



Memorandum from the Office of the Inspector General

September 30, 2011

Robert J. Fisher, LP 3K-C

FINAL REPORT – INSPECTION 2010-13530 – REVIEW OF TVA'S FOSSIL FIRE PROTECTION SYSTEMS

Attached is the subject final report for your review and 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.

Information contained in this report may be subject to public disclosure. Please advise use of any sensitive information in this report which you recommend be withheld.

If you have any questions, please contact Janell B. Cunio, Auditor, at (423) 785-4811 or Greg R. Stinson, Director, Inspections, at (865) 633-7367. We appreciate the courtesy and cooperation received from your staff during the audit.

Robert E. Martin

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Assistant Inspector General
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OIG File No. 2010-13530



Tennessee Valley Authority
Office of the Inspector General

Inspection Report

REVIEW OF TVA'S FOSSIL FIRE PROTECTION SYSTEMS

Inspection 2010-13530
September 30, 2011

ACRONYMS AND ABBREVIATIONS

FPG	Fossil Power Group
FPFA	Fire Protection Self-Assessment
NFPA	National Fire Protection Association
OIC	Operations Information Center
PER	Problem Evaluation Report
SCBA	Self-Contained Breathing Apparatus
SERTA	Safety and Emergency Response Training Academy
SPP	Standard Processes and Procedures
TVA	Tennessee Valley Authority

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MEMORANDUM DATED SEPTEMBER 30, 2011, FROM ROBERT J. FISHER TO ROBERT E. MARTIN



Inspection 2010-13530 – Review of TVA's Fossil Fire Protection Systems

EXECUTIVE SUMMARY

Why the OIG Did This Review

This review was initiated as part of the 2010 Annual Inspection Plan.

The objective of our review was to determine if the fire protection systems are adequately maintained and mitigating actions are taken to minimize the impacts of fires at Tennessee Valley Authority (TVA) fossil plants.

What the OIG Found

During our review, we identified a number of issues related to fire protection at TVA's fossil plants. Specifically, we found (1) that numerous impairmentsⁱ exist with fire protection systems at a number of the sites and most are not returned to service in a timely manner, (2) some fire brigade members have concerns about fire response preparedness, (3) lessons learned from fire events are not being consistently communicated across the fleet, (4) opportunities for improvement with fire prevention, and (5) instances of noncompliance with TVA policy regarding testing, inspection, and maintenance of fire protection equipment, pre-fire plans, and use of fire equipment.

- **Numerous fire protection system impairments exist and most are not returned to service in a timely manner.**

- ❖ We reviewed fire protection systems at five fossil plants and found that numerous impaired fire protection systems existed in 2010. During calendar year 2010, there were 30 impairments at Cumberland, 10 at Gallatin, 6 at John Sevier, 20 at Paradise, and 49 at Shawnee. The impairments in 2010 that have been closed were impaired for an average length of between 40 and 158 days depending on the site. The average number of days far exceeds the maximum 48-hour time frame for system repairs.

- **Fire brigade members have concerns about fire response preparedness.**

- ❖ Fire brigade members identified several areas of concern about fire response preparedness. These concerns included poor fitting equipment, condition of fire trucks, an inadequate staging area, bad communication equipment, not enough training, and insufficient staffing.

ⁱ An impairment is a term for a fire protection system that is out of service.



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- **Lessons learned are not being consistently communicated across the fleet.**
 - ❖ Lessons learned from fire events are not being communicated consistently across the fleet. Lessons learned are shared in different ways and are not always shared with fire brigade members. Additionally, not all fire brigade members are interviewed following fire events. We also identified 10 Problem Evaluation Reports for fire incidents that were not reported in the Operations Information Center (OIC).
- **Opportunities for improvement exist with fire prevention.**
 - ❖ Opportunities to improve fire prevention exist in the areas of coal dust accumulation and smoking. TVA policy establishes tolerable limits for coal dust accumulation and prohibits smoking in all TVA-owned or leased buildings. During our review, we observed areas of significant coal dust accumulation and evidence of smoking at several sites.
- **Instances of noncompliance with TVA policy.**
 - ❖ We identified instances of noncompliance with some TVA fire protection policies. Two of the policies were: (1) Fossil Power Group (FPG) Standard Processes and Procedures (SPP) 18.121 Fire Protection Inspection, Testing, and Maintenance and (2) FPG.SPP.10.013 Fire Brigade Organization. Some systems were not inspected and tested as required. Additionally, we identified that pre-fire plans are in need of updating, and fire equipment is being misused.

What the OIG Recommends

We recommend that the Senior Vice President, Fossil Generation:

- Take immediate steps to restore all impaired fire protection systems to service and determine if additional personnel or resources are needed to expedite repairs of fire protection systems in the future.
- Determine (1) the equipment needs of fire brigade members, including protective equipment and emergency communication devices, and take steps to provide that equipment, (2) what additional training is needed for fire brigade members and take steps to provide that training, and (3) if increased staffing is warranted for fire brigades.



