Memorandum from the Office of the Inspector General

February 2, 2026

Carol Y. Barajas
Melanie E. Farrell
Matthew M. Rasmussen

REQUEST FOR MANAGEMENT DECISION – EVALUATION 2025-17531 – SEQUOYAH NUCLEAR PLANT MOISTURE SEPARATOR REHEATER REPLACEMENT PROJECT

Attached is the subject final report for your review and management decision. Your written comments, which addressed your management decision and actions ongoing or planned for three of the ten recommendations, have been incorporated into the report. Please advise us of your management decision on the remaining recommendations within 60 days from the date of this report. In accordance with the Inspector General Act of 1978, as amended, the Office of the Inspector General is required to report to Congress semiannually regarding evaluations that remain unresolved after 6 months from the date of report issuance.

If you have any questions or wish to discuss our findings, please contact Lisa H. Hammer, Director, Evaluations – Projects, at (865) 633-7342. We appreciate the courtesy and cooperation received from your staff during the evaluation.

Greg Stinson
Assistant Inspector General
(Audits and Evaluations)

JBF:KDS
Attachment
cc (Attachment):

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OIG File No. 2025-17531

Office of the Inspector General

Evaluation Report

To the Vice President, Projects and Outages; and to the Vice President, Supply Chain; and to the Senior Vice President and Chief Nuclear Officer

SEQUOYAH NUCLEAR PLANT MOISTURE SEPARATOR REHEATER REPLACEMENT PROJECT

Evaluation Team
Justin B. Franklin
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Evaluation 2025-17531
February 2, 2026

ABBREVIATIONS

ASL	Acceptable Supplier List
CAP	Corrective Action Program
CR	Condition Report
CWA	Contractor Work Authorization
MSR	Moisture Separator Reheater
NLE	Nuclear Life Extension
NPG	Nuclear Power Group
NQAP	Nuclear Quality Assurance Plan
OEM	Original Equipment Manufacturer
PEG	Procurement Engineering Group
PRB	Project Review Board
QA	Quality Assurance
SC	Supply Chain
SPP	Standard Programs and Processes
SQN	Sequoyah Nuclear Plant
TAA	Trade Agreements Act
TVA	Tennessee Valley Authority
WBN	Watts Bar Nuclear Plant

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Evaluation 2025-17531 – Sequoyah Nuclear Plant Moisture Separator Reheater Project

EXECUTIVE SUMMARY

Why the OIG Did This Evaluation

During fiscal year 2024, the Tennessee Valley Authority (TVA) communicated its intent to invest approximately $7 billion over the next 20 years to ensure safe and reliable operations of its three nuclear sites. This investment is to extend and preserve the life of its nuclear units and will be accomplished through nuclear life extension (NLE) projects. Moisture separator reheaters (MSRs) are a major plant asset that will be included in the NLE focus. Sequoyah Nuclear Plant's (SQN) Unit 1 includes six MSRs located at the SQN Turbine Building.[i] These MSRs have been in place since SQN Unit 1 entered commercial operation in 1981.

In February 2020, because of MSR performance degradation and the risk to plant operability, SQN issued a purchase order to an original equipment manufacturer (OEM) to perform a study on improvement options for the MSRs. The OEM recommended that SQN perform a complete MSR replacement with new MSRs that were 6.5 feet longer and approximately 75,000 pounds heavier than the existing MSRs. The new MSRs could also provide an increase in capacity of approximately ten megawatts. TVA accepted the OEM's recommendation and initiated the SQN Unit 1 MSR Replacement Project. The project's initial forecasted cost was $43.6 million with an in-service date of December 31, 2022. By September 2024, the forecasted cost had increased to $93.9 million with a December 31, 2025, in-service date.

Due to MSRs being part of a high-energy system, they are required to be procured as quality-related or better. Quality-related items (1) must meet requirements that provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the public and (2) include plant features that contribute in an important way to safe operation and protection of the public. TVA maintains a Nuclear Quality Assurance Plan (NQAP), approved by the Nuclear Regulatory Commission, that defines requirements for controlling quality of quality-related items. If conditions adverse to quality exist, the Nuclear Power Group's Standard Programs and Processes 22.300, *Corrective Action Program,* defines the requirements for documenting the condition.

Because of the operational and financial impact to SQN, we performed an evaluation to determine the reasons for cost increases and schedule delays of the MSR Replacement Project.

[i] Three MSRs are located directly inside the turbine building, while the other three are outside on the turbine building deck.

Evaluation 2025-17531 – Sequoyah Nuclear Plant Moisture Separator Reheater Project

EXECUTIVE SUMMARY

What the OIG Found

We determined the primary reason for the cost increases and schedule delays for the MSR Replacement Project was the initial estimate and schedule did not fully consider the scope of the structural modifications necessary to support the increased size and weight of the new MSRs. As a result, TVA spent more than three years evaluating options without an identified solution, and the project's forecasted cost increased from $43.6 million in February 2021 to $93.9 million in September 2024. With the cost estimate increasing and over $55 million spent, TVA deferred the MSR Replacement Project. To address MSR degradation, TVA planned a partial refurbishment project. As of December 2025, the partial refurbishment project was complete and in-service with a spend of approximately $37 million. TVA continues to evaluate the feasibility of utilizing the six purchased MSRs, which cost $25.4 million, on future projects. We also identified other cost increases related to storage costs resulting from project delays, the initial installation estimate being understated, and contractor costs that could have potentially been avoided.

