



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

July 25, 2016

Mr. Michael D. Skaggs  
Senior Vice President  
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Tennessee Valley Authority  
6A Lookout Place  
1101 Market Street  
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**SUBJECT: WATTS BAR NUCLEAR PLANT UNIT 2 CONSTRUCTION - NRC INTEGRATED  
INSPECTION REPORT 05000391/2016606**

Dear Mr. Skaggs:

On June 30, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection of construction and testing activities at your Watts Bar Unit 2 reactor facility. The enclosed integrated inspection report documents the inspection results, which were discussed on July 14, 2016, with Mr. Paul Simmons and other members of your staff. As described in the Reactor Oversight Process Transition Plan for Watts Bar Unit 2 (ADAMS ML15096A204), applicable inspections for all cornerstones as required by the baseline inspection program for a dual unit site, as described in IMC 2515 "Light-Water Reactor Inspection Program - Operations Phase", are performed and documented together for both Unit 1 and Unit 2 in the Watts Bar Nuclear Plant - NRC Integrated Inspection Reports, which are available on the NRC public website.

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

Based on the results of this inspection, the enclosed report documents one self-revealing and two NRC-identified findings which were determined to involve violations of NRC requirements. However, because the findings were Severity Level IV violations and were entered into your corrective action program, the NRC is treating the violations as non-cited violations (NCVs) consistent with Section 2.3.2 of the NRC Enforcement Policy.

If you contest the NCVs in the enclosed report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the United States Nuclear Regulatory Commission, ATTENTION: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region II; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident

M. Skaggs

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Inspector at the Watts Bar Unit 2 Nuclear Plant. In addition, if you disagree with a cross-cutting aspect assignment in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region II, and the NRC Resident Inspector at Watts Bar Unit 2 Nuclear Plant.

In accordance with Title 10 of the *Code of Federal Regulations* 2.390, "Public Inspections, Exemptions, Requests for Withholding," of the NRC's Rules of Practice, a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records System (PARS) component of NRC's Agencywide Documents Access and Management 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/**

Daniel W. Rich, Chief  
Reactor Projects Branch 8  
Division of Reactor Projects

Docket No. 50-391  
License No. NPF-96

Enclosure:  
IIR 05000391/2016606  
w/Attachment: Supplemental Information

cc w/encl: (See next page)

Inspector at the Watts Bar Unit 2 Nuclear Plant. In addition, if you disagree with a cross-cutting aspect assignment in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region II, and the NRC Resident Inspector at Watts Bar Unit 2 Nuclear Plant.

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w/ Attachment: Supplemental Information

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Letter to Michael D. Skaggs from Daniel W. Rich dated July 25, 2016.

SUBJECT: WATTS BAR NUCLEAR PLANT UNIT 2 CONSTRUCTION - NRC INTEGRATED  
INSPECTION REPORT 05000391/2016606

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**U.S. NUCLEAR REGULATORY COMMISSION**

**REGION II**

Docket No.: 50-391

License No.: NPF-96

Report No.: 05000391/2016606

Licensee: Tennessee Valley Authority (TVA)

Facility: Watts Bar Nuclear Plant, Unit 2

Location: Spring City, TN 37381

Dates: June 1, 2016 – June 30, 2016

Inspectors: J. Jandovitz, Senior Resident Inspector, RII  
J. Eargle, Resident Inspector, RII  
A. Nielsen, Senior Health Physicist, RII (Sections SU.1.7, SU.1.8)  
B. Davis, Senior Construction Inspector, RII (Section OA.1.1)

Approved by: Daniel W. Rich, Chief  
Reactor Projects Branch 8  
Division of Reactor Projects

Enclosure

## SUMMARY

### Watts Bar Nuclear Plant, Unit 2

This integrated inspection included aspects of engineering and construction activities performed by Tennessee Valley Authority (TVA) associated with the Watts Bar Nuclear (WBN) Plant Unit 2 construction project. This report covered a one-month period of inspections in the areas of quality assurance (QA), identification and resolution of construction problems, engineering and construction activities, preoperational and startup testing, and follow-up of other activities. The inspection program for Unit 2 construction activities is described in Nuclear Regulatory Commission (NRC) Inspection Manual Chapter (IMC) 2517, "Watts Bar Unit 2 Construction Inspection Program." 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

- A self-revealing, Severity Level (SL) IV non-cited violation (NCV) of Title 10 of the Code of Federal Regulations (10 CFR) part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," was identified for the failure to follow Procedure 2-SOI-85.01, "Control Rod Drive and Indication System," during reactor start-up. The performance deficiency was more than minor, in accordance with IMC 2517, Appendix C, because it represented an improper or uncontrolled work practice that could impact quality or safety, involving safety-related structures, systems, and components. The inspectors determined this finding to be of very low safety significance, SL IV, in accordance with Section 6.5 of the NRC Enforcement Policy because it represented a failure to meet a regulatory requirement, including one or more QA criteria that had more than minor safety significance; however, it did not represent a breakdown of the licensee's QA program. This finding had a cross-cutting aspect in the Human Performance cross-cutting area, as defined in IMC 0310. Individuals did not recognize and plan for the possibility of mistakes, latent issues, and inherent risk, even while expecting successful outcomes. Individuals did not correctly implement appropriate error reduction tools, including the peer check (H.12).
- The NRC identified a SL IV NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for the failure to accurately translate design requirements associated with the containment sump into the protective coatings specification. This performance deficiency was determined to be more than minor, in accordance with IMC 2517, Appendix C, because it represented an inadequate process that, if left uncorrected, could adversely affect the analysis of a safety-related structure, system, or component. The inspectors determined this finding to be of very low safety significance, SL IV, in accordance with Section 6.5 of the NRC Enforcement Policy because it represented a failure to meet a regulatory requirement, including one or more QA criteria that had more than minor safety significance; however, it did not represent a breakdown of the licensee's QA program.
- The NRC identified a SL IV NCV of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," for the failure to follow procedures during the development and implementation of the Uncontrolled Coating Log Report of Revision and Current Status. This performance deficiency was determined to be more than minor, in accordance with IMC 2517, Appendix C, because the finding represented an inadequate process that if left uncorrected could adversely affect the analysis and

records of a safety related structure, system, or component. The inspectors determined this finding to be of very low safety significance, SL IV, in accordance with Section 6.5 of the NRC Enforcement Policy because it represented a failure to meet a regulatory requirement, including one or more QA criteria that had more than minor safety significance; however, it did not represent a breakdown of the licensee's QA program.

