



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

July 24, 2015

James R. Dalrymple, LP 3K-C

**REQUEST FOR FINAL ACTION – EVALUATION 2015-15294 – HYDRO GENERATION  
FIRE PROTECTION**

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.

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

If you have any questions or wish to discuss our findings, please contact John A. Jacosalem, Auditor, at (423) 785-4821 or Gregory R. Stinson, Director, Evaluations, at (865) 633-7367. We appreciate the courtesy and cooperation received from your staff during the evaluation.

*Robert E. Martin*

Robert E. Martin  
Assistant Inspector General  
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Attachment

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TVA Board of Directors  
OIG File No. 2015-15294



Office of the Inspector General

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# *Evaluation Report*

To the Senior Vice  
President, Power  
Operations

# **HYDRO GENERATION FIRE PROTECTION**

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Audit Team  
John Jacosalem  
Heather Kulisek

Evaluation 2015-15294  
July 24, 2015

## **ABBREVIATIONS**

ECA	Equipment Condition Assessment
ERL	Emergency Response Liaison
ERM	Enterprise Risk Management
FBD	Fire Branch Director
NFPA	National Fire Protection Association
SPP	Standard Programs and Processes
TVA	Tennessee Valley Authority

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ROBERT E. MARTIN



## Evaluation 2015-15294 – Hydro Generation Fire Protection

### EXECUTIVE SUMMARY

#### Why the OIG Did This Evaluation

This review was initiated based on findings from a previous review<sup>i</sup> conducted by the Office of the Inspector General. The objective of our review was to determine whether fire protection systems are adequately maintained and mitigating actions are taken to minimize the impacts of fires at the Tennessee Valley Authority's (TVA) Hydro Generation plants. Although the likelihood of fire is lower at hydro plants than at coal plants, they are not without fire risk. Hydroelectric stations share many of the same fire hazards as coal plants such as oil-filled transformers, electrical cables and switchgear, air-cooled generators, and large quantities of combustible hydraulic oil. Hydro plants are typically an underground/underwater windowless structure. In many ways, a hydro plant poses more extreme safety issues and rescue risks because of limited building access, lack of natural lighting, and embedded structures, all of which increase the potential for a fire on a higher level to trap workers on a lower level.

#### What the OIG Found

During our review, TVA indicated that fire protection systems and equipment are generally being maintained and in good condition with some exceptions. Additionally, Hydro Generation is making improvements to condition assessments of fire protection equipment.

However, we found mitigating actions to decrease the impact of fires could be strengthened in four areas: (1) risk assessment reports indicated that hydro plants could use more fire protection equipment and process enhancements to documentation of inspection, testing, and maintenance are still needed; (2) TVA indicated fire drills are being conducted on a routine basis, but are not documented as required, fire incidents are not being tracked, and lessons learned are being shared inconsistently; (3) TVA has not fully implemented the Emergency Response Liaison (ERL) role; and (4) the increased risk from replacing the ERL role has not been included in TVA's enterprise risk.

<sup>i</sup> Evaluation 2014-15216 – Follow up Review of TVA's Coal Plant Fire Protection Systems, September 29, 2014.



# Evaluation 2015-15294 – Hydro Generation Fire Protection

## EXECUTIVE SUMMARY

### What the OIG Recommends

We recommend the Senior Vice President, Power Operations:

- Implement risk reduction suggestions from insurance reports.
- Create and implement a formal process for capturing and sharing lessons learned from fire events across the fleet, and ensuring documentation requirements for all fire drills and incidents are followed.
- Complete implementation of the ERL role including notifying the appropriate fire departments and training.
- Consider including the increased risk from replacing the Fire Branch Directors with ERLs in the Enterprise Risk Management.

### TVA Management's Comments

TVA management generally agreed with the findings and recommendations in this report. See the Appendix for TVA's complete response.

### Auditor's Response

The Office of the Inspector General concurs with TVA management's response.

## **BACKGROUND**

The Tennessee Valley Authority's (TVA) 29 conventional hydropower plants and Raccoon Mountain Pumped-Storage Plant play a strategic role in TVA's mission of providing affordable, reliable electricity, managing a thriving river system, and supporting sustainable economic development. In a normal rainfall year, these plants generate about 16.4 million megawatt hours of electricity. Although TVA's hydroelectric generation is only 10 percent of generation capacity, it offers other advantages such as being emissions-free and the least expensive source of generation.