In addition, we determined the MSRs were not purchased as quality-related components in accordance with TVA's Nuclear Regulatory Commission approved NQAP. The NQAP details the steps necessary for properly overseeing the manufacture of quality-related nuclear plant components. Since the MSRs were not manufactured in accordance with the NQAP, they may require additional evaluation to determine if they can be used at SQN or another site in the future. Additionally, we found that the MSR quality-related identification and purchasing issues were not properly documented in TVA's Corrective Action Program, as required.

Lastly, we identified actions that increased risk to TVA, including the (1) OEM being absolved of liability related to the study of improvement options for the MSRs, (2) contracting officer not being included in some contract changes, and (3) OEM not being held accountable for procuring components from unapproved sources.

What the OIG Recommends

We made ten recommendations to TVA management to address the issues identified.

TVA Management's Comments

TVA management agreed with seven of the OIG's recommendations and will further evaluate the remaining three recommendations. TVA management provided planned actions for three recommendations related to contractor cost recovery and nuclear procurements. In addition, TVA management disagreed that the MSRs were not procured in accordance with TVA's NQAP. TVA management also provided informal comments that were incorporated as appropriate. See the Appendix for TVA management's complete response.

Auditor's Response

We agree with management's planned actions related to cost recovery and nuclear procurements. While TVA management disagreed that the MSRs were not procured in accordance with the NQAP, we believe the initial inaccurate quality designation resulted in gaps in the oversight of MSR manufacturing.

BACKGROUND

During fiscal year 2024, the Tennessee Valley Authority (TVA) communicated its intent to invest approximately $7 billion over the next 20 years to ensure safe and reliable operations of its three nuclear sites. This investment is to extend and preserve the life of its nuclear units and will be accomplished through nuclear life extension (NLE) projects. Moisture separator reheaters (MSRs) are a major plant asset that will be included in the NLE focus. In addition to separating moisture, MSRs provide dry superheated steam to the low-pressure turbines, which improves turbine efficiency and reduces maintenance of the turbine blading. Sequoyah Nuclear Plant's (SQN) Unit 1 includes six MSRs located at the SQN Unit 1 Turbine Building.[1] These MSRs have been in place since SQN Unit 1 entered commercial operation in 1981.

In February 2020, because of MSR performance degradation and the risk to plant operability, SQN issued a purchase order to an Original Equipment Manufacturer (OEM) to perform a study on improvement options for the MSRs. The OEM's study was to (1) evaluate the options, including specifications, effects on other systems, and performance indicators; (2) evaluate existing plant instrumentation; and (3) provide a recommended path forward based on cost, project risk, and return on investment.

In May 2020, the OEM provided SQN with the results of their study, describing MSR components as "nearing catastrophic failure." According to the OEM, some MSR components were severely eroded, imminently nearing the end of their life, and had contributed to plant "underperformance and reduced reliability." The OEM recommended that SQN perform a complete MSR replacement, which consisted of new MSRs that were each 6.5 feet longer and approximately 75,000 pounds heavier than the existing MSRs. The OEM's study indicated that installation of the MSRs would cost $6 million and could provide an increase in capacity of approximately ten megawatts. TVA accepted the OEM's recommendation and initiated the SQN Unit 1 MSR Replacement Project.

On February 18, 2021, TVA contracted with the OEM to design, manufacture, and deliver six MSRs at a cost of approximately $24 million to be delivered by August 31, 2022. Due to MSRs being high-energy systems, they are required to be procured as quality-related or better. Quality-related items (1) must meet requirements that provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the public and (2) include plant features that contribute in an important way to safe operation and protection of the public. TVA maintains a Nuclear Quality Assurance Plan (NQAP), approved by the Nuclear Regulatory Commission, that defines requirements for controlling the quality of quality-related items. To supplement these requirements, Nuclear Power Group's (NPG) Standard Programs and Processes (SPP) 04.001, *Procurement of Material, Labor, and Services,* describes detailed steps to be taken when procuring

[1] Three MSRs are located directly inside the turbine building, while the other three are outside on the turbine building deck.

a quality-related item to maintain compliance with TVA's NQAP and to meet all licensing commitments. If conditions adverse to quality exist, NPG-SPP-22.300, *Corrective Action Program,* defines the requirements for documenting the conditions.

The project was originally presented to TVA's Project Review Board (PRB) for approval on February 25, 2021, with a forecasted capital cost of approximately $43.6 million and an in-service date of December 31, 2022. TVA estimated approximately $24.8 million in equipment/material and another $18.8 million for other costs such as turbine building beam strengthening, labor, engineering, and contingency. In September 2024, the project was again presented to the PRB to obtain additional funding, with a forecasted cost of $93.9 million and an in-service date of December 31, 2025.

