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

October 3, 2013

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 – NRC POST-APPROVAL SITE INSPECTION FOR LICENSE RENEWAL, INSPECTION REPORT 05000259/2013009, 05000260/2013009, AND 05000296/2013009

Dear Mr. Shea:

On August 23, 2013, 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. The enclosed report documents the inspection results, which were discussed on August 23, 2013, with Mr. Keith J. Polson, site Vice President, and other members of the Browns Ferry management staff. Additionally, on September 12, 2013 and September 27, 2013, the NRC held conference calls with members of the Browns Ferry licensing staff to discuss the final inspection results as presented in this report.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, and interviewed plant personnel.

Based on the inspection sample selected for review, no findings were identified. The inspectors identified an unresolved item associated with the implementation status of one aging management program (AMP) and two time-limited aging analyses (TLAAs). The NRC is planning to conduct an additional inspection of the unresolved item after Unit 1 enters the period of extended operation. The inspectors also identified a number of observations associated with the implementation of certain aging management activities and changes to the updated final safety analysis report (UFSAR) supplement for license renewal.

The inspectors determined that the overall implementation of AMPs and TLAAs was consistent with the license renewal commitments, the UFSAR 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 10 CFR 54.37(b) were adequately identified and evaluated. The inspectors determined that commitment changes not affecting the UFSAR were evaluated in accordance with the applicable requirements.

In accordance with 10 CFR 2.390 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 Public Document Room or from the Publicly Available Records System (PARS) component of 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

Steven J. Vias, Chief
Engineering Branch 3
Division of Reactor Safety

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

Enclosure:
Inspection Report 05000259/2013009,
05000260/2013009, 05000296/2013009
w/Attachment: Supplemental Information

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U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket No(s):	05000259, 05000260, 05000296
License No:	DPR-33, DPR-52, DPR-68
Report No:	05000259/2013009, 05000260/2013009, 05000296/2013009
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:	August 5 – 23, 2013
Inspectors:	J. Rivera-Ortiz, Senior Reactor Inspector, Team Lead L. Lake, Senior Reactor Inspector R. Carrion, Senior Reactor Inspector C. Fletcher, Senior Reactor Inspector M. Coursey, Reactor Inspector A. Butcavage, Reactor Inspector
Approved by:	Steven J. Vias, Chief Engineering Branch 3 Division of Reactor Safety

Enclosure

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SUMMARY OF FINDINGS

IR 05000259, -260, -296/2013009; 08/05/2013 – 08/23/2013; Browns Ferry Nuclear Plant, Units 1, 2, and 3; Post Approval Site Inspection for License Renewal.

The report covers a team inspection conducted by six regional inspectors in accordance with NRC Manual Chapter 2515 and NRC Inspection Procedure 71003.

This inspection resulted in no findings. The inspectors identified an unresolved item associated with the implementation status of one aging management program (AMP) and two time-limited aging analyses (TLAAs). The inspectors also identified a number of observations associated with the implementation of certain aging management activities and changes to the updated final safety analysis report (UFSAR) supplement for license renewal.

On the basis of the sample selected for review, the inspectors determined that the licensee had completed, or was on track to complete, the necessary tasks to meet the license renewal commitments, license conditions, and regulatory requirements associated with the issuance of the renewed operating license at Browns Ferry Nuclear Plant Units 1, 2, and 3. Based on the review of program documents and activities completed at the time of this inspection, the inspectors determined that the licensee had established the majority of required programs to manage aging effects of in-scope structures, systems, and components in order to maintain their function(s) through the period of extended operation of the three units. For the established AMPs and TLAAs, the inspectors determined that the licensee completed all planned aging management activities due prior to entering the period of extended operation of Units 1, 2, and 3, with some exceptions. While most commitment items remained open in the corrective action program the inspectors determined that essentially all the required aging management activities such as inspections, procedure revisions, and evaluations were performed as described in the commitments. For the commitment sample selected for review, the inspectors also determined that the licensee completed all the aging management activities required for Unit 1 prior to restart from the extended shutdown.

The inspectors determined that the licensee took appropriate actions to assure that “newly identified” structures, systems, and components within the scope of 10 CFR 54.37(b) were identified and evaluated for management of aging affects. The inspectors did not identify inconsistencies between the aging management program description in the UFSAR supplement for license renewal, as revised, and the aging management activities been implemented, with the exception of one observation identified for the selective leaching program. The inspectors also determined that commitment changes not affecting the UFSAR were evaluated in accordance with the applicable requirements.

REPORT DETAILS

4. OTHER ACTIVITIES

4OA5 Other Activities: Post-Approval Site Inspection for License Renewal (Phase 2)

.1 License Conditions and Commitments for License Renewal, Implementation of Aging Management Programs and Time-Limited Aging Analysis

a. Inspection Scope

The inspectors reviewed a sample of regulatory commitments, AMPs, and TLAAs associated with the renewed operating license for Browns Ferry Nuclear Plant, Units 1, 2, and 3 issued on May 4, 2006. This inspection took place prior to the period of extended operation for Units 1, 2, and 3, which begins on December 20, 2013, June 28, 2014, and July 2, 2016, respectively. The inspectors reviewed license renewal implementing documents 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 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 AMPs and TLAAs as described in the NRC safety evaluation report and the license renewal supplement to the UFSAR.

For those license renewal action items that were not completed at the time of this inspection, the team verified that there was reasonable assurance that such action items were on track for completion prior to the period of extended operation or in accordance with an established implementation schedule consistent with the license renewal application, the NRC safety evaluation report, and the UFSAR supplement. The licensee was tracking the completion of regulatory commitments for license renewal through the corrective action program, via problem evaluation report (PER) 89791, "License Renewal Commitment Tracking," and the commitment action tracking database. The inspectors initiated unresolved items for issues that require follow-up during subsequent license renewal inspections.

The commitment items and associated AMPs/TLAAs selected for the inspection sample are summarized below based on their description in Table 1 and Table 2 of the NRC safety evaluation report 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 1 (Table 1) – Accessible Non-Environmental Qualification Cables and Connections Inspection Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3, a new program for inspection of accessible

[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

non-environmental qualification cables and connections will be developed and implemented consistent with the program described in NUREG-1801, "Generic Aging Lessons Learned Report," Revision 0, Section XI.E1. The UFSAR supplement stated that the program would be a condition monitoring program that manages the aging effects of insulated cables and connections within the scope of license renewal exposed to adverse localized environments.

The inspectors reviewed the program implementation notebook which included administrative procedures, implementing procedures, and summary of testing results to verify that the program was developed as described in the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors interviewed licensee personnel to discuss the selection process of accessible non-environmental qualification cables and connections. The inspectors also reviewed a sample of visual examination results for Units 1, 2, and 3, to verify that the examination and evaluation of results were performed in accordance with the program implementing procedures.

The inspectors identified one observation associated with the implementation of this program, which is discussed in further details in section 4OA5.1.b(2) of this report.

Commitment Item 2 (Table 1) – Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3, the program implementing documents for low power radiation monitoring cable system aging will be revised to reference existing Technical Specification requirements and license renewal references. Additionally, the licensee would develop and implement a new program to manage intermediate range monitoring cable system aging prior to the period of extended operation for each unit. This commitment was also associated with a unit specific commitment to include the Unit 1 high range radiation monitoring cables in the scope of the environmental qualification program prior to restart from the extended shutdown. The UFSAR supplement described that the program manages the aging effects of sensitive, low level signal circuits exposed to adverse localized environments. The scope of this program would be limited to the cables of the intermediate range monitors and local power range monitors.

The inspectors reviewed the program implementation notebook which included administrative procedures, implementing procedures, and summary of testing results to verify that the program was developed as described in the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors interviewed licensee personnel to discuss the implementation of the program and verify consistency with the program implementing procedures.

The inspectors identified one observation associated with changes to the UFSAR description of this program, which is discussed in further details in sections 4OA5.4.b(1) of this report.

Commitment Item 3 (Table 1) – Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3, the licensee would develop and implement a new program to manage the medium voltage cables to the residual heat removal service water pumps. The UFSAR supplement described this

AMP as a condition monitoring program to manage the aging effects of medium voltage cables that are exposed to adverse localized environments caused by moisture while energized. The program would include testing and inspection of in-scope medium voltage cables. Additionally, the UFSAR supplement formally incorporated in the UFSAR per 10 CFR 50.71(e) after the renewed operating license was issued (UFSAR Amendment 22) stated that handholes and manholes associated with in-scope cables will be visually inspected for signs of moisture.

The inspectors reviewed the program implementation notebook which contained work orders, preventative maintenance procedures, and implementing procedures to verify that the program was developed and implemented as described in the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors also interviewed licensee personnel to discuss the scoping process of inaccessible medium voltage cables within the scope of the program to verify consistency with the implementing procedures.

Commitment Item 5 (Table 1) – Chemistry Control Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the licensee will revise the implementing program documents to include license renewal references. This commitment was also associated with a unit specific commitment to include Unit 1 within the scope of the program prior to restart from the extended shutdown. The UFSAR supplement described that the program consists of monitoring and control of water chemistry to keep peak levels of various contaminants below system specific limits based on the industry recognized guidelines of Electric Power Research Institute (EPRI) technical report TR-103515, “BWR Water Chemistry Guidelines – BWRVIP-79.”

The inspectors reviewed the program implementation notebook which contained administrative procedures, implementing procedures, and self-assessments to verify that the program was implemented as described in the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors interviewed licensee personnel to discuss the implementation of the program and verify that the implementing procedures were revised prior to Unit 1 restart. The inspectors also reviewed a sample of previous chemistry results to verify compliance with the program implementing procedures.

Commitment Item 6 (Table 1) – Reactor Head Closure Studs Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the licensee will revise the implementing program documents to include license renewal references. The UFSAR supplement described that the program includes inservice inspection in conformance with the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (BPVC), Section XI, Subsection IWB, Table IWB 2500-1. The UFSAR also described that the program includes preventive measures to mitigate cracking, including the preventive measures of NRC Regulatory Guide 1.65, “Materials and Inspections for Reactor Vessel Closure Studs,” and approved lubricants to minimize the potential of cracking of the non-metal-plated reactor head closure studs.

The inspectors reviewed the program implementation notebook which contained administrative procedures, implementing procedures, and inservice examination results to verify that the program was developed as described in the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors

verified that the required procedure enhancements to address the period of extended operation were completed. The inspectors also reviewed the latest inservice inspection examination results for each of the units to verify that the reactor head closure studs were included in the inservice program and that the examination methods and results were in conformance with the ASME BPVC.

Commitment Item 7 (Table 1) – Boiling Water Reactor Vessel Inside Diameter Attachment Welds Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the licensee will revise the implementing program documents to include license renewal references. This commitment was also associated with a unit specific commitment to include Unit 1 within the scope of the program prior to restart from the extended shutdown.

The UFSAR supplement described that the program includes inspection and flaw evaluation in conformance with the guidelines of NRC approved Boiling Water Reactor Vessel and Internals Project (BWRVIP) document BWRVIP-48, "Vessel Inside Diameter Attachment Weld Inspection and Evaluation Guidelines." Inspections and flaw evaluations would be performed in accordance with the guidelines of ASME BPVC, Section XI, Subsections IWB, IWC, and IWD. The program would also credit monitoring and control of reactor coolant water chemistry by the chemistry control program.

The inspectors reviewed the program implementation notebook which included administrative procedures, implementing procedures, and self-assessments to obtain reasonable assurance that the program was developed as described in the license renewal application, the corresponding section of the NRC safety evaluation report, and BWRVIP documentation. The inspectors interviewed licensee personnel to discuss the current status of the program and the implementation plan for future inspections.

The inspectors reviewed unit-specific implementing procedures to verify that Unit 1 had been incorporated within the scope of BWRVIP-48 and that the applicable Unit 1 inspections were required to be performed prior to restart from extended shutdown. The inspectors reviewed a sample of inspection results for the Unit 1 feed-water sparger end bracket performed in 2005 to verify the inspection was performed prior to Unit 1 restart. The inspectors also reviewed implementing procedures for Units 2 and 3 to obtain reasonable assurance that future inspections within the scope of BWRVIP-48 were planned to meet the regulatory commitment.

Commitment Item 8 (Table 1) – Boiling Water Reactor Feedwater Nozzle Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the licensee will revise the implementing program documents to include license renewal references. This commitment was also associated with a unit specific commitment to include Unit 1 within the scope of the program prior to restart from the extended shutdown.