On September 27, 2002, there was a fire at the Watts Bar Hydroelectric Plant. The dam is approximately one-half mile long and has a generating capacity of 175,000 kilowatts. It supplies power and provides back-up power for the Watts Bar Nuclear Power Station located directly south of the dam. At the time of ignition, there were five employees working in the hydroelectric plant control room. The fire spread rapidly, giving these personnel only 4 minutes to realize there was a fire and to escape. All five were able to evacuate and there were no injuries. The estimated business loss of closing the plant due to the fire was \$100,000 per day. The total cost of the fire was approximately \$36 million in property damage and \$24 million in business interruption. This fire illustrated that a fire in an electrical system can quickly be life-threatening regardless of the structure type. Although the likelihood of fire is lower at hydro plants than at coal plants, they are not without fire risk. Hydroelectric stations share many of the same fire hazards as coal plants such as oil-filled transformers, electrical cables and switchgear, air-cooled generators, and large quantities of combustible hydraulic oil. Hydro plants are typically an underground/underwater windowless structure. In many ways, a hydro plant poses more extreme safety issues and rescue risks because of limited building access, lack of natural lighting, and embedded structures, all of which increase the potential for a fire on a higher level to trap workers on a lower level.

TVA's hydro plants are not staffed to handle major fires and rely on off-site responders to provide principal fire-fighting capabilities. On-site personnel provide only incipient fire<sup>1</sup> response. All permanent assigned site personnel are assigned as responders to incipient fires and receive training. For fires beyond incipient response, Fire Branch Directors (FBD) were previously selected at each site to coordinate and direct all activities for controlling and extinguishing fires, including coordinating off-site fire responders' activities and any confined space entry or rescue. TVA decided in 2014 to replace the FBD role with the Emergency Response Liaison (ERL) role, which responds to all emergencies but does not actively participate in emergency response beyond the incipient stage of firefighting. This decision dictates that there will no longer be any site

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<sup>1</sup> OSHA describes an incipient fire as a fire which is in the initial or beginning stage and that can be controlled or extinguished by portable fire extinguishers, Class II, or 1.5 inch fire hose systems without the need for protective clothing or breathing apparatus for the fire responder.

personnel who could don turn-out gear<sup>2</sup> and accompany external emergency responders. TVA communicated implementation of this decision to plant personnel in August 2014 and plans to notify local fire departments of this decision this year. As part of this decision, TVA mandated all plants, with the exception of Raccoon Mountain, to return turn-out gear.

Fire prevention and fire protection codes and standards are established by the National Fire Protection Association (NFPA).<sup>3</sup> NFPA codes provide recommendations, not requirements, for fire prevention and fire protection for electric generating plants. Other fire protection codes and standards exist, but their contents are usually based on NFPA documents. Standard Programs and Processes (SPP) RO-SPP-35.002, Facility Emergency Response Plan, provides emergency response procedures to be followed at hydro plants in the event of emergency situations, including fire. However, it does not deal with requirements for inspection, testing, and maintenance of fire protection systems and equipment. Several Standard Maintenance Procedures are in place, which drive inspection, testing, and maintenance of fire protection systems and equipment. According to TVA, a new SPP is under development that will be NFPA compliant and include TVA coal, gas, and hydro fleets. The new SPP will address among other things inspections, testing, and maintenance.

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

This review was initiated based on findings from a previous review, 2014-15216 – Follow-Up Review of TVA's Coal Plant Fire Protection Systems, conducted by the Office of the Inspector General. The objective of this review was to determine if fire protection systems are adequately maintained and mitigating actions are taken to minimize the impacts of fires at TVA hydro plants. This review includes the activities of hydro plant Fire Protection during calendar years 2012 and 2013.

To achieve our objective, we:

- Reviewed related SPPs, related guidance and regulatory requirements.
- Interviewed fire protection personnel to determine what systems are in place and how the conditions of the systems are determined.