Due to installation challenges, an internal review of the project's future was conducted by TVA in the fall of 2024, which recommended a partial refurbishment of the existing MSRs in lieu of MSR replacement. In response to the internal review, TVA initiated a refurbishment project and deferred the MSR Replacement Project. As of December 2025, TVA had spent approximately $55.3 million on the replacement project, and the partial refurbishment project was in-service with a spend of approximately $37 million. Because of the operational and financial impact to SQN, we performed an evaluation to determine the reasons for cost increases and schedule delays of the MSR Replacement Project.

OBJECTIVE, SCOPE, AND METHODOLOGY

Our objective was to determine the reasons for cost increases and schedule delays of the SQN Unit 1 MSR Replacement Project. The scope of our evaluation was the MSR Replacement Project. To achieve our objective, we:

- Conducted interviews with applicable personnel, including SQN Site Projects,[2] SQN Engineering, TVA Supply Chain (SC) and TVA Office of the General Counsel to gain an understanding of the history of the project as well as roles and responsibilities.
- Reviewed project documentation, including MSR technical drawings, engineering studies, and project schedules to understand the history of the project.
- Reviewed PRB documentation, and change orders through May 1, 2025, to identify cost increases for the MSR Replacement Project.
- Reviewed PRB documentation to identify forecasted cost for the MSR refurbishment project.

[2] During our evaluation, project management was moved from SQN to the Nuclear Projects and Outages department. However, for the purposes of this report, we will continue to refer to SQN Site Projects throughout the report.

- Reviewed condition reports (CRs)[3] related to the MSR Replacement Project to identify documented issues.
- Conducted a site visit in May 2025 to observe the new MSRs and layout of SQN Turbine Building.
- Reviewed TVA's contract with the OEM to understand contract terms and conditions.
- Reviewed TVA and Nuclear SPP to understand processes and related requirements for project management and plant modifications.
- Reviewed TVA's NQAP and NPG-SPP-04.001, *Procurement of Material, Labor, and Services,* to understand requirements for nuclear procurements.
- Reviewed a third-party quality assurance (QA) report issued to SQN during MSR manufacturing to identify potential impacts to quality.
- Reviewed procurement documentation for the MSRs to determine if quality requirements were followed.
- Discussed quality-related procurements with regulatory personnel to obtain information related to regulatory requirements.
- Compared a vendor's charges to approved work authorizations to determine if charges exceeded approved amounts.

This evaluation was conducted in accordance with the Council of the Inspectors General on Integrity and Efficiency's *Quality Standards for Inspection and Evaluation*.

FINDINGS AND RECOMMENDATIONS

We determined the primary reason for the cost increases and schedule delays for the MSR Replacement Project was the initial estimate and schedule did not fully consider the scope of the structural modifications necessary to support the increased size and weight of the new MSRs. As a result, TVA spent more than three years evaluating options without an identified solution, and the project's forecasted cost increased from $43.6 million in February 2021 to $93.9 million in September 2024. With the cost estimate increasing and over $55 million spent, TVA deferred the MSR Replacement Project. To address MSR degradation, TVA planned a partial refurbishment project. As of December 2025, the partial refurbishment project was complete and in-service with a spend of approximately $37 million. TVA continues to evaluate the feasibility of utilizing the six purchased MSRs, which cost $25.4 million, on future projects. We also identified other cost increases related to storage costs resulting from project delays, the initial installation estimate being understated, and contractor costs that could have potentially been avoided.

[3] A CR is used within the corrective action program (CAP) to document evaluation and resolution of issues.

In addition, we determined the MSRs were not purchased as quality-related components in accordance with TVA's Nuclear Regulatory Commission approved NQAP. The NQAP details the steps necessary for properly overseeing the manufacture of quality-related nuclear plant components. Since the MSRs were not manufactured in accordance with the NQAP, they may require additional evaluation to determine if they can be used at SQN or another site in the future. Additionally, we found that the MSR quality-related identification and purchasing issues were not properly documented in TVA's CAP, as required.

Lastly, we identified actions that increased risk to TVA, including the (1) OEM being absolved of liability related to the study of improvement options for the MSRs, (2) contracting officer not being included in some contract changes, and (3) OEM not being held accountable for procuring components from unapproved sources.

REASONS FOR COST INCREASES AND DELAYS

We determined the initial estimate and schedule did not fully consider the scope of the structural modifications necessary to support (1) moving the MSRs into the plant and (2) increased nozzle loads[4] due to the increase in size and weight. In February 2020, SQN issued a purchase order to the OEM to evaluate improvement options for Unit 1 MSRs. The study concluded that the OEM's experience from installing new MSRs at Watts Bar Nuclear Plant (WBN), coupled with the high level of similarity between the sites, provided "excellent confidence" in the feasibility of MSR replacement at SQN. However, the OEM study described a different method for moving the MSRs inside the plant than was used at WBN. According to the project manager, WBN slid the MSRs across the turbine building floor to get them in place for installation. At SQN, the OEM indicated the turbine building crane and a mobile crane would be used to move them into place.

