



Memorandum from the Office of the Inspector General

July 11, 2011

Tracy A. Flippo, MR 5K-C

REQUEST FOR FINAL ACTION – AUDIT 2010-13280 – REVIEW OF THE
TRANSMISSION LINE MAINTENANCE PROGRAM

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 within one year from the date of this memorandum when final action is complete.

Information contained in this report may be subject to public disclosure. Please advise us of any sensitive information in this report that you recommend be withheld.

If you have any questions, please contact Scott M. Norris, Auditor, at (865) 633-7331 or Lisa H. Hammer, Director, Financial and Operational Audits, at (865) 633-7342. We appreciate the courtesy and cooperation received from your staff during the audit.

Robert E. Martin

Robert E. Martin
Assistant Inspector General
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Attachment

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OIG File No. 2010-13280



Office of the Inspector General

Audit Report

To the Vice President,
Transmission Operations
and Maintenance

REVIEW OF THE TRANSMISSION LINE MAINTENANCE PROGRAM

Audit Team
Scott M. Norris
Amy R. Rush
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Audit 2010-13280
July 11, 2011

ACRONYMS AND ABBREVIATIONS

| | |
|-------|--|
| ALS | Applied Line Services |
| ECATA | Environmental Compliance and Awareness Training Assessment |
| ETAT | Electronic Training Assessment Tool |
| kV | Kilovolts |
| NERC | North American Electric Reliability Council |
| OIG | Office of the Inspector General |
| PMTM | Project Manager for Transmission Maintenance |
| PSO | Power System Operations |
| ROW | Right-of-Way |
| RRO | Regional Reliability Organization |
| TOM | Transmission Operations and Maintenance |
| TSC | Transmission Service Center |
| TVA | Tennessee Valley Authority |

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MEMORANDUM DATED JUNE 30, 2011, FROM TRACY A. FLIPPO TO
ROBERT E. MARTIN

EXECUTIVE SUMMARY

Tennessee Valley Authority (TVA) owns and operates one of the largest transmission systems in North America, serving some 9 million residents spanning portions of seven states. The TVA transmission system is comprised of approximately 260,000 acres of transmission rights-of-way (ROW), 15,900 circuit miles of transmission line, and 102,200 transmission line structures. TVA's transmission system moves electric power from the generating plants to distributors of TVA power and to industrial and federal customers across the region. According to TVA, in fiscal year 2010 the TVA system delivered its eleventh straight year of 99.999 percent reliability.

Ensuring the reliability of the TVA transmission system is the responsibility of TVA's Power System Operations (PSO) organization. More specifically, PSO's Transmission Operations and Maintenance (TOM) and Applied Line Services organizations are responsible for the inspection and maintenance of various aspects of the transmission system.

As part of the Office of the Inspector General's fiscal year 2010 audit plan, we reviewed the inspection and maintenance programs for transmission lines/structures and ROW. The audit objective was to evaluate the adequacy and effectiveness of the programs.

Based on our review, we determined that the transmission line inspection and maintenance program is adequate and effective. However, some potential areas of improvement were identified. Specifically, we identified (1) instances in which transmission lines were not assigned a preventive maintenance inspection interval, (2) improvements that could be made to the manual and system documentation to allow for recording of inspection results and trending of recurring maintenance issues, and (3) improvements that could be made in scheduling preventive maintenance inspections of tower lighting.

We recommend that the TOM organization:

- Ensure all lines are assigned a preventive maintenance inspection interval in Maximo.ⁱ Also, periodically reconcile all transmission locations loaded into Maximo to all transmission locations that have been assigned a preventive maintenance inspection interval in Maximo.
- Update the line maintenance manual to state that the Record of Transmission Line Defects form should be completed for all preventive maintenance inspections even if deficiencies are not identified. This would provide a trail of evidence that the inspection was performed and may increase the accountability of those performing the inspections.

ⁱ Maximo is IBM software that consolidates TVA's work management, supply chain, financial management, and corrective action program data into a single repository.