- The inspectors concluded that issues pertaining to two open items dealing with the containment coatings have been appropriately addressed for WBN Unit 2. These items are closed.



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## REPORT DETAILS

### Summary of Plant Status

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

### I. QUALITY ASSURANCE PROGRAM

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

##### a. Inspection Scope

The inspectors continued to review condition reports (CRs), as part of the licensee's corrective action program, to verify that issues being identified under the corrective action program were being properly identified, addressed, and resolved by the licensee.

##### b. Observations and Findings:

Introduction: A self-revealing Severity Level (SL) IV non-cited violation (NCV) of Title 10 of the Code of Federal Regulations (10 CFR) Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," was identified for the failure to follow procedure 2-SOI-85.01, "Control Rod Drive and Indication System," when the rod bank selector switch was moved from the manual position to the Control Bank A position prior to control bank withdrawal.

Description: On June 22, 2016, the licensee commenced startup of Unit 2 using procedure 2-GO-2, "Reactor Startup." Step 5.3 [19] states, "start Control Bank withdrawal per 2-SOI-85.01, "Control Rod Drive and Indication System." Procedure 2-SOI-85.01, Section 5.5, step [5], requires the operator to ensure 2-RBSS, rod bank selector switch [2-M-4], is in manual. The switch was in the manual position. Step [6] is to obtain approval from the senior reactor operator (SRO) to continue with control bank withdrawal. Step [7] requires monitoring of four control bank parameters including proper bank overlap. Step [8] directs the operator to withdraw the control banks.

When the SRO approved control bank withdrawal, step [6], the operator placed switch 2-RBSS to Control Bank A instead of keeping it in manual. Withdrawal, step [8], was then started in violation of the procedure. The peer check also failed to identify the action taken was not in accordance with the procedure. The mistake was identified by control room staff after control bank overlap should have occurred but prior to the reactor reaching criticality. Startup was halted and Control Bank A was inserted back into the reactor. TVA recommenced reactor startup the next day with the rod bank selector switch in manual. The operations staff involved in the incident were removed from shift for remedial training. The licensee initiated CR 1184858.

The control banks are controlled such that withdrawal is sequenced in the order, Bank A, B, C, and D. The bank overlap feature works by withdrawing a single control bank until it reaches a preset position near the center of the core. Then the next control bank begins moving out in synchronism until the first control bank reaches the top of the core and stops. This process repeats until all control banks are withdrawn from the core. The bank overlap feature performs two functions: 1) it automatically selects the proper control bank for movement, and; 2) it overlaps the control banks which are to be moved according to a preset pattern. By selecting an individual bank, in this case Bank A, only Bank A would be withdrawn and no overlap would occur. Bank overlap is required to keep the incremental changes in reactivity relatively constant while the control banks are being moved.

The licensee's failure to follow procedures during the Unit 2 reactor startup was determined to be a performance deficiency. The performance deficiency was more than minor because it represented an improper or uncontrolled work practice that could impact quality or safety, involving safety-related structures, systems, and components. Specifically, not following the procedures for proper placement of the rod bank selector switch could lead to a non-incremental change in reactivity. The inspectors determined this finding to be of very low safety significance, SL IV, in accordance with Section 6.5 of the NRC Enforcement Policy because it represented a failure to meet a regulatory requirement, including one or more QA criteria that had more than minor safety significance; however, it did not represent a breakdown of the licensee's QA program. This finding had a cross-cutting aspect in the Human Performance cross-cutting area, as defined in IMC 0310, regarding human performance. Individuals did not recognize and plan for the possibility of mistakes, latent issues, and inherent risk, even while expecting successful outcomes. Individuals did not correctly implement appropriate error reduction tools, such as peer checks (H.12).

Enforcement: 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," requires that activities affecting quality shall be prescribed by documented instructions, and procedures, and shall be accomplished in accordance with these instructions, and procedures. Procedure 2-SOI-85.01, "Control Rod Drive and Indication System," implements control bank withdrawals as directed by procedure 2-GO-2, "Reactor Startup." Specifically, procedure 2-SOI-85.01, Step 5.5 [5] states, "Ensure 2-RBSS, Rod Bank Select switch [2-M-4], in manual."

Contrary to the above, on June 22, 2016, when the approval was given by the SRO to begin withdrawing control banks, the rod bank select switch was moved to Control Bank A and Control Bank A was partially withdrawn.

TVA took immediate corrective actions by stopping the reactor startup, reinserting Control Bank A back into the reactor, and reviewing the personnel actions and plant status prior to recommencing startup activities the next day. The issue was entered into the licensee's corrective action program as CR 1184858. This violation is being treated as an NCV consistent with Section 2.3.2 of the NRC Enforcement Policy. This NCV is identified as 05000391/2016606-01, "Failure to Perform Control Bank Withdrawal in Accordance with the Approved Procedure."

c. Conclusion

A self-revealing NCV associated with the Unit 2 startup was identified. The licensee generated CR 1184858 to address the finding and completed corrective actions. The issues identified in the CRs reviewed were adequately identified, addressed, and resolved.