The OEM study documented several challenges with performing MSR replacement at SQN, including the increase in MSR diameter, length, and weight reacting on the turbine floor foundation. The OEM indicated that TVA was responsible for evaluating the impact of the weight increases. To assess the impacts of the weight increases, TVA hired an engineering firm to perform a floor loading study of the turbine building. In June 2020, the engineering firm concluded that only three beams would need to be reinforced to support the new MSRs in place and operating. The estimated cost to reinforce the three beams was approximately $3.2 million. Based on the OEM recommendation and the conclusion that only three beams needed reinforcement, TVA made the decision to proceed with Unit 1 MSR replacement.

On February 18, 2021, TVA contracted with the OEM to design and manufacture six MSRs at a cost of approximately $24 million to be delivered by August 31, 2022. TVA also contracted with another engineering firm for the conceptual design

[4] Nozzle loads are defined as the net forces and moments (i.e. torque) exerted on equipment nozzles from the weight and thermal expansion of connected piping and other equipment.

of the SQN MSR Replacement Project. The conceptual design noted (1) alternative methods would be needed to move four MSRs to their respective locations as they were not directly accessible to the turbine building crane, and (2) the details of the travel path for the MSRs would be determined during detailed design, with input from TVA's rigging contractor.

In February 2022, TVA subcontracted with a rigging contractor to develop the plan to move the MSRs into place. The rigging contractor determined the four MSRs would need to "slide" across the turbine building floor to be installed, as was previously done at WBN. However, due to structural concerns, SQN was unable to identify a path that would support the weight impact of sliding the MSRs across the floor. Although the OEM's study attributed assurance of successful installation based on "experience and lessons learned from SQN's sister plant," there was no evidence the approach of sliding the MSRs across the turbine building floor at SQN and any associated risks were considered in the OEM's study or further assessed by TVA.[5]

In addition, the increased nozzle loads were not evaluated prior to approving the project. Specifically, the June 2020 floor loading study did not include the potential nozzle load increases on the operating weight of the new MSRs. According to SQN Civil Engineering, at the time of the floor study, nozzle loads of the new MSRs were not known and as such, were not assessed in the floor loading analysis. SQN Civil Engineering indicated that, due to the previous success of MSR installation at WBN, the site did not expect nozzle loads to have a significant impact on SQN's turbine building. During conceptual design, the OEM provided the nozzle loads for the new MSRs and, according to SQN Civil Engineering, the size of the piping associated with the new MSRs resulted in high-dead weight and thermal loads[6] that the turbine building was not designed to support.

TVA spent approximately $2.5 million primarily to identify a viable path to move the MSRs into place and support increased nozzle loads. By December 2024, the number of turbine building beams requiring modification had increased from three to as many as 57 to support MSR replacement. In April 2025, the responsible engineering firm signed a change request that stated, ". . .there are many additional beams, which require modification. . .." With no identified solution to address nozzle loads or movement of the MSRs into the turbine building, TVA opted to stop design work for the MSR Replacement Project.

Delays Resulted in Storage Costs

As a result of project delays, TVA was unable to take delivery of the MSRs as scheduled. The OEM proposed to store and maintain the MSRs at their facility for $2,500 per month, per MSR. In addition to the monthly charge, the OEM noted they would need site improvements along with heavy haul movement and long-term preservation preparation at a cost of $460,000 to be able to store the

[5] The OEM's study contained a picture from WBN related to an outdoor sliding arrangement but was otherwise silent on that particular rigging method.

[6] Thermal loads cause expansions in piping against its restraints that result in internal stresses.

MSRs.[7] Based on financial data, TVA paid approximately $700,000 to the OEM in storage costs.

In November 2024, TVA took delivery of the MSRs. To support long-term storage, TVA bought and installed steel storage buildings at a cost of approximately $682,000. Figure 1 below shows two MSRs stored in one of the buildings. In total, TVA paid approximately $1.4 million to store the MSRs because of project delays.

Figure 1

Impact of Delays

The MSR Replacement Project continued for more than three years while costs increased to over $55 million without a solution to address installation difficulties. TVA made the decision to refurbish instead of replace the MSRs at SQN in late 2024. As of December 2025, the partial refurbishment project was noted to be in-service with a spend of approximately $37 million. By not identifying risks early in the project, TVA incurred unnecessary costs.

Recommendation

We recommend the Vice President, Projects and Outages:

1. Develop a process for identifying and evaluating key assumptions of, and risks to, nonroutine projects prior to approval.

[7] According to the project manager for the SQN MSR Replacement Project, the OEM's site improvements consisted of extending and reinforcing gravel pads.

TVA Management's Comments – TVA management agreed with the recommendation and stated they will evaluate. See the Appendix for TVA management's complete response.

