



Memorandum from the Office of the Inspector General

September 29, 2011

William R. McCollum, Jr., LP 6A-C
Anda A. Ray, WT 11A-K

**FINAL REPORT – INSPECTION 2009-12943 – REVIEW OF TVA'S PLAN FOR REMOVAL
OF POLYCHLORINATED BIPHENYL EQUIPMENT**

Attached is the subject final report for your review and action. Your written comments to the draft report have been incorporated. Please advise us of your planned actions in response to our findings within 60 days from the date of this report.

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, please contact me at (865) 633-7450 or Greg R. Stinson, Director, Inspections, at (865) 633-7367. We appreciate the courtesy and cooperation received from your staff during this review.

Robert E. Martin

Robert E. Martin
Assistant Inspector General
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ET 3C-K

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Attachment

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OIG File No. 2009-12943



Tennessee Valley Authority
Office of the Inspector General

Inspection Report

REVIEW OF TVA'S PLAN FOR REMOVAL OF POLYCHLORINATED BIPHENYL EQUIPMENT

Inspection 2009-12943
September 29, 2011

ACRONYMS AND ABBREVIATIONS

EPA	Environmental Protection Agency
ERC	Environmental Resource Center
GE	General Electric
OIG	Office of the Inspector General
PCB	Polychlorinated Biphenyl
PERs	Problem Evaluation Reports
PPM	Parts Per Million
REEs	Reportable Environmental Events
SBU	Strategic Business Unit
TVA	Tennessee Valley Authority

TABLE OF CONTENTS

EXECUTIVE SUMMARY i

BACKGROUND..... 1

OBJECTIVE, SCOPE, AND METHODOLOGY 3

FINDINGS AND RECOMMENDATIONS 4

 NO CURRENT REQUIREMENTS FOR THE REMOVAL OF PCB
 EQUIPMENT, BUT PREVIOUS TVA PLANNED ELIMINATION ACTIONS
 WERE NOT COMPLETED..... 4

 TVA FACES SIGNIFICANT RISK FROM THE CONTINUED USE OF PCB
 EQUIPMENT 6

RECOMMENDATIONS 16

MANAGEMENT'S RESPONSE 16

APPENDIX

MEMORANDUM DATED JULY 19, 2011, FROM WILLIAM R. McCOLLUM, JR.,
AND ANDA A. RAY TO ROBERT E. MARTIN



Inspection 2009-12943 – TVA’s Plan for Removal of Polychlorinated Biphenyl Equipment

EXECUTIVE SUMMARY

Why the OIG Did This Review

This review was included on the annual inspection plan as a follow-up to previous reviews performed by the Office of the Inspector General (OIG).

The objective of our review was to determine whether the Tennessee Valley Authority (TVA) is meeting all requirements and planned actions for the removal of equipment containing polychlorinated biphenyls (PCBs).

What the OIG Found

Our review found that there are currently no requirements for the removal of PCB equipment. However, some previous TVA planned actions for PCBⁱ equipment removal were not completed. Additionally, we found TVA is at significant risk from the continued use of PCB-containing equipment, as (1) TVA maintains one of the largest inventories of PCB equipment in the electric utility industry, (2) the condition of some PCB equipment at TVA increases the risk of an incident, and (3) TVA does not have an accurate inventory of its PCB-contaminatedⁱⁱ equipment.

- **No Current Requirements for the Removal of PCB Equipment, but Previous TVA Planned Elimination Actions Were Not Completed** – While there are currently no requirements for the elimination of PCB equipment, the Environmental Protection Agency (EPA) has released an Advance Notice of Proposed Rulemaking, which serves notice that a future requirement for eliminating PCB equipment is likely.

Additionally, in 1988, TVA issued a Management Directive requesting TVA offices to develop an integrated agency approach for the removal of PCB equipment. Cost estimates and estimated dates of completion were established. However, PCB equipment removal was not completed. In November 2003, TVA issued an Environmental Policy stating that it would no longer aim to eliminate PCB equipment before the end of its useful life. The failure to complete the PCB elimination efforts has forced TVA to develop a new elimination strategy to meet potential EPA requirements.

- **TVA Faces Significant Risk From the Continued Use of PCB Equipment** – TVA is at significant risk based on the continued use of PCB equipment as we found (1) TVA maintains one of the largest inventories of PCB equipment in the

ⁱ For purpose of this report, “PCB” refers to electrical equipment that contains 500 parts per million (ppm) or greater PCBs.

ⁱⁱ For purpose of this report, “PCB contaminated” refers to electrical equipment that contains from 50 to 499 ppm PCBs.



Inspection 2009-12943 – TVA's Plan for Removal of Polychlorinated Biphenyl Equipment

EXECUTIVE SUMMARY

electric utility industry, (2) the condition of some PCB equipment at TVA increases the risk of an incident, and (3) TVA does not have an accurate inventory of its PCB-contaminated equipment.

- **Significant PCB Equipment Inventory** – TVA had more than 400 pieces of known PCB equipment in service at the end of fiscal year 2009 that contained ≥ 500 parts per million (ppm) PCBs. The EPA has proposed rules to eliminate the use of equipment with 500 to 100,000 ppm PCBs by 2020. However, most of TVA's PCB equipment has PCB contamination levels exceeding 100,000 ppm PCBs (referred to as "askarel" equipment). The EPA has proposed rules for the elimination of such equipment by 2015. We were informed by TVA that there is a possibility that the EPA may alter the schedule for equipment removal, however, that information is not publically available.
- **Condition of Some PCB Equipment Increases the Risk of an Accident** – Through our plant walkdowns and review of Problem Evaluation Reports (PERs) and TVA Environmental Audit reports, we identified certain issues that increase the risk of a PCB-related incident. These include equipment covered in coal dust, rags in close proximity to PCB equipment, a PCB transformer without a containment dike, and leaking PCB equipment.
- **TVA Does Not Have an Accurate Inventory of PCB-Contaminated Equipment** – PCB-contaminated equipment contains from 50 to 499 ppm PCBs. Through discussion with TVA management and plant personnel, we determined that there is no accurate inventory of this equipment. The EPA has proposed a deadline to eliminate the use of this equipment by 2025.

What the OIG Recommends

We recommend that the Chief Operating Officer (1) expedite the removal of PCB equipment by (a) providing dedicated funding and (b) developing a standard methodology for assessing risk of PCB equipment to prioritize its removal and (2) provide dedicated funding to expedite the efforts to determine the PCB-contaminated inventory in order to prioritize and allocate funding for the removal of this equipment. Until the PCB-contaminated inventory is completed, TVA should treat all fires involving electrical equipment as if they involve PCBs until determined otherwise.

