



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
REGION II
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ATLANTA, GEORGIA 30303-1257

October 1, 2012

Mr. Michael D. Skaggs
Senior Vice President
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Tennessee Valley Authority
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1101 Market Street
Chattanooga, TN 37402-2801

**SUBJECT: WATTS BAR NUCLEAR PLANT UNIT 2 CONSTRUCTION - NRC INTEGRATED
INSPECTION REPORT 05000391/2012607**

Dear Mr. Skaggs:

On August 18, 2012, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection of construction activities at your Watts Bar Unit 2 reactor facility. The enclosed integrated inspection report documents the inspection results, which were discussed on August 23, 2012, with Mr. Hruby, General Manager, and other members of your staff.

This inspection examined activities conducted under your Unit 2 construction permit as they relate to safety and compliance with the Commission's rules and regulations, the conditions of your construction permit, and fulfillment of Unit 2 regulatory framework commitments. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

No findings were identified during this inspection.

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 (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Should you have questions concerning this letter, please contact us.

Sincerely,

/RA/

Joel E. Rivera-Ortiz, Acting Chief
Construction Projects Branch 3
Division of Construction Projects

Docket No. 50-391
Construction Permit No: CPPR-92

Enclosure: Inspection Report 05000391/2012607 w/Attachment

cc w/encl: (See next page)

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* Previous Concurrence

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Letter to Michael D. Skaggs from Joel Rivera-Ortiz dated October 1, 2012.

SUBJECT: WBN NUCLEAR PLANT UNIT 2 CONSTRUCTION - NRC INTEGRATED
INSPECTION REPORT 05000391/2012607

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PUBLIC

U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket No.: 50-391

Construction Permit No.: CPPR-92

Report No.: 05000391/2012607

Applicant: Tennessee Valley Authority (TVA)

Facility: Watts Bar Nuclear Plant, Unit 2

Location: 1260 Nuclear Plant Rd
Spring City, TN 37381

Dates: July 1 – August 18, 2012

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Approved by: Joel E. Rivera-Ortiz, Acting Chief
Construction Projects Branch 3
Division of Construction Projects

Enclosure

EXECUTIVE SUMMARY

Watts Bar Nuclear Plant, Unit 2

This integrated inspection included aspects of engineering and construction activities performed by TVA associated with the Watts Bar Nuclear (WBN) Plant Unit 2 construction project. This report covered a seven-week period of inspections in the areas of quality assurance, identification and resolution of construction problems, construction activities, and follow-up of other activities. The inspection program for Unit 2 construction activities is described in NRC Inspection Manual Chapter 2517. Information regarding the WBN Unit 2 Construction Project and NRC inspections can be found at <http://www.nrc.gov/info-finder/reactor/wb/watts-bar.html>.

Inspection Results

- The inspectors concluded that concerns pertaining to several open items, including Unresolved Items (URIs), Three Mile Island (TMI) Action Items, and Construction Deficiency Reports (CDRs) have been appropriately addressed for WBN Unit 2. These items are closed.
- Other areas inspected were adequate with no findings of significance identified. These areas included various electrical systems and components; mechanical systems and components; nuclear welding; Corrective Action Programs (CAPs) and Special Programs (SPs); nondestructive examination (NDE); NRC Bulletins (BLs); CDRs, and refurbishment.

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REPORT DETAILS

Summary of Plant Status

During the inspection period covered by this report, TVA performed construction completion activities on safety-related systems and continued engineering design activities of the Watts Bar Nuclear (WBN) Plant, Unit 2.

I. QUALITY ASSURANCE PROGRAM

Q.1 Quality Assurance Oversight Activities

Q.1.1 Identification and Resolution of Construction Problems (Inspection Procedure 35007)

a. Inspection Scope

During this inspection period, the inspectors continued to review problem evaluation reports (PERs), as part of the applicant's corrective action program, to verify that issues being identified under the corrective action program were being properly identified, addressed, and resolved by the applicant.

b. Observations and Findings

No findings were identified.

c. Conclusions

Generally, the issues identified in the PERs were properly identified, addressed, and resolved.

Q.1.2 Safety Conscious Work Environment (Inspection Procedure 35007)

a. Inspection Scope

The inspectors reviewed existing program requirements and recent safety-related concerns identified by the applicant's and contractor's employee concerns program (ECP). The inspectors also met with the ECP coordinator and reviewed monthly and quarterly reports. The inspectors verified that significant problems were documented under the corrective action program and were being properly identified, addressed, and resolved by the applicant.

b. Observations and Findings

No findings were identified. The inspectors met with the ECP coordinator and discussed recent changes to the organizational reporting structure of the ECP. The inspectors also met with the senior manager for the ECP who indicated that the site's program would continue to meet existing program requirements.

c. Conclusions

The inspectors did not identify any issues or concerns regarding the ability of the applicant to provide a safety conscious work environment.

II. MANAGEMENT OVERSIGHT AND CONTROLS

C.1 Construction Activities

C.1.1 Unit 1 and Unit 2 Construction Activity Interface Controls

a. Inspection Scope

The inspectors independently assessed applicant controls, associated with Unit 2 construction work activities, to prevent adverse impact on Unit 1 operational safety. The inspectors attended routine Unit 1/Unit 2 interface meetings to assess the exchange and sharing of information between the two site organizations. Periodic construction and planning meetings were observed to assess the adequacy of the applicant's efforts to identify those construction activities that could potentially impact the operating unit. This included the review of selected work activities which the applicant had screened as not affecting Unit 1 to verify the adequacy of that screening effort. Additionally, the inspectors independently assessed selected construction activities to verify that potential impacts on the operating unit had been identified and adequately characterized with appropriate management strategies planned for implementation. Furthermore, the inspectors performed independent walkdowns of select construction work locations to verify that controls to protect the operating unit provided an adequate level of protection and had been properly implemented.

Specific work activities observed included:

- Work Order (WO) 113495814, pertaining to energization and voltage calibration of the Eagle 21 panels

b. Observations and Findings

No findings were identified.

c. Conclusions

Adequate management oversight and controls were in place for observed construction activities that could potentially impact the operating unit, and an adequate level of protection had been implemented.

C.1.2 Piping Work Observation and Magnetic Particle Examination (Inspection Procedures 49063 and 57070)

a. Inspection Scope

The inspectors observed the installation of auxiliary feedwater piping to determine whether the following were met.

- Piping was installed in accordance with specifications
- Inspections of the piping installation were conducted in accordance with procedures
- Installation activities were documented in accordance with record requirements
- Piping pieces were clearly identified and controlled in accordance with procedures and American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code 1971 edition through 1973 summer addenda

The inspectors observed handling, cleanliness control, and grinding activities of auxiliary feedwater (AFW) piping to determine whether the material was appropriately installed. The inspectors observed a quality control (QC) inspection of a weld made on the AFW piping to determine whether the inspection identified any non-conforming conditions. Specifically, the inspectors observed the installation of a flange-elbow-eccentric reducer-flange segment of piping on the inlet side of the turbine driven auxiliary feedwater pump. The inspectors reviewed field drawings and procedures to determine whether the above piping segment was installed in the correct position. The inspectors reviewed certified material test reports to determine whether the elbow and eccentric reducer in the piping segment met ASME material specifications.

The inspectors reviewed magnetic particle examination (MT) report MT-277, to determine whether the report, evaluation of data, and results were in accordance with procedures and ASME B&PV Code 1971 edition through 1973 summer addenda. The inspectors reviewed MT examination personnel qualification records to determine whether the MT inspector was qualified and whether the quality records met procedure requirements and ASME B&PV Code 1971 edition through 1973 summer addenda. The inspectors reviewed MT equipment calibration records and MT material certification records to determine whether these records met procedure requirements and ASME B&PV Code 1971 edition through 1973 summer addenda.

Documents reviewed are listed in the attachment.

The following samples were inspected:

- IP 49063 Section 02.01 – one sample
- IP 49063 Section 02.02 – one sample
- IP 57070 Section 02.03 – one sample

b. Observations and Findings

No findings were identified

c. Conclusions

The turbine driven auxiliary feedwater piping installation activities observed were conducted in accordance with procedures and ASME B&PV Code 1971 edition through 1973 summer addenda. The MT records reviewed were in compliance with procedures and ASME B&PV Code 1971 edition through 1973 summer addenda.

C.1.3 Reactor Coolant Pressure Boundary Piping and Liquid Penetrant Examination (Inspection Procedures 49053 and 57060)

a. Inspection Scope

The inspectors observed the installation of water quality sensing line fittings, which were part of the reactor coolant pressure boundary piping, to determine whether the following were met:

- Piping was installed in accordance with specifications
- Inspections of the piping installation were conducted in accordance with procedures
- Installation activities were documented in accordance with record requirements

- Piping pieces were clearly identified and controlled in accordance with procedures and ASME B&PV Code 1971 edition through 1973 summer addenda

The inspectors observed handling and protection of a reactor coolant system (RCS) sensing line to determine whether the material was appropriately installed. The inspectors observed QC inspection of a weld made on an RCS sensing line to determine whether the inspection identified any non-conforming conditions. Specifically, the inspectors observed the installation of a tube-to-tee segment of the RCS hot leg loop 1 sensing line. The inspectors reviewed field drawings and procedures to determine whether the above piping segment was installed in the correct position. The inspectors reviewed certified material test reports to determine whether the sensing line material met ASME material specifications.

