



**Memorandum from the Office of the Inspector General**

June 4, 2021

Timothy S. Rausch

**REQUEST FOR FINAL ACTION – EVALUATION 2021-15780 – TVA NUCLEAR'S  
HANDLING OF POTENTIALLY CONTAMINATED LIQUIDS**

Attached is the subject final report for your review and final action. Your written comments, which addressed your management decision and actions planned or taken, have been included in the report. Please notify us when final action is complete. 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 J. Lauren Pionke, Senior Auditor, at (865) 633-7381 or E. David Willis, Director, Evaluations, at (865) 633-7376. We appreciate the courtesy and cooperation received from your staff during the evaluation.

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

JLP:FAJ

Attachment

cc (Attachment):

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OIG File No. 2021-15780



Office of the Inspector General

## *Evaluation Report*

To the Executive Vice President  
and Chief Nuclear Officer, TVA  
Nuclear

# **TVA NUCLEAR'S HANDLING OF POTENTIALLY CONTAMINATED LIQUIDS**

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Evaluation Team  
J. Lauren Pionke  
Lucas W. Cotter

Evaluation 2021-15780  
June 4, 2021

## **ABBREVIATIONS**

CFAM	Corporate Function Area Manager
CFR	Code of Federal Regulations
NISP	Nuclear Industry Standard Process
NRC	Nuclear Regulatory Commission
RCA	Radiologically Controlled Area
RP	Radiological Protection
SPP	Standard Programs and Processes
TVA	Tennessee Valley Authority

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MEMORANDUM DATED MAY 25, 2021, FROM TIMOTHY S. RAUSCH  
TO DAVID P. WHEELER



## Evaluation 2021-15780 – TVA Nuclear’s Handling of Potentially Contaminated Liquids

### EXECUTIVE SUMMARY

#### Why the OIG Did This Evaluation

The Nuclear Regulatory Commission (NRC) Title 10, Code of Federal Regulations (CFR), Part 20, *Standards for Protection Against Radiation* (10 CFR §§ 20.1001-20.2402), establishes standards for protection against ionizing radiation<sup>i</sup> resulting from activities conducted under licenses issued by the NRC. The Tennessee Valley Authority’s (TVA) Nuclear Standard Programs and Processes (SPP) 05.1, *Radiological Controls*, outlines the minimum requirements for the radiation protection program at TVA’s three licensed nuclear plant sites: Browns Ferry, Sequoyah, and Watts Bar.

TVA’s nuclear sites have radiologically controlled areas (RCA), where access is limited and controlled by the radiation protection program, to manage occupational radiation exposure. According to TVA Nuclear SPP-05.1, workers shall not remove any radioactive materials from RCAs without authorization from Radiation Protection personnel. The Nuclear Industry Standard Process (NISP), Radiological Protection (RP) 007, *Control of Radioactive Material*, provides guidance for the survey, release, or control of materials from RCAs. According to NISP-RP-007, liquids shall be controlled as radioactive material until samples indicate they can be released for unrestricted use. Specifically, liquids can only be released after all analyses have been completed including testing results for (1) gamma radiation<sup>ii</sup> and (2) tritium,<sup>iii</sup> if there is the potential for tritium to be present.

Due to concerns identified during Evaluation 2020-15743, Sequoyah Nuclear Plant Radiation Protection’s Organizational Effectiveness (report issued December 10, 2020), we performed an evaluation of TVA Nuclear’s handling of potentially contaminated liquids at its nuclear sites. The scope of our evaluation was limited to TVA Nuclear’s process for releasing liquids from RCAs for unrestricted use.

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<sup>i</sup> Ionizing radiation comes from X-ray machines and radioactive elements. Radioactive elements emit ionizing radiation as their atoms undergo decay. The ionizing radiation emitted can include alpha particles, beta particles, and/or gamma rays. Radioactive decay occurs in unstable atoms called radionuclides.

<sup>ii</sup> Gamma rays are weightless packets of energy called photons and are often emitted along with alpha or beta particles during radioactive decay. Gamma rays are a radiation hazard for the entire body and can damage tissue and DNA.

<sup>iii</sup> Tritium is a beta-emitting atom and is most hazardous when inhaled or swallowed. The health risks include increased occurrence of cancer.



