



Memorandum from the Office of the Inspector General

March 27, 2013

Robin E. Manning, MR 3H-C

REQUEST FOR FINAL ACTION – AUDIT 2012-14607 – TVA METER TESTING

Tennessee Valley Authority's (TVA) meter testing is a key internal control in its revenue recognition process after the move from end-use billing to wholesale billing. Since it is a key control, we performed an audit of the adequacy of TVA's process for testing meters that are owned and read by TVA. Our audit included (1) evaluating whether TVA meter testing policies and procedures meet or exceed identified industry standards, (2) verifying TVA tested meters within the applicable time limits in compliance with TVA meter testing policies and procedures, and (3) determining if TVA has processes in place to identify all meters used to capture data for wholesale billing purposes.

In summary, we determined TVA's meter testing (1) complies with TVA policies and procedures regarding timeliness and (2) meets identified industry standards. However, we noted areas for improvement in TVA's meter testing processes including (1) verification of meter constants,¹ (2) reconciliation of meter information in TVA systems, and (3) consistency of testing documentation.

We recommend TVA's Executive Vice President and Chief Energy Delivery Officer (1) formalize the policy for testing and/or documenting meter constants as part of preventative maintenance; (2) develop a process or procedure for reconciling meter information included in the Maximo, Itron Enterprise Edition (IEE), and Lodestar systems; and (3) develop guidelines for acceptable documentation of meter tests including information requirements, review, and maintenance. TVA management agreed with the audit findings and recommendations in the report and has taken or plans to take corrective actions. See the Appendix for TVA's complete response.

BACKGROUND

On April 1, 2011, TVA moved from distributors self-reporting customer usage (end-use system) to billing distributors based on actual energy and demand takings using meter readings (wholesale system). On September 30, 2012, TVA had wholesale power contracts with 155 municipalities and cooperatives. TVA also sold power to directly served customers, consisting primarily of federal agencies and customers with large or

¹ Meter constants, also referred to as meter multipliers, are the multipliers used to convert meter kilowatt hours readings to actual kilowatt hours.

unusual loads. In fiscal year 2012, the revenues generated from TVA's electricity sales were \$11.1 billion and accounted for virtually all of TVA's revenues.

In order for TVA to properly invoice its customers, TVA must have accurate meter readings. Inaccurate meter readings could cause a significant billing error. Recent examples include three inappropriately configured meters at Memphis Light, Gas and Water Division resulting in an overbilling of approximately \$24 million; and two meter issues at Nashville Electric Service resulting in an overbilling of approximately \$21 million and an underbilling of approximately \$3 million.

TVA-owned meters are tested as part of the preventative maintenance program. The meters are tested for functionality and accuracy. Adjustments are made if necessary, and the meter may be replaced if adjustments cannot be made to restore the required accuracy. TVA utilizes the Maximo system as the inventory system-of-record for its meters and to track actions taken as part of the preventative maintenance program. The IEE system contains information such as meter constants necessary to read the meter and actual meter readings. This information is communicated to the Lodestar system for use in billing customers.

Since meter testing is a key internal control in its revenue recognition process after the move from end-use billing to wholesale billing, we planned an audit to determine the adequacy of TVA's process for testing meters that are owned and read by TVA.

OBJECTIVE, SCOPE, AND METHODOLOGY

Our audit objective was to determine the adequacy of meter testing for meters owned and read by TVA (i.e., meters at delivery points to distributors, direct serve/federal/industrial customers, and distributor-served, end-use customers that have a TVA-owned meter) by:

- Evaluating whether TVA meter testing policies and procedures meet or exceed identified industry standards.
- Verifying TVA tested meters within the applicable time limits in compliance with TVA meter testing policies and procedures.
- Determining if TVA has processes in place to identify all meters used to capture data for wholesale billing purposes.

This audit was performed to determine the efficiency and effectiveness of TVA's meter testing internal control and as such, each of our audit findings is related to deficiencies in internal control in the context of the audit objectives and based upon the audit work performed. To achieve our objective, we:

- Reviewed TVA meter testing policies to obtain an understanding of the process, procedures, and controls related to TVA meter testing.
- Identified National Institute of Standards and Technology (NIST) standards related to the calibration of testing equipment. Compared TVA meter testing equipment policies

to NIST standards to determine whether TVA policies and procedures meet or exceed industry standards.

