UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
245 PEACHTREE CENTER AVENUE N.E., SUITE 1200
ATLANTA, GEORGIA 30303

June 19, 2014

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 – U.S. NUCLEAR REGULATORY COMMISSION POST-APPROVAL SITE INSPECTION FOR LICENSE RENEWAL, INSPECTION REPORT 05000259/2014011, 05000260/2014011, AND 05000296/2014011

Dear Mr. Shea:

On May 9, 2014, the U.S. Nuclear Regulatory Commission (NRC) completed a Post-Approval Site Inspection for License Renewal at your Browns Ferry Nuclear Plant, Units 1, 2, and 3 in accordance with NRC Inspection Procedure 71003. On May 9, 2014, the NRC inspectors discussed the preliminary results of this inspection with Mr. Keith J. Polson, site Vice President, and other members of the Browns Ferry management staff. Additionally, on June 19, 2014, the NRC held a conference call with members of Browns Ferry licensing staff to discuss the final inspection results. The inspectors documented the results of this inspection in the enclosed inspection report.

No NRC-identified or self-revealing findings were identified during this inspection. The inspectors determined that the overall implementation of aging management programs and time-limited aging analysis was consistent with the license renewal commitments, the updated Final Safety Analysis Report supplement for license renewal, and the conditions in the renewed operating license. The inspectors also determined that structures, systems, and components within the scope of Title 10 of the *Code of Federal Regulations* (10 CFR) 54.37(b) were adequately identified and evaluated.

In accordance with 10 CFR 2.390, “Public inspections, exemptions, requests for withholding,” of the NRC's "Rules of Practice," a copy of this letter, its Enclosure, and your response (if any), will be available electronically for public inspection in the NRC’s Public Document Room, or from

the Publicly Available Records (PARS) component of the NRC's Agencywide Documents Access and Management System (ADAMS), accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Mark G. Kowal, Acting Chief
Engineering Branch 3
Division of Reactor Safety

Docket Nos. 50-259, 50-260, and 50-296
License Nos. DPR-33, DPR-52, and DPR-68

Enclosure:
Inspection Report 05000259/2014011,
05000260/2014011, and 05000296/2014011
w/Attachment: Supplementary Information

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SIGNATURE	JER6	MLY via e-mail	JHB1 via e-mail	MXK7			
NAME	J. Rivera-Ortiz	M. Yoo	J. Bartley	M. Kowal			
DATE	6/ 19 /2014	6/ 17 /2014	6/ 17 /2014	6/ 19 /2014			
E-MAIL COPY	**YES** NO	**YES** NO	**YES** NO	**YES** NO			

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U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos:	05000259, 05000260, and 05000296
License Nos:	DPR-33, DPR-52, and DPR-68
Report Nos:	05000259/2014011, 05000260/2014011, and 05000296/2014011
Licensee:	Tennessee Valley Authority (TVA)
Facility:	Browns Ferry Nuclear Plant, Units 1, 2, and 3
Location:	Corner of Shaw and Nuclear Plant Roads Athens, AL 35611
Dates:	May 5 – 9, 2014
Inspectors:	J. Rivera-Ortiz, Senior Reactor Inspector (Lead) Mark Yoo, Materials Engineer
Accompanying Personnel:	Christopher Hovanec, Materials Engineer
Approved by:	Mark G. Kowal, Acting Chief Engineering Branch 3 Division of Reactor Safety

Enclosure

SUMMARY

Inspection Report (IR) 05000259/2014011, 05000260/2014011, and 05000296/2014011; 05/05/2014 – 05/09/2014; Browns Ferry Nuclear Plant, Units 1, 2, and 3; Post Approval Site Inspection for License Renewal

The report covers an inspection conducted by a Region II inspector, and a materials engineer from the Office of Nuclear Reactor Regulation (NRR), in accordance with U.S. Nuclear Regulatory Commission (NRC) Inspection Manual Chapter (IMC) 2515 and NRC Inspection Procedure (IP) 71003. There were no NRC-identified or self-revealing findings. On the basis of the sample selected for review, the inspector determined that the licensee had completed the necessary actions to meet the regulatory commitments for license renewal discussed in NRC unresolved item (URI) 2013009-001. Based on the review of program documents and completed activities, the inspectors determined that the licensee had established the required programs and analyses to manage the aging effects of in-scope structures, systems, and components (SSCs) in order to maintain their function(s) through the period of extended operation (PEO) of the three units.