## Evaluation 2021-15780 – TVA Nuclear’s Handling of Potentially Contaminated Liquids

### EXECUTIVE SUMMARY

#### What the OIG Found

We determined potentially contaminated liquids were released from RCAs at each nuclear site. This occurred because all applicable analyses were not performed on some liquids prior to release. In addition, we identified opportunities for improvement related to (1) TVA Nuclear’s processes for tritium analysis prior to the release of liquids for unrestricted use and (2) documentation issues at each nuclear site, including the incomplete submittal of records, incomplete maintenance processes, and inaccurate logs.

#### What the OIG Recommends

We made seven recommendations regarding TVA Nuclear’s processes for releasing liquids from RCAs, related to (1) verifying liquids do not contain any detectable radioactivity prior to release, (2) defining processes and developing guidance regarding tritium analysis, and (3) addressing documentation issues at each site. Our detailed recommendations are listed in the body of this report.

#### TVA Management’s Comments

In response to our draft report, TVA management agreed with six of our seven recommendations as written and stated actions have been, or will be, taken to address the recommendations. TVA management provided an alternative solution to one recommendation regarding maintenance processes. See the Appendix for TVA’s complete response.

#### Auditor’s Response

We concur with TVA management’s planned or completed actions for the recommendations.

## **BACKGROUND**

The Nuclear Regulatory Commission (NRC) Title 10, Code of Federal Regulations (CFR), Part 20, *Standards for Protection Against Radiation* (10 CFR §§ 20.1001-20.2402), establishes standards for protection against ionizing radiation<sup>1</sup> resulting from activities conducted under licenses issued by the NRC. The purpose of the standard is to control the receipt, possession, use, transfer, and disposal of licensed material.

The Tennessee Valley Authority's (TVA) Nuclear Standard Programs and Processes (SPP) 05.1, *Radiological Controls*, outlines the minimum requirements for the radiation protection program at TVA's three licensed nuclear plant sites: Browns Ferry, Sequoyah, and Watts Bar. According to TVA Nuclear SPP-05.1, NRC requires licensees to establish procedures that cover the control of radioactivity to limit materials released to the environment and personnel exposure.

TVA's nuclear sites have radiologically controlled areas (RCA), where access is limited and controlled by the radiation protection program, to manage occupational radiation exposure. According to TVA Nuclear SPP-05.1, workers shall not remove any radioactive materials from RCAs without authorization from Radiation Protection personnel. Liquids, such as water, oil, or glycol,<sup>2</sup> can be released from RCAs for unrestricted use, as long as they do not contain any detectable radioactivity.

The Nuclear Industry Standard Process (NISP), Radiological Protection (RP) 007, *Control of Radioactive Material*, provides guidance for the survey, release, and control of materials from RCAs. According to NISP-RP-007, liquids shall be controlled as radioactive material until samples<sup>3</sup> indicate they can be released for unrestricted use. Specifically, liquids can only be released after being analyzed for (1) gamma radiation<sup>4</sup> and (2) tritium,<sup>5</sup> if there is the potential for tritium to be present. If no activity is detected other than naturally occurring isotopes, liquids can be released.

TVA Nuclear SPP-05.1 was revised on December 3, 2020, to incorporate NISP-RP-007. TVA Nuclear SPP-05.1 states *liquids that require monitoring under*

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<sup>1</sup> Ionizing radiation comes from X-ray machines and radioactive elements. Radioactive elements emit ionizing radiation as their atoms undergo decay. The ionizing radiation emitted can include alpha particles, beta particles, and/or gamma rays. Radioactive decay occurs in unstable atoms called radionuclides.

<sup>2</sup> Glycol works to lower a fluid's freezing temperature.

<sup>3</sup> NISP-RP-007 states liquids cannot be released by monitoring only, but must include sample analysis unless the container holding the liquids was unopened while in the RCA.

<sup>4</sup> Gamma rays are weightless packets of energy called photons and are often emitted along with alpha or beta particles during radioactive decay. Gamma rays are a radiation hazard for the entire body and can damage tissue and DNA.

<sup>5</sup> Tritium is a beta-emitting atom and is most hazardous when inhaled or swallowed. The health risks include increased occurrence of cancer.

*NISP-RP-007* shall be monitored to no detectable activity above background<sup>6</sup> prior to unrestricted release, whereas prior to December 3, 2020, the process indicated *all liquids* shall be monitored.