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<sup>2</sup> According to RO-SPP-35.002, Facility Emergency Response Plan, minimum turn-out gear includes self-contained breathing apparatus, spare breathing air cylinders, portable radios, personal protective clothing, and confined space rescue equipment.

<sup>3</sup> 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 by providing and advocating consensus codes and standards, research, training, and education. 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.

- Performed site walkdowns and interviewed personnel at selected dams to determine how systems are being maintained and other fire protection concerns.
- Attempted to review equipment assessment reports to determine the condition of fire protection systems.
- Attempted to review past fire incidents to determine what mitigating actions were taken to minimize the impacts of future fires at hydro plants.

We judgmentally selected 3 plants for site walkdowns and personnel interviews: (1) Watts Bar, (2) Fort Loudoun, and (3) Chickamauga. In addition, we reviewed the latest property risk assessment reports at these sites.

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

## **FINDINGS**

During our review, TVA indicated that fire protection systems and equipment are generally being maintained and in good condition with some exceptions. Additionally, Hydro Generation is making improvements to condition assessments of fire protection equipment.

However, we found mitigating actions to decrease the impact of fires could be strengthened in four areas: (1) risk assessment reports indicated that hydro plants could use more fire protection equipment and process enhancements to documentation of inspection, testing, and maintenance are still needed; (2) TVA indicated fire drills are being conducted on a routine basis, but are not documented as required, fire incidents are not being tracked, and lessons learned are being shared inconsistently; (3) TVA has not fully implemented the ERL role; and (4) the increased risk from replacing the ERL role has not been included in TVA's enterprise risk.

### **HYDRO GENERATION IS GENERALLY MAINTAINING ITS SYSTEMS AND EQUIPMENT AND MAKING IMPROVEMENTS TO BETTER TRACK THE CONDITION OF THE EQUIPMENT**

During our interviews and walkdown of sites, TVA indicated that the fire protection systems and equipment were generally being maintained and in good condition with some exceptions. However, TVA is having difficulty finding replacement parts for the high-pressure CO2 system. Additionally, TVA is making revisions to its condition assessments of fire protection equipment to increase usefulness.

We performed site walkdowns of fire protection systems and equipment and interviewed fire protection personnel at 3 of TVA's hydro plants. The 3 plants we

judgmentally selected were: (1) Watts Bar, (2) Fort Loudoun, and (3) Chickamauga. Our interviews with site personnel indicated fire protection systems and equipment were generally being maintained in accordance with standard maintenance procedures and that fire protection systems were in good condition with some exceptions. We also observed hoses, fire extinguishers, emergency lighting, fire alarm systems, and signage in good condition throughout the plant. We observed up-to-date inspection stickers on hoses and fire extinguishers during our site walkdowns. However, during our interviews with site personnel, several expressed a concern regarding difficulty finding replacement parts for the high pressure CO2 and Water Mist systems.

TVA performed Equipment Condition Assessments (ECA) in 2013 of fire protection systems and equipment at hydro plants. Engineering Guidance Document EGD-09.021, Equipment Condition Assessment (ECA) Program, describes the ECA process as an assessment of major equipment and systems as well as physical and material condition of Hydro Operations. The assessments are used to prioritize projects and determine corrective and preventive maintenance requirements.

The condition criteria used for the 2013 condition assessments of hydro plant fire protection systems and equipment included age, physical condition, operations history, and maintenance history. However, TVA indicated ECAs used generic condition criteria, did not paint a complete picture of the true condition of fire protection systems, and were not very helpful. Additionally, TVA indicated they may not have had a complete list of assets. TVA is currently working on an Asset Condition Assessment to replace the ECA. Instead of the generic condition criteria of the ECAs previously used, TVA is developing specific condition criteria for each fire protection system. TVA is also gathering a complete list of fire protection assets and plans on completing Asset Condition Assessments for all fire protection systems by end of fiscal year 2015.

## **MITIGATING ACTIONS TO DECREASE THE IMPACT OF FIRES COULD BE IMPROVED**

Risk assessments performed by an external party at the 3 hydro plants we visited found that, in order for TVA to achieve a rating of higher than “Fair” on its fire protection program, it would need enhancing in a few areas. Specifically, more fire protection equipment would be needed and certain process enhancements would need to be implemented at TVA hydro plants. We were informed fire drills are being conducted on a routine basis, but documentation is done inconsistently. In addition, fire incidents are not being tracked, and lessons learned are being shared inconsistently.