The inspectors reviewed liquid penetrant (PT) examination report PT-1421, to determine whether the report, evaluation of data, and results were in accordance with procedures and ASME B&PV Code 1971 edition through 1973 summer addenda. The inspectors reviewed PT examination personnel qualification records to determine whether the PT inspector was qualified and the quality records met procedure requirements and ASME B&PV Code 1971 edition through 1973 summer addenda. The inspectors reviewed certification of contaminant content for the PT materials to determine whether the halogen and sulfur content met ASME B&PV Code 1971 edition through 1973 summer addenda.

Documents reviewed are listed in the attachment.

The following samples were inspected:

- IP 49053 Section 02.01 – one sample
- IP 49053 Section 02.03 – one sample
- IP 57060 Section 02.03 – one sample

b. Observations and Findings

No findings were identified

c. Conclusions

The sensing line installation activities observed were conducted in accordance with procedures and ASME B&PV Code 1971 edition through 1973 summer addenda. The PT records reviewed were in compliance with procedures and ASME B&PV Code 1971 edition through 1973 summer addenda.

C.1.4 Visual Examination, Mechanical Components Work Observation, and Construction Refurbishment Process (Inspection Procedures 57050, 50073, and 37002)

a. Inspection Scope

The inspectors observed visual examination and remediation on the internal surface of the pressurizer to determine whether these activities were conducted in accordance with procedures, ASME B&PV Code 1971 edition through 1973 summer addenda, and American National Standards Institute (ANSI) standards. Specifically, the inspectors observed visual examination on the pressurizer to determine the following:

- The applicable drawings and instructions specified the procedure to be used and a copy was available in the area
- The necessary tools and examination aids to conduct the inspection were available
- The areas to be examined were clearly defined and marked in accordance with work instructions
- The acceptance criteria was specified and in compliance with procedures
- The examination results were evaluated in accordance with procedures
- A visual examination indication evaluation process was followed and appropriate corrective actions were used.

The inspectors reviewed visual inspection personnel qualification records to determine whether the records met procedure requirements and ASME B&PV Code 1971 edition through 1973 summer addenda. The inspectors reviewed records of a visual inspection performed on the pressurizer to determine whether the records met procedure requirements and the data was evaluated.

Documents reviewed are in the attachment.

The following samples were inspected:

- IP 57050 Section 02.02 – one sample
- IP 57050 Section 02.03 – one sample

b. Observations and Findings

No findings were identified.

c. Conclusions

The observed visual examination and remediation work on the pressurizer was conducted in accordance with procedures and ASME B&PV Code 1971 edition through 1973 summer addenda. The visual inspection records reviewed met procedure requirements and ASME B&PV Code 1971 edition through 1973 summer addenda. Remediation work on the pressurizer continues and will be inspected as the work progresses.

C.1.5 Instrument Components and Systems – Work Observation (Inspection Procedure 52053)

a. Inspection Scope

The inspectors observed and evaluated in-process installation activities of instrument lines associated with process variables and subsystems that require manual operator safety actions. The inspectors performed a walkdown of in-process work being completed by WO 110707181. The in-process WO included various tasks; however, the inspectors observed the work scope related to the fabrication of interface supports for sensing lines associated with flow transmitter 2-FT-62-27 and root valve 2-RTV-062-0323A of the chemical and volume control system. The fabrication consisted of the welding of the support and steel components.

The inspectors verified that the latest approved revision of applicable drawings and procedures was available and used by the installers; components were as specified

such as type, range, proof pressure/rating and material; associated mounting hardware and supports were of the type and material specified; the required component identification was properly maintained; and inspection activities were timely and properly completed by qualified personnel. The inspectors reviewed the WO, design specifications and drawings, and interviewed design engineers and quality control inspectors on the procurement process associated with steel components such as Unistrut. The inspectors reviewed Bechtel procedure 25402-000-GPP-0000-N620, "Field Material Control and Traceability," for the correct requirements on traceability of materials. Documents reviewed are in the attachment.

The following sample was inspected:

- IP 52053 Section 2.02.c – one sample

b. Observations and Findings

No findings were identified.

c. Conclusions

The inspectors determined that in-process work was being performed in accordance with design specifications, drawings, and work instructions. Further inspection will need to be completed in order to verify the installation of instrument lines and supports.

C.1.6 Instrument Components and Systems – Work Observation and Construction Refurbishment Process (Inspection Procedures 52053 and 37002)

a. Inspection Scope

The inspectors observed the applicant's energization and calibration of power supply voltage levels for the Eagle 21 solid-state protection system. The inspectors witnessed activities associated with several of the racks encompassed by WO 113495814 and verified that procedures were adequate and properly followed, measurement and test equipment was properly checked out to the subject WO and within its calibration periodicity, and that craft performing the work were qualified for the work performed. The inspectors independently verified that the applicable sub-tier calibration procedure, 2-IMI-99.025, was the current revision and that all values were recorded as the data was taken. Documents reviewed are in the attachment.

The following sample was inspected:

- IP 52053 Section 02.02.f – one sample

b. Observations and Findings

No findings were identified.

c. Conclusions

Licensee refurbishment and test/calibration activities associated with the subject WO were performed in compliance with regulations, applicant commitments, procedures, and work implementing instructions.

IV. OTHER ACTIVITIES

OA.1.1 (Discussed) Electrical Conduit and Conduit Supports Corrective Action Program Plan (Temporary Instruction 2512/018, Inspection Procedures 51051, 51053, and 51055)

a. Inspection Scope

Background:

The Electrical Conduit and Conduit Supports Corrective Action Program (CAP) (Conduit CAP) was developed by TVA to address programmatic and structural deficiencies associated with conduits and conduit supports. Integrated inspection Report (IIR) 05000391/2010604 documented inspection results and background details of the Conduit CAP. Recent inspection efforts, associated with the Conduit CAP, were documented in IIRs 05000391/09-605, 05000391/10-603, 05000391/10-604, 05000391/11-605, and 05000391/11-607. This inspection was to gather and evaluate sufficient information to make a determination as to whether the applicant's Conduit CAP had been adequately developed. This was done to ensure that the Unit 1 historical issues were being resolved for Unit 2. This inspection focused on a review of the adverse conditions involving the Conduit CAP which were programmaticaly characterized by TVA.

Inspection Activities:

Modification Addition Instruction (MAI) 3.1, "Installation of Electrical Conduit Systems & Conduit Boxes," Rev.18, was reviewed to ensure consistent implementation of design output documents. The inspectors reviewed design output documents as well as design basis documents. The inspectors reviewed design criteria document WB-DC-40-31.10, "Seismically Qualifying Conduit Supports," Rev. 11, to verify whether the design criteria were updated to address previous Unit 1 discrepancies, along with supporting Unit 1 calculations. The inspectors reviewed the design criteria to verify that they were consistent with the Final Safety Analysis Report (FSAR). The inspectors reviewed the adequacy of the design output documents; such as drawings, calculations, and specifications. During the review, the inspectors reviewed the design output documents to verify that all design parameters (e.g., location, orientation, support, etc.) were appropriately addressed and the issued modifications were implemented accordingly.

The inspectors held discussions with engineering and quality assurance (QA) personnel about the implementation and oversight of the Conduit CAP. The inspectors reviewed some of the bounding critical cases of existing installations and evaluated the supports against the design basis. The inspectors observed that for cases where the existing/as-built configurations could not be qualified by the bounding critical cases with engineering judgment, modifications were generated in the form of EDCRs or field change requests (FCRs). The inspectors interviewed applicant's QA personnel to verify that surveillances, audits and assessments were performed for Conduit CAP activities.

The inspectors sampled several safety-related conduit supports associated with the Conduit CAP. This included the review and field verification of the relevant sections of the drawings and as-built installation walkdown packages for a sample of conduit supports with typical configuration and dimensional characteristics. The conduit supports with typical configurations were identified and characterized by TVA as part of the Conduit CAP development. TVA designated these conduit supports by their typical drawing number (i.e. common drawings used originally to fabricate the conduit supports). The inspectors reviewed "Typical 66" conduit supports numbers 8141 and

5334 to verify they were installed, located, oriented and supported in accordance with construction specification, and installation and design drawings.

The inspectors reviewed and evaluated qualification records of walkdown personnel to determine whether the qualification records met stated requirements and were adequately maintained. The inspectors reviewed 18 records to determine if they reasonably supported qualifications in terms of authentication, certification, experience, proficiency, training, testing, and other qualification requirements. This review was also performed to satisfy questions associated with qualification requirements.

A sample of PERs was reviewed by the inspectors to determine whether records were legible, complete, and promptly reviewed by qualified personnel. These PER records were also reviewed to verify if they were properly and timely processed, evaluated, identified, controlled and stored. The inspectors verified that these PERs included the status of corrective action(s) or resolution, as well as adequate justification for any use-as-is dispositions.

The following samples were inspected:

- IP 51053 Section 02.02.f – 2 samples
- IP 51055 Section 02.03 – 18 samples
- IP 51055 Section 02.04 – 2 samples

b. Observations and Findings

The inspectors identified the following unresolved item (URI):

Introduction: The inspectors identified an unresolved item associated with the qualification records and requirements of walkdown personnel.

