



Memorandum from the Office of the Inspector General

February 14, 2020

Laura J. Campbell
James R. Dalrymple

**REQUEST FOR MANAGEMENT DECISION – EVALUATION 2019-15647 –
TRANSMISSION, POWER SUPPLY AND SUPPORT – CRITICAL SPARE PARTS**

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 Christopher E. Sheets, Senior Auditor, at (865) 633-7362 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)

CES:FAJ

Attachment

cc (Attachment):

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OIG File No. 2019-15647



Office of the Inspector General

Evaluation Report

To the Vice President, Supply Chain and
the Senior Vice President, Transmission,
Power Supply and Support

TRANSMISSION, POWER SUPPLY AND SUPPORT – CRITICAL SPARE PARTS

Evaluation Auditor
Christopher E. Sheets

Evaluation 2019-15647
February 14, 2020

ABBREVIATIONS

SPP	Standard Programs and Processes
TGRR	Transmission Grid Resiliency Review
TRANS	Transmission
Transmission	Transmission, Power Supply and Support
TVA	Tennessee Valley Authority

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MEMORANDUM DATED FEBRUARY 11, 2020, FROM JAMES R. DALRYMPLE
AND LAURA J. CAMPBELL TO DAVID P. WHEELER



Evaluation 2019-15647 – Transmission, Power Supply and Support – Critical Spare Parts

EXECUTIVE SUMMARY

Why the OIG Did This Evaluation

The Tennessee Valley Authority manages over 16,200 miles of transmission lines and 500 substations throughout the Tennessee Valley by (1) ensuring constant equipment reliability, (2) monitoring, detecting, and responding to physical or cybersecurity threats, and (3) recovering from damage if an event occurs. The goal of the Tennessee Valley Authority's Transmission, Power Supply and Support (Transmission) group is to provide reliable power and reduce the amount of recovery time after events that may occur on the transmission system.

Due to the importance of having critical spare parts available to reduce the amount of recovery time after events that may affect the transmission system, we conducted an evaluation to determine if Transmission is effectively managing critical spare parts. Transmission manages its critical spare parts as storm restoration material.

What the OIG Found

We determined storm restoration material could be managed more effectively. Specifically, we found (1) discrepancies between storeroom inventory counts and Maximoⁱ data, (2) storm restoration materials were not properly identified, and (3) storm restoration material reorder points were incorrect. Additionally, Transmission's Web site contained out-of-date and incomplete data.

What the OIG Recommends

We recommend the Vice President, Supply Chain and Senior Vice President, Transmission, address issues related to inventory, storm restoration material identification, and documentation. Our detailed recommendations are listed in the body of this report.

TVA Management's Comments

In response to our draft report, TVA management agreed with the recommendations in the report. See the Appendix for TVA management's complete response.

ⁱ Maximo is TVA's work management system.

BACKGROUND

With over 16,200 miles of transmission lines and 500 substations throughout the Tennessee Valley, grid resiliency¹ is an important area of focus for the Tennessee Valley Authority (TVA). TVA's grid resiliency plan focuses on three areas that:

- Ensure constant equipment reliability.
- Monitor, detect, and respond to physical or cybersecurity threats.
- Recover from damage if an event occurs.

TVA's Transmission, Power Supply and Support (Transmission) manages its critical spare parts and components as storm restoration material. Transmission defines storm restoration material as items held in inventory that must be immediately available to restore the transmission system. It developed Transmission (TRANS) Standard Programs and Processes (SPP) 09.022, *Storm Restoration Material Program*, to define, identify, procure, store, maintain, and utilize inventory² to mitigate the impact of major events, such as storms or failure of equipment. This inventory includes critical material with long lead times held to mitigate risk.

The purpose of TRANS-SPP-09.022, among other things, is to formalize a method for Transmission to (1) identify transmission components required for storm restoration, (2) determine the right amount to maintain in inventory, and (3) reduce the amount of recovery time after events that may occur on the transmission system.

Since 2017, Transmission has (1) established a \$13 million budget to bolster inventory through 2020, (2) established a second location for storm restoration material inventory storage, and (3) formalized storm restoration material procedures and processes. Due to the importance of the availability of storm restoration material to reduce the amount of recovery time after events that may affect the transmission system, we conducted an evaluation of Transmission's critical spare parts.