### **Risk Assessments Indicate More Fire Protection Equipment and Process Enhancements Can Be Implemented, and Outstanding Risk Reduction Opportunities Exist**

We reviewed the latest property risk assessment reports conducted by AEGIS Insurance Services, Inc., for the 3 plants. The purpose of these property risk assessments is to evaluate the critical plant equipment located at the facility with regard to operations and maintenance. The Fire Protection rating for all 3 plants was considered “Fair” due to the lack of adequate fire protection for some components. This also affected the Major Equipment rating for Watts Bar and Fort Loudoun, with the property risk assessment report citing the lack of adequate fire protection system for some components as a reason for a “Fair” rating.

Part of the risk assessment includes a tour of the premises along with a review of special hazards present, protective systems, building construction details, management loss control programs and other related aspects of the facility. National and industry recognized standards are the basis for the evaluation and suggestions in the reports. The property risk assessment gives a rating on three major criteria: (1) Risk Reduction Programs, (2) Fire Protection, and (3) Major Equipment.

To determine the rating of each criterion, the following Risk Characteristic Ratings are used:

- Excellent - The facility has taken measures per industry standards and best practices. Loss potential is considered significantly reduced.
- Good - The facility has taken measures that are consistent with industry standards and best practices. Loss potential is considered to be average.
- Fair - The facility has taken some measures that approach industry standards and best practices; however, deficiencies exist. Loss potential is considered somewhat increased. Any rating in this category should reference a Risk Reduction Suggestion to raise the level to Good.
- Poor - The facility has major deficiencies and does not approach industry standards and best practices. Loss potential is considered to be significantly increased.

**Figure 1: Property Risk Assessment Summary**

<b>Plant</b>	<b>Year Issued</b>	<b>Fire Protection Rating</b>	<b>Outstanding Risk Reduction Suggestions</b>
Chickamauga	2012	Fair	6
Fort Loudoun	2011	Fair	8
Watts Bar	2012	Fair	6

There were also several outstanding Risk Reduction Suggestions for all 3 plants that were identified as far back as 2006 through 2009. Risk Reduction Suggestions represent opportunities for continued improvement and are based and customized for each facility using national and industry recognized standards and recommended practices. According to TVA Power Operations management, as of February 23, 2015, none of these Risk Reduction Suggestions have been resolved since they were initially issued in the 2006 through 2009 property risk assessment reports. Additionally, one of the identified Risk Reduction Suggestions for all 3 plants was for enhancing documentation of inspection, testing, and maintenance of fire protection equipment/systems to meet the requirements of NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Systems and NFPA 12, Standard on Carbon Dioxide Extinguishing Systems. The TVA Fire Protection Program Manager has acknowledged that all 30 hydro plants do not meet the documentation requirements for NFPA 12 and 25, but TVA has prioritized completion of the revision to and inclusion of Hydro Generation in SPP 18.121, Inspection, Testing, and Maintenance, to address this issue. Implementation of additional fire protection equipment and Risk Reduction Suggestions may help prevent future fires and reduce harm to systems and personnel in the event of a fire. By not implementing the property risk assessment report's recommendations, opportunities are missed for mitigating some of the additional risks resulting from TVA's decision to replace the Fire Branch Liaison with the ERL role as described below.

### **Fire Drills are Conducted on a Routine Basis, but Are Documented Inconsistently**

TVA indicated fire drills are being conducted on a routine basis. However, we found that fire drills are being documented inconsistently. Fire drills should be done in accordance with TVA-SPP-17.016, Conduct and Evaluation of Fire Drills, which ensures consistent practice in conducting and evaluating fire drills. According to TVA-SPP-17.016, fire drills are designed to allow for a practice session by plant personnel and to systematically evaluate personnel performance and the effectiveness of plant emergency fire procedures, pre-fire plans, alarm systems, and training programs. According to TVA-SPP-17.016, hydro plants should conduct a minimum of two fire drills annually. One fire drill should be conducted with the off-site fire department that has an active agreement to provide firefighting and equipment response to the plant. The other fire drill should be planned and coordinated by plant management as an "unannounced" fire drill. Additionally, hydro plants are required to complete Form 20478 Fire Drill Evaluation Report to document performance of drill participants. A post fire drill critique should also be held with drill participants to discuss drill performance using this form as a guide and should include noting actions where performance did not meet standards, areas for improvement, and lessons to be learned.

