORTS part 1 of 2
158. Att. H - SAFE REPORTS part 2 of 2
159. Att. I - OPDRV Isolation Evaluation
160. Att. J - Evaluation of NSCA Systems for NPO Applicability
161. Att. K - Miscellaneous Reference Material
162. Fire Protection Report, Volume 2
163. MDQ099920100002, Rev 5 - Plant Partitioning
164. MDN0009992012000015, Rev 0 - Component Selection
165. Cable Selection and Routing
166. EDN0009992012000056, Rev 0 - Cable Selection
167. Circuit Failure Mode Likelihood Analysis
168. EDQ0009992012000110, Rev 1 - Circuit Failure Mode Likelihood Analysis
169. Unit 1 TRM Bases
170. Unit 1 TRM
171. Unit 2 TRM Bases
172. Unit 2 TRM
173. Unit 3 TRM Bases
174. Unit 3 TRM-1
175. Chapter 13 of the Browns Ferry Updated Final Safety Analysis Report

NRC NFPA 805 Audit Entrance Meeting Attendance

NFPA 805 Audit:	Browns Ferry Nuclear Plant Entrance Meeting
Date:	September 9, 2013
Time:	9:30 AM
U.S. Nuclear Regulatory Commission	
Leslie Fields Alex Klein Hossein Hamzehee Jay Robinson Harold Barrett Paul Lain Stephen Dinsmore Naeem Iqbal Gary Cooper Angela Wu Nicholas Melly David Gennardo	
Pacific Northwest National Laboratories (NRC Contractors)	
Steve Short Robert Layton William Ivans Garill Coles	
Center for Nuclear Waste Regulatory Analyses (NRC Contractors)	
Marc Janssens Jason Huczek Kaushik Das Robert Fosdick	
Tennessee Valley Authority (TVA)	
Brenda Simril Ching Geuy Dan Kearnaghan Todd Stafford Shannon Lovvorn JD Wolcott Lanny Thornsberry Joe Williams John Osborne Hangbing Jiang Tom Hess Eric Browne Lance Christianson	
Consultants (TVA Contractors)	
Andy Ratchford – Ratchford Engineering Services Mark Schairer – EPM Doug Bucknell – Enercon Jessica Walker – Hughes Associates Matt Aloisio – Nexus Nick Lovelace – Hughes Associates Pete Mazzaferro – Hughes Associates Richard Rennie – EPM	

BROWNS FERRY NUCLEAR PLANT REGULATORY AUDIT PLAN
IN SUPPORT OF THE LICENSE AMENDMENT REQUEST TO IMPLEMENT A RISK-INFORMED, PERFORMANCE-BASED FIRE PROTECTION PROGRAM AS ALLOWED BY TITLE 10 OF THE CODE OF FEDERAL REGULATIONS PARAGRAPH 50.48(C)
DOCKET NOS. 50-259, 50-260, AND 50296
(TAC NOS. MF1185, MF1186, AND MF1187)

I. BACKGROUND

Tennessee Valley Authority (TVA) the licensee for Browns Ferry Nuclear Plant Units 1, 2, and 3 (Browns Ferry) has submitted a license amendment request (LAR) (Reference 1) to change its fire protection program to one based on the National Fire Protection Association (NFPA) standard 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition, as incorporated into Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 50.48(c).

The Nuclear Regulatory Commission (NRC) staff's review of the LAR has commenced in accordance with the Office of Nuclear Reactor Regulation's (NRR) Office Instruction LIC-101, "License Amendment Review Procedures." The NRC staff has determined that a Regulatory Audit of the Browns Ferry LAR should be conducted in accordance with NRR Office Instruction LIC-111, "Regulatory Audits," for the staff to gain a better understanding of the licensee's calculations, proposed plant modifications, and other aspects of the LAR.

