



**Memorandum from the Office of the Inspector General**

January 22, 2020

James Barstow  
Anthony L. Williams IV

**REQUEST FOR FINAL ACTION – EVALUATION 2019-15651 – NUCLEAR FATIGUE  
RULE AT WATTS BAR NUCLEAR PLANT**

Attached is the subject final report for your review and final action. Your written comments, which addressed your management decision and actions planned or taken, have been included in the report. Please notify us when final action is complete. In accordance with the Inspector General Act of 1978, as amended, the Office of the Inspector General is required to report to Congress semiannually regarding evaluations that remain unresolved after 6 months from the date of report issuance.

If you have any questions or wish to discuss our findings, please contact Lindsay J. Denny, Manager, Evaluations, at (865) 633-7349 or E. David Willis, Director, Evaluations, at (865) 633-7376. We appreciate the courtesy and cooperation received from your staff during the evaluation.

David P. Wheeler  
Assistant Inspector General  
(Audits and Evaluations)

LJD:FAJ

Attachment

cc (Attachment):

TVA Board of Directors  
Danny Bost  
David M. Czufin  
Robertson D. Dickens  
Lucia W. Harvey  
Jeffrey J. Lyash  
Justin C. Maierhofer  
Jill M. Matthews  
Sherry A. Quirk  
Timothy S. Rausch  
OIG File No. 2019-15651



Office of the Inspector General

# *Evaluation Report*

To the Vice President, Watts Bar Nuclear  
Plant and the Vice President, Nuclear  
Regulatory Affairs and Support Services

## **NUCLEAR FATIGUE RULE – WATTS BAR NUCLEAR PLANT**

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Evaluation Team  
Lindsay J. Denny  
Nicholas J. Ramsey

Evaluation 2019-15651  
January 22, 2020

## **ABBREVIATIONS**

CFR	Code of Federal Regulations
CR	Condition Report
D&Z	Day & Zimmermann
NFR	Nuclear Fatigue Rule
NPG	Nuclear Power Group
SPP	Standard Programs and Processes
SSC	Systems, Structures, and Components
TVA	Tennessee Valley Authority

## **TABLE OF CONTENTS**

EXECUTIVE SUMMARY .....	i
BACKGROUND.....	1
OBJECTIVE, SCOPE, AND METHODOLOGY .....	2
FINDINGS .....	4
FATIGUE ASSESSMENTS.....	4
OPPORTUNITIES FOR IMPROVEMENT.....	4
RECOMMENDATIONS .....	5

## **APPENDIX**

MEMORANDUM DATED JANUARY 16, 2020, FROM JAMES BARSTOW AND ANTHONY L. WILLIAMS IV TO DAVID P. WHEELER



# Evaluation 2019-15651 – Nuclear Fatigue Rule – Watts Bar Nuclear Plant

## EXECUTIVE SUMMARY

### Why the OIG Did This Evaluation

According to the Occupational Safety and Health Administration, worker fatigue increases the risk for illness and injuries and has been a contributing factor in several industrial disasters. The Tennessee Valley Authority's Nuclear Fatigue Rule (NFR) procedure establishes requirements for managing fatigue and controlling work hours in accordance with Title 10 Code of Federal Regulations, Part 26, Subpart I, *Managing Fatigue*. The regulation requires average minimum days off for covered individuals<sup>i</sup> based on the work the individual performs and the length of their shifts.

Due to the importance of employees being able to safely and competently perform their duties, we performed an evaluation of the NFR at Watts Bar Nuclear Plant. Our objective was to determine if the Tennessee Valley Authority was in compliance with the NFR at Watts Bar.

### What the OIG Found

Nuclear Power Group Standard Programs and Processes 03.21, *Fatigue Rule and Work Hour Limits*, includes rules regarding required average minimum days off for covered individuals, as well as work-hour limits for how many hours can be worked in specific time periods. Our review of sampled employee and contract employee work hours and badging records for October 1, 2017, through June 30, 2019, identified no violations of NFR minimum days off or work-hour limits. However, we identified an area of deficiency related to Watts Bar's performance of fatigue assessments. Additionally, we identified opportunities for improvement related to NFR work-hour tracking and documentation.

