



Memorandum from the Office of the Inspector General

July 5, 2023

Kris G. Edmondson

REQUEST FOR FINAL ACTION – EVALUATION 2022-17376 – COMBUSTIBLE COAL DUST

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 Kristin S. Leach, Senior Auditor, at (423) 785-4818 or Lindsay J. Denny, Director, Evaluations, at (865) 633-7349. 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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OIG File No. 2022-17376



Office of the Inspector General

Evaluation Report

To the Vice President,
Power Operations, Coal

COMBUSTIBLE COAL DUST

ABBREVIATIONS

Combustible Dust TSP	TVA Technical Safety Procedure 18.1205, <i>Combustible Dust</i>
Cumberland	Cumberland Fossil Plant
eSOMS	Electronic Shift Operations Management System
FY	Fiscal Year
LMS	Learning Management System
TVA	Tennessee Valley Authority

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MEMORANDUM DATED JUNE 27, 2023, FROM KRIS G. EDMONDSON
TO DAVID P. WHEELER



Evaluation 2022-17376 – Combustible Coal Dust

EXECUTIVE SUMMARY

Why the OIG Did This Evaluation

Combustible coal dusts are fine particles created when coal is crushed, ground, or pulverized. This dust can be deposited on various surfaces and eventually create a thick layer of accumulation. According to the Occupational Safety and Health Administration, coal dust also presents an explosion hazard when suspended in air in certain conditions and can be catastrophic and cause employee deaths, injuries, and the destruction of entire buildings. The Tennessee Valley Authority (TVA) Combustible Dust Program establishes requirements to protect employees and minimize fire and explosion hazard potentials from combustible dust. Due to the potential for fire and explosion from combustible dust, we performed an evaluation of actions taken to minimize combustible coal dust.

What the OIG Found

We determined TVA's coal plants have taken steps to reduce combustible coal dust since dedicated Combustible Dust Program funding was provided by TVA in 2018. Specifically, coal plants have dedicated combustible dust housekeeping crews to help mitigate combustible dust accumulations, and projects were completed to improve conditions at the plants. However, we identified areas of noncompliance with TVA Technical Safety Procedure 18.1205, *Combustible Dust* (Combustible Dust TSP), related to (1) coal dust accumulation, (2) documentation of combustible dust daily inspections, and (3) training. In addition, we identified an area for improvement related to inconsistent language in the Combustible Dust TSP and site combustible dust programs.

What the OIG Recommends

We recommend TVA management address (1) areas of noncompliance with the Combustible Dust TSP and (2) inconsistent language in the Combustible Dust TSP and site combustible dust programs.

TVA Management's Comments

In response to the draft report, TVA management provided (1) context around one of the findings, and (2) ongoing and planned actions to address the recommendations. See the Appendix for management's complete response.



Evaluation 2022-17376 – Combustible Coal Dust

EXECUTIVE SUMMARY

Auditor's Response

We agree with TVA management's ongoing and planned actions to address our recommendations regarding (1) areas of noncompliance with the Combustible Dust TSP and (2) inconsistent language in the Combustible Dust TSP and site combustible dust programs.

BACKGROUND

Combustible coal dusts are fine particles created when coal is crushed, ground, or pulverized. This dust can be deposited on various surfaces and eventually create a thick layer of accumulation. According to the Occupational Safety and Health Administration, coal dust also presents an explosion hazard when suspended in air in certain conditions and can be catastrophic and cause employee deaths, injuries, and the destruction of entire buildings.

The Tennessee Valley Authority (TVA) Combustible Dust Program establishes requirements to protect employees and minimize fire and explosion hazard potentials from combustible dust. TVA Technical Safety Procedure 18.1205, *Combustible Dust* (Combustible Dust TSP), establishes requirements to minimize fire and explosion hazard potential from combustible dust. It includes the following requirements:

- Dust level accumulations shall be maintained less than or equal to 1/32 inch on all surfaces.
- Plants/facilities shall conduct testing for combustibility if combustibility of dust is in question.
- All plants/facilities with combustible dust shall have a written program.
- TVA employees, contractors, and unescorted visitors shall be trained regarding the hazards of combustible dust.

Each of TVA's five active coal plants¹ has a site combustible dust technical program procedure that establishes the Combustible Dust Program requirements to (1) ensure employees and property are protected from deflagration,² fire, and explosion hazards associated with combustible dust and (2) demonstrate compliance with the Combustible Dust TSP.