## II. MANAGEMENT OVERSIGHT AND CONTROLS

### C.1 Construction Activities

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

a. Inspection Scope

The inspectors independently assessed licensee controls, associated with Unit 2 testing 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 planning meetings were observed, at least once per week, to assess the adequacy of the licensee's efforts to identify those testing activities that could potentially impact the operating unit. This included the review of select testing activities, which the licensee had screened as not affecting Unit 1, to verify the adequacy of that screening effort. Additionally, the inspectors independently assessed select testing 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 testing work locations to verify that controls to protect the operating unit provided an adequate level of protection and had been properly implemented.

b. Observations and Findings

No findings were identified.

c. Conclusions

Overall, management oversight and controls were in place for the observed preoperational tests and surveillance activities that could potentially impact the operating unit.

### SU.1 Startup Testing Activities

#### SU.1.1 Startup Test Witnessing and Observation (Inspection Procedures 72302)

a. Inspection Scope

Background: The purpose of IMC 2514, "Light Water Reactor Inspection Program – Startup Testing Phase," issue date August 21, 1989, is to verify that the licensee is meeting the requirements and conditions of the facility license for precritical tests, initial fuel loading, initial criticality, low-power testing, and power ascension tests. This

verification is to be achieved through reviewing procedures and records, direct observation, witnessing tests, reviewing test data, and evaluating test results.

Inspection Activities: The inspectors observed activities associated with the performance of test procedure 2-PAT-5.3, "Automatic Steam Generator Level Control," to verify that the test was conducted in accordance with the approved procedure, to observe operating staff performance, and to ascertain the adequacy of test program records and preliminary evaluation of test results. The inspectors verified the following:

- current revision of the appropriate procedure was available and in use by the operating staff;
- minimum crew requirements were met;
- test prerequisites and initial conditions were met and those that were waived were reviewed/approved in accordance with procedure and Technical Specifications (TS) requirements;
- required test equipment or data collection equipment was calibrated and in service;
- the test was performed as required by procedure;
- crew actions appeared to be timely during the performance of the test and coordination was adequate;
- a summary analysis was performed to assure proper plant response to the test;
- all data were collected for final analysis by proper personnel;
- overall acceptance criteria was met;
- the licensee's preliminary test evaluation was consistent with the inspector's observation; and
- adherence to TS limiting conditions of operation (LCOs) was maintained during testing.

Additionally, inspectors reviewed the test sequencing document and applicable changes, test directors log, control room log, and plant information report daily.

b. Observations and Findings

No findings were identified.

c. Conclusions

The inspectors determined that the licensee's power ascension test was performed in a manner consistent with the guidance of procedure 2-TI-438, "Watts Bar Nuclear Plant Unit 2 Power Ascension Test Program," Rev. 5. This completes the witnessing of power ascension test procedure 2-PAT-5.3.

### **SU.1.2 Startup Test Witnessing and Observation (Inspection Procedures 72302)**

a. Inspection Scope

Background: The background for this startup test procedure review is the same as that in the background of Section SU.1.1 above.

Inspection Activities: The inspectors observed activities associated with the performance of test procedure 2-PET-301, "Core Power Distribution Factors," which

included the observations of the data collection for 2-TI-41, "Incore Flux Mapping"; 2-SI-0-22, "Incore QPTR"; 2-SI-0-21, "Excore QPTR & Axial Flux Difference;" and 2-SI-0-20, "Hot Channel Factors Determination." The inspectors observed the test to verify that the test was conducted in accordance with the approved procedure, to observe operating staff performance, and to ascertain the adequacy of test program records and preliminary evaluation of test results. The inspectors verified the following:

- current revision of the appropriate procedure was available and in use by the operating staff;
- minimum crew requirements were met;
- test prerequisites and initial conditions were met and those that were waived were reviewed/approved in accordance with procedure and TS requirements;
- required test equipment or data collection equipment was calibrated and in service;
- the test was performed as required by procedure;
- crew actions appeared to be timely during the performance of the test and coordination was adequate;
- a summary analysis was performed to assure proper plant response to the test;
- all data were collected for final analysis by proper personnel;
- overall acceptance criteria was met;
- the licensee's preliminary test evaluation was consistent with the inspector's observation; and
- adherence to TS LCOs was maintained during testing.

Additionally, inspectors reviewed the test sequencing document and applicable changes, test directors log, control room log, and plant information report daily.

b. Observations and Findings

No findings were identified.

c. Conclusions

The inspectors determined that the licensee's power ascension test was performed in a manner consistent with the guidance of procedure 2-TI-438, "Watts Bar Nuclear Plant Unit 2 Power Ascension Test Program," Rev. 5. This completes the witnessing of power ascension test procedure 2-PET-301 for the 30% power plateau.

### **SU.1.3 Startup Test Results Evaluation (Inspection Procedure 72301)**

a. Inspection Scope

Background: The background for this startup test procedure review is the same as that in the background of Section SU.1.1 above.