Description: During the inspection period, the inspectors reviewed qualification records and requirements of walkdown personnel. The inspectors identified a number of examples where objective evidence was not available to confirm the qualification of personnel to perform walkdown activities in accordance with procedures requirements.

In the first example, Calculation WCG-2-308, "Engineering Walkthrough and Evaluation of Conduit and Conduit Supports," Rev. 1, which details the requirements for walkthrough evaluations of safety-related conduit and conduit supports, associated with the Conduit CAP, states under Section 5.1, "Preliminary Actions: Ensure all engineering personnel involved in the walkdown have received training in this calculation." However, the inspectors could not find objective evidence to conclude that several engineering personnel, including walkdown engineers, were previously trained on this calculation to perform walkdown activities in accordance with the procedure.

In the second example, Calculation WCG-2-308, "Engineering Walkthrough and Evaluation of Conduit and Conduit Supports," Rev. 1, states under Section 5.1, "Preliminary Actions: Ensure personnel used to record weld data are either certified Weld Inspectors or have had documented training by TVA course QNQ002, 'Weld Identification and Sizing Techniques,' that will qualify them to use a weld sizing gauge and to verify weld type, size, length, and location as required by this Calculation." However, the inspectors could not find objective evidence to conclude that two engineering personnel, including walkdown engineers, were previously trained on this calculation to perform walkdown activities in accordance with the procedure.

In the third example, WDP-GEN-1, "Walkdown Procedure for General Walkdown Requirements," Rev. 14, which addresses the common aspect of walkdowns such as definitions, training/qualification requirements, required equipment, and documentation requirements, requires in sections 4.2 and 4.3, under "Prerequisite Actions: Ensure personnel involved in the Walkdown have received training in accordance with Appendix B," and "Ensure personnel involved in the Walkdown meet the qualification/experience requirements of Appendix B," respectively. However, the inspectors could not find objective evidence to conclude that one walkdown engineer was previously trained on this calculation to perform walkdown activities in accordance with the procedure.

In the fourth example, WDP-C-3, "Walkdown Procedure for Civil," Rev. 3, which provides instructions for collecting walkdown data of safety-related conduit and conduit supports, associated with the Conduit CAP, states under Section 4.1, "Preliminary Actions: Refer to Prerequisite requirements of WDP-GEN-1." Sections 4.2 and 4.3 of WDP-GEN-1, "Walkdown Procedure for General Walkdown Requirements," Rev. 14, requires: "Ensure personnel involved in the Walkdown have received training in accordance with Appendix B," and "Ensure personnel involved in the Walkdown meet the qualification/experience requirements of Appendix B," respectively. However, the inspectors could not find objective evidence to conclude that one walkdown engineer was previously trained on this calculation to perform walkdown activities in accordance with the procedure.

The applicant initiated PER 592709 to address the issues of concern identified by the inspectors as discussed in the four examples above. The inspectors determined that additional information was required to determine if walkdown personnel were adequately trained and qualified, as required by the procedures, for the scope of these activities. The additional review by the NRC is required to determine if this issue of concern represents a performance deficiency, a more-than-minor performance deficiency, or constitutes a violation of NRC requirements. This issue was identified as URI 05000391/2012607-01, "Discrepancies Associated with Training Records and Requirements of Conduit CAP Personnel."

c. Conclusions

The inspectors reviewed a sample of completed actions, associated with the Conduit CAP, to evaluate whether the program was adequately developed and implemented. The inspectors concluded that additional inspection would be required to resolve additional questions associated with the program development and implementation, including questions associated with training records and procedural requirements. The inspectors were not able to observe a sufficient amount of completed field work to evaluate the adequacy of field implementation. Therefore, additional inspection will be needed to evaluate the adequacy of the field implementation.

OA.1.2 (Discussed) Corrective Action Tracking Document 50400-WBN-04: Cracking Problems in Safety Injection Accumulators (IP 35007)

a. Inspection Scope

This issue involved the fact that cracking problems that had been identified on a cold leg accumulator (CLA) on Unit 1 and this required review for applicability to Unit 2 (reference Unit 1 PER WBP900419). This item also identified a previous problem with CLA support welds on Unit 1 which required review for applicability to Unit 2 (reference CATD 50400-WBN-04). The inspectors reviewed documentation associated with these issues

including the original PER, welding records for both units' CLAs, and applicant documentation for the Corrective Action Tracking Document.

b. Observations and Findings

No findings were identified. The applicant showed that the cracking issue was isolated to the Unit 1 CLA number 3 and that the cracking had occurred as a result of weld repairs performed due to previous use of the wrong weld filler material. Unit 2 weld records showed that repairs had not been made on Unit 2 and the correct weld filler material had been used. The potential problem with support welds was being tracked but had not yet been evaluated by the applicant.

c. Conclusions

The applicant's evaluation of the cracking issue was adequate and, therefore, this portion of the item is closed. This item remains open pending completion of the applicant's review of the Unit 2 CLA supports for potential problems.

OA.1.3 (Discussed) Bulletin 88-11: Pressurizer Surge Line Thermal Stratification (Inspection Procedure 92717)

a. Inspection Scope

Background: The BL identified that unexpected movement of the pressurizer surge line had been observed at operating nuclear power plants due to thermal stratification in the line. In view of the occurrence of thermal stratification, licensees were requested to establish and implement a program to confirm pressurizer surge line integrity and also to inform the NRC of the actions taken to resolve this issue. TVA response for Unit 1 was deemed acceptable in IIR 50-390/94-55. NRC letter, dated October 30, 1992, concluded that the TVA response and associated Westinghouse report were acceptable for Units 1 and 2.

Unit 2 actions are to complete modifications to accommodate surge line thermal movement and incorporate a temperature limitation, during heat-up and cool-down operations, into the Unit 2 procedures. TVA applied the leak-before-break evaluation for the surge line. The NRC recognized acceptance of this philosophy permitted by General Design Criteria (GDC)-4 in an NRC letter dated April 28, 1993, and authorized elimination of a pressurizer surge line rupture from the design basis for both units.

Inspection Activities: The inspectors previously reviewed documentation for this issue and observed craft field activities (see IIR 05000391/2011610, Section OA.1.2). During this inspection the inspectors conducted additional field observations and reviewed additional documentation of the vendor analysis of the Unit 2 pressurizer surge line support design (Westinghouse letter WBT-D-3617, Watts Bar Unit 2 Surge Line Layout Comparison).

b. Observations and Findings

No findings were identified. The inspectors noted that field work on the supports was nearing completion with only minor work remaining on the last support. Supports matched drawings for the modifications and appeared visually to be of high quality such as the coating of removal areas and condition of weld surfaces. The additional documentation showed that the new support design was equivalent to the Unit 1 design.

c. Conclusions

The applicant's actions to date are considered adequate and this item is considered acceptable at the engineering complete stage. Additional NRC inspection is required to verify the incorporation of temperature limits in Unit 2 operating procedures and confirmation of thermal deflections during hot functional testing.

OA.1.4 (Discussed) Bulletin 88-08: Thermal Stresses in Piping Connected to Reactor Coolant System (Inspection Procedure 92717)

a. Inspection Scope

Background: This Bulletin (BL) issue resulted from industry experience when several PWR plants experienced leakage in the RCS due to cracking resulting from thermal stratification in the RCS. Potential cracking was shown to occur from in-leakage into the RCS of colder water and out-leakage of RCS onto cooler lines causing thermal fatigue cracks. The applicant's original response to the BL from 1994 was credited for actions planned to address this issue. This response indicated that a modification to one line of piping would be performed and NRC would be notified upon completion of the modification.

Inspections Activities: The inspectors reviewed the documentation contained in the applicant's engineering complete package which included the historic NRC documentation, previous applicant commitments, the updated analysis to meet industry guidelines for thermal stratification, and the current action plan.

b. Observations and Findings

No findings were identified. The inspectors noted that the applicant's plans were different than the initial BL response indicated, in that, rather than performing the modification, monitoring of leakage was planned for two areas and inspection of three drain lines was planned. The applicant's vendor analysis for this issue was based on the latest industry guidance, MRP-146, "Management of Thermal Fatigue in Normally Stagnant Non-Isolable Reactor Coolant System Branch Lines," Rev. 1. This standard was pending publication and had not yet been endorsed by the NRC.

c. Conclusions

The applicant's planned actions to correct this problem are different than the original credited commitments and based on discussions with the TVA licensing, a new response to BL 88-08 has been planned in order for the NRC to conduct a proper review of the revised actions to address this issue. This item remains open pending review of the updated BL response and implementation of approved actions.

OA.1.5 (Discussed) Construction Deficiency Report 391/81-07: Steel Containment Penetration Assembly (Inspection Procedure 92701)

a. Inspection Scope:

Background: The subject deficiency was initially reported to the NRC on December 19, 1980, in accordance with 10 CFR 50.55(e) as non-conformance report (NCR) WBN CEB 8014. The NRC documented the deficiency as construction deficiency report (CDR) 50-390/81-08 for Unit 1 and CDR 50-391/81-07 for Unit 2.