During interviews with site personnel and review of documentation, TVA indicated that both unannounced fire drills and drills with off-site fire department

responders were being conducted on a routine basis. However, TVA indicated that documentation of Form 20478 Fire Drill Evaluation Report was being done inconsistently. Fort Loudoun Hydro Plant was not able to provide one out of four required forms from 2012 through 2013. Chickamauga and Watts Bar were not documenting Form 20478 at all during 2012 and 2013. Inconsistent documentation as required increases the likelihood that fire drill performance deficiencies and areas for improvement are not followed up on. Hydro plants have an increased safety risk due to being underground/underwater windowless structures with limited building access. Lessons learned from fire drills may help mitigate some of this risk, but inconsistent documentation makes sharing of lessons learned across all TVA hydro plants difficult.

### **Fire Incidents Are Not Being Tracked and Sharing of Lessons Learned Are Being Done Inconsistently**

We found that TVA is not tracking fire incidents and that sharing of lessons learned is being done inconsistently.

TVA currently uses the Operations Information Center database for recording fire incidents at coal plants. However, TVA currently does not use this system for hydro plants and does not have a standard for recording fire incidents. Currently, TVA addresses fire incidents through the use of Problem Evaluation Reports. According to TVA, the only efficient way of pulling fire incident information across all hydro plants would be to perform keyword searches of Problem Evaluation Reports for all 30 facilities. Additionally, TVA has acknowledged that there is a possibility not all fire incidents are being reported and recorded.

During our interviews with site personnel and plant managers, we also found that sharing of lessons learned from fire incidents is being done, however inconsistently. Site personnel and plant managers indicated there were several ways of sharing lessons learned from fires, including morning meetings, operations experience emails, and a lessons learned SharePoint. However, TVA indicated the lessons learned SharePoint was not maintained. Additionally, TVA management has acknowledged sharing of lessons learned could be better and would help educate people. Communicating consistently across the fleet may help to prevent recurrence of similar events at various sites. If information is not recorded and communicated, prevention opportunities are missed, and the risk to plant personnel and assets may be greater.

### **THE FIRE BRANCH DIRECTOR ROLE HAS NOT BEEN FULLY IMPLEMENTED OR INCLUDED IN ENTERPRISE RISK**

TVA has made a decision to replace the FBD role with the ERL role. The employees designated for this role have not been fully trained, the personnel at sites do not have a clear understanding of the role, and local fire departments have not been informed of the decision. In addition, the increased risks associated with this decision have not been included in TVA's enterprise risk roll up.

### **The ERL Role Has Not Been Fully Implemented**

The decision to change from FBD to ERL has taken several months to disseminate throughout the organization and has not been communicated to all of the fire departments responsible for responding to fires at the sites. In addition, as of February 3, 2015, the employees designated as the ERLs have not all received training and therefore do not have a full understanding of their new role.

In early 2014, TVA's Emergency Response Training Center<sup>4</sup> discovered in an evaluation of hydro personnel, that there was a lack of employees who could qualify for requirements under the previous FBD role and decided to replace the FBD with the ERL role. TVA Hydro Generation communicated implementation of this decision to plant personnel in August 2014. Several site personnel stated that they were not sure why TVA made the decision. Some also stated that they did not understand the new ERL role and hoped to get more information at future training. Several site personnel stated that they did not know what the changes were by replacing the FBD with the ERL role. Others guessed that ERLs would no longer be involved in active firefighting and rescue of personnel with emergency responders citing TVA requiring the return of all turn-out gear for this assumption.