The UFSAR supplement described that the program includes inservice inspections in accordance with the requirements of the ASME BPVC, Section XI, Subsection IWB, Table IWB 2500-1 and the recommendations of General Electric NE-523-A71-0594 "Alternate BWR Feedwater Nozzle Inspection Requirements." Additionally, the program would include system modifications to mitigate cracking. According to the UFSAR, the program addressed BWR feedwater nozzle cracking by implementation of the recommendations in NUREG-0619, "BWR Feedwater Nozzle and Control Rod Drive

Return Line Nozzle Cracking." Particularly, the feedwater nozzles had been modified to mitigate cracking by removing the stainless steel cladding and machining the safe end and nozzle bore and inner bend radius to accept improved double piston ring interference fit spargers with a forged tee design and orificed elbow discharges. The reactor water cleanup system return lines were also routed to both feedwater headers (Unit 3 only). The UFSAR also stated that changes to plant operating procedures, such as improved feedwater control, to decrease the magnitude and frequency of temperature fluctuations had been implemented on Units 2 and 3. The program would be enhanced to implement the program on Unit 1 prior to the period of extended operation.

The inspectors reviewed the program implementation notebook which included administrative procedures, implementing procedures, and self-assessments to obtain reasonable assurance that the program was developed as described in the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors interviewed licensee personnel to discuss the operating procedure changes within the scope of the program. The inspector reviewed operating procedure 1-OI-3, "Browns Ferry Nuclear Plant Unit 1, Operating Instruction, Reactor Feed-Water System," Revision 35, to verify that it included operational methods to help minimize thermal duty on the reactor feed-water nozzles in the precautions and limitations, and verify that the enhancement to minimize thermal cycles was adequately identified as a regulatory commitment for license renewal.

The inspectors interviewed plant staff to confirm that the modifications implemented in Unit 3 to reroute the reactor water cleanup system return lines addressed the recommendations in NUREG-0619. The inspectors also verified that the scope of required license renewal examinations was not affected as a result of risk-informed inservice inspection activities.

The inspectors reviewed technical instruction 1-TI-365, "Unit 1 Technical Instruction, Reactor Pressure Vessel Internals Inspection (RPVII)," Revision 6, to confirm that it included an examination schedule for feedwater sparger end brackets and nozzles, including specification of examination method, reference to baseline examinations, and discussions of indications from prior examination results. The inspectors also reviewed a sample of nozzle inspections results from past inspections of Unit 1 and Unit 3 feedwater nozzles to confirm the implementation of the program.

Commitment Item 9 (Table 1) – Boiling Water Reactor Control Rod Drive Return Line Nozzle Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the licensee will revise the implementing program documents to include license renewal references. The UFSAR supplement described that the program includes inservice inspections in accordance with the ASME BPVC, Section XI, Subsections IWB, IWC, and IWD. The program would also include system modifications to mitigate cracking. According to the UFSAR, the licensee had modified the control rod drive return lines to meet the recommendations of NUREG-0619. The control rod drive return line flow was rerouted to return to the reactor water cleanup system piping, the line nozzle piping connected to the vessel had been removed, and the reactor vessel nozzles had been capped.

The inspectors reviewed the program implementation notebook which included administrative and implementing procedures to obtain reasonable assurance that the program was developed as described in the license renewal application and the

corresponding section of the NRC safety evaluation report. The inspectors interviewed licensee personnel to discuss the current approach used at Browns Ferry Nuclear Plant to address control rod drive return line nozzle cracking. Specifically, the inspectors interviewed the program owner to verify that the licensee had modified the control rod drive return lines to meet the recommendations of NUREG-0619. The inspectors also discussed the modification to remove the control rod guide return line nozzle piping, rerouting the line to the reactor water cleanup piping, capping the reactor vessel nozzles, and the future examination plans of affected welds within the scope of the inservice inspection program. In addition, the inspectors reviewed a sample of engineering packages and examination summary sheets to confirm the implementation of the control rod drive return line modifications in all units.

Commitment Item 11 (Table 1) – Boiling Water Reactor Penetrations Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the licensee will revise the implementing program documents to include license renewal references. This commitment was also associated with a unit specific commitment to include Unit 1 within the scope of the BWR penetrations program prior to restart from the extended shutdown.

The UFSAR supplement described that the BWR penetrations program includes inspection and flaw evaluation in conformance with the guidelines of documents BWRVIP-49, “Instrument Penetration Inspection and Flaw Evaluation Guidelines,” and BWRVIP-27, “BWR Standby Liquid Control System/Core Plate Delta-P Inspection and Flaw Evaluation Guidelines.” Inspection and flaw evaluation would be conducted in accordance with the ASME BPVC, Section XI, Subsections IWB, IWC, and IWD inservice inspection program and the augmented exam recommendations of the BWRVIP-27 and BWRVIP-49 guidelines. The program would also credit monitoring and control of reactor coolant water chemistry in accordance with the EPRI, “BWR Water Chemistry Guidelines.”

The inspectors reviewed the program implementation notebook which included administrative procedures, implementing procedures, and self-assessments to obtain reasonable assurance that the program was developed as described in the license renewal application, the corresponding section of the NRC safety evaluation report, and applicable BWRVIP documentation. The inspectors interviewed licensee personnel to discuss the current status and scope of the program relative to the implementation of BWRVIP-27 and BWRVIP-49.

Additionally, the inspectors reviewed an implementing procedure for Unit 1, technical instruction (TI) 1-TI-365, to confirm that Unit 1 inspections were specified in accordance with the latest approved versions of BWRVIP-27 and BWRVIP-49. The inspectors reviewed a sample of examination results for an instrumentation nozzle indication identified in Unit 1 during the vessel nozzle penetration examinations conducted in the fall cycle six restart outage in 2005, prior to Unit 1 restart. The inspectors also reviewed documentation for the weld overlay applied to this Unit 1 instrumentation nozzle to verify compliance with ASME Section XI and Code Case N-504-3, “Alternative Rules for Repair of Class 1, 2, and 3 Austenitic Stainless Steel Piping, Section XI, Division 1.”

Commitment Item 12 (Table 1) – Boiling Water Reactor Vessel Internals Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the licensee will revise the implementing program documents to include license renewal

references. Additionally, the licensee committed to: (a) inspect each reactor unit internals top guide beams prior to the period of extended operation, (b) establish an aging management program for steam dryers two years before the first unit enters the period of extended operation, (c) enhance the reactor pressure vessel internals inspection procedures for all units to require visual inspection of the access hole covers and their welds, and (d) implement the inspection of jet pump thermal sleeve weld TS-2 when the inspection technique is developed by the BWRVIP inspection committee. This commitment was also associated with a unit specific commitment to include Unit 1 within the scope of the BWR vessel internals program prior to restart from the extended shutdown.

The UFSAR supplement described that the BWR vessel internals program includes inspection and flaw evaluation in conformance with the guidelines of applicable BWRVIP documents. Additionally, certain components that are addressed as part of the BWR vessel internals program would be inspected in accordance with ASME BPVC, Section XI. The processes of BWRVIP-94 would be used to implement the BWR vessel internals program at Browns Ferry. The program would also credit monitoring and control of reactor coolant water chemistry in accordance with the guidelines of EPRI, "BWR Water Chemistry Guidelines."

The inspectors reviewed the program implementing notebook which included administrative procedures, implementing procedures, and self-assessments to verify that the program was developed as described in the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors interviewed licensee personnel to discuss the approach used to update the Unit 1, 2 and 3 reactor internals programs to include license renewal documents. The inspectors reviewed technical instructions for Units 1, 2, and 3 to verify that program implementing documents were revised as stated in the commitment, including inspection program requirements for each unit with categorization by the related BWRVIP basis document, type of required inspection, and target dates for each inspection. The inspectors reviewed a sample of steam dyer inspection results summary completed prior to the restart of Unit 1 and a sample of other completed inspection results to obtain reasonable assurance that the licensee was applying the industry BWRVIP guidelines in accordance with the regulatory commitments for license renewal.

Commitment Item 13 (Table 1) – Flow-Accelerated Corrosion Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the licensee will revise the implementing program documents to include license renewal references. This commitment was also associated with a unit specific commitment to include Unit 1 within the scope of the program prior to restart from the extended shutdown. The UFSAR description of this program stated that the flow-accelerated corrosion program consists of appropriate analysis and baseline inspections followed by the determination of the extent of wall thinning with replacement or repair of components if necessary. This existing program was in response to NRC Generic Letter 89-08, "Erosion/Corrosion-Induced Pipe Wall Thinning," and was based on EPRI NSAC-202L, "Recommendations for an Effective Flow-Accelerated Corrosion Program," guidelines.

The inspectors reviewed the program implementation notebook which contained administrative procedures, implementing procedures, and self-assessments to verify the licensee revised the existing program documents to incorporate license renewal references as described in the license renewal application and the corresponding

section of the NRC safety evaluation report. The inspectors also verified that Unit 1 was included within the scope of the program prior to restart from the extended shutdown.

Commitment Item 14 (Table 1) – Bolting Integrity Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the licensee will revise the implementing program documents to include license renewal references. The program would be consistent with the recommendations in NUREG-1801, Revision 0, with the exception that it would not include the aging management of structural bolting (covered in the structural monitoring program) and bolting for Class 1 nuclear steam supply system component supports (covered in the ASME Code Section XI, Subsection IWF Program). The UFSAR supplement described that the program provides for condition monitoring of selected pressure-retaining bolted joints and external surfaces for piping and components within the scope of license renewal, except reactor vessel internal and reactor vessel closure bolting.

The UFSAR supplement also stated that the program would provide for preventive actions through the selection of bolting material and the use of lubricants and sealants. The program would be consistent with the guidelines of EPRI document NP-5769, "Degradation and Failure of Bolting in Nuclear Power Plants," and recommendations of NUREG-1339, "Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants," to prevent or mitigate degradation and failure of safety-related bolting. The program would include condition monitoring through inservice inspections of Class 1, 2, and 3 components in accordance with ASME BPVC, Section XI, Subsections IWB, IWC, and IWD. The inspection for bolting within the scope of license renewal not included in the ASME Section XI inservice inspection program would be provided by the system monitoring program.

The inspectors reviewed the program implementation notebook which contained administrative procedures, implementing procedures, and inservice examination results to verify that the program was developed as described in the license renewal application and the corresponding section of the NRC safety evaluation report. Specifically, the inspectors reviewed the latest inservice examination results for each unit to verify that bolting integrity inspection was included in the inservice inspection program activities and that the examination methods and results were in conformance with the ASME BPVC. The inspectors verified that the required procedure enhancements to address the period of extended operation were completed.

Commitment Item 15 (Table 1) – Open-Cycle Cooling Water System Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the licensee will revise the implementing program documents to include license renewal references. In addition, this commitment specified that the open-cycle cooling water system program will be enhanced to perform confirmatory inspections of the residual heat removal service water pump pit supply piping, sluice gate valves, and seismic restraints in the residual heat removal service water pump pit prior to the period of extended operation and subsequently within ten years after entering the period of extended operation. This commitment was also associated with a unit specific commitment to include Unit 1 within the scope of the program prior to restart from the extended shutdown. The UFSAR supplement described that this program manages loss of material, biofouling, pitting, flow blockage, and reduction of heat transfer aging effects in raw cooling water piping and components through the implementation of condition monitoring activities and preventive actions.

The inspectors reviewed the program implementation notebook which contained work orders, preventative maintenance procedures, implementing procedures, and self-assessments to verify that the program was implemented as described in the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors also interviewed licensee staff to confirm the implementation of the program and the completion status of inspection activities related to this commitment. The inspectors also verified that Unit 1 was included within the scope of the program prior to restart from the extended shutdown.

The inspectors captured the implementation status of this commitment as an observation in section 4OA5.1.b(3) of this report.

Commitment Item 16 (Table 1) – Closed-Cycle Cooling Water System Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the licensee will revise the implementing program documents to include license renewal references. This commitment was also associated with a unit specific commitment to include Unit 1 within the scope of the program prior to restart from the extended shutdown. The UFSAR supplement described that the program includes (a) preventive measures to minimize corrosion and (b) surveillance testing and inspection to monitor the effects of corrosion on the intended function of the components. The program would rely on maintenance of system corrosion inhibitor concentrations within specified limits of EPRI technical report TR-107396, "Closed Cooling Water Chemistry Guidelines," to minimize corrosion. Testing and inspection in accordance with the standards in EPRI technical report TR-107396 for closed-cycle cooling water systems would be performed to evaluate system and component performance.

The inspectors reviewed the program implementation notebook which included administrative procedures, implementing procedures, and self-assessments to verify that the program was developed as described in the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors interviewed licensee personnel to discuss the selection process of components within the scope of the program and verify that program procedures were revised as described in the commitment. The inspectors also reviewed a sample of surveillance tests, inspections, and chemistry trend charts to verify that the examination and evaluation of results were performed in accordance with the program implementing procedures. Additionally, the inspectors verified that Unit 1 was included within the scope of the program prior to restart from the extended shutdown.

