



Memorandum from the Office of the Inspector General

August 24, 2021

Jason T. Regg
Jacinda B. Woodward

REQUEST FOR FINAL ACTION – EVALUATION 2020-15755 – GAS PLANT INDUSTRIAL HYGIENE

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 Samuel L. Ruble, Senior Auditor, 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)

SLR:FAJ

Attachment

cc (Attachment):

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OIG File No. 2020-15755



Office of the Inspector General

Evaluation Report

To the Director, Safety and
the Senior Vice President,
Power Operations

GAS PLANT INDUSTRIAL HYGIENE

Evaluation Auditor
Samuel L. Ruble

Evaluation 2020-15755
August 24, 2021

ABBREVIATIONS

CC	Combined Cycle
CT	Combustion Turbine
IH	Industrial Hygiene
OSHA	Occupational Safety and Health Administration
PO	Power Operations
TSP	Tennessee Valley Authority Safety Procedure
TVA	Tennessee Valley Authority

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JACINDA B. WOODWARD TO DAVID P. WHEELER



Evaluation 2020-15755 – Gas Plant Industrial Hygiene

EXECUTIVE SUMMARY

Why the OIG Did This Evaluation

According to the Occupational Safety and Health Administration, one of the root causes of workplace injuries, illnesses, and incidents is the failure to identify or recognize hazards that are present or could have been anticipated. The Tennessee Valley Authority's (TVA) industrial hygiene (IH) program is intended to identify, evaluate, and control health hazards to which TVA employees may be exposed in a timely manner.

Due to the risk of worker exposure to health hazards at TVA generation facilities, we conducted evaluations of coal, gas, and hydro IH. This report summarizes our evaluation of IH at TVA gas plants.ⁱ The objectives of this evaluation were to determine if (1) health hazards were identified and evaluated and (2) appropriate actions were taken by TVA management when adverse conditions were identified.

What the OIG Found

We determined TVA's IH planning and assessment process had weaknesses that resulted in some hazards not being identified and evaluated. Specifically, we identified the following IH process weaknesses: (1) TVA relied on limited information to identify health hazards; (2) there was no formal evaluation of the risks posed by identified hazards; (3) IH plans did not prioritize hazards; and, (4) an incomplete monitoring process allowed for misalignment between plans and exposure assessments.

We also determined TVA is taking appropriate actions to address adverse conditions which were identified during assessments at gas plants; however, hazard exposures were not documented and employees were not notified as required. In addition, we identified opportunities for improvement related to handling of IH issues in the contractor population.

What the OIG Recommends

We recommend management take actions regarding (1) IH planning, (2) IH annual assessments, (3) employee notification of exposures, and (4) handling of IH issues in the contractor population. Our detailed recommendations are listed in the body of this report.

ⁱ Our other IH evaluations included Evaluation 2020-15754, *Coal Plant Industrial Hygiene*, July 20, 2021, and Evaluation 2020-15756, *Hydro Plant Industrial Hygiene*, August 20, 2021.



Evaluation 2020-15755 – Gas Plant Industrial Hygiene

EXECUTIVE SUMMARY

TVA Management Comments

Prior to issuing their formal response, TVA management reviewed the draft report and provided informal comments and additional information that have been incorporated into the final report as appropriate. In their formal response, TVA management provided additional information about the IH program and actions planned or taken to address the recommendations. See the Appendix for TVA management's complete response.

Auditor's Response

We concur with the planned actions that were provided to address the recommendations.

BACKGROUND

According to the Occupational Safety and Health Administration (OSHA), industrial hygiene (IH) is the science of protecting and enhancing the health and safety of people at work and in their communities. One of the root causes of workplace injuries, illnesses, and incidents is the failure to identify or recognize hazards that are present or could have been anticipated. Therefore, a critical element of any effective safety and health program is a proactive, ongoing process to identify and evaluate such hazards.

OSHA's *Recommended Practices for Safety and Health Programs* provides a framework for addressing safety and health issues, which includes identification, assessment, prevention, control, and monitoring of hazards. OSHA recommends addressing the hazards with greatest risk first, but employers have an ongoing obligation to control all serious recognized hazards and to protect workers. A risk assessment helps employers understand hazards in the context of their own workplace and prioritize hazards for permanent control.

