Memorandum from the Office of the Inspector General

June 10, 2022

Frank K. Grover

REQUEST FOR FINAL ACTION – EVALUATION 2021-17297 – TVA NUCLEAR RADIATION DOSAGE

Title 10, Code of Federal Regulations, Part 20 (10 CFR §§ 20.1001-20.2402), *Standards for Protection Against Radiation*, establishes dose limits for radiation workers. According to 10 CFR § 20.1101(b), licensees shall, to the extent practical, use procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are as low as is reasonably achievable. Due to the risk of worker exposure to radiation at the Tennessee Valley Authority (TVA) nuclear generation facilities, we conducted an evaluation of TVA nuclear radiation dosage. The objectives of our evaluation were to determine (1) the effectiveness of the radiation protection program in limiting employee dosage and (2) if notifications were made when required.

We determined TVA's radiation protection program was effective in limiting employee dosage levels during calendar years (CY) 2019 and 2020. Additionally, we determined the Nuclear Regulatory Commission (NRC) and TVA personnel were notified, as required, when personnel dosage met regulatory milestones. However, we identified an opportunity for improvement as not all dosimetry investigations were performed as required.

We recommend the Vice President, Nuclear Operations Support, take steps to verify dosimetry investigations are performed as required.

In response to our draft report, TVA management stated they take steps to verify dosimetry investigations and dosimetry investigation reports (DIR) are completed as required. See the Appendix for TVA management's complete response.

BACKGROUND

As stated above, 10 CFR §§ 20.1001-20.2402, *Standards for Protection Against Radiation*, establishes dose limits for radiation workers. According to 10 CFR § 20.1101(b), licensees shall, to the extent practical, use procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are as low as is reasonably achievable. Although the limits vary depending on the affected part of the body the annual total effective dose equivalent (TEDE) for the whole body should be limited to 5,000 millirem (mrem).[1] NPG-SPP-05.1 requires authorization from management to exceed any dosage exposure

[1] A mrem is one thousandth of a rem. A rem is one of two standard units used to measure the dose equivalent that combines the amount of energy (from any type of ionizing radiation that is deposited in human tissue) along with the medical effects of the given type of radiation.

beyond 2,000 mrem. According to the CFR, individuals who receive occupational exposure and require monitoring shall have their doses reported annually to the NRC. Additionally, individuals whose TEDE is greater than 100 mrem will be notified.

Dosage is measured by wearing both a primary dosimeter[2] and a self-reading dosimeter (SRD). TVA's Radiation Protection (RP) group[3] uses both dosimeters to compare the employee's dose of legal record (DLR) for quality assurance.[4] According to industry standards,[5] if the difference in the readings between the DLR and SRD exceed 30 percent, additional testing is required, and if the readings are still out of parameters, a dosimetry investigation must be performed to investigate the difference.[6] The dosimetry investigation and the most accurate dose is reported by means of the DIR as the DLR.

OBJECTIVE, SCOPE, AND METHODOLOGY

The objectives of this evaluation were to determine (1) the effectiveness of the radiation protection program in limiting employee dosage and (2) if notifications were made when required. The scope of the evaluation was CYs 2019 and 2020. To achieve our objectives, we:

- Reviewed SPPs, federal regulations, and industry standards to obtain an understanding of dosage limitations and reporting requirements, including:
  - NPG-SPP-05.1, *Radiological Controls*
  - 10 CFR, Part 19.13, *Notifications and Reports to individuals*
  - 10 CFR, Part 20, *Standards for Protection Against Radiation*
  - ANSI/HPS N13.11-2009, *Personnel Dosimetry Performance – Criteria for Testing*
- Conducted interviews with appropriate personnel at each site to gain an understanding of the related processes for radiation dosage.
- Reviewed related condition reports[7] and other documentation to determine if dosage amounts were recorded properly.

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2 A small portable instrument used to measure and record the total accumulated personal dose of ionizing radiation.

3 The RP group is responsible for ensuring activities are conducted in ways that protect the radiological health of workers and the public by keeping radiation doses as low as (is) reasonably achievable, as required by the NRC.

4 In some instances, due to the loss or damage of a monitoring device or the inability of the monitoring device to measure certain types of radiation, it will be necessary to calculate an individual's dose as appropriate.