Inspection Activities: The inspectors performed a detailed review of the results for test procedure 2-PAT-5.0, "Test Sequence for the 30% Plateau," which included 2-PET-301, "Core Power Distribution Factors"; 2-TI-41, "Incore Flux Mapping"; 2-TRI-0-22, "Incore QPTR"; 2-SI-0-21, "Excore QPTR & Axial Flux Difference"; and 2-SI-0-20, "Hot Channel Factors Determination." The inspectors completed the review to verify that the licensee's evaluation of the procedure performance and results were conducted in

accordance with approved procedures at the 30% plateau. This review was performed to provide assurance that the test data was within the established acceptance criteria and the licensee's methods for identifying and correcting deficiencies were adequate. The inspectors performed the following activities associated with this test results review:

- Reviewed all changes made to the test procedure to verify they were properly annotated, did not affect the objective of the test, and were performed in accordance with administrative procedures.
- Reviewed all documented test deficiencies to verify they had been properly resolved, reviewed, and accepted.
- Reviewed the original 'as-run' copy of the test procedure to verify that data sheets were completed and properly initialed and dated, data was recorded within acceptance tolerances, and test deficiencies that were identified were noted.
- Reviewed the test summary and evaluation to verify that the system was evaluated to meet design requirements and acceptance criteria, specifically:
  - measured hot channel factors (peaking factors) were within their respective TS limits;
  - measured TS quadrant power tilt ratio (QPTR) was within TS limits;
  - hot channel factors were evaluated to ensure that limits would not be exceeded before reaching the next power plateau; and
- Reviewed the approval of the test results to verify completeness with respect to the acceptance of the test results.

The inspectors reviewed the test results to verify that the overall test acceptance was met. The inspectors conducted a review with the responsible test engineer to assure that the test evaluation was performed in accordance with established procedures.

b. Observations and Findings

No findings were identified.

c. Conclusions

The inspectors determined that the licensee's test procedure results were reviewed, evaluated, and accepted in a manner consistent with the guidance of procedure 2-TI-438, "Watts Bar Nuclear Plant Unit 2 Power Ascension Test Program," Rev. 5. This completes the test results evaluation of test procedure 2-PAT-5.0 and the applicable sections of 2-PET-301 for the 30% plateau.

#### **SU.1.4 Startup Test Results Evaluation (Inspection Procedure 72301)**

a. Inspection Scope

Background: The background for this startup test procedure review is the same as that in the background of Section SU.1.1 above.

Inspection Activities: The inspectors performed a detailed review of the results for power ascension test procedure 2-PAT-5.1, "Dynamic Automatic Steam Dump Control," to verify that the licensee's evaluation of the procedure performance and results were conducted in accordance with approved procedures. This review was performed to

provide assurance that the test data was within the established acceptance criteria and the licensee's methods for identifying and correcting deficiencies were adequate. The inspectors performed the following activities associated with this test results review:

- Reviewed all changes made to the test procedure to verify they were properly annotated, did not affect the objective of the test, and were performed in accordance with administrative procedures.
- Reviewed all documented test deficiencies to verify they had been properly resolved, reviewed, and accepted.
- Reviewed the original 'as-run' copy of the test procedure to verify that data sheets were completed and properly initialed and dated, data was recorded within acceptance tolerances, and test deficiencies that were identified were noted.
- Reviewed the test summary and evaluation to verify that the system was evaluated to meet design requirements and acceptance criteria, specifically:
  - after varying reactor power, the steam pressure controller maintained steam header pressure stable;
  - after varying reactor power, the plant trip controller maintained a stable Tavg;
  - the loss of load controller responded properly for the plant input signal to the controller; and
  - the steam dump valve open and close stroke times were within acceptable limits.
- Reviewed the approval of the test results to verify completeness with respect to the acceptance of the test results.

The inspectors reviewed the test results to verify that the overall test acceptance was met. The inspectors conducted a review with the responsible test engineer to assure that the test evaluation was performed in accordance with established procedures.

b. Observations and Findings

No findings were identified.

c. Conclusions

The inspectors determined that the licensee's test procedure results were reviewed, evaluated, and accepted in a manner consistent with the guidance of procedure 2-TI-438, "Watts Bar Nuclear Plant Unit 2 Power Ascension Test Program," Rev. 5. This completes the test results evaluation of test procedure 2-PAT-5.1.

### **SU.1.5 Startup Test Results Evaluation (Inspection Procedures 72301)**

a. Inspection Scope

Background: The background for this startup test procedure review is the same as that in the background of Section SU.1.1 above.

Inspection Activities: The inspectors performed a detailed review of the results for power ascension test procedure 2-PAT-5.3, "Automatic Steam Generator Level Control Transients at Low Power," to verify that the licensee's evaluation of the procedure



performance and results was conducted in accordance with approved procedures. This review was performed to provide assurance that the test data was within the established acceptance criteria and the licensee's methods for identifying and correcting deficiencies were adequate. The inspectors performed the following activities associated with this test results review:

- Reviewed all changes made to the test procedure to verify they were properly annotated, did not affect the objective of the test, and were performed in accordance with administrative procedures.
- Reviewed all documented test deficiencies to verify they had been properly resolved, reviewed, and accepted.
- Reviewed the original 'as-run' copy of the test procedure to verify that data sheets were completed and properly initialed and dated, data was recorded within acceptance tolerances, and test deficiencies that were identified were noted.
- Reviewed the test summary and evaluation to verify that the system was evaluated to meet design requirements and acceptance criteria, specifically:
  - after varying steam generator levels, the feedwater bypass control valves returned steam generator levels to program level;
  - after transferring control from the feedwater bypass control valves to the main feedwater regulating valves, the steam generator levels stabilized at program level; and
  - after transferring control from the feedwater bypass control valves to the main feedwater regulating valves, demand signal oscillations for the main feedwater regulating valves, as well as feedwater flow, were within acceptable range during steady state operation.
- Reviewed the approval of the test results to verify completeness with respect to the acceptance of the test results.

The inspectors reviewed the test results to verify that the overall test acceptance was met. The inspectors conducted a review with the responsible test engineer to assure that the test evaluation was performed in accordance with established procedures. Documents reviewed are listed in the Attachment.

b. Observations and Findings

No findings were identified.

c. Conclusions

The inspectors determined that the licensee's test procedure results were reviewed, evaluated, and accepted in a manner consistent with the guidance of procedure 2-TI-438, "Watts Bar Nuclear plant Unit 2 Power Ascension Test Program," Rev.5. This completes the test results evaluation of test procedure 2-PAT-5.3.