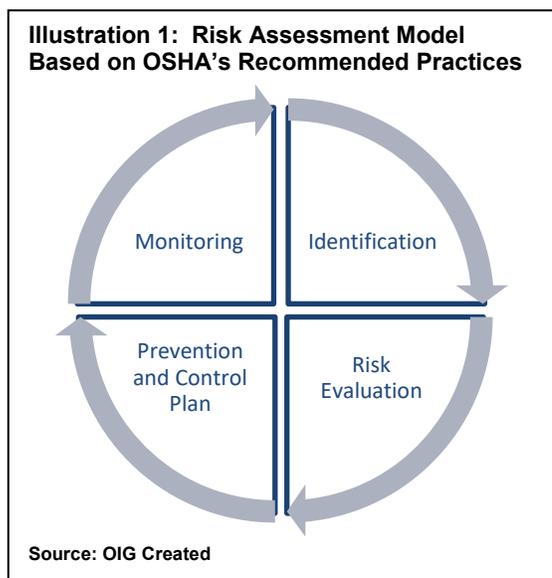


Illustration 1 provides a high-level summary of the steps that OSHA recommends in the form of a risk assessment model. First, employers should identify and document all known and suspected hazards. After identification, OSHA recommends understanding and evaluating the hazards identified and the risks of incidents that could result from worker exposure to those hazards. Then, employers should prioritize hazards for prevention and control as well as develop, implement, and update a hazard control plan.¹ Once implemented, the program should be monitored periodically to identify needed program improvements.

According to OSHA, an ongoing assessment

of plant hazards is necessary as work environments and processes change, equipment or tools become worn, maintenance is neglected, or housekeeping practices decline.

TVA's IH Program

The Tennessee Valley Authority's (TVA) Safety Procedure (TSP) 18.900, *Implement Industrial Hygiene Activities*, is intended to provide a (1) process for identifying, evaluating, and controlling health hazards to which TVA employees may be exposed in a timely manner and (2) framework for planning, budgeting, prioritizing, executing, and evaluating IH activities, strategies, and services. In addition, TVA has IH safety procedures for individual health hazards such as arsenic, asbestos, noise, extreme heat, hexavalent chromium, lead, and silica.

¹ According to OSHA, a hazard control plan describes how the selected controls will be implemented.

According to IH plans developed by the IH program manager and safety professionals, the plans are developed and executed to anticipate, recognize, evaluate, and control workplace conditions that may cause illness. As shown in Illustration 2, annual exposure assessments are supposed to be conducted based on the annual IH plan and are designed to assess normal conditions at the plants. The IH plans include a list of potential site hazards and employees at risk, controls for the identified health hazards, and a proposed testing plan for the annual exposure assessment. In addition, according to the IH program manager, TVA managers, contractors, or other personnel may request IH assessments to address nonroutine hazards such as specific hazards related to outage projects or in response to a complaint or other concern in an area. TVA established contracts with vendors to perform IH assessments that document monitoring performed, results, and recommendations. TVA plant management is responsible for addressing findings and recommendations as well as tracking actions taken to satisfy IH vendor recommendations and exposure investigations.

Illustration 2: Drivers and Types of Exposure Assessments



As of July 29, 2020, TVA operated 101 natural gas- and fuel oil-fired generators at 17 plants. Together, they have a generation capacity of over 12,000 megawatts, enough to power about 7 million homes. TVA provided 19 IH assessments (13 routine and 6 nonroutine) conducted between January 1, 2017, and June 30, 2020, at various gas plants.

Due to the risk of worker exposure to health hazards at TVA generation facilities, we performed evaluations of coal, gas, and hydro plant IH. This report summarizes our evaluation of IH at TVA's gas plants.²

OBJECTIVE, SCOPE, AND METHODOLOGY

The objectives of this evaluation were to determine if (1) health hazards were identified and evaluated and (2) appropriate actions were taken by TVA management when adverse conditions were identified. The scope of the evaluation was IH assessments performed and potential hazards identified at gas plants from January 1, 2017, to June 30, 2020. To achieve our objectives, we:

² Our other IH evaluations included Evaluation 2020-15754, *Coal Plant Industrial Hygiene*, July 20, 2021, and Evaluation 2020-15756, *Hydro Plant Industrial Hygiene*, August 20, 2021.

- Reviewed relevant OSHA regulations and guidance to gain an understanding of required and recommended practices.³
- Reviewed related TVA Safety Procedures, including:
 - TVA-SPP-18.004, *Contractor Safety Management*
 - TVA-TSP-18.900, *Implement Industrial Hygiene Activities*
 - TVA-TSP-18.902, *Arsenic*
 - TVA-TSP-18.903, *Asbestos Management and Exposure Control*
 - TVA-TSP-18.906, *Heat Stress*
 - TVA-TSP-18.908, *Hearing Conservation*
 - TVA-TSP-18.909, *Lead*
 - TVA-TSP-18.913, *Silica*
 - TVA-TSP-18.915, *Hexavalent Chromium*
- Interviewed Safety, Power Operations (PO), and IH vendor personnel to gain an understanding of IH regulations, programs, and processes.
- Conducted keyword searches or obtained information from various sources related to employee concerns or issues⁴ and reviewed recordable and serious injuries data from TVA's medical case management system to detect any unidentified IH hazards.
- Conducted an employee survey to ensure hazards identified reflected working environments encountered by employees. The survey was sent to all 340 gas plant employees, including plant management and 3 plant medical personnel.⁵ We received 158 responses, a 46 percent response rate.
- Reviewed all 19 IH assessment⁶ reports provided by TVA in our scope to identify adverse conditions and recommendations from IH vendors. For recommendations issued in response to adverse conditions, we corresponded with safety consultants and other relevant personnel to identify actions taken by TVA to remediate the conditions.
- Compared assessments to the list of hazards identified by TVA to determine if all identified hazards were evaluated.
- Selected 5 employees with documented exposure to hazards and requested medical files be reviewed to determine if employee exposure letters were included in the files.