A regulatory audit is a planned, license or regulation-related activity that includes the examination and evaluation of primarily non-docketed information. A regulatory audit is conducted with the intent to gain understanding, to verify information, and/or to identify information that will require docketing to support the basis of the licensing or regulatory decision. Performing a regulatory audit of licensee information is expected to assist the staff in efficiently conducting its review or gain insights on the licensee's processes or procedures. Information that the NRC staff relies upon to make the safety determination must be submitted on the docket. However, there may be supporting information retained as records under 10 CFR 50.71 and/or 10 CFR 54.37 that, although not required to be submitted as part of the licensing action, would help the staff better understand the licensee's submitted information.

The objectives of this regulatory audit are to:

- Gain a better understanding of the detailed calculations, analyses and bases underlying the NFPA 805 LAR and confirm the staff's understanding of the LAR;

- Identify further information that is necessary for the licensee to submit for the staff to reach a licensing or regulatory decision; this will result in requests for additional information (RAIs);

- Verify that the licensee's planned process for self-approval of fire protection program (FPP) changes will meet the proposed NFPA 805 license condition and quality requirements;

- Establish an understanding of proposed plant modifications necessary to implement NFPA 805; and,

- Verify the implementation of processes or procedures that the licensee committed to as part of NFPA 805 implementation.

II. REGULATORY AUDIT BASIS

The basis of this audit is the licensee's LAR (Reference 1) and the NRC's Standard Review Plan (SRP) Section 9.5.1.2, "Risk-Informed, Performance-Based (RI/PB) Fire Protection" (Reference 2). References 3 through 7 provide additional information that will be used to support the audit.

III. REGULATORY AUDIT SCOPE OR METHOD

The staff will review the licensee's NFPA 805 transition as proposed in the LAR. Key to this effort is the licensee's RI/PB FPP. The staff will review the fundamental FPP elements and minimum design requirements. A sample of fire protection engineering evaluations may be selected for review. In addition, the staff will review, as necessary, the regulatory basis, references, licensing actions, existing engineering equivalency evaluations, and issues that the licensee has deemed "previously approved."

The scope of the review of nuclear safety performance criteria may include both at-power and non-power operational modes, and may require sampling of procedures and other documentation. The compliance by fire area review will, as necessary, include multiple spurious operations, the transition of operator manual actions to recovery actions (RAs), fire protection engineering evaluations, and NFPA 805 deterministic requirements. The audit may also include alternatives to compliance with NFPA 805 if any are identified.

The staff may review a sample of fire risk assessments and plant change evaluations for one or more fire areas, the evaluation of the additional risk of RAs, the licensee's process for self-approving post-transition FPP changes, cumulative risk and combined changes, as well as uncertainty and sensitivity analyses. The review may also include licensee risk-informed evaluations to ensure that defense-in-depth and safety margins have been evaluated.

The staff will also review the licensee's assessment of the technical adequacy of the probabilistic risk assessment (PRA) model used for any risk evaluations required to transition to a RI/PB FPP, including resolution of peer review findings and licensee self-assessments. This effort may include auditing a sample of logic models and

calculations in the fire PRA model as well as the Internal Events PRA model. The review will include, as necessary, the licensee's process that has or will be implemented to

maintain the quality of the Internal Events and fire PRA models to support self-approval of risk-informed change evaluation after transition is completed.

The scope may also include the licensee's NFPA 805 monitoring program which is to establish and monitor acceptable levels of availability, reliability, and performance of fire protection systems and features relied upon for NFPA 805 compliance. Also, the scope may include, as appropriate, selected plant modifications to confirm they have been appropriately characterized in the LAR. The staff may review the process for controlling compensatory measures to confirm their adequacy while they remain in effect until the modifications are completed.

In addition, the audit may review program documentation, configuration control, and the FPP quality assurance program. The FPP design basis document may be reviewed, as well as other documentation of fire hazards identification and nuclear safety capability assessments. The review may include configuration control of the FPP design basis document, the fire PRA methods and model, and other relevant documentation as necessary. The staff may also review the FPP quality assurance program, and sample fire models and fire model calculations. Plant walkdowns may be performed as necessary to observe features of the licensee's FPP and design elements of building with in the power block.