The Hydro Generation, General Manager informed us in February 2015 that TVA planned on informing local fire departments of this decision this year. TVA has not yet completed training for all personnel selected for the ERL role as of February 3, 2015. In case of fire before all training is received, a lack of understanding and expectations of the ERL role by site personnel increases the fire risk to TVA assets and personnel. Additionally risk to local fire departments is also increased if they respond to a fire before being informed of this decision.

### **The Increased Risk From Replacing the FBD Role Has Not Been Included in Enterprise Risk**

Through interviews, we found the risks associated with the decision to replace the FBD with the ERL were not considered in the Hydro Generation risks assessments including the Enterprise Risk Management (ERM) risk roll up. The lack of qualified personnel to fill the FBD role was identified in 2014 after the 2014 ERM assessment and therefore the decision would not have been included in the 2014 ERM assessment. However, TVA has also decided not to include the decision on the 2015 ERM. The factors discussed on the following page that contributed to the decision to replace the FBD should have been accounted for in previous years' ERM risk roll up.

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<sup>4</sup> TVA's Emergency Response Training Center provides classroom and hands-on training to TVA employees in firefighting, medical, hazardous materials, and rescue emergencies.

According to TVA personnel several factors were considered for replacing the FBD role including:

- Hydro plants were not staffed 24/7 and sometimes operate unmanned, and the highest risk of fire is when a plant is operating.
- It would be more cost effective.
- FBDs were only onsite 25 percent of the time, and there was a possibility FBDs may not be reached after hours or FBDs would be able to reach the facility in a timely manner.
- A catastrophic failure resulting in fire would cause a total loss of equipment and/or assets anyway, so sending personnel back into an enclosure could be dangerous.
- A lack of hydro personnel who could qualify for requirements under the FBD program.

During our interviews with site personnel, concerns were expressed regarding this decision. TVA management and site personnel notified us that local fire departments are not willing to fight fires unless guaranteed all equipment has been deenergized. However, local fire departments may make an exception for rescue of personnel. Although energized equipment can be turned off remotely, TVA management indicated backup systems would kick in and turn some equipment back on. According to TVA, this decision prioritized the safety of personnel over saving TVA hydro plant assets. However, several personnel expressed a concern that a rescue of someone stuck inside the plant in the event of a fire is unlikely due to lack of familiarity of local fire departments with the plant and expressed concerns regarding this decision.

We also found TVA management has not considered both the potential loss of asset or personnel in the event of a fire arising from the risks of this decision in its ERM risk roll up. Risks associated with this decision were not included in TVA's 2014 and 2015 Enterprise Risk. According to TVA management, there is uncertainty that the previous plan using the FBD role was executable due to (1) a slim risk of fire while the plant was manned and (2) FBDs probably did not have enough oxygen to direct emergency responders very far in the plant. TVA management did not believe the risk was any different under the FBD role versus the decision to switch to the ERL role. According to TVA Power Operations management, the original plan of the FBD role working with emergency responders may not have necessarily worked. As described above, this decision prioritizes safety of personnel in favor of site assets and equipment. However, there is still risk to personnel stuck inside the plant in the event of fire. The increased risk to plant assets and personnel should be considered in risk management.

If the FBD role was known to not be executable prior to the decision to switch to ERL, then the risks should have been documented somewhere in prior ERM

assessments. We did not see any indication where this risk was considered. If the risks were identified during this decision-making process, then the risks should be considered in TVA's ERM assessment.

## **RECOMMENDATIONS**

We recommend the Senior Vice President, Power Operations:

- Implement risk reduction suggestions from insurance reports.
- Create and implement a formal process for capturing and sharing lessons learned from fire events across the fleet, and ensuring documentation requirements for all fire drills and incidents are followed.
- Complete implementation of the ERL role including notifying the appropriate fire departments and training.
- Consider including the increased risk from replacing the FBDs with ERLs in the ERM.

**TVA Management's Comments** – TVA management generally agreed with the findings and recommendations in this report. In response to our recommendations, management plans to complete the following actions.