- Emphasize to Transmission Service Center personnel that the Record of Transmission Line Defects form should be retained in accordance with the PSO Records Schedule.
- Either enforce the requirement noted in the line maintenance manual to submit the Record of Transmission Line Defects form to Line Maintenance or update the line maintenance manual to eliminate the requirement to more accurately reflect the process that is in place.
- Revise Maximo to require (1) the priority code field to be manually populated when generating a corrective maintenance work order and (2) that problem, cause, and remedy code fields are populated when closing a corrective maintenance work order.
- Implement a process to ensure tower lights are inspected at the interval required by the line maintenance manual.

TVA management generally agreed with our recommendations and has taken, or is taking, actions to address these recommendations. We revised the report as necessary based on those comments. See the Appendix for TVA's complete response.

BACKGROUND

Tennessee Valley Authority (TVA) owns and operates one of the largest transmission systems in North America, serving some 9 million residents spanning portions of seven states. The TVA transmission system is comprised of approximately 260,000 acres of transmission rights-of-way (ROW), 15,900 circuit miles of transmission line, and 102,200 transmission line structures. TVA's transmission system moves electric power from the generating plants to distributors of TVA power and to industrial and federal customers across the region. According to TVA, in fiscal year 2010 the TVA system delivered its eleventh straight year of 99.999 percent reliability.

Ensuring the reliability of the TVA transmission system is the responsibility of TVA's Power System Operations (PSO) organization. More specifically, PSO's Transmission Operations and Maintenance (TOM) and Applied Line Services (ALS) organizations are responsible for the inspection and maintenance of various aspects of the transmission system.

Transmission Operations and Maintenance Organization

The TOM organization is responsible for the inspection and maintenance of the transmission lines and various structures, such as poles and towers, which comprise TVA's transmission system. The organization's inspection and maintenance program cost approximately \$15 million in fiscal year 2010. Within the TOM organization, there are 15 Transmission Service Centers (TSC) located across the TVA service area. Each TSC employs one or more crews that are responsible for performing the preventive maintenance inspections and corrective maintenance activities.

The inspections are performed to identify defects that could cause an interruption or an unsafe condition for employees or the public. The inspections are executed in a variety of ways to accomplish this and are as follows:

- Foot Patrol inspections consist of walking the entire transmission line segment¹ and visually inspecting the conductors, structures, and ROW.
- Minimal Climbing inspections consist of sounding and boring wood poles to identify decay and climbing structures as required to investigate potential or reported defects.
- Climbing inspections consist of climbing structures to perform detailed visual inspections for defects including sounding and boring wood poles and wood crossarms for decay.
- Routine Aerial inspections consist of flying the entire transmission line segment for visual inspection. If an item looks questionable and warrants

¹ Transmission lines are segmented because a single line may span the responsible area of more than one inspection crew. An inspection crew inspects the segment of a line that is within the crew's responsible area.

closer inspection, the item is reported so it can be inspected by maintenance personnel thereafter.

- Aerial Infrared inspections consist of flying the lines with a contracted inspector that uses infrared sensing equipment to identify and report components with elevated temperatures, which may indicate a need for maintenance.

The inspections are performed at a specified frequency to identify the need for corrective maintenance, to plan maintenance activities accordingly, and to protect TVA's easement rights. In general, this frequency is based on multiple criteria and varies based on (1) the types of structures² and (2) the types of feed.³ The inspection frequency is summarized in the table below. The table represents the minimum inspection interval that is required by TOM; however, transmission lines and structures may be inspected more often than the table dictates. Conversely, TOM allows a grace period⁴ for completing the required inspections outside of the specified frequency.

| Line Structure | Critical | Interval | Noncritical | Interval |
|--|--|---|--|--|
| Wood Pole Wood Crossarm | Aerial Patrol Climbing Inspection* Foot Patrol* Aerial Infrared | 6 Mo. 4 Yr. 4 Yr. 4 Yr. | Aerial Patrol Climbing Inspection Aerial Infrared | 6 Mo. 4 Yr. 4 Yr. |
| Wood Pole Steel Crossarm Epoxy Crossarm | Aerial Patrol Minimal Climbing Aerial Infrared | 6 Mo. 4 Yr. 4 Yr. | Aerial Patrol Minimal Climbing Aerial Infrared | 6 Mo. 4 Yr. 4 Yr. |
| Steel/Concrete Pole Steel Tower | Aerial Patrol Aerial Infrared Foot Patrol/Climbing | 6 Mo. 4 Yr. 4 Yr. | Aerial Patrol Aerial Infrared Foot Patrol/Climbing | 6 Mo. 4 Yr. 4 Yr. |
| De-energized Lines Wood Pole Steel Pole Steel Tower | N/A | N/A | For road crossings or other areas that may be a danger to the public | 1 Yr. |
| Tower Lighting - Monitored AC powered Solar powered | Annual Annual | 12 Mo. 12 Mo. | Annual Annual | 12 Mo. 12 Mo. |
| Tower Lights- Not monitored AC powered AC powered Solar powered Solar powered | N/A Visual Annual Visual Annual | N/A 3 Mo. 12 Mo. 6 Mo. 12 Mo. | See Section 2.10-1 Visual Annual Visual Annual | 3 Mo. 12 Mo. 6 Mo. 12 Mo. |