### **SU.1.6 Startup Test Results Evaluation (Inspection Procedure 72301)**

#### a. Inspection Scope

Background: The background for this startup test procedure review is the same as that in the background of Section SU.1.1 above.

Inspection Activities: The inspectors performed a detailed review of the results for power ascension test procedure 2-PAT-5.4, "Calibration of Steam and Feedwater Flow Instruments at 30% Power," to verify that the licensee's evaluation of the procedure performance and results was conducted in accordance with approved procedures. This review was performed to provide assurance that the test data was within the established review criteria and the licensee's methods for identifying and correcting deficiencies were adequate. The inspectors performed the following activities associated with this test results review:

- Reviewed the original 'as-run' copy of the test procedure to verify that data sheets were completed and properly initialed and dated, and data was recorded within acceptance tolerances.
- Reviewed the test summary and evaluation to verify that the system was evaluated to meet design requirements. Specifically, the test collected data at the 30% power plateau to determine feedwater versus steam flow differences.
- Reviewed the approval of the test results to verify completeness with respect to the acceptance of the test results.

The inspectors reviewed the test results to verify that the overall test acceptance was met. The inspectors conducted a review with the responsible test engineer to assure that the test evaluation was performed in accordance with established procedures. Documents reviewed are listed in the Attachment.

#### b. Observations and Findings

No findings were identified.

#### c. Conclusions

The inspectors determined that the licensee's test procedure results were reviewed, evaluated, and accepted in a manner consistent with the guidance of procedure 2-TI-438, "Watts Bar Nuclear plant Unit 2 Power Ascension Test Program," Rev. 5. This completes the test results evaluation of test procedure 2-PAT-5.4.

### **SU.1.7 Radiation Protection – Startup (Inspection Procedure 83521)**

#### a. Inspection Scope

Background: The background for this startup inspection activity is the same as that in the background of Section SU.1.1 above.

Inspection Activities: The inspectors performed a review of the licensee's radiation protection activities during initial startup, specifically looking at surveys in potential

radiation exposure areas identified in the final safety analysis report (FSAR). This included the following activities:

- Reviewed procedures for performing gamma and neutron surveys, including startup surveys.
- Reviewed the results of surveys performed pre-fuel load and at 3% power in the Auxiliary Building and Reactor Building.
- Observed performance of startup surveys in the Reactor Building, Lower Containment, at 6% - 12% power.
- Performed independent surveys in the Reactor Building, Lower Containment, at 6% - 12% power.
- Reviewed corrective action documents regarding issues identified during performance of startup surveys.
- Discussed the guidance contained in ANSI/ANS 6.3.1, "Program for Testing Radiation Shields in Light Water Reactors (LWR)" with licensee staff.

Documents reviewed are listed in the Attachment.

b. Observations and Findings

No findings were identified.

c. Conclusions

The inspectors determined that the licensee's low-power radiological surveys were performed in a manner consistent with the requirements of procedure RCI-159, "Radiation Baseline Surveys", Rev. 1. The inspectors also determined that issues regarding startup surveys were identified and corrected and that the guidance contained in ANSI/ANS 6.3.1 was incorporated into the survey program to the extent possible. This inspection procedure is complete.

### **SU.1.8 Radwaste - Startup (Inspection Procedure 84521)**

a. Inspection Scope

Background: The background for this startup inspection activity is the same as that in the background of Section SU.1.1 above.

Inspection Activities: The inspectors performed a review of the licensee's chemistry and radwaste activities during initial startup. This included the following activities:

- Reviewed procedures for primary and secondary chemistry control during startup.
- Evaluated sodium and chloride data trends for feedwater and steam generator blowdown.
- Evaluated Dose Equivalent Iodine and pH trends for primary coolant.
- Reviewed component cooling water cross-contamination sampling results.
- Discussed System 77 (radwaste) power ascension testing with licensee staff.

Documents reviewed are listed in the Attachment.

b. Observations and Findings

No findings were identified.

c. Conclusions

The inspectors determined that the licensee's startup chemistry activities were performed in a manner consistent with the requirements of procedures 2-CM-5.29, "Power Ascension Testing Secondary Chemistry Control," Rev. 3 and 2-CM-1.01, "Primary Chemistry Program Strategic Plan," Rev. 0. The inspectors noted that there was not sufficient radioactivity in Unit 2 systems to perform a meaningful comparison of effluent monitor readings with known laboratory results (Inspection Procedure 84521 item 02.03). However, radioactive effluent QA (including effluent monitor testing) for both units is typically reviewed as part of baseline inspection procedure 71124.06, "Radioactive Gaseous and Liquid Effluent Treatment." This inspection procedure is complete.

### III. OTHER ACTIVITIES

#### OA.1.1 (Closed) Generic Letter 2004-02 - Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors and Pressurized Water Reactor Containment Sump Blockage (Temporary Instruction 2515/166)

a. Inspection Scope

Background: Generic Letter (GL) 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors", requested licensees to evaluate the emergency core cooling system (ECCS) and containment spray systems (CSS) recirculation functions and take actions, if appropriate. Pressurized water reactor recirculation sump screens had been identified to be potentially susceptible to debris blockage during design basis accidents requiring recirculation operation of ECCS or CSS, and flow paths necessary for ECCS and CSS recirculation and containment drainage were identified to be susceptible to additional adverse effects.

In response to the generic letter mentioned above, WBN determined that they would remove the outer trash racks provided on each side of the sump and install a new strainer. The new strainer has an available flow area of 4600 ft<sup>2</sup> compared to the original screen area of approximately 200 ft<sup>2</sup>. The new strainer openings are 0.085 inches in diameter compared to the 0.25 inch mesh that cover the outer trash racks. The strainer has an advanced configuration intended to be much more resistant to potential sump blockage.