### What the OIG Recommends

We recommend the Vice President, Watts Bar Nuclear Plant and Vice President, Nuclear Regulatory Affairs and Support Services, address issues related to fatigue assessments, work-hour tracking, and documentation. Our detailed recommendations are listed in the body of this report.

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<sup>i</sup> Any individual granted unescorted access to a nuclear power plant protected area to perform certain risk-significant tasks is a covered individual.



## Evaluation 2019-15651 – Nuclear Fatigue Rule – Watts Bar Nuclear Plant

### EXECUTIVE SUMMARY

#### **TVA Management's Comments**

TVA management agreed with the recommendations in this report and provided actions to address the recommendations. See the Appendix for management's complete response.

#### **Auditor's Response**

We concur with TVA management's planned actions.

## **BACKGROUND**

According to the Occupational Safety and Health Administration, worker fatigue increases the risk for illness and injuries and has been a contributing factor in several industrial disasters. Nuclear Power Group (NPG) Standard Programs and Processes (SPP) 03.21, *Fatigue Rule and Work Hour Limits*,<sup>1</sup> implements requirements for managing fatigue and controlling work hours in accordance with Title 10 Code of Federal Regulations [CFR], Part 26, Subpart I, *Managing Fatigue*. This subpart includes requirements related to general provisions, work hours, waivers and exceptions, self-declarations of fatigue, and fatigue assessments.<sup>2</sup>

While fatigue management applies to all individuals who have unescorted access to protected areas<sup>3</sup> at a nuclear plant, work-hour controls apply only to covered individuals<sup>4</sup> who perform or direct covered work. Covered work includes:

- Operating or on-site directing of the operation of systems, structures, and components (SSC) that a risk-informed evaluation process has shown to be significant to public health and safety.
- Performing maintenance or on-site directing of the maintenance of SSCs that a risk-informed evaluation process has shown to be significant to public health and safety.
- Performing radiation protection or chemistry duties required as a member of the on-site emergency response organization.
- Performing duties of a fire brigade member who is responsible for understanding the effects of fire and fire suppressants on safe shutdown capability.
- Performing activities that change the condition or state of risk-significant SSCs.
- Performing security duties as an armed security-force officer, alarm-station operator, response team leader, or watchperson.

Title 10 CFR, Part 26, requires average minimum days off for covered individuals based on work the individual performs and length of their shifts. These minimum days off differ based on whether the unit is online or in an outage. However, the following work-hour limits<sup>5</sup> apply to covered individuals regardless of whether the unit is online or in an outage:

- No more than 16 work hours in any 24-hour period.

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<sup>1</sup> The SPP is commonly referred to as the Nuclear Fatigue Rule (NFR).

<sup>2</sup> Fatigue assessments are face-to-face evaluations of an individual whose alertness may be impaired.

<sup>3</sup> Protected areas are areas encompassed by physical barriers and where access is controlled.

<sup>4</sup> Any individual who is granted unescorted access to a nuclear power plant protected area and performs covered work is a covered individual.

<sup>5</sup> Work hours are maintained in a system used to schedule, develop, and track work hours and shift cycles.

- No more than 26 work hours in any 48-hour period.
- No more than 72 work hours in any 7-day period (168 hours).
- At least a 10-hour break between successive work periods.
- A continuous break of at least 34 hours in any 9-day period (216 hours).

To ensure employees are not working while fatigued, fatigue assessments are required for four conditions: (1) for cause - in response to an observed condition of impaired individual alertness creating a reasonable suspicion that an individual is not fit for duty, (2) self-declaration - in response to an individual's self-declaration to their supervisor that they are not fit to safely and competently perform their duties or any part of a work shift due to fatigue, (3) post-event - in response to events requiring post-event drug and alcohol testing, or (4) follow-up - to follow a "for cause" fatigue assessment or a self-declaration when the individual is returning to duty following a break of less than 10 hours.

