



Memorandum from the Office of the Inspector General

February 7, 2022

Robert B. Williams

**REQUEST FOR MANAGEMENT DECISION – AUDIT 2021-15796 – MAINTENANCE OF
TVA-OWNED GAS PIPELINES**

Attached is the subject final report for your review and management decision. 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 audits that remain unresolved after 6 months from the date of report issuance.

If you have any questions, please contact Michael A. Driver, Audit Manager, at (423) 785-4813 or Rick C. Underwood, Director, Financial and Operational Audits, at (423) 785-4824. We appreciate the courtesy and cooperation received from your staff during the audit.

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

MAD:FAJ

Attachment

cc (Attachment):

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OIG File No. 2021-15796



Office of the Inspector General

Audit Report

To the Vice
President, Generation
Services

MAINTENANCE OF TVA-OWNED GAS PIPELINES

Audit Team
Michael A. Driver
Maria V. Edwards

Audit 2021-15796
February 7, 2022

ABBREVIATIONS

CFR	Code of Federal Regulations
CT	Combustion Turbine
CY	Calendar Year
GTP	Gas Transmission Pipelines
IA	Integrity Assessment
IM	Integrity Management
MAOP	Maximum Allowable Operating Pressure
PHMSA	Pipeline and Hazardous Materials Safety Administration
PSR	Pipeline Safety Regulation
TRA	Tennessee Regulatory Authority
TVA	Tennessee Valley Authority

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 ROBERT BRYAN WILLIAMS TO DAVID P. WHEELER



Audit 2021-15796 – Maintenance of TVA-Owned Gas Pipelines

EXECUTIVE SUMMARY

Why the OIG Did This Audit

The Tennessee Valley Authority (TVA) owns and operates three lateral natural gas transmission pipelines (GTP) within the state of Tennessee to enable natural gas delivery at the Gallatin and Johnsonville Combustion Turbine Plants and the Lagoon Creek Combined Cycle Plant. TVA contracts with two Contract Operations Providers to operate and maintain its three natural gas pipelines and components in compliance with Pipeline and Hazardous Materials Safety Administration pipeline safety guidance. TVA also has a contract with an engineering provider to oversee the Contract Operations Providers related to adherence to approved contract scope, quality, and schedule as well as the review and monitoring of documented operation and maintenance.

We included an audit of TVA's maintenance of its owned gas pipelines in our annual audit plan due to pipeline issues identified at other utilities and potential risks to TVA. Our audit objective was to determine if TVA's maintenance of its owned gas pipelines is adequate. Our audit scope included TVA-owned gas pipeline compliance and inspection reports and any relevant supporting documentation from January 1, 2018, through December 31, 2020.

What the OIG Found

We found TVA did not provide sufficient oversight of the two Contract Operations Providers and the Contract Engineering Provider. We found the lack of oversight resulted in inadequate maintenance in some areas and inconsistencies in reporting that hindered TVA's ability to track and correct the identified deficiencies. In addition, we found TVA's GTP Policy (TVA Power Operations Standard Programs and Processes 09.120, *Natural Gas Transmission Pipeline Operations*) in place between July 2016 and October 2020 was limited and outdated on contractor oversight.

What the OIG Recommends

We recommend that TVA (1) enforce contract documentation requirements to verify work required by Pipeline and Hazardous Materials Safety Administration pipeline safety guidance is performed and properly documented and maintenance is performed as needed, (2) develop an oversight program to track maintenance deficiencies, and (3) reinforce the requirements for TVA to provide oversight of its owned gas pipelines as provided for in the GTP Policy.



Audit 2021-15796 – Maintenance of TVA-Owned Gas Pipelines

EXECUTIVE SUMMARY

TVA Management's Comments

In response to our draft report, TVA management agreed with the recommendations in the report and provided information on improvement and engagement actions they have initiated. See Appendix B for TVA management's complete response.

BACKGROUND

The Tennessee Valley Authority (TVA) owns and operates three lateral natural gas transmission pipelines (GTP) within the state of Tennessee to enable natural gas delivery at the Gallatin and Johnsonville Combustion Turbine (CT) Plants and the Lagoon Creek Combined Cycle Plant (see Table 1).