INITIAL INSTALLATION ESTIMATE UNDERSTATED

As described in TVA-SPP-34.000, *Project Management*, one of the ways to perform a cost estimate is through expert opinion or judgement. The OEM's 2020 study indicated that installation of the MSRs would cost approximately $6 million, which was included in the OEM's cost/benefit analysis for replacing or refurbishing the MSRs. As such, TVA included the OEM's estimated installation cost in their overall budget development. TVA issued a request for proposal for the installation of the MSRs and received two bids. One bid was approximately $6 million, and the second bid was approximately $19 million. SC recommended a more detailed evaluation needed to be conducted to understand the large gap in the two bids. However, additional evaluation was not performed, and TVA awarded the installation work to the vendor whose bid for installation was approximately $6 million. By the time the project was presented to the PRB in September 2024 for additional funding, the overall project installation estimate had increased from $6 million to approximately $35 million. The inaccurate estimate could have impacted the decision to replace or refurbish the MSRs.

Recommendation

We recommend the Vice President, Projects and Outages:

2. Determine if additional steps are needed for estimates related to nuclear projects.

TVA Management's Comments – TVA management agreed with the recommendation and stated they will evaluate. See the Appendix for TVA management's complete response

POTENTIAL AVOIDED COSTS IDENTIFIED

TVA's alliance partner for nuclear maintenance and modifications was selected to perform the installation of the new MSRs. During our review of contractor work authorizations (CWAs), we determined that the alliance partner billed for positions TVA previously decided were not needed. In the initial CWA, the alliance partner included 25 pipefitters as part of a $7 million dollar work authorization. After review by TVA, it was determined the pipefitters were unnecessary for the work being performed and subsequently removed them from the CWA. However, we reviewed invoices for the project and determined that as of April 9, 2025, the alliance partner had billed TVA for 17 pipefitters amounting to approximately $742,000. In addition, we identified $2.8 million billed for positions that were not authorized by TVA.

Recommendations

We recommend the Vice President, Projects and Outages:

3. Determine if the approximate $2.8 million in charges by the installation vendor were authorized.

We recommend the Vice President, SC:

4. Recover the $742,000 for unauthorized pipe fitters and any of the $2.8 million determined by Nuclear to be unauthorized.

TVA Management's Comments – TVA management acknowledged the recommendations and indicated further review is required. TVA management stated once the review is complete, they will pursue recovery as appropriate. See the Appendix for TVA management's complete response

Auditor's Response – We agree with TVA management's planned action.

MSRs NOT PROCURED IN ACCORDANCE WITH NUCLEAR QUALITY ASSURANCE PLAN

TVA's NQAP defines QA requirements and establishes responsibilities for their implementation at TVA's nuclear plants. We determined MSRs were not purchased in accordance with TVA's NQAP. Although MSRs are quality-related, the electronic purchase request initiated in February 2021 designated them as non-quality-related, which resulted in gaps in the QA oversight of the MSRs manufacturing process. According to the NQAP, the identification of quality-related items shall be verified and documented prior to release for fabrication, assembly, shipping, and installation. Further, identification requirements shall be specified in applicable design and procurement documents. NPG-SPP-04.001 states that when procuring material or services, the purchase request should state whether the request is for a safety-related, quality-related, or non-quality-related material or service. Accurate designation of the purchase request is critical to maintaining compliance with the NQAP, as specific steps are to be performed if the request is for a quality-related item/service.

NPG-SPP-04.001 defines required steps for quality-related purchases, including (1) ensuring the supplier is qualified based on TVA Nuclear's Acceptable Supplier List (ASL) if invoking a supplier quality program requirement, (2) noting any supplier restrictions on procurement documentation, (3) notifying TVA Nuclear's Vendor Audit Services when contract/purchase orders are issued for procurements of materials and services that impose a supplier quality program and/or source surveillance is required, (4) ensuring quality-related requirements are included in procurement documentation, and (5) obtaining Procurement Engineering Group (PEG) review for developing technical requirements.

The MSRs were long-lead items and needed to be ordered early in the project. This resulted in the engineering review being skipped until after the purchase order was submitted to SC. Later, during the PEG review, the MSRs were determined to be quality-related. PEG noted the MSRs would need to be procured with "augmented" quality requirements but work by the OEM was already in progress. Documentation between the OEM and TVA indicated the issue regarding the quality classification of the MSRs and applicable requirements for manufacturing were not resolved until late September 2021, seven months after TVA approved the manufacture. As a result of the quality designation of the MSRs being inaccurate, TVA did not (1) establish potential witness and hold points prior to manufacturing, (2) notify Vendor Audit Services to verify implementation and adequacy of QA requirements, or (3) verify if the OEM was on the ASL.

Potential Witness Points and Hold Points Not Established Prior to Manufacturing

Witness points are used to observe in-process work, while hold points are a designated stopping place where inspection or examination is required before work proceeds. TVA's procurement specification with the OEM stated that witness points were to be mutually agreed upon prior to the start of any work. However, the approval for manufacturing was given before the procurement specification was completed and the project manager for the SQN MSR Replacement Project confirmed no witness points were established prior to the start of work.