Commitment Item 17 (Table 1) – Inspection of Overhead Heavy Load and Light Load Handling Systems Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the licensee will revise the implementing program documents to include license renewal references. The UFSAR supplement described that this AMP is a condition monitoring program that is implemented by the 10 CFR 50.65 maintenance rule program. Visual inspections would verify the structural integrity of crane components. Inspection requirements would be consistent with the guidance provided in NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," for load handling systems that handle heavy loads which can directly or indirectly cause a release of radioactive materials and with applicable industry standards for other cranes within the scope of license renewal. The effectiveness of the program would be monitored in accordance with the guidance of NRC Regulatory Guide 1.160, "Monitoring

the Effectiveness of Maintenance at Nuclear Power Plants." The program would be consistent with the program elements in NUREG-1801, Revision 0, Section XI.M23 with the exception that crane fatigue monitoring would not monitored by the program since the applicable TLAAs were evaluated and qualified for the period of extended operation.

The inspectors reviewed the program implementation notebook which contained administrative and implementing procedures, and interviewed plant staff to verify that the program was developed as described in the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors verified that enhancements to the program implementing documents were completed to explicitly include license renewal references, including verification that industry standards and NRC guidance were incorporated. The inspectors reviewed a maintenance snapshot self-assessment to verify implementation of the program as described in the commitment.

The inspectors identified one observation associated with changes to the UFSAR description of this program, which is discussed in further details in sections 4OA5.4.b(1) of this report.

Commitment Item 18 (Table 1) – Compressed Air Monitoring Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the licensee will revise the implementing program documents to include license renewal references and incorporate the guidelines in ASME Operational and Maintenance Code OM-S/G-2000, Part 17, "Performance Testing of Instrument Air Systems in Light-Water Reactor Power Plants;" American National Standards Institute (ANSI)/ISA-S7.0.01-1996, "Quality Standard for Instrument Air;" and EPRI technical report TR-108147, "Compressor and Instrument Air System Maintenance Guide." This commitment was also associated with a unit specific commitment to include Unit 1 within the scope of the program prior to restart from the extended shutdown. The UFSAR supplement described that the program consists of condition monitoring and preventive actions. Condition monitoring activities would consist of inspection and testing of the entire system; including frequent leak testing of valves, piping, and other system components. Preventive actions would include monitoring of air quality at various locations in the system to ensure that oil, water, rust, dirt, and other contaminants are kept within the specified limits. These limits would be determined from manufacturers' recommendations for individual components and the industry standards incorporated by the commitment. The UFSAR also stated that the program is based on NRC Generic Letter 88-14, "Instrument Air Supply System Problems Affecting Safety-Related Equipment," and the Institute of Nuclear Power Operations (INPO) Significant Operating Experience Report 88-01, "Instrument Air System Failures." The compressed air monitoring program would incorporate provisions conforming to the guidance of EPRI NP-7079, "Instrument Air Systems, A Guide for Power Plant Maintenance Personnel."

The inspectors reviewed the program implementation notebook which included administrative and implementing procedures, and interviewed plant staff to verify that the program was developed as described in the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors verified that enhancements to the program implementing documents were completed to explicitly include license renewal references, including verification that industry standards and NRC guidance were incorporated. The inspectors reviewed a maintenance snapshot self-assessment to verify implementation of the program as described in the

commitment. The inspectors also reviewed a sample of work orders to verify that the licensee performed system sampling, testing, and maintenance activities in accordance with the implementing procedures and industry standards, and that the inspection results were evaluated in accordance with the program attributes described in the license renewal application and the UFSAR supplement. Additionally, the inspectors verified that Unit 1 was included within the scope of the program prior to restart from the extended shutdown.

Commitment Item 19 (Table 1) – BWR Reactor Water Cleanup System Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the implementing documents for the reactor water cleanup system program will be revised to include license renewal references. This commitment was also associated with a unit specific commitment to include Unit 1 within the scope of the program prior to restart from the extended shutdown. The UFSAR supplement stated that this existing AMP applies to the reactor water cleanup piping welds outboard of the second isolation valve. The program would monitor and control reactor water chemistry based on industry recognized guidelines to reduce the susceptibility of reactor water cleanup system piping to stress corrosion cracking and intergranular stress corrosion cracking. At the time the licensee submitted the license renewal application, Units 2 and 3 reactor water cleanup system piping had been replaced with piping that is resistant to intergranular stress corrosion cracking in response to NRC concerns described in Generic Letter 88-01, “NRC Position on Intergranular Stress Corrosion Cracking (IGSCC) in BWR Austenitic Stainless Steel Piping." In addition, the UFSAR stated that all actions requested in NRC Generic Letter 89-10, “Safety-Related Motor-Operated Valve Testing and Surveillance,” had been completed. The program would be enhanced to implement the industry guidelines, NRC Generic Letters 88-01 and 89-10 for Unit 1 prior to the period of extended operation.

The inspectors reviewed the program implementation notebook which contained administrative and implementing procedures, along with license renewal boundary drawings to verify that the program was established as described in the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors reviewed a completed design change package for Unit 1 to verify that the applicable piping was replaced with material resistant to intergranular stress corrosion cracking to address NRC Generic Letter 88-01 as described in the UFSAR. Additionally, the inspectors reviewed implementing procedures for the motor operated valve program to verify that the licensee had included the applicable reactor water cleanup system valves within the scope of actions to address NRC Generic Letter 89-10. The inspectors also interviewed licensee personnel to confirm the implementation of the chemistry program relative to the reactor water cleanup system to verify consistency with the UFSAR description. The inspectors also reviewed a sample of chemistry monitoring results for the Unit 1 reactor coolant system and the reactor water cleanup system to verify that monitored parameters were maintained in accordance with the implementing procedures.

The inspectors identified one observation associated with the implementation of this program, which is discussed in further details in section 4OA5.1.b(4) of this report.

Commitment Item 20 (Table 1) – Fire Protection Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the implementing documents for the fire protection program will be revised to include license renewal

references. This commitment was also associated with a unit specific commitment to update the Fire Protection Report to incorporate Unit 1 as an operating unit and fully implement the program on Unit 1 prior to restart from the extended shutdown.

The UFSAR stated that the fire protection program includes fire barrier inspections and diesel-driven fire pump tests. Inspections and tests would be mandated by the Fire Protection Report, Volume 1, which is incorporated by reference into UFSAR, Section 10.11. The Fire Protection Report would require periodic visual inspection of fire barrier penetration seals, fire barrier walls, ceilings, and floors, and periodic visual inspection of fire rated doors to ensure that their operability is maintained. The Fire Protection Report would also require that the diesel driven fire pumps be periodically tested to ensure that the fuel supply line can perform its intended function. Additionally, the Fire Protection Report would include periodic inspection and test of the carbon dioxide fire suppression system.

The inspectors reviewed the program implementation notebook which contained administrative procedures, implementing procedures, and self-assessments to verify the licensee revised the existing program documents to incorporate license renewal references as described in the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors' review included interviews with plant staff to confirm the implementation of the program. The inspectors also verified that the Fire Protection Report was updated to incorporate Unit 1 as an operating unit and the program was fully implemented on Unit 1 prior to restart from the extended shutdown.

Commitment Item 21 (Table 1) – Fire Water System Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the implementing documents for the fire water system program will be revised to include license renewal references. Additionally, the licensee would perform flow tests or non-intrusive examinations to identify evidence of loss of material due to corrosion prior to the period of extended operation. The commitment also required sprinkler head inspections to ensure signs of degradation, such as corrosion, are detected in a timely manner prior to exceeding the 50-year service life of any sprinkler. This commitment was associated with a unit specific commitment to update the Fire Protection Report and procedures to incorporate Unit 1 as an operating unit and fully implement the program on Unit 1 prior to restart from the extended shutdown.

The UFSAR supplement stated that the fire water system program applies to water based fire protection systems that consist of sprinklers, nozzles, fittings, valves, hydrants, hose stations, standpipes, water storage tanks, and aboveground and underground piping and components that are tested in accordance with the applicable National Fire Protection Association codes and standards. The fire water system flow tests were mandated by the Fire Protection Report, Volume 1, which is incorporated by reference into the UFSAR, Section 10.11.

The inspectors reviewed the program implementation notebook which contained administrative procedures, implementing procedures, and self-assessments to verify the licensee revised the existing program documents to incorporate license renewal references as described in the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors' review included interviews with plant staff to confirm the implementation of the program. The inspectors verified, on

a sampling basis, that the licensee performed the flow tests or non-intrusive examinations and sprinkler head inspections as stated in the commitment. The inspectors also verified that the Fire Protection Report was updated to incorporate Unit 1 as an operating unit and the program was fully implemented on Unit 1 prior to restart from the extended shutdown.

Commitment Item 22 (Table 1) – Aboveground Carbon Steel Tanks Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the implementing documents for the aboveground carbon steel tanks program will be revised to include license renewal references. The UFSAR supplement described that the program includes preventive measures to mitigate corrosion by protecting the external surface of the unit specific condensate storage carbon steel tanks with paint or coatings in accordance with standard industry practice. The program would also rely on periodic inspections conducted in accordance with the 10 CFR 50.65 maintenance rule program and the systems monitoring program to monitor the unit specific condensate storage tank degradation.

The inspectors reviewed the program implementation notebook which contained administrative procedures, implementing procedures, and self-assessments to verify that the program was developed as described in the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors interviewed licensee personnel to discuss the material condition of the tanks and reviewed inspection results for non-destructive examinations of the tanks to confirm the implementation of the program. The inspectors verified that the inspections performed were in accordance with the implementing procedures.

Commitment Item 23 (Table 1) – Fuel Oil Chemistry Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the implementing documents for the fuel oil chemistry program will be revised to include license renewal references. The UFSAR stated that the program relies on a combination of surveillance and maintenance procedures. The program would monitor and control fuel oil contamination to maintain the fuel oil quality. Exposure to fuel oil contaminants such as water and microbiological organisms would be minimized by fuel oil sampling and analysis, including analysis of new fuel before its introduction into the storage tanks. If required, a biocide would be added to the fuel oil storage tanks during each new fuel delivery. Sampling and testing of diesel fuel oil would be in accordance with the American Society for Testing Materials (ASTM) Standards D 1796, D 2276, and D 4057.

The inspectors reviewed the program implementation notebook which contained administrative procedures, implementing procedures, and self-assessments to verify that the program was developed as described in the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors interviewed licensee personnel to confirm the implementation of the fuel oil chemistry program for in-scope systems. The inspectors also reviewed a sample of non-destructive examinations and visual inspections of in-scope tanks as part of the one-time inspection program to verify that the examination and evaluation of results were performed in accordance with the program implementing procedures.

The inspectors identified one observation associated with the implementation of this program, which is discussed in further details in section 4OA5.1.b(5) of this report.

Commitment Item 24 (Table 1) – Reactor Vessel Surveillance Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the licensee will revise the implementing program documents to include license renewal references. Additionally, the licensee committed to: (a) enhance the integrated surveillance program per proposed BWRVIP-116 document prior to the period of extended operation, (b) if the integrated surveillance program was not approved two years prior to the commencement of the license renewal period, a plant specific surveillance program for each unit would be submitted to the NRC two years prior to the commencement of the period of extended operation, and (c) maintain Unit 1 and 3 surveillance capsules (standby capsules) available for the integrated surveillance program.

This commitment was associated with a unit specific commitment to: (a) either include Unit 1 within the BWRVIP integrated surveillance program, or submit for NRC approval a plant-specific surveillance program that meets the requirements of 10 CFR 50 Appendix H for the period of extended operation, and (b) ensure BWRVIP-86-A and BWRVIP-116 are revised to incorporate Unit 1, and submit to the NRC a license amendment request to implement the integrated surveillance program for site-specific use for Unit 1; both due prior to the period of extended operation.

The inspectors reviewed the program implementing notebook which contained administrative procedures, implementing procedures, and self-assessments to verify that the program was developed as described in the license renewal application and the corresponding section of the NRC safety evaluation report and BWRVIP documentation. The inspectors interviewed licensee personnel to confirm the current status and scope of the program relative to the implementation of BWRVIP-116 and BWRVIP-86, Revision 1.

The inspectors reviewed the site governing document for the implementation of the reactor surveillance program in all units (i.e. technical instruction 0-TI-381,"Reactor Vessel Test Specimens," Revision 7) in combination with the applicable BWRVIP documentation to obtain reasonable assurance that the scope and frequency of activities described in the procedure met the regulatory commitment for license renewal. Specifically the inspectors confirmed the licensee's participation in the integrated surveillance program by reviewing documentation and interviewing plant staff about the submittal of the Unit 2 surveillance capsule to the BWRVIP group for analysis following the 2011 refueling outage. The inspectors also verified that the BWRVIP program in BWRVIP-86, Revision 1 included Browns Ferry Units 1, 2 and 3.

The inspectors identified one observation associated with the implementation of this program, which is discussed in further details in section 4OA5.1.b(6) of this report.