³ OSHA's *Recommended Practices for Safety and Health Programs* include seven core program elements. Our evaluation relates to "hazard identification and assessment," "hazard prevention and control," and "program evaluation and improvement" core elements. Additional program elements such as "management leadership," "worker participation," "education and training," and "communication and coordination for host employers, contractors, and staffing agencies," were not within the scope of this evaluation.

⁴ Employee concerns or issues were obtained from the Office of the Inspector General's confidential connection for reporting fraud, waste, and abuse (EmPowerline), nonnuclear employee concerns, OSHA complaints, and condition reports. Condition reports document how problems were found, analyzed, and fixed in TVA's corrective action program.

⁵ Medical personnel assigned to fossil plants collocated with gas plants.

⁶ Not all plants received an assessment while other plants received more than 1 assessment.

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 AND RECOMMENDATIONS

We determined TVA's IH planning and assessment process had weaknesses that resulted in some hazards not being identified and evaluated. We also determined TVA is taking appropriate actions to address adverse conditions that were identified during assessments at gas plants; however, some hazard exposures were not documented and employees were not notified as required. In addition, we identified opportunities for improvement related to clarifying responsibilities for notification and monitoring of contractor actions taken to address IH recommendations.

Prior to issuing their formal response, TVA management reviewed the draft report and provided informal comments and additional information that have been incorporated into the final report as appropriate.

IH PROCESS WEAKNESSES RESULTED IN SOME HAZARDS NOT BEING IDENTIFIED AND EVALUATED

As shown on page 1, TVA-TSP-18.900 provides for an annual planning and assessment process to identify, evaluate, and control health hazards to which employees may be exposed in a timely manner. Further, the purpose of TVA's IH plans is to determine the extent of employee exposure to hazards and determine controls to reduce exposures to "acceptable levels of risk." However, TVA did not conduct a formal, documented risk assessment of health hazards at its gas plants; rather, risks were considered informally to prioritize hazards for annual exposure assessments. As a result, we determined TVA's IH planning and assessment process had weaknesses that resulted in some hazards not being identified and evaluated.

We identified the following IH process weaknesses: (1) TVA relied on limited information to identify health hazards; (2) there was no formal evaluation of the risks posed by hazards identified; (3) IH plans did not prioritize hazards; and (4) an incomplete monitoring process allowed misalignment between plans and exposure assessments.

TVA Used Limited Information to Identify Health Hazards

To identify hazards, OSHA recommends employers collect existing information about workplace hazards, inspect the workplace for safety hazards, identify health hazards, conduct incident investigations, and identify hazards associated with emergency and nonroutine situations. OSHA also indicates workers are often best positioned to identify safety and health concerns and program shortcomings, such as emerging workplace hazards, unsafe conditions, close calls/near misses, and actual incidents. TVA maintains information from employee complaints and concerns, condition reports, and injuries that could help identify hazards. TVA's hazard identification process consisted primarily of input from the IH program manager and safety consultants.

We surveyed gas plant employees and medical personnel to assess the state of the IH program and to include feedback on specific conditions or areas at the plants. Most employees responding to the survey indicated TVA adequately protected employees from health hazards. However, some employees identified additional health hazards that were not specifically captured in IH plans including:

- Biological hazards (i.e., mold and mildew).
- Chemical hazards (e.g., ammonia, diesel, hydrogen sulfide, and silica).

Using limited information to identify IH hazards could lead to unsafe conditions that are not identified in a timely manner.

TVA Did Not Conduct a Formal Risk Evaluation of IH Hazards

After identification, OSHA recommends evaluating each hazard by considering the (1) severity of potential outcomes and likelihood that an event or exposure will occur and (2) number of workers who might be exposed. TVA's gas IH plans list potential hazards, location of hazards, and potential exposed employees. However, there was no formal document to evaluate the severity and likelihood of an event or exposure from the hazard.

IH Plans Did Not Prioritize Hazards

According to OSHA, an effective plan would prioritize the hazards based on evaluated risk, addressing serious hazards first. TVA's gas IH plans listed controls for each identified hazard. However, as discussed in the previous section, TVA does not conduct a formal, documented risk evaluation of the hazards, and therefore, the plans do not prioritize the hazards.

TVA's Monitoring Efforts Are Incomplete

OSHA recommends a program evaluation be conducted on an annual basis to monitor how well the program is performing and identify any needed improvements. TVA-TSP-18.900 requires TVA to assess implementation of the IH plan/exposure assessment annually. However, we identified (1) assessments were not completed as frequently as required, (2) assessments did not align with IH plans, and (3) some known hazards were not included in IH plans or assessed.