We identified additional gaps related to witness points and hold points. These included (1) not establishing witness points and hold points as recommended by an independent nuclear QA reviewer and (2) discrepancies in data related to witness points in the quality packages submitted by the OEM.

Witness Points and Hold Points Not Performed as Recommended

After the determination was made that the MSRs were quality-related, SQN awarded a purchase order for an independent nuclear QA review in February 2022 to assess the fabrication progress of the six MSRs. The review noted that certain components had already been welded, and many of the witness points and hold points that would typically be observed had already passed. The reviewers recommended SQN add witness points and hold points due to the risk that additional major steps could be bypassed without TVA verification. However, according to the OEM's manufacturing inspection and test plans, TVA did not witness any manufacturing activities until 2023, when final assembly occurred. Additionally, TVA waived several witness points and hold points primarily during final assembly related to (1) inspection of certain component installations, (2) internal cleaning of the MSRs and removal of foreign material, (3) final cleanliness checks, and (4) security inspections.

The tests waived by TVA during final assembly were of increased concern because of previous findings related to the OEM. The MSRs for SQN Unit 2 were refurbished in a previous outage. Following the outage, Unit 2 experienced issues with the steam generator. One of the possible causes identified was related to fabrication and cleanliness of MSR internal components supplied by the OEM.

Based on the lessons learned, it was recommended the manufacturing process should be audited and "witness points should be incorporated" to ensure adherence to the fabrication specification. Further, it was noted that if the vendor uses subcontractors, the recommendation would be "even more important," and that verification of cleanliness should be performed. However, several witness points and hold points, including those related to cleanliness and removal of foreign material, were waived by TVA for the Unit 1 manufacturing.

Discrepancies in Test Verification Data from the OEM

A key step of final acceptance testing is the hydro pressure test.[8] TVA contracted with a former employee to witness hydro pressure tests for each of the six MSRs. The OEM's manufacturing inspection and testing plans reflected that TVA witnessed this testing on each MSR during final assembly. However, there was no customer witness signature on the OEM's certified pressure test reports for three MSRs and another report contained a signature dated four days after the test was performed. TVA was unable to provide any additional evidence the contractor observed all six tests. Without documented signatures, there is no way to verify the pressure tests were observed.

Vendor Audit Services Was Not Notified

TVA's procurement specification invoked QA program requirements to the OEM by requiring them to ". . . institute and maintain a Quality Assurance / Quality Control Program or System for the design, procurement of materials, fabrication, inspection and test of equipment . . .." NPG-SPP-04.001 states that Vendor Audit Services, who is responsible for conducting audits of suppliers to verify implementation and adequacy of specified QA requirements, should be notified for procurements that impose a supplier quality program. There was no evidence that Vendor Audit Services was notified.

The OEM Was Not on Acceptable Supplier List When Manufacturing Was Approved

NPG-SPP-04.001 states, for quality-related procurements that invoke supplier QA program requirements, ensure that the selected supplier is qualified based on the ASL listing and that applicable ASL restrictions are included in the procurement document. The OEM was not on the ASL at the time TVA approved manufacturing to begin. The OEM's quality program should have been evaluated to determine if it met the requirements to be added to the ASL before manufacturing began.

Need for Quality Evaluation of the MSRs

According to TVA Nuclear Projects personnel, TVA is considering two long-term options for the MSRs purchased for the MSR Replacement Project: install the MSRs at (1) SQN in 8 to 10 years as part of an uprate at SQN or (2) WBN around 2035 in support of TVA's NLE efforts. The identified gaps in QA oversight will require additional analyses to properly determine if the MSRs meet the quality specifications and thus can be used in future projects. To be able to use the MSRs in 8 to 10 years, TVA will need the necessary evidence and evaluations to support

[8] Hydro testing is a process where components such as pressure vessels are tested for strength and leaks.

that the MSRs meet quality-related requirements. TVA increases its risk of not being able to use the MSRs, which cost $25.4 million, if the necessary additional analyses and gathering of documented evidence are not conducted timely.

Recommendations

We recommend the Senior Vice President and Chief Nuclear Officer:

5. Implement a verification process to ensure an engineering review is performed prior to placing orders for long-lead nuclear procurements.

TVA Management's Comments – TVA management agreed with the recommendation and stated they will evaluate the process to ensure manufacturing specifications, including quality requirements, are accurately determined prior to initiating the purchase order. See the Appendix for TVA management's complete response.

Auditor's Response – We agree with TVA management's planned actions.

6. Initiate actions to evaluate the quality of the MSRs to determine usability.

TVA Management's Comments – TVA management acknowledged the recommendation and indicated they will evaluate if further documentation is necessary. TVA management also stated they disagree that the MSRs were not purchased as quality-related components in accordance with TVA's NQAP. TVA management stated the initial purchase order was for QA0 (non-quality-related) components, but that the purchase order was adjusted to specify QA3 (quality-related components). Additionally, TVA management stated the six MSRs were fully received as quality-related components and further inspections are not necessary to certify the MSRs as quality-related components. See the Appendix for TVA management's complete response.