Commitment Item 25 (Table 1) – One-Time Inspection Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3 the licensee will: (a) develop and implement new one-time inspection program, (b) perform a one-time inspection of ASME equivalent Class MC supports in a submerged environment of the Units 2 and 3 torus, (c) perform a one-time inspection of the in-scope submerged concrete in one individual component cooling water pump bay of the intake pumping station, and (d) perform ultrasonic thickness measurements of tank bottoms for those tanks specified in the fuel oil chemistry program and the aboveground carbon steel tanks program. Additionally, the licensee would develop and submit the one-time inspection

program procedure for NRC review at least two years prior to the expiration of the current operating license. This commitment was also associated with a unit specific commitment to perform a one-time inspection of ASME equivalent Class MC supports in a submerged environment of the Unit 1 torus prior to restart from the extended shutdown.

The UFSAR supplement described that the one-time inspection program is a new program that includes measures to verify that unacceptable degradation is not occurring; thereby validating the effectiveness of existing programs or confirming that there is no need to manage aging related degradation for the period of extended operation. The program elements would include: (a) determination of the sample size, (b) identification of the inspection locations, (c) determination of the examination technique, and (d) evaluation of the need for follow up examinations to monitor the progression of any aging degradation. When one-time inspections fail to meet the established acceptance criteria, the corrective action program would be used to schedule, track, and trend the appropriate corrective actions and follow up inspections.

The original version of the UFSAR supplement submitted with the license renewal application stated that non-destructive techniques will generally be used; however in some circumstances, such as small-bore piping, destructive testing would be used. The licensee later revised this statement in the UFSAR to rely only on non-destructive testing. The elimination of destructive testing from the UFSAR was the result of the licensee's response to request for additional information RAI 3.1.2.4-7, dated April 5, 2005, which is discussed in section 3.1.2.2.4 of the NRC safety evaluation report.

The inspectors interviewed licensee staff to discuss the implementation of the program, particularly the methodology for the selection of inspection samples and disposition of inspection results. The inspectors also reviewed a sample of work orders to verify that one-time inspections were performed in accordance with the implementing procedures and the inspection results were evaluated in accordance with the program attributes described in the license renewal application and the UFSAR supplement. The inspectors' review included problem evaluation reports initiated for indications that were entered into the corrective action program and received an engineering evaluation for additional inspections.

Additionally, the inspectors reviewed commitment closure forms and supporting documentation to verify the licensee completed the necessary actions to meet this commitment. The selected commitment closure forms were associated with: (a) the development of a one-time inspection program, (b) the submittal of the program procedure to the NRC at least two years prior to the period of extended operation, (c) the one-time inspection of the ASME equivalent Class MC supports in a submerged environment of the Units 2 and 3 torus, (d) the one-time inspection of the in scope submerged concrete in one individual component cooling water pump bay of the intake pumping station, and (e) the one-time ultrasonic thickness measurements of tank bottoms for those tanks specified in the fuel oil chemistry program and the aboveground carbon steel tanks program. The inspectors also verified that the specific Unit 1 commitment to inspect the ASME equivalent Class MC supports was completed prior to restart from the extended shutdown.

Furthermore, the inspectors reviewed corrective actions for an observation related to indications on the reactor vessel head vent piping that was identified during an NRC

post-approval license renewal inspection in Unit 2. This NRC inspection was conducted in accordance with NRC inspection procedure 71003 and documented in NRC inspection report 05000260/2013008 (ADAMS Accession Number ML13116A219).

Commitment Item 26 (Table 1) – Selective Leaching of Materials Program: This commitment specified that prior to the period of extended operation of Units 1, 2, and 3; the licensee will develop and implement a selective leaching program. The UFSAR stated that this new program will consist of one-time visual inspections and hardness measurements on selected components susceptible to selective leaching. The materials of construction for these components may include cast iron, brass, bronze, or aluminum-bronze. These components may be exposed to a raw water, treated water, or ground water environment.

The inspectors reviewed the program implementation notebook which contained administrative procedures, implementing procedures, and summary of inspection results along with license renewal boundary drawings to verify that the program was established as described in the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors interviewed licensee staff to confirm the implementation of the program, particularly the methodology for the selection of inspection samples and disposition of inspection results. The inspectors also reviewed a sample of work orders to verify that selective leaching inspections were performed in accordance with the implementing procedures and the inspection results were evaluated in accordance with the program attributes described in the license renewal application and the UFSAR supplement.

The inspectors identified one observation associated with the implementation of this program, which is discussed in further details in section 4OA5.1.b(7) of this report.

Commitment Item 27 (Table 1) – Buried Piping and Tanks Inspection Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3, the licensee will revise the program implementing documents to include license renewal references, revise implementing documents to inspect buried piping when it is excavated, and add a trigger to the excavation permit document to require notification of engineering to perform a piping inspection when piping is excavated for the buried piping and tanks inspection program. In addition, this commitment stated that within ten years after entering the period of extended operation, the licensee will determine if sufficient inspection have been performed to draw a conclusion regarding the ability of underground coating to protect piping, and if required, conduct a focused inspection to draw a conclusion concerning the coating. The UFSAR supplement stated that there are no buried tanks within the scope of license renewal, but the program includes preventive measures and opportunistic inspections for buried piping within the scope of the program.

The inspectors reviewed the program implementation notebook which contained administrative procedures, implementing procedures, self-assessments, and summary of inspection results to verify that the program was developed and implemented as described in the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors also interviewed licensee personnel to confirm the implementation of the buried piping program as described in the commitment for license renewal.

Commitment Item 30 (Table 1) – 10 CFR 50 Appendix J Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the licensee will revise the program implementing documents to include license renewal references. The UFSAR description of this program stated that the 10 CFR 50, Appendix J program is an existing program that monitors leakage rates through the containment pressure boundary (including the drywell and torus, penetrations, fittings, and other access openings) in order to detect degradation of the primary containment pressure boundary. Additionally, seals, gaskets, and bolted connections would also be monitored. Type A and Type B containment leak rate tests would be performed in accordance with the regulations in 10 CFR 50, Appendix J, Option B; the guidance provided in NRC Regulatory Guide 1.163, "Performance-Based Containment Leak-Testing Program;" and Nuclear Energy Institute (NEI) document NEI 94-01, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J."

The inspectors reviewed the program implementation notebook which contained administrative procedures, implementing procedures, and self-assessments to verify the licensee revised the existing program documents to incorporate license renewal references as described in the license renewal application and the corresponding section of the NRC safety evaluation report.

Commitment Item 31 (Table 1) – Masonry Wall Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the licensee will revise the program implementing documents to include license renewal references, clearly identify structures with masonry walls within scope, and clarify qualification requirements for personnel who perform masonry wall walkdowns. The UFSAR supplement stated that the program provides for condition monitoring of masonry walls and is included in the structures monitoring program that implements the structures monitoring requirements of 10 CFR 50.65. Masonry wall condition monitoring would be based on guidance provided in NRC Bulletin 80-11, "Masonry Wall Design," and Information Notice 87-67, "Lessons Learned from Regional Inspections of Licensee Actions in Response to I.E. Bulletin 80-11." Visual inspections would be performed consistent with techniques identified in industry codes and standards such as American Concrete Institute (ACI) standard ACI 349.3, "Evaluation of Existing Nuclear Safety-Related Concrete Structures" and American National Standards Institute/American Society of Civil Engineers (ANSI/ASCE) document ANSI/ASCE 11-99, "Guideline for Structural Condition Assessment of Existing Buildings.

The inspectors reviewed the program implementation notebook which contained administrative procedures, implementing procedures, and self-assessments; and interviewed the program owner to verify that the program was developed as described in the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors verified that enhancements to the program implementing documents were completed to explicitly include license renewal references, applicable industry standards and NRC guidance, and clear identification of in-scope structures and personnel qualification requirements.

Commitment Item 32 (Table 1) – Structures Monitoring Program: This commitment specified that prior to the period of extended operation 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 licensee would also enhance procedure LCEI-CI-C9, Attachment 1, "Buried Piping Inspection Checklist" to include "mechanical penetration" as an inspection attribute.

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-ASME equivalent pipe supports, and electrical component supports.

The inspectors reviewed the program implementation notebook which included administrative procedures, implementing procedures, results of previous program walkdowns/inspection results, and self-assessments to verify that the program was developed as described in the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors also interviewed the program owner to confirm the implementation of the program as described in the commitment. The inspectors verified that enhancements to the program implementing documents were completed to explicitly include license renewal references, applicable industry standards, and NRC guidance to address aging management of in-scope structures during the period of extended operation. Additionally, the inspectors reviewed an evaluation for a change to this commitment associated with the revision of procedure LCEI-CI-C9. The commitment change involved not enhancing procedure LCEI-CI-C9 as originally intended, but enhancing technical instruction 0-TI-561, "Buried Piping Inspection Checklist," to include the "mechanical penetration" inspection attribute.

Commitment Item 33 (Table 1) – Inspection of Water-Control Structures Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the licensee will revise the program implementing documents to include license renewal references; identify required structures and structural components within the scope of license renewal, and include special inspections following the occurrence of large floods, earthquakes, tornadoes, and intense rainfall. Additionally, the licensee would implement periodic monitoring of the raw service water in close proximity to the intake pumping station for the requirements of an aggressive environment.

The UFSAR supplement described that the program manages age-related deterioration, degradation due to extreme environmental conditions, and the effects of natural phenomena that may affect water-control structures. The program would be included in the structures monitoring program, which implements the structures monitoring requirements of the 10 CFR 50.65 maintenance rule. The Inspection of water-control structures program would include inservice inspection and surveillance activities for dams, slopes, canals, and other water-control structures.

The inspectors reviewed the program implementation notebook which contained administrative procedures, implementing procedures, and results of previous program

walkdowns/inspection results to verify that the program was developed and implemented as described in the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors also interviewed the program owner to confirm implementation of the program as described in the commitment. The inspectors' review included a self-assessment and a program calculation to verify that monitored water-control structures were maintained in accordance with the implementing procedures. The inspectors verified that enhancements to the program implementing documents were completed to explicitly include license renewal references and address aging management of in-scope structures during the period of extended operation.

Commitment Item 34 (Table 1) – Environmental Qualification Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the licensee will revise the implementing program documents to include license renewal references. This commitment was also associated with a unit specific commitment to include Unit 1 within the scope of the program prior to restart from the extended shutdown. The UFSAR stated that this program manages thermal, radiation, and cyclical aging for components subject to 10 CFR 50.49 requirements through the use of aging evaluations based on 10 CFR 50.49(f) qualification methods. In addition, components subject to 10 CFR 50.49 requirements not qualified for the license term would be refurbished, replaced, or have their qualification extended prior to reaching the aging limits established in the evaluation.

The inspectors reviewed the program implementation notebook which contained administrative procedures, implementing procedures, and self-assessments to verify that the program was developed as described in the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors also verified that Unit 1 was included within the scope of the program prior to restart from the extended shutdown.

Commitment Item 35 (Table 1) – Fatigue Monitoring Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the licensee would implement an enhanced fatigue monitoring program using the 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.

The inspectors reviewed the program implementation notebook which described the current implementation status of the fatigue monitoring program to verify that the program was established as described in the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors interviewed licensee staff to discuss the implementation status of the program. The inspectors also reviewed calculations for cycle projections, cycle classification, and cycle counting methodology to verify the licensee's fatigue monitoring approach was consistent with the approved program attributes. Additionally, the inspectors reviewed licensee responses to NRC generic communications associated with fatigue monitoring programs to verify the licensee had adequately addressed applicable operating experience identified after the operating license was issued.

The inspectors captured the implementation status of this commitment as an unresolved item in section 4OA5.1.b(1) of this report.

Commitment Item 36 (Table 1) – Systems Monitoring Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the licensee will revise the program implementing documents to include license renewal references. The UFSAR supplement described that this existing plant specific program consists of the appropriate ten elements described in Appendix A of NUREG-1800. The systems monitoring program would be a condition monitoring program that includes periodic visual inspections of systems' and components' material condition, operation, and configuration. System visual inspections would identify degraded conditions prior to the loss of the systems' and components' intended function. The UFSAR supplement formally incorporated in the UFSAR per 10 CFR 50.71(e) (UFSAR Amendment 22) revised the program description to exclude systems' and components' operation and configuration from the scope of periodic visual inspections.

The inspectors reviewed the program implementation notebook which contained administrative and implementing procedures to verify that the program was developed as described in the license renewal application. The inspectors verified that enhancements to the program implementing documents were completed to explicitly include license renewal references and address aging management of in-scope systems and components during the period of extended operation.

The inspectors identified one observation associated with changes to the UFSAR description of this program, which is discussed in further details in sections 4OA5.4.b(1) of this report.