TVA management provided written comments on a draft of this report, which are reproduced in their entirety in the Appendix. TVA management agreed with the recommendations and provided various contextual and clarifying comments that we evaluated and incorporated into the final report as appropriate. Comments that were not incorporated into the final version of the report are discussed in the Management's Response section of the report.

BACKGROUND

Polychlorinated biphenyls (PCBs) are toxic and persistent chemicals primarily used as insulating fluids in heavy-duty electrical equipment in power plants, industries, and large buildings across the country. PCBs, valued for chemical stability and fire resistance, were manufactured and processed from 1929 through the late 1970s.

In 1979, the Environmental Protection Agency (EPA) banned the manufacture of PCBs through the Toxic Substances Control Act. Since the ban, no new equipment containing PCBs at concentrations greater than or equal to (\geq) 50 parts per million (ppm) has been manufactured in the United States. The number of PCB transformers in the United States is decreasing, but many are still in use. As the useful life of transformers is typically no more than 30 to 40 years, PCB-containing equipment is nearing the end of its expected useful life. Equipment is increasingly vulnerable to leaks as it becomes older.

According to the EPA, electrical equipment is regulated as “PCB”¹ (\geq 500 ppm) or “PCB contaminated”² (50–499 ppm), with the \geq 500 ppm regulations being the most restrictive. Additionally, PCB equipment that contains \geq 100,000 ppm has been categorized as askarel equipment.

In the United States, PCBs are managed under the Toxic Substances Control Act and the PCB regulations found at 40 CFR 761. These regulations do not require the removal of PCB-containing equipment. However, in April 2010, the EPA released an Advance Notice of Proposed Rulemaking that, if passed, would impose deadlines for the removal of PCB and PCB-contaminated equipment. The Advance Notice includes deadlines for “phasing out all PCB-electrical equipment uses.”³

¹ For purpose of this report, “PCB” refers to electrical equipment that contains 500 ppm or greater PCBs.

² For purpose of this report, “PCB contaminated” refers to electrical equipment that contains from 50 to 499 ppm PCBs.

³ We were informed by TVA that there is a possibility that EPA may alter the schedule for equipment removal, however, that information is not publically available.

Figure 1 presents the deadlines proposed by the EPA for the different categories of equipment, as well as the Tennessee Valley Authority's (TVA) current inventory of the different categories.

Figure 1: EPA Proposed Deadlines

	PCB Concentration	Deadline for Removal According to EPA's Advance Notice	TVA Inventory
PCB-Contaminated Equipment	From 50 to 499 ppm PCBs	By 2025, eliminate all use of any PCB-contaminated equipment.	The current inventory is unknown. However, the potential exists that TVA has a large PCB-contaminated inventory.
PCB Equipment	500 ppm or greater PCBs	By 2020, eliminate all use of oil-filled PCB equipment.	TVA has approximately 400 pieces of this equipment.
Askarel Equipment*	100,000 ppm or greater PCBs	By 2015, eliminate all use of askarel equipment, removing from service the equipment in high potential exposure areas first.	The amount of askarel equipment was not identified separately in the PCB equipment inventory listing.

*Askarel is a subcategory of PCB. It is currently subject to the same regulatory requirements as PCB. The only regulatory difference lies with the potential deadline for removal. The inventory listings we received did not separate askarel equipment from other PCB equipment. However, management estimates that of the 400 pieces of PCB equipment, approximately 95 percent would be askarel.

PCBs pose significant risks to companies that use them. PCBs in liquid form can contaminate both sediment and water, which can be extremely expensive to clean up. A recent example is General Electric's (GE) cleanup of the Hudson River. Between the 1940s and 1976 when the U.S. Congress outlawed PCB manufacture, GE discharged about 1.3 million pounds of PCBs into the Hudson River. In 2000, the EPA charged GE with the responsibility to remediate the 2.65 million cubic yards of sediment contaminated by PCBs. The cleanup will cost GE an estimated \$460 million. On top of that, GE has attempted to stop the contamination by placing a \$200 million groundwater pump and treat system at its Hudson Falls facility. In 2009, GE began digging up 400,000 tons of toxic sludge and shipping it to a specially designed, sealed hole in west Texas.

In addition to environmental impacts, PCBs can affect company operations. For example, in 1981, a fire involving PCBs took place at the State Office Building in Binghamton, New York, closing the building for 13 years, with cleanup costs totaling \$47 million.

It is internationally recognized that PCBs pose a risk to human health and the environment. Information on health effects of PCBs is available from studies of people exposed in the workplace, by consumption of contaminated rice oil in Japan (the Yusho incident) and Taiwan (the Yu-Cheng incident), by consumption of contaminated fish, etc. Health effects that have been associated with exposure to PCBs in humans and animals include liver, thyroid, dermal, and ocular changes; immunological alterations; neurodevelopmental changes; reduced birth weight; reproductive toxicity; and cancer.

In the mid-1990s, the Office of the Inspector General (OIG) completed a review of TVA's electrical equipment containing PCBs, Audit 94-035P-01. During that time, TVA was actively working to reduce its inventory of PCB equipment. The OIG recommended that TVA's Board of Directors, in consultation with the Executive Committee, assess whether an expedited effort to eliminate PCBs would be appropriate, taking into consideration the (1) risks and potential liabilities associated with having PCB and PCB-contaminated equipment, (2) costs TVA incurs in managing this equipment, and (3) age and useful life of the PCB equipment in service.

OBJECTIVE, SCOPE, AND METHODOLOGY

The objective of our review was to determine whether TVA is meeting all requirements and planned actions for the removal of equipment containing PCBs. To achieve our objective, we:

- Reviewed PCB regulatory requirements and assessed TVA's compliance and/or progress in meeting those requirements.
- Obtained and reviewed TVA's current PCB inventory.
- Conducted interviews and reviewed Reportable Environmental Events (REEs), Problem Evaluation Reports (PERs), and TVA Environmental Audit reports pertaining to PCBs to identify spills, near misses, risk exposure, noncompliance, and other issues.
- Obtained and reviewed TVA's PCB elimination strategy.
- Interviewed pertinent TVA personnel and obtained documentation to determine (1) how TVA assesses PCB risk and (2) what actions TVA has implemented to mitigate risks.
- Obtained benchmarking information pertaining to PCBs and compared information pertaining to other utilities with TVA's PCB inventory and strategy to assess TVA's risk position and PCB standing within the industry.

- Reviewed regulatory and other information, studies, white papers, etc., to document views on PCB risks and elimination strategy.
- Performed walkdowns of five fossil fuel plants and two nuclear plants to assess TVA's PCB and PCB-contaminated equipment risks.