TVA-Owned Gas Pipelines		
Location	Length	Steel Pipeline Size
Gallatin	2.3 miles	12 inches
Johnsonville	27.5 miles	28 inches
Lagoon Creek	5.2 miles	24 inches

Table 1

The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration's (PHMSA) Office of Pipeline Safety Regulation (PSR) is responsible for carrying out a national program to ensure the safe, reliable, and environmentally sound operation of the nation's natural gas and hazardous liquid pipeline transportation system. As TVA is a federally owned corporation, their pipelines and meter stations do not fall under the requirements of PHMSA, Code of Federal Regulations (CFR) Title 49 Subchapter D – Pipeline Safety, Parts 190-199. The Tennessee Regulatory Authority (TRA) adopted certain sections of the CFR Title 49 governing pipeline safety; however, TRA does not have authority over TVA.

While TVA is not required to follow these regulations, TVA Power Operations Standard Programs and Processes 09.120, *Natural Gas Transmission Pipeline Operations* (GTP Policy) states it is the intent of TVA to follow the CFR regulations concerning safety, operation, maintenance, and reporting. The purpose of the GTP Policy is to establish a standardized framework for the ownership, operation, maintenance, service, and oversight of the three TVA-owned gas pipelines. The GTP Policy also provides authoritative descriptions regarding the governance, oversight, execution, and support for TVA-owned pipelines and pipeline meter stations.

According to a document provided by TVA Gas Operations management, it is their desire to “meet and/or exceed any federal regulations to ensure the safe operation of the TVA natural gas pipelines; therefore, it is TVA’s expectation that all work performed will meet the requirements and the standards of PSR.” In order to ensure this, TVA maintains contracts with both pipeline service and engineering companies to assist TVA in meeting the PSR requirements.

TVA contracts with two Contract Operations Providers to operate and maintain its three natural gas pipelines and components in compliance with PHMSA pipeline safety guidance. TVA also has a contract with an engineering provider to oversee the Contract Operations Providers related to adherence to approved contract scope, quality, and schedule and the review and monitoring of documented

operation and maintenance. The Contract Engineering Provider is also responsible for developing and maintaining pipeline technical instruction procedures and conducting regulatory reviews as required to comply with PHMSA and TRA regulations. The PHMSA Gas Transmission Integrity Assessment (IA) Question Set is utilized to determine compliance with CFR regulations.

An effort is currently underway within Gas Operations, with assistance from Engineering and Technical Programs, Fuels and Hedging, Office of General Counsel, Realty Services, and Environmental Services, to divest ownership of these gas pipelines. According to TVA Gas Operations management, the basis for divestiture of the pipelines is that TVA's core competencies do not include the continuing knowledge or resources to properly operate and maintain a pipeline the size of the TVA laterals. They additionally noted that due to this lack of knowledge and resources, TVA has historically looked to the gas supply companies to assist TVA with expertise to operate and maintain the lines. TVA Gas Operations management noted divestiture will allow them to reduce the public risk associated with pipeline ownership; reduce the total number of TVA owned assets; and reduce operating and maintenance costs on the lines going forward while still allowing full use of the lateral's capacity. According to TVA Gas Operations management, negotiations are currently in progress for divestiture of the Lagoon Creek lateral and Johnsonville lateral which include Right of Way land adjustments and maintenance.

Internal Control

TVA gas engineering management contracts with a pipeline Contract Engineering Provider to perform operational engineering support roles. The Contract Engineering Provider performs the main internal control associated with pipeline maintenance by providing oversight of the Contract Operations Providers. The Contract Engineering Provider is supposed to conduct regulatory reviews as required to maintain compliance with PHMSA regulations and submit engineering records and annual assurance reports to TVA. The current GTP Policy assigns the oversight role to the GTP program manager to periodically measure and report on the health of the program through site assessments, peer team meetings, and published key performance indicators.

OBJECTIVE, SCOPE, AND METHODOLOGY

We included an audit of TVA's maintenance of its owned gas pipelines in our annual audit plan due to pipeline issues identified at other utilities and potential risks to TVA. Our audit objective was to determine if TVA's maintenance of its owned gas pipelines is adequate. Our audit scope included TVA-owned gas pipeline compliance and inspection reports and any relevant supporting documentation from January 1, 2018, through December 31, 2020. A complete discussion of our audit objective, scope, and methodology is included in Appendix A.