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- Create and implement a formal process for capturing and sharing lessons learned from fire events across the fleet, and capture all fire incidents and report them in a consistent manner in the OIC.
- Perform regular coal washdowns at all the plants to minimize coal dust accumulations, and strictly enforce TVA's "No Smoking" policy.
- Evaluate whether additional personnel are needed to properly inspect, test, and maintain fire protection equipment, update pre-fire plans to reflect current conditions, and reinforce that fire equipment is only to be used by fire brigade personnel.

TVA management agreed with our recommendations, and we concur with their planned actions. See the Appendix for a complete response.

BACKGROUND

The Tennessee Valley Authority (TVA) Fossil Power Group's (FPG) coal-fired generating facilities have been the backbone of TVA's power system since the 1950s. TVA currently has 56 operating units at 11 fossil plant sites in the Tennessee Valley. TVA's coal-fired generating facilities have 14,675 megawatts capacity, accounting for above 60 percent of TVA's power generation. TVA's fossil plants have produced an average of 92.3 billion kilowatt-hours of electricity per year over the past 10 years.

Fire hazards such as large quantities of fuel, combustible/flammable liquids, electrical hazards, combustible dusts, and warehousing are common in electric generating plants. Although fires are not a daily occurrence at TVA, they could cause severe property damage and business interruption. To mitigate this risk, various fire protection systems are installed at TVA fossil plants, including:

- Fire pumps
- Hydrants
- Sprinkler/water spray systems
- Hoses
- Halon systems
- Dry chemical systems
- Carbon dioxide systems
- Detection/alarm systems
- Portable fire extinguishers

Fire protection systems are a combination of mechanical and electrical components and, like power generation equipment, need regular attention. If these systems are needed, they are counted upon to perform reliably and protect vital plant equipment from fire. However, every year fire protection systems throughout the industry fail to operate satisfactorily in fire situations. In about one-third of these cases, the cause is inadequate inspection, testing, and maintenance.

At TVA's coal-fired plants, a number of plant personnel participate as fire brigade members. These individuals take on the responsibilities of fire brigade members in addition to their normal job duties. Each fire brigade member is required to receive specialized training. According to TVA policy, fire brigade members are part of an organized group of TVA employees who are qualified, knowledgeable, trained in industrial fire fighting, and skilled in at least basic structural fire fighting operations, who perform advanced exterior and interior structural fire fighting response duties, and who are trained in the use of protective clothing and breathing apparatuses.

Fire prevention and fire protection codes and standards are established by the National Fire Protection Association (NFPA).¹ NFPA codes provide recommendations, not requirements, for fire prevention and fire protection for electric generating plants. TVA's policies and standards for fire protection equipment and fire brigades are based on NFPA guidelines. Other fire protection codes and standards exist, but their contents are usually based on NFPA documents.

OBJECTIVE, SCOPE, AND METHODOLOGY

This review was initiated as part of the 2010 Annual Inspection Plan. The objective of our review was to determine if the fire protection systems are adequately maintained and mitigating actions are taken to minimize the impacts of fires at TVA fossil plants.

To achieve our objective, we:

- Reviewed policies and procedures in place for fire protection.
- Reviewed insurance reports, fire protection self-assessments (FPSA), and Problem Evaluation Reports (PER) to identify issues with fire protection equipment.
- Reviewed remediation actions taken to address issues identified with the fire protection systems in the self-assessments, system impairment reports, fire incident reports, and PERs.
- Reviewed system impairment reports for length of time involved in completing remediation actions.
- Interviewed fire brigade members at selected fossil plants to determine if the training and equipment provided adequately prepared them to respond to an actual fire.
- Performed walkdowns at fossil plants to identify issues with fire protection equipment and/or fire prevention.

The scope of our review included fire protection systems at five of TVA's fossil plants and focused on documentation from calendar year 2010. The five plants we judgmentally selected were: (1) John Sevier, (2) Cumberland, (3) Shawnee, (4) Paradise, and (5) Gallatin. In addition to the documentation reviewed for calendar year 2010, we also looked at insurance reports and selected FPSAs from calendar year 2009.

¹ NFPA is an international non-profit organization whose mission is to reduce the burden of fire and other hazards on the worldwide quality of life. NFPA has designed 300 codes and standards to minimize the risk and effects of fire. NFPA also provides public safety education, advocacy campaigns, professional development training, a premier source for fire data research, and multiple publications on fire and fire safety.