Unit 2 containment is a mirror image to Unit 1's containment. Therefore, the results of debris generation, transport analyses, and downstream effects were the same for Unit 2 as for Unit 1. The WBN Unit 2 letter to the NRC dated March, 4, 2011 (NRC's Agencywide Documents Access and Management System (ADAMS) Accession Number (No.) ML110680248) stated that Unit 2 actions were to replace containment sump intake screens with an advanced design containment sump strainer arrangement under

Engineering Document Construction Release (EDCR) 53580. The design was the same as that used for Unit 1 except that the strainer stack to plenum opening was increased in size. This change reduces the strainer pressure drop, thus increasing the margin to plugging the strainer when compared to Unit 1.

As stated in the NRC closeout letter dated September 18, 2014 (ADAMS Accession No. ML14163A658), it was identified that three actions needed to be accomplished prior to closeout for the GL 2004-02. Those items included: (1) install sump modifications per the requirements of GL 2004-02 prior to Unit 2 fuel load; (2) complete a confirmatory walkdown for loose debris after containment work is complete, prior to start-up, to ensure that potential quantities of post-accident debris are maintained within the bounds of the analyses and design-bases that support ECCS and CSS recirculation functions, and; (3) install new throttle valves in the chemical volume control system and safety injection system lines to the reactor coolant system, opened sufficiently to preclude downstream blockage.

As documented in inspection report 05000391/2016603 (ADAMS Accession No. ML16127A025), the NRC has completed all inspection activities with the exception of a final review of the coatings calculations, inspection, and repairs. The inspection of these areas is described below.

Inspection Activities: The inspectors reviewed the Watts Bar Reactor Building Debris Generation calculation and the evaluations for ECCS upon ingestion of containment debris. These calculations and evaluations were reviewed to determine the allowable latent and coatings debris inside containment for a design basis event. The inspectors compared the allowable debris levels from the calculations to those documented and tracked in the unqualified coatings log to ensure unqualified coatings were maintained within appropriate levels.

Other inspection activities included a review of the unqualified coating log. As part of the review, the inspectors verified that items found on the log were accurate and represented conditions found inside containment. The inspectors reviewed work order (WO) 110921696 to ensure all coatings inside containment were inspected, repaired as necessary, and representative of what was documented in the unqualified coatings log and the final containment coatings report. The inspectors also reviewed specification G-55, "General Engineering Specification for Technical and Programmatic Requirements for the Protective Coating program for TVA nuclear Plants," to ensure the program was implemented as described in project procedures.

Documents reviewed are listed in the Attachment.

b. Observations and Findings

Two Severity Level (SL) IV violations were identified.

NCV 50000391/2016606-02, Failure to Translate Coatings Acceptance Criteria into Project Specifications

Introduction: The inspectors identified a SL IV NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for failure to accurately translate design requirements associated with the containment sump into the protective coatings specification.

Description: The inspectors performed a review of specification G-55, "Technical and Programmatic Requirements for the Protective Coating Program for TVA Nuclear Plants," to verify whether the acceptance criteria established in the uncontrolled coatings log were accurate. The uncontrolled coatings log is used to track the amount of uncontrolled coatings inside containment that could fail and transport to the sump during a design basis accident. Debris transported to the sump during a design basis accident could impede the performance of ECCS recirculation. The inspectors compared the acceptance criteria established in the G-55 specification and the uncontrolled coatings log to those established in ALION-CAL-TVA-2739-03, "Watts Bar Reactor Building GSI-191 Debris Generation Calculation," and CN-SEE-I-10-39, "Watts Bar Unit 2 Sump Debris Downstream Effects Evaluation for ECCS Equipment," and determined the acceptance criteria were not accurate. The design calculations analyzed and bounded the amount of uncontrolled coatings in pound mass; however, the G-55 coatings specification and the uncontrolled coatings log established the acceptance criteria in square feet. An analysis was performed by the licensee to convert the amount of unqualified coatings from square feet to pound mass and found that the amount of unqualified coatings assumed to fail during a design basis accident was not bounded by the acceptance criteria established in the design calculations.

The inspectors determined that the failure to translate design requirements into design documents was a performance deficiency. This performance deficiency was determined to be more than minor in accordance with IMC 2517, Appendix C, because it represented an inadequate process that, if left uncorrected, could adversely affect the analysis of a safety-related structure, system, or component. Specifically, the failure to translate the square footage acceptance criteria in the G-55 specification to pound mass resulted in unknown satisfaction of the acceptance criteria. The subsequent analysis concluded that the actual amount of unqualified coatings within containment was above that analyzed in the design calculations. The inspectors determined this finding to be of very low safety significance, SL IV, in accordance with Section 6.5 of the NRC Enforcement Policy, because it represented a failure to meet a regulatory requirement, including one or more QA criteria that had more than minor safety significance; however, it did not represent a breakdown of the licensee's QA program. The inspectors reviewed this finding against cross-cutting area components, as described in IMC 0310 "Components Within the Cross-Cutting Areas," and determined that no cross-cutting aspect applied.

Enforcement: 10 CFR Part 50, Appendix B, Criterion III, "Design Control," states, in part, "measures shall be established to assure that applicable regulatory requirements and the design basis, as defined in 10 CFR 50.2 and as specified in the license application, for those structures, systems, and components to which this appendix applies are correctly translated into specifications, drawings, procedures, and instructions."

Calculation ALION-CAL-TVA-2739-03, "Watts Bar Reactor Building GSI-191 Debris Generation Calculation," is the design document used to determine the amount of debris that would be generated inside containment during a design basis accident. Section 6 of the calculation bounds the amount of coatings assumed to fail during a design basis accident and analyzed for WBN Unit 2 in pound mass.