Commitment Item 37 (Table 1) – Bus Inspection Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3, the licensee will develop and implement a new bus inspection program. The UFSAR supplement stated that the program will provide reasonable assurance that the intended functions of isolated and non-segregated phase bus will be maintained consistent with the current licensing basis through the period of extended operation. This program would manage non-segregated phase bus insulation exposed to adverse localized environments caused by heat in the presence of oxygen and loosening of fastening hardware associated with isolated and non-segregated phase bus due to cyclic loading resulting in thermal expansion and contraction of the bus. The program would also include inspection of the bus enclosure. This program would manage all portions of isolated and non-segregated phase bus, within the scope of license renewal, associated with the unit station service transformers, main transformers, and common station service transformers.

The inspectors reviewed the program implementation notebook which contained administrative procedures, implementing procedures, and self-assessments to verify that the program was developed as described in the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors interviewed licensee personnel to discuss the results of the bus inspections within the scope of the program and verify that program procedures and work orders included bus inspections as described in the commitment. The inspectors also reviewed a sample of examination results and associated corrective actions to verify that the examination and evaluation of results were performed in accordance with the program implementing procedures.

Commitment Item 38 (Table 1) – Diesel Starting Air Program: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the licensee will revise the implementing documents to include license renewal references for the diesel starting air program. The UFSAR supplement described that the program includes preventive actions and condition monitoring. The diesel starting air program would be implemented by the preventive maintenance program. The frequencies for replacements and inspections would be established and maintained in accordance with the preventive maintenance program. The diesel starting air piping, fittings, tubing, and receivers would be included in the one-time inspection program.

The inspectors reviewed the program implementation notebook which contained administrative procedures, implementing procedures, license renewal drawings, and self-assessments to verify that the program was developed as described in the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors interviewed licensee personnel to discuss the results of the inspections of the diesel starting air tanks and piping along with corrective actions taken to assure the continued integrity of the system during the period of extended operation.

The inspectors identified one observation associated with the implementation of this program, which is discussed in further details in sections 4OA5.1.b(8) of this report. The inspectors also identified one observation associated with changes to the UFSAR description of this program in section 4OA5.4.b(1) of this report.

Commitment Item 39 (Table 1) – Time-Limited Aging Analysis: Reactor Vessel Thermal Limit Analyses: Operating Pressure-Temperature Limits (P-T): This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the licensee would develop and submit revised pressure-temperature (P-T) limits to the NRC for approval. Sections 4.2.5 and A.3.1.5 of the license renewal application stated, in part, that because of the relationship between the P-T limits and the fracture toughness transition of the reactor vessel, the three reactor vessels will require new P-T limits to be calculated and approved before the period of extended operation. The license renewal application also 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 period of extended operation.

The inspectors reviewed the implementation notebook, commitment closure forms, and interviewed licensee staff to discuss the implementation status of this commitment and verify that the P-T curves were submitted to the NRC for review and approval prior to the period of extended operation.

The inspectors identified one observation associated with the implementation of this commitment, which is discussed in further details in sections 4OA5.1.b(9) of this report.

Commitment Item 40 (Table 1) – Time-Limited Aging Analysis: Environmental Qualification of Electrical Equipment: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the licensee will revise the existing environmental qualification program to cover the extended period of operation. The UFSAR description of this TLAA stated that the analyses that establish a qualified life of at least forty 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 period of extended operation.

The inspectors captured the implementation status of this commitment as an unresolved item in section 4OA5.1.b(1) of this report.

Commitment Item 41 (Table 1) – Time-Limited Aging Analysis: Emergency Equipment Cooling Water Weld Flaw Evaluation: This commitment specified that prior to the period of extended operation 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 select emergency equipment cooling water system piping locations. The locations of the emergency equipment cooling water piping within the scope of this TLAA consisted of 17 welds which had flaws larger than normally considered acceptable and were analyzed for the period of extended operation. 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 interviewed licensee staff to discuss the implementation status of the TLAA as described in the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors captured the implementation status of this program as an unresolved item in section 4OA5.1.b(1) of this report.

Commitment Item 42 (Table 1) – Request for Additional Information RAI 2.1-2A(3): This commitment specified that the licensee would identify additional piping segments and supports/equivalent anchors to be placed within the scope of license renewal. The inspectors reviewed TVA response to RAI 2.1-2A(3), dated February 28, 2005, and associated records along with a sample of license renewal boundary drawings to verify the affected structures, systems, and components had been included within the scope of license renewal as described in the commitment. This commitment was considered complete at the time the NRC issued the safety evaluation report.

Commitment Item 43 (Table 1) – Request for Additional Information RAI 2.1-2B: This commitment specified that prior to the period of extended operation for Units 1, 2, and 3; the licensee would perform a design change to qualify 12 temperature switches installed in the steam tunnel portion of the turbine building and ensure they will be protected from age-related degradation. Specifically, the licensee would make these circuits qualified for wetting and spray from a moderate/low energy line break.

The inspectors reviewed licensee design packages, including a sample of work orders in the selected design packages, for Units 1, 2, and 3 to verify that the design documentation and testing of temperature switch results were performed in accordance with the commitment.

Commitment Item 44 (Table 1) – Request for Additional Information RAI 2.1-2C, Residual Heat Removal Service Water Tunnel: This commitment specified that the 24-inch raw cooling water discharge piping located in the residual heat removal service water tunnel was included in scope of license renewal.

The inspectors reviewed scoping drawings and commitment closure forms to verify that the subject 24-inch discharge piping was included in scope of license renewal. The inspectors also reviewed the instructions provided in the periodic preventive maintenance task for visually inspecting the exterior of the discharge piping in the residual heat removal service water tunnel, as part of the systems monitoring program, to verify that the 24-inch discharge piping was included within the scope of an aging management program.

Commitment Item 45 (Table 1) – Request for Additional Information RAI 2.1-2C, Intake Pumping Station: This commitment specified that the licensee would revise the 10 CFR 54.4(a)(2) scoping methodology document to address components located in the lower compartments of the intake pumping station.

The inspectors reviewed TVA Response to RAI 2.1-2C related to components in the intake pumping station, dated September 3, 2004 and the document containing the 10CFR54.4(a)(2) scoping methodology to confirm that components located in the lower compartments of the intake pumping station were addressed. This commitment was considered complete at the time the NRC issued the safety evaluation report.

Commitment Item 46 (Table 1) – NRC Safety Evaluation Report, Open Item OI 2.4-3: This commitment specified that prior to the period of extended operation for Units 2, and 3; the licensee would perform one-time confirmatory ultrasonic thickness measurements on a portion of the cylindrical section of the drywells on each unit. This commitment was also associated with a specific Unit 1 commitment to perform one-time confirmatory ultrasonic thickness measurements on the Unit 1 drywell vertical cylindrical area immediately below the drywell flange prior to restart from the extended shutdown.

The inspectors reviewed Enclosures 1 and 9 of TVA letter to the NRC, dated November 16, 2005 associated with the commitment to inspect Units 2 and 3; Table 2, Item 46 of TVA letter to NRC, dated April 21, 2003; commitment completion forms, work orders, and ultrasonic examination reports to verify that the commitment was completed as described in the licensee correspondence and the NRC safety evaluation report. The inspectors also verified that the Unit 1 inspections were performed prior to restart from the extended shutdown.

Commitment Item 47 (Table 1) – NRC Safety Evaluation Report, Open Item OI 4.7.7: This commitment specified that TVA would perform a plant-specific analysis consistent with BWRVIP-25 to demonstrate that the core plate hold-down bolts can withstand required loads, considering the effects of stress relaxation until the end of the period of extended operation. The commitment also specified that appropriate corrective action would be taken if analysis did not satisfy BWRVIP-25 criteria and that the analysis would be submitted to the NRC two years prior to the extended period of operation.

The inspectors reviewed a letter from TVA to the NRC, dated June 15, 2011 (ADAMS Accession Number ML11171A037) to verify that the licensee submitted the core plate bolt analysis stress report for Units 1, 2, and 3 as stated in the commitment. The inspector also reviewed a sample of results included in Enclosure 1 of this letter, evaluation NEDC-33632P, Revision 0, to obtain reasonable assurance that the evaluation was performed in accordance with BWRVIP-25 requirements and that the stress in the core plate bolts remained under ASME allowable guidance values for the three BWRVIP-25 loading scenarios.

Commitment Item 49 (Table 2) – Unit 1 Periodic Inspection Program: This commitment specified that prior to Unit 1 restart; the licensee will develop and implement a new periodic inspection program. Additionally, the licensee would develop and submit the program implementing procedure(s) for NRC review. The UFSAR program summary description was first included in the next UFSAR revision per 10 CFR 50.71(e) following the issuance of the renewed operating license. The UFSAR supplement described that the program performs periodic inspections of the non-replaced piping/fittings that were not in service supporting operation of Units 2 and 3 following the extended Unit 1 shutdown to verify that no latent aging effects are occurring and to correct degraded conditions prior to loss of function.

The piping in the program is carbon/low-alloy or stainless steel that: (1) was exposed to air, treated water or raw water during the extended Unit 1 shutdown; and (2) will be exposed to treated water or raw water during normal operation. The inspection locations would be selected from non-replaced piping which is in-scope for license renewal and include areas where degradation would be expected as well as areas where degradation would not be expected. The sample selected for periodic inspection would be based on a 95/95 confidence level on a common material and environment bases. The sample size for the 95/95 assurance criterion for the common material and environment groupings would be based on NUREG-1475, “Applying Statistics,” Chapter 21 which is based on a large or infinite lot size.

The initial sample, once selected, would be utilized in subsequent inspections. The initial baseline inspection of the sample locations would be performed prior to restart. The first Unit 1 periodic inspection of all sample locations would be performed after Unit 1 returned to operation but prior to the end of the current operating period. The second periodic inspection of all sample locations would be completed within the first ten years of the period of extended operation. The inspection frequency would be re-evaluated each time the inspection is performed and can be changed based on the trend of the results. The inspections would continue until the trend of the results provides a basis to discontinue the inspections. However, as a minimum, periodic inspections of all selected sample locations must be performed: (1) after Unit 1 returned to operation but prior to the end of the current operating period; and (2) within the first ten years of the period of extended operation.

On April 23, 2007, the licensee submitted the program implementing procedures to the NRC for review and approval as stated in the commitment (ADAMS Accession Number ML 071150369). On March 30, 2012, the NRC issued a request for additional information on the alternative aging management approach presented by TVA for small-diameter stainless steel piping in raw and treated water given that a small population was included in the Unit 1 periodic inspection program (ADAMS Accession Number ML 12083A020). On April 30, 2012, the licensee responded that the implementing procedure 1-TI-521, “Unit 1 Periodic Inspection Program for License Renewal,” would be revised to include small diameter stainless steel piping/tubing (½ to 1-inch) with at least 50-percent of the inspection sample in a stainless steel/raw water environment and no less than 20-percent stainless steel/treated water environment (ADAMS Accession Number ML 012123A707). At least 70-percent of these inspections would be performed prior to the period of extended operation.

The inspectors reviewed the implementation notebook which included administrative procedures, implementing procedures, and a sample of work orders to verify that the program was developed as described in the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors interviewed licensee personnel to discuss the selection process of Unit 1 inspection locations within the scope of the program and the disposition of inspection results. The inspectors verified that program procedures described the sampling requirements as described in the commitment and the UFSAR supplement. The inspectors also reviewed a sample of non-destructive examination results to verify that the examination and evaluation of results were performed in accordance with the program implementing procedures.

Commitment Item 63 (Table 2) – Response to NRC Questions Concerning Reactor Pressure Vessel Internals: In the licensee's response to a request for additional information dated May 25, 2005, concerning reactor pressure vessel internals, the licensee committed to replace all Unit 1 dry tubes, perform mechanical stress improvement for the Unit 1 control rod drive return line cap, and change the Unit 1 core shroud access hole covers to bolted design prior to restart from the extended shutdown. The replacement of the dry tubes and the implementation of mechanical stress improvement on the control rod drive return line cap were to address susceptibility of the material to intergranular stress corrosion cracking. The modification of the core shroud access hole covers was to address existing cracking indications in the Unit 1 welded design by eliminating the affected welds from the design and thereby eliminating the need for ultrasonic examination in accordance with the industry requirements.

The inspectors reviewed commitment closure forms, work orders, design change packages, and design drawings to verify the specific commitment actions were completed. The inspectors confirmed that the Unit 1 dry tubes and access hole covers were replaced and that mechanical stress improvement was performed on the control rod drive return line cap as described in the NRC safety evaluation report.

b. Findings and Observations

No findings were identified.

On the basis of the sample selected for review, the inspectors determined that the licensee had completed, or was on track to complete, the necessary tasks to meet the license renewal commitments, license conditions, and regulatory requirements associated with the issuance of the renewed operating license at Browns Ferry Nuclear Plant Units 1, 2, and 3. Based on the review of program documents and activities completed at the time of this inspection, the inspectors determined that the licensee had established the required AMPs and TLAAs to manage the aging effects of in-scope structures, systems, and components through the period of extended operation of the three units, with the exception of the unresolved item discussed in this report section (URI 2013009-001). For the established aging management programs, the inspectors determined that the licensee completed all the activities due prior to entering the period of extended operation of Units 1, 2, and 3, with the exception of the observation discussed below for Commitment 15 (item 3).