This review was conducted in accordance with the "Quality Standards for Inspections."²

FINDINGS

During our review, we identified a number of issues related to fire protection at TVA's fossil plants. Specifically, we found (1) that numerous impairments exist with fire protection systems at a number of the sites, and most are not returned to service in a timely manner, (2) some fire brigade members have concerns about fire response preparedness, (3) lessons learned from fire events are not being consistently communicated across the fleet, (4) opportunities for improvement with fire prevention, and (5) instances of noncompliance with TVA policy regarding testing, inspection, and maintenance of fire protection equipment, pre-fire plans, and use of fire equipment.

NUMEROUS FIRE PROTECTION SYSTEM IMPAIRMENTS EXIST, AND MOST ARE NOT RETURNED TO SERVICE IN A TIMELY MANNER

During our review, we observed that numerous impaired fire protection systems exist at the five plants we reviewed; most were not returned to service in a timely manner. Numerous impaired fire protection systems place plant personnel and plant assets at greater risk from fire. Functional fire protection equipment is key in limiting the impact of a fire, and early operation of a suppression system is critical during a fire event. Causes of the large number of impairments may have included:

- Lack of manpower to maintain fire protection equipment
- Aging equipment
- Financial constraints

An impairment is a term for a fire protection system that is out of service. TVA recognizes three different types of impairments: emergency, planned, and hidden. An emergency impairment occurs when an unforeseen incident, accident, or equipment failure impairs the effectiveness of a protective system. A planned impairment occurs when it is necessary to shut down a fire or life safety protective system for maintenance or modification. A hidden impairment is an impairment that is not known to exist. A hidden impairment can be caused when a system is shut down and inadvertently left out of service upon completion of work, a system is shut down without proper notification, or a system is maliciously shut down. In discussions with plant personnel, the issue of hidden impairments was mentioned as a problem. In 2011, during a walkdown at one of the sites, TVA personnel discovered nine hidden impairments.

² Council of the Inspectors General on Integrity and Ethics' "Quality Standards for Inspections" issued in 2011.

Details of the fire impairments in calendar year 2010 at the five plants we reviewed can be seen in Figure 1 below. However, as of August 2011, the number of open impairments at the five plants have been significantly reduced.

Figure 1: Fire Impairments in 2010³

Fire Impairments in 2010						
Plant	# Impairments	# Open	# Closed	Average # Days Impaired ⁴	Shortest # Days Impaired	Longest # Days Impaired
Paradise	20	14	6	158	6	274
Shawnee	49	11	38	40	0	159
Gallatin	10	1	9	72	12	117
Cumberland	30	0	30	49	0	154
John Sevier	6	2	4	114	0	322

To be effective, fire protection elements should be operable at all times; however, due to the necessity of repairs, testing modifications, and to provide worker safety, it is necessary to remove these elements from service periodically. Therefore, TVA's Fire Protection System Impairments policy provides the requirements for establishing the administrative controls to assure that complete precautionary measures are taken for the protection of employees, assets, and operations against the threat of fire when any life safety, fire barrier, fire suppression, fire detection, emergency notification system, or fire water supply is impaired for emergency or pre-planned conditions.

FPG Standard Processes and Procedures (SPP) 18.119, Fire Protection System Impairments, requires each impairment to be classified as a Priority I, Priority II, or Priority III. Priority I impairments create an imminent hazard to employees and property and affects equipment critical to continued operations or the potential for an environmental release in excess of allowed limits. Priority I impairments are required to be repaired or restored to operation within 8 hours. Priority II impairments reduce the protection to employees, property, or the environment, but are not imminent hazards. Priority II impairments are required to be repaired or restored to operation within 24 hours. Priority III impairments must be corrected, but they do not directly reduce the protection to employees, property, operations, or the environment and are not imminent hazards. Priority III impairments are required to be repaired or restored to operation within 48 hours.

³ The numbers in the chart do not include hidden impairments, unless the hidden impairments were discovered and recorded in an impairment report.

⁴ The average number of days impaired, shortest number of days impaired, and longest number of days impaired were calculated only for the closed impairments.

Figure 2 below shows the breakdown of the impairments by priority levels at the five plants we reviewed.

Figure 2: Priority Level of Impairments⁵

Priority Level of Impairments					
Plant	Paradise	Shawnee	Gallatin	Cumberland	John Sevier
Priority Level I					
Total #	0	30	0	4	0
Average Days	-	24	-	43	-
Day Range	-	0-84	-	1-81	-
Priority Level II					
Total #	20	4	0	12	2
Average Days	158	83	-	15	105
Day Range	6-274	23-159	-	0-61	-
Priority Level III					
Total #	0	14	5	12	3
Average Days	-	64	73	81	117
Day Range	-	8-139	12-90	2-154	0-322
Not Categorized					
Total #	0	1	5	2	1

As shown in Figure 1 on the previous page, the impairments in 2010 that have been closed were impaired for an average length of between 40 to 158 days depending on the site. The average number of days far exceeds the maximum 48-hour time frame for system repairs. This increases the risk to plant personnel and the plant. According to the 2010 insurance report for Shawnee, some fire impairments have existed for over 2 years. Of the 115 total impairments, 9 were not given a prioritization level as required by FPG.SPP.18.119, Fire Protection System Impairments.

