



Memorandum from the Office of the Inspector General

March 20, 2020

Danny G. Bost
Preston P. Pratt

**REQUEST FOR MANAGEMENT DECISION – EVALUATION 2019-15678 – NUCLEAR
CLEARANCE PROCESS**

Attached is the subject final report for your review and management decision. You are responsible for determining the necessary actions to take in response to our findings. Please advise us of your management decision within 60 days from the date of this report. 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 Leslie A. Franks, Senior Auditor, at (865) 633-7330 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)

LAF:FAJ

Attachment

cc (Attachment):

TVA Board of Directors
Steven M. Bono
David M. Czufin
James R. Dalrymple
Robertson D. Dickens
Lucia W. Harvey
Jeffrey J. Lyash
Justin C. Maierhofer

Jill M. Matthews
Sherry A. Quirk
Matthew M. Rasmussen
Timothy S. Rausch
Ronald R. Sanders II
Anthony L. Williams IV
OIG File No. 2019-15678



Office of the Inspector General

Evaluation Report

To the Senior Vice President,
Nuclear Operations and the
Director, Safety and Enterprise
Improvement

NUCLEAR CLEARANCE PROCESS

Evaluation Team
Leslie A. Franks
Nicholas J. Ramsey

Evaluation 2019-15678
March 20, 2020

ABBREVIATIONS

AE	Authorized Employee
BFN	Browns Ferry Nuclear Plant
CPAL	Clearance Personal Accountability Log
NPG	Nuclear Power Group
PAE	Primary Authorized Employee
QE	Qualified Employee
RE	Responsible Employee
SPP	Standard Programs and Processes
SQN	Sequoyah Nuclear Plant
TSP	TVA Safety Procedure
TVA	Tennessee Valley Authority
WBN	Watts Bar Nuclear Plant

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MEMORANDUM DATED MARCH 16, 2020, FROM DANNY G. BOST TO
DAVID P. WHEELER



Evaluation 2019-15678 – Nuclear Clearance Process

EXECUTIVE SUMMARY

Why the OIG Did This Evaluation

Working in industrial environments is inherently dangerous and steps must be taken to ensure the safety of personnel performing work on energized equipment. Proper clearance procedure practices can reduce the number of accidents resulting from an inadvertent release of hazardous energy,ⁱ which accounts for close to 10 percent of serious accidents in many industries, according to the Occupational Safety and Health Administration. The Tennessee Valley Authority's clearance procedures establish standardized clearance requirements to ensure equipment is isolated from its energy source and rendered nonoperative before performing work on machines or equipment where the unexpected energizing, start up, or release of stored energy could occur and cause injury or property damage.

Due to the importance of the clearance procedure in preventing injury and/or property damage while equipment is being serviced, we performed an evaluation of the nuclear clearance process. Our objective was to determine if (1) the clearance procedure was being performed for work requiring clearances to safely control hazardous energy, (2) clearances issued were in compliance with the clearance procedure, and (3) required training and audits were being performed in compliance with the clearance procedure.

What the OIG Found

We determined the clearance procedure was being performed for work requiring clearances to safely control hazardous energy and training was completed as required. However, we determined (1) some clearances were not issued in accordance with all procedural requirements, and (2) audits performed were not in compliance with the clearance procedure. We also identified an opportunity for improvement related to the alignment of clearance procedures.

What the OIG Recommends

We recommend the Senior Vice President, Nuclear Operations take action related to the identified deficiencies with clearances and audits. We also recommend the Senior Vice President, Nuclear Operations, in conjunction with the Director, Safety and Enterprise Improvement, take action related to the alignment of clearance procedures. Our detailed recommendations are listed in the body of this report.

ⁱ Energy sources including electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other sources in machines and equipment can be hazardous to workers. During the servicing and maintenance of machines and equipment, the unexpected startup or release of stored energy can result in serious injury or death to workers.



Evaluation 2019-15678 – Nuclear Clearance Process

EXECUTIVE SUMMARY

TVA Management's Comments

In response to the draft report, the Senior Vice President, Nuclear Operations, accepted our conclusions and recommendations. In addition, the Director, Safety and Enterprise Improvement, provided informal comments, which indicated agreement with the findings. See the Appendix for Nuclear Operation's complete response.

BACKGROUND

Working in industrial environments is inherently dangerous and steps must be taken to ensure the safety of personnel performing work on energized equipment. Proper clearance procedure practices can reduce the number of accidents resulting from an inadvertent release of hazardous energy,¹ which accounts for close to 10 percent of serious accidents in many industries, according to the Occupational Safety and Health Administration. The Tennessee Valley Authority's (TVA) clearance process utilizes a tagout² system to ensure equipment with potential for release of hazardous energy is properly controlled, providing a safe working environment for employees.