The scope of our review focused on TVA's PCB equipment. This review was conducted in accordance with the "Quality Standards for Inspections."

FINDINGS AND RECOMMENDATIONS

There are currently no requirements to remove PCB equipment. However, some previous TVA planned actions for PCB equipment removal were not completed. TVA has recently approved a new PCB elimination strategy to address potential EPA requirements. Additionally, TVA is at significant risk from the continued use of PCB equipment, as (1) TVA maintains one of the largest inventories of PCB equipment in the electric utility industry, (2) the condition of some of TVA's PCB equipment increases the risk of an incident, and (3) TVA does not have an accurate inventory of its PCB-contaminated equipment.

NO CURRENT REQUIREMENTS FOR THE REMOVAL OF PCB EQUIPMENT, BUT PREVIOUS TVA PLANNED ELIMINATION ACTIONS WERE NOT COMPLETED

While there are currently no requirements for the elimination of PCB equipment, the EPA has released an Advance Notice of Proposed Rulemaking, which serves notice that a future requirement for PCB equipment removal is likely.

During our review, TVA personnel submitted a PCB elimination strategy to senior management, which has been approved. TVA's Environment and Technology personnel told us that this strategy was developed in response to likely regulations coming from the EPA. These regulations would require the removal of (1) askarel equipment by 2015, (2) the remainder of PCB equipment by 2020, and (3) PCB-contaminated equipment by 2025. TVA has formed a working group that will assist the Strategic Business Units (SBU) in developing PCB elimination strategies. The charter for the working group contains a time frame for developing an inventory of PCB-contaminated equipment.

Prior TVA PCB Elimination Plans

The OIG completed a review pertaining to PCBs in the mid-1990s, at which time TVA was working to eliminate its inventory of PCB equipment. This was in response to a 1988 General Manager Directive requesting TVA offices to develop an integrated agency approach for the removal of PCB equipment. Also, in 1991, an Executive Management Directive from the Senior Executive Officer and President, Resource Group, was issued asking for the groups to provide cost estimates to remove all PCB equipment and a realistic schedule for this removal. The 1991 cost estimate showed approximately 1,600 pieces of electrical

equipment containing PCBs, with an estimated removal cost of approximately \$123 million. The estimated dates for the completion of removal were 1994 for the nuclear sites and no earlier than 2001 for the fossil and hydro sites.

However, PCB equipment removal was not completed, and in November 2003, TVA issued an Environmental Policy stating that it would no longer aim to eliminate PCB equipment before the end of its useful life. The main reason given for this change in strategy was that “Benefits include cost savings by SBU in halting existing replacement programs for functional PCB equipment, and delay of an estimated expenditure of approximately \$230 million to eliminate PCB and PCB-contaminated electrical equipment within TVA.”

TVA again changed its PCB strategy in 2008 by issuing an Environmental Policy that contained the following PCB Critical Success Factor: *“Further reduce the risk of polychlorinated biphenyl (PCB) releases to the environment over time by eliminating use of PCBs in large electrical equipment.”*

Prioritization of PCB Equipment for Removal

When the OIG conducted a review of PCBs in the mid-1990s, several of the operating groups employed a risk-rating system utilizing a mathematical formula to assign a numerical value in order to prioritize removal of PCB equipment. According to TVA personnel, this type of risk assessment is no longer being performed. However, during our visits to the plants, we found that some plants are prioritizing PCB equipment for removal based on risk at the plant level. Some plants considered location of the equipment as one factor. Specifically, one plant has askarel equipment located on the powerhouse floor that is ranked as high risk because of its potential impact on plant operations. Other plants may look at location, age, maintenance, or condition of the equipment, or a combination thereof, when assessing risk. We were informed by TVA management that they roll up the information generated by the Fossil Power plants in order to make any replacement decisions at the fleet level.

Funding for PCB Equipment Removal and Replacement

Through interviews with TVA personnel, we determined that funding for removal and replacement of PCB equipment is currently allocated from internal plant funding. PCB removal is part of the capital budget and must compete with other projects for funding. At this time, PCB removal receives no specific corporate funding.

The elimination strategy established for the removal and replacement of PCB equipment contains proposed deadlines that correspond with the EPA Advance Notice. The strategy estimates the cost of removal and replacement for this equipment to be approximately \$62 million. However, the strategy does not provide funding for equipment removal and replacement. It is up to the business units to secure necessary funding.

TVA FACES SIGNIFICANT RISK FROM THE CONTINUED USE OF PCB EQUIPMENT

PCB equipment presents major risks to TVA. The primary risks associated with PCB equipment are environmental and operational. These risks contribute to enterprise risks in three key areas:⁴

- Catastrophic plant accident
- Environmental contamination
- Regulatory compliance

When PCBs are subjected to a fire or heated substantially, they can change composition and may form very hazardous by-products. Some of these by-products are much more toxic than PCBs. Groups at risk from this type of exposure include firefighters and other emergency response personnel, cleanup workers, and occupants of affected structures. Humans exposed to these PCB fire by-products have developed chloracne,⁵ metabolic disorders, and other systemic problems, including increased incidences of cancer.

Additionally, a spill or fire involving PCBs can affect a company's ability to maintain its operations. For example, a fire involving PCBs could contaminate a facility, rendering it unusable. The contaminated area would have to undergo extensive cleanup in accordance with EPA regulations before people could safely return to the area. In some cases, an entire building or facility may be closed off indefinitely. Such an incident at one of TVA's generation facilities could cost millions in cleanup costs and lost generation.

TVA Still Maintains a Significant Inventory of PCB Equipment

We reviewed documentation showing that TVA had more than 400 pieces of PCB equipment in service at the end of fiscal year 2009. This is the equipment that contains ≥ 500 ppm PCBs, with most of this equipment being askarel, which contains $\geq 100,000$ ppm PCBs. The EPA's Advance Notice would require all askarel equipment to be removed by 2015. The EPA is considering allowing exceptions on a case-by-case basis based on hardship and no unreasonable risk.

⁴ The current TVA Risk Scorecard areas where PCBs contribute are Strategic (Long Range Planning External Influences), Operations (Asset Performance and Operations and Business Disruptions) and Compliance (Environmental).