In addition to impairments being open for an excessive amount of time, we also identified that many outstanding work orders for fire protection equipment have existed at some of the plants. Having greater than 10 outstanding work orders for fire protection would receive a rating of unacceptable⁶ in the FPSA. A 2009 insurance report for Paradise stated that there were 140-150 work orders written for fire protection equipment repairs. The repairs ranged in scope from a leaking fitting to replacing an entire valve. A 2010 FPSA for Paradise stated that there were 125-plus fire protection work orders identified as open that needed to be worked to restore reliability to Paradise fire protection. A 2009 FPSA at Shawnee indicated over 101 outstanding work orders for fire protection. According to the FPSAs, TVA aims to have no outstanding work orders for fire protection.

⁵ The average days and day range were calculated only for the closed impairments.

⁶ Unacceptable is defined in the FPSAs as an item that does not comply with the requirements for fire preparedness, fire codes, and TVA requirements.

During our interviews with fire brigade personnel, several fire brigade members indicated that there are not enough maintenance personnel to maintain the reliability of the fire protection systems.

FIRE BRIGADE MEMBERS HAVE CONCERNS ABOUT FIRE RESPONSE PREPAREDNESS

During our interviews with fire brigade members, several areas of concern were identified regarding the fire brigade's preparedness to respond in the event of a fire. These included equipment and equipment staging, training, and staffing. Proper training and equipment are imperative to fire brigade personnel being able to safely and effectively combat fires. As a result of the identified deficiencies, TVA's fire brigade may not be adequately prepared to fight fires and personnel safety, and plant assets may be at greater risk.

Equipment and Equipment Staging

A number of fire brigade members raised concerns about equipment and equipment staging. These concerns related to protective apparel, fire trucks, communication equipment, and equipment-staging areas. One concern is that there is not enough protective apparel for those members who were not of "average" size, i.e., those who are taller/larger or shorter/smaller. This could result in the apparel being cumbersome to put on, restricting movement, and/or not providing adequate protection for the fire brigade member. TVA policy FPG.SPP.10.013, Fire Brigade Organization, states that an adequate amount of fire brigade personal protective clothing shall be maintained in order to ensure that all employees assigned to the fire brigade can dress out in personal protective clothing that will fit them.

In addition, there is some concern regarding certain fire trucks. We were told by fire brigade members that the fire truck at Cumberland is in very poor condition and that the fire trucks at Paradise and Cumberland are very old.

Another area of concern is related to emergency communication devices used at John Sevier. Problems with emergency communication devices were identified by a number of individuals at the site. One fire brigade member told us that the lack of effective emergency communication devices almost proved fatal during a recent fire incident. The fire event involved a 4160V electrical board catching fire. The electricity going to the board should have automatically shut off; however, it did not. The fire brigade member serving as the dispatcher was aware that electricity was still flowing to this piece of equipment but was unable to warn the responding fire brigade members because of problems with the two-way radios being used. In fact, the dispatcher said he thought he had just killed four responding fire brigade members. Fortunately, one of the team members was using an extinguisher on the fire and recognized a slight charge being conducted back to him through the use of the extinguisher.

Another concern related to communication devices was documented in a PER. The PER stated that during a fire drill conducted on December 14, 2010, the fire brigade was unable to communicate effectively due to failure of the communication equipment. The equipment was identified as Nextel i325 radios, and the lack of communication during the drill resulted in a "fail" rating for the drill. A TVA-wide team led by PSO is currently searching for replacements for the Nextel i325 radios.

In addition, at Gallatin, we were told that the fire brigade room did not provide adequate space to properly stage all of the equipment. Based on viewing the fire brigade equipment rooms at Gallatin and other facilities, it is clear that staging space at Gallatin is lacking compared to the other sites. In particular, we noted that all of the other facilities we visited had adequate space to have the self-contained breathing apparatuses (SCBA) staged and ready, while Gallatin had theirs stacked in storage cases. Removing the SCBAs from their cases could add additional time for fire brigade members to dress and respond. A comparison of fire brigade equipment rooms at Gallatin and Cumberland can be seen in Figures 3 and 4 below.

Figure 3: Gallatin Fire Brigade Equipment Room



Figure 4: Cumberland Fire Brigade Equipment Room



Training

In addition to improvements with equipment and space, several fire brigade members are of the opinion they could use more training to be better prepared to respond in a fire event.