FINDINGS

We found TVA did not provide sufficient oversight to ensure its contractors were performing required maintenance. The following provides a detailed discussion of our findings.

TVA DID NOT PROVIDE SUFFICIENT OVERSIGHT OF CONTRACTORS

TVA contracts with two Contract Operations Providers to operate and maintain its three natural gas pipelines and components in compliance with PHMSA pipeline safety guidance. TVA also has a contract with a Contract Engineering Provider to oversee the Contract Operations Providers related to adherence to approved contract scope, quality, and schedule and the review and monitoring of documented operation and maintenance. We found TVA did not provide sufficient oversight of the two Contract Operations Providers and the Contract Engineering Provider. This lack of oversight resulted in inadequate maintenance in some areas and inconsistencies in reporting that hindered TVA's ability to track and correct the identified deficiencies. In addition, we found TVA's GTP Policy was limited and outdated on contractor oversight.

Maintenance Was Not Adequate in Some Areas

We found TVA's maintenance of its owned gas pipelines was not adequate in some areas. Specifically, we (1) found TVA and its Contract Operations Providers had not addressed some maintenance issues identified in calendar year (CY) 2018 that could result in pipeline failure and (2) identified five categories in the PHMSA Question Sets applicable to the maintenance of TVA-owned gas pipelines where a significant percentage of TVA's actions were rated as "Unsatisfactory."

Outstanding Maintenance Issues

We found TVA and its Contract Operations Providers had not documented performing maintenance work on issues identified in CY 2018 that could result in pipeline failure.¹ During our review of TVA Natural Gas Pipeline Annual Compliance Reports and supporting attachments, including the PHMSA Question Set, we noted the following CY 2018 maintenance issues identified by the Contract Engineering Provider as high risk and were still outstanding in CY 2020.

- **Johnsonville**
 - No records showing procedures were followed for examination of exposed buried piping for corrosion after pipe was uncovered during repair of a leak. Internal and external corrosion could disqualify the pipeline for service if it is unable to operate at the maximum allowable operating pressure (MAOP).

¹ The maintenance issues we identified included a lack of documentation confirming the maintenance had been performed. This could result in TVA paying for work that has not been performed.

- No documentation showing the welding procedures used in making repairs were qualified or that welding repairs were inspected and tested. The Contract Operations Provider has been using their in-house welding procedures (rather than TVA's) which do not ensure the procedures are adequate to address pipeline characteristics. Welding procedures should be in accordance with the minimum federal safety standards. Additionally, any replacement pipe must be tested to the pressure required for a new line installed in the same location.
- No documentation showing valve maintenance procedures were followed. As a result, TVA has a serious violation of the PHMSA regulations because operation of valves, especially critical valves, is essential in responding to emergency situations. The pipeline must have enough valve capacity to be depressurized as rapidly and safely as practicable. Additionally, blowdown valves were not within 10 miles of a sectionalizing block valve as required by regulation.
- Lagoon Creek
 - No documentation of methodology for establishing a MAOP to ensure the pipeline is operating at a safe pressure level. According to the CY 2020 TVA Natural Gas Pipeline Annual Compliance Report, the lack of an established MAOP should be regarded as the most concerning of the noncompliance issues due to the extended time operating without one.
 - No documentation of a mitigation plan to address elevated A/C levels. An A/C voltage concern appeared in 2018 with touch potentials above the generally accepted 15 volts. The higher touch potentials pose a danger to personnel as well as a possible source of ignition and a threat to the cathodic protection system² and integrity of the pipeline.
- Gallatin
 - No documentation regarding the inspection of critical and noncritical bonds. Cathodic protection level issues occurring after nearby construction in 2018 put the pipeline more at risk. Noncritical bonds must be inspected once a year and critical bonds must be inspected 6 times a year. Critical bonds are those that if not attached, would allow corrosion to occur and jeopardize the safe operation of one of the pipelines in question. A critical bond was identified in September 2019. Additionally, cathodic protection levels fell below acceptable levels in the third quarter of 2020 as the result of an electrical short across flange bolts.