Due to concerns identified during Evaluation 2020-15743, Sequoyah Nuclear Plant Radiation Protection's Organizational Effectiveness (report issued December 10, 2020), we performed an evaluation of TVA Nuclear's handling of potentially contaminated liquids at its nuclear sites.

## **OBJECTIVE, SCOPE, AND METHODOLOGY**

The objective of our evaluation was to determine if TVA Nuclear is taking appropriate steps before releasing liquids. The scope of our evaluation was limited to TVA Nuclear's process for releasing liquids from RCAs for unrestricted use.

To achieve our objectives, we:

- Reviewed TVA Nuclear's processes and procedures and other related documentation to gain an understanding of the process for releasing liquids from RCAs.
- Reviewed condition reports<sup>7</sup> to identify any concerns and issues related to TVA Nuclear's process for releasing liquids from RCAs.
- Interviewed pertinent TVA Nuclear personnel to gain an understanding of (1) the process for releasing liquids from RCAs, (2) each site's understanding and application of the related procedures, (3) roles and responsibilities related to releasing liquids from RCAs, and (4) the availability of data or documentation related to liquid releases from RCAs at each site.
- Compared industry standards and applicable regulatory requirements to TVA's processes and procedures to ensure alignment.
- Reviewed recent documentation to identify liquid releases from RCAs at each site.<sup>8</sup>
- Reviewed liquid releases from RCAs at each site<sup>9</sup> to (1) verify all applicable analyses were performed and (2) determine if liquids above the detectable limit or potentially contaminated liquids were released from RCAs.

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

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<sup>6</sup> Background radiation means radiation from cosmic sources, naturally occurring radioactive material, and global fallout as it exists in the environment from the testing of nuclear explosive devices or from past nuclear accidents such as Chernobyl.

<sup>7</sup> A condition report is a mechanism used to document an issue (undesired condition, problem, or concern raised by personnel).

<sup>8</sup> Because of differing processes at each site, the number of releases and the documentation available varied greatly.

<sup>9</sup> Liquid releases ranged from one sample (e.g., 125 milliliters) to multiple drums of liquids.



## **FINDINGS AND RECOMMENDATIONS**

We determined potentially contaminated liquids were released from RCAs at each nuclear site. This occurred because all applicable analyses were not performed on some liquids prior to release. In addition, we identified opportunities for improvement related to TVA Nuclear's processes and documentation.

### **POTENTIALLY CONTAMINATED LIQUIDS WERE RELEASED FROM RCAs**

TVA Nuclear is responsible for controlling radioactivity to limit materials released to the environment and personnel exposure. Specifically, material released for unrestricted use should not contain detectable radioactivity. However, we determined potentially contaminated liquids were released from RCAs because all applicable analyses were not performed on some liquids prior to release at Browns Ferry, Sequoyah, and Watts Bar.

#### **Browns Ferry**

We reviewed 4 liquid releases at Browns Ferry that occurred between August 11, 2020, and December 17, 2020.<sup>10</sup> One liquid release occurred after TVA Nuclear SPP-05.1 was revised, and according to Radiation Protection personnel, the liquids did not have the potential to contain tritium. However, we determined 3 of the 4 liquid releases occurred prior to December 3, 2020, when TVA Nuclear SPP-05.1 required all liquids to be monitored for gamma radiation and tritium. The 3 releases contained 15 oil samples, 8 drums of water, and 3 glycol samples. We determined the 15 oil samples were released from the RCA without being monitored for tritium. According to Maintenance personnel, routine oil samples are pulled for preventive/predictive maintenance purposes, which requires oil to be shipped offsite for analysis.<sup>11</sup> However, Browns Ferry does not have the capability to test oil for tritium onsite and we determined Radwaste<sup>12</sup> personnel did not ship any oil offsite for tritium analysis in 2020. Therefore, potentially contaminated oil samples were sent to TVA Central Laboratories<sup>13</sup> for oil analysis and disposed of as used oil. Maintenance personnel estimated 600 oil samples were pulled from equipment inside the RCA and sent out for oil analysis in 2020. According to Maintenance personnel, they started shipping oil samples to a licensed laboratory<sup>14</sup> for tritium analysis in 2021.

In addition, we reviewed documentation related to 8 drums of water and 3 glycol samples released from the RCA at Browns Ferry in August and October 2020,

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<sup>10</sup> We were unable to identify all releases that occurred at Browns Ferry due to documentation issues discussed below.