IV. INFORMATION AND OTHER MATERIAL NECESSARY FOR THE AUDIT

The NRC audit team will require access to licensee personnel knowledgeable regarding the technical aspects of the Browns Ferry LAR. At a minimum, a hardcopy and electronic copy of the following documentation should be available to the audit team:

- Calculational models and supporting documentation for PRA models used in support of the LAR, including peer review history and resolution of peer review findings;
- Calculational models and supporting documentation for fire models used in support of the LAR;
- Procedures that have been modified or developed to transition to NFPA 805;
- Procedures that have been modified or developed to maintain the NFPA 805 licensing basis after transition is completed;
- Documentation of changes made to PRA models in support of change analysis;

- Documentation about PRA configuration control and procedures to support self-approval of risk-informed plant changes after transition;

- Documentation of plant modifications or operational changes identified, screened, and considered (or planned for) during the licensee's transition to NFPA 805;

- Calculations and evaluations used to transition to NFPA 805 such as plant change evaluations, engineering equivalency evaluations, and RA evaluations;

- Plant layout and design drawings of FPP and safe shutdown features; and,

- Other documents, which the licensee deems as necessary to support the NRC staff's audit, outlined under audit activities.

V. TEAM ASSIGNMENTS

The audit will be conducted by NRC staff from the Office of Nuclear Reactor Regulation (NRR); Division of Risk Assessment (DRA); Fire Protection Branch (AFPB) and the PRA Licensing Branch (APLA) staff knowledgeable in PRA; safe shutdown and circuit analysis, and fire protection engineering. Contractors from the Pacific Northwest National Laboratories and from the Center for Nuclear Waste Regulatory Analysis may be utilized to augment the technical audit team members. NRC staff from other organizations may be assigned to the team as appropriate and others may participate as observers. Observers at the audit may include NRR Program Managers and various Regional Inspectors.

The NRC Audit Team Leader will be Leslie Fields and the NRC Technical Lead will be Harold Barrett. The team leader will conduct daily briefings on the status of the review and coordinate audit activities while on site. The tables below show (1) audit milestones and schedule, and (2) planned audit team composition and their assigned areas for review.

Audit Milestones and Schedule Relative to First Audit Day Onsite		
Activity	Time Frame	Comments
Technical Presentations via GoTo Meetings	9/02/13 – 9/04/13	NRC will host GoTo meeting sessions for up to 3 days, as needed, the week prior to the audit. Licensee is requested to provide overview presentations with important site specific information.
Onsite Audit Kick-Off Meeting	9/09/13	NRC will conduct a brief introduction and scope of the audit.
Onsite Escorted Tour	9/10/13	Tours of risk significant power block areas. 2nd day if needed
End of Day Summary Briefing	9/9/13-9/12/13	Meet with licensee to provide a summary of any significant findings and requests for additional assistance.
Provide Break-out Areas	9/09/13-9/13/13	Facilitate discussion between site and staff in different technical areas. Reviewers may need break-out areas the first four days.

Audit Milestones and Schedule Relative to First Audit Day Onsite		
Onsite Audit Exit Meeting	9/13/13	NRC will conduct a brief conclusion of the audit.
Audit Summary (see VIII)	11/01/13	To document the audit.