The instances detailed above where the Contract Operations Provider was not providing contractually required documentation to TVA or the Contract Engineering Provider do not allow the Contract Engineering Provider and/or TVA to verify the Contract Operations Providers are performing the required work to ensure compliance with PHMSA pipeline maintenance guidance. Additionally, not performing required maintenance in areas identified as high risk for extended periods of time may increase the risk of pipeline failure.

² Cathodic protection is the prevention of electrolytic corrosion by applying a current to the pipeline.

Maintenance Categories With Consistently Unsatisfactory Ratings

We identified five categories in the PHMSA IA Question Sets applicable to the maintenance of TVA-owned gas pipelines where a significant percentage of TVA's actions were rated as Unsatisfactory in CYs 2019 and 2020. We determined these categories of questions were relevant to maintenance of the pipelines because they consisted of required procedures, work performed, monitoring of pipelines, and qualifications of individuals performing pipeline tasks.

Responses to each question were rated on a range from "Satisfactory+" to Unsatisfactory. A response of Unsatisfactory indicates noncompliance with PHMSA regulations.³ Unsatisfactory ratings can be the result of inadequate procedures, inadequate maintenance and repair records, or lack of documentation provided demonstrating the work performed by the Contract Operations Providers met requirements. As shown in Table 2, ratings for responses to questions related to five categories in pipeline maintenance identified as Unsatisfactory increased from 46 percent in CY 2018 to 66 percent in both CYs 2019 and 2020.

Unsatisfactory Responses to Questions by Category and Calendar Year						
Category	2018		2019		2020	
Field Review Pipe	0	0%	5	50%	3	30%
Construction	7	78%	7	78%	9	100%
Corrosion Control	1	7%	12	92%	12	92%
Operations and Maintenance	26	79%	21	72%	21	72%
Operator Qualifications	<u>2</u>	<u>100%</u>	<u>2</u>	<u>100%</u>	<u>2</u>	<u>100%</u>
Totals	36	46%	47	66%	47	66%

Table 2

³ PHMSA Ratings:

- Satisfactory+ - Exceeds requirements/exemplary performance
- Satisfactory - Meets requirements
- Concern - Meets requirements, but is an area of recommendation and/or area that if not addressed may lead to noncompliance
- Unsatisfactory - Does not meet requirements
- N/A - Not Applicable
- N/C - Not Checked

We summarized the type of maintenance work represented by the five categories of questions and listed them in Table 3 below to show the significance of the areas rated as Unsatisfactory:

Maintenance Work Categories With Responses Rated as Unsatisfactory	
Category	Maintenance Area
Field Review Pipe	Maintenance of impressed current sources; Adequacy of pressure limiting stations; Testing of replacement pipe and repairs; Atmospheric corrosion monitoring.
Construction	Welding procedures; Qualifications of individuals inspecting and testing welding; Qualifications nondestructive testing personnel; Pipe installation and protection requirements; Record keeping.
Corrosion Control	Qualification of individuals implementing pipeline corrosion control methods; Records documenting exposed buried pipe examined for corrosion; Removed pipe internal corrosion; New buried pipe corrosion examination; Cathodic protection monitoring; Atmospheric corrosion; Electrical checks of sources of rectifiers or other impressed current sources; Isolation from other metallic structures; Actions taken to correct deficiencies in corrosion control.
Operations and Maintenance	Records of work done by operator personnel; Testing of pressure limiting and regulating station capacity of relief devices; Leakage surveys; Inspection and partial operation of transmission line valves that may be required during an emergency; Qualifications of individuals performing covered tasks; Emergency response training; Liaison with public officials such as fire and police; Effectiveness evaluation of the program.
Operator Qualifications	Records of evaluation and qualifications of individuals performing covered task and contractor and other entity qualification.

Table 3

As a result of not documenting work performed on some maintenance issues identified in CY 2018 for all three pipelines and the Unsatisfactory ratings for a significant percentage of areas in the five maintenance categories above, we concluded maintenance of TVA's owned gas pipelines is not adequate in some areas.