<sup>11</sup> The oil is analyzed for quality and wear, not radioactivity.

<sup>12</sup> TVA Nuclear's Radwaste groups are responsible for radioactive shipments sent from each site to licensed laboratories for analysis or disposal.

<sup>13</sup> TVA's Central Laboratories performs oil analysis on lube oils from TVA's entire fleet. Lube oil samples are typically held for 30 days then disposed of as used oil.

<sup>14</sup> Licensed laboratories maintain radioactive materials licenses, which allow the laboratories to process and dispose of radioactive contaminated materials.

respectively, and determined all 11 liquids were released without being tested to the minimum detection limit for tritium. As stated previously, TVA Nuclear SPP-05.1 requires liquids to be monitored to no detectable activity above background for tritium with a defined minimum detection limit. According to Chemistry personnel, they had not been meeting the detection limit for tritium when analyzing water and glycol. Therefore, the water and glycol should not have been released by Radiation Protection personnel. As a result of our evaluation, Browns Ferry's Chemistry group relocated the testing equipment to a lower dose area in the laboratory and are now meeting detection limits for tritium below the requirement.

### **Sequoyah**

We reviewed all releases that occurred at Sequoyah between January 1, 2020, and December 18, 2020, and identified 157 releases from the RCA that contained liquids, the majority of which were non-water. We reviewed 8 releases that occurred prior to December 3, 2020, when TVA Nuclear SPP-05.1 required all liquids to be monitored for gamma radiation and tritium. The 8 releases contained 15 oil samples and 2 glycol samples. We determined all 17 samples were released from the RCA without being monitored for tritium. Furthermore, Sequoyah does not have the capability to analyze tritium onsite for non-water liquids and we determined Radwaste personnel only shipped 1 oil sample offsite for tritium analysis in 2020.

According to Maintenance personnel and procedures, routine oil samples are pulled for preventive/predictive maintenance purposes, which requires oil to be shipped offsite for analysis. Therefore, potentially contaminated oil samples were sent to TVA Central Laboratories and disposed of as used oil. However, according to Maintenance and Radwaste personnel, they started shipping oil samples that had the potential to contain tritium from the RCA to a licensed laboratory for oil analysis in December 2020.

### **Watts Bar**

We reviewed all releases from the RCA that occurred at Watts Bar between December 2, 2019, and January 26, 2021, and identified 4 that contained liquids. Three liquid releases occurred after TVA Nuclear SPP-05.1 was revised, and according to Radiation Protection personnel, the liquids did not have the potential to contain tritium. However, we determined 1 liquid release occurred prior to December 3, 2020, when TVA Nuclear SPP-05.1 required all liquids to be monitored for gamma radiation and tritium. The release contained 1 water sample, which was released from the RCA without being monitored for tritium. According to Radiation Protection personnel, the water sample was released from the RCA at Watts Bar based on the gamma radiation results; however, the sample was not tested for tritium. According to Chemistry and Radiation Protection personnel, once released, the sample was brought to an onsite Chemistry laboratory outside the RCA for additional testing and then returned to the RCA. Therefore, it appears potentially contaminated liquids were released from the RCA.

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We determined TVA Nuclear was not taking appropriate steps before releasing liquids from RCAs. Since required analysis was not performed, TVA Nuclear cannot confirm if liquids had detectable radioactivity when releases occurred, which puts the environment and personnel at risk of potential exposure to radioactive contamination.

### **Recommendation**

We recommend the Executive Vice President and Chief Nuclear Officer, TVA Nuclear, verify and document all required analyses have been performed on liquids prior to release from the RCA.

**TVA Management's Comments** – The Radiation Protection peer team reinforced procedural requirements with all Radiation Operations personnel in shift turnover meetings. Follow-up oversight was performed by fleet center Operations Support personnel to ensure the standards for releasing liquids are being met. Additionally, a quarterly touchpoint was added for the Corporate Function Area Manager (CFAM) of Radiation Protection/Radwaste to review a sample of the liquid release surveys to ensure procedural compliance. A CFAM gap statement with recovery actions was issued to the Radiation Protection peer team for lack of compliance to the process. See the Appendix for TVA's complete response.