Regulatory Audit Team and Assignments			
SRP 9.5.1.2 Section	Audit Plan Review Areas	Lead	Support
III.1.2	Modifications	Team	Team
III.1.3	Licensee Self-Approval	J. Robinson	R. Fosdick
III.2	Fundamental FPP and Design Elements	P. Lain	H. Barrett, R. Layton
III.3.1.2	Multiple Spurious Operation	G. Cooper	H. Barrett, R. Layton
III.3.2	Fire Area Compliance	Team	Team
III.3.2	Engineering Evaluations, Previous Approval	Team	Team
III.3.2.2	Fire Modeling	N. Iqbal	J. Huzcek, D. Basu, M. Janssens
III.3.2.2	Recovery Actions	Team	Team
III.3.3	Non-Power Operations (NPOs)	Team	Team
III.5.3-5.6	Fire Risk Assessments	S. Dinsmore	J. Hyslop, C. Fong, S. Short W. Ivans, P. Lowry
III.5.1	PRA Technical Adequacy	S. Dinsmore	J. Hyslop, C. Fong, S. Short, W. Ivans, P. Lowry
III.5.2	DID and Safety Margins	Team	Team
III.6	Monitoring Program	J. Robinson	R. Fosdick
III.7.1-7.3	Documentation, Configuration Control, & Quality	J. Robinson	R. Fosdick
	Plant Walkdowns	As needed	As needed

VI. LOGISTICS

This regulatory audit is planned for the week of September 9, 2013, and last approximately 5 days. We will reserve a few days the week before, Sept 2-4, to review technical presentations and general topics that can be conducted via GoTo Meeting. These dates are subject to change based on mutual agreement between the licensee and the NRC. An entrance meeting for this audit will be held on the first day at 9:30 AM and an exit meeting will be held the final audit day at 3:00 PM to provide preliminary feedback to the licensee. The NRC audit leader will provide daily progress to licensee personnel on the second, third, and fourth day of the audit.

The audit will take place at a location agreed upon by the licensee and NRC Audit Leader where (1) the necessary reference material and (2) appropriate analysts will be available to support the review. Because the audit scope includes NRC staff walkdowns of selected fire areas in the power block, the regulatory audit must be conducted in a location that allows for travel to the plant's protected area for escorted access.

VII. SPECIAL REQUESTS

The audit team will require the following to support the regulatory audit:

- Escorted access to fire areas within the protected area.
- Two printers and six computers with internet access, access to the site portal, and printing capability. Wired and wireless internet access.
- Private conference room(s) to support document review, breakout sessions, and audit team meetings.
- Access to the FPP documentation, including but not limited to: plant drawings depicting fire area boundaries, the Fire Hazards Analysis, Safe Shutdown Analysis, and the internal events PRA and fire PRA.
- Access to licensee personnel knowledgeable in FPP, fire modeling; safe shutdown and circuit analysis; fire PRA and internal events PRA, non-power operations, radiological release analysis, and the NFPA 805 fire protection design-basis document.

VIII. DELIVERABLES

A regulatory audit summary will be issued within approximately 30 days of the completion of the audit. The summary will use the guidance of NRR Office Instruction LIC-111 for content. Since this audit will likely result in formal RAIs for the licensee regarding the LAR, the summary itself is expected to be an internal memorandum from the audit team leader to the responsible supervisors. The summary will be placed in Agencywide Documents Access and Management System (ADAMS) to document the audit.

IX. REFERENCES

1. Letter from J.W. Shea, Browns Ferry Nuclear Plant Units 1, 2, and 3 to the U.S. Nuclear Regulatory Commission, "License Amendment Request to Adopt NFPA 805, Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants (2001 Edition)" March 27, 2013 (ADAMS accession no. ML13092A393).
2. U.S. NRC, Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants, NUREG-0800, Section 9.5.1.2, "Risk-Informed, Performance-Based Fire Protection Program," (ADAMS accession no. ML092590527).
3. Title 10 Code of Federal Regulations, Part 50, Section 48 (10 CFR 50.48), "Fire Protection."

4. NFPA 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Stations," 2001 Edition.

5. Regulatory Guide 1.205, Rev. 1, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants," December 2009 (ADAMS accession no. ML092730314).

6. Nuclear Energy Institute, NEI 04-02, "Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program Under 10 CFR 50.48(c)," Revision 2, April 2008 (ADAMS accession no. ML081130188).