Exposure Assessments Were Not Completed as Frequently as Required

We determined the frequency of the exposure assessments were not aligned with the procedure. As stated above, TVA-TSP-18.900 states TVA will prepare, execute, and evaluate IH plans and exposure assessments annually. Instead, TVA Safety personnel indicated TVA has chosen a 3-year cycle to assess the gas plants. However, we found Paradise Combined Cycle (CC) has been in operation for 4 years without an IH plan. According to Safety, Paradise CC has not been assessed because it was not fully operational and still under construction in 2017, and that it will be assessed in 2021 based on the current assessment cycle.

In addition, we reviewed 19 gas plant assessments provided by TVA that were conducted between January 1, 2017, and June 30, 2020, and found 3 plants had no assessment conducted during the period and none of the remaining 12 plants were

assessed annually. We inquired about the 3 plants that were not assessed during the scope of our evaluation and were informed that resources might not be allocated during the assessment period or that several gas plants are new or recently purchased. However, the table below shows the year in which TVA began operating the 3 gas plants.

Plant	Year Operational
Gallatin ⁷ CT*	1975
John Sevier CC	2012
Paradise CC	2017
*Combustion Turbine	

Table 1

Without an IH plan, employees could be working in hazards that have not been identified, evaluated, or controlled.

Exposure Assessments Did Not Always Align with IH Plans

We determined the hazards assessed did not always align with the hazards identified at the plants. TVA-TSP-18.900 requires TVA to develop and execute annual IH plans and exposure assessments tailored to the potential exposures present in the organization. Each plants' IH plan consisted of five hazard areas of concern: lead, miscellaneous chemical constituents, noise, organic vapors, and welding fumes. Our review of the 19 assessments provided by TVA found not all five hazard areas identified in the IH plans were assessed at each plant, as shown below and on the following page.⁸

- **Lead** – None of the 19 assessments included tests for lead.
- **Miscellaneous Chemicals** – None of the 19 assessments included tests for miscellaneous chemicals.
- **Noise** – Eleven of 19 assessments included tests for noise.
- **Organic Vapors** – None of the 19 assessments included tests for organic vapors.
- **Welding Fumes** – Two of 19 assessments included tests for welding fumes.

We inquired as to the reasoning behind the low-monitoring rate for the five identified hazards and TVA Safety personnel indicated the following:

- Unless an activity such as an outage is being performed that disturbs the hazard condition such as lead, TVA does not consider the hazard a safety/health concern.
- Based on an informal risk assessment, it was determined there is no need to assess each item in the plant plans.
- There are times when plant management does not allocate resources to do sampling during the designated assessment period.

⁷ TVA conducted an assessment at Gallatin on March 24, 2021, which was outside the scope of our evaluation.

⁸ There were 6 assessments conducted for items not in the IH plans.

- Few opportunities exist outside of an outage to sample for welding fumes. Those hazards would be more easily assessed during outages or special projects which are not typically performed by plant personnel.

Some Known Hazards Were Not Included in IH Plans or Assessed

We determined IH plans did not include all known hazards. Some plants have specific concerns not reflected in the plants' generic IH plans. For example, Allen CC, Gleason CT, and Johnsonville CC have air-quality concerns that are known to TVA, but are not included in their IH plans. Although there was an air-quality assessment for Gleason, there were no air-quality assessments for Allen and Johnsonville. These issues were also identified in a few responses to our employee survey.

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Weaknesses in TVA's planning and assessment process are likely due to the time-intensive nature of OSHA's recommended practices, which would be difficult to achieve with the breadth of responsibility for the 1 full-time IH employee. According to the IH program manager, he currently manages the IH plans for approximately 50 coal, gas, and hydro generating plants; 3 nuclear generating plants; and other business units such as Transmission and Facilities, when necessary. According to safety personnel, when the program was developed, TVA anticipated four IH positions. Two positions were never filled and the remaining position was lost in attrition when a manager retired in 2016.

Limited identification, evaluation, planning, and monitoring of health hazards could leave TVA employees and contractors vulnerable to potentially overlooked or insufficiently mitigated health hazards.

TVA Management's Comments – TVA management stated that TVA strives to continuously improve its IH program to ensure employees are protected from health hazards in the workplace. TVA management also stated OSHA's *Recommended Practices for Safety and Health Programs*, noted on page 1 of the report, is designed to be used in a wide variety of small- and medium-sized business settings. According to TVA management, TVA's facilities constitute a large business setting and TVA has conducted more than 80,000 samples over almost 50 years to ensure hazards and risks are identified, evaluated, and employees are adequately protected. Additionally, TVA management stated OSHA regulations do not require monitoring at a specified time frequency, and monitoring according to a fixed schedule does not guarantee worker protection. TVA management further stated TVA has protected employees from hazards listed in this report (ammonia, diesel, hydrogen sulfide, miscellaneous chemicals, organic vapor silica, noise, mildew, welding fumes, mold, and lead) by either assessing the hazard and determining it is not a risk, implementing controls to manage the hazard, or performing site specific or representative sampling on an as-needed basis to monitor any exposure. See the Appendix for TVA management's complete response.