Contrary to the above, the licensee failed to accurately translate design criteria from Calculation ALION-CAL-TVA-2739-03 into specification G-55, "Technical and Programmatic Requirements for the Protective Coating Program for TVA Nuclear Plants." Specifically, specification G-55 established the acceptance criteria for the amount of failed or uncontrolled coatings as square footage instead of pound mass, as analyzed in the debris generation calculation.

TVA performed immediate corrective actions by engaging with Westinghouse on the issue, and received a letter from Westinghouse documenting analyses that the additional amount of unqualified coatings does not adversely affect GSI-191 or the flow of emergency core cooling to the core. The SL IV violation was entered into the licensee's corrective action program as CR 1173130 to address the finding. Corrective actions involve formally revising and updating the analyses to reflect that there are no ingestion effects on the equipment. This violation is being treated as an NCV consistent with Section 2.3.2 of the NRC Enforcement Policy. This NCV is identified as 50000391/2016606-02, "Failure to Translate Coatings Acceptance Criteria into Project Specifications."

#### NCV 50000391/2016606-03, Failure to Follow Procedures

Introduction: The inspectors identified a SL IV NCV of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," for the failure to follow procedures during the development and implementation of the Uncontrolled Coating Log Report of Revision and Current Status.

Description: The inspectors performed a review of the licensee's documentation developed in support of the coatings program described in specification G-55, "Technical and Programmatic Requirements for the Protective Coating Program for TVA Nuclear Plants". G-55, Appendix E, Section 3.3.2 requires that site engineering prepare the uncontrolled coating log, forward it to the responsible engineering manager for approval, and maintain the log as a quality record. The inspectors observed that the licensee captured the amount of uncontrolled coatings in containment in a spreadsheet instead of using the Uncontrolled Coating Log Report of Revision and Current Status. In addition, the spreadsheet was not verified by the responsible engineering manager for the appropriate amount of coatings and was not maintained as a quality record within the licensee's electronic data management system as a quality record.

The inspectors determined that the failure to follow procedures during the development of the Uncontrolled Coating Log Report of Revision and Current Status was a performance deficiency. This performance deficiency was determined to be more than minor in accordance with IMC 2517, Appendix C, because the finding represented an inadequate process that, if left uncorrected, could adversely affect the analysis and records of a safety related structure, system, or component. Specifically, the inadequate documentation and verification of uncontrolled coatings could adversely affect the records that are used to demonstrate the operability of the containment sump and ECCS. The inspectors determined this finding to be of very low safety significance, SL IV, in accordance with Section 6.5 of the NRC Enforcement Policy, because it represented a failure to meet a regulatory requirement, including one or more QA criteria that had more than minor safety significance; however, it did not represent a breakdown of the licensee's QA program. The inspectors reviewed this finding against cross-cutting

area components, as described in IMC 0310 "Components Within the Cross-Cutting Areas," and determined that no cross-cutting aspect applied.

Enforcement: 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," states, in part, "activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings."

Specification G-55, "Technical and Programmatic Requirements for the Protective Coating Program for TVA Nuclear Plants," Rev. 18, Appendix E, Section 3.3.2 (C) states, in part, "Site Engineering Prepares the Uncontrolled Coating Log Report of Revision and Current Status (Attachment 3) and forwards to the Responsible Engineering Discipline Manager with the Uncontrolled Coating Report and Request for Evaluation and the Uncontrolled Coating Evaluation (Attachment 1) and Disposition Record (Attachment 2)."

Specification G-55, "Technical and Programmatic Requirements for the Protective Coating Program for TVA Nuclear Plants," Rev. 18, Appendix E, Section 3.3.3 (B) states, in part, "Responsible Engineering Discipline Manager verifies the Uncontrolled Coatings Log Report of Revision and Current Status, signs for concurrence, and returns to Coatings Program Owner."

Specification G-55, "Technical and Programmatic Requirements for the Protective Coating Program for TVA Nuclear Plants," Rev. 18, Appendix E, Section 3.3.2 (E) states, in part, "upon approval by Responsible Engineering Discipline Manager, the Coatings Program Owner assigns RIMS (document catalog) number to final documentation package (includes attachments 1, 2, and 3, or equivalents) for retention and distributes as necessary."

Contrary to the above, the licensee failed to accomplish activities affecting quality in accordance with procedures. Specifically, the licensee failed to generate the Uncontrolled Coatings Log Report of Revision and Current Status, have the appropriate engineering manager verify the reports for approval, and prepare the final documentation package for uncontrolled coatings for entry into the RIMS.

The SL IV violation was entered into the licensee's corrective action program as CR 1180094. Corrective actions involved TVA staff completing evaluations of uncontrolled coatings log records, and an apparent cause evaluation. This violation is being treated as an NCV consistent with Section 2.3.2 of the NRC Enforcement Policy. This NCV is identified as 05000391/2016606-03, "Failure to Follow Procedures."

c. Conclusions

The inspectors identified two NCVs associated with the failure to translate design requirements into specifications, drawings, procedures and instructions and the failure to follow procedures. The licensee generated CRs 1173130 and 1180094, respectively, to address these findings. Aside from these findings and based on the aforementioned inspection activities, the inspectors concluded that Generic Letter 2004-02 and Temporary Instruction 2515/166 are closed.



**IV. MANAGEMENT MEETINGS****X1 Exit Meeting Summary**

An exit meeting was conducted on July 14, 2016, to describe the results of the inspection to Mr. Paul Simmons. The inspectors identified that no proprietary information was received during the inspection and none would be used in the inspection report. The licensee acknowledged the observations and provided no dissenting comments.