The inspectors determined that the licensee took appropriate actions to assure that “newly identified” SSCs, within the scope of 10 CFR 54.37(b), were identified and evaluated for management of aging affects. The inspectors determined that the aging management program (AMP) descriptions in the Updated Final Safety Analysis Report (UFSAR) supplement, for license renewal, were consistent with the aging management activities which have been implemented.

REPORT DETAILS

4OA5 OTHER ACTIVITIES

.1 (Closed) Unresolved Item 05000259, 05000260, and 05000296/2013009-001, Implementation of Aging Management Programs and Time-Limited Aging Analyses

a. Inspection Scope

On August 23, 2013, the NRC completed an inspection of aging management programs (AMPs), and time-limited aging analysis (TLAAs) associated with the renewed operating license for Browns Ferry Nuclear Plant, Units 1, 2, and 3 issued on May 4, 2006. The inspection results were documented in NRC inspection report 2013009, dated October 3, 2013, (ADAMS Accession Number ML13280A276). The inspection report included an unresolved item (URI), 2013009-001, associated with one AMP and two TLAAs that were not fully implemented at the time of the inspection. From May 5 – 9, 2014, the NRC conducted a followup inspection of the URI to verify that the licensee met the associated regulatory commitments for license renewal.

The inspectors reviewed license renewal implementing documents for the AMP and TLAAs discussed in URI 2013009-001, and conducted interviews with licensee staff to verify that the licensee completed the necessary actions to: (a) comply with the conditions stipulated in the renewed facility operating license; (b) meet the commitments for license renewal as described in NUREG-1843, "NRC Safety Evaluation Related to the License Renewal of the Browns Ferry Nuclear Plant, Units 1, 2, and 3," (ADAMS Accession Number ML061030027); and (c) implement the AMP and TLAAs as described in the NRC safety evaluation report, and the license renewal supplement to the Updated Final Safety Analysis Report (UFSAR).

The commitment items and corresponding AMPs/TLAAs associated with the URI are summarized below, based on their description in Table 1 of the NRC Safety Evaluation Report (SER) supplement issued in April 2006 (ADAMS Accession Number ML061220272), and the UFSAR supplement for license renewal, as revised, submitted with the license renewal application[1]. The specific inspection activities conducted for each commitment, AMP, and TLAA are also described below. Specific documents reviewed for each commitment are listed in the report Attachment.

Commitment Item 35 (Table 1) – Fatigue Monitoring Program: This commitment specified that prior to the period of extended operation (PEO) for Units 1, 2, and 3; the licensee would implement an enhanced fatigue monitoring program using the Electric Power Research Institute (EPRI)-licensed FatiguePro® cycle counting, and fatigue usage tracking computer program. The UFSAR supplement stated that this enhanced AMP is used for management of metal fatigue of select components in the reactor coolant pressure boundary and primary containment. The program would provide for monitoring fatigue stress cycles to ensure that the design fatigue usage factor limit is not exceeded.

[1] The license renewal application for Browns Ferry Nuclear Plant is available at: http://www.nrc.gov/reactors/operating/licensing/renewal/applications/browns-ferry/lra-bfn.pdf

The inspectors reviewed the program basis documents, administrative procedures, and implementing procedures to verify that the program was developed as described in the license renewal application, and the corresponding NRC SER. The inspectors interviewed licensee personnel to discuss the implementation of the enhanced fatigue monitoring program, using FatiguePro®, and verify consistency with the program implementing procedures. The inspectors reviewed the FatiguePro® methodology, inputs, calculations, and sample results to verify that FatiguePro® had been implemented in the enhanced fatigue monitoring program, to monitor and track transient cycles and fatigue usage.