**Auditor's Response** – We concur with management's completed and planned actions.

## **OPPORTUNITIES FOR IMPROVEMENT**

We identified opportunities for improvement related to (1) TVA Nuclear's processes for tritium analysis prior to the release of liquids for unrestricted use and (2) documentation issues at each nuclear site, including the incomplete submittal of records, incomplete maintenance processes, and inaccurate logs.

### **Processes Were Not Clearly Defined**

TVA Nuclear SPP-05.1 was revised on December 3, 2020, to align TVA Nuclear's process with industry standards. According to NISP-RP-007, liquids can only be released after a review of all analysis has been completed, including analysis for (1) gamma radiation and (2) tritium, if there is the potential for tritium activity to be present. We determined TVA Nuclear's revised process was not clearly defined regarding tritium analysis prior to the release of liquids for unrestricted use. Specifically, TVA Nuclear had not developed clear guidance or processes regarding (1) what liquids could potentially contain tritium and would require analysis prior to release and (2) how sites are to analyze liquids if they have the potential to contain tritium.

### Lack of Guidance Regarding Liquids With Potential to Contain Tritium

We determined there was no defined criteria or guidance regarding what liquids could potentially contain tritium and would require tritium analysis. Therefore, the determination is subjective, which allows for inconsistency and creates a risk that contaminated liquids could be released.

According to TVA Nuclear's Chemistry personnel, Radiation Protection personnel are responsible for determining what analyses are needed for the free release of liquids, so Chemistry personnel would typically only analyze for tritium if requested by Radiation Protection personnel. Furthermore, some Radiation Protection personnel said they assumed analysis for gamma radiation was sufficient or were not aware other analysis was required. For example, a Browns Ferry employee said Chemistry tests for Cobalt-60 during the gamma radiation analysis and tritium cannot be present without also having Cobalt-60. However, we found several samples at Watts Bar where gamma radiation was not detected, but tritium was detected; therefore, Radiation Protection personnel should not rely solely on gamma radiation results for release. In addition, some Radiation Protection personnel indicated they rely on Chemistry to perform the required analyses and/or were unaware site Chemistry could not perform all required analyses prior to release. According to TVA Nuclear management, as of January 2021, sites had not formally documented the basis to clarify when liquid samples could be released from the RCA without tritium analysis, but sites were in the process of developing that basis.

### Lack of Processes Regarding Analyzing Tritium

We determined there was no formal process for how to analyze liquids if there was potential for tritium to be present. The lack of a formal process has resulted in inconsistencies across the nuclear fleet. For example, as discussed previously, routine oil samples pulled from the RCA for preventive/predictive maintenance purposes have been treated differently at each site. Until recently, these oil samples were released from RCAs without being tested for tritium and shipped by Maintenance personnel to TVA's Central Laboratories. In 2018, Watts Bar's Radwaste personnel started shipping these oil samples to a licensed laboratory capable of performing the required oil analysis on potentially contaminated oil. In 2020, Sequoyah's Radwaste personnel began shipping some oil samples to licensed laboratories, but they utilized two different laboratories, one that conducts analysis to verify tritium contamination does not exist and one that conducts the required oil analysis on potentially contaminated oil. In 2021, Browns Ferry's Radwaste personnel began shipping oil samples to a licensed laboratory to verify tritium contamination does not exist. If the oil samples test negative for tritium, they are released from the RCA and Maintenance personnel ship them to TVA's Central Laboratories for oil analysis. Although each site has begun taking steps to ensure liquids do not contain tritium contamination, it does not appear any cost analyses have been performed to determine the best course of action or process for analyzing tritium at each site.

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The lack of guidance and formal processes have resulted in inconsistent analysis and handling of liquids across the fleet. This creates a risk that contaminated liquids could be released to the environment.

### **Documentation Issues**

We identified documentation issues at each site, including (1) records not being submitted into TVA's content management system, (2) maintenance processes that did not specify tritium analysis may be required for oil samples, and (3) radioactive material shipments inaccurately logged as releases.

#### Incomplete Submittal of Records

To document liquid releases from the RCA, Browns Ferry utilizes paper copies of unconditional release forms, which are filed onsite until they can be uploaded into TVA's content management system. However, as of January 27, 2021, the last unconditional release form in TVA's content management system for Browns Ferry was dated May 28, 2020. Therefore, there is a risk of documentation being lost or destroyed at Browns Ferry. A related condition report was issued at Browns Ferry in December 2020, which recognized a substantial amount of quality assurance records<sup>15</sup> (which includes unconditional release forms) had not been submitted in accordance with TVA Nuclear SPP-31.2, *Records Management*. The procedure states completed records should be submitted to TVA's content management group for processing and records storage.