Current training requirements for fire brigade members include:

- Initial training, which consists of a 32-hour Fire Brigade Membership Course at SERTA.
- Practical reviews consisting of a 24-hour Fire Brigade Member Practical Review at SERTA to be completed every 4 years.
- Fire Brigade Computer-Based Training Modules to be completed 4 times a year.

Fire brigade members are to participate in fire drills at least once every 6 months.

One specific area where fire brigade members feel they need more training involved the use of the fire trucks. Several fire brigade members said they had little to no experience working with the truck. One fire brigade member commented that they could use additional hazardous material and confined space rescue training, while others commented they could simply use the current training more frequently. Overall, the majority of brigade members we interviewed indicated that training could be expanded, improved, and/or more frequent.

Staffing

Several fire brigade members told us they do not believe they have adequate staffing to fill fire brigade positions. FPG.SPP.10.013, Fire Brigade Organization, requires a minimum of one fire brigade leader and four Level 1 fire brigade members working on each shift. In addition, during our review of the PERs for 2010, we observed that John Sevier had four PERs relating to insufficient fire brigade staffing. Three of the PERs were initiated due to shifts without proper fire brigade staffing. In these instances, additional fire brigade members were called in to satisfy the staffing requirement. The other PER was initiated because proposed staffing at the John Sevier Combined Cycle plant may cause insufficient staffing of the fire brigade members at John Sevier Fossil Plant.

LESSONS LEARNED FROM FIRE EVENTS ARE NOT BEING CONSISTENTLY COMMUNICATED ACROSS THE FLEET

During the course of our review, we found that lessons learned from fire events were not being communicated on a consistent basis. FPG.SPP.18.120, Fire Incident Reporting, states that any fire should be reported, and any other "near miss" type incident that would be of interest to other plants or facilities should be reported. However, we were unable to identify a formal process of communicating information learned from fire events. Communicating

consistently across the fleet may help to prevent the recurrence of similar events at the various sites. If information is not communicated, prevention opportunities are missed, and the risk to plant personnel and assets may be greater. This is especially true when TVA had a number of fire incidents during calendar year 2010.

Figure 5 below shows the fire events at each of the five plants. The fire events ranged from none at John Sevier to 18 at Shawnee. As noted previously in Figure 1, the site with the highest number of fires in 2010—Shawnee—also experienced the highest number of fire impairments.

Figure 5: Fire Incidents in 2010

Number of Fire Incidents in 2010	
Paradise	2
Shawnee	18
Cumberland	2
Gallatin	1
John Sevier	0

In addition to the incidents listed in the chart above, we identified 10 PERs in 2010 for fire incidents. These incidents were not recorded in a fire incident report in the Operations Information Center (OIC). FPG.SPP.18.120, Fire Incident Reporting, states that all fire-related incidents shall be reported using the electronic fire incident report form within 8 hours after the occurrence. Four of the PERs not recorded in the OIC database were from Shawnee, two were from Cumberland, two were from John Sevier, and two were from Paradise. For example, one of the PERs was initiated because of a fire near a coal conveyor that was caused by a failed roller that caused friction on the belt. Another PER was initiated because of a fire in a 4kV board.

During our interviews, plant personnel indicated lessons learned were shared in different ways across the plants and are not always shared with fire brigade members. One fire brigade member specifically stated that they routinely do not go over anything from other plants related to lessons learned from fire events. Another fire brigade member stated that information on lessons learned is shared in the plan of the day meeting, and it will eventually be passed down from the Shift Operations Supervisor. Another fire brigade member told us that only information is shared from major events, and it involves minimal information. One individual who led a response to a serious fire event said he was never interviewed or asked any questions about the response.

OPPORTUNITIES FOR IMPROVEMENT EXIST WITH FIRE PREVENTION

While reviewing documentation and performing our walkdowns of the five fossil sites, we observed areas for improvement with respect to fire prevention. First, during our walkdowns we witnessed numerous areas of significant coal dust accumulation at several of the plants. In reviewing FPSAs and insurance reports, the issue of significant coal dust accumulations was identified several times. FPSAs for Shawnee stated that the units are only washed down during outages. TVA Safety Manual Procedure Number 816, Combustible Dust, requires that combustible dust accumulations shall be maintained less than 1/32 inch on the floor, on overhead beams, joists, ducts, vertical surfaces, the tops of equipment, and other surfaces. Limiting the accumulation of coal dust could serve to reduce the frequency and severity of a fire.

Examples of coal dust accumulation can be seen in Figure 6 below and Figure 7 on the following page.