As stated in TVA's final report issued on October 19, 1983, the NCR was written to identify a design deficiency identified by TVA's Division of Engineering Design where TVA was unaware of the significant axial loading induced into a piping system at the bellows penetration due to steel containment vessel (SCV) pressurization following a loss of coolant accident (LOCA). The residual heat removal (RHR), main steam, main feedwater, and feedwater bypass pipes penetrate the SCV through free floating bellows penetration assemblies. During a LOCA, the maximum design pressure existing inside the SCV is 15 lb/in². This pressure will produce an axial load on the effective areas of the SCV penetration openings. These axial loads were not originally considered by the piping analyst.

TVA identified 13 rigorously analyzed problems which were affected by the axial loads produced on the free floating bellows penetration assemblies. The reanalysis of all of the 13 problems have been completed and all related piping drawings have been issued for both units. All redesign work for the Unit 1 piping supports, affected by the reanalysis, is complete. CDR 50-390/81-08 was closed by the NRC on April 24, 1984 in integrated inspection reports (IIRs) 50-390/84-25 and 50-391/84-20.

For Unit 2, the following actions have been taken:

1. The impacted free floating bellows penetration assembly models were corrected and the affected pipe stress analyses were revised. The shield wall anchorages for non-free floating bellows assemblies were reevaluated. Design changes were implemented by engineering change notice (ECN) 2800.
2. ECN 4755 was initiated to perform Unit 2 work for NCR WBN CEB 8014 that was included in ECN 2800, but not completed as of April 18, 1984.
3. The design work was completed as documented in closed ECNs 2800 and 4755. NCR WBN CEB 8014, R1 has been closed.
4. The WBN Unit 2 Hanger and Analysis Updated Program (HAAUP) Corrective Action Program has performed the same review and update of the pipe stress analysis and pipe support design calculations as was performed under the Unit 1 HAAUP.
5. Unit 2 piping that penetrates the SCV through bellows penetrations has been reanalyzed in piping calculations 0600250-02-0, 02-04 (feedwater) and 0600250-06-01, 06-02, 06-03, 06-04 (main steam) and qualified in accordance with applicable WBN criteria and procedures using current design inputs.
6. Modifications resulting from these piping analyses, which pass through free floating penetrations, have been transmitted to Construction via engineering document construction releases (EDCRs) 52430, 52431, 52435, 52437, 52438, 52439, and 52457.

Remaining Unit 2 Actions:

Engineering actions to resolve the issue have been completed and remaining modification is being tracked by PER construction action 172772-008. This commitment will be closed by the applicant after the completion of EDCRs 52430, 52431, 52435, 52437, 52438, 52439, and 52457.

Inspection Activities: The inspectors reviewed the applicant's completed and proposed actions to resolve the deficiency by reviewing the engineering complete closure

package, which included EDCRs, drawing changes, calculations, and WOs mentioned above.

b. Observations and Findings:

No findings were identified.

c. Conclusions:

Additional inspection activities are still required prior to closure of CDR 50-391/81-07; specifically, the inspectors will review TVA's field implementation.

OA.1.6 (Discussed) Construction Deficiency Report 391/87-23: Failed Motor Pinion Keys & Motor Shaft in Limitorque Operator (Inspection Procedure 50075)

a. Inspection Scope

Background: The applicant identified multiple motor-operated valves (MOVs) with failed motor pinion keys and motor shafts in Limitorque actuators, the original equipment manufacturer. These failures consisted primarily of circumstances resulting from high impact loading on components inside of the MOV actuator and were the result of rapid impact overloading in high speed MOV actuators with valve stem speeds greater than 50 inches/minute. The applicant implemented modifications to Limitorque actuators that experienced rapid impact overloading to slow down many of these MOV actuators so they would have valve stem speeds of less than 50 inches/minute, and have motor shaft and pinion key fabricated with higher strength material.

Inspection Activities:

The inspectors reviewed the applicant's engineering complete closure packages, purchase order (PO), and specification to ensure that proposed actions would satisfy the concerns identified in CDR 391/87-23. Specifically, EDCR-2 54850 and EDCR-2 54851 and various corrective action documents were reviewed to verify that the applicant addressed the problems of MOV actuator failures. In addition, the inspectors reviewed TVA PO 25157 and TVA Project Specification 25402-011-3PS-MUMA-00001 to ensure that adequate requirements existed in the specification and PO for the replacement MOV actuators to address the issue of failed Limitorque actuator motor pinion keys and motor shafts.

The inspectors reviewed several letters on the issue of failed motor pinion keys and motor shafts in Limitorque actuators to verify that the applicant addressed these failures correctly and implemented adequate corrective actions. The inspectors reviewed the applicant's condition adverse to quality report (CAQR) WBP870996, which was subsequently reclassified into significant corrective action report (SCAR) WBP870996SCA. The inspectors also reviewed SCAR WBP870996SCA. The SCAR WBP870996SCA documented the motor pinion key and motor shaft failures, and actions that the applicant was going to take to address these failures. Documents reviewed are listed in the attachment.

b. Observations and Findings

No findings were identified.

c. Conclusions

All documentation reviewed to date was adequate and properly detailed. Additional observations and review of documents related to this issue are needed prior to closure of this CDR.

OA.1.7 (Discussed) Construction Deficiency Report 391/89-02: Deficiency in the Design of the Emergency Gas Treatment System (Inspection Procedure 92701)

a. Inspection Scope:

Background: The subject deficiency was initially reported to the NRC on February 8, 1989, in accordance with 10 CFR 50.55(e) as CAQR WBP 880773 for Unit 1 and CAQR WBP 880772 for Unit 2. The NRC documented the deficiency as CDR 50-390/89-01 for Unit 1 and CDR 50-391/89-02 for Unit 2.

As stated in TVA's final report issued on March 7, 1989, both CAQRs were written to identify the same design deficiency in the Units 1 and 2 emergency gas treatment system (EGTS). The deficiency identified that a single failure of the auto path controls for the discharge modulating damper of the air cleanup subsystem or a mechanical failure of the auto path discharge modulating dampers could prevent the automatic switchover to the standby exhaust path. This failure to switchover would result in the loss of annulus pressure control capabilities. The cause of this design deficiency was that this specific type of failure was not anticipated in the initial design.

TVA initially issued drawing change notice (DCN) P-03419-A to resolve CAQR 880773. The DCN installed time delay relays 1-62-65-81, -83, -86, and -87 to provide an electrical back-up to the pressure switches that arm the transfer to the standby train. In addition to issuing the DCN, engineering procedures and project guidelines were revised and issued to prevent recurrence of this type of deficiency.

The NRC reviewed TVA's response for adequacy, recurrence control, and performed field inspections to verify implementation of DCN P-03419-A. The NRC concluded that the corrective actions implemented were adequate and closed the CDR in NRC IIRs 50-390/91-26, 50-391/91-26, 50-390/92-22, and 50-391/92-22.

In April 2007, an issue was identified by TVA that constant operator monitoring would be required if, following an accident, the containment isolation phase 'A' signal is reset prior to annulus differential pressure decreasing to the setpoint needed for the EGTS pressure control loop's isolation valves to open. Subsequently, DCN 52216 was issued to modify the logic for the EGTS pressure control valves (PCV) so that they are independent of the annulus differential pressure. The modification eliminates the EGTS PCVs for Train 'A' and Train 'B' auxiliary relay circuits, including the time delay relays previously added by DCN P-03419-A, and removes the A-Auto Standby position and function from the respective PCV's hand-switches. The current design places both EGTS control loops in the A-Auto position.

According to the engineering complete package, Unit 2's design will be identical to the current Unit 1 configuration. The required Unit 2 modifications were being implemented by DCN 5264. As discussed, time delay relays are no longer required in the control loops.

Inspection Activities: The inspectors reviewed the applicant's proposed actions to resolve the deficiency by reviewing the engineering complete closure package, which included DCN 52641 and applicable drawing changes and WOs.

b. Observations and Findings:

No findings were identified.

c. Conclusions:

Additional inspection activities are still required prior to closure of CDR 50-391/89-02; specifically, the inspectors will review TVA's field implementation.

OA.1.8 (Discussed) Construction Deficiency Report 391/89-05: Failure of Auxiliary Feedwater Steam Generator Level Controllers (Inspection Procedure 92701)

a. Inspection Scope:

Background: On April 30, 1986, TVA issued a 10 CFR 50.55(e) NCR due to failures in the Beckman 8800 model auxiliary feedwater (AFW) steam generator level controllers. The NRC documented this deficiency as CDR 50-390/86-51 for Unit 1 and CDR 50-391/86-51 for Unit 2. Excessive heat build up on the controllers was found as blistering on the output boards of the AFW level controllers. As the state of the AFW level controllers was indeterminate, this could have resulted in the steam generator level to be outside the desired operating limit, which could have adversely affected the safe shutdown of the plant. Rather than repair the components, the licensee decided to replace the controllers with a different system.

The purpose of the AFW system is to provide feedwater to remove primary system decay heat in the event of loss of main feedwater. The AFW steam generator level controllers are used to open and close the control valves associated with the AFW turbine driven and motor driven pumps.

Inspector Activities: The inspectors reviewed the applicant's proposed actions to resolve the deficiency by reviewing the engineering complete closure package, which included EDCR 52343. The inspectors reviewed PER 172734, DCNs 53338 and P-03373-B, and WO 09-954559-001. The inspectors also reviewed Unit 1 designs associated with the AFW level controllers to verify the changes made on Unit 1 were the same as Unit 2.

b. Observations and Findings:

No findings were identified. The Unit 1 controllers operate on a range of 10-50 μ A and the Unit 2 controllers operate on a range of 4-20 μ A. However, in the future, Unit 1 plans to switch the controllers to the same range as Unit 2.

c. Conclusions:

Additional inspection activities are still required prior to closure of CDR 50-391/86-51; specifically, the inspectors will review TVA's field implementation.