## **SUPPLEMENTAL INFORMATION**

### **KEY POINTS OF CONTACT**

#### **Licensee personnel**

P. Simmons, TVA – Site Vice President  
M. Skaggs, TVA – Senior Vice President  
G. Arent, TVA – Licensing Manager  
Terry Wilburn, Chemistry  
Mahlon Tuck, Radiation Protection  
Bill Jasper, Radiation Protection  
Ben Kennedy, TVA Engineering  
Cindy Abidi, TVA Engineering  
Mathew Smith, TVA Engineering  
Rusty Stroud, TVA Licensing

## **INSPECTION PROCEDURES USED**

IP 35007	Quality Assurance Program Implementation During Construction and Pre-Construction Activities
IP 72302	Startup Test Witnessing and Observation
IP 72301	Startup Test Results Evaluation
IP 83521	Radiation Protection Startup
IP 84521	Radwaste Startup

## **TEMPORARY INSTRUCTIONS USED**

TI 2515/166	Pressurized Water Reactor Containment Sump Blockage
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## LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

### Closed

2004-02	GL	Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors and Pressurized Water Reactor Containment Sump Blockage (OA.1.1)
2515/166	TI	Pressurized Water Reactor Containment Sump Blockage (OA.1.1)

### Open and Closed

05000391/2016606-01	NCV	Failure to Perform Control Bank Withdrawal in Accordance with the Approved Procedure (Q.1.1)
05000391/2016606-02	NCV	Failure to Translate Coatings Acceptance Criteria into Project Specifications (OA.1.1)
05000391/2016606-03	NCV	Failure to Follow Procedures (OA.1.1)

## LIST OF DOCUMENTS REVIEWED

### SU.1 STARTUP TESTING ACTIVITIES

#### SU 1.5 Startup Test Results

##### Procedures

2-PAT-5.3, "Automatic Steam Generator Level Control Transients at Low Power," revision 5, dated June 2, 2016

##### Condition Reports

CR 1181278, Auto SG Level Control at Low Power

#### SU 1.6 Startup Test Results

##### Procedures

2-PAT-5.4, "Calibration of Steam and Feedwater Flow Instruments at 30%," revision 2, dated June 3, 2016

#### SU.1.7 Radiation Protection - Startup

##### Miscellaneous

RCI-159, Radiation Baseline Surveys, Rev. 1  
RCI-101, Radiation, Contamination, and Airborne Surveys, Rev. 36  
Radiation Baseline Survey Data Package, Pre-Fuel Load, 12/3/15  
Radiation Baseline Survey Data Package, 3% Power, 5/24/16  
Radiation Baseline Survey Data Package, 6%-12% Power, 5/31/16  
CR 1177146  
CR 1169103

#### SU.1.8 Radwaste - Startup

##### Miscellaneous

2-CM-5.29, Power Ascension Testing Secondary Chemistry Control, Rev. 3  
2-CM-1.01, Primary Chemistry Program Strategic Plan, Rev. 0  
S/G Feedwater Chemistry Data Trends, Sodium and Chloride Concentrations, 5/23/16 – 5/28/16  
S/G Blowdown Chemistry Data Trends, Sodium and Chloride Concentrations, 5/23/16 – 5/28/16  
Reactor Coolant System Dose Equivalent Iodine Trend, 5/23/16 – 5/28/16  
Reactor Coolant System pH Trend, 5/23/16 – 5/28/16

### OA.1 OTHER ACTIVITIES

**OA.1.1 (Closed) Generic Letter 2004-02 - Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors and Pressurized Water Reactor Containment Sump Blockage (Temporary Instruction 2515/166)**

Engineering Reports

TVA Watts Bar Unit 2 Coatings Installation Summary report, "Watts Bar Unit 2 Coatings Service Level I Installation Summary Report," September 29, 2015  
ALION-CAL-TVA-2739-03, "ALION – Watts Bar Reactor Building GSI-101 Debris Generation Calculation," Rev. 07  
CN-SEE-I-10-29, Watts Bar Unit 2 Sump Debris Downstream Effects Evaluation for ECCS Equipment, Rev. 3  
CN-SEE-I-10-38, Watts Bar Unit 2 GSI-191 Downstream Effects Debris Ingestion Evaluation, Rev. 2  
CN-See-I-10-41, Watts Bar Unit 2 Sump Debris Downstream Effects Evaluation for ECCS Valves, Rev. 2  
Watts Bar Nuclear Plant Unit 2 Primary Containment Evaluation of Service Level I Coatings Summary Report, April 23, 2014  
GSI-191 Latent Debris Walkdown Final Report, April 13, 2016

Procedures, Standards and Specifications

G-55, General Engineering Specification G-55 for Technical and Programmatic Requirements for the Protective Coating Program for TVA Nuclear Plants, Rev. 18

Work Orders

110921692, WIL SYS 512PER 447735 WBN-2-CTNG-512-PAINTQ

## LIST OF ACRONYMS

ADAMS	Agencywide Documents Access and Management System
CFR	<i>Code of Federal Regulations</i>
CR	Condition Report
CSS	Containment Spray System
ECCS	Emergency Core Cooling System
EDCR	Engineering Document Construction Release
FSAR	Final Safety Analysis Report
GL	Generic Letter
IIR	Integrated Inspection Report
IMC	Inspection Manual Chapter (NRC)
IP	Inspection Procedure
LCO	Limiting Condition of Operation
NCV	Non-Cited Violation
No.	Number
NRC	Nuclear Regulatory Commission
QA	Quality Assurance
Rev.	Revision
QPTR	Quadrant Power Tilt Ratio
SL	Severity Level
SRO	Senior Reactor Operator
TI	Temporary Instruction (NRC)
TS	Technical Specification
TVA	Tennessee Valley Authority
WBN	Watts Bar Nuclear Plant
WO	Work Order