TVA Safety Procedure (TSP) TVA-TSP-18.613, *Clearance Procedure to Safely Control Hazardous Energy Using Group Tagout*, establishes minimum TVA-wide clearance requirements, while Nuclear Power Group (NPG) Standard Programs and Processes (SPP) NPG-SPP-10.2, *Clearance Procedure to Safely Control Hazardous Energy*, governs the clearance process at the nuclear plants. These procedures establish standardized clearance requirements to ensure equipment is isolated from its energy source and rendered nonoperative before performing work on machines or equipment where the unexpected energizing, start up, or release of stored energy could occur and cause injury or property damage.

Clearance responsibilities are assigned based on an individual's qualifications (i.e., level of clearance training completed) and not based on title or position. TVA's clearance procedures require employees to be trained and examined annually relative to their responsibilities in the clearance process. Key roles in the clearance process include:

- **Responsible Employee (RE)** – The RE is responsible for preparing, reviewing, approving, and issuing clearances. The RE confirms the technical accuracy of the clearance boundary,³ verifies the scope of work and clearance boundaries are supported by plant status, and authorizes placement of the clearance. As the clearance issuer, the RE authorizes work to proceed and assumes an oversight role for the clearance process.
- **Qualified Employee (QE)** – The QE implements the clearance by deenergizing equipment and installing clearance tags utilized to establish the clearance boundary. A second, independent QE performs clearance verification and is equally responsible with the QE who hung the tags for ensuring components are tagged correctly. QEs are responsible to the Primary Authorized Employees and Authorized Employees for

¹ Energy sources including electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other sources in machines and equipment can be hazardous to workers. During the servicing and maintenance of machines and equipment, the unexpected startup or release of stored energy can result in serious injury or death to workers.

² The placement of a tag on an energy-isolating device (e.g., circuit breaker) indicates the device and the equipment being controlled shall not be operated until the tag is removed.

³ The clearance boundary is comprised of points at energy-isolating devices that isolate equipment from sources of energy to allow personnel to safely work on equipment under clearance.

deenergizing equipment and hanging the clearance according to the clearance instructions.

- Primary Authorized Employees (PAE) – The PAE holds the clearance and bears overall responsibility for the safety of personnel working under the clearance and the correct execution of the clearance process. The PAE has an active role in the process from the time the clearance is approved for placement until the work being performed is complete. The PAE also maintains the Clearance Personal Accountability Log (CPAL), which identifies all Authorized Employees working on the equipment under clearance.
- Authorized Employees (AE) – AEs perform servicing, maintenance, and/or modification on equipment under clearance. AEs are responsible for signing on the CPAL prior to starting work, which identifies them as being protected by the clearance, and signing off the CPAL when work is completed.

NPG-SPP-10.2 requires clearance audits to be conducted annually to ensure employees are knowledgeable of the clearance process, implement it correctly, and utilize it as required when performing work. Audits are to be performed by someone who is qualified at the RE level, but who did not write or issue the clearances being audited. Any deficiencies identified during the audit are to be addressed through TVA's Corrective Action Program, which is utilized to identify, track, and resolve conditions adverse to quality.

Due to the importance of the clearance procedure in preventing injury and/or property damage while equipment is being serviced, we performed an evaluation of the nuclear clearance process.

OBJECTIVE, SCOPE, AND METHODOLOGY

The objective of our evaluation was to determine if (1) the clearance procedure was being performed for work requiring clearances to safely control hazardous energy, (2) clearances issued were in compliance with the clearance procedure, and (3) required training and audits were being performed in compliance with the clearance procedure. The scope of the evaluation included Browns Ferry (BFN), Sequoyah (SQN), and Watts Bar (WBN) Nuclear Plants and the time frames noted below. To achieve our objective, we:

- Interviewed personnel in Safety and Enterprise Improvement, Nuclear Operations Support, and Nuclear Training and Performance Management to gain an understanding of the clearance process and requirements.
- Reviewed the following documentation to gain an understanding of the clearance process and identify potential areas for improvement:
 - TVA-TSP-18.613, *Clearance Procedure to Safely Control Hazardous Energy Using Group Tagout*
 - NPG-SPP-10.2, *Clearance Procedure to Safely Control Hazardous Energy*
 - Quality Assurance audits conducted at BFN, SQN, and WBN during 2019