5 American National Standards Institute (ANSI)/Health Physics Society (HPS) N13.11-2009, American National Standard for Dosimetry, *Personnel Dosimetry Performance – Criteria for Testing*. This is the proficiency-testing standard for personnel dosimetry performance developed through a joint-agency agreement between the NRC and the National Institute of Standards and Technology, an agency of the U.S. Department of Commerce.

6 According to RP group staff, SRDs are calibrated to read 110 percent of the actual dose to provide additional margin to assure regulatory dose limits are not exceeded.

7 Condition reports document how problems were found, analyzed, and fixed in TVA's corrective action program.

- Verified that dosimeter exposure data was current by reviewing reports from TVA's Exposure Control System database.
- Compared individual dose data with TVA acceptable dosage limits and regulatory limits to determine if any employees exceeded administrative dose levels and regulatory limits.
- Verified employees, supervisors, and the NRC were notified of exposures, as required.
- Verified if DIRs were completed, when required.

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

FINDINGS

We determined TVA's radiation protection program was effective in limiting employee dosage levels during CYs 2019 and 2020. Specifically, we found (1) no one exceeded an annual TEDE greater than 2,000 mrem; (2) TVA has systems and processes in place to warn personnel if they are approaching dosage limits for specific jobs inside the radiologically controlled area;[8] and (3) all sites have SRD readers in multiple locations, which transmit dose information in real time so it can be monitored by TVA's RP group. Additionally, we found (1) the NRC was notified, as required, when personnel dosage exceeded 10 mrem, and (2) personnel were notified, as required, when their annual dosage exceeded 100 mrem. However, we identified an opportunity for improvement as not all dosimetry investigations were performed as required.

OPPORTUNITY FOR IMPROVEMENT

We identified an opportunity for improvement related to performing a dosimetry investigation when the difference between an employee's DLR and their SRD are outside the established industry limits. We found not all DIRs were completed or TVA was unable to provide evidence that dosimetry investigations were conducted in some cases at Watts Bar and Browns Ferry nuclear plants. Specifically, we found 7 of 71 DIRs were not completed. Subsequent to the Office of the Inspector General requesting DIRs, Browns Ferry and Watts Bar nuclear plants began taking actions to investigate and complete the missing DIRs. Without performing dosimetry investigations, management cannot identify what caused the discrepancies and if dosimetry readings are accurate.

RECOMMENDATION

We recommend the Vice President, Nuclear Operations Support, take steps to verify dosimetry investigations are performed as required.

TVA Management's Comments – In response to our draft report, TVA management stated they take steps to verify dosimetry investigations and DIRs are completed as required. See the Appendix for TVA management's complete response.

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[8] Radiologically controlled area access is limited and controlled by the radiation protection program to manage radiation exposure.

Auditor's Response – We concur with TVA's planned actions for the recommendation.

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This report is 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 observations, please contact Samuel L. Ruble, Senior Auditor, Evaluations, at (865) 633-7384 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)

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cc: TVA Board of Directors
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OIG File No. 2021-17297

June 8, 2022

David P. Wheeler – WT 2C-K

RESPONSE TO REQUEST FOR COMMENTS – EVALUATION 2021-17297 – NUCLEAR RADIATION DOSAGE

Thank you for your evaluation of TVA nuclear radiation dosage. TVA has reviewed the subject report 2021-17297, accepts the evaluation conclusions and recommendations, and provides its response to the OIG recommendation below.

OIG Recommendation:

We recommend the Vice President, Nuclear Operations Support, take steps to verify dosimetry investigations are performed as required.

Management Actions to Address:

Action 1: The Vice President, Nuclear Operations Support, will verify through the RP CFAM, that Dosimetry Investigations and subsequent Dosimetry Investigation Reports (DIRs) are completed in accordance with RCTP-105, section 3.6. The responsible party will be the RP Technical Support Superintendent.

Action 2: The RP CFAM to perform a touchpoint verification at each station after each monitoring period to ensure that dosimetry investigation reports are identified and completed as required

These actions are being tracked within CR# 1781989.

Thank you again for the work performed by your staff and your feedback. The recommendation identified provides an improvement opportunity which supports our vision of top industry performance.

Frank K. Grover

Acting Vice President, Operations Support
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