*Note: Scheduled so that one of each inspection type is performed every two years. **Table 1**

² Structures can be made of wood or steel.

³ A line may be a radial feed or dual feed. A radial feed line is the only path by which electric power can flow to the customers tied into that line; therefore, when a radial feed line is interrupted, the customers tied into that line will be without power. TOM classifies these lines as "critical." A dual feed line means there is more than one path by which electric power can flow to the customers tied into that line; therefore, when a dual feed line is interrupted, power can generally be restored through switching. TOM classifies these lines as "noncritical."

⁴ TOM allows a grace period for the inspection that is equal to one quarter of the required interval. For example, if a transmission line segment is on a 48-month inspection frequency, then the grace period is 12 months. A line inspection is not considered late until the grace period has lapsed.

The TOM Transmission Support team reviews the design of each segment of a transmission line, considering the types of structures and types of feed, to determine the frequency with which the line should be inspected. The team then assigns the determined preventive maintenance inspection frequency to the line segment in the Maximo work management system. Once the preventive maintenance frequency has been assigned, each TSC is responsible for scheduling and performing inspections accordingly.

Corrective maintenance needs identified during a preventive maintenance inspection are recorded on a hard copy Record of Transmission Line Defects form⁵ that is required to be retained for a period of four years after the inspection or correction of the defect. Corrective maintenance needs for a specific job will have a work order generated in Maximo by the TSC's Project Manager for Transmission Maintenance (PMTM). Maximo allows for corrective maintenance work orders to be assigned a priority code that can be used to prioritize the corrective maintenance needs and to develop a schedule to complete these activities. The PMTM assigns the priority code based on discussions with the TSC crew regarding the type of corrective maintenance that is needed. Once the corrective maintenance is completed, the PMTM changes the work order to a "closed" status.

Applied Line Services Organization

The ALS organization is responsible for the inspection and maintenance of the ROW through which the transmission lines and structures pass. Within the ALS organization, there are approximately 13 specialists that are responsible for inspecting the ROW and coordinating contract workers to perform maintenance on the vegetation growing on the ROW. The objective of the program is to prevent vegetation-related outages by inspecting and maintaining the undergrowth on the ROW as well as the buffer zone and danger trees alongside the ROW.

The audit team did not include details of the ALS processes here because they are subject to change due to a vegetation-related outage that we detail below in the Objective, Scope, and Methodology section of this report.

Training

The TOM and ALS organizations require each of their team members to complete certain training courses at specified intervals. The majority of training requirements for each fiscal year are determined through the Electronic Training Assessment Tool (ETAT) and the Environmental Compliance and Awareness Training Assessment (ECATA). Both the ETAT and ECATA contain a list of questions that are answered for various crafts. If the answer to a question is "yes" for a particular craft, then those team members are required to complete the training course(s) that correspond to that question as listed in the ETAT and

⁵ Previously, TOM utilized an automated inspection tool that rendered the paper inspection forms obsolete. Subsequently, TOM reverted back to paper inspection forms after a system change; however, the Line Maintenance Manager stated that TOM is currently testing a new automated inspection tool which, if approved, will once again render the paper forms obsolete.

ECATA. There are also general training courses such as Continuity of Operations and Ethics that are required in addition to the courses noted in the ETAT and ECATA.