- Operational Assurance evaluations, including:
 - o *TVA Clearance Process*, June 21, 2017
 - o *Nuclear Clearance Independence*, December 18, 2018
 - o *Nuclear Configuration Control*, April 26, 2019
- Internal Assessment of NPG Clearance Communication performed by Safety and Enterprise Improvement in June 2018
- Randomly selected a sample of 66 of 6,565 work orders with actual start dates between January 1, 2019, and July 31, 2019, identified in Maximo⁴ as requiring a clearance to determine if clearances were established as required. We selected the sample using rate of occurrence sampling with a 95-percent confidence level. Since this was a statistical sample, we can project the results of the sample testing to the population.
- Randomly selected a sample of 66 of 5,505 clearances hung between January 1, 2019, and July 31, 2019, to determine if clearances were issued in compliance with the procedural requirements. We selected the sample using rate of occurrence sampling with a 95-percent confidence level. The achieved precision was outside our desired range; therefore, we did not project the results of the sample to the population. We tested various elements of the clearance procedure, including clearance requests (of which there were 116 associated with the 66 sampled clearances), preparation, placement, sign-ons, and release.
 - As a result of the error rate discovered with testing sign-ons, we performed additional testing. Our sign-on testing consisted of determining if CPALs were signed as required by the procedure. The additional testing included 91 clearances associated with the 66 work orders sampled above. In total, this increased the sample population to 157 clearances. However, only 127 had associated CPALs for testing.
- Judgmentally selected a sample of 21 active clearances⁵ (7 at each of the 3 nuclear sites) for walkdowns to verify all tags were hung, tags contained the correct clearance information required, equipment components were in the position specified on the clearance, and tags-plus⁶ devices were utilized where applicable. Clearances were judgmentally selected based on equipment descriptions, date created, types of tags, and location in the plant.
- Randomly selected a sample of 83 of 605⁷ employees to determine if clearance training was being completed as required. We selected the sample using rate of occurrence sampling with a 95-percent confidence level. Since this was a statistical sample, we can project the results of the sample testing to the population.

⁴ Maximo is TVA's asset management system.

⁵ Clearances were active as of the date of the walkdowns, which were performed at BFN on November 1, 2019, SQN on November 20, 2019, and WBN on November 22, 2019.

⁶ Tags-plus is the use of a device or component configuration to prevent the inadvertent energization of a machine or equipment under clearance by a single human mistake.

⁷ The population of 605 employees included 17 duplicates; however, no duplicates were selected in the sample.

- Reviewed the most recently completed annual clearance audits conducted by each site⁸ to determine if audits were performed in compliance with the procedural requirements.
- Reviewed the most recently completed monthly clearance reviews⁹ conducted by each site¹⁰ to determine if reviews were performed in compliance with the procedure.

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

We determined the clearance procedure was being performed for work requiring clearances to safely control hazardous energy and training was completed as required. However, we determined (1) some clearances were not issued in accordance with all procedural requirements, and (2) audits performed were not in compliance with the clearance procedure. We also identified an opportunity for improvement related to the alignment of clearance procedures.

SOME CLEARANCES ISSUED WERE NOT IN COMPLIANCE WITH ALL PROCEDURAL REQUIREMENTS

Our review of clearances found some were not issued in compliance with all procedural requirements. Specifically, we found (1) incomplete clearance requests and (2) PAEs did not always sign CPALs.

Incomplete Clearance Requests

Each person identifying a need for a clearance on equipment to perform maintenance, servicing, and/or modification work is required to submit a clearance request, which is submitted with the applicable work order through Maximo. NPG-SPP-10.2 requires certain information to be included on the clearance request, such as the equipment to be cleared, a description of the work to be performed, etc. The procedure also requires the Operations Department's review and approval of the clearance request to be documented in Maximo. We tested 116 clearance requests associated with the 66 clearances sampled and found (1) 34 of the clearance requests were missing one or more required elements, (2) 1 clearance did not have a clearance request, and (3) 1 clearance request did not have Operations' review and approval documented in Maximo.

⁸ Audits reviewed for BFN, SQN, and WBN were dated June 25, 2019, February 27, 2019, and January 16, 2019, respectively.

⁹ According to NPG-SPP-10.2, reviews are to be performed on a monthly basis to identify clearances near or greater than 60 days old to ensure completion of reviews required by 10 Code of Federal Regulations sections 72.48 or 50.59, as applicable.

¹⁰ The monthly reviews obtained from BFN, SQN, and WBN were dated November 4, 2019, October 8, 2019, and October 30, 2019, respectively.