Inconsistencies in Reporting Hinder TVA's Ability to Track and Correct Identified Deficiencies

We noted inconsistencies in Contract Engineering Provider reporting that limit TVA's ability to (1) track and/or monitor identified deficiencies with maintenance and (2) ensure those items are corrected. Gas Operations staff informed us the Contract Engineering Provider was responsible for oversight of the Contract Operations Providers and was supposed to provide information to TVA if their oversight was unsuccessful. They also informed us it is hard for TVA personnel to

tell what is critical and what is not from the reports submitted by the Contract Engineering Provider.

The inconsistencies included the following:

- The Annual Compliance Reports and PHMSA IA Question Sets do not always agree on deficiencies in maintenance with PHMSA regulations. Specifically, the PHMSA IA Question Sets combine all three pipelines on one report and do not always note which pipeline resulted in the deficiency in maintenance.
- The Annual Compliance Reports do not always cite a specific CFR that resulted in the deficiency in maintenance.
- An attachment to the Annual Compliance Report showed the violation severity associated with some of the deficiencies in maintenance, but items identified as high-risk severity in the attachment were not always listed as urgent findings in the report body of the Annual Compliance Report.

Additionally, no mechanism was identified in reports or external to reports to track the status of deficiencies in maintenance to ensure they are resolved.

We noted that a reporting and tracking mechanism identified in the TVA Natural Gas Transmission Operations and Maintenance Manual and Annual Compliance Reports is an Integrity Management (IM) Plan. An IM Plan is a written explanation of the mechanisms or procedures that the operator will use to implement its IM Program and to ensure compliance with requirements. The Contract Engineering Provider is responsible for creating an IM Plan for all three pipelines in accordance with PHMSA regulations. However, the Contract Engineering Provider had not created any IM Plans during our audit period. An IM Plan assesses and mitigates risks by establishing baseline assessments in high-consequence areas and creating assessment methods to continue to evaluate the pipelines. Having an IM Plan in place would allow TVA to more easily identify areas of noncompliance.

TVA Policy Was Limited and Outdated on Contractor Oversight

TVA relies on the Contract Engineering Provider to perform the main internal control associated with pipeline maintenance by providing oversight of the Contract Operations Providers. We found that guidance as to who should be providing oversight of contractors was limited and outdated. As a result, TVA has been relying solely on the contractors to resolve noncompliance issues even though TVA has ultimate responsibility and liability for their owned gas pipelines.

The GTP Policy effective July 6, 2016, placed responsibility for oversight of the Contract Operations Provider primarily on the Contract Engineering Provider. The GTP Policy stated the TVA CT system engineer “provides oversight of the Contract Engineering Provider and the Pipeline Consultant Provider related to adherence to approved contract scope, quality, and schedule through the use and documentation of an assessment check sheet.” However, the position of TVA CT system engineer was eliminated from the organization chart during a

reorganization in late 2017. The position of CT system engineer was present on the September 2017 organization chart, but had been removed as of November 2017. The GTP Policy was not reviewed or revised until October 14, 2020, even though it was on a 2-year review cadence.

The updated GTP Policy assigned additional oversight roles to the TVA GTP program manager, which includes periodically measuring and reporting on the health of the program through site assessments, peer team meetings, and published key performance indicators. The duties assigned to the GTP program manager were in place less than 3 months of our audit period, which did not allow us to determine if the additional responsibilities improved TVA's oversight.

RECOMMENDATIONS

We recommend the Vice President, Generation Services:

1. Enforce contract documentation requirements to verify work required by PHMSA pipeline safety guidance is performed and properly documented and maintenance is performed as needed.
2. Develop an oversight program to track maintenance deficiencies.
3. Reinforce the requirements for TVA to provide oversight of its owned gas pipelines including oversight of the Contract Engineering Provider and health of the program as provided for in the GTP Policy.

TVA Management's Comments -- In response to our draft report, TVA management agreed with the recommendations in the report and provided information on improvement and engagement actions they have initiated. See Appendix B for TVA management's complete response.