Auditor's Response – We focused our efforts on the most recent 3.5 year period, January 1, 2017, through June 30, 2020, of IH data available to capture a current snapshot of TVA's IH practices. Although TVA highlighted OSHA's statement

regarding the applicability of its guidance to small- and medium-sized business settings, OSHA's *Recommended Practices for Safety and Health Programs* states larger employers, who have more complex work processes and hazards, may require a more formal and detailed program. While TVA provided information for the exclusion or selective monitoring of known health hazards, TVA has not documented their risk-based approach to assessing these hazards nor the historical context supporting their methodology in a formal, documented manner as recommended below. This risk is elevated because much of the legacy knowledge related to the program resides with the single IH employee.

Recommendations

We recommend the Director, Safety:

- Conduct a formal, documented risk assessment of health hazards at gas plants that includes robust hazard identification, risk evaluation, and prioritization and update IH plans as necessary.

TVA Management's Comments – Corporate Safety will implement this recommendation by documenting the process, tools and subject matter expertise used by TVA's IH program manager to conduct hazard identification, risk evaluation and prioritization of health hazards. See the Appendix for TVA management's complete response.

- Take immediate actions to create an IH plan at Paradise CC.

TVA Management's Comments – Corporate Safety stated this recommendation is complete. See the Appendix for TVA management's complete response.

- Conduct IH assessments of gas plants that had limited or no coverage since January 1, 2017.

TVA Management's Comments – Corporate Safety agrees with this recommendation. See the Appendix for TVA management's complete response.

- Determine the appropriate assessment cycle frequency for gas plants and update TVA-TSP-18.900, if necessary.

TVA Management's Comments – Corporate Safety agrees with this recommendation. See the Appendix for TVA management's complete response.

- Periodically monitor the effectiveness of the IH program to include the alignment of IH plans and exposure assessments.

TVA Management's Comments – Corporate Safety will implement this recommendation by documenting the current process and incorporating relevant changes in the next TVA-TSP-18.900 revision. See the Appendix for TVA management's complete response.

- Evaluate the broad job responsibilities and duties of IH and determine if staffing levels are appropriate to ensure proper coverage and effective implementation of needed program changes.

TVA Management's Comments – Corporate Safety agrees with this recommendation. See the Appendix for TVA management's complete response.

- In coordination with the Senior Vice President, PO, conduct more assessments during outages and special projects when most hazards identified in the plans could be present.

TVA Management's Comments – Corporate Safety and Power Operations agree with this recommendation. See the Appendix for TVA management's complete response.

Auditor's Response – We concur with TVA management's planned actions and have reviewed documentation related to the completion of the Paradise IH plan.

TVA IS TAKING APPROPRIATE ACTIONS TO ADDRESS IDENTIFIED ADVERSE CONDITIONS; HOWEVER, EXPOSURES WERE NOT DOCUMENTED AS REQUIRED

Based on our review of documentation, we determined TVA is taking appropriate actions to address IH hazards that were identified during assessments at gas plants. For example, water was collecting under a control room floor, which could have created mold spores in the control room air. TVA began actions to mitigate and remove the water, and actions are ongoing. However, we determined TVA does not document employee exposures as required. TVA-TSP-18.900 indicates (1) IH vendors will prepare employee exposure letters and (2) copies of signed employee exposure letters shall be sent by the supervisor to medical for inclusion in employee's medical file.

We selected 5 employees with documented exposure to hazards and requested medical files be reviewed to determine if employee exposure letters were included in the files. According to a TVA nurse practitioner, none of the employees' exposures were documented in their medical records. A TVA Safety employee indicated the requirement to retain letters in the employee medical file was included in the safety procedure to drive accountability.

Recommendations

We recommend the Senior Vice President, PO, take steps to include signed exposure letters in employee medical files.

TVA Management's Comments – Power Operations agrees with this recommendation. See the Appendix for TVA management's complete response.

OPPORTUNITIES FOR IMPROVEMENT

We identified opportunities for improvement related to TVA (1) clarifying responsibilities regarding contract employers addressing IH recommendations and (2) monitoring of actions taken by contractors to address IH recommendations. Without providing clear responsibilities and oversight, TVA runs the reputational risk of being seen as a contributor to potential violations of IH regulations and contractor health claims.

IH Recommendations Issued to Contract Employers

Contract employers use TVA's IH vendors to assess hazards at TVA gas plants, but the safety procedure does not establish protocols for communications between contract employers and TVA. TVA-TSP-18.900 does not require contractors to provide IH assessment reports and does not specifically provide guidance for TVA's handling of the documents or responsibilities regarding the assessments' findings and recommendations issued to contract employers.