- Development of a Fire Protection System Impairments SPP to provide guidance for reporting and maintaining historical records of fire protection system impairments and a Fire Protection System Inspection, Testing, and Maintenance SPP to provide guidance for implementing code requirements for inspection, testing, and maintenance.
- Evaluate fire protection risk reduction suggestions for applicability, feasibility, and cost-effectiveness by developing a property risk improvement prioritization methodology to qualify and prioritize property loss control recommendations, which includes rating each loss control recommendation based on the likelihood and severity of the risk exposure outcome for the recommendation it is intended to mitigate.
- Requiring the creation of a Problem Evaluation Report or Create Condition Report to capture lessons learned for all fires, revising the Operations Information Center to make lessons learned a mandatory field before fire incidents can be archived, communicating lessons learned via Operating Experience to be distributed weekly to each site for review, and utilizing the Enterprise Lessons Learned Information System to capture and communicate lessons learned from fire incidents throughout Power Operations.
- Development of Power Operations Emergency Response Teams Programs SPP using the Homeland Security Exercise and Evaluation Program for design, conduct, and documentation of emergency response exercises, to reference TVA-SPP-17.016, Conduct and Evaluation of Fire Drills, which provides detailed guidance for fire specific drills.

- Complete implementation of the Emergency Response Liaison role including notifying the appropriate fire departments and training.
- Communicate to ERM transition from the Fire Branch Director role to the Emergency Response Liaison role.

See the Appendix for TVA's complete response.

**Auditor's Response** – The Office of the Inspector General concurs with TVA management's response.

July 16, 2015

Robert E. Martin, ET 3C-K

REQUEST FOR COMMENTS – DRAFT EVALUATION 2015-15294 – HYDRO GENERATION  
FIRE PROTECTION

We appreciate the opportunity to provide further comments and details on the Office of the Inspector General's draft evaluation report of TVA's Hydro Generation (HG) fire protection dated May 26, 2015.

**What the OIG Recommends**

We recommend the Senior Vice President, Power Operations:

- Implement risk reduction suggestions from insurance reports.
- Create and implement a formal process for capturing and sharing lessons learned from fire events across the fleet, and ensuring documentation requirements for all fire drills and incidents are followed.
- Complete implementation of the Emergency Response Liaison (ERL) role including notifying the appropriate fire departments and training.
- Consider including the increased risk from replacing the Fire Branch Directors (FBDs) with ERLs in the Enterprise Risk Management (ERM).

Recommendation

- Implement risk reduction suggestions from insurance reports.

Response

- Each year TVA's insurance provider conducts walkdowns of several HG plants and makes suggestions in two areas - risk reduction and fire protection.
- Risk reduction suggestions are programmatic in nature and can be grouped into four categories: (1) Fire protection impairment reporting, (2) Fire protection inspection, testing, and maintenance, (3) Housekeeping, and (4) Pre-plans.
  1. Power Operations (PO) Generation Engineering (GE) is developing PO-SPP-18.119, Fire Protection System Impairments, which provides guidance for reporting and maintaining a historical record of fire protection system impairments in HG as well as coal and gas. The document is scheduled for peer team review by January 1, 2016.

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2. PO GE is developing PO-SPP-18.121, Fire Protection System Inspection, Testing and Maintenance (IT&M), providing guidance and implementing the code required IT&M activities. The document is scheduled for peer team review by October 1, 2015.
  3. PO GE performs annual facility walkdowns to verify compliance with housekeeping. Formalizing this walkdown, a form will be used to document the housekeeping inspection. This form will be made available for review and archived via the PO GE Fire Protection SharePoint. This form is scheduled to be used by January 1, 2016.
  4. RO-SPP-35.002, Facility Emergency Response Plan, will be superseded by site specific emergency response plans, SPP-xxx-35.001 (i.e., for Gunterville Hydro it would be SPP-GUH-35.001). These emergency response plans are scheduled for peer team review by January 1, 2016.
- Fire protection suggestions focused on installing additional fixed fire protection systems for specific assets. NFPA 851, a recommended practice created in 1987, is the basis of the insurer's suggestions for HG assets. Each suggestion must be evaluated for applicability, feasibility, and cost-effectiveness. For example, some fire protection suggestions would provide increased protection of an asset, however, they may adversely impact life safety or be costly to implement with minimal risk reduction. Some suggestions are not possible as certain buildings are on the National Register of Historic Places and their appearance cannot be modified. To evaluate all requests for all plants, from all sources, for funding in a consistent manner, PO is developing a property risk improvement prioritization methodology to qualify and prioritize property loss control recommendations across the organization.
    - The methodology involves rating each loss control recommendation based on the likelihood and severity of the risk exposure outcome for which the recommendation is intended to mitigate. These ratings will be weighted with scores to give a raw ranking. The final component involves employing a modifier to capture the criticality of the affected plant or unit to TVA's load strategy.
    - Each recommendation will also be coded with a cost-to-complete factor which may be used to filter individual projects ranking high on the severity and likelihood scales based on the funds available for improvement projects.
    - The raw risk reduction impact score will be determined by multiplying the likelihood factor by the consequences factor.
    - The weighted risk reduction impact scores will be determined by multiplying the raw risk reduction impact score by the asset criticality factor. Weighted risk reduction impact scores across all recommendations can then be ranked and prioritized for resolution.