OA.1.9 (Discussed) Construction Deficiency Report 391/90-11: Potential for Gas Accumulation in Emergency Core Cooling System Piping (Inspection Procedure 92701)

a. Inspection Scope:

Background: On January 8, 1991, TVA issued a 10 CFR 50.55(e) NCR due to gas accumulation in the ECCS at the Sequoyah Nuclear Plant. The NRC documented this

deficiency as CDR 50-390/90-11 for Unit 1 and CDR 50-391/90-11 for Unit 2. This gas accumulation caused the centrifugal charging pump (CCP) to become gas bound when started. If there is gas accumulation in the ECCS, the operability of the CCPs is indeterminate. Watts Bar Nuclear Plant has a similar design, so it was determined that there was the potential for gases to accumulate in the WBN CCPs as well.

The CCPs provide high pressure coolant injection into the reactor core and are used during a LOCA.

Inspector Activities: The inspectors reviewed the applicant's actions to resolve the deficiency by reviewing the engineering complete closure package, which included EDCR 52945 and EDCR 53421. The inspectors also reviewed PER 144224, DCN M-20638-A, and LTR-LIS-08-627 Attachment 1. The inspectors also reviewed Unit 1 actions associated with the same CDR to verify that the actions planned for Unit 2 were the same as those performed on Unit 1.

b. Observations and Findings:

No findings were identified.

c. Conclusions:

Additional inspection activities are still required prior to closure of CDR 391/90-11; specifically, the inspectors will review TVA's field implementation.

OA.1.10 (Closed) Three Mile Island Action Item III.D.3.4: Control Room Habitability (Inspection Procedure 35007)

a. Inspection Scope

Background:

The control room design review (CRDR) program was developed in response to NRC NUREG-0660, which was established following the Three Mile Island (TMI) Station accident, in order to identify and correct licensee/applicant human factor discrepancies in the control rooms. NUREG guidance for the conduct of the CRDR allowed licensees to perform a preliminary design assessment to identify human engineering discrepancies (HEDs) and establish a schedule for corrections with NRC staff approval and complete a full CRDR at a later date. Guidance for conducting a detailed control room design review (DCRDR) was provided in NUREG-0700 and NUREG-0801 and additional guidance provided in NUREG-0737 and NUREG-0737, Supplement 1.

TVA performed a preliminary design assessment which was submitted to NRC in March 1981. A CRDR summary report was identified as a license condition in order to implement corrective actions and resolve the discrepancies identified. In October 1987, the CRDR summary report for both Units 1 and 2 was submitted by TVA. The DCRDR had been performed for Watts Bar Unit 1, in which 222 HEDs for implementation were identified. All of the 222 have been successfully implemented on Unit 1, and the NRC has completed their final assessment of the CRDR Special Program and issued a safety evaluation report (SER) for Unit 1 meeting NRC requirements satisfactorily.

Unit 2 control room design was designed to be identical to Unit 1; however, there are design differences that exist between Units 1 and 2 that may require differences in design changes. The approach used to implement design changes and correct

deficiencies on Unit 1 was the same for Unit 2. Therefore, a separate DCRDR will not be required for Unit 2. Since the Unit 2 control room layout is based on Unit 1, the 222 HEDs will be addressed by the Unit 2 CRDR.

There are also commitment items and employee concerns in the CRDR Special Program that will be closed separately in accordance with procedure NGDC PP-19, "Closure of Commitments/Open Items Required for Licensing." This inspection focused on the commitment item being tracked as NCO080008069. This action was required to be completed in accordance with NUREG-0737, TMI Action Item III.D.3.4, Control Room Habitability. This requires licensees to assure that control room operators will be adequately protected against the effects of accidental release of toxic and radioactive gases and that the nuclear power plant can be safely operated or shut down under design basis accident conditions (Criterion 19 of Appendix A, "General Design Criteria" to 10 CFR Part 50). According to the final status of this commitment within the PP-19 closure package, the control room habitability for Unit 2 will be completed upon CRDR completion. The main control room was evaluated using Regulatory Guide (RG)1.95, RG1.78, and GDC 19 and is addressed in the TVA's Final Safety Analysis Report, Section 6.4 for Unit 1. Inspections on Unit 1 in this area had taken place and were described in IIRs 50-390, 391/94-58, 94-65, 94-73, 95-24, and 95-46. In IIR 50-390/95-74, the TMI action item was closed for Unit 1.

Inspection Activities:

The inspectors verified the actions that were addressed within the PP-19 closure package for resolution of TMI Action Item III.D.3.4 requirements to assure they were adequate for Unit 1 and met the requirements for Unit 2 control room habitability. Revision 6 of Supplemental SER Supplement 22, Section 6.4, concluded that the control room habitability systems met the relevant requirements of TMI Action Plan Item III.D.3.4; GDC 2, 4, 19; RGs 1.52 and 1.78, and therefore considered acceptable for WBN Unit 2.

The inspectors reviewed applicable calculations: TI-552, "Main Control Room Habitability during a Hazardous Chemical Release," Rev. 14 and TI-RPS-198, "Dose to Control Room Personnel Due to a Regulatory Guide 1.4 Loss of Coolant Accident," Rev. 24. These calculations were completed for Unit 1 using the guidance of RGs 1.52 and 1.78 and submitted by the licensee to fulfill the requirement of the TMI action by providing results of analyses of control room concentrations from postulated accidental release of toxic gases and control room operator radiation exposures from airborne radioactive material and direct radiation resulting from design-basis accidents. The inspectors verified that the calculations were revised to account for Unit 2 design applicability.

Documents reviewed are listed in the attachment.

b. Observations and Findings

No findings were identified. Based on the review of the commitment NCO080008069 within the PP-19 closure package, the control room habitability design for WBN Unit 2 would be the same for Unit 1 since the main control room envelope is shared for Units 1 and 2. The NRC staff reviewed Unit 1 license amendment 70, dated October of 2008, and accepted the changes to the common systems in the control room habitability program and the same systems as meeting TMI Action Plan requirements for Unit 2.

c. Conclusion

The inspectors reviewed the applicant's final closure package and verified the status of TMI Action III.D.3.4. The inspectors determined that the control room habitability requirements have been met by the Unit 2 design based on the commonality of systems between the Unit 1 and Unit 2 control room. Therefore, the inspectors have determined that the TMI Action Item III.D.3.4 is closed and no further inspection is required.

OA.1.11 (Closed) Construction Deficiency Report 391/87-01: Inadequate Support Shown on Typical Valve Support Drawings (Inspection Procedure 92701)

a. Inspection Scope

Background: In October 1986, the applicant initially identified that typical valve support drawings 47A054-41 and -42 allow the support of a valve by means of an attachment to the upper part of the valve only, leaving the bottom of the valve unsupported, contrary to the seismic qualification requirements of the valve as specified by the vendor. The vendor qualified the subject valves by modeling two supports – at the valve body and at the actuator center of gravity. The applicant entered this issue into their corrective action program as SCAR SCRWBNCEB8684SCA to track the concern. The NRC identified the item as CDR 390/87-01 and CDR 391/87-01 for Unit 1 and Unit 2, respectively.

The applicant identified this deficiency as being applicable only to solenoid-actuated valves attached to 3/8-inch heavy wall tubing used in radiation sampling lines associated with System 43 (Sampling and Water Quality). Approximately 125 valves were noted as affected, with 50 of those valves associated with Unit 2. In May 1990, the applicant initiated SCAR WBP900228SCA to track issue resolution for Unit 2. The applicant initiated DCN C-04325 that same month to add typical valve support details to Support Detail Drawing 47A052, which reflect the as-installed configurations, and four calculations were issued to qualify these supports.

Support calculation 47A052044 and equipment seismic qualification (ESQ) calculation WCG-ACQ-0391 were issued for Westinghouse-supplied valves (Copes-Vulcan, Fisher, and ITT Grinnell), while calculation 47A052045 and ESQ calculation WCG-ACQ-0216 were issued for Hoke valves. The calculations concluded that the valves met seismic design criteria as originally installed and DCNs initiated for fieldwork (S-16891-A and C-04419-B) reflected these conclusions. For recurrence control, training on controlling procedures was completed. For Unit 1 closure, NRC inspectors reviewed training records and material and determined that the corrective actions relative to recurrence controls for this issue were adequate for both units as discussed in IIRs 50-390(391)/91-26 and conducted walkdowns and documentation reviews to close CDR 50-390/87-01 for Unit 1 in NRC IR 50-390(391)/94-61.

Inspection Activities: The inspectors performed the following inspection activities for Unit 2:

- Reviewed the applicant's closure report including its associated corrective action document PER 144149.
- Reviewed ECN 6660, DCN C-04325, DCN C-04419, and DCN S-16891 to verify the completion of required reconciliatory actions.
- Performed in-plant walkdowns of a number of subject installations, both Hoke and ITT-Grinnell, to verify as-built configurations align with current qualification

assumptions.