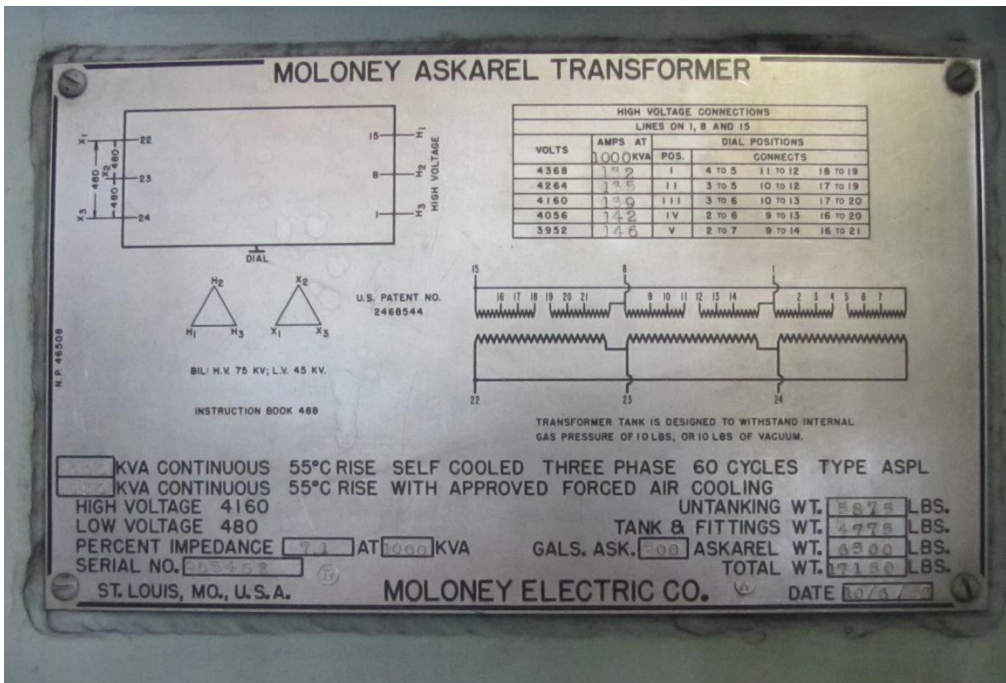
⁵ Chloracne is an acne-like eruption of blackheads, cysts, and pustules associated with overexposure to certain halogenated aromatic compounds, such as chlorinated dioxins and dibenzofurans.

Figures 2 and 3 show examples of askarel equipment and a nameplate on a piece of askarel equipment, respectively.

Figure 2: Example of Askarel Equipment

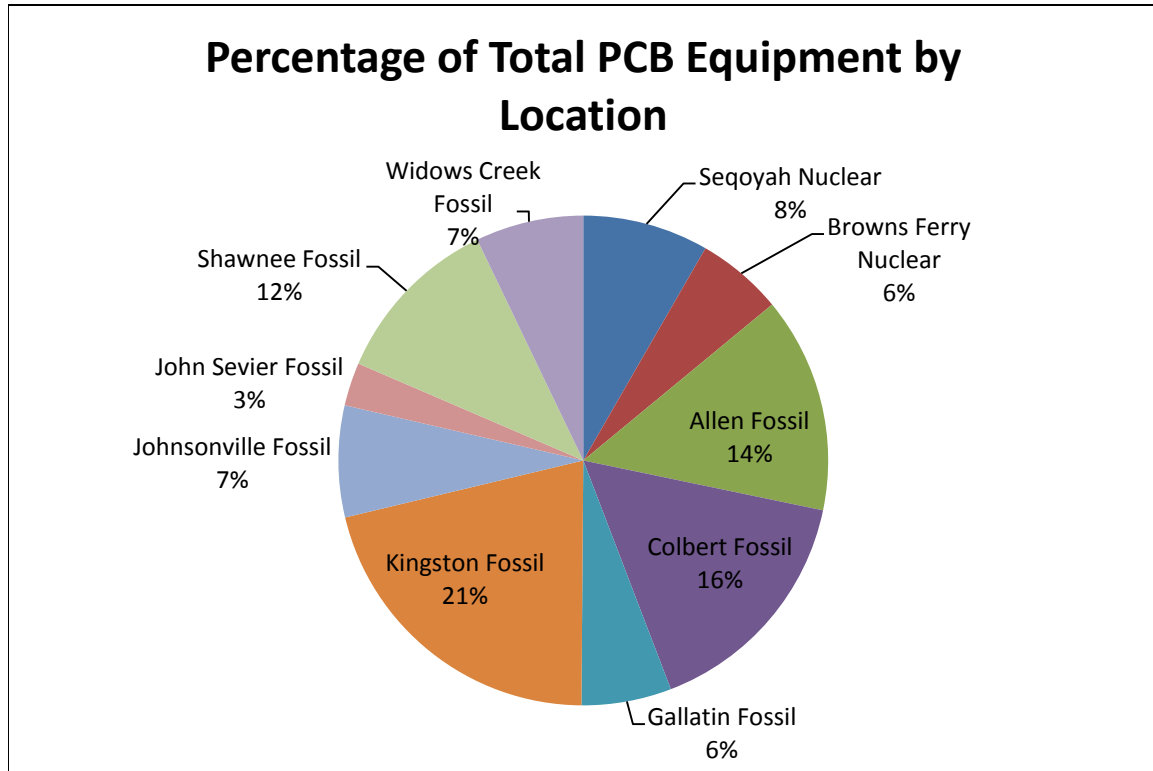


Figure 3: Nameplate on Askarel Equipment



At the end of calendar year 2009, TVA Fossil Power Group had 279 PCB transformers and 83 PCB capacitors. At the end of September 2009, TVA Nuclear had 59 PCB transformers. Figure 4 shows the locations of these 421 PCB items.

Figure 4: Percentage of 421 Known PCB Equipment Items by Location⁶



Source: Developed by OIG based on data provided by TVA personnel.