7. Nuclear Energy Institute, NEI 00-01, Guidance for Post-Fire Safe Shutdown Analysis, Revision 2, May 2009 (ADAMS accession no. ML091770265).

NRC NFPA 805 Audit Exit Meeting Attendance

NFPA 805 Audit:	Browns Ferry Nuclear Plant Exit Meeting
Date:	September 13, 2013
Time:	8:00 AM

U.S. Nuclear Regulatory Commission

Leslie Fields
Alex Klein
Hossein Hamzehee
Jay Robinson
Harold Barrett
Paul Lain
Stephen Dinsmore
Naeem Iqbal
Gary Cooper
Angela Wu
Nicholas Melly
David Gennardo

Pacific Northwest National Laboratories (NRC Contractors)

Steve Short
Robert Layton
William Ivans
Garill Coles

Center for Nuclear Waste Regulatory Analyses (NRC Contractors)

Marc Janssens
Jason Huczek
Kaushik Das
Robert Fosdick

Tennessee Valley Authority (TVA)

Brenda Simril	Jerry Jones
Ching Geuy	Ed Schrull
Dan Kearnaghan	Mone Gilman
Todd Stafford	Michael Boone
Shannon Lovvorn	Robert Eckard
JD Wolcott	Harrison Brown
Lanny Thornsberry	Jacob Johnson
John Osborne	Matt Rasmussen
Hangbing Jiang	Lang Hughes
Tom Hess	Phil Summers
Eric Browne	Mark Floyd
Lance Christianson	James Emins
Joe Williams	Scott Hunnewell

Consultants (TVA Contractors)

Andy Ratchford – Ratchford Engineering Services
Mark Schairer – EPM
Doug Bucknell – Enercon
Jessica Walker – Hughes Associates
Matt Aloisio – Nexus
Nick Lovelace – Hughes Associates
Pete Mazzaferro – Hughes Associates
Richard Rennie – EPM
Elizabeth Kleinsorg – Hughes Associates

May 8, 2015

Mr. Joseph W. Shea
Vice President, Nuclear Licensing
Tennessee Valley Authority
1101 Market Street, LP 3D-C
Chattanooga, TN 37402-2801

SUBJECT: BROWNS FERRY NUCLEAR PLANT, UNITS 1, 2, AND 3 – AUDIT REPORT TO SUPPORT PROPOSED AMENDMENT TO TRANSITION TO THE NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 805 FIRE PROTECTION LICENSING BASIS (TAC NOS. MF1185, MF1186, AND MF1187)

Dear Mr. Shea:

A review team, consisting of U.S. Nuclear Regulatory Commission (NRC) staff and contractors, participated in a regulatory audit of the Browns Ferry Nuclear Plant, Units 1, 2, and 3. The audit took place at Tennessee Valley Authority (TVA) in Athens, Alabama, from September 9, 2013, to September 13, 2013. The regulatory audit supports the NRC staff's review of TVA's application for license amendment for Browns Ferry Nuclear Plant, Units 1, 2, and 3, to transition the plant's fire protection licensing basis to Title 10 of the *Code of Federal Regulations* Section 50.48(c), which endorses, with exceptions, the National Fire Protection Association Standard 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition.

Enclosed pleased find the NRC staff's audit report, documenting completion of the audit. The NRC staff's review of the subject application for amendment is still ongoing.

If you have any questions regarding this matter, please contact me at 301-415-1447 or Farideh.Saba@nrc.gov.

Sincerely,

/RA by PTam for/

Farideh E. Saba, Senior Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-259, 50-260, and 50-296

Enclosure:
Audit Report

DISTRIBUTION:

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NAME	PTam	FSaba (PTam for)	LRonewicz	BClayton	AKlein	HHAmzehee	SHelton	FSaba
DATE	3/17/15	4/7/15	3/25/15	3/26/15	3/9/15	3/9/15	5/6/15	5/8/15

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