Defined Risks

In the July 30, 2009, Enterprise Risk Management Update, TVA defined two risks, Significant Equipment Failures and Natural Disaster, associated with transmission line inspection and maintenance. Significant Equipment Failures is defined as equipment failures and forced outages due to aging lines, substations, communications/control system equipment, and end of life issues with support applications, infrastructure, and cyber security. TVA classified the risk as "medium" in the short term, increasing to "high" within the next ten years. Natural Disaster is defined as significant weather events such as widespread tornadoes, ice storms, and flooding causing major outages and property damages and the associated restoration of substations, transmission lines, and structures. TVA classified the risk as "high"; however, we noted the risk to be inherent.

OBJECTIVE, SCOPE, AND METHODOLOGY

As part of the Office of the Inspector General's fiscal year 2010 audit plan, we reviewed the inspection and maintenance programs for transmission lines/structures and ROW. The audit objective was to evaluate the adequacy and effectiveness of the programs.

To achieve our objective, we:

- Obtained and reviewed the TOM line maintenance manual for information regarding the policies and procedures applicable to transmission line inspections and maintenance.
- Interviewed TOM personnel, including the Transmission Support Manager, the Line Maintenance Manager, various TSC Managers, PMTMs, and Line Foremen to obtain information related to the transmission line inspection and maintenance processes.
- Statistically selected a sample of 49 line segments from a total line segment population of 3,488 in order to review the documentation of preventive maintenance inspections maintained by the TSCs, including the Record of Transmission Line Defects form.
- Visited six of seven judgmentally selected TSCs to obtain documentation for the sample mentioned above and to conduct aforementioned interviews. We obtained the documentation via e-mail for the seventh TSC.⁶ There are 15 TSCs within the TOM organization.
- Interviewed a PSO Lineman Instructor and a TOM Area Manager to obtain information related to the training provided to those conducting transmission

⁶ We selected the TSCs based on those having the highest or second highest number of statistically sampled line segments in their respective areas.

line inspections and maintenance. During testing, we determined there is no process in place for maintaining complete records of prior years' training requirements. As such, we were unable to perform testing to determine whether Linemen and ROW Specialists completed required training in prior years. The current fiscal year, at the time of testing, had not concluded; therefore, those training records were not addressed in our fieldwork.

- Interviewed the PSO Environmental Programs Manager and a TOM Environmental/Easement Tech to obtain information related to the environmental stewardship responsibilities of those conducting transmission line inspections and maintenance.
- Interviewed a TOM Project Control Specialist to gain an understanding of work orders in Maximo and to obtain electronic work order data for analysis.
- Obtained and reviewed the vegetation maintenance program for information regarding the policies and procedures applicable to ROW inspections and maintenance.
- Interviewed the ALS Manager to obtain information related to the ROW inspection and maintenance processes and a vegetation-related outage on a 500 kilovolts (kV) transmission line that occurred in August 2010. Based on the information obtained in regard to the likelihood for process changes due to the August 2010 vegetation outage detailed below, the frequency and methods of ROW inspections and maintenance executed by the ALS organization were not addressed in our fieldwork.

In August 2010, TVA experienced a vegetation-related outage on a transmission line that operates at 500 kV. Transmission lines that operate at 200 kV or above are subject to a North American Electric Reliability Council reliability standard. The purpose of the standard is "to improve the reliability of the electric transmission systems by preventing outages from vegetation located on the transmission ROW and minimizing outages from vegetation located adjacent to ROW, maintaining clearances between transmission lines and vegetation on and along transmission ROW, and reporting vegetation-related outages of the transmission systems to the respective Regional Reliability Organizations (RRO) and the North American Electric Reliability Council (NERC)."⁷

According to ALS personnel, in an outage such as the one TVA experienced in August 2010, the reliability standard requires a mitigation plan, intended to reduce the likelihood of future similar outages, to be submitted to the RRO; in TVA's case, SERC Reliability Corporation. According to ALS management, the mitigation plan could significantly alter the processes and procedures of the ALS organization as they apply to inspections and maintenance.

We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and

⁷ Source: Standard FAC-003-1.

perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. We do not express an opinion on TVA's internal control structure because this audit was not designed to identify all material weaknesses in TVA's transmission line inspection and maintenance program. Although we did not test for compliance with laws and regulations, nothing came to our attention during the audit that indicated noncompliance with laws and regulations.