Backlogs also exist for Sequoyah and Watts Bar. As of February 1, 2021, the last unconditional release form in TVA's content management system for Sequoyah was dated August 12, 2019. As of March 16, 2021, the last unconditional release form in TVA's content management system for Watts Bar was dated May 31, 2020. However, these sites also document unconditional release forms in another system, which reduces the risk of documentation being lost or destroyed.

#### Incomplete Maintenance Processes

We determined some maintenance processes did not specify tritium analysis may be required for oil samples. As stated previously, Sequoyah handles oil samples pulled from the RCA for preventive/predictive maintenance purposes in a few different ways. Therefore, we reviewed two related maintenance instructions at Sequoyah and determined they direct Maintenance personnel to deliver oil samples to the Chemistry lab for radiological count/isotopic analysis.<sup>16</sup> In addition, one maintenance instruction directed personnel to coordinate the shipment of oil samples offsite to have a quality and wear analysis performed. The two maintenance instructions did not specify that off-site tritium analysis may be required prior to shipment for quality and wear analysis or that quality and wear analysis may need to be performed by a licensed laboratory. This creates a risk at Sequoyah that contaminated oil samples could be released to the environment.

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<sup>15</sup> Quality assurance records furnish documentary evidence of the quality of items and of activities affecting quality.

<sup>16</sup> According to Chemistry personnel, radiological count/isotopic analysis refers to gamma radiation analysis only.

### Inaccurate Logs

During our review of liquid releases at Watts Bar, we identified 13 liquid samples inaccurately logged on unconditional release forms. We determined these liquid samples were controlled and shipped as radioactive material to a licensed laboratory and therefore were not released from the site for unrestricted use. According to Watts Bar personnel, radioactive shipments should not be on the unconditional release form.

### Recommendations

We recommend the Executive Vice President and Chief Nuclear Officer, TVA Nuclear:

- Establish criteria and guidance regarding what liquids would require tritium analysis.

**TVA Management's Comments** – Each site completed analysis to formally document the evidence that forms the basis for required tritium sampling and analysis as part of the RCA release plan. The Radiation Protection Technical Subcommittee will review the documentation and consolidate into one fleet position paper. The paper will be forwarded to the peer team for approval with recommended required procedural changes. A CFAM Missed Opportunity is also being performed to determine what actions were not in place to prevent this gap from occurring. See the Appendix for TVA's complete response.

**Auditor's Response** – We concur with management's completed and planned actions.

- Conduct cost analyses to establish the best course of action for each site when handling liquids that require tritium analysis and formalize processes accordingly.

**TVA Management's Comments** – An action to complete a cost analysis to identify the primary vendor used by the fleet for liquid samples that require tritium analysis will be completed. An analysis to determine the long-term feasibility of shipping the oil samples as radioactive material directly to TVA's Central Laboratories will be completed. Once the analysis is complete, the standardized method will be added to Radiation Protection's formal processes. See the Appendix for TVA's complete response.

**Auditor's Response** – We concur with management's planned actions.

- Educate site personnel on the revised process for releasing liquids, including requirements, roles, and responsibilities.

**TVA Management's Comments** – An action to train all Radiation Protection management, technicians, and specialists on the process for releasing liquids, including requirements, roles, and responsibilities, will be completed. A training performance analysis will be performed to determine the scope, content, and verification of retention of the training. An additional analysis is planned to determine if other groups outside of Radiation Protection (e.g., Chemistry,



Maintenance, and Engineering) need training on the process. See the Appendix for TVA's complete response.

**Auditor's Response** – We concur with management's planned actions.

- Verify all release forms are recorded electronically in a timely manner.

**TVA Management's Comments** – Procedures are under revision to require the site unconditional release form to be entered each day, or next working day, into the electronic survey system, if there are samples that were released. All supporting documentation is required to be scanned and attached. The Radiation Protection supervisor verifies each day, or next working day, that the unconditional release form is complete, accurate, and recorded electronically. See the Appendix for TVA's complete response.