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Recommendation

- Create and implement a formal process for capturing and sharing lessons learned from fire events across the fleet, and ensuring documentation requirements for all fire drills and incidents are followed.

Response

- Revise FPG-SPP-18.120, Fire Incident Reporting Attachment 1, to a PO procedure which includes HG by August 1, 2015. Creating the requirement to create a PER or CCR to capture lessons learned (LL) for all fires.
- LL will be communicated via operating experience (OE) through MRC review and distributed weekly to operations staff.
- Revise Operations Information Center for fire incidents by August 1, 2015 to make the LL check box a mandatory field before the incident can be archived.
- The Enterprise Lessons Learned Information System (ELLIS) will be utilized to capture and communicate LL from fire incidents throughout PO.
- LL and OE that involve fire protection systems will be flagged as such when entered into ELLIS. The alert feature in ELLIS will then allow anything flagged as fire protection to be emailed to the appropriate audience. This will allow LL and OE on fire protection systems to be automatically communicated to those who need it. Fire protection OE and LL can also be easily searched in ELLIS later by searching for everything flagged as fire protection in the database.
- The expectation that fire protection LL and OE should be flagged as fire protection in ELLIS will be added into the forthcoming OE and LL procedure for Operations, which will supersede COO-SPP-02.003.
- All draft LLs are reviewed by PO and GE executives weekly to ensure they are in agreement with the message and any follow-up actions before they get sent to each site. Each site then reviews the LLs during weekly MRCs and takes actions accordingly.
- A new procedure providing governance for emergency response programs at the facility level, PO-SPP-35.002, Power Operations Emergency Response Teams Programs, is being developed to supersede FPG-SPP-10.013, Fire Brigade Procedure. The new procedure requires the use of the Homeland Security Exercise and Evaluation Program for design, conduct, and documentation of emergency response exercises. TVA-SPP-17.016, Conduct and Evaluation of Fire Drills, provides detailed guidance for fire specific drills and is referenced by PO-SPP-35.002, Power Operations Emergency Response

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Teams Programs. This procedure is scheduled to be implemented during the first quarter of FY 16.

Recommendation

- Complete implementation of the ERL role including notifying the appropriate fire departments and training.

Response

- Implementation of the ERL role is scheduled for completion by January 1, 2016. HG identified all employees required to fill the role of ERL and assigned responsibilities. ERLs are now undergoing training which adequately reflects the position's role as technical advisor to offsite emergency responders. ERL's specific roles, responsibilities, and actions will be captured in the facility emergency response plan. Annual emergency response exercises are conducted at each facility allowing the facility managers to evaluate the capability of the ERLs to perform operational coordination and communications with offsite responders. PO Programs and Performance monitors the ERL role through its comprehensive emergency preparedness program. Communication of the change from FBDs to ERLs are currently being communicated to local offsite emergency response organizations through a series of face-to-face meetings conducted by the PO Emergency Preparedness Program Manager and hydro plant managers. This communication is scheduled for completion by January 1, 2016.

Recommendation

- Consider including the increased risk from replacing the FBDs with ERLs in the ERM.

Response

- To ensure adequate communication of changes to emergency preparedness program in the HG fleet including the transition from FBDs to ERLs, ERM will be contacted and informed of this change by July 1, 2015.

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

  
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