FINDINGS

We determined that the transmission line inspection and maintenance program is adequate and effective. Based on our review, we determined that the TOM organization has an inspection and maintenance process that is generally executed as designed. However, some potential areas of improvement were identified.

Specifically, we identified:

- Twelve transmission lines that had not been assigned a preventive maintenance inspection interval in Maximo and therefore were not scheduled for inspections.
- Improvements that could be made to the manual and system documentation to allow for recording of inspection results.
- Trending of recurring maintenance issues using problem codes from Maximo not being done; however, TVA management states that failure codes in the System Interruption Data provide information for trending of the most serious recurring maintenance issues.
- Improvements that could be made with scheduling preventive maintenance inspections of tower lighting.

Preventive Maintenance Scheduling

The TOM line maintenance manual provides the interval with which all transmission lines should receive a preventive maintenance inspection, and that interval is assigned to the line in Maximo. During the course of this audit, many TSC crews stated that they view the assigned interval in Maximo as the minimum requirement and that they may inspect lines more often than required because they are familiar with those that are prone to issues needing corrective maintenance.

The audit team identified 12 transmission lines that had been loaded into Maximo but did not have a preventive maintenance inspection interval assigned. The 12 lines were identified by reconciling the lines listed in the transmission line

index⁸ to a report provided by TOM that detailed the last inspection date recorded in Maximo for all lines.

As previously discussed in Table 1, the Transmission Support team determines the appropriate interval for each transmission line segment and assigns that interval to the line in Maximo. However, the process for assigning the intervals is manual, and these 12 lines were not assigned an interval when they were loaded into Maximo. According to the Line Maintenance Manager, a member of the Transmission Support team periodically performs tests for the TOM organization to detect anomalies such as this; however, these were not identified.

Each of the 12 lines was installed between the years 2007 and 2010, which means they are relatively new lines in TVA's transmission system. According to the Line Maintenance Manager, these 12 lines had not missed any preventive maintenance inspections due to their recent installation. According to the responsible TSC, one of those lines did immediately fall into the grace period however. Without having an inspection interval assigned, foot patrols, minimal climbing inspections, and climbing inspections would not have been conducted for these lines. During our audit, the Transmission Support team stated that they subsequently assigned the appropriate intervals; however, this was not verified by the audit team.

Inspection Documentation

According to the line maintenance manual and the PSO Records Schedule, preventive maintenance inspections are required to be documented using a Record of Transmission Line Defects form. The required retention of this paper form at the TSC is a period of four years after the inspection or correction of the defect. Deficiencies should be provided to Line Maintenance, with a follow-up copy of the inspection report sent to Line Maintenance after all significant corrections have been completed. Any minor defects not corrected should be noted, initialed, and dated on the correction report.

We requested the Record of Transmission Line Defects form for 49 sampled segments out of a total line segment population of 3,488. Forty-two, or 86 percent, of the 49 sampled segments did not have a Record of Transmission Line Defects form on file for the most recently completed preventive maintenance inspection. According to the Maximo data, 1 of the 42 segments was last inspected in May 2006, which was outside PSO's four-year retention requirement. According to the respective TSC Managers, the last inspection date recorded in Maximo for 11 of the sampled segments, including the one outside of the retention requirement, was prior to their tenure. Therefore, they could not determine why the form was not on file.

According to the TSC personnel, the inspection crews did not identify any defects in 29 of those inspections, several citing that steel structures generally do not

⁸ The index is a list of all transmission lines and structures that are maintained by TOM. At the time of the audit, there were 919 active transmission lines in the transmission line index.

have defects. The audit team verified in the transmission line index that 24 of these 29 segments contain only steel structures. Documentation of those inspection results was not generated because the line maintenance manual only states that a Record of Transmission Line Defects form must be completed to report deficiencies but does not specifically state that the form must be completed if there are no defects identified during the inspection. The absence of this form does not have a significant impact on subsequent inspections; however, the line maintenance manual does state that the previous inspection report should be reviewed prior to the current inspection.