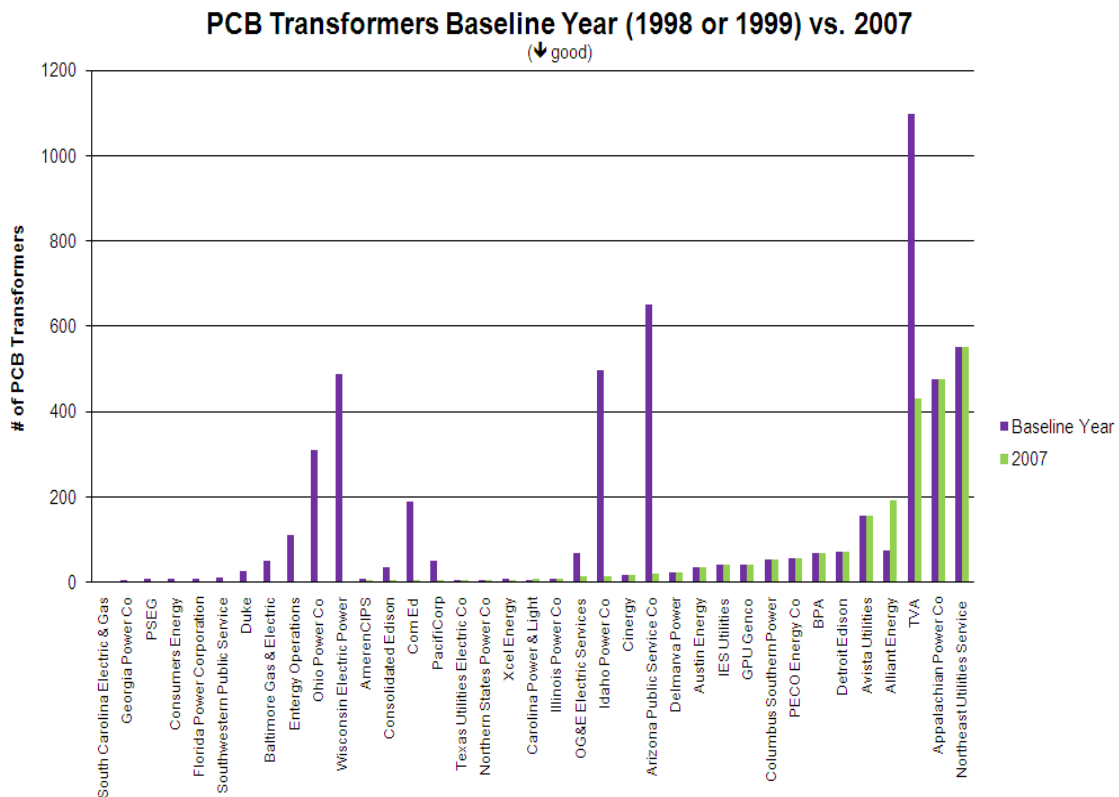
⁶ Based on our review of this information, we determined that the following sites would be visited because of the quantity of PCB equipment in use: Allen Fossil Plant, Browns Ferry Nuclear Plant, Colbert Fossil Plant, Johnsonville Fossil Plant, Kingston Fossil Plant, Sequoyah Nuclear Plant, and Shawnee Fossil Plant. The following Nuclear and Fossil plants contained no known PCB equipment Bellefonte Nuclear, Watts Bar Nuclear, Bull Run Fossil, Cumberland Fossil, and Paradise Fossil.

TVA's Inventory of PCB Equipment Compared to the Industry

In our 2010 report, *Review of TVA's Environmental Performance Results*,⁷ we noted that TVA fared poorly when benchmarking itself against 36 other electric utilities with respect to the number of transformers containing ≥ 500 ppm PCBs.

As Figure 5 shows, TVA ranked near the bottom despite reducing its number of transformers with ≥ 500 ppm PCBs from 1,130 in 1998 to 416 in 2007. TVA has gone from having 20.66 percent of the total population of PCB transformers for the peer group during the baseline years to 18.75 percent in 2007.

Figure 5: Number of PCB Transformers Compared to Industry



Source: Inspection 2007-11402, Review of TVA's Environmental Performance Results.

As Figure 5 shows, many companies have done a better job of reducing PCB equipment inventory than TVA. Some companies, in fact, have completely eliminated the use of PCB transformers. While it is considered industry best practice⁸ to eliminate PCBs, current regulations do not require their elimination.

⁷ Inspection 2007-11402, August 3, 2010.

⁸ The Campus Environmental Resource Center (ERC) noted the removal of PCBs as a best practice. The ERC is intended to be a library of resources to support campus environmental performance improvement.

The following key issues relating to PCB transformers were discussed in the Environmental Performance Results report and were acknowledged by TVA:

- If TVA does not take proactive action, it may be forced into unscheduled outages to remove equipment to comply with anticipated rulemaking end dates.
- As the industry has made significant headway in removal of PCB equipment, the market demand for and number of PCB disposal companies have decreased. Consequently, PCB disposal costs may increase in the future.
- The longer TVA uses PCB equipment, the higher the risk of catastrophic failure.

The Condition of Some PCB Equipment Increases the Risk of an Incident at TVA

Through the review of Problem Evaluation Reports (PERs), Environmental Audit reports, and walkdowns of five fossil plants and two nuclear plants, we identified issues that increase the risk of an incident involving PCBs at TVA. We identified PCB equipment covered in coal dust, rags in close proximity to PCB equipment, a PCB transformer with no containment dike, and leaking PCB equipment. TVA's Environmental Auditors commented that in the past, TVA had more problems with its PCB-containing equipment. However, they told us that TVA is currently doing a better job of maintaining this equipment.

Since the manufacturing of PCBs was banned in the United States in 1979, all equipment containing PCBs is at least 30 years old. As PCB-containing equipment reaches the end of its useful life, the benefits of continued use of this equipment may be diminished by the increased risk that an equipment failure could release PCBs to the environment. The cost of cleaning up PCB spills may exceed the cost of reclassifying or disposing of the intact PCB-containing equipment and replacing it with new equipment. The consequences of failure could include direct costs in equipment damage, equipment replacement, service interruption, and lost revenue. Additionally, TVA could face liability costs in compensation to other parties and potential fines for damages to human health and the environment.

During our walkdowns, as shown in Figure 6, we found equipment that was covered in coal dust, which could present a fire hazard. Federal regulations⁹ prohibit the storage of combustible materials within five meters of a PCB transformer and provide penalties for failure to comply. While rags or coal dust may be considered combustible materials posing an increased fire risk, their presence within five meters of a PCB transformer may not be a regulatory violation, as this may not be considered “storage.”

Figure 6: PCB Equipment Covered in Coal Dust



⁹ 40 CFR 761.30.

We found other combustible material near a PCB transformer. Figure 7 shows cleanup rags within five meters of a PCB transformer, which poses a potential fire risk.

Figure 7: Cleanup Rags Within Five Meters of PCB Transformer



TVA's Environmental Auditors regularly perform site reviews that may include PCBs, or perform PCB-specific reviews. We reviewed the Environmental Audit reports from January 1, 2007, through March 1, 2010, to identify any PCB-related issues. Multiple reports cited combustible materials located near PCB equipment as a problem. Additionally, we reviewed Problem Evaluation Reports (PERs) from January 2007 through July 2009. Again, the storage of combustible materials within the exclusion area of PCB equipment was identified as a recurring issue. We did not find any Reportable Environmental Events (REEs) relating to TVA PCB incidents from October 2006 through February 2010.

As fire can have a significant impact on generating facilities, plant personnel, and the environment, the OIG has initiated a review to determine if the fire protection systems are adequately maintained and processes are in place to minimize the impacts of a fire at TVA fossil plants.