PAEs Did Not Sign CPALs

CPALs identify all AEs working under a specific clearance and Clearance Holders Lists identify PAEs holding the clearance. According to NPG-SPP-10.2 and TVA-TSP-18.613, the PAE holding a clearance should sign onto both the Clearance Holders List and the CPAL regardless of whether the PAE delegates the work to others. Our review of CPALs for 127 clearances found 67 of those clearances contained CPALs that had not been signed by the PAEs holding the clearance. According to Safety and Nuclear personnel, clearances are locked (i.e., cannot be revised or released) in the system when a PAE signs onto the Clearance Holders List and, as such, a second sign-on by the PAEs onto the CPAL is unnecessary as it does not provide additional protection. Therefore, TVA plans to remove this requirement from the clearance procedures.¹¹

CLEARANCE AUDITS WERE NOT IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS

Clearance audits are conducted annually to ensure employees are knowledgeable of the clearance process and utilize the required clearance when performing servicing, maintenance, or modification on equipment. Our review of the most recently performed clearance audits found they were not completed in accordance with procedural requirements. Specifically, we found (1) two audits contained a clearance that had been written and/or issued by the same individuals auditing them and (2) two audits contained incomplete and incorrect documentation related to interviews conducted during the audit.

Clearances Audited by the Individuals Who Issued Them

NPG-SPP-10.2 and TVA-TSP-18.613 specify the individual performing the annual clearance audit must not have written or issued the clearances being audited. However, our review of the annual clearance audits found two of the three included a clearance that had been written and/or issued by the same individual performing the audit. If auditor independence is impaired, so could the effectiveness of the clearance audits being performed.

Incomplete and Incorrect Audit Interview Documentation

According to NPG-SPP-10.2 and TVA-TSP-18.613, clearance audits should include interviews with employees regarding the specific clearance under audit to ensure they understand the limitations of a tagout system and their responsibilities established in the clearance procedure. The procedures also require a listing of employees interviewed during the audit to be included in the audit documentation. However, one audit we reviewed contained no evidence that employees had been interviewed. Additionally, another audit listed two employees as the QEs interviewed for a specific clearance, but the clearance system logs indicate that these employees never worked on the clearance in any capacity.

¹¹ TVA-TSP-18.613 and NPG-SPP-10.2 were under revision at the time of our evaluation.

OPPORTUNITY FOR IMPROVEMENT

While performing our evaluation, we identified an opportunity for improvement related to the alignment of clearance requirements defined in TVA-TSP-18.613 and NPG-SPP-10.2. We noted some discrepancies between the two procedures. For example, TVA-TSP-18.613 requires clearance requests to be submitted at least 3 days in advance of the work needing to be performed, while NPG-SPP-10.2 does not contain this requirement. The clearance procedures should be aligned to ensure clear requirements are established to enable correct execution of the clearance process.

RECOMMENDATIONS

We recommend the Senior Vice President, Nuclear Operations:

- Reinforce the importance of submitting complete clearance requests with all required information and obtaining and documenting Operations' approval in Maximo.
- Implement a control to verify the independence of those performing annual clearance audits.
- Reinforce the importance of completing and documenting all audit activities required by the clearance procedure.
- Review the Nuclear and Safety clearance procedures (in conjunction with the Director, Safety and Enterprise Improvement) to ensure the requirements are in alignment.

TVA Management's Comments – The Senior Vice President, Nuclear Operations, accepted the conclusions and recommendations in this report and indicated corrective actions would be completed by June 30, 2020. In addition, the Director, Safety and Enterprise Improvement, provided informal comments, which indicated agreement with the findings. See the Appendix for TVA Nuclear Operation's complete response.

March 16, 2020

David P. Wheeler, WT 2C-K

RESPONSE TO REQUEST FOR COMMENTS - DRAFT EVALUATION 2019-15678 -
NUCLEAR CLEARANCE PROCESS

In accordance with the request dated February 27, 2020, TVA has reviewed the subject draft report 2019-15678 and accepts the evaluation conclusions and recommendations.

In the draft report, OIG made four specific recommendations as shown below. We anticipate addressing these by the dates indicated.

- Reinforce the importance of submitting complete clearance requests with all required information and obtaining and documenting Operations' approval in Maximo (June 26, 2020)
- Implement a control to verify the independence of those performing annual clearance audits (June 26, 2020)
- Reinforce the importance of completing and documenting all audit activities require by the clearance procedure (June 26, 2020)
- Review the Nuclear and Safety clearance procedures (in conjunction with the Director, Safety and Enterprise Improvement) to ensure the requirements are in alignment (June 30, 2020)

I'd like to thank you for the work performed by your staff. The recommendations identified provide improvement opportunities which support our vision of top industry performance.



Danny G. Bost
Senior Vice President, Nuclear Operations
LP 4A-C

DGB:LWH:JLA

cc: Steven M. Bono
David M. Czufin
James R. Dalrymple
Robertson D. Dickens
Lucia W. Harvey
Sherry A. Quirk
Matthew M. Rasmussen
Timothy S. Rausch
Ronald R. Sanders II
Anthony L. Williams IV
OIG File No. 2019-15678