**Auditor's Response** – We concur with management's planned actions.

- Update preventive maintenance processes as needed, to reflect that tritium analysis may be required for oil samples.

**TVA Management's Comments** – All samples, including oil for unconditional release, will be taken directly to Radiation Protection to eliminate the risk of releasing samples without the required analysis. Therefore, applicable preventive maintenance process revisions are planned to instruct Maintenance to bring the samples directly to Radiation Protection to determine what analysis is needed for release of the sample.

**Auditor's Response** – We concur with management's alternative planned actions.

- Verify radioactive shipments are not logged on the unconditional release forms.

**TVA Management's Comments** – Radiation Protection supervisors will verify each day, or next working day, that no radioactive shipments are logged on the unconditional release form, and they will validate all criteria has been met prior to signing the form.

**Auditor's Response** – We concur with management's planned actions.

May 25, 2021

David P. Wheeler

RESPONSE TO OIG EVALUATION 2021-15780 - TVA NUCLEAR'S HANDLING OF POTENTIALLY  
CONTAMINATED LIQUIDS

We appreciate the efforts taken by the audit team in conducting this evaluation. We also value and agree with the recommendations provided in this report. The concerns previously identified in the Sequoyah Radiation Protection Organizational Effectiveness Evaluation (Evaluation 2020-15743) were both insightful and pertinent to this evaluation. TVA's process for the unconditional release of liquids is an industry wide standard process covering all three sites. It requires liquids (including oils) to be analyzed for tritium to the environmental Lower Limit of Detection (LLD), unless there is justification (process knowledge, a technical basis, etc.) for not performing a tritium analysis.

Our follow up investigation found that there was a lack of accountability in owning and executing the established process. This evaluation also correctly identified that the technical basis for not analyzing a sample for tritium in oil was not properly compiled and documented. The actions already taken, and those that are planned in response to these recommendations, will ensure the requirements for releasing liquids from the Radiologically Controlled Area (RCA) are clearly understood and performance to these requirements is sustainable.

The specific actions that have been taken and those that are planned are discussed below. All actions are captured in the fleet Corrective Action Program.

**Recommendation 1: The Executive Vice President and Chief Nuclear Officer, TVA Nuclear, verify and document all required analysis have been performed on liquids prior to release from the Radiologically Controlled Area (RCA).**

Radiation Protection personnel are responsible for determining the analysis and acceptance criteria for the release of liquids. Radiation Protection reports through the site organization to the Chief Nuclear Officer. On 4/28/2021, the Radiation Protection peer team reinforced the requirements in NISP-RP-007 and NPG-SPP-05.1 for releasing liquids from the RCA with all Radiation Operations personnel in shift turnover meetings. Each site also issued standing orders, used to force immediate actions on shift, on the requirements for releasing liquids from the RCA for unconditional use. Follow up oversight was performed by fleet center Operations Support personnel to ensure the standards for free releasing liquids are being met. Additionally, a quarterly touchpoint was added for the Corporate Function Area Manager (CFAM) of Radiation Protection/Radwaste (RP/RW) to review a sample of the liquid release surveys to ensure compliance with NISP-RP-007 and NPG-SPP-05.1. A CFAM gap statement with recovery actions was issued to the Radiation Protection Peer Team for lack of compliance to the process for releasing liquids for unrestricted use. Actions require the Radiation Protection shift supervisor to verify and document that all required analysis have been performed on liquids prior to release from the RCA. (CR 1693983 - Completion Date: 9/30/21)

**Recommendation 2: The Executive Vice President and Chief Nuclear Officer, TVA Nuclear, establish Criteria and guidance regarding what liquids would require tritium analysis.**

Radiation Protection personnel are responsible for determining the analysis and acceptance criteria for the release of liquids. Radiation Protection reports through the site organization to the Chief Nuclear Officer. On 1/20/2021, CR 1667429 was initiated requiring each station Radiation Protection department



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to formally document evidence that forms the basis for required tritium sampling and analysis as part of the RCA release plan. Currently each site has completed the analysis and the results can be found attached to CR 1667429 in actions -001, -002, and -003. The next action due on 5/28/2021 requires the Radiation Protection Technical Subcommittee to review the documentation and consolidate into one fleet position paper. The Radiation Protection Technical Support subcommittee will forward to the peer team for approval and recommend required procedure changes. A CFAM Missed Opportunity is also being performed in accordance with NPG-SPP-01.4 to determine what actions were not in place to prevent this GAP from occurring.  
(CR 1667429 - Completion Date: 8/30/21)