- Reviewed example implementing instructions and qualification documents for planned replacement of the Hoke valves in Unit 2

b. Observations and Findings

No findings were identified.

c. Conclusions

The inspectors reviewed the applicant's actions contained in the final closure package for CDR 50-391/87-01 and determined those to be adequate. This item is now considered closed for Unit 2.

OA.1.12 (Closed) Unresolved Item 05000391/2011603-06: Apparent Failure to Identify and Prevent Damage to Safety-Related Material and Equipment from Nearby Construction Activities (Inspection Procedure 92701)

a. Inspection Scope

Background: This issue involved damage to equipment identified by NRC after work was completed on the systems in the area apparently caused by nearby construction activities. This included a lack of fusion on tube steel on a support and a strut that was locked up. The inspectors identified that further review was required to determine whether future quality inspections would have identified these issues and what measures were in place to prevent these problems from occurring.

Inspection Activities: The inspectors reviewed the applicant's corrective action documented in PER 533348 to determine if the applicant appropriately resolved the concern in a timely manner. The applicant's actions included repairing the identified discrepancy, verifying various walkdown activities were in place to identify these types of problems, and processes were in place to ensure the protection of adjacent equipment during construction. Walkdowns were established by procedures including prior to hydro testing, prior to insulating, prior to turnovers to the Startup organization and Operations organization, prior to area turnovers, and a loose/damaged and missing parts walkdown. The inspectors reviewed the procedures associated with each of these walkdowns. In addition, the applicant confirmed processes were in place to ensure equipment protection during construction. Some of these had recently been upgraded. These included caution steps in WOs, use of start cards, pre-job walkdowns, and pre-job briefings. The inspectors reviewed the controls established for these activities. Documents reviewed are listed in the attachment.

b. Observations and Findings

No findings were identified. The applicant had established appropriate controls, prior to the NRC identification of these problems, to identify similar deficiencies. In addition, improvements were implemented for preventing similar deficiencies identified by the URI. The inspectors confirmed that WOs were initiated and completed for the repairs.

c. Conclusions

Based on the activities reviewed, the inspectors concluded that the URI can be closed without escalation.

OA.1.13 (Closed) Construction Deficiency Report 391/89-01: Limitorque Worm Shaft Clutch Gear Failure (Inspection Procedure 50075)

a. Inspection Scope

Background: The applicant identified MOVs with failed worm shaft clutch gears in Limitorque actuators. These failures consisted primarily of circumstances resulting from high impact loading on components inside of the MOV actuator and were identified to be the result of rapid impact overloading when certain Limitorque actuators were declutched into the manual operation mode for valves that were in the closed position.

Inspection Activities: The inspectors reviewed the applicant's engineering complete closure package and POs to ensure that proposed actions would satisfy the concerns identified in CDR 391/89-01, Limitorque Worm Shaft Clutch Gear Failure. Specifically, EDCR-2 54850 and EDCR-2 54851 were reviewed because they encompassed issues that the applicant identified through failures discovered on MOVs, which consisted primarily of circumstances resulting from high impact loading on components inside the MOV actuator.

The inspectors reviewed TVA PO 336540 to ensure replacement MOV actuator component parts were ordered that satisfied the issue of failed Limitorque actuator worm shaft clutch gears at WBN. In addition, the inspectors reviewed Material Receiving Instruction 25402-000-MRI-JV15-00039, "Flowserve Limitorque Parts," Rev. 0

The inspectors reviewed the corrective actions and commitments stated in the applicant's revised final report to the NRC in response to CDR 390/86-30 for Unit 1 and CDR 390/89-01 for Unit 2 dated April 8, 1993.

b. Observations and Findings

No findings were identified.

c. Conclusions

Based upon the review of the applicant's engineering complete closure packages and additional documentation the inspectors concluded that the scope and effectiveness of the applicant's corrective actions were the same as Unit 1, are in compliance with all applicable requirements, and are adequate to address this sub-issue/CDR. Based on these actions, CDR 391/89-01 is closed.

V. MANAGEMENT MEETINGS

X.1 Exit Meeting Summary

On August 23, 2012, the resident inspectors presented the inspection results to Mr. Hruby, General Manager, and other members of his staff. Although some proprietary information may have been reviewed during the inspection, no proprietary information was included in this inspection report.

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Applicant personnel

J. Adair, QA Oversight, TVA
D. Beckley, Electrical Design, TVA, Unit 2
J. Boykin, Quality Assurance, TVA, Unit 2
D. Charlton, Licensing, TVA, Unit 2
J. Clark, Quality Assurance, TVA, Unit 2
R. Goyal, Civil Engineering, Bechtel
M. Johnson, Design Engineer, TVA, Unit 2
G. Lee, MOV Engineer, TVA, Unit 2
G. Lewis, I&C Construction, TVA
D. Malone, Quality Assurance, TVA, Unit 2
J. McLemore, Field Engineer, TVA
C. Miller, Civil Engineering, Bechtel
C. Pinto, Civil Engineering, Bechtel
B. Pittman, MOV Test Leader, TVA, Unit 2
H. Reaves, Quality Assurance, TVA, Unit 2
G. Scott, Licensing, TVA, Unit 2
J. Trimmer, General Foreman, TVA

INSPECTION PROCEDURES USED

IP 35007	Quality Assurance Program Implementation During Construction and Pre-Construction Activities
IP 37002	Construction Refurbishment Process – Watts Bar Unit 2
IP 49053	Reactor Coolant Pressure Boundary Piping – Work Observation
IP 49063	Piping – Work Observation
IP 52053	Instrument Components and Systems – Work Observation
IP 50073	Mechanical Components – Work Observation
IP 50075	Safety-Related Components – Records Review
IP 51051	Electrical Components and Systems - Procedure Review
IP 51053	Electrical Components and Systems – Work Observation
IP 51055	Electrical Components and Systems – Record Review
IP 57050	Nondestructive Examination Procedure Visual Examination Procedure Review/Work Observation/Record Review
IP 57060	Nondestructive Examination Procedure Liquid Penetrant Examination Procedure Review/Work Observation/Record Review
IP 57070	Nondestructive Examination Procedure Magnetic Particle Examination Procedure Review/Work Observation/Record Review
IP 92701	Follow-up
IP 92717	IE Bulletins for Information and IE Information Notice Follow-up
TI 2512/018	Inspection of Watts Bar Nuclear Plant Electrical Conduit and Supports Corrective Action Program Plan

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Open

05000391/2012607-01	URI	Discrepancies Associated with Training Records and Requirements of Conduit CAP Personnel (Section OA.1.1)
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Discussed

2512/018	TI	Electrical Conduit and Conduit Supports Corrective Action Program Plan (Section OA.1.1)
	Other	Cracking Problems in SI Accumulators (Section OA.1.2)
88-11	BL	Pressurizer Surge Line Thermal Stratification (Section OA.1.3)
88-08	BL	Thermal Stresses in Piping Connected to Reactor Coolant System (Section OA.1.4)
391/81-07	CDR	Steel Containment Penetration Assembly (OA.1.5)
391/87-23	CDR	Failed Motor Pinion Keys 7 Motor Shaft in Limitorque Operator (Section OA.1.6)
391/89-02	CDR	Deficiency in the Design of the Emergency Gas Treatment System (OA.1.7)
391/89-05	CDR	Failure of Auxiliary Feedwater Steam Generator Level Controllers (OA.1.8)
391/90-11	CDR	Potential for Gas Accumulation in Emergency Core Cooling System (OA.1.9)

Closed

III.D.3.4	TMI Action Item	Control Room Habitability (Section OA.1.10)
391/87-01	CDR	Inadequate Support Shown on Typical Valve Support Drawings (Section OA.1.11)
391/2011603-06	URI	Apparent Failure to Identify and Prevent Damage to Safety-Related Material and Equipment From Nearby Construction Activities (Section OA.1.12)
391/89-01	CDR	Limitorque Worm Shaft Clutch Gear Failures (Section OA.1.13)

LIST OF DOCUMENTS REVIEWED

II. MANAGEMENT OVERSIGHT AND CONTROLS

C.1.2 Piping Work Observation and Magnetic Particle Examination (IPs 49063 and 57070)

Procedures

MT-ASME, *Magnetic Particle Examination*, rev. 7
25402-000-GPP-0000-N6104, *Materials Receiving*, rev. 8

Specifications

PF-2011, *G-29B-S02B-Standard Materials Specification Manual*, rev. 3

Work Order

WO 09-951941-002, rev.0

Corrective Action Documents

PER 589477, CMTR listed spec. SA-105 instead SA-234
PER 596353, Receipt inspection did not identify wrong material spec. on CMTR

Drawings

FSK-M-368, *System 003B (Auxiliary Feedwater) Weld Map Details for Installation of New 8"X10" Flanges, Piping, and Fittings*, rev. 1

Miscellaneous

Magnetic Particle Examination Report No. MT-277
Material Requisition No. 25402-011-MRA-PX00-00002 rev. 004
Material Receiving Report for PO 00073725-00316, MRR-05476, Material ID CPF068D
Material Receiving Report for PO 00073725-00316, MRR-05561, Material ID CPF201G
Certificate of Calibration, MT AC Yoke S/N 7986
Certificate of Calibration and Traceability, Certificate No. 557502, MT 10lb Test Bar
MT Material Certification for PO 947, Batch 10L039