According to the Line Maintenance Manager, the inspection forms are not being sent to Line Maintenance as the line maintenance manual requires. Prior to the implementation of an automated inspection tool, the inspection forms were provided as required but became obsolete with the automated system. Subsequent to a system change, TOM reverted back to paper inspection forms because the automated inspection tool was not compatible, and the process of providing those forms to Line Maintenance did not commence. Recurring maintenance issues may not be identified unless these forms are provided to Line Maintenance.

Codes on Corrective Maintenance Work Orders

Maximo allows corrective maintenance work orders to be tagged with priority, problem, cause, and remedy codes. The priority code represents the urgency of the maintenance issue, whereas the problem code is representative of the maintenance issue. A priority 1 or priority 2 is deemed essential by TOM. The cause and remedy codes are beneficial for identifying the source of and solution to the problem. However, TOM has not made these required fields in Maximo.

A TOM Project Control Specialist provided the audit team with work order data for analysis, which contained 355 corrective maintenance work orders that were dated calendar year 2010. We determined that 199, or 56 percent, of the 355 corrective maintenance work orders were not populated with a priority code. Work orders containing priority codes deemed essential by TOM, priority 1 and priority 2, are reviewed by area managers to determine if anything can be done to expedite the work. However, since 56 percent of the work orders reviewed did not have a priority code, it is difficult to determine if all work orders are being prioritized and if all essential work orders are being reviewed.

Of the 355 corrective maintenance work orders in our analysis, we identified 171 that were considered "closed." Of those, 161, or 94 percent, were not populated with a problem code. Based on the fact that 94 percent of the closed work orders did not have a problem code, we did not test the cause and remedy codes. The absence of the problem code makes trending of recurring corrective maintenance issues more difficult. In addition, the use of the cause and remedy codes would increase the effectiveness of the trending; however, TVA management states that failure codes in the System Interruption Data provide information for trending of the most serious recurring maintenance issues. Trending of recurring maintenance issues could prove beneficial in identifying

systemic problems and provide support needed to undertake large-scale maintenance projects.

Tower Lighting

A Federal Aviation Administration advisory circular stipulates that any temporary or permanent structure that exceeds an overall height of 200 feet above ground level should normally be marked and/or lighted. According to the Line Maintenance Manager, TVA has lights on 68 structures that either meet the 200-foot criterion or are in close proximity to an aircraft landing area. According to one TSC Manager interviewed by the audit team, a safety risk may exist with the lighting of the TVA towers. The line maintenance manual requires a 3-, 6-, or 12-month inspection frequency on tower lights, depending on the type. However, the TSC Manager stated that (1) tower lights are not included in Maximo to schedule preventive maintenance inspections, and (2) there are no automated systems to detect and warn appropriate personnel when the lights are not functioning properly. This information was confirmed with the Line Maintenance Manager who explained that TVA is currently pursuing a project to determine the cost associated with equipping all tower lights with monitoring systems to detect when the lights are not functioning properly and alarm systems to inform the appropriate personnel in that scenario.

RECOMMENDATIONS

We recommend that the TOM organization:

- Ensure all lines have been assigned a preventive maintenance inspection interval in Maximo. Also, periodically reconcile all transmission locations loaded into Maximo to all transmission locations that have been assigned a preventive maintenance inspection interval in Maximo.
- Update the line maintenance manual to state that the Record of Transmission Line Defects form should be completed for all preventive maintenance inspections even if deficiencies are not identified. This would provide a trail of evidence that the inspection was performed and may increase the accountability of those performing the inspections.
- Emphasize to TSC personnel that the Record of Transmission Line Defects form should be retained in accordance with the PSO Records Schedule.
- Either enforce the requirement noted in the line maintenance manual to submit the Record of Transmission Line Defects form to Line Maintenance or update the line maintenance manual to eliminate the requirement to more accurately reflect the process that is in place.
- Revise Maximo to require (1) the priority code field to be manually populated when generating a corrective maintenance work order and (2) that problem, cause, and remedy code fields are populated when closing a corrective maintenance work order.

- Implement a process to ensure tower lights are inspected at the interval required by the line maintenance manual.