Commitment Item 40 (Table 1) – Time-Limited Aging Analysis: Environmental Qualification of Electrical Equipment: This commitment specified that prior to the PEO for Units 1, 2, and 3; the licensee would revise the existing environmental qualification program to cover the PEO. The UFSAR description of this TLAA stated that the analyses that establish a qualified life of at least 40 years for electrical components, subject to the requirements of 10 CFR 50.49, were TLAAs as defined by 10 CFR 54.21. The aging effects of electrical components subject to the requirements of 10 CFR 50.49 would be managed in the environmental qualification program, in accordance with the requirements of 10 CFR 54.21(c)(1)(iii) for the PEO.

The inspectors reviewed the program basis document, implementing procedures, and a sample of environmental qualification binders for components within the scope of the TLAA, to verify that the analyses were implemented as described in the license renewal application, and the corresponding section of the NRC SER. The inspectors reviewed the aging evaluation in each environmental qualification binder to verify that these were revised to address the PEO. The inspectors interviewed licensee personnel to discuss the process to identify the applicable components and the extent of the evaluations. The inspectors also conducted a walkdown of the plant areas listed below that contained components within the scope of this TLAA, to verify that the actual material condition supported the assumptions and results of the environmental qualification analyses.

- Unit 2 – North East Quadrant (Elevation 519)
- Unit 2 – South East Quadrant (Elevation 541)
- Unit 2 – Southeast Quadrant (Elevation 519)
- Unit 3 – Drywell Access Room (Elevation 580)

Commitment Item 41 (Table 1) – Time-Limited Aging Analysis: Emergency Equipment Cooling Water Weld Flaw Evaluation: This commitment specified that prior to the PEO for Units 1, 2, and 3; the licensee would implement an administrative tracking system to ensure the limiting number of fatigue cycles will not be exceeded at the selected emergency equipment cooling water (EECW) system piping locations. The locations of the EECW piping within the scope of this TLAA consisted of 17 welds which had flaws larger than normally considered acceptable, and were analyzed for the PEO. The analysis included a stress evaluation of the flawed welds and fatigue crack growth calculations. The fatigue crack growth calculations were based on a conservative projection of 125 cycles for the remainder of the plant operating live. The fatigue crack growth portion of this analysis was considered a TLAA.

The inspectors reviewed the administrative and implementing procedures to verify that the administrative tracking system was developed, as described in the license renewal

application, and the corresponding NRC SER. The inspectors interviewed licensee personnel to discuss the implementation of the tracking system, as described in the commitment. The inspectors reviewed technical instruction (TI) 0-TI-584, "EECW Weld Flaw Fatigue Cycle Monitoring," to verify that the procedure will monitor the applicable fatigue cycles of the identified locations within the scope of this commitment, and includes appropriate acceptance criteria and corrective actions.

b. Findings and Observations

No findings were identified. The inspectors determined that the licensee completed the necessary actions to meet regulatory commitments 35, 40, and 41 prior to the PEO of Unit 1 (December 20, 2013).

.2 License Conditions and Commitments for License Renewal, Implementation of Aging Management Programs and Time-Limited Aging Analysis (Inspection Procedure 71003, Phase 3)

a. Inspection Scope

The inspectors reviewed program documents, conducted walkdowns, and interviewed licensee staff for selected commitment items and associated AMPs/TLAAs, to verify that the licensee completed the necessary actions to meet the commitments for license renewal, and implemented the AMP/TLAAs, as described in the NRC SER and the license renewal supplement to the UFSAR.