Auditor's Response – While we acknowledge the MSRs were ultimately determined to be quality-related, the initial inaccurate quality designation resulted in required NQAP steps not being performed. In addition, when PEG identified the required quality classification change, they noted the MSRs would need to be procured with "augmented" quality requirements, but manufacturing requirements were not resolved between TVA and the OEM until seven months after manufacturing was approved. This created gaps in oversight of MSR manufacturing as documented by the independent QA contractor hired by TVA. During their initial inspection the contractor noted certain components had already been welded, and many of the witness points and hold points that would typically be observed had already passed. We believe the inaccurate quality designation and gaps in oversight of MSR manufacturing could pose risk to the usability of the MSRs.

QUALITY ISSUES WERE NOT PROPERLY DOCUMENTED

Appendix B to Title 10 Code of Federal Regulations, Part 50, states that measures should be established to assure that conditions adverse to quality are promptly identified and corrected. NPG-SPP-22.300, *Corrective Action Program,* defines the requirements for TVA Nuclear's CAP. The SPP requires any condition adverse to quality to be documented in the CAP with a CR. Conditions adverse to quality include those associated with a structure, system, component, or program within the scope of TVA's NQAP. In April 2021, PEG recommended that SQN engineering document the quality designation issue with the MSRs in a CR. The project manager for the SQN MSR Replacement Project was also made aware of PEG's recommendation. However, we found that TVA did not document any of the issues related to quality in the CAP.

As described above, additional analysis may be required to verify quality of the MSRs before they are used. Had the issues been documented in the CAP in a timely manner, compensatory measures could have been identified to address potential questions related to quality. As a result of this evaluation, a CR was written in October 2025 that documented the inaccurate quality designation. However, based on the low significance level assigned to the CR, the causes of the issues were not evaluated, and corrective actions were not initiated.

Recommendations

We recommend the Senior Vice President and Chief Nuclear Officer:

7. Take steps to have quality issues and corrective actions with the SQN MSR project documented in the CAP.

8. Initiate a review to determine why the issues were not documented in the CAP in a timely manner.

TVA Management's Comments – TVA management agreed with the recommendations and stated they will evaluate. See the Appendix for TVA management's complete response.

ACTIONS THAT INCREASED RISK TO TVA

TVA SC guidance sets forth requirements for TVA employees when procuring goods or services. In addition, TVA's Code of Conduct states that employees should not perform any procurement action outside of their authorized responsibilities. We identified actions that increased risk to TVA, including the (1) OEM being absolved of liability related to the study of improvement options for the MSRs, (2) contracting officer not being included in some contract changes, and (3) OEM not being held accountable for procuring components from unapproved sources.

OEM Absolved of Liability for MSR Study

According to TVA's *Supply Chain Buyer Guide*, contracts allocate risks and liabilities between suppliers and TVA. The *Supply Chain Buyer Guide* also states there are some risks TVA will not accept without approval from senior leadership depending on the dollar value or exposure level associated with the risk. An example of those risks includes the acquisition of any product or service that expressly excludes a warranty. While TVA's contract for manufacturing of the MSRs contained warranties for items such as workmanship and equipment, the OEM's proposal for the study included a clause that stated, "ANY AND ALL WORK PERFORMED, AS A RESULT OF [OEM'S] RECOMMENDATIONS SHALL BE AT THE ENTIRE RISK AND OBLIGATION OF THE BUYER." This transferred all risk in using the OEM's study to TVA and absolved the OEM of any errors or problems with the study. There is no evidence that input from senior management was obtained before the OEM's proposal was accepted, which waived liability.

While the study itself was an $18,000 expense, it resulted in a multi-million-dollar project that TVA has not been able to execute and has limited recourse due to the lack of warranty associated with the OEM's study.

Contracting Officer Not Included in Some Contract Changes

TVA's contract with the OEM stated that no change, supplement, or amendment to the contract was valid without written consent of the contracting officer, and that the OEM was to provide all notices and related correspondence directly to the contracting officer. The contract also stated the project manager's contract administration role was limited to directing technical communications and/or documents and was prohibited from modifying the contract or issuing direction contrary to the contract. In July 2022, TVA formally amended the OEM's contract to revise the delivery date of the new MSRs. Based on the amendment, other terms of the contract would remain unchanged. However, approximately two weeks later, the OEM submitted a change order that reflected storage costs for the new MSRs as described above and a proposal to change terms in their contract. Specifically, the OEM proposed a delivery date different than stated in the formal contract amendment, with a stipulation that liquidated damages for delivery would not apply. The project manager agreed to change the contract terms as proposed by the OEM and indicated this action waived liquidated damages. This occurred without notification to the contracting officer as required. The contracting officer stated that the liquidated damages should have been re-negotiated and included in a formal contract amendment. By agreeing to changes to the contract, the project manager exceeded their authority and waived negotiated protections for TVA.