MANAGEMENT'S RESPONSE AND OUR EVALUATION

TVA management stated that they agree with the facts found during the audit and has taken, or is taking, the following actions to address the above recommendations:

- The omitted preventive maintenances have been entered into Maximo for all 12 of the active line segments identified during the audit as not having a preventive maintenance inspection assigned. In addition, a Maximo query that identifies active or not-ready line segments without preventive maintenance inspections assigned in Maximo will be used at least quarterly to review Maximo for segments with missing preventive maintenance inspections. Further, the line maintenance manual will be updated to require Transmission Support personnel to verify that preventive maintenances are assigned to all active line segments quarterly.
- Relevant sections of the line maintenance manual are being revised to require that, if no discrepancies are identified, the inspection report should be completed showing "no discrepancies found" and retained in accordance with the PSO Records Schedule.
- The line maintenance manual will be revised to include the requirement that inspection reports be retained in accordance with the PSO Records Schedule.
- The line maintenance manual is being revised to eliminate the requirement for the Record of Transmission Line Defects form to be sent to Line Maintenance.
- A request has been made to the Enterprise Asset Management Governance Group to require that the priority code field in Maximo be populated when generating a corrective maintenance work order.
- TOM will request the Enterprise Asset Management Governance Group to require the problem, cause, and remedy code fields in Maximo be populated when closing a corrective maintenance work order.
- A new location classification with the appropriate specification fields for tower lights is being created for population in Maximo.

The Office of the Inspector General (OIG) agrees with the actions planned and taken by TVA management.

TVA management also provided other clarifications related to the OIG's use of the word "assets" versus "locations" when referring to transmission line facilities and how trending of recurring maintenance issues is currently being performed. We revised the report, as necessary, to address these comments.

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June 30, 2011

Robert E. Martin, ET 3C-K

COMMENTS ON DRAFT AUDIT 2010-13280 - REVIEW OF THE TRANSMISSION LINE
MAINTENANCE PROGRAM - COMMENTS

This memorandum is in reply to your request for comments on the DRAFT REVIEW OF THE TRANSMISSION LINE MAINTENANCE PROGRAM dated April 6, 2011. We appreciate the opportunity to provide comments to you concerning the recommendations of the audit. We do not disagree with the facts found during the audit. The few comments that we do not agree with are addressed respectively with TOM responses.

Office of the Inspector General (OIG) Finding 1

Twelve transmission lines that had not been assigned a preventive maintenance inspection interval in Maximo and therefore, were not scheduled for inspections.

Transmission Operations and Maintenance (TOM) Response

We do agree with the finding that 12 of approximately 3,500 transmission line segments did not have preventive maintenances assigned in Maximo. These were on relatively newly constructed segments or new segments resulting from a change to an existing segment. No inspections on these segments were late at the time of the audit, but could have been late if the omissions were not corrected.

OIG Recommendation 1

Ensure all lines have been assigned a preventive maintenance inspection interval in Maximo. Also, periodically reconcile all transmission assets loaded into Maximo to all transmission assets that have been assigned a preventive maintenance inspection interval in Maximo.

TOM Response

The transmission line facilities are classified as locations in Maximo and not assets. Where the term asset is used in the following discussion it refers to Maximo locations.

We agree that all transmission line assets required by the program to have periodic preventive maintenance inspections should have these inspections assigned in Maximo. We also agree that a periodic reconciliation should be performed to verify that the line assets required by the program to have a preventive maintenance inspection have a preventive maintenance inspection assigned in Maximo. Not all transmission line assets in Maximo are required to have preventive maintenance inspections assigned. Assets classified as Inactive or Not Ready do not have a preventive maintenance assigned. Also, only certain types of active line assets are required to have preventive maintenance inspections. Lines, structures, conductors, overhead ground wires, switches, etc., do not have separate preventive maintenance inspections assigned.

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The omitted preventive maintenances have been entered into Maximo for all 12 of the active line segments identified during the audit as not having a preventive maintenance inspection assigned. A query that identifies active or not ready line segments without preventive maintenance inspections assigned in Maximo has been developed and provided to Transmission Support (TS) employees. It is used at least quarterly to review Maximo for segments with missing preventive maintenance inspections. The link below initiates the report created by the query.

http://chaptpsnet.cha.tva.gov:8025/Analysis/PM/LocationsWithNoPMs_Segments.asp

A new section of the line maintenance manual addressing the preventive maintenance program has been drafted requiring TS to verify that preventive maintenances are assigned to all active line segments quarterly. This section will be published by October 1, 2011.