While performing our walkdowns at the five fossil plants and two nuclear plants, we noted that virtually all of the PCB equipment was surrounded by containment dikes, which mitigate the risks from a PCB spill. An example of a containment dike is shown in Figure 7.

During our walkdowns, we noted only one PCB transformer that was not surrounded by a containment dike. Figure 8 shows this transformer, which is located at Allen Fossil Plant. This piece of equipment was retrofilled¹⁰ in late October 2010, subsequent to our walkdown of the facility. Before the transformer was retrofilled, a spill would have affected the sediment surrounding the transformer and could have required major cleanup. This issue was also identified during an Environmental Audit. While the use of containment dikes mitigates the risks posed by a spill of PCB liquid, it does not lessen the risk of an airborne release or fire involving equipment containing PCBs.

Figure 8: PCB Transformer Lacking Containment Dikes



¹⁰ In order to reduce the PCB concentration in the core and coil of a PCB-contaminated transformer, the contaminated oil is drained out and new non-PCB containing oil is put in its place, a process called “retrofilling.”

During our walkdowns, we observed incidents of leaking/seeping equipment (see Figure 9). Based on this, and discussions with plant personnel, leaking/seeping equipment does not appear to be a rare occurrence. This could be indicative of the equipment's increased age and deteriorating condition. However, all of the leaking/seeping equipment we encountered was surrounded by containment dikes, which served to control the spills.

TVA personnel note leaks during quarterly walkdowns and/or Environmental Audits, and corrective actions are to be taken when found. More frequent inspections are conducted for equipment that has identified leaks/seeps.

Figure 9: Spill From Leaking PCB Equipment



TVA Does Not Have an Accurate Inventory of Its PCB-Contaminated Equipment

Through discussions with TVA management, we determined that TVA does not have an accurate inventory of its PCB-contaminated equipment. Plant management and other plant personnel confirmed that they do not have a good grasp on their PCB-contaminated inventory. EPA's Advance Notice would require companies to remove all PCB-contaminated equipment by 2025. Not having an accurate inventory poses a risk and hampers TVA's efforts to remove and replace this equipment.

In December 2009, a fire at the John Sevier Fossil Plant spread to a piece of equipment containing PCBs. After the fire, plant personnel closed off the area due to concerns that asbestos equipment was involved. Later, concerns were raised that PCBs may have been involved, and debris from the burnt equipment was sent to a lab for testing. The lab reported that PCBs were indeed involved, so PCB cleanup was initiated. The total cost to clean up the asbestos, PCBs, and other contaminants was more than \$900,000, and the area was not declared clean for six months. During this time, access to the area was restricted, and employees had to wear protective apparel to enter. Additionally, we were informed that this was a piece of PCB-contaminated equipment (equipment containing 50–499 ppm PCBs) and not a piece of PCB equipment (≥ 500 ppm) and therefore was not on the plant's inventory of PCB equipment.

TVA is currently performing preliminary work for inventorying PCB-contaminated equipment. Upon completion of this inventory, TVA plans to perform a risk analysis for this equipment and prioritize it for removal by 2025. Until an accurate inventory and risk analysis are completed, TVA will not be able to determine the cost for removing and replacing its PCB-contaminated equipment.

Currently, each SBU is in the process of developing their PCB elimination strategy and cost estimates. Our review of internal documentation, which was not finalized or approved, found the cost estimate for completing the inventory to be approximately \$2.5 million and a completion date of fiscal year 2015. The documentation also states that to develop an accurate PCB-contaminated inventory, TVA will review:

- Pieces of equipment for which actual PCB concentrations are known either by nameplate or previous analytical data.
- Pieces of equipment for which nameplate PCB concentrations are not available, but manufacturer name, serial number, date of manufacture, date of installation, or similar information is available from nameplate or internal records.
- Pieces of equipment for which no information is available to support a PCB concentration determination.

RECOMMENDATIONS

We recommend that the Chief Operating Officer (1) expedite the removal of PCB equipment by (a) providing dedicated funding and (b) developing a standard methodology for assessing risk of PCB equipment to prioritize its removal and (2) provide dedicated funding to expedite the efforts to determine the PCB-contaminated inventory in order to prioritize and allocate funding for the removal of this equipment. Until the PCB-contaminated inventory is completed, TVA should treat all fires involving electrical equipment as if they involve PCBs until determined otherwise.

MANAGEMENT'S RESPONSE

TVA management provided written comments on a draft of this report, which are reproduced in their entirety in the Appendix. TVA management agreed with the recommendations and provided various contextual and clarifying comments that we evaluated and incorporated into the final report as appropriate. Comments that were not incorporated into the final version of the final report are discussed below.

TVA management disagreed that PCB disposal costs may rise due to the decreasing number of PCB disposal companies. In a Benchmark Performance Report prepared by TVA, it was commented that "the market demand for and number of PCB disposal companies have decreased. Consequently, PCB disposal costs are increasing." EPA in their advanced notice also stated that disposal costs may increase faster than the general increase in inflation or cost of living.

TVA management stated that the transformer at Allen Fossil Plant was not a PCB transformer and that no additional examples of a PCB transformer without a dike were provided in the report. However, as noted in our report, when we performed our walkdown at Allen Fossil Plant, the transformer was an active PCB transformer. It was subsequent to our visit that the transformer was retrofilled, which is also noted in the report.

TVA management stated that TVA routinely tests for PCBs in fires involving electrical equipment. They also stated that the Fossil Power Group Fire Brigade personnel are aware of the electrical equipment that contains PCBs and take appropriate precautions for fires in these areas. We were informed that, while testing to see if asbestos had been involved in the John Sevier fire, a decision was made to see if any PCBs were involved. It was not initially known whether PCBs were involved in the fire as it was found that the piece of equipment that contained PCBs was not on any inventory list. Fire Brigade personnel may be aware of the large pieces of PCB equipment (≥ 500 ppm PCB), but as there is not an inventory of PCB-contaminated equipment, they would not know of this equipment. Therefore, all fires involving electrical equipment should be treated as if PCBs may be involved.

July 19, 2011

Robert E. Martin, ET 3C-K

DRAFT INSPECTION 2009-12943 – REVIEW OF TVA's PLAN FOR REMOVAL OF
POLYCHLORINATED BIPHENYL EQUIPMENT

We appreciate the opportunity to provide comments on the draft report of Inspection
2009-12943 – Review of TVA's Plan for Removal of Polychlorinated Biphenyl (PCB) Equipment
on June 15, 2011.

Comments are summarized in the attached table titled "Comments on OIG Draft PCB
Inspections 2009-12943."