C.1.3 Reactor Coolant Pressure Boundary Piping and Liquid Penetrant Examination (IPs 49053 and 57060)

Procedures

PT(SR)-ASME, *Liquid Penetrant Examination*, rev. 9

Work Order

WO 09-954099-006, rev.1

Miscellaneous

Swagelok Welding System Weld Log Record for Weld 114
Material Requisition No. 25402-011-MRA-PX00-00005 rev. 002
Material Receiving Report for PO 128081, MRR-18462, Material ID CPN883M
Material Receiving Report for PO 128706, MRR-22008, Material ID CPV504K
Liquid penetrant report PT-1421
PT Certificate of Contaminant Content reports: PO 1031, Type SKD-S2, Batch 11G02K; PO 1047, Type SKL-SP2, Batch 11G05K; PO 703, Type SKC-S, Batch 08K10K

C.1.4 Visual Examination, Mechanical Components Work Observation, and Construction Refurbishment Process (IPs 57050, 50073, and 37002)

Procedures

PCI GQP 9.6, Visual Examination of Welds, rev. 13
 PCI PS-902202-01, GQP 9.6 Procedure Supplement, rev.0

Work Order

WO 112716006, Inspection of Pressurizer

Miscellaneous

Westinghouse Letter LTR-NCE-12-122, *Watts Bar Unit 2 Pressurizer Vessel Final Interior Accessible Surfaces Engineering Disposition Report*, August 7, 2012
 Westinghouse Letter LTR-MRCDA-11-141, rev. 2, attachment C, *Watts Bar 2 Inspection Checklist*, June 12, 2012.

C.1.5 Instrument Components and Systems (IP 52053) – Work Observation (IP 52053)

Work Orders

WO 110707181, EDCR 53644 Sys 062 2-RTV-62-322A

Procedures

25402-000-GPP-0000-N620, rev. 16, Field Material Control and Traceability

C.1.6 Instrument Components and Systems – Work Observation and Construction Refurbishment Process (IPs 52053 and 37002)

Work Orders

WO 113495814, SUTI Sys 099 Perform 2-IMI-99.025 Eagle 21 Channel Normalization

Procedures

2-IMI-99.025, Eagle 21 Channel Normalization, Rev. 0

Corrective Action Documents

PER 5644443, Eagle 21 Power Supply voltage Out of Tolerance (Sequoyah), 6/12/2012
 PER 597000, Unplanned LCO Entry for Trip of WBN-2-INV-235-0004-G, 8/15/2012

IV. OTHER ACTIVITIES

OA.1.1 (Open) Inspection of Watts Bar Unit 2 Electrical Conduit and Conduit Supports Corrective Action Program Plan (TI 2512/018, IPs 51051, 51053, and 51055)

Procedures and Standards

Integrated Cable and Raceway Design System (ICRDS) Procedure,” Revision (Rev.) 2
 WP-51, “Watts Bar Engineering Project, Project Walk down Procedure,” Rev. 0
 WDP-C-3, “Walk down Procedure for Civil,” Rev. 3
 G-40, “Installation, Modification and Maintenance of Electrical Conduit, Cable Trays, Boxes, Containment Electrical Penetrations, Electric Conductor Seal Assemblies, Lighting and Miscellaneous Systems,” Rev. 16
 N3C-944, “Conduit and Conduit Support Installations,” Rev. 15
 N3C-946, “Attachments to Civil Structures,” Rev. 4.

Work Orders

WO 113480822, “TVA Junction Box”

Walkdown Packages

WBN2-C-293-817-08

WBN2-C-293-817-14

WBN2-C-292-815-02

Limited Scope Walkdown Packages

LSWD-1394

LSWD-489

LSWD-488

LSWD-492

LSWD-495

LSWD-497

Problem Evaluation Reports

PER 393731

PER 143584

PER 143789

Service Request

SR 588548

Design Packages

EDCR 54172

EDCR 58419

Conduit and Conduit Supports

Conduit ID#

2PLC-293-1096B

2PLC-293-1095A

2PM-293-6365D

Conduit Support ID#

Unique Support # 41788

Junction Box ID#

2-JB-293-0519-A

Drawings

47A056-55A, "Mechanical Category 1 Support Conduit," Rev. 2

47A056-66, "Mechanical Category 1 Support Conduit," Rev. 6

47A056-66A, "Mechanical Category 1 Support Conduit," Rev. 2

47A056-66B, "Mechanical Category 1 Support Conduit," Rev. 3

47A056-66C, "Mechanical Category 1 Support Conduit," Rev. 0

47A056-66D, "Mechanical Category 1 Support Conduit," Rev. 0

Unit 1 Calculations

WCG-1-1419, "WBN Seismic/Civil Validation Program Methodology Summary Report," Rev. 5

WCG-1-1313, "Thermal Affected Conduits," Rev. 3

WCG-1-1415, "Initial Assessment Report," Rev. 3

TI-2011, "Walk down of Electrical Conduit and Conduit Supports, Rev. 2

TI-2006, "Engineering Walkthrough and Evaluation of Plant Conduit and Conduit Supports,"
Rev. 1

Unit 2 Calculations

WCG-2-361, "Walkthrough Procedure of Unique Evaluations for Electrical Conduits and Conduit Supports," Rev. 0

WCG-2-308, "Engineering Walkthrough and Evaluation of Conduit and Conduit Supports," Rev. 1

WCG-2-866, "Evaluation of Conduits and Conduit Supports for Conduit Overweight Condition for the Unit 2 Conduit and Conduit Support CAP," Rev. 1

WCG-2-714, "Evaluation of Conduits/Supports for Disposition of Various PERs," Rev. 2

WCG-2-866, "Evaluation of Conduits and Conduit Supports for Conduit Overweight Condition for the Unit 2 Conduit and Conduit Support CAP," Rev. 1

WCG-2-378, "Evaluation of Typical 55 Conduit Supports," Rev. 1

WCG-2-407, "Adequacy of Typical 55s, Typical 66s, and Conduits with Over Spans Where Peak OBE Horizontal Acceleration is Less than 1.58g," Rev. 1

WCG-2-366, "Evaluation of unique conduit supports similar to Typical 85," Rev. 0

Miscellaneous Documents

"Watts Bar Nuclear Plant Unit 1 Electrical Conduit and Conduit Supports Corrective Action Program Closure Report," T21951026 977, dated October 26, 1995

"Watts Bar Nuclear Plant Unit 2 Electrical Conduit and Conduit Supports Corrective Action Program Closure Report," T03111018001, dated October 17, 2001

"Implementation Plan for the Conduits and Conduit Supports Corrective Action Program"

Design Criteria Document

WB-DC-40-31.10, "Seismically Qualifying Conduit Supports," Rev. 11

Engineering Change Notice

ECN 6269, Rev. 2

Field Change Request

FCR 57130-A, Rev. 0

FCR 55336-A, Rev. 0

FCR 58688, AA-06

Engineering Document Construction Release

EDCR 58419, Rev. A

Nuclear Central Office Item

NCO 850365002

NCO 860057002

NCO 860087007

NCO 860087008

NCO 860099007

NCO 860099008

NCO 860226003

NCO 860226004

NCO 870290002

NCO 870290004

NCO 880178002

NCO 880178010
 NCO 880178011
 NCO 890140007

OA.1.6 CDR 391/87-23, MOV Worm Shaft Clutch Gear Failure (IP 50075)

Procedures

GOI-7, Generic Equipment Operating Guidelines, Rev. 45, February 13, 2012
 GTE-11, Motor Operated Valve / Damper Test, Rev. 4, December 7, 2011
 0-MI-0.03, Limitorque Motor Operator Adjustment Guideline Type SMB and SB (10 CFR 50.49), Rev. 2, March 6, 2012
 0-MI-0.006, MOVATS Testing of Motor Operator Valves, Rev. 1, March 12, 2012
 0-MI-0.15, Adjustment of Westinghouse Supplied Motor Operator Valve Limit and Torque Switches, Rev. 0, May 24, 2011
 0-MI-16.01, Limitorque Motor Operator Repair and Adjustment Guidelines for SMB-000 (10 CFR 50.49), Rev. 19, July 28, 2010
 0-MI-16.02, Limitorque Motor Operator Repair and Adjustment Guidelines for SMB-00, SB-00 and SBD-00, Rev. 18, July 28, 2010

Design Change Documents

DCN P-01667-C, Slow down valve operators as much as possible (RIMS T56 950119 855), November 1, 1992
 DCN 12553-A, Special Testing AISI 4140 Steel Shaft Material for Motors (RIMS T56 940316 823), December 17, 1992
 EDCR-2 54850, Replacement Valve Actuators and Valve Assemblies for Unit 2 Systems, Rev. A, June 30, 2010
 EDCR-2 54851, Replacement Valve Actuators for Unit 2 Systems, Rev. A, July 15, 2010
 DCA P01667-06 for drawing 1-47W576, Sheet 9, Rev. 1, from DCN P-01667-C, October 30, 1992

Purchase Orders

TVA PO 25157, Limitorque Actuators, September 29, 2009
 TVA PO 336540, Replacement Geared Limit Switch Cartridge Sub-Assemblies & Drive Pinion Gear, November 9, 2011
 TVA Project Specification No. 25402-011-3PS-MUMA-00001, WBN / Units 1 and 2 Class 1E and Non-Class 1E Valve Electric Motor Operators Rev. 1, April 29, 2010