OBJECTIVE, SCOPE, AND METHODOLOGY

Our audit objective was to determine if the Tennessee Valley Authority's (TVA) maintenance of its owned gas pipelines is adequate. Our audit scope included TVA-owned gas pipeline compliance and inspection reports and any relevant supporting documentation from January 1, 2018, through December 31, 2020. To achieve our objective we:

- Reviewed TVA Power Operations Standard Programs and Processes 09.120, *Natural Gas Transmission Pipeline Operations*, to identify key requirements and federal regulations applicable to the ownership, operation, maintenance, service, and oversight of the three TVA-owned gas pipelines.
- Obtained annual assurance reports for TVA-owned natural gas pipeline and annual Pipeline and Hazardous Materials Safety Administration (PHMSA) Standard Inspection Reports.
- Reviewed PHMSA inspection categories applicable to pipeline maintenance with questions answered as unsatisfactory to determine compliance with TVA policy.
- Reviewed TVA Natural Gas Pipeline Annual Compliance Reports to identify deficiencies in maintenance according to PHMSA requirements.
- Obtained key performance indicators reports and other relevant maintenance documentation from TVA Gas Transmission Pipeline personnel and TVA SharePoint.
- Reviewed and summarized TVA compliance and inspection reports and any relevant supporting documentation to identify deficiencies in maintenance and categorize those issues by pipeline, type, and significance.
- Interviewed TVA Gas Transmission Pipeline personnel and requested/reviewed additional supporting documentation or clarification of TVA-owned natural gas pipeline maintenance.

We conducted this performance audit 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.

January 31, 2022

David P. Wheeler, WT 2C-K

**GENERATION SERVICES RESPONSE TO 30 DAY REQUEST FOR COMMENTS - DRAFT
AUDIT 2021-15796 - MAINTENANCE OF TVA-OWNED GAS PIPELINES**

Generation Services would like to extend thanks to the OIG audit team that conducted this audit of the gas pipeline laterals associated with Gallatin Combustion Turbine (GCT), Johnsonville Combustion Turbine (JCT), and Lagoon Creek Combustion Turbine (LCT). The safety, integrity and reliability of the gas pipelines are a priority as demonstrated by the implementation of a focused program under Engineering and Technical Programs (E&TP). We appreciate the TVA Office of the Inspector General (OIG) team's insights in their report as it provides us an opportunity to further strengthen our program.

In response to the OIG memorandum dated December 1, 2021, Generation Services has reviewed your draft report and have the following comments and responses.

Comments on the Evaluation

The OIG audit team identified missing documentation supporting gas pipeline inspection, maintenance, testing and repair activities from January 1, 2018, through December 31, 2020, and included the most significant items in the report. The OIG found that TVA did not provide sufficient oversight of the two Contract Operations Providers (COP) and the Contract Engineering Provider (CEP) and that the lack of oversight resulted in inadequate maintenance.

Generation Services recognized the need to improve programmatic oversight of the three lateral gas pipelines and initiated improvement and engagement actions at the end of 2020. The actions taken include:

1. Issued Revision 1 (10/14/2020) of the governing program procedure that corrected the outdated roles and responsibilities. This included the creation of a new position to monitor program health and help drive compliance.
2. As part of program oversight, the services of a new CEP were contracted in July 2021. The new CEP has been engaged in resolving the identified missing documentation and significant progress has already been made in closing the majority of the identified deficiencies. The CEP is actively working to close and disposition the remaining open items.
3. A meeting between E&TP and TVA Supply Chain was held to review the two COP contract requirements and to identify actions that can be taken when the COP are not following the contract.

David P. Wheeler, WT 2C-K
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Recommendations

We recommend the Vice President, Generations Services:

1. Enforce contract documentation requirements to verify work required by the Pipeline and Hazardous Materials Safety Administration is performed and properly documented, and maintenance is performed as needed.

Response

Generation Services agrees with this recommendation.

2. Develop an oversight program to track maintenance deficiencies.

Response

Generation Services agrees with this recommendation.

3. Reinforce the requirements for TVA to provide oversight of its owned gas pipelines including oversight of the Contract Engineering Provider and health of the program as provided for in the Gas Transmission Pipeline Policy.

Response

Generation Services agrees with this recommendation.

Thank you for the time to allow us to review and provide feedback on the draft evaluation.



Robert Bryan Williams
Vice President
Generation Services
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