OBJECTIVE, SCOPE, AND METHODOLOGY

Our objective was to determine if Transmission is effectively managing critical spare parts.³ The scope of our evaluation included policies, procedures, and inventory related to storm restoration material. To achieve our objective, we:

¹ Grid resiliency refers to the transmission system's ability to bounce back quickly from disruptions.

² TVA's Supply Chain administratively owns spare parts records and works with Transmission groups to procure needed parts and equipment.

³ Transmission manages its critical spare parts as storm restoration material.

- Interviewed Transmission and Supply Chain personnel and reviewed the following TVA SPPs to gain an understanding of storm restoration material and the inventory process:
 - TRANS-SPP-09.022, *Storm Restoration Material Program*
 - TVA-SPP-04.021, *TVA Inventory Management Process*
- Interviewed nine Transmission personnel to identify any issues related to storm restoration material or the inventory process.
- Requested all available documentation from Site Inventory Review Committee meetings to gain a better understanding of storm restoration material program processes, item classifications, and storage allocations.
- Analyzed instances in which the storm restoration material quantity on hand was less than the reorder point.
- Observed storeroom and inventory yard conditions at the Muscle Shoals and Hartsville distribution centers and performed physical inventory counts to determine if the quantities on hand matched the quantities listed in Maximo.⁴ Of the storm restoration material in inventory (514 line items) on June 1, 2019, we:
 - Judgmentally selected all storm restoration material stored at Hartsville (18 line items) that had a quantity balance above zero.
 - Judgmentally selected 11 line items at Muscle Shoals in which item quantities were more than five units below the established reorder points.
 - Randomly selected 79 line items from the remaining 425⁵ storm restoration material line items stored at Muscle Shoals.
- Reviewed the Transmission Grid Resiliency Review (TGRR) Web site to determine if information was current and required documentation was available.

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 storm restoration material could be managed more effectively. Specifically, we found (1) discrepancies between storeroom inventory counts and Maximo data, (2) storm restoration materials were not properly identified, and (3) storm restoration material reorder points were incorrect. Additionally, TVA's TGRR Web site contained out-of-date and incomplete data.

⁴ Maximo is TVA's work management system.

⁵ We excluded 60 line items from the population due to zero quantity balances.

MANAGEMENT OF STORM RESTORATION MATERIAL COULD BE IMPROVED

We determined the management of storm restoration material could be improved by (1) eliminating inventory discrepancies, (2) identifying all storm restoration materials, and (3) correcting reorder points.

Inventory Count Did Not Match Maximo Data

TRANS-SPP-09.022, *Storm Restoration Material Program*, states Supply Chain should ensure storm restoration material inventory shown in Maximo is accurate. We performed physical counts of 103 line items⁶ at Muscle Shoals and Hartsville and found 7 items that did not match the count displayed in Maximo. All discrepancies between the actual item quantity on hand and the quantity listed in Maximo occurred at the Muscle Shoals storeroom on July 16, 2019. See Table 1 below for details.

Storm Restoration Material Count Discrepancies

Item Number	Item Description	Maximo Count	Physical Count	Dollar Variance
AHR344Q	Conductor Spacer	108	84	(\$1,341)
AMR648B	Compression Joint	27	25	(\$137)
ANR048L	Compression Joint	105	99	(\$415)
AXH361P	Suspension Assembly	10	11	\$0 ⁷
BXE456L	Anchor Assembly	668	666	(\$138)
CRP981H	Steel Pole	17	18	\$3,108
RP984X	Steel Pole	19	21	\$8,222

Table 1

Inaccurate quantities of storm restoration material recorded in Maximo could affect both the timing in which an item is reordered and the ability to fully respond to major events if inventory has a lower balance than expected.

Storm Restoration Material Not Properly Identified

During our site walkdowns at Muscle Shoals and Hartsville, we identified items (1) not properly classified as storm restoration material and (2) tagged incorrectly.

Unidentified Storm Restoration Material

TRANS-SPP-09.022 states Transmission Asset Management is to work with Transmission Engineering and Construction to identify critical components for the transmission system. During our site walkdown and inventory count at Hartsville, we observed an item stored in the same location as other storm restoration material components but classified as a spare part. Supply Chain reviewed the

⁶ We selected 108 line items for inventory testing; however, we (1) did not count 6 items because the item balance in Maximo was zero at the time of our site visits and (2) counted an additional item not originally selected because this item was added to Hartsville's inventory. Therefore, we counted 103 storm restoration line items.