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 PER 144092, MOV Worm Shaft Clutch Gear Failure, May 3, 2008
 PER 154361, Manual MOV Operation, October 9, 2008
 CAQR WBP870996, Failure of Motor Pinion Key and Motor Shaft in the Actuator on 2-FCV-63-72A, October 6, 1987
 CAQR WBP890153, Part 21 Notification letter from Limitorque to the NRC dated August 13, 1985 (L33850827803), March 27, 1989
 SCAR WBP870995SCA, Failure of Components in MOV Actuator in Unit 1, Rev. 6, February 12, 1991
 SCAR WBP870996SCA, Failure of Components in MOV Actuator in Unit 2, Rev. 0, June 14, 1991

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1-47A8910-63-14, Mechanical Table of Motor-Operated Valve Requirements for 1-FCV-63-72-A, Rev. 0, January 20, 1995

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- 1-47A8910-63-15, Mechanical Table of Motor-Operated Valve Requirements for 1-FCV-63-73-B, Rev. 0, January 20, 1995
- 1-47A8910-63-15, Mechanical Table of Motor-Operated Valve Requirements for 1-FCV-63-73-B, Rev. 2, August 21, 2003
- 1-47A8910-0-04, Mechanical Table of Motor-Operated Valve Requirements, Rev. 2, August 21, 2003
- 1-47W576-9, Mechanical Table of Motor-Operated Valve Requirements, Rev. 1, December 11, 1991
- 2-47A8910-0-04, Mechanical Table of Motor-Operated Valve Requirements, Rev. 1, May 25, 2010
- 2-47A8910-63-1, Mechanical Table of Motor-Operated Valve Requirements for 2-FCV-63-1-A, Rev. 0, February 1, 2010
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- 2-47A8910-63-17, Mechanical Table of Motor-Operated Valve Requirements for 2-FCV-63-94-B, Rev. 0, February 1, 2010
- 2-47A8910-63-102, Mechanical Table of Motor-Operated Valve Requirements for 2-FCV-63-67-B, Rev. 0, January 25, 2012
- 2-47A8910-63-103, Mechanical Table of Motor-Operated Valve Requirements for 2-FCV-63-80-A, Rev. 0, February 14, 2010
- 2-47A8910-63-104, Mechanical Table of Motor-Operated Valve Requirements for 2-FCV-63-98-B, Rev. 0, February 14, 2010
- 2-47A8910-63-105, Mechanical Table of Motor-Operated Valve Requirements for 2-FCV-63-118-A, Rev. 0, February 14, 2010

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- MRI 25402-000-MRI-JV15-00039, Flowserve Limitorque Parts, Rev. 0, December 15, 2011
- MRI 25402-011-MRI-JV15-00005, Flowserve Limitorque Actuators, Rev. 4, July 1, 2010
- MRR-11638, Flowserve Limitorque Actuators, April 21, 2010
- MRR-12243, Flowserve Limitorque Actuators, May 4, 2010
- MRR-12247, Flowserve Limitorque Actuators, May 6, 2010
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- Letter from Baldor to Flowserve, Shaft Material for Valve Actuator Motors Supplied to Flowserve, October 28, 2011

Letter from Limitorque to TVA, Motor Shaft Material of Electric Actuators Supplied to Watts Bar
 2 PO 25157 Order 96075, November 1, 2011
 Vendor Manual WBN-VTD-L200-0160, Instruction and Maintenance Manual for Limitorque Type
 SMB Operator
 Vendor Manual WBN-VTD-L200-0350, Limitorque Maintenance Update 92-2
 Vendor Manual WBN-VTD-L200-0460, Limitorque Technical Update 05-02, Non-Locking
 Stem/Stem Nut Thread
 Vendor Manual WBN-VTD-L200-0460, Limitorque Technical Update 05-03, SB-00 Drive Sleeve
 Hypoid Gear

OA.1.10 (Closed) NUREG-0737, TMI Action Item III.D.3.4: Control Room Habitability (IP&S 301)

Calculations

TI-552, Rev. 14, Main Control Room Habitability during a Hazardous Chemical Release
 TI-RPS-198, Rev. 24, Dose to Control Room Personnel Due to a Regulatory Guide 1.4 Loss of
 Coolant Accident

Others

Final PP-19 Closure Package, NCO080008069, Rev. 01

OA.1.11 (Closed) CDR 391/87-01: Inadequate Support Shown on Typical Valve Support Drawings

Documents Reviewed

PER 144149, Typical Valve Drawing 47A054-41 and -42 Allow the Support of a Valve by Means
 of an Attachment to the Upper Part of the Valve Only, 5/3/2008
 DCN C-04325, Update Typical Support Drawing in System 043, Rev. C
 DCN S-16891, Update Typical Support Drawing in System 043, Rev. A
 DCN C-04419, Provide Support Requirements for System 043 Flow and Pressure Control
 Valves, Rev. B
 WB-DC-40-31.2, Seismic/Structural Qualification of Seismic Category I Electrical and
 Mechanical Equipment, Rev. 14
 WO 113524453, CCI Sys 043 EDCR2 53917 2-FCV-043-0067
 WCG-ACQ-0391, Seismic Qualification of Westinghouse Supplied Valves Related to 47A052
 Dwgs, Rev. 3
 47A052044, Typical Support 47A052-44, Rev. 3
 WCG-ACQ-0216, Seismic Qualification of Hoke Valves, Rev. 6
 47A052045, Calculation for Valve Support 47A052-45, Rev. 2
 25402-011-V1D-JV00-00013-004, Design Report 3/8-inch Class 1550 SPX/Copes Vulcan Air
 Operated Control Valve, Rev. 3

OA.1.12 (Closed) URI 05000391/2011603-06: Apparent Failure to Identify and Prevent Damage to Safety-Related Material and Equipment From Nearby Construction Activities (IP 92701)

Procedures and Specifications

25402-000-GPP-0000-N1213; Walkdown Verification for Construction Area Completion and
 Damaged, Loose, or Missing Hardware, Rev. 1
 25402-000-GPP-0000-N1601, Systems Completion and Turnover, Rev. 6
 25402-000-GPP-0000-N3506; Pressure Testing of Piping, Tubing and Components, Rev. 8
 25402-000-GPP-0000-N7204, ASME Section III Material and Component Surface Assessment,
 Rev. 1
 SMP-4.0, Watts Bar Nuclear Plant Unit 2 System Turnover, Rev. 4

TI-338, Operational Readiness Area Turnovers for Unit 2, Rev. 3
 TI-437, Operational Readiness Turnover Process for Unit 2 Systems, Rev. 10

Work Orders

WO 112407991, Repair of 3-Inch Tube Steel
 WO 10-951388-006, Strut Repair

OA.1.13 CDR 391/89-01, Limitorque Worm Shaft Clutch Gear Failure (IP 50075)

Procedures

GOI-7, Generic Equipment Operating Guidelines, Rev. 45, February 13, 2012
 GTE-11, Motor Operated Valve / Damper Test, Rev. 4, December 7, 2011
 0-MI-0.03, Limitorque Motor Operator Adjustment Guideline Type SMB and SB (10 CFR 50.49),
 Rev. 2, March 6, 2012
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 Switches, Rev. 0, May 24, 2011
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 72A, October 6, 1987
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LIST OF ACRONYMS

AFW	Auxiliary Feedwater
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
B&PV	Boiler & Pressure Vessel
BL	Bulletin
CAQR	Condition Adverse to Quality Report
CATD	Corrective Action Tracking Document
CCP	Centrifugal Charging Pump
CDR	Construction Deficiency Report
CLA	Cold Leg Accumulator
CRDR	Control Room Design Review
DCN	Drawing Change Notice
DCRDR	Detailed Control Room Design Review
ECCS	Emergency Core Cooling System
ECN	Engineering Change Notice
ECP	Employee Concerns Program
EDCR	Engineering Document Construction Release
EGTS	Emergency Gas Treatment System
ESQ	Equipment Seismic Qualification
FCR	Field Change Request
FSAR	Final Safety Analysis Report
GDC	General Design Criteria
HAAUP	Hanger and Analysis Update Program
HED	Human Engineering Discrepancies
IFI	Inspection Follow-up Item
IP	Inspection Procedure (NRC)
IP&S	Inspection Planning and Scheduling
IIR	Integrated Inspection Report (NRC)
LOCA	Loss-of-Coolant Accident
MOV	Motor-Operated Valve
MRI	Material Receiving Instruction
MT	Magnetic Particle
NCR	Non-Conformance Report
NCV	Non-Cited Violation
NRC	Nuclear Regulatory Commission
PCV	Pressure Control Valve
PER	Problem Evaluation Report
PO	Purchase Order
PT	Liquid Penetrant
QA	Quality Assurance

RCS	Reactor Coolant System
RG	Regulatory Guide
RHR	Residual Heat Removal
SCAR	Significant Corrective Action Report
SCV	Steel Containment Vessel
SER	Safety Evaluation Report
SP	Special Program
TMI	Three Mile Island
TVA	Tennessee Valley Authority
URI	Unresolved Item
WBN	Watts Bar Nuclear Plant
WO	Work Order