Except for the commitments listed below, the inspectors noted that the status of the selected commitment sample in the corrective action program was shown as "waiting for approval." This status meant that all the planned actions to meet the commitments were

complete, but final approval from responsible licensee personnel was required to formally close the action items in the corrective action program.

- Commitment Item 15 remained "in-progress" pending completion of certain inspections as discussed in Observation 3 below. However, the inspectors determined that the licensee completed the revision of program implementing procedures required to meet this commitment.

- Commitment Items 25 and 26 remained "in-progress" pending the licensee's review and approval of the commitment closure documents. However, the inspectors determined that the licensee developed the program procedures and implemented the field activities required to meet these two commitments.

- Commitment Items 35, 40, and 41 remained "in-progress" as described in unresolved item 2013009-001 of this report section.

While most commitment items remained open in the corrective action program, the inspectors determined through interviews and documentation review that the majority of required aging management activities, such as inspections, procedure revisions, and evaluations, were performed as described in the commitments and the pending actions consisted of the administrative closure of action items.

The inspectors noted that only Commitment Items 17, 42, 44 through 47, 49, and 63 were formally closed in the corrective action program with all planned actions completed and approved by responsible licensee personnel. For the selected commitment sample, the inspectors determined that all action items tracking the completion of aging management activities required for Unit 1 prior to restart from the extended shutdown were complete and closed in the corrective action program.

The inspectors identified an unresolved item associated with the implementation status of the fatigue monitoring program, the TLAA on emergency equipment cooling water weld flaw evaluation, and the TLAA on environmental qualification of electrical equipment. This unresolved item is described in item 1 below and requires follow-up during future license renewal inspections to obtain reasonable assurance that the license renewal commitments were met and that the aging effects of affected structures, systems, and components would be managed during the period of extended operation. The inspectors also identified eight observations associated with the implementation of certain AMPs and TLAAs. These observations, described in items 2 through 9 below, involved issues of minor significance that were entered in the corrective action program for resolution. Therefore, these observations are not subject to enforcement action in accordance with the NRC Enforcement Policy.

1) (Opened) Unresolved Item (URI) 05000259, -260, -296/2013009-001, Implementation of Aging Management Programs and Time-Limited Aging Analyses

Introduction: The inspectors identified an unresolved item associated with the implementation status of the fatigue monitoring program, the TLAA on environmental qualification of electrical equipment, and the TLAA on emergency equipment cooling water weld flaw evaluation.

Description: The inspectors identified that the licensee had not completed all the necessary actions to meet three regulatory commitments as described below. The status of the action items tracking the completion of these commitments in the corrective action program remained "in-progress," pending the licensee's final development and implementation of the program and TLAAs, and the review and approval of commitment closure documents. The inspectors verified that administrative controls were in place to track these commitment items to completion prior to the period of extended operation for Unit 1 in December 2013.

- Commitment Item 35, Fatigue Monitoring Program – The inspectors identified that the licensee had not finalized the implementation of this program with respect to the automatic monitoring of fatigue cycles using FatiguePro®. The inspectors noted that several calculations associated with the cycle projection, classification, and counting methodology were completed, but the program was not completely developed and implemented at the time of this inspection.

- Commitment Item 40, TLAA on Environmental Qualification of Electrical Equipment – The inspectors identified that the licensee had not revised the existing environmental qualification program to address this TLAA for the period of extended operation.

- Commitment Item 41, TLAA on Emergency Equipment Cooling Water Weld Flaw Evaluation – The inspectors identified that the licensee was still developing a FatiguePro® model to monitor fatigue cycles of the identified locations within the scope of this commitment.

The inspectors determined that there was not sufficient information confirming the full implementation of the AMP and TLAAs to obtain reasonable assurance that the licensee would effectively manage the applicable aging effects during the period of extended operation. The licensee stated that all required actions to meet these commitments were expected to be completed prior to the period of extended operation of each unit. The licensee was tracking the completion of these commitments in the corrective action program via PER 89791, "License Renewal Commitment Tracking." The inspectors determined that it was necessary to open an unresolved item to further review the implementation of the AMP/TLAAs and verify that the commitments were met. This issue requires follow-up inspection and will be tracked as unresolved item URI 05000259, -260, -296/2013009-001, "Implementation of Aging Management Programs and Time-Limited Aging Analyses."

2) Observation for Commitment 1, Accessible Non-Environmental Qualification Cables and Connections Inspection Program: The summary description of this program in the UFSAR supplement for license renewal, section O.1.1, stated in part that the representative sample of accessible non-environmental qualification cables within the scope of the program will include power, instrumentation, control, and communication applications located in accessible adverse localized environments. However, the inspectors identified that implementing procedure 0-TI-566, "Accessible Non-Environmental Qualification Cables and Connections Inspection Program," Revision 2, did not include the sampling attributes described in the UFSAR. The licensee entered this issue into the corrective action program for resolution as service request (SR) 763988.

3) Observation for Commitment 15, Open-Cycle Cooling Water System Program: The inspectors noted that the licensee had not completed all the necessary actions to meet the commitment as stated in the NRC safety evaluation report. Specifically, the licensee had not completed the initial inspection of the residual heat removal service water pump pit supply piping and the residual heat removal service water pump seismic restraints due prior to the period of extended operation of Units 1, 2, and 3. For this reason, Commitment Item 15 remained "in-progress" in the licensee's corrective action program. The inspectors verified that the licensee had administrative controls in place to provide reasonable assurance that the pending inspections would be completed in accordance with the commitment. The inspectors noted that these pending inspections were tracked in the licensee's work control process via work orders WO 09-721010-000, WO 112999039, and WO 112999023. These inspections were scheduled to be completed prior to the period of extended operation for each unit.

4) Observation for Commitment 19, Reactor Water Cleanup System Program: The enhancements to this program for Unit 1 included the replacement of susceptible stainless steel piping in the reactor water cleanup system downstream of the primary containment second isolation valve. The inspectors reviewed design change package DCN 51194 for the piping replacement and noted that all the piping that met the criteria described in NRC Generic Letter 88-01 for material, size, content, and operating temperature was included within the scope of the modification. However, the inspectors identified that no records were available to confirm whether a small section of piping connecting the Unit 1 'A' and 'B' non-regenerative heat exchangers was replaced or evaluated to be excluded from the scope of Generic Letter 88-01 prior to Unit 1 restart from extended shutdown. The licensee entered this issue in the corrective action program for resolution as SR 770337.

5) Observation for Commitment 23, Fuel Oil Chemistry Program: The inspectors identified that the 10-year frequency of the preventive maintenance task (PM 46244) to inspect the channel diesel fire pump fuel oil tank (BFN-0-TNK-018-0803) was based on assumptions that were inconsistent with the current condition of the tank. Specifically, the established preventive maintenance frequency did not consider the existing wall thinning and a thru-wall indication in the tank that was identified during a previous one-time inspection. The thru-wall indication allowed seepage of fuel oil from this location at a rate far less than one drop per minute. The licensee entered this issue in the corrective action program for resolution as SR 770328. The inspectors confirmed that the licensee had measures in place to monitor the tank leakage and that a work order existed to repair or replace the tank.

6) Observation for Commitment 24, Reactor Surveillance Program: The BWRVIP-86 program includes an integrated reactor vessel surveillance program that allows the licensees to share reactor capsule sample specimen evaluation results in order to satisfy requirements established by 10 CFR 50 Appendix G, "Fracture Toughness Requirements," and Appendix H, "Reactor Vessel Material Surveillance Program Requirements."

   The provisions in 10 CFR 50, Appendix H, Section III, Part IV(A) state in part that each capsule withdrawal and the test results must be the subject of a summary technical report to be submitted, as specified in part 50.4, within one year of the date capsule withdrawal, unless and extension is granted by the Director, Office of Nuclear Reactor Regulation. The inspectors identified that the test results of the Unit 2 120-degree

surveillance capsule pulled during the 2011 refueling outage were not submitted within one year of capsule withdrawal. The licensee neither requested an extension to submit the results as allowed by 10 CFR 50, Appendix H. The inspectors noted that on March 28, 2012, the BWRVIP Industry Committee sent a letter to the NRC (ADAMS Accession Number ML12090A474) reporting delays associated with the capsule pulled from Browns Ferry Unit 2 during the 2011 outage. However, the licensee did not formally submit a request for extension to the NRC.

The inspectors determined that this issue involved a minor violation of 10 CFR 50, Appendix H for the failure to meet the reporting requirements in this regulation. The inspectors characterized the violation as minor because the NRC had been informed of the expected delays on the capsule test results by the BWRVIP Industry Committee. The licensee entered this issue in the corrective action program as SR 769792 to evaluate the extension request and delay in transmitting capsule test results data. Since this violation was minor in significance and the licensee entered the issue in the corrective action program, it does not warrant enforcement action in accordance with the NRC Enforcement Policy, Section 2.3.1, dated July 9, 2013.

7) Observation for Commitment 26, Selective Leaching Program: The inspectors noted that selective leaching was identified in the flange area of cast iron temperature control valve BFN-0-TCV-082-0026D in the Unit 1/Unit 2 “D” emergency diesel generator. The licensee confirmed the selective leaching aging effect through a one-time visual inspection and laboratory testing. The licensee expanded the scope of the inspections to all similar valves in all diesel generators and subsequently replaced all temperature control valves. Additionally, the licensee included the visual inspection of these valves in the diesel generator preventive maintenance procedures MPI-0-82-INS004 and MPI-0-82-INS005, performed every 6 and 12 years, respectively, to continuously identify potential selective leaching aging effects. However, the inspectors identified that the maintenance procedures did not include specific guidance to identify selective leaching indications. The licensee entered this issue in the corrective action program for resolution as PER 765549.

8) Observation for Commitment 38, Diesel Starting Air Program: The inspectors identified that preventive maintenance tasks MPI-0-082-INS002, -INS003, -INS004, and -INS005, which inspect the air start motor lift check valves of the diesel air start system, were not updated to reflect their applicability to license renewal under the diesel starting air program. The licensee entered this issue in the corrective action program for resolution as SR 76893

9) Observation for Commitment 39, Time-Limited Aging Analysis of Reactor Vessel Thermal Limit Analyses – Operating Pressure-Temperature Limits (P-T): The NRC safety evaluation report, NUREG-1813, Section 4.2.5, stated that the licensee planned to calculate reactor vessel P-T limit curves for all units and submit them to the staff for approval before the start of the period of extended operation. The NRC staff concluded that the licensee would generate the P-T limits for the periods of extended operation and that the TLAA for the P-T limits will meet the requirements of 10 CFR 54.21(c)(1)(ii) when the P-T limits for the periods of extended operation were generated and incorporated into the technical specifications.

The inspectors identified that the license had not calculated or projected the pressure-temperature curves for the period of extended operation and neither submitted the

revised pressure-temperature curves as stated in the regulatory commitment for license renewal. Since the current Unit 1, 2, and 3 pressure-temperature limit curves approved by the NRC covered operation into the period of extended operation, the licensee was planning to use those curves until they were required to be revised and submitted to the NRC for approval. However, this approach was not consistent with the regulatory commitment as stated in the application and approved by the NRC in the safety evaluation report in that the analysis was not projected until the end of the period of extended operation as required by 10 CFR 54.21(c)(1)(ii). The licensee entered this issue in the corrective action program for resolution as PER 764578. The inspectors did not identify any issue of concern with the current P-T curves because they were approved by the NRC through the license amendment process and the licensee was planning to only rely on these curves during their period of validity.

.2 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 a licensee evaluation performed for two newly identified structures within the scope of license renewal to verify that aging management review was performed in accordance with 10 CFR 54.37. The inspectors also reviewed a list of plant modifications performed from the time the license renewal application was submitted to the time the renewed operating license was issued to identify any potentially new SSCs that would have been subject to aging management review at the time the NRC was reviewing the license renewal application. Additionally, the inspectors reviewed a sample of licensee procedures to verify that adequate guidance was provided to ensure that SSCs with the scope of 54.37(b) were identified, evaluated, and reported.

b. Findings and Observations

No findings were identified.

On the basis of the sample selected for review, the inspectors determined that the licensee took appropriate actions to assure "newly identified" SSCs were identified and evaluated for management of aging affects. Based on the review of licensee self-assessments, the inspectors determined that two "newly identified" structures had been identified that would have been subject to aging management during the preparation of the original license renewal application and subsequent revisions. These structures were the discharge control structure and gate structure number 2. The inspectors determined that the licensee performed an aging management review of these structures consistent with the requirement in 10 CFR 54 and included them within the scope of existing aging management programs. The licensee also planned to update the UFSAR to include these 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) during the independent review of commitments and aging management programs described in section 4OA5.1.a of this report. However, the inspectors identified the following observation associated with the guidance in the licensee's procedure for 54.37(b) evaluations. This observation involved an issue of minor significance and was entered

in the corrective action program for resolution. Therefore, the observation is not subject to enforcement action in accordance with the NRC Enforcement Policy.