- Reviewed information pertaining to meter testing equipment to determine how TVA ensures the accuracy of meter testing.
- Reviewed a sample of meter testing reports to determine compliance with TVA meter testing policies and procedures related to timeliness. To determine compliance, we used ACL software to select a random sample of 73 TVA-owned revenue meters from the population of 1,450 active meters in the Maximo system sent to us on July 3, 2012. The results of the sample may be projected as statistical sampling was used.
- Compared meter inventories in TVA systems to determine completeness of meter inventory.
- Reviewed TVA policies and interviewed TVA personnel to determine how TVA ensures all revenue meters are tested and meter inventory is complete.

When evaluating the results of our audit work, we used both qualitative and quantitative factors when considering the significance of an item. The quantitative factor(s) considered in determining an item's significance were (1) percentage of meters tested outside the acceptable limits of accuracy, (2) percentage of meters not tested as scheduled, and (3) whether the dollar value of an error(s) exceeded .5 percent of TVA's 2011 revenue, which was about \$11.7 billion. The qualitative factor(s) considered in determining an item's significance were if (1) meter testing policies and procedures did not meet industry standards or (2) the item impacted system reliability, TVA revenue, or reputation by violating the meter testing policies and procedures.

The scope of the audit was TVA meter testing policies and procedures in place during our fieldwork, meter testing performed between April 2011 and September 2012, and industry standards. Fieldwork was conducted between July 2012 and December 2012. This performance audit was conducted in accordance with generally accepted government auditing standards. Those standards require we plan and 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 the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

FINDINGS

TVA's meter testing (1) complies with TVA policies and procedures regarding timeliness and (2) meets identified industry standards regarding meter testing equipment. However, we noted areas for improvement in TVA's meter testing processes. Specifically,

- Meter constants are not verified except at initial installation.
- Meter information is not reconciled between TVA's preventative maintenance, inventory, and billing systems.
- Testing documentation consistency could be improved.

The following provides a more detailed discussion of each of our findings.

Testing Performed Within the Applicable Time Limits and Testing Equipment Meets Calibration Standards

According to TVA policies and procedures, revenue meters are generally tested on a 48- or 60-month rotation as part of the preventative maintenance program. The program allows for a 25-percent leeway up to one year past the due date. We selected a random sample of 73 TVA-owned revenue meters from a listing of 1,450 active meters in the Maximo system to determine whether meters were tested within the applicable time limits. We reviewed testing documentation and noted all of the meters in our sample had been tested within the applicable time limit. Additionally, documentation provided by TVA indicated its meter testing equipment was calibrated according to the NIST calibration standard for meter testing equipment.

Meter Constants Not Verified Except at Initial Installation

A customer's usage and demand from the meter reading is multiplied by the meter constant to arrive at the customer's billed usage and demand amounts. Therefore, it is important that meter constant information in the meter inventory and billing systems is accurate because a small error in the meter constant could potentially cause a significant billing error. A recent example of this occurred when TVA overbilled a distributor approximately \$21 million because a meter constant in TVA's billing system did not reflect what was actually established per the meter.

We were unable to compare the meter constants in the billing system to the testing documentation for the 73 sampled meters because TVA's preventative maintenance program does not require meter constants to be tested or verified except at initial installation. Therefore, any meter constants information included on the testing forms provided was arbitrary. The testing and/or documenting of meter constants as a part of routine preventative maintenance would allow for verification of their accuracy in the meter inventory and billing systems.

At the time of the audit, a policy was not in place requiring the testing and/or documenting of meter constants except at initial installation. However, TVA personnel stated a policy to begin testing and/or documenting meter constants as part of the preventative maintenance program was instituted during November 2012. As of January 7, 2013, the written policies had not yet been updated to reflect these changes.

Meter Information in TVA Systems is Not Reconciled

TVA utilizes the Maximo system as the inventory system-of-record for its meters and to track actions taken as part of the preventative maintenance program. The IEE system contains information such as meter constants necessary to read the meter and actual meter readings. This information is communicated to the Lodestar system for use in billing customers. According to TVA personnel, a reconciliation has not been performed between the three systems.