Figure 6: Coal Dust Accumulation at Paradise



Figure 7: Coal Dust Accumulation at Cumberland

While we observed areas of significant coal dust accumulation during our walkdowns, we witnessed firsthand plant personnel performing coal washdowns as well as areas that had recently been cleaned. These efforts should be continued, as they are key in limiting coal accumulations. Minimizing coal dust is an important part of good housekeeping. In addition, some of the plants appear to have quality housekeeping practices in place. For example:

- John Sevier received a rating of "good" for housekeeping in 2009 and 2010 from the insurance reports.
- Gallatin received a rating of "excellent" for housekeeping in the same years.

We also observed these two sites to have very good housekeeping during our visits, and their efforts in this area should be commended.

Another area where we saw an opportunity to improve fire prevention is with respect to smoking. TVA policy prohibits smoking of any tobacco product, without exception, in all TVA-owned or leased buildings, as well as in certain designated outdoor areas identified as smoke-free zones. However, we observed evidence of personnel smoking inside the buildings at several of the sites we visited. At one of the sites we witnessed a contractor employee smoking in the powerhouse. The plant personnel accompanying us on our site visit immediately addressed the issue with the contractor employee and notified an on-site supervisor. Smoking could provide an ignition source especially for areas with significant coal dust accumulations as discussed above.

Evidence of smoking seen during our walkdown can be seen in Figure 8 below.

Figure 8: Cigarette Butts Inside One of the Facilities



In addition to the evidence of smoking at several of the sites, we observed a charcoal grill inside the powerhouse at one of the plants. Permits are required for the use of open flame in areas with combustible dust. Grilling should only be done outdoors and should be controlled in accordance with hot work procedure. TVA personnel accompanying us on our site visit notified management of the charcoal grill and recommended having it removed from inside the plant.

A picture of the charcoal grill can be seen in Figure 9 below.

Figure 9: Charcoal Grill at Paradise



INSTANCES OF NONCOMPLIANCE WITH TVA POLICY

During our review, we found instances of noncompliance with TVA policy. These related to inspections, testing, and maintenance of fire protection equipment, updating of pre-fire plans, misuse of fire equipment, as well as coal dust accumulation and smoking, which were discussed above.

TVA policy FPG.SPP.18.121, Fire Protection System Inspection, Test, & Maintenance, specifies the weekly, monthly, quarterly, semi-annual and annual testing and maintenance of all fire suppression systems, fire detection systems, supervisory switches, fire pump, pressure relief valves, fire hydrants, water spray tests, standpipes, fire extinguishers, fire doors, dampers, and other related equipment. This procedure was established using applicable NFPA documents as a reference including NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems. Based on our review of insurance assessments and FPSAs, this policy is not being complied with in some cases. For example, March and April 2009 FPSAs for Cumberland stated that annual functional and flow tests for Water-Based Fire Protection Systems

have not been done. The FPSA for this category was rated at watch list.⁷ In Shawnee's February 2009 FPSA, a rating of unacceptable was listed for the annual functional test for all plant-wide fire protection annunciation systems not being completed. The FPSA also stated that the policy regarding the testing of the fire alarm control panels was not being followed. Multiple FPSAs at Paradise in 2009 and 2010 listed unacceptable ratings for annual maintenance not being performed on all portable and wheeled fire extinguishers. Also, Paradise was rated at watch list in multiple FPSAs for not checking high pressure CO₂ systems monthly.

In addition, we found instances of noncompliance with TVA policy FPG.SPP.10.013, Fire Brigade Organization. Section 3.2.7 of the policy, pre-fire plans, states that pre-fire plans should be updated as needed to reflect any changes and additions in plant conditions as well as to reflect any changes in fire hazards, fire suppression activities, or fire suppression equipment. Pre-fire plans identify the important hazards and safety equipment in each area of the plant, along with cautions and procedures for certain fire fighting functions. The pre-fire plans are used as reference documents for emergency responders during a fire scenario and as training documents to familiarize all personnel with plant configuration and hazards. The insurance reports consistently noted that pre-fire plans should be updated. For example, a 2010 insurance report for John Sevier states that the existing pre-fire plans were last revised in 2000 and that there have been several plant changes since that time. The insurance report also states that no pre-fire plans have been developed to include the coal-handling areas, belt conveyors, out buildings, water treatment buildings, and ash-handling facilities. The insurance report recommends that the existing pre-fire plans should be reviewed and revised to show the current plant upgrades for the main powerhouse and supporting areas. A 2009 insurance report for Paradise identified similar issues. A 2010 Gallatin insurance report states that the coal-handling yard is not included in the pre-plans.

Another area of noncompliance was related to the misuse of fire hoses. During our walkdowns at several sites, we observed fire hoses were being used for purposes other than fighting fires, such as coal washdowns. FPG.SPP.10.013, Fire Brigade Organization, Section 3.2.10, states that only eligible fire brigade members shall use fire fighting equipment, i.e., fire hose, nozzles, appliances, and wheeled extinguishers. Plant personnel indicated that misuse of fire hoses has been a recurring problem. Misuse of fire hoses may result in the hoses being unavailable or damaged when they are needed to respond to a fire. Plant personnel responsible for fire equipment have taken steps to more clearly mark fire hoses and explain to the other plant personnel that fire hoses are not to be used except for fighting fires.