The commitment items and associated AMPs/TLAAs selected for the inspection are summarized below based on their description in Table 1 of the NRC SER supplement issued in April 2006, and the UFSAR supplement for license renewal, as revised, submitted with the license renewal application. The specific inspection activities conducted for each commitment, AMP and TLAA, are also described below. Specific documents reviewed for each commitment are listed in the report Attachment.

Commitment Item 32 (Table 1) – Structures Monitoring Program: This commitment specified, in part, that prior to the PEO for Units 1, 2, and 3; the licensee will revise the program implementing documents to include license renewal references. Additionally, the licensee would enhance the procedures implementing the 10 CFR 50.65 maintenance rule program to identify all structures and structural components within scope, include examinations of below-grade concrete in the sampling approach when excavated, and include the guidance provided in document ACI 349.3R-96, Chapter 7.

The UFSAR supplement described that the program includes periodic inspection and monitoring of the condition of accessible areas of structures. The structures monitoring program would implement the requirements of the 10 CFR 50.65 maintenance rule and incorporate the guidance of NRC Regulatory Guide 1.160, and Nuclear Management and Resources Council (NUMARC) document, NUMARC 93-01. The structures monitoring program would provide inspection guidelines and walkdown checklists for concrete features, roofs, structural steel, masonry walls, seismic gaps, tanks, earthen structures, buried piping, and miscellaneous components such as doors, suspended systems supports, non-American Society of Mechanical Engineers (ASME) equivalent pipe supports, and electrical component supports.

The inspectors conducted a walkdown of the plant areas listed below to assess condition of plant structures and confirm implementation of the program, as described in the license renewal documents.

- Intake Pumping Station
- Unit 2 – North East Quadrant (Elevation 519)
- Unit 2 – South East Quadrant (Elevation 541)
- Unit 2 – Southeast Quadrant (Elevation 519)
- Unit 3 – Drywell Access Room (Elevation 580)

Commitment Item 39 (Table 1) – Time-Limited Aging Analysis: Reactor Vessel Thermal Limit Analyses: Operating Pressure-Temperature Limits: This commitment specified that prior to the PEO for Units 1, 2, and 3; the licensee would develop and submit revised pressure-temperature (P-T) limits to the NRC for approval. The license renewal application stated that the disposition of this TLAA would be in accordance with 10 CFR 54.21(c)(1)(ii), in that the analyses will be projected to the end of the PEO.

The inspectors interviewed licensee staff and reviewed docketed correspondence to verify that the Unit 1 P-T curves were submitted to the NRC for review and approval, prior to the Unit 1 PEO. The inspectors also discussed the status of the P-T curves for Units 2 and 3 to confirm that the licensee planned to submit the P-T curves prior to the PEO of each Unit.

b. Findings and Observations

No findings were identified.

.3 Newly Identified Structures, Systems, and Components

a. Inspection Scope

The inspectors discussed the evaluation of newly identified structures, systems, or components (SSCs) with the licensee's staff to verify compliance with the provisions of 10 CFR 54.37(b). The inspectors reviewed the latest revision to the UFSAR supplement for license renewal to verify that it included the description of newly identified SSCs, that would have been subject to an aging management review (or evaluation of TLAA), and the description of how the effects of aging will be managed such that the intended function(s) will be effectively maintained during the PEO.

b. Findings and Observations

No findings were identified. The inspectors noted that the licensee added a section to the UFSAR's license renewal supplement to describe the aging management of newly-identified SSCs. The inspection team did not identify any other new SSCs that were subject to the provisions of 10 CFR 54.37(b).

.4 Description of Aging Management Programs in the UFSAR Supplement

a. Inspection Scope

As part of the review of implementation activities for the selected AMPs and TLAAs described in section 4OA5.1 and 4OA5.2 of this report, the inspectors reviewed the corresponding UFSAR sections to verify that the program descriptions were consistent with the license renewal application, the corresponding section of the NRC SER, and subsequent revisions performed under the provisions of 10 CFR 50.59.

b. Findings and Observations

No findings were identified.