1) Procedure for 10 CFR 54.37(b) Evaluations: The inspectors identified that the guidance in procedure NEDP-21, "Technical Evaluations for License Renewal," Revision 6, was not fully consistent with the requirements in 10 CFR 54.37(b) for new SSCs within the scope of this rule, in that the procedure described the requirement to include newly identified SSCs in the UFSAR as a recommendation rather than a requirement. Specifically, the procedure stated in part that the FSAR update required by 10 CFR 54.37(b) "should" include a description of the newly identified SSCs. The inspectors determined that the guidance was not aligned with the requirements in the rule because 10 CFR 54.37(b), as clarified in Regulatory Issue Summary (RIS) 2007-16, state that the FSAR update "must" include any SSCs newly identified that would have been subject to an aging management review or evaluation of time-limited aging analyses. The licensee entered this issue in the corrective action program for resolution as PER 765546.

.3 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.a of this report, the inspectors reviewed the corresponding UFSAR sections to verify that the program descriptions were consistent with the license renewal application and the corresponding section of the NRC safety evaluation report. The inspectors reviewed three versions of the UFSAR supplement for license renewal as follows:

- The inspectors reviewed the UFSAR supplement submitted with the license renewal application, as revised, to identify the program attributes and future inspection activities that were originally relied upon for the approval of the renewed operating license.

- The inspectors reviewed the revision of the UFSAR submitted to the NRC pursuant to the requirements in 10 CFR 50.71(e)(4) following the issuance of the renewed operating license to verify that the UFSAR supplement for license renewal was included with the updated FSAR as required by the condition of the renewed operating license. This revision of the UFSAR (i.e. Amendment 22) was submitted to the NRC in a TVA Letter, dated October 11, 2007.

- The inspectors reviewed the latest revision of the UFSAR supplement for license renewal (Amendment 25) to verify that the program attributes and inspection activities were consistent with the AMPs as originally approved by the NRC and subsequent revisions performed under the provisions of 10 CFR 50.59. The inspectors also verified that any changes caused by the inclusion of "newly identified" SSCs were included in the UFSAR supplement.

b. Findings and Observations

No findings were identified.

With the exception of item 1 below, the inspectors determined the UFSAR supplement, as revised, was incorporated into the UFSAR. Additionally, the inspectors determined that the UFSAR supplement description matched the AMPs and TLAAs being implemented, with the exception of item 2 below. The inspectors also determined that changes, caused by the inclusion of "newly identified" SSCs, were scheduled to be included in the next revision of the UFSAR under 10 CFR 50.71(e).

1) Observation for License Condition 2D: The Operating License for Browns Ferry Nuclear Plant, Condition 2D, states that the UFSAR supplement, as revised, submitted pursuant to 10 CFR 54.21 (d), shall be included in the next scheduled update to the UFSAR required by 10 CFR 50.71 (e)(4) following the issuance of this renewed operating license. The inspectors identified that the licensee did not include a fully revised version of the UFSAR in the next scheduled UFSAR update per 50.71(e). Specifically, the licensee did update the UFSAR supplement for license renewal as stated in its response to a request for additional information submitted during the NRC review of the LRA, dated September 3, 2004 (ADAMS Accession Number ML042520374). In the September 2004 letter, the licensee stated that the UFSAR supplement would be updated to include the paragraph shown below; however the next revision of the UFSAR per 10 CFR 50.71(e), UFSAR Amendment 22, did not include such description in the supplement for license renewal.

   "The integrated plant assessment for license renewal identified new programs, enhancements to existing programs, and existing programs necessary to continue operation of BFN Units 1, 2, and 3 during the additional twenty years beyond the initial license term. This chapter describes those programs. The TVA Nuclear Quality Assurance Program implements the requirements of 10 CFR 50, Appendix B. The TVA Nuclear Quality Assurance Program includes elements of corrective action, confirmation process, and administrative controls. These elements are applicable to all aging management programs credited for license renewal. The Corrective Action Program ensures corrective actions, including root cause determinations and prevention of recurrence are timely. The Corrective Action Program also includes the confirmation process that ensures preventive actions are adequate and that appropriate corrective actions have been complete and are effective. Administrative controls provide for a formal review and approval process of program implementing documents."

   The inspectors determined that this issue involved a minor violation of License Condition 2D. The violation was determined to be of minor significance because the inspectors did not identify any examples where the licensee failed to conduct activities in accordance with the omitted section of the UFSAR. The licensee entered this issue in the corrective action program for resolution as SR 767062. Since this violation was minor in significance and the licensee entered the issue in the corrective action program, it does not warrant enforcement action in accordance with the NRC Enforcement Policy, Section 2.3.1, dated July 9, 2013.

2) Observation for Commitment Item 26 – Selective Leaching of Materials Program: The description of this program in section O.1.27 of the UFSAR stated that the program will consist of one-time visual inspections and hardness measurements on selected components susceptible to selective leaching. The inspectors identified that TVA had conducted one-time inspections of susceptible components in accordance with the program description but opted to perform destructive laboratory testing to confirm if

selective leaching was occurring instead of using hardness measurements. The inspectors determined that the UFSAR did not accurately reflect the selected aging management approach in that destructive laboratory testing in lieu of harness testing was not included in the UFSAR program description. This observation involved an issue of minor significance and was entered in the corrective action program for resolution as service request SR 762857. Therefore, the observation is not subject to enforcement action in accordance with the NRC Enforcement Policy.

.4 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.a of this report, the inspectors reviewed license renewal commitment change documents to verify the licensee followed the guidance in NEI 99-04, "Guidelines for Managing NRC Commitment Changes," for any change to the commitments, including their elimination. The inspectors verified that the licensee properly evaluated, reported, and approved where necessary, changes to license renewal commitments listed in the UFSAR in accordance with 10 CFR 50.59.

The inspectors also reviewed the licensee's procedures for commitment revision to obtain reasonable assurance that future changes to regulatory commitments would follow the guidance in NEI 99-04, and would properly evaluate, report, and approve changes to license renewal commitments listed in the UFSAR in accordance with 10 CFR 50.59.

b. Findings and Observations

1) Observation for Changes to the UFSAR Supplement for License Renewal: The renewed operating license for Browns Ferry Nuclear Plant, Condition 2D, states in part that the revised UFSAR supplement submitted with the license renewal application shall be included in the next scheduled update to the UFSAR required by 10 CFR 50.71 (e)(4) following the issuance of the renewed operating license. Until that update is complete, the license condition allowed the licensee to make changes to the programs and activities described in the supplement without prior Commission approval, provided that TVA evaluates such changes pursuant to the criteria set forth in 10 CFR 50.59 and otherwise complies with the requirements in that section. The inspectors identified that the licensee made changes to the UFSAR supplement after the renewed license was issued, but prior to the next update required by 10 CFR 50.71(e)(4). However, the licensee could not provide documentation demonstrating that those changes were evaluated pursuant to 10 CFR 50.59.

Specifically, the licensee revised the UFSAR description of the fuel oil chemistry program to delete a sentence that stated: "If required, a biocide is added to the fuel oil storage tanks during each new fuel delivery." Additionally, the licensee revised the systems monitoring program description to exclude "systems' and components' operation and configuration" from the scope of periodic visual inspections.

The inspectors determined that the failure to evaluate UFSAR changes after the renewed license was issued, but prior to the next update required by 10 CFR

50.71(e)(4), pursuant to the criteria set forth in 10 CFR 50.59 involved a violation of License Condition 2D. The inspectors characterized the violation as minor in accordance with section 2.1.3.E.6 of the NRC Enforcement Manual, dated September 9, 2013, because there was not a reasonable likelihood that the UFSAR changes requiring 10 CFR 50.59 evaluation would ever require Commission review and approval prior to implementation. The licensee entered the issue in the corrective action program for resolution as PER 764203. Since this violation was minor in significance and the licensee entered the issue in the corrective action program, it does not warrant enforcement action in accordance with the NRC Enforcement Policy, Section 2.3.1, dated July 9, 2013.

Additionally, the inspectors reviewed commitment evaluation forms and safety evaluation report change packages for changes made to the regulatory commitments and their respective UFSAR descriptions after the UFSAR supplement was formally incorporated into the UFSAR pursuant to 10 CFR 50.71(e). The inspectors identified that the licensee did not consider the provisions in 10 CFR 50.59 for several changes affecting the UFSAR description, including the following:

- Commitment Item 2, Electrical Cables Not Subject to 50.49 EQ Requirements Used in Instrumentation Circuits Program: The licensee revised this commitment in the UFSAR to incorporate direct testing of the intermediate range monitor cable system consistent with GALL, Revision 2, Section XI.E2 instead of relying on routine calibration tests as stated in the original program description.

- UFSAR Description for the Inspection of Overhead Heavy Load and Light Load Handling Systems Program: The licensee revised the program description in Amendment 25 of the UFSAR to delete a statement about the overhead heavy load and light load handling systems program being implemented by the 10 CFR 50.65 maintenance rule program. The program description was also revised to no longer monitor the effectiveness of the program in accordance with NRC Regulatory Guide 1.160.

- UFSAR Description for the Reactor Vessel Fatigue Analysis: The licensee revised the UFSAR program description to change unit specific results of projected cumulative usage factors and state that several components would exceed the cumulative usage factor limit of 1.0 in the period of extended operation without reference to a specific unit.

- UFSAR Description for the Structures Monitoring Program: The licensee revised the program description to delete “buried piping” from the scope of the structures monitoring.

- UFSAR Description for the Diesel Starting Air Program: The licensee revised the program description to delete “fitting and tubing” from the scope of the program and clarified that the aging effect was loss of material. The description was also revised to clarify that the inspections would be performed using the one-time inspection program.

The inspectors determined that the licensee did not follow the process established in licensee procedure NPG-SPP-09.4, “10 CFR 50.59 Evaluations of Changes, Tests, and

Experiments," Revision 6, to implement UFSAR changes after the supplement for license renewal was formally incorporated in the UFSAR. The inspectors characterized this performance deficiency as minor in significance following the guidance in section 2.1.3.E.6 of the NRC Enforcement Manual, dated September 9, 2013, because there was not a reasonable likelihood that the UFSAR changes would ever require Commission review and approval prior to implementation. The inspectors also followed the guidance in Manual Chapter 0612, Appendix B, dated September 7, 2012, to determine that the performance deficiency was minor in significance. The licensee entered the issue in the corrective action program for resolution as PERs 764697, 765544, and 76588. Since this performance deficiency was minor in significance and the licensee entered the issue in the corrective action program, it does not warrant enforcement action in accordance with the NRC Enforcement Policy, Section 2.3.1, dated July 9, 2013.

2) Observation for Commitment Change Process: The inspectors identified that the commitment evaluation form provided in procedure NPG-SPP-03.3, "NRC Commitment Management Procedure," Revision 2, did not provide clear guidance to ensure that regulatory commitments included in the UFSAR were evaluated through the 50.59 screening/evaluation process as applicable. Specifically Part I of the commitment screening form did not make reference to 10 CFR 50.59 as a codified process for commitments embodied in the UFSAR. Additionally, Part IV of the commitment evaluation form did not provide accurate guidance to ensure that changes to commitment not embodied in the UFSAR were reported to the NRC in accordance with the process in NEI 99-04. This observation involved an issue of minor significance and was entered in the corrective action program for resolution as PER 768249 and SR 767053. Therefore, the observation is not subject to enforcement action in accordance with the NRC Enforcement Policy.