⁷ Watch list is defined in the FPSAs as an item that meets the majority of the requirements for fire preparedness, fire codes, and TVA requirements.

RECOMMENDATIONS

We recommend that the Senior Vice President, Fossil Generation:

1. Take immediate steps to restore all impaired fire protection systems to service and determine if additional personnel or resources are needed to expedite repairs of fire protection systems in the future.
2. Determine (1) the equipment needs of fire brigade members, including protective equipment and emergency communication devices, and take steps to provide that equipment, (2) what additional training is needed for fire brigade members and take steps to provide that training, and (3) if increased staffing is warranted for fire brigades.
3. Create and implement a formal process for capturing and sharing lessons learned from fire events across the fleet, and capture all fire incidents and report them in a consistent manner in the OIC.
4. Perform regular coal washdowns at all the plants to minimize coal dust accumulations, and strictly enforce TVA's "No Smoking" policy.
5. Evaluate whether additional personnel are needed to properly inspect, test, and maintain fire protection equipment, update pre-fire plans to reflect current conditions, and reinforce that fire equipment is only to be used by fire brigade personnel.

MANAGEMENT'S RESPONSE

Management's Response - The Senior Vice President, Fossil Generation, provided comments on a draft of this report and agreed to implement our recommendations.

In response to our recommendations, management plans to complete the following actions:

- Revise FPG.SPP.18.119, Fire Protection System Impairments to correspond with FPG work management process levels of priority and industry standards.
- Continue to use Management Review Meetings to validate and monitor reduction of hidden impairments.
- Inventory all plant fire brigade equipment and determine gaps.
- Begin providing annual refresher training.
- Develop process to track, document, and communicate emergency response equipment inspections.
- Revise the Conduct of Operations procedure. Revision will include reference to the FPG Fire Impairment procedure and the Fire Incident Reporting

procedure. This reference will establish clear expectations around reporting any and all fires. It will also re-enforce expectations that all fire protection system components that are removed from service with have a "Fire Impairment" documented.

- Revise the OIC to add Operations peer team and the O/E Manager to the drop down list, which are automatically notified when an incident is generated.
- A Fleet Focus specific to expectations of adhering to TVA's "No Smoking" Policy and reinforcing that fire equipment is only to be used for fire brigade personnel will be issued from the Vice President of Operations.
- Evaluate staffing needs as a part of the FY13 Business Planning process.

The complete text of TVA management's response is provided in the Appendix.

Auditor's Comments - We concur with TVA management's planned actions.

September 30, 2011

Robert E. Martin, ET 3C-K
Assistant Inspector General
(Audits and Inspections)

REQUEST FOR COMMENTS - DRAFT AUDIT 2010-13530 - REVIEW OF TVA'S FOSSIL FIRE PROTECTION SYSTEMS

We appreciate the opportunity to provide comments on the draft report of TVA's fossil fire protection systems on August 31, 2011.

The Fossil Power Group (FPG) has one correction to the draft report. Page 7 incorrectly states that SERTA is conducting a search for replacement radios. This search is actually being accomplished by a TVA wide team, led by PSO.

Responses for each recommendation are summarized below.

Recommendations:

1. Take steps to restore all fire impaired protection systems to service and determine if additional personnel or resources are needed to expedite repairs of fire protection systems in the future.

Response:

In 2011 FPG directed significant attention to fire system impairments. Fire Protection Program Health Reports were developed and are issued twice per year. Fire Protection status including open fire system impairments are included monthly in the Plan of the Day package. As of the end of August, significant progress in reducing the number of open impairments was made, compared to information in the OIG report. The OIG report indicates: 20 open impairments for Paradise, at the end of August 2011 there were only 9 open impairments; 49 open impairments versus 1 for Shawnee; 10 open impairments versus 5 for Gallatin; 30 open impairments versus 18 for Cumberland which will be closed during the upcoming outage; 6 open impairments versus 0 for John Sevier. Each plant developed work-off plans for their impairments and is tracking progress against the plan. Impairments, properly implemented to correct standards, are an operational necessity. A reduction to zero impairments is not appropriate.