According to NPG-SPP-14.1, *Fitness-For-Duty and Fatigue Management*, fatigue assessments address (1) acute and cumulative fatigue, (2) potential degradations in alertness and performance due to circadian variations,<sup>6</sup> (3) potential degradations in alertness and performance that could affect risk-significant functions, and (4) whether any controls and conditions must be established under which the individual will be permitted to perform work.

Additionally, NPG-SPP-03.21, *Fatigue Rule and Work Hour Limits*, requires quarterly and annual reviews be performed by each department to determine NFR compliance. Documents to be reviewed include condition reports (CR),<sup>7</sup> fatigue assessments, and waivers. In conjunction with the quarterly reviews, the annual review shall evaluate the effectiveness of the control of work hours for covered individuals.

Due to the importance of employees being able to safely and competently perform their duties, we performed an evaluation of the NFR at Watts Bar Nuclear Plant.

## **OBJECTIVE, SCOPE, AND METHODOLOGY**

The objective of our evaluation was to determine if the Tennessee Valley Authority (TVA) was in compliance with the NFR at Watts Bar. Our scope included employee and contract employee work hours from October 1, 2017, through June 30, 2019. In order to fulfill our objective, we:

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<sup>6</sup> Circadian variations are the increases and decreases in alertness and cognitive/motor functioning caused by human physiological processes (e.g., body temperature, release of hormones) that vary on an approximate 24-hour cycle.

<sup>7</sup> A CR is a mechanism used to document an issue (undesired condition, problem, or concern raised by personnel).



- Reviewed pertinent SPPs and interviewed the Director of Nuclear Security, the Watts Bar NFR Coordinator, and each department's NFR coordinator to gain an understanding of the NFR process.
- Compared the general requirements in 10 CFR, Part 26, Subpart I, *Managing Fatigue*, to TVA policies, procedures, training and examinations content, recordkeeping, reports, and audits to determine TVA's compliance with the regulation.
- Compared departmental lists of covered employees being tracked for NFR purposes to employees listed in TVA's human capital management system in departments that perform covered work to determine if all appropriate employees were being included in the NFR program.
- Reviewed documentation for a statistically selected sample of 53 of 3,239 contract employees who performed work at Watts Bar at any time during our project scope but were not included in the NFR program to determine if any covered work was performed outside of the NFR program. We selected our sample using rate of occurrence sampling with a 95-percent confidence level.
- Reviewed all fatigue assessments and waivers performed during our scope to determine if they were performed in accordance with 10 CFR, Part 26, and TVA's NFR procedures.
- Reviewed documentation for a statistically selected sample of 96 of 14,317 covered employee pay periods with overtime during our scope. We selected our sample using rate of occurrence sampling with a 95-percent confidence level and performed the following steps:
  - Compared work hours from payroll, work-hour system, and badging records to determine if records were consistent.
  - Reviewed records to identify any NFR violations.
- Reviewed contractor documentation for a statistically selected sample of 85 of 1,317 Day & Zimmerman (D&Z) contract employees<sup>8</sup> using rate of occurrence sampling with 95-percent confidence level and performed the following steps:
  - Compared work hours from payroll and time clock to determine if records were consistent.
  - Reviewed records to identify any NFR violations.
- Reviewed TVA documentation for a statistically selected sample of 40 of 200 contract employees (non-D&Z) with work hours tracked for NFR purposes during our project scope and performed the following steps:
  - Compared work hours from work-hour system and badging records to determine if work-hour system captured all covered work hours.
  - Reviewed time records to identify any NFR violations.

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<sup>8</sup> D&Z contract employee work hours were tested separately because they were not included in the TVA work-hour system.

This evaluation was performed in accordance with the Council of the Inspectors General on Integrity and Efficiency's *Quality Standards for Inspection and Evaluation*.