.5 Changes to License Renewal Commitments and the UFSAR Supplement for License Renewal

a. Inspection Scope

As part of the review of license renewal commitments, AMPs, and TLAAs described in section 4OA5.1 and 4OA5.2 of this report, the inspectors interviewed the licensee regarding any commitment changes implemented after the NRC inspection performed on August 23, 2013, to verify the licensee followed the guidance in Nuclear Energy Institute (NEI) 99-04, “Guidelines for Managing NRC Commitment Changes,” for any change to the commitments. The inspectors were informed that no new commitment changes were implemented.

b. Findings and Observations

No findings were identified.

4OA6 Management Meetings

Exit Meeting Summary

On May 9, 2014, the inspectors presented the inspection results to Mr. Keith Polson, Site Vice President, and other members of the licensee staff. The inspectors confirmed that none of the potential report input discussed was considered proprietary. Proprietary material received during the inspection was returned to the licensee.

On June 19, 2014, the inspectors held a conference call with plant staff from the licensing organization to discuss the final inspection results as presented in this report.

ATTACHMENT: SUPPLEMENTARY INFORMATION

SUPPLEMENTARY INFORMATION

KEY POINTS OF CONTACT

Licensee

S. Austin, Site Licensing Engineer
J. Colvin, Engineering
K. J. Polson, Site Vice President
V. Schiavone, Engineering Programs, Aging Management Coordinator

LIST OF REPORT ITEMS

Opened

None

Opened and Closed

None

Closed

05000259, -260, -296/2013009-001	URI	Implementation of Aging Management Programs and Time-Limited Aging Analyses (Section 4OA5.1)

Discussed

None

LIST OF DOCUMENTS REVIEWED

Commitment Item 35 – Fatigue Monitoring Program

0-TI-19, Rev. 10, Reactor Vessel and Reactor Pressure Boundary Component Fatigue Usage Factor Monitoring, Recording, Evaluating, and Reporting, 11/26/13
FP-BFN-305, Baseline and Fatigue Update for Browns Ferry Unit 1 using FatiguePro Software, Rev. 0
FP-BFN-306, Baseline and Fatigue Update for Browns Ferry Unit 2 using FatiguePro Software, Rev. 0
FP-BFN-307, Baseline and Fatigue Update for Browns Ferry Unit 3 using FatiguePro Software, Rev. 0
FP-BFN-401, System Description and Plant Data Specification for Browns Ferry Nuclear Plant FatiguePro Monitoring System, Rev. 0, July 2013

FP-BFN-402, Cycle Counting Methodology Report for the Transient and Fatigue Monitoring System for Browns Ferry Nuclear Power Plant, Rev. 0, October 2013
FP-BFN-403, Cycle-Based Fatigue Report for the Transient and Fatigue Monitoring System for the Browns Ferry Nuclear Power Plant, Rev. 0, October 2013
FP-BFN-405, Software Verification and Validation Report for Browns Ferry Plant-Specific FatiguePro 3 Software, Rev. 0, November 2013
NCO 040006075 (R20 131206 054), Commitment Completion Form: Fatigue Monitoring Program, 12/20/13
PER 176055, License Renewal Fatigue Analysis, 8/7/12
PER 490517, RIS 2011-14: Metal Fatigue Analysis Performance by Computer Software, 8/10/12
PER 815755, 0-TI-19 acceptance criteria exceeded, 12/18/13
R06 140207 019, Aging Management Program Notebook: Fatigue Monitoring Program, Rev. 1

Commitment Item 39 – Time-Limited Aging Analysis: Reactor Vessel Thermal Limit Analyses: Operating Pressure-Temperature Limits (P-T)
CNL-13-148, Browns Ferry Nuclear Plant (BFN), Unit 1 - Application to Modify Technical Specification 3.4.9, "RCS Pressure and Temperature (P/T) Limits" (BFN TS-484), December 18, 2013