Due to the potential for fire and explosion from combustible dust, we performed an evaluation of TVA's actions taken to minimize combustible coal dust.

OBJECTIVE, SCOPE, AND METHODOLOGY

The objective of our evaluation was to evaluate the adequacy of actions TVA has taken to minimize combustible coal dust. The scope of our evaluation included fiscal years (FY) 2021 and 2022. To achieve our objective, we:

- Interviewed program managers to gain an understanding of the Combustible Dust Program and program requirements.

¹ During this evaluation, TVA's five active coal plants included Bull Run Fossil Plant, Cumberland Fossil Plant (Cumberland), Gallatin Fossil Plant, Kingston Fossil Plant, and Shawnee Fossil Plant.

² Dispersion of dust particles in sufficient quantity and concentration can cause rapid combustion known as deflagration.

- Reviewed documentation to determine recent issues and identify any trends related to combustible coal dust, including:
 - Condition reports³
 - Safety incidents
 - Monthly combustible coal dust reporting data
 - FYs 2021 and 2022 annual combustible dust walkdown inspection reports
- Reviewed site combustible dust programs to determine if the programs included content outlined in the Combustible Dust TSP.
- Conducted site visits at TVA's five active coal plants in September 2022 to observe dust accumulation conditions in coal ash handling areas in the powerhouses and coal yards.⁴
- Requested dust combustibility documentation from each coal plant to determine if plants were testing for combustibility.
- Analyzed data to determine if individuals had received required training:⁵
 - Obtained and tested training records as of November 2022 to determine if site Combustible Dust Program Coordinators and Subject Matter Experts completed required training in FYs 2021 and 2022 as required by site combustible dust programs.
 - Obtained and tested training records as of December 2022 to determine if coal plant employees and contractors active as of September 30, 2022, had completed required training.

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

FINDINGS

We determined TVA's coal plants have taken steps to reduce combustible coal dust since dedicated Combustible Dust Program funding was provided by TVA in 2018. Specifically, coal plants have dedicated combustible dust housekeeping crews to help mitigate combustible dust accumulations, and projects were completed to improve conditions at the plants. However, we identified areas of noncompliance with the Combustible Dust TSP related to (1) coal dust accumulation, (2) documentation of combustible dust daily inspections, and (3) training. In addition, we identified an area for improvement related to inconsistent language in the Combustible Dust TSP and site combustible dust programs.

³ A condition report is the document used within the TVA corrective action program to document how a problem was found, how the problem was analyzed, and how the problem was fixed.

⁴ Instances of coal dust accumulation exceeding 1/32 inch were based on visual observations. Direct measurements were not taken.

⁵ Due to instances of multiple hire dates for some contractors and employees, we focused on the last hire date for testing.

STEPS TAKEN TO REDUCE COMBUSTIBLE COAL DUST

According to Generation Services documentation, from FYs 2012 through 2018, TVA's Combustible Dust Program lacked resources to reduce combustible dust risk and improve compliance. The Combustible Dust Program first received dedicated funding to mitigate risk in FY 2018.

Benchmarking of peer utilities in 2018 showed TVA was behind in managing combustible dust hazards in the areas of (1) maintaining a dedicated clean-up crew, (2) end-of-life replacement plan for components allowing fugitive dust excursions,⁶ and (3) longstanding accumulations. Starting in FY 2018, the Combustible Dust Program has provided funding to complete projects to improve conditions at the plants, including replacement of end-of-life components such as coal pipes. Since FY 2020, TVA Coal Operations has provided funding to coal plants for designated combustible dust housekeeping crews to help mitigate combustible dust accumulations.

According to personnel at multiple coal plants, combustible dust conditions have improved since funding has been provided and clean-up crews have been present.

NONCOMPLIANCE WITH THE COMBUSTIBLE DUST TSP

Although Coal Operations has made improvements in combustible dust management, we found areas of noncompliance with the Combustible Dust TSP, including: (1) coal dust accumulation, (2) documentation of daily inspections, and (3) training.

Coal Dust Accumulation Was Greater Than 1/32 Inch

The Combustible Dust TSP states combustible dust accumulations shall be maintained at less than or equal to 1/32 inch on all surfaces.⁷ We observed accumulations that exceeded 1/32 inch at each of the five coal sites, including some that were the result of active leaks.