TVA's Monitoring of Contractor IH Recommendations

TVA-SPP-18.004, *Contractor Safety Management*, indicates contract employers assume direct responsibility for the safety and health of all personnel under its supervision, including subcontractors. We reviewed a TVA managed task contract that used IH vendors for exposure assessments and noted TVA had clauses to provide for review of the safety and health practices. However, TVA personnel indicated that TVA does not periodically audit, validate, or otherwise verify if contractors appropriately address recommendations from IH vendors.

Recommendations

We recommend the Director, Safety:

- Revise TVA-TSP-18.900 to identify when TVA should receive IH exposure assessments issued to contractors as well as define associated responsibilities for any adverse conditions identified in such reports.

TVA Management's Comments – Corporate Safety will implement this recommendation in the next revision of the TSP to identify the situations in which TVA receives a copy of IH results and to clarify the responsibilities of the contractor and/or TVA in such a situation. See the Appendix for TVA management's complete response.

- Consider amending TVA-TSP-18.900 to require TVA to conduct periodic monitoring of actions taken by contract employers to address adverse conditions identified in IH exposure assessments.

TVA Management's Comments – Corporate Safety agrees with the recommendation. Corporate Safety will work with Supply Chain to review TVA's contract oversight procedures and determine the best method of periodically monitoring how contractors are fulfilling their contractual obligations to address adverse conditions. See the Appendix for TVA management's complete response.

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

August 13, 2021

David P. Wheeler, WT 2C-K

CORPORATE SAFETY AND POWER OPERATIONS RESPONSE TO 30 DAY REQUEST FOR COMMENTS - DRAFT EVALUATION 2020-15755 - GAS PLANT INDUSTRIAL HYGIENE (IH)

TVA Corporate Safety and Power Operations would like to extend thanks to the Office of the Inspector General (OIG) team that conducted this evaluation of Gas Plant Industrial Hygiene (IH). The health and safety of our workforce and the public is TVA's top priority. We appreciate the TVA Office of the Inspector General team's insights in their report since it provides us an opportunity to further strengthen our health and safety efforts. Although documentation of current processes needs to be improved, the findings identified do not result in the health or safety of our workers being compromised and TVA continues to meet Occupational Safety and Health Administration (OSHA) standards.

In response to the OIG memorandum dated July 15, 2021, Corporate Safety and Power Operations (PO) have reviewed your draft evaluation and have the following comments and responses.

Comments on the Evaluation

IH Process Weaknesses Resulted in Some Hazards not Being Identified and Evaluated

TVA strives to continuously improve its industrial hygiene program to ensure employees are protected from health hazards in the workplace.

According to an October 18, 2016 OSHA Trade Release, OSHA's Recommended Practices for Safety and Health Programs, noted on page 1 of the draft evaluation report, states, "The recommendations are advisory only and do not create any new legal obligations or alter existing obligations created by OSHA standards or regulations" and according to the OSHA web site is designed to be used in a wide variety of small and medium-sized business settings.

Given that TVA's facilities constitute a large business setting, TVA conducts extensive monitoring of industrial hygiene hazards. TVA has conducted more than 80,000 samples over almost 50 years to ensure hazards and risks are identified, evaluated, and that employees are adequately protected. The OIG evaluated information from a limited three year time period, and in cases where contaminants had not been evaluated during that timeframe, they have been previously eliminated or controlled to prevent employee exposure. In addition, historical monitoring at one facility may be representative for exposures at another facility and additional monitoring may not be required. The lack of capturing a health hazard in an IH plan does not indicate that the hazard was not previously reviewed, controlled, or eliminated just as a lack of sampling for hazards is not evidence that the hazard was present in the workplace.

For instance, on page 5 of the draft evaluation report, the OIG reported that the hazards such as mold, mildew, ammonia, diesel, hydrogen sulfide, and silica were not specifically captured in IH plans. On page 6 of the draft evaluation report, the OIG reported that lead, miscellaneous

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chemical, noise, organic vapor, and welding fume hazards are listed in IH plans but were not assessed at each plant. On page 7 of the draft evaluation report, it states that Allen Combined Cycle (CC), Gleason Combustion Turbine (CT), and Johnsonville CC have air-quality concerns that are known to TVA, but are not listed in their IH plans. For the hazards listed in the OIG report, TVA has protected employees by one of the following methods: assessed the hazard and determined it is not a risk; implemented controls to manage the hazard; or performed site specific or representative sampling on an as needed basis to monitor any exposure.

OSHA regulations do not require monitoring at a specified time frequency and monitoring according to such a fixed schedule does not guarantee worker protection. Instead, additional monitoring occurs when work environment, processes, or equipment change. For example, lead is not a hazard in the workplace until something containing the lead is disturbed; therefore, lead monitoring typically occurs during cutting or grinding operations that may disturb lead based paint and coatings. It would not be unusual to have several years lapse at a plant without lead monitoring. Potential hazards at TVA facilities may also occur during non-routine times. For that reason, monitoring outside of the scope of routine assessments may occur during special projects, outages, emergent work, or due to employee feedback.