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



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Attachment

cc (Attachment):

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K. S. Greene, WT 7B-K
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OIG File No. 2009-12943
EDMS, WT CA-K

TVA's Plan for Removal of Polychlorinated Biphenyl Equipment - Draft Inspection 2009-12943

Review Comments

Comment #	Page #	Heading/Section	OIG Finding/ Recommendation	Agree/Disagree	Comment
1.	i - ii	Executive Summary/ What the OIG Found		Disagree	The OIG report was started in 2009, and relies very heavily on the EPA Advance Notice of Proposed Rule Making (ANPRM) regarding PCB removal deadlines. The EPA has now moved their rulemaking schedule out to mid-2013, and it is believed, through USWAG PCB Committee, that EPA is considering something much less sweeping in scope. This entire section and the report should be updated as needed based on the below comments and the most recent information on the pending proposed PCB regulations from EPA.
2.	2	Background/ Figure 1: EPA Deadlines/3rd Column		Agree	Schedules for removal deadlines are as listed in the ANPRM; however, no firm date has been established to issue the proposed rule, which is not expected before mid-2013 with a final rule in 2014. Suggest listing Figure as "Proposed" EPA Deadlines.
3.	2	Background/ Figure 1: EPA Deadlines/ 4th Column	<i>...Approximately 50,000 pieces of equipment may potentially fall into this category...</i>	Disagree	PCB-contaminated equipment estimate in TVA inventory is stated as 50,000. It appears that estimate came from the Policy staff working document, where the data is not sufficient to support. If that's the source, as with the comments referenced below on page 15, it should be deleted. While the "potential" may exist for large numbers of PCB contaminated equipment - verification is part of the inventory process. In the meantime, our practice is to treat unverified equipment with the same discipline as contaminated equipment - until actual content is sampled and tested.
4.	2	Background/ Figure 1: EPA Deadlines/ 4th Column	<i>...TVA has approximately 400 pieces of this equipment...</i>	Disagree	The inventory of 400 pieces of equipment includes both oil-filled PCB equipment and "askarel" equipment. "Most" of this equipment (95% or more) is askarel and would have to be removed by 2015, if that date is in the final rule, unless EPA grants exceptions.
5.	2	Background/ Figure 1: EPA Deadlines/ 4th Column and Askarel footnote	<i>The amount of askarel equipment was not identified separately in the PCB equipment inventory listing.</i>	Agree	Under the current regulations a 500 ppm PCB transformer and a 100,000 ppm PCB transformer are treated the same with the exception of routine inspections. Since most of the PCB equipment (95% or more) is askarel there was no need for separate PCB transformer inventories. The PCB concentration in the equipment is listed in the inventory.

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6.	4	Findings and Recommendations/No Current Requirement For the Removal of PCB Equipment. But Previous TVA planned Elimination Actions were not completed, 2nd paragraph	<i>These regulations would require the removal of PCB equipment by 2020 and removal of PCB-contaminated equipment by 2025</i>	Disagree	In the ANPRM EPA has considered eliminating the use of all askarel equipment by 2015, eliminating the use of oil-filled PCB equipment (> 500 ppm) and PCBs at ≥ 50 ppm in pipeline systems by 2020, and eliminating the use of any authorized PCB contaminated equipment (≥ 50 ppm) by 2025. Most of TVA's known PCB equipment inventory is askarel (contains > 100,000 ppm) triggering the 2015 removal date, if that is the date in the final rule. FPG will replace all PCB transformers at the following plants: Colbert & CT – 41 Transformers Gallatin – 17 Transformers Kingston – 95 Transformers FPG will remove and dispose of all PCB transformers as part of plant demolition (within 1 year of official plant closure) as required by TVA-SPP-05.60 at the following plants: Widows Creek Plant A – 29 Transformers John Sevier – 12 Transformers Johnsonville – 31 PCB Transformers NGDC are currently eliminating PCB Ballasts at BLN.
7.	4	Findings and Recommendations/No Current Requirement For the Removal of PCB Equipment. But Previous TVA planned Elimination Actions were not completed, 2nd paragraph-last sentence	<i>Additionally, the charter for the working group responsible for developing TVA's PCB elimination strategy contains a time frame for developing an inventory of PCB - contaminated equipment</i>	Disagree	The PCB Working group has schedules for developing PCB inventories in their charter, and is currently responsible for this task. However, the Working Group will be assisting the Strategic Business Units (SBU), as needed, in developing PCB elimination strategies; but the overall responsibility for this task will remain with each SBU and not the PCB Working Group.
8.	4	Findings and Recommendations/ Prior TVA PCB Elimination Plans	<i>TVA planned actions for PCB equipment removal were not completed. The estimated dates for the completion of removal were 1994 for the nuclear sites and no earlier than 2001 for fossil and hydro sites. PCB</i>	Agree	NPG's PCB Reduction Projects are included in the BFN and SQN FY12-16 Business Plan Gap Analysis

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9.	5	Findings and Recommendations/ Prioritization of PCB Equipment for Removal	<p>equipment removal was not completed.....</p> <p>TVA strategy for prioritizing PCB equipment removal is not consistent for each plant.</p> <p>...in the mid-1990s, a risk-rating system was used to prioritize removal of PCB equipment. Some plants prioritize removal based on risk at the plant level. Some consider location of equipment</p>	Disagree	<p>It is recognized, that the strategy for removal of PCB equipment may be appropriately different among different business functions - as long as compliance is achieved and safety practices adhered to.</p> <p>For FPG PCB equipment replacement is based on electrical/physical condition, availability of replacement, outage schedules, and other considerations. This is completed at the site level and rolled up to a fleet level prioritization.</p>
10.	5	Findings and Recommendations/ Funding for PCB Equipment Removal and Replacement	<p>PCB removal receives no specific corporate funding. The strategy estimates cost of removal...\$62Mbut does not provide funding for equipment removal and replacement.BUS must secure necessary funding.</p>	Agree	<p>For FPG PCB removal projects were identified as a separate line item in the current Business Plan proposal. Final determination is pending finalization of the Business Plan. Additionally, FPG is implementing a capital budget allocation process that separates PCB removal projects from other plant projects as a dedicated program.</p> <p>For NPG, PCB Reduction Projects are included in the BFN and SQN FY12-16 Business Plan Gap Analysis. Approvals pending for FY12 budget/spend plans.</p>
11.	6	TVA Faces Significant Risk From the Continued Use of PCB Equipment	<p>PCB equipment presents major risks to TVA</p>	Agree	<p>The aggregate risks are significant. However, there are major variations in the levels of each SBU's risks due to concentration of PCBs, locations, costs to clean up, MWs of generation at risk, and marginal cost to replace lost generation. Please see attached PCB Risks presentation.</p>
12.	6	TVA Faces Significant Risk From the Continued Use of PCB Equipment	<p>These risks contribute to enterprise risks in three key areas: Catastrophic plant accident, Environmental contamination, regulatory compliance</p>	<p>Agree - if generic areas Disagree - if are Enterprise Risk categories</p>	<p>These areas appear to be previous enterprise risk categories. The current TVA Risk Scorecard areas where PCBs contribute are Strategic (Long Range Planning External Influences), Operations (Asset Performance and Operations and Business Disruptions), and Compliance (Environmental).</p>
13.	6	TVA Faces Significant Risk From the Continued Use of PCB Equipment/ TVA Still Maintains a Significant Inventory of PCB Equipment, first paragraph	<p>TVA had more than 400 pieces of PCB equipment in service at the end of fiscal year 2009.some of this equipment being askarel.....</p>	Agree	<p>Note that currently FPG has 194 PCB transformers. This accounts for transformers that have been replaced since the 2009 data reflected in the OIG draft report and Kingston precipitator transformers that are accounted for and will be replaced by the HAPs projects.</p> <p>However, it should be noted that most (95% or more) of the identified 421 pieces of equipment would be askarel with</p>