OIG identified that impairments are remaining open beyond the SPP required 48 hour maximum time frame for system repairs. The procedure, FPG-SPP-18.119 *Fire Protection System Impairments*, Priority I, II, and III criteria is not based on requirements or industry standards and is being revised to define Impairment Priorities in accordance with FPG's work management process. The requirement to restore impairments to service in 8hrs, 24hrs and 48hrs is not based on any industry standard and is not reasonable. This procedure is being revised and the changes will include the requirement to put in place appropriate compensatory measures for all outstanding impairments. The three levels of priority will be revised to correspond with the FPG Work Management process levels of priority and industry standards. Examples will be included

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to remove subjectivity in identifying the priority level and to ensure impairments are appropriately prioritized.

Hidden impairments are still a significant concern for FPG management. At every Management Review Meeting (MRM), the FPG Fire Protection Engineer identifies a number of hidden impairments. The FPG Operations CFAM will be working with the FPG Fire Protection Engineer to identify and conduct training for the plant operators to ensure hidden impairments are eliminated. FPG management will use the MRM to validate elimination of hidden impairments.

Action(s)

- Complete revision of FPG-SPP-18.119 *Fire Protection System Impairments*. Owner: Jim Hallenbeck. Due Date: 12.01.11
- Continue to use MRMs to validate and monitor reduction of hidden impairments. Due date: Ongoing

2. Determine (1) the equipment needs of fire brigade members, including protective equipment and emergency communication devices, and take steps to provide that equipment, (2) what additional training is needed for fire brigade members and take steps to provide that training, and (3) is increased staffing warranted for fire brigades.

Response:

To determine equipment needs, a PER action will be assigned through the Corrective Action Program (CAP) to all General Managers and Plant Managers of coal-fired generating sites to inventory all plant fire brigade equipment, determine gaps, and procure replacement equipment as needed.

A review of our program, that included benchmarking with other utilities, determined the need for increased FPG Fire Brigade refresher training. Corporate Training and FPG are currently changing our program to provide annual refresher training for structural fire brigades.

The Emergency Response Training staff will inspect the emergency response equipment rooms on an annual basis to verify the quality and quantity of the equipment meets the minimum requirements listed in FPG-SPP.10.013 *Fire Brigade Organization*. Any deficiencies and suggested improvements will be discussed with plant management. A process to track, document, and communicate these inspections will be in place by January 31, 2012.

The comments specific to staffing were predominately about John Sevier Fossil Plant, which will be retired by the end of calendar year 2012. Actions leading to plant retirement will result in the elimination of a structural fire brigade. The plant will utilize an offsite contract with the local fire department to provide services.

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Action(s)

- Inventory all plant fire brigade equipment and determine gaps. Owner: General and Plant Manager. Due Date: December 1, 2011.
- Begin providing annual refresher training. Owner: Technical Training. Due Date: January 31, 2012.
- Develop process to track, document, and communicate emergency response equipment inspections. Owner: Technical Training. Due Date: January 31, 2012.

3. Create and implement a formal process for capturing and sharing lessons learned from fire events from across the fleet, and capture all fire incidents and report them in a consistent manner in the OIC.

Response:

The Operations Peer Team will address the capturing and sharing of lessons learned by the completion of the actions listed below.

Action(s)

- Revise the Conduct of Operations procedure. Revision will include reference to the FPG Fire Impairment procedure and the Fire Incident Reporting procedure. This reference will establish clear expectations around reporting any and all fires. It will also re-enforce expectations that all fire protection system components that are removed from service will have a "Fire Impairment" documented. Owner: Operations Peer Team. Due Date: December 1, 2011
- Revise the Operations Information Center (OIC) to add Operations peer team and the O/E Manager to the drop down list, which are automatically notified when an incident is generated. Owner: Operations Peer Team. Due Date: December 1, 2011

4. Perform regular washdowns at all the plants to minimize coal dust accumulations, and strictly enforce TVA's "No Smoking" policy.

Response:

FPG has invested significant amounts of funding and effort in FY10 and FY11 to minimize coal dust including regular coal washdowns. This will continue in FY12 and beyond. Monthly scorecards tracking coal dust housekeeping and a combustible dust deficiency work off curve are being utilized to ensure compliance.

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Action(s):

A Fleet Focus specific to expectations of adhering to TVA's "No Smoking" Policy and reinforcing that fire equipment is only to be used for fire brigade personnel will be issued from the Vice President of Operations. Owner: Dave Schavey. Due Date: October 31, 2011

5. Evaluate whether additional personnel are needed to properly inspect, test, and maintain fire protection equipment, update pre-fire plans to reflect current conditions, and reinforce that fire equipment is only to be used for fire brigade personnel.

Response:

The annual Business Planning process addresses staffing level needs. The FY13 Business Planning process begins during October 2011 and will conclude in June 2012.

Action(s):

- Evaluate staffing needs as part of the FY13 Business Planning process. Ongoing.
- See Action on Fleet Focus for recommendation #4.

Please let us know if you have any other questions or need additional information.



Robert J. Fisher
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OIG File No. 2010-13530