Further information for the hazards listed above is set out below:

Ammonia - Gas Combined Cycle sites use aqueous ammonia. Aqueous ammonia is maintained in a closed system and is injected directly into the process flow of the combined cycle heat recovery equipment for emissions control. The location where aqueous ammonia is injected is not a routinely occupied workspace for employees. Because of the closed system engineering controls and operational procedures for aqueous ammonia, it does not present an exposure hazard to employees outside of an emergency release. In the case of a release, TVA's training for on-site access covers guidelines for emergency site evacuation. The Simple Cycle sites do not use aqueous ammonia. Sampling for this potential hazard is based on employee feedback, special projects, outages, emergent work, a release, etc. and would not typically be covered in operational IH plans.

Diesel - Diesel storage tanks are used at some facilities to provide fuel for diesel operated equipment and generators. These storage tanks are contained and exposure is very limited to pumping fuel similar to exposures experienced at a service station. Diesel is a fuel that has a low vapor pressure and does not readily vaporize, leading to little or no airborne exposure. Additionally, the flashpoint of diesel fuel is typically greater than 140 degrees Fahrenheit as opposed to gasoline's flashpoint of negative 45 degrees Fahrenheit. Because of these chemical properties, OSHA does not have a permissible exposure limit for diesel fuel. In summary, diesel fuel is not an exposure risk to employees and would not typically be covered in operational IH plans.

Hydrogen Sulfide - Sampling for this potential hazard is based on employee feedback and would not typically be covered in operational IH plans. Since February of 2019 at Allen CC plant, continuous monitoring has been conducted for low-level long-term exposure to

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hydrogen sulfide. There has been no exposures above OSHA limits. In addition, to alleviate the nuisance odor inside the building, a filtration system has been installed. The source of the odor is the non-TVA TE Maxson Waste Water Treatment Facility located approximately 0.6 miles away from the TVA Allen CC facility.

Silica - Sampling for this potential hazard is based on special projects, outages, emergent work, etc. and would not typically be covered in operational IH plans. As allowed by OSHA's Hierarchy of Controls, administrative work practice controls and personal protective equipment reduce and/or eliminate exposure to silica. TVA-TSP-18.913 Silica Attachment 2 has specified exposure control methods for silica based on OSHA regulations. Over the last 10 years, TVA has conducted approximately 800 respirable silica dust samples across TVA to assess various exposure to silica and ensure that employees were properly protected. Silica hazards exist at gas sites when a material such as concrete is disturbed via cutting, drilling, jackhammering, etc. Additionally, silica can be a hazard during cutting operations during outages when welders perform grinding on metal. During the OIG assessment period, TVA assessed 38 samples each for respirable dust and silica during an outage. Silica samples results were below laboratory detectable limits.

Lead - Sampling for this potential hazard is based on special projects, outages, emergent work, etc. and would not typically be covered in operational IH plans. As allowed by OSHA's Hierarchy of Controls, administrative work practice controls and personal protective equipment reduce and/or eliminate exposure to lead. TVA maintains a separate procedure TVA-TSP-18.909 Lead, which is also specified as control in the IH plan, for specific guidance for lead exposures. It should be noted that a negative exposure assessment (NEA) was conducted at Lagoon Creek for lead chromate residue in March of 2021. Sixteen samples were taken to assess potential exposure risk to outage workers when removing generator coolers. Fifteen of the sixteen samples were below the detectable limits for lead, indicating that there was no significant exposure risk for this task. Such negative exposure assessments are utilized to characterize exposure risk to employees performing task where lead hazards are introduced, such as generator removal. These NEAs are utilized to plan work at other gas sites and can be representative of a similar task for like processes and equipment.

Miscellaneous Chemicals - As allowed by OSHA's Hierarchy of Controls, administrative work practice controls and personal protective equipment reduce and/or eliminate exposure to miscellaneous chemicals. TVA's hazard communication process defined in TVA-TSP-18.917 Hazard Communication defines expectations that employees comply with container labels and Safety Data Sheet (SDS) requirements. SDSs contain specific minimum requirements including hazard identification and exposure controls/personal protections. Therefore, monitoring within normal use is not necessary.

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Noise - During the OIG evaluation period, 64 personal time weighted average dosimetry samples and 446 area sound power level samples were collected across 12 gas sites. The results revealed that no employees were exposed to noise above regulatory levels. This sampling was considered representative of gas employees. Evaluation of the data has consistently proven that no further action is necessary to protect employees from noise hazards.