**Recommendation 3: The Executive Vice President and Chief Nuclear Officer, TVA Nuclear, conduct a cost analysis to establish the best course of action for each site when handling liquids that require tritium analysis and formalize the processes accordingly.**

Radiation Protection personnel are responsible for determining the analysis and acceptance criteria for the release of liquids. Radiation Protection reports through the site organization to the Chief Nuclear Officer. An action to complete a cost analysis to identify the primary vendor used by the fleet for liquid samples that require tritium analysis has been added to CR 1693983. Water samples are analyzed using the site's liquid scintillation detectors capable of seeing the Lower Limit of Detection for tritium identified in NPG-SPP-05.1. TVA's Central Laboratories currently has a NRC radioactive material license. An analysis to determine the long term feasibility of shipping the oil samples as radioactive material directly to TVA's Central Laboratories has also been added to CR 1693983. Once the cost analysis is complete, the standardized method will be added to Radiation Protection's formal processes for release of liquids.  
(CR 1693983 - Completion Date: 10/31/21)

**Recommendation 4: The Executive Vice President and Chief Nuclear Officer, TVA Nuclear, educate site personnel on the revised process for releasing liquids, including requirements, roles, and responsibilities.**

Radiation Protection personnel are responsible for determining the analysis and acceptance criteria for the release of liquids. Radiation Protection reports through the site organization to the Chief Nuclear Officer. An action was added to CR 1693983 to train all Radiation Protection management, technicians, and specialists on the process for releasing liquids, including requirements, roles, and responsibilities. A training performance analysis will be performed to determine the scope, content, and verification of retention (testing) of the training. An additional analysis using the Systematic Approach to Training is planned to determine if other groups outside of Radiation Protection (e.g. Chemistry, Maintenance, and Engineering) need training on the process for releasing liquids.  
(CR 1693983 - Completion Date: 10/31/21)

**Recommendation 5: The Executive Vice President and Chief Nuclear Officer, TVA Nuclear, verify all release forms are recorded electronically in a timely manner.**

Radiation Protection personnel are responsible for determining the analysis and acceptance criteria for the release of liquids. Radiation Protection reports through the site organization to the Chief Nuclear Officer. Procedures are under revision to require the site unconditional release form to be entered each day or next working day into the electronic survey system (VSDS) as a one line entry, if there are samples

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that were released. All supporting documentation is required to be scanned and attached to the one line survey. The Radiation Protection supervisor verifies each day or next working day that the unconditional release form is complete, accurate, and recorded electronically.  
(CR 1693983 Completion Date: 8/31/21)

**Recommendation 6: The Executive Vice President and Chief Nuclear Officer, TVA Nuclear, update preventive maintenance process as needed, to reflect tritium analysis may be required for oil samples.**

Radiation Protection personnel are responsible for determining the analysis and acceptance criteria for the release of liquids. Radiation Protection reports through the site organization to the Chief Nuclear Officer. All samples including oil for unconditional release will be taken directly to Radiation Protection to eliminate the risk of releasing samples without the required analysis. Therefore, applicable Preventative Maintenance instruction revisions are planned to instruct Maintenance to bring the samples directly to Radiation Protection to determine what analysis is needed for unconditional release of the sample.  
(CR 1693983 - Completion Date: 12/31/21).

**Recommendation 7: The Executive Vice President and Chief Nuclear Officer, TVA Nuclear, verify radioactive shipments are not logged on the unconditional release forms.**

Radiation Protection personnel are responsible for determining the analysis and acceptance criteria for the release of liquids. Radiation Protection reports through the site organization to the Chief Nuclear Officer. Radioactive shipments or material will not be logged on unconditional release forms. Radiation Protection supervisors will verify each day or next working day that no radioactive shipments are logged on the unconditional release form, and they validate all criteria has been met prior to signing the unconditional release form.  
(CR 1693983 - Completion Date: 8/31/21).

If you have any questions, please contact Steve McCamy at 423.751.2635 or at [ismccamy@tva.gov](mailto:ismccamy@tva.gov).

Sincerely,



Timothy S. Rausch  
Executive Vice President and Chief Nuclear Officer  
TVA Nuclear  
LP 4A-C

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