OEM Was Not Held Accountable for Procuring Components from Unapproved Sources

TVA's contract with the OEM specified the use of United States or designated country products or services, as required by Title 19, U.S. Code Chapter 13, Trade Agreements Act (1979) (TAA),[9] unless such end products or services (1) are not

[9] The TAA requires products purchased by the United States Government be either manufactured or substantially transformed in the United States or a designated country.

available from the United States or designated country sources, (2) are insufficient to fulfill TVA's requirements, or (3) costs are unfair, unreasonable, or both. Further, the contract required the OEM to notify the TVA contracting officer prior to provision of foreign work and when purchases are made outside of the sourcing plan. We identified two instances where TVA failed to hold the OEM accountable related to components procured from unapproved TAA countries.

- The OEM's sourcing plan sent to both the MSR Replacement Project manager and the contracting officer indicated that the OEM planned to procure certain components from China, a TAA nondesignated country. The contracting officer informed the OEM and the project manager that China was not an acceptable supplier for TVA; however, the OEM still sourced the material from China as documented in an invoice sent to and paid by TVA. Further, the Chinese supplier and respective components were the same as those that were noted to be a potential cause of contaminants in the steam generator related to the Unit2 MSR refurbishment project previously discussed.
- The OEM requested approval for items to be fabricated in India, another TAA nondesignated country. Project documentation indicated that the OEM acknowledged requirements of the contract to notify TVA in writing prior to the provision of foreign work. However, instead of notifying the contracting officer as required by the contract, the OEM notified the project manager for the MSR Replacement Project. Based on documentation, the project manager informed both SQN engineering and the contracting officer of the OEM's request. However, there was no evidence that the (1) contracting officer reviewed the request before the procurement was approved by the project manager or (2) procurement met any of the exceptions noted in the contract for not procuring products or services from either the United States or TAA approved countries.

Recommendations

We recommend the Vice President, Projects and Outages, coach project managers on the importance of:

9. Obtaining input from appropriate personnel and only taking actions they are authorized to perform when making contracting decisions.

10. Reviewing invoices thoroughly and obtaining input from contracting officers to identify potential unauthorized expenses before approval.

TVA Management's Comments – TVA management agreed with the recommendations and stated they will evaluate. See the Appendix for TVA management's complete response.

January 21, 2026

Greg Stinson, WT 2C-K

RESPONSE TO REQUEST FOR COMMENTS – DRAFT EVALUATION 2025-17531 – SEQUOYAH NUCLEAR PLANT MOISTURE SEPARATOR REHEATER REPLACEMENT PROJECT

Reference: Request for Comments – Draft Evaluation 2025-17531 – Sequoyah Nuclear Plant Moisture Separator Reheater Replacement Project

Projects, Engineering, and Supply Chain has reviewed the report and provides the following comments and management decision:

We disagree that the MSRs were not purchased as quality-related components in accordance with TVA's NQAP. The initial PO was for QA0 components; however, the PO was adjusted to specify QA3 components and the six MSRs are currently on site and fully received as QA3 components. Further inspections are not necessary to certify the MSRs as quality-related components.

RESPONSE TO RECOMMENDATIONS

Recommendation 1: Develop a process for identifying and evaluating key assumptions of, and risks to, nonroutine projects.

- Nuclear Projects agrees and will evaluate.

Recommendation 2: Determine if additional steps are needed for estimates related to nuclear projects.

- Nuclear Projects agrees and will evaluate.

Recommendation 3: Determine if the approximately $2.8 million in charges by the installation vendor were authorized.

- Nuclear Projects acknowledges the recommendation; however, further review is required. Upon completion of this review, Projects will pursue recovery as appropriate.

Recommendation 4: Recover the $742,000 for unauthorized pipe fitters and any of the $2.8 million determined by Nuclear to be unauthorized.

- Supply Chain acknowledges the recommendation; however, further review is required. Upon completion of this review, Supply Chain will pursue recovery as appropriate.

Recommendation 5: Implement a verification process to ensure an engineering review is performed prior to placing orders for long-lead nuclear procurements.

- Nuclear Projects agrees and will evaluate the process to ensure manufacturing specs, including quality requirements, are accurately determined prior to initiating the purchase order."

Recommendation 6: Initiate actions to evaluate the quality of the MSRs to determine usability.

- Nuclear Projects acknowledges the recommendation and will evaluate if further documentation is necessary.

Recommendation 7: Take steps to have quality issues and corrective actions with the SQN MSR project documented in the CAP.

- Nuclear Projects agrees and will evaluate.

Recommendation 8: Initiate a review to determine why the issues were not documented in the CAP in a timely manner.

- Nuclear Projects agrees and will evaluate.

Recommendation 9: Coach Project Managers on the importance of obtaining input from appropriate personnel when making contracting decisions.

- Nuclear Projects agrees and will evaluate.

Recommendation 10: Coach Project Managers on the importance of reviewing invoices thoroughly and obtaining input from contracting officers to identify potential unauthorized expenses before approval.

- Nuclear Projects agrees and will evaluate.

Conclusion

We would like to thank the OIG staff for their professionalism in conducting this audit. If you have further questions, please contact Christopher Dahlman, Senior Manager NASP, at 423-843-6801.

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