⁷ Average item value is \$0.01.

item, determined it should be classified as storm restoration material, and reclassified the item accordingly.

Storm Restoration Material Tagged Incorrectly

TRANS-SPP-09.022 states storm restoration items should have up-to-date item numbers, descriptions, part numbers, and vendor information. During our site walkdown and inventory count at Muscle Shoals, we observed a tower leg assembly that displayed conflicting item numbers. Different item numbers were either painted directly on the assembly or printed on a red tag attached to the assembly. Supply Chain personnel determined the tag attached to the assembly displayed the incorrect item number. Supply Chain stated the tag was subsequently removed from the item.

Reorder Points Were Incorrect

TRANS-SPP-09.022, states any material utilized for storm restoration (or other purposes) will be immediately reordered and placed in inventory. Transmission's June 1, 2019, inventory records included 43 storm restoration items that had a negative reorder point.⁸ Supply Chain personnel stated it was appropriate for items that can be housed in multiple storerooms to include this designation to indicate the item should not be reordered at a specific storeroom. However, we found items that displayed negative reorder points for both Muscle Shoals and Hartsville storerooms. Subsequently, Supply Chain personnel updated 23 items from a negative reorder point and stated the remaining items with negative reorder points would prevent these items from being reordered at the designated storeroom.

ADDITIONAL INFORMATION

According to TRANS-SPP-09.022, TVA's TGRR Web site should contain up-to-date transmission documents related to emergency reports, restoration material inventory, stocking plans, grid resiliency material, and substation material. Our review of the Web site found (1) several documents did not appear on the site or were outdated and (2) incomplete data. Examples of issues identified include:

- The *SK-Grid Resiliency Material* document was dated August 5, 2016. (Transmission subsequently updated this document on January 6, 2020.)
- The Major Equipment section of the Web site contained incomplete data.
- The *Storm Restoration Material Inventory for Light-Duty Steel Poles* did not appear on the Web site as required.⁹
- The Severe Storms section of the Web site included outdated SPPs and contract sourcing information.

⁸ A negative reorder point indicates an item should not be reordered.

⁹ The document was later added to the Severe Storms section of the TGRR Web site.

Since the TGRR Web site should be the central location for documents, lessons learned, and event data, the use of inaccurate or outdated information could lead to an improper approach to mitigating vulnerabilities of TVA's transmission system.

RECOMMENDATIONS

We recommend the Vice President, Supply Chain, verify the accuracy of the inventory data in Maximo.

We recommend the Senior Vice President, Transmission, (1) verify storm restoration material is properly identified and (2) update the TGRR Web site and establish a review frequency for documentation required by the SPP.

TVA Management's Comments – TVA management agreed with the recommendations in this report. See the Appendix for TVA management's complete response.

February 11, 2020

David P. Wheeler, WT 2C-K

RESPONSE TO REQUEST FOR COMMENTS – DRAFT EVALUATION 2019-15647 –
TRANSMISSION, POWER SUPPLY & SUPPORT – CRITICAL SPARE PARTS

Transmission, Power Supply & Support (TPS&S) and Supply Chain (SC) greatly appreciates the efforts put forth by Chris Sheets and the Office of Inspector General to conduct this evaluation of Transmission Critical Spare Parts. The critical spare parts program (also referred to as the Storm Restoration Material Program) addresses the need to have transmission line material and substation equipment available after a natural disaster or other damaging event. This evaluation has provided valuable input to improve processes and achieve a sustainable program.

TPS&S and SC agree with the recommendations of ensuring the accuracy of the inventory data in Maximo, verifying storm restoration material is properly identified, and updating the Transmission Grid Resiliency Review website while establishing a review frequency for documentation required by TRANS-SPP-09.022. The OIG report also mentions that reorder points were incorrect for some storm restoration material and this will be addressed, as well.

The recommendations from this evaluation will help improve and maintain a critical spare parts program that will allow TPS&S to respond quickly to urgent needs and ultimately bring greater reliability to the Transmission system.

Thank you for the opportunity to review and respond to the evaluation. If you have further questions, please let us know.



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