In addition, we reviewed FYs 2021 and 2022 annual combustible dust walkdown reports and identified some of the same coal dust accumulation issues were still present during our September 2022 site visits. Specifically, we observed cable trays at Kingston Fossil Plant and Cumberland that were identified in the annual combustible dust walkdown reports. Coal dust accumulation should be addressed to help reduce risk associated with combustible dust.

⁶ Fugitive dust refers to particulate matter that enters the atmosphere without first passing through a stack or duct designed to direct or control its flow.

⁷ Examples of surfaces include floors, overhead beams, joists, ducts, piping, conduit, cable trays, and machinery.

Daily Inspections Were Not Documented as Required

We determined daily combustible dust inspections were not documented as required. The Combustible Dust TSP requires daily combustible dust inspections be performed. According to program managers for combustible dust, the Electronic Shift Operations Management System (eSOMS)⁸ is to be used by Operations personnel when documenting combustible dust inspections. We reviewed daily inspection documentation in eSOMS for FYs 2021 and 2022 and could not locate daily inspections for all sites. For example, Gallatin Fossil Plant had 172 daily combustible dust inspections for all four units during the 2-year period we reviewed. We were informed by a program manager that this could be due to sites being offline or in an outage. However, no exceptions to daily inspections were noted in the Combustible Dust TSP or site combustible dust programs. In addition, site combustible dust programs indicate daily inspections of the coal yard and powerhouses be documented separately. However, we found some combustible dust checks were not documented separately.

Deficiencies in Training Were Identified

The Combustible Dust TSP requires TVA employees, contractors and unescorted visitors be trained regarding the hazards of combustible dust. Specifically, training includes (1) initial training, within 30 days of hire or transfer to a facility with combustible dust and (2) annual refresher training. To meet both requirements, employees and contractors are required to take “Unescorted Coal and Gas Site Access” training.

For the 2,373⁹ active employees and contractors at the five coal plants as of September 30, 2022, we found many employees and contractors did not complete initial or annual refresher training as required during FYs 2021 and 2022.¹⁰ Of the 1,253 individuals who required initial training during our scope, 164 either did not complete it by September 30, 2022, or within the established 30-day time period. For the 1,397 active employees and contractors who should have had the annual refresher, 555 were missing at least 1 year of training, 264 were late taking the training, and 33 were both late 1 year and missing 1 year of training.

TVA Technical Training personnel informed us that the course was inadvertently unassigned to some employees and contractors. During our evaluation, Technical Training personnel assigned the course to all employees and contractors with a coal site job location.

⁸ eSOMS is a software application suite that is designed to automate and integrate the major processes involved in plant operations management.

⁹ We excluded six from testing because their last hire date was outside of our scope.

¹⁰ Some employees and contractors had requirements for initial and refresher training during the scope of our evaluation.

OPPORTUNITY FOR IMPROVEMENT

We found multiple instances where language in the Combustible Dust TSP and site combustible dust programs was not consistent related to training requirements. In addition, we found an instance where language in the Combustible Dust TSP and site combustible dust programs was different than TVA's Learning Management System (LMS). Alignment of procedures and programs could clarify expectations around the Combustible Dust Program.

The Combustible Dust TSP requires unescorted visitors be trained regarding the hazards of combustible dust; however, site combustible dust programs only require training for employees and contractors. Also, the Combustible Dust TSP does not mention the Combustible Dust Program Coordinator and Subject Matter Expert training that is required in the site combustible dust programs. Additionally, we found language in the Combustible Dust TSP and site combustible dust programs regarding training for "Unescorted Coal and Gas Site Access" did not match the frequency language in the course description in TVA's LMS. Language in the Combustible Dust TSP and site combustible dust programs states an annual refresher should not exceed 30 days beyond expiration of prior training. However, language in the LMS course description states the training should be completed annually by the end of the quarter in which the training occurred. Inconsistent language could cause confusion among employees.

RECOMMENDATIONS

We recommend the Vice President, Power Operations, Coal:

- Address identified areas with coal dust accumulation greater than 1/32 inch.

TVA Management's Comments – TVA provided additional context around the finding that accumulations of greater than 1/32 inch of combustible dust were observed. They stated there are times when active leaks emerge on systems where combustible dust accumulations may exceed 1/32 inch, thus the reason for programmatic daily inspections and dedicated crews to clean up surfaces when we identify them. Our site teams through dedicated clean-up crews have been instrumental in helping to support timely clean up as well as identify repairs to stop leaks at the source.