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14.	8	TVA Faces Significant Risk From the Continued Use of PCB Equipment /Figure 4		Agree	PCB levels exceeding 100,000 ppm PCBs. It should also be noted that in the EPA Advanced Notice, exceptions are being considered for the 2015 removal date based on hardship and no unreasonable risks. Note that currently FPG has 194 PCB transformers. This accounts for transformers that have been replaced since the 2009 data reflected in the OIG draft report and Kingston precipitator transformers that are accounted for and will be replaced by the HAPs projects. Suggest deleting the 0% facilities from the pie chart because their inclusion implies a rounding to zero, and replace with a footnote listing the plants with no known PCB equipment.
15.	9-10	TVA Faces Significant Risk From the Continued Use of PCB Equipment /TVA's Inventory of PCB Equipment Compared to the Industry	<i>....TVA fared poorly when benchmarking itself against 36 other electric utilities with respect to the number of transformers containing ≥ 500 ppm PCBs.</i>	Agree	Although TVA has reduced its number of PCB transformer with ≥ 500 ppm PCB, the current inventory is significantly higher than other companies in the utility industry.
16.	10	TVA Faces Significant Risk From the Continued Use of PCB Equipment /TVA's Inventory of PCB Equipment Compared to the Industry	<i>...number of PCB disposal companies have decreased. Consequently, PCB disposal costs are increasing</i>	Disagree	There is no evidence that the reduction in PCB disposal facilities is driving up the PCB disposal costs. TVA has blanket contract pricing with our vendors and based on our records the disposal cost for 50-499 ppm PCB transformers has not increased since 2006. Also, the >500ppm PCB transformer disposal cost has only increased by 5% since 2009.
17.	11	TVA Faces Significant Risk From the Continued Use of PCB Equipment /The Condition of Some PCB Equipment Increases the Risk of an Incident at TVA, Figure 6	<i>.....We identified PCB equipment covered in coal dust..... Figure 6. PCB Equipment Covered in Coal Dust</i>	Agree	We agree with the comments associated with Figure 6. The coal dust is not in storage but a product of the environment for the equipment. For this reason, the coal dust should not be a regulatory violation under 761.30 (a)(1)(viii). Minor coal dust and oil absorption pads do not constitute "storage of combustible materials" within 5 meters of a PCB transformer.

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18.	12	TVA Faces Significant Risk From the Continued Use of PCB Equipment/ The Condition of Some PCB Equipment Increases the Risk of an Incident at TVA, Figure 7	<i>Figure 7 shows cleanup rags within five meters of a PCB transformer, which poses a fire risk.</i>	Disagree	The fire risk is minimal. The regulations under 761.30 (a)(i)(viii) prohibit stored combustibles within 5 meters of a transformer, and the rags in Figure 7 are being used for their intended purpose. If a box of these rags were stored within 5 meters of this PCB transformer, then it would be a violation. Minor coal dust and oil absorption pads do not constitute "storage of combustible materials" within 5 meters of a PCB transformer. This PCB transformer was retrofitted in October 2010, and TVA has mitigated any PCB risk that could be associated with a spill or fire. Note that Allen Fossil Plant does not have any "known" PCB transformers. The example provided in the report was not a PCB transformer and no additional examples of a PCB transformer without a dike were provided in the report. As noted in your report, TVA documents its inspections and promptly cleans any leaks or spills.
19.	13	TVA Faces Significant Risk From the Continued Use of PCB Equipment/ The Condition of Some PCB Equipment Increases the Risk of an Incident at TVA, Figure 8	<i>Figure 8 - PCB Transformer Lacking Containment Dike at Allen Fossil Plant</i>	Disagree	
20.	14	TVA Faces Significant Risk From the Continued Use of PCB Equipment/ The Condition of Some PCB Equipment Increases the Risk of an Incident at TVA, Figure 9	<i>Figure 9- Spill From Leaking PCB Equipment</i>	Agree	
21.	14	TVA Faces Significant Risk From the Continued Use of PCB Equipment/ TVA Does Not Have an Accurate Inventory of its PCB-Contaminated Equipment	<i>..... TVA does not have an accurate inventory of its PCB-contaminated equipment. ... Plant personnel confirmed that they do not have a good grasp on their PCB contaminated inventory</i>	Agree	Not all SBU's have detailed inventories of known PCB-contaminated equipment. However, it isn't clear what SBU or management supported the findings in this section except for references to 'plant personnel'. PSO has an asset replacement program for aging equipment, using various operational parameters, to prioritize removal and replacement. Over time, this is eliminating remaining potential PCB-contaminated equipment in the transmission system. While the asset data information has some gaps to have well defined inventory, the asset management and replacement programs are working and having an effect to reduce risk. The PCB Working Group is also leading the effort to identify data gaps for all SBU's and develop detailed inventories by

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22.	15	TVA Faces Significant Risk From the Continued Use of PCB Equipment/ TVA Does Not Have an Accurate Inventory of Its PCB-Contaminated Equipment/first paragraph <i>The cost of the PCB clean up at the John Sevier Fossil Plant was more than \$900,000</i>	Disagree	September 30, 2015. However, all PCB contaminated equipment may not be identifiable due to sampling limitations, etc. Resources will be needed to complete this task by the proposed due date. The piece of equipment that failed was not PCB contaminated. The fire spread to component(s) that was PCB-contaminated, resulting in the dispersion of PCBs. The clean-up costs were not PCB specific. The cost was the total cost of fire-related cleanup including clean-up costs for asbestos, dioxins and other contaminants.
23.	15	TVA Faces Significant Risk From the Continued Use of PCB Equipment/ TVA