4OA6 Management Meetings

Exit Meeting Summary

On August 23, 2013, the inspectors presented the inspection results to Mr. Keith Polson, Site Vice President, and other members of the licensee staff. The licensee acknowledged the issues presented. 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 September 12, 2013 and September 27, 2013, the inspectors held conference calls with plant staff from the licensing organization to discuss the final disposition of inspection issues as presented in this report.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee

S. Austin, Site Licensing Engineer
K. Brune, TVA Corporate Engineering, Program Manager
M. Floyd, Projects and Modifications Director
D. Green, Site Licensing
K.J. Polson, Site Vice-President
W. Rice, Engineering
A. Rogers, Site License Renewal Coordinator
V. Schiavone, Engineering Programs, Aging Management Coordinator

LIST OF REPORT ITEMS

Opened

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

Closed

None

Discussed

None

Attachment

LIST OF DOCUMENTS REVIEWED

Commitment Item 1 – Accessible Non-Environmental Qualification Cables and Connections Inspection Program
NLDP-5, TVA FSAR Management Procedure, Rev. 6
R06130730712, BFN Aging Management Program Notebook, Rev. 0
Service Request (SR) 763988, 0-TI-566 Procedure Enhancement, August 8, 2013
Technical Instruction 0-TI-566, Browns Ferry Nuclear Plant, Unit 0, Accessible Non-Environmental Qualification Cables and Connections Inspection Program, Rev. 2
TVA 40496 (R08 050302 861), Commitment Evaluation Form NCO0400006052, Response to Follow-up RAI 2.5-2, March 02, 2005

Commitment Item 2 – Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program
NPG-SPP-03.3, NRC Commitment Management Procedure, Rev. 2
R06130530555, BFN Aging Management Program Notebook
SII-0-XX-92-054, Browns Ferry Nuclear Plant Unit 0, IRM/SRM Testing and Temporary Protection Maintenance Instruction, Rev. 9
SR 763901, Commitment Revised Without Performing 50.59 Evaluation, August 8, 2013
SR 768754, FSAR Management and 10 CFR 50.59, August 20, 2013

Commitment Item 3 – Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program
R06130603572, BFN License Renewal Notebook
Work Order (WO) 07-726655-001
WO 07-726655-002
WO 07-726655-003
WO 07-726655-004
WO 07-726655-005
WO 07-726655-006
WO 111004285
Preventive Maintenance (PM) Change/Deferral Form, Tracking # 611406, License Renewal Inaccessible Medium Voltage, October 26, 2012
G-38, Installation, Modification, and Maintenance of Insulated Cables Rated up to 15,000 Volts, Rev. 20

Commitment Item 5 – Chemistry Control Program
BFN-CEM-F-09-001, Primary Chemistry Control Self-Assessment, September 11, 2009
CHEM-001, Water Chemistry Strategic Plan, Rev. 06
CI-13.1, Chemistry Program, Rev. 41
PER 158360, December 2, 2008
PER 291161, November 30, 2010
PER 461569, November 14, 2011
R06 130628 644, Chemistry Control Program Aging Management Program Notebook, Rev. 2

Commitment Item 6 – Reactor Head Closure Studs Program
1-SI-4.6.G, Inservice Inspection and Risk-Informed Inservice Inspection Program – Unit 1, Rev. 30
2-SI-3.3.1A, ASME Section XI System Leakage Test of the Reactor Pressure Vessel and Associated Piping (ASME Section III, Class 1 and 2), Rev. 32

2-SI-4.6.G, Inservice Inspection and Risk-Informed Inservice Inspection Program – Unit 2, Rev. 51
3-SI-3.3.1A, ASME Section XI System Leakage Test of the Reactor Pressure Vessel and Associated Piping (ASME Section III, Class 1 and 2), Rev. 24
3-SI-4.6.G, Inservice Inspection and Risk-Informed Inservice Inspection Program – Unit 3, Rev. 45
Aging Management Program (AMP) Assessment and Operating Experience Review, Rev. 2
Aging Management Program Evaluation: Reactor Head Closure Studs Program, Rev. 8
Generic Letter 91-17, Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants
Inspection and Enforcement (IE) Bulletin 82-02, Degradation of Threaded Fasteners in the Reactor Coolant Pressure Boundary of PWR Plants
L44 110706 001, Letter from TVA to NRC transmitting Owner Activity Report (OAR) for Unit 2, which discusses inservice examination results, July 6, 2011
L44 120824 001, Letter from TVA to NRC transmitting OAR for Unit 3, which discusses inservice examination results, August 24, 2012
L44 130301 007, Letter from TVA to NRC transmitting OAR for Unit 1, which discusses inservice examination results, March 1, 2013
MSI-0-001-VSL001, Reactor Vessel Disassembly and Reassembly, Rev. 108
NUREG-1339, Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants
PER 489563, BFN License Renewal GALL Gap Analysis for Reactor Head Closure Studs Program
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Regulatory Guide 1.65, Material and Inspection for Reactor Vessel Closure Studs, Rev. 1
Surveillance Instruction (SI) 1-SI-3.3.1A, ASME Section XI System Leakage Test of the Reactor Pressure Vessel and Associated Piping (ASME Section III, Class 1 and 2), Rev. 13

Commitment Item 7 – Boiling Water Reactor Vessel Inside Diameter Attachment Welds Program
1-TI-365, Unit -1 Technical Instruction, Reactor Pressure Vessel Internals Inspection (RPVII), Rev. 06
2-TI-365, Unit-2 Technical Instruction, Reactor Pressure Vessel Internals Inspection (RPVII), Rev. 05
3-TI-365, Unit-3 Technical Instruction, Reactor Pressure Vessel Internals Inspection (RPVII), Rev. 06
BFN Aging Management Program Notebook, Boiling Water Reactor Vessel Inside Diameter Attachment Welds Program Evaluation, Rev. 7
NRC Final License Renewal Safety Evaluation Report for BWR Vessel and Internals Project Vessel ID Attachment Weld Inspections and Flaw Evaluation Guidelines (BWRVIP-48), January 17, 2001

Commitment Item 8 – Boiling Water Reactor Feedwater Nozzle Program
Browns Ferry Nuclear Plant, Aging Management Program Notebook, Boiling Water Reactor Feedwater Nozzle Program, Rev. 1
BFN-ENG-S-11-007, Snapshot Self-Assessment Report, Unit 1 Refueling Outage No.8, ISI Scope, October 18, 2010
1-OI-3, Browns Ferry Nuclear Plant Unit 1, Operating Instruction, Reactor Feed-water System, Rev. 35

CRP-ENG-F-12-013, TVA Focused Compliance Self-Assessment Report, BFN 95003 Related Corrective Actions for In-service Inspection, May 29, 2012
Aging Management Program Evaluation, BWR Feed-water Nozzle Program, Rev. 8
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GE-NE-523-A71-0594-A, Alternate BWR Feed-water Nozzle Inspection Requirements, Rev. 1
USNRC Final Safety Evaluation of BWR Owner's Group Alternate Boiling water reactor (BWR) feed-water Nozzle Inspection (TAC No. MA6787), March 10, 2000
1-TI-365, Unit -1 Technical Instruction, Reactor Pressure Vessel Internals Inspection (RPVII), Rev. 06
2-TI-365, Unit-2 Technical Instruction, Reactor Pressure Vessel Internals Inspection (RPVII), Rev. 05
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0-TI-19, Reactor Vessel Fatigue Usage Factor Evaluation, Monitoring Recording Evaluating and Reporting, July 26, 2013
1-TVA-N9-NV, Browns Ferry Nuclear U1R9, Rector Vessel Nozzle Ultrasonic Examination Final Report, Section 21, N9 Nozzle to Vessel Weld Examination Data, November 12, 2012
3-TVA-N9-NV, Browns Ferry Nuclear U3R15, Rector Vessel Nozzle Ultrasonic Examination Final Report, Section 23, N9 Nozzle to Vessel Weld Examination Data, April 23, 2012
PER 468246, Vault Summary Report, January 23, 2012
PER 468246, Corrective Action 468246-018, January 6, 2012

<u>Commitment Item 9 – Boiling Water Reactor Control Rod Drive Return Line Nozzle Program</u>
1-CHM-1098-C, Browns ferry Nuclear Plant, Unit 1 Drawing, Reactor Water Clean Up, Recirculation, and CRD Weld identification Rev. 3
1-SI-4.6.G, Browns Ferry Nuclear Plant, Inservice Inspection Program Unit 1, Rev. 6
Aging Management Program Evaluation, BWR Control Rod Drive Return Line Nozzle, Rev. 6
Browns Ferry Nuclear Plant, Aging Management Program Notebook, Boiling Water Reactor Control Rod Drive Return Line Nozzle Program, Rev. 2
Corrective Action 468246-019, BWR CRD Return Line Nozzle Gap Analysis Review, January 6, 2012
Sketch No. SK-B1001, Browns Ferry Unit 1, Reactor Pressure Vessel Assembly for ISI Program, Rev. 0
TVA Engineering Change Notice, (ECN) L1990, BFN Unit 1, 2 and 3, Reroute Control Rod Drive, Hydraulic Return Line as Described in DCR 1064, September 30, 1977
TVA Report No. R061, Examination Summary and Resolution Sheet, Component ID RCRD-2-33, April 6, 2008
TVA Report No. R116, Examination Summary and Resolution Sheet, Component ID RCRD-2-33, March 16, 2007
TVA Report No. R961, Examination Summary and Resolution Sheet, Component ID RCRD-1-33, September 22, 2005

<u>Commitment Item 11 – Boiling Water Reactor Penetrations Program</u>
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1-TI-365, Unit -1 Technical Instruction, Reactor Pressure Vessel Internals Inspection (RPVII), Rev. 06
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CRP-ENG-F-10-010, Focused/Snapshot Self-Assessment Report, (BFN) Unit 1,2, and 3 ISI Programs and Watts Bar Nuclear (WBN) Unit 1 ISI Program, (section related to BFN only), September 8, 2010
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0-TI-455, BFN Technical Instruction, Mechanical Technical Evaluations for License Renewal, Rev. 04
0-TI-458, BFN Technical Instruction, License Renewal Time Limited Aging Analysis, Rev. 04
0-TI-458, License Renewal Time Limited Aging Analysis, Section 6.0, Rev. 4
1-SI-4.6.G, Inservice Inspection and Risk Informed Inservice Inspection Program, Unit 1, Section 7.13, Rev. 30
1-TI-365, Unit -1 Technical Instruction, Reactor Pressure Vessel Internals Inspection (RPVII), Rev. 06
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BFN Unit-2, Core Shroud Examination Summary Sheet, Weld H2, Plate to Top Guide Ring, March 24, 2007
BFN Unit-2, RPV Interior (ASME Sect. XI) 2013 In-Vessel Visual Inspection, Cycle 17, Exam Results, Spring 2013
BFN Unit-3, Core Shroud Examination Summary Sheet, Weld H2, Plate to Top Guide Ring, April 12, 2008
BFN-ENG-S-12015, Snapshot Self-Assessment, Unit-3 Refuel Outage15, ISI Scope, December 10, 2012
BP-257, NPG Business Practice, Integrated Materials Issues Management Plan, Rev. 15
CRP-ENG-F-10-008, BFN Reactor Pressure Vessel Internals Inspections (RPVII) Program, Focused Self-assessment Report, August 2010
GE-NE-0000-0016-2112-02R1, Time Limited Aging Analyses, Reactor Vessel Internals, BFN Units 1, 2 and 3, Rev. 1
IVVI-BFN-1C06R-05-3Q, Attachment Examination Data Sheet, Steam Dryer RPV Support and RPV Attachment Weld, September 7, 2005
NCO040006039, Commitment Completion From, Section Entitled “Review of 0-CI-13.1, Rev.28, Chemistry Program”, April 5, 2007
NEDP-21, NPG Standard Department Procedure, Technical Evaluations For License Renewal, Rev. 06
NETP-112, NPG Common Technical Procedure, BWR Reactor Pressure Vessel Internals Inspections (RPVII), Rev. 03
NPG-SPP-09.3, Standard Programs and Processes, Plant Modifications and Engineering Change Control, Appendix “C”, Design Inputs and Change Impact Screen, Rev. 13

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Structural Integrity Inc. Calculation File No. 1300440.301, BFN Unit-2 Core Spray Line Flaw Evaluation, April 12, 2013

Commitment Item 13 – Flow-Accelerated Corrosion Program

Browns Ferry Nuclear Plant Aging Management Program Notebook, Flow Accelerated Corrosion Program, FSAR Section O.1.14, Rev. 0
Technical Instruction 0-TI-140, Monitoring Program for Flow-Accelerated Corrosion, Rev. 4
NPG-SPP-09.7, Corrosion Control Program, Rev. 05
NCO04000640, Commitment Completion for Flow-Accelerated Corrosion Program to Incorporate Unit 1 Prior to Unit 1 Restart
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Drawing 0-7E835-1-LR – Unit 0 Potable Water
Drawing 0-7E836-2-LR – Unit 0 Raw Service Water and Fire Protection
Drawing 0-7E836-3-LR – Unit 0 High Pressure Fire Protection
Drawing 0-7E840-3-LR – Unit 0 Fuel Oil System
Drawing 0-7E850-4-LR – Unit 1 & 2 Fire Protection and Raw Service Water
Drawing 0-7E861-1-LR – Unit 1 & 2 Diesel Starting Air Generator A
Drawing 1-47E801-1-LR – Unit 1 Main Steam
Drawing 1-47E803-1-LR – Unit 1 Reactor Feedwater
Drawing 1-7E810-1-LR – Unit 1 Reactor Water Cleanup
Drawing 1-7E811-1-LR – Unit 1 Residual Heat Removal
Drawing 1-7E814-1-LR – Unit 1 Core Spray
Drawing 1-7E818-1-LR – Unit 1 Condensate Storage
Drawing 1-7E822-1-LR – Unit 1 & 0 Closed Cooling Water
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