Organic Vapor - The IH plan lists controls allowed by OSHA's Hierarchy of Controls: substitution/elimination, administrative work practice controls (e.g. ventilation) and personal protective equipment reduce and/or eliminate exposure to organic vapors. TVA's hazard communication process defined in TVA-TSP-18.917 Hazard Communication defines expectations that employees comply with container labels and Safety Data Sheet (SDS) requirements. SDSs contain specific minimum requirements including hazard identification and exposure controls/personal protections. Therefore, monitoring within normal use is not necessary.

Welding Fumes - Potential exposure may occur during non-routine times. For that reason monitoring outside of the scope of routine assessments may occur during special projects, outages, or emergent work. During the course of the OIG assessment period, TVA performed monitoring at three representative sites (Southaven Combined Cycle, Ackerman Combined Cycle, and Johnsonville Combustion Turbine) during outages. TVA took 43 personal TWA samples for hexavalent chromium on welders performing hot work. The sampling results confirmed that personal protective equipment were adequate to protect workers. Assessment data such as this is representative to similar work activities at other gas sites and therefore monitoring at all sites is not required. As allowed by OSHA's Hierarchy of Controls, administrative work practice controls and personal protective equipment reduce and/or eliminate exposure to hexavalent chromium. TVA-TSP-18.915 Hexavalent Chromium Attachment B contains exposure management decision logic based on TVA historical sampling.

Air Quality (including mold and mildew) - Sampling for mold/mildew (i.e. indoor air quality) is based on employee feedback or visible presence of mold/mildew and is not always covered during operational IH plans. In the OIG evaluation period, one indoor air quality assessment was performed in gas at Gleason CT as described on pg. 7 of the draft evaluation (and 15 across the Agency) based on employee feedback. Monitoring based on air quality concerns mentioned on pg. 7 of the draft evaluation report is as follows:

- Allen CC - see Hydrogen Sulfide above.
- Gleason CT - Indoor air quality assessment was performed on July 25, 2019.
- Johnsonville CC - Employee concerns in reference to air quality were attributed to titanium dioxide and lime. The source of the potential hazards was Chemours, a non-TVA chemical facility, located approximately a quarter mile from TVA. The lime originated from an open shed where it was stored. It has since been moved and does not present an exposure risk. The titanium dioxide which from a Hazardous Materials Identification System (HMIS) and National Fire Protection Association (NFPA) ratings is rated as zero does not have a

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chemical specific exposure limit, but, instead would regulated under particulates not otherwise classified.

Response to Recommendations

Corporate Safety provides the following responses to the recommendations set forth in the evaluation.

IH Process Weaknesses Resulted in Some Hazards not Being Identified and Evaluated

The Director, Safety:

- Conduct a formal, documented risk assessment of health hazards at gas plants that includes robust hazard identification, risk evaluation, and prioritization and update IH plans as necessary.
 - Corporate Safety will implement this recommendation by documenting the process, tools, and subject matter expertise used by TVA's IH program manager to conduct hazard identification, risk evaluation, and prioritization of health hazards.
- Take immediate actions to create an IH plan at Paradise CC.
 - This recommendation is complete.
- Conduct IH assessment of gas sites that had limited or no coverage since January 1, 2017.
 - Corporate Safety agrees with this recommendation.
- Determine the appropriate assessment cycle frequency for gas plants and update TVA-TSP-18.900, if necessary.
 - Corporate Safety agrees with this recommendation.
- Periodically monitor the effectiveness of the IH program to include the alignment of hazards and exposure assessments.
 - Corporate Safety will implement this recommendation by documenting the current process and incorporating relevant changes in the next TVA-TSP-18.900 revision.
- Evaluate the broad job responsibilities and duties of IH and determine if staffing levels are appropriate to ensure proper coverage and effective implementation of needed program changes.
 - Corporate Safety agrees with this recommendation.
- In coordination with the Senior Vice President, PO, conduct more assessments during outages and special projects when most hazards identified in the plans could be present.
 - Corporate Safety and Power Operations agree with this recommendation.

TVA Is Taking Appropriate Actions To Address Identified Adverse Conditions; However, Exposures Were Not Documented as Required

The Senior Vice President, Power Operations (PO):

- Take steps to include signed employee exposure letters in employee medical files.
 - Power Operations agrees with the recommendation.

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Opportunities for Improvement

The Director, Safety:

- Revise TVA-TSP-18.900 to identify when TVA should receive IH exposure assessments issued to contractors as well as define associated responsibilities for any adverse conditions identified in such reports.
 - Corporate Safety will implement this recommendation in the next revision of the TSP to identify the situations in which TVA receives a copy of IH results when contractors use IH services through TVA's preferred vendors, and to clarify the responsibilities of the contractor and/or TVA in such a situation.
- Consider amending TVA-TSP-18.900 to require TVA to conduct periodic monitoring of actions taken by contract employers to address adverse conditions identified in IH exposure assessments.
 - Corporate Safety agrees with the recommendation. Corporate Safety will work with Supply Chain to review TVA's contract oversight procedures and determine the best method of periodically monitoring how contractors are fulfilling their contractual obligations to address adverse conditions.

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



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