OIG Finding 2

Improvements that could be made to the manual and system documentation to allow for recording of inspection results.

TOM Response

We do agree that improvements could be made to the manual and system of inspection documentation.

OIG Recommendation 2

Update the line maintenance manual to state that the Record of Transmission Line Defects form should be completed for all preventive maintenance inspections, even if deficiencies are not identified. This would provide a trail of evidence that the inspection was performed and may increase the accountability of those performing the inspections.

We agree that there should be documentation that every preventive maintenance has been completed, even when no discrepancies are identified.

TOM Response

The sections of the line maintenance manual providing instructions for Routine Foot Patrols, Minimal Climbing Inspections, and Climbing Inspections have been revised to include the requirement that: If no discrepancies are identified, the inspection report should be completed showing "no discrepancies found" and retained in accordance with PSO records schedule. Drafts of these changes have been made and approved by the Line Solutions Team. These and revisions will be published by October 1, 2011.

OIG Recommendation 3

Emphasize to Transmission Service Center (TSC) personnel that the Record of Transmission Line Defects form should be retained in accordance with the PSO records schedule.

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We agree that inspection records should be retained in accordance with the PSO records schedule.

TOM Response

A revision of the line maintenance manual section, Inspection Program TOM-LMM-6-INSP-001, has been drafted and approved by the Line Solutions Team to include the requirement that inspection reports be retained in accordance with the PSO records schedule. This revision will be published by October 1, 2011.

OIG Recommendation 4

Either enforce the requirement noted in the line maintenance manual to submit the Record of Transmission Line Defects form (TVA 6320) to Line Maintenance or update the line maintenance manual to eliminate the requirement to more accurately reflect the process that is in place.

We agree that actual practices should be in accordance with requirements in the line maintenance manual or if the requirements in the line maintenance manual are not needed, they should be charged.

TOM Response

A revision of the line maintenance manual section, Inspection Program TOM-LMM-6-INSP-001, has been drafted and approved by the Line Solutions Team to eliminate the requirement for the Record of Transmission Line Defects form to be sent to Line Maintenance group. This revision will be published by October 1, 2011.

OIG Finding 3

Trending of recurring maintenance issues using problem codes from Maximo not being done.

TOM Response

We do agree that Maximo problem codes are not being used to trend recurring maintenance issues. However, we do not agree that trending of recurring maintenance issues is not being performed. Failure codes in the Service Interruption Data provide information for trending of the most serious recurring maintenance issues. TVA transmission system reliability metrics (11 consecutive years of 99.999 percent reliability) support that we have identified and corrected serious recurring maintenance issues.

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OIG Recommendation 5

Revise Maximo to require (1) the priority code field to be manually populated when generating a corrective maintenance work order, and (2) that problem, cause, and remedy code fields be populated when closing a corrective maintenance work order.

We agree that (1) the priority code field should be manually populated when generating a corrective maintenance work order, and (2) that problem, cause, and remedy code fields should be populated when closing a corrective maintenance work order.

TOM Response

A defect ticket has been turned to the Enterprise Asset Management (EAM) Governance Group to require that the priority code field be populated when generating a corrective maintenance work order. This action has been approved by the EAM Governance Group and will be effective after the July 2011 Maximo outage.

We plan to initiate a defect ticket to the EAM Governance Group for changes to Maximo that would require problem, cause, and remedy code fields be populated when closing a corrective maintenance work order by August 1, 2011. If approval by the EAM Governance Group, we will implement this action.

OIG Finding 4

Improvements could be made with scheduling preventive maintenance inspections of tower lightning.

TOM Response

We agree that there are opportunities for improvement in the scheduling of preventive maintenance inspections of tower lights.

OIG Recommendation 6

Implement a process to ensure tower lights are inspected at the interval required by the line maintenance manual.

We agree that that tower lighting inspections should be completed within the intervals defined in the line maintenance manual.

TOM Response

A new location classification with the appropriate specification fields for tower lights is being created for population in Maximo. The tower lighting data and preventive maintenances will be entered into Maximo by March 1, 2012.

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If you have any questions or wish to discuss our response, please contact John E. Peckinpaugh, Manager of Line Maintenance, at (423)-751-4980.

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