We attempted to reconcile the meters listed in the three systems and found discrepancies that TVA was unable to explain. This information was given to TVA for further follow-up. Complete and accurate meter information in all three systems is important to ensure all meters are billed correctly and tested. When accounting for TVA revenue, even a fraction of a percent of accuracy can mean the difference of thousands of dollars. Reconciliation

of these three systems could prevent and/or detect an error, which could affect customer billing and TVA revenue.

Testing Documentation Could be Improved

According to TVA personnel, there are no requirements for specific testing documentation to be completed, reviewed, and maintained. TVA was able to provide testing documentation for all of the 73 sampled meters. However, the information included on the documentation was not consistent. Having formal documentation requirements could improve the consistency of testing and communication of test results.

RECOMMENDATIONS

We recommend TVA's Executive Vice President and Chief Energy Delivery Officer (1) formalize the policy for testing and/or documenting meter constants as part of preventative maintenance, (2) develop a process or procedure for reconciling meter information included in the Maximo, IEE, and Lodestar systems, and (3) develop guidelines for acceptable documentation of meter tests including information requirements, review, and maintenance.

TVA Management's Comments – TVA management agreed with the audit findings and recommendations in the report. TVA management provided clarifying information, and we have revised our report based on this information. In response to our recommendations, the Vice President, Transmission Operations and Maintenance, has agreed to (1) formalize the policy to validate the equipment ratios (meter constants); (2) reconcile the differences identified in the Maximo, IEE, and Lodestar systems identified during the audit; and (3) complete a review of required documentation and performance expectations relative to consistency of data recording. See the Appendix for TVA's complete response.

Auditor's Response – The Office of the Inspector General concurs with TVA management's planned actions.

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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.

Robin E. Manning
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If you have questions or need additional information, please contact me at (865) 633-7373 or Rick C. Underwood, Director, Corporate Governance and Finance Audits, at (423) 785-4824. We appreciate the courtesy and cooperation received from your staff during the audit.



David P. Wheeler
Deputy Assistant Inspector General
(Audits)
ET 3C-K

MAD:DBS
Attachment

cc (Attachment):

Tracy A. Flippo, MR 5K-C
Peyton T. Hairston, Jr., WT 7B-K
Joseph J. Hoagland, WT 7C-K
William D. Johnson, WT 7B-K
Richard W. Moore, ET 4C-K
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OIG File No. 2012-14607

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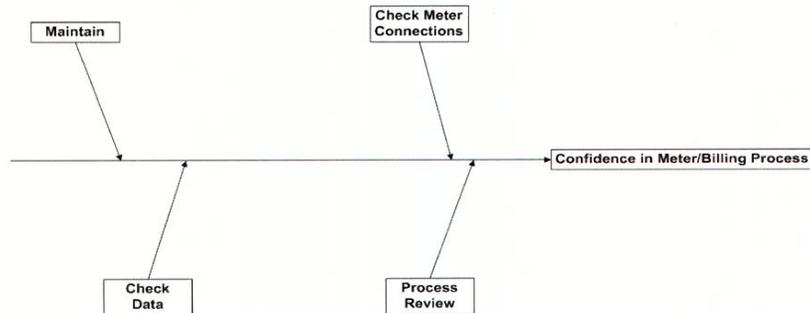
REFERENCE DRAFT AUDIT 2-12-14607 - TVA METER TESTING

This memorandum is in response to our February 22, 2013 memorandum from the Office of the Inspector General, Draft Audit 2012-14607 - TVA Meter Testing.

We have reviewed the report and have no substantial disagreement with the stated facts and are in concurrence with the recommendations included in your draft report. We appreciate your review and the areas for improvement that you provided. Our response will provide the status on actions that have been completed and those in progress related to the recommendations of your report. These recommendations line up with actions in progress from our **Meter Improvement Plan** that was developed based on the customer impact of various recent metering and billing errors.