## **FINDINGS**

As stated above, NPG-SPP-03.21, *Fatigue Rule and Work Hour Limits*, includes rules regarding required average minimum days off for covered individuals, as well as work-hour limits for how many hours can be worked in specific time periods. Our review of sampled employee and contract employee work hours and badging records for October 1, 2017, through June 30, 2019, identified no violations of NFR minimum days off or work-hour limits. However, as discussed below, we identified an area of deficiency related to Watts Bar's performance of fatigue assessments. Additionally, we identified opportunities for improvement related to NFR work-hour tracking and documentation.

### **FATIGUE ASSESSMENTS**

Our review of the 17 fatigue assessments performed during our project scope identified one was performed by an incorrect and untrained individual. According to 10 CFR, Part 26, for a post-event fatigue assessment, the individual who conducts the fatigue assessment may not have performed or directed the work activities during which the event occurred. However, one post-event fatigue assessment was performed by the person who directed the work that resulted in the event. Additionally, this assessment was performed by a nonnuclear supervisor who had not completed the appropriate fitness for duty training. According to 10 CFR, Part 26, only supervisors and Fitness-For-Duty program personnel who are appropriately trained may conduct a fatigue assessment. However, the fatigue assessment form includes instructions that direct a supervisor to proceed in performing the assessment even if they have checked the box stating they have not had the required training, which could have contributed to the deficiency identified.

### **OPPORTUNITIES FOR IMPROVEMENT**

We identified opportunities for improvement related to (1) NFR work-hour tracking that could impact the site's ability to staff overtime shifts and (2) documentation deficiencies that could impact the site's ability to monitor for adverse NFR trends.

#### **Work-Hour Tracking**

During our comparison of work hours in the payroll system and the work-hour system, we identified issues related to hours not worked included in the schedule. Employee work hours are tracked through an NFR work-hour system that indicates when an employee is eligible for overtime or when an overtime shift would create an NFR violation. When an employee takes leave or does not work on a holiday, the employee's schedule should be adjusted to create an accurate reflection of the employee's time worked for future overtime purposes. However,

we identified hours not worked were still included in the system for 15 of 96 employee pay periods in our sample testing.

Without an accurate reflection of actual time worked, the site may not be able to adequately and efficiently staff overtime shifts.

### **Documentation Deficiencies**

During our review of fatigue assessments and waivers, we identified documentation deficiencies that could impact the site's ability to monitor for adverse trends in fatigue assessments, waivers, and their associated CRs.

#### Fatigue Assessments

According to NPG-SPP-14.1, *Fitness-For-Duty and Fatigue Management*, "Supervisors must initiate a CR on each fatigue assessment performed to include referencing 'fatigue' within the summary for tracking purposes and to ensure the use of appropriate anonymity in the CR." However, our review identified two fatigue assessments with CRs that did not include "fatigue" in the summary.

#### Waivers

According to NPG-SPP-03.21, *Fatigue Rule and Work Hour Limits*, the Overtime Limits Waiver document consists of four sections, including a supervisor closeout review. This review should document the amount of time actually worked under the waiver, as well as the CR initiated to document the waiver, and notation of whether the individual performed satisfactorily. However, our review found three of the four waivers performed during our scope did not include completion of the supervisor closeout review.

## **RECOMMENDATIONS**

We recommend the Vice President, Watts Bar Nuclear Plant and the Vice President, Nuclear Regulatory Affairs and Support Services:

- Reinforce the importance of completing fatigue assessments as required.

**TVA Management's Comments** – TVA management stated they will communicate to supervisors and above the importance of completing fatigue assessments by properly trained individuals. See the Appendix for TVA's complete response.

**Auditor's Response** – We concur with management's planned actions.

- Update fatigue assessment form to include instructions indicating nonnuclear supervisors are not allowed to perform fatigue assessment unless properly trained.

**TVA Management's Comments** – TVA management stated they will update the fatigue assessment form to clarify the requirements for supervisors' eligibility to complete the form. See the Appendix for TVA's complete response.

**Auditor's Response** – We concur with management's planned actions.

- Reinforce the expectation for hours not worked to be removed from the schedule software.