TVA management stated they will continue to follow program requirements to mitigate combustible dust accumulation including funding program projects, using housekeeping crews, and testing accumulations.

Auditor's Response – We concur with TVA's ongoing actions.

- Confirm all required individuals have completed “Unescorted Coal and Gas Site Access” training.

TVA Management’s Comments – TVA management agreed with our recommendation and stated they will enter a condition report to track until completed.

Auditor’s Response – We concur with TVA’s action.

- Reinforce the requirement for documenting the daily combustible dust inspections.

TVA Management’s Comments – TVA management agreed with our recommendation and stated they will enter a condition report to track until completed.

Auditor’s Response – We concur with TVA’s action.

- In conjunction with TVA Safety and Technical Training, address inconsistent language between the Combustible Dust TSP, site combustible dust programs and LMS.

TVA Management’s Comments – TVA management agreed with our recommendation and stated they will enter a condition report to track until completed.

Auditor’s Response – We concur with TVA’s action.

June 27, 2023

David P. Wheeler, WT 2C-K

**COAL OPERATIONS' RESPONSE TO 30-DAY REQUEST FOR COMMENTS – DRAFT
EVALUATION 2022-17376 – COMBUSTIBLE COAL DUST**

Tennessee Valley Authority (TVA) Coal Operations would like to thank Kristin S. Leach (Office of Inspector General (OIG) Senior Auditor / Evaluation Auditor) for evaluating Coal Operations' management of combustible dust. We appreciate the independent review conducted, along with the observations and insights in the report, as it provides us an opportunity to further strengthen our programmatic efforts to mitigate combustible coal dust hazards.

In response to the memorandum dated May 24, 2023, Coal Operations has reviewed the OIG's draft evaluation, and we would like to address findings with additional context for clarity and alignment.

We are pleased in the finding that the significant increase in program funding initiated over the last five years has improved programmatic combustible dust mitigation at our coal plants. Coal Operations has allotted nearly \$14 million of funding for projects and housekeeping. The projects have significantly reduced combustible dust at the source. These projects included coal belt scrapers, chute repairs, coal pipe and elbow replacements, along with many others. The addition of dedicated site combustible dust housekeeping crews has been instrumental in mitigating combustible dust hazards by cleaning coal handling systems and adjacent areas in accordance with routine schedules developed by each site. We have found this to be very effective in cleaning up coal dust accumulations and timely response to emergent leaks. The purpose of daily programmatic inspections is to identify new coal leaks or dusting issues and deploying crews for timely mitigation.

We would like to provide more context around the finding that accumulations of greater than 1/32" of combustible dust were observed. There are times when active leaks emerge on systems where combustible dust accumulations may exceed 1/32", thus the reason for programmatic daily inspections and dedicated crews to clean up surfaces when we identify them. Our site teams through dedicated clean-up crews have been instrumental in helping to support timely clean up as well as identify repairs to stop leaks at the source. When cable tray accumulations do occur, we test the constituents for LOI (loss on ignition) to confirm material is combustible (versus ash). Once confirmed, mitigation requires a phased approach to safely access cable trays to clean up these locations.

Coal Operations concurs with the remaining findings and commit to following responses to the recommendations.

Recommendations

You recommended the Vice President, Power Operations, Coal:

1. Address identified areas with coal dust accumulation greater than 1/32 inch.

David P Wheeler
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Response

Coal Operations will continue to follow program requirements to mitigate combustible dust accumulation. We will continue to fund program projects and use housekeeping crews in each site's coal yard and powerhouse to programmatically maintain combustible dust accumulations under 1/32 inch. In areas such as cable trays, we will continue to test accumulations to confirm constituents and develop phased approaches as needed to safely mitigate.

2. Confirm all required individuals have completed "Unescorted Coal and Gas Site Access" training.

Response

Coal Operations agrees with this recommendation and will enter a Condition Report (CR) with necessary action(s) to track until completed.

3. Reinforce the requirement for documenting the daily combustible dust inspections.

Response

Coal Operations agrees with this recommendation and will enter a CR with necessary action(s) to track until completed.

4. In conjunction with TVA Safety and Technical Training, address inconsistent language between the Combustible Dust TSP, site combustible dust programs and Learning Management System (LMS).

Response

Coal Operations agrees with this recommendation and will enter a CR with necessary action(s) to track until completed.

Thank you for the time to allow us to review and provide feedback on the draft evaluation. Please contact us with any questions.



Kris G. Edmondson
Vice President
Coal Operations

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