Meter Improvement Plan Overview

- Headcount
 - Add 2 SAM Meter Techs **\$260K**
 - Add 1 SAM Elec. Engr. **\$130K**
 - Add 1 TSD Maximo Data Specialist **\$130K**
- Equipment for Meter Techs/Engr **\$150K**
- Check of "Old Hickory" sites **(Complete)**
- Add checkpoint in Meter Change Management (MCM) **(Complete)**
- 2 Year Plan to check all CT ratios **(95% complete on high-risk)**
(15% complete overall)
- Change process to verify CT ratio on routine **(Complete)**



- Get all MS&CO electronic **(2/28/13) \$10K**
- Compare Maximo/MCM/IEE **(3/31/13)**
Two contractors for 3 months **\$100K**
- Review and document overall process **(3/31/13)**
One Contractor for 3 months **\$50K**
- Independent review **(5/30/13) \$30K**

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Additional Resources provided to support performance improvement

- Program changes require additional time for each preventative maintenance (PM) performed
- Achieve validation and maintain assurance into the future
- Availability of resources for independent review of Meter Set Change Order (MSCO) and Billing Service Flow Diagram (BSFD) accuracy
- Provide additional technical support capabilities for the meter technicians
- Ten sector alignment will decrease monthly driving by each technician and the associated risk allowing increased FOCUS on the work
- Provides resource availability to better support power quality monitoring health and analysis

Validation of Ratios and Documentation

- Completed 95 percent of the 104 units as high risk meters due to MV90-IEE cut-over with zero additional problems found
- All sites will have been visited as of 12/31/2012
- System Applied Maintenance (SAM) has implemented a two-year plan to check all current transformer (CT) ratios
- Over 15 percent complete – Target for completion is December 2014
- There are 1,369 remaining as of 3/14/2013

Data Check

- All MSCO documents have been converted to electronic format
- Compare Maximo / Meter Change Management (MCM) / Itron Enterprise Edition (IEE) data - in progress

Process Review

- Review and documentation of the overall meter to cash process - in progress
- Obtain an independent review of the documented process - planned for 5/30/2013

Recommendation 1:

Formalize the policy for testing and /or documenting meter constants as a part of preventative maintenance

During the Exit Meeting for this audit, we discussed the terminology of meter constants and equipment ratios. With this in mind, the ongoing Meter Improvement Project

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includes provisions to validate the equipment ratios (stated in your report as meter constants) during each PM performance and document the results. This process is being formalized in the PM Program and will be effective by April 30, 2013. Additionally, we are achieving a base line validation of each revenue metering site by December 2014. We currently have 1,369 of 1,772 sites remaining and are ahead of our target by 11 sites.

Recommendation 2:

Develop a process or procedure for reconciling meter information included in Maximo, IEE, and Lodestar systems

As a part of the ongoing Meter Improvement Project, personnel resources have been obtained and assigned the task to reconcile the information in MAXIMO, IEE, and Lodestar. From the 592 discrepancies identified by the Office Inspector General Audit, 562 have been reviewed with 54 issues identified in IEE and 35 issues identified in Maximo. Most of the non-issues on the list resulted from new meters having been installed just prior to or immediately following the snapshot of the two databases during the review period. This resulted in the discrepancies during the allowable time for updating Maximo as a part of the cut-in process. The estimated completion date for this effort is March 30, 2013.

Recommendation 3:

Develop guidelines for acceptable documentation of meter tests including information requirements, review, and maintenance

System Applied Maintenance has completed a review of required documentation and performance expectations relative to consistency of data recording with his staff of meter technicians. Additionally, as a part of continuous improvement efforts, any needed revisions to the test documents will be processed accordingly.

Additionally, we also offer the following clarification regarding some essential information that we believe should be clarified.

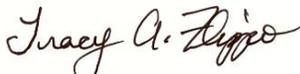
On page 2, paragraph 2 states, "TVA's meter inventory is maintained in the IEE system. The meter inventory contained in the IEE system includes information such as meter

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constants and readings." We believe this statement could be misinterpreted as the meter inventory is maintained in Maximo. The IEE system contains meter readings and information necessary to read the meter, such as meter constants as was stated in your report.

In the next major section, Meter Information in TVA Systems is Not Reconciled, the statement that "TVA's meter inventory is maintained in the IEE system," we recommend that the report be modified to reflect that Maximo is the system-of-record for meters.

Again, thank you for the detailed review by your audit team and the associated recommendations that will help us improve our Meter Testing Program and the overall customer satisfaction with the TVA Metering and Billing Process. If you have questions regarding this response, please contact me or Tom Ballew, Senior Manager, System Applied Maintenance, at (423) 751-6145.



Tracy A. Flippo
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GTB:JML:DMF