**TVA Management's Comments** – TVA management stated they will provide communication to include expectations for hours not worked to be removed from the schedule software. See the Appendix for TVA's complete response.

**Auditor's Response** – We concur with management's planned actions.

- Reinforce the expectation for fatigue assessments and waivers to include all required information for trending purposes.

**TVA Management's Comments** – TVA management stated they will provide communication to reinforce the requirement and basis for the word "fatigue" being added to CR summaries documenting fatigue assessments being performed. See the Appendix for TVA's complete response.

**Auditor's Response** – We concur with management's planned actions.

January 16, 2020

David P. Wheeler, WT 2C-K

**RESPONSE TO REQUEST FOR COMMENTS ON DRAFT EVALUATION 2019-15651  
NUCLEAR FATIGUE RULE AT WATTS BAR NUCLEAR PLANT**

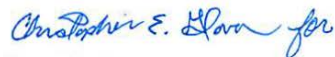
In accordance with the request dated December 16, 2019, TVA has reviewed the subject draft report and accepts the evaluation conclusions and recommendations.

TVA agrees with the report findings, opportunities for improvement, and recommendations appropriate to promote and reinforce the requirements for managing fatigue and controlling work hours in accordance with TVA procedures and the Federal Regulation.

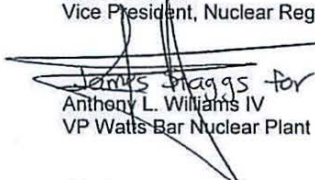
The OIG recommendation is for the Vice President, Watts Bar Nuclear Plant and the Vice President, Nuclear Regulatory Affairs and Support Services to reinforce the importance of completing fatigue assessments as required, the expectation for hours not worked to be removed from the schedule software and for fatigue assessments and waivers to include all required information for trending purposes. Also, there is a recommendation to update the fatigue assessment form to include instructions indicating that non-nuclear supervisors are not allowed to perform fatigue assessments unless properly trained.

TVA places a high value on managing fatigue and controlling work hours of our impacted nuclear workers and the importance it has in the safety of our people and the plant. Your report identified an opportunity for continued improvement, we value the learnings and will move forward with actions to address your recommendations.

Sincerely,



James Barstow  
Vice President, Nuclear Regulatory Affairs and Support Services.



Anthony L. Williams IV  
VP Watts Bar Nuclear Plant

Enclosure

cc(Attachment)  
Clifford Beach, Jr.  
Danny Bost  
David M. Czufin

Lucia Harvey  
Sherry A. Quirk  
Timothy S. Rausch

**Enclosure 1**  
**Comments and Action Plan for Addressing OIG Recommendations in Draft**  
**Evaluation 2019-15651 – Nuclear Fatigue Rule – Watts Bar Nuclear Plant**

The draft audit report identifies a number of Nuclear Fatigue Rule related deficiencies and gaps. The actions described in the table below are intended to be responsive to each of the specific recommendations made by the OIG in the draft report.

<u>OIG Recommendation No.</u>	<u>Recommendation</u>	<u>Action</u>	<u>Owner</u>	<u>Due Date</u>	<u>Comments</u>
1	Reinforce the importance of completing fatigue assessments as required.	Draft and provide communication to reinforce the importance of completing fatigue assessments by properly trained individuals to supervisors and above	Eynus Ellis	03/15/20	
2	Update the fatigue assessment form to include instructions indicating nonnuclear supervisors are not allowed to perform fatigue assessment unless properly trained.	Update the fatigue assessment form for clarity for the requirements for supervisors eligible to complete the form.	Chris Glover	04/01/20	
3	Reinforce the expectation for work hours not worked to be removed from the schedule software.	Draft and provide communication to include expectations for hours not worked be removed from the schedule software	Chris Glover	04/01/20	
4	Reinforce the expectation for fatigue assessments and waivers to include all required information for trending purposes	Draft and provide communication to reinforce the requirement and basis for the word, "fatigue" being added to CR summaries documenting fatigue assessments being performed	Eynus Ellis	03/15/20	