Commitment Item 40 – TLAA on Environmental Qualification of Electrical Equipment
0-TI-624, Aging Management Program Basis Document Environmental Qualification Program, Rev. 0
Binder BFN0EQ-CABL-012, Environmental Qualification Document Package – Eaton Cable TVA Type MS, Rev. 15
Binder BFN0EQ-CABL-023, Environmental Qualification Document Package – Triangle/PWC Inc. TVA Type CPJ and CPJJ, Rev. 13
Binder BFN0EQ-HS-001, Environmental Qualification Document Package – Cutler-Hammer Company Handswitches, Model 10250T Series, Rev. 14
Binder BFN0EQ-SOL-003, ASCO - NP SERIES, Rev. 21
NCO 040006080 (R 20 131201 046), Commitment Completion Form, Table 1 Commitment Item 40, Revise Existing EQ Program to Cover the Extended Period of Operation, 10/21/13
NPG-SPP-09.2, Equipment Environmental Qualification Program, Rev. 4
PER 882820, NRC identified 'T' Drains in the Following Valve Operators are not Located in the Lowest Point: 1-FCV-074-0013, 1-FCV-074-0002, and 2-FCV-023-0034, May 2014
PER 884204, Environmental Qualification of Solenoid for valve 0-FSV-067-0053, 5/09/14
R 06 140217 038, Aging Management Program Notebook – Environmental Qualification Program, Rev. 1
SR 880815, QM Activities Needed for EQ devices, 05/05/14
SR 880817, Revision of NPG-SPP-09.2 is needed to Address Qualified Life Greater than 40 Years, 05/05/14
SR 881086, Ampacity Calculations Do Not Agree with EQ Binder 10 CFR 50.49 Temperature Rating for 60 years, 5/6/14

Commitment Item 41 – TLAA on Emergency Equipment Cooling Water Weld Flaw
NCO 040006081 (R20 131003044), Commitment Completion Form: Emergency Equipment Cooling Water Weld Flaw Evaluation, 12/20/13
0-TI-584, EECW Weld Flaw Fatigue Cycle Monitoring, Rev. 0

Other Documents

Browns Ferry Updated Final Safety Analysis Report, Amendment 25
DWG 0-10E201-1-LR, License Renewal Location of Structures, Rev. 0
DWG 0-31N315, Concrete Intake Conduits to Powerhouse-Outline, Rev. 0
DWG 3IN300, Concrete Intake & Discharge Conduits Under Powerhouse-Outline-Sheet 1, Rev. E, 12/7/87
Letter from TVA to the NRC, Subject: Browns Ferry Nuclear Plant - Updated Final Safety Analysis Report, Amendment 25, October 4, 2013
PER 689274, Condenser Circulating Water Conduit Degradation With Excessive in Leakage into the Radioactive Waste System Resulting In Unit 3 Talen Offline, 4/5/13
PER 816957, Prompt Determination of Operability Documentation, 12/10/13
WO 114638867, 2-SR-3.4.9.1(2) – Reactor Vessel Shell Temperature & Reactor Coolant Pressure Monitoring During In-Service Hydrostatic or Leak Testing, 5/1/13

LIST OF ACRONYMS

AMP	Aging Management Program
ASME	American Society of Mechanical Engineers
EECW	Emergency Equipment Cooling Water
IMC	Inspection Manual Chapter
NEI	Nuclear Energy Institute
NRR	Nuclear Reactor Regulation
NUMARC	Nuclear Management and Resources Council
PEO	Period of Extended Operation
P-T	Pressure-Temperature
SER	Safety Evaluation Report
SSCs	Structures, Systems, or Components
TI	Technical Instruction
TLAA	Time-limited Aging Analysis
UFSAR	Updated Final safety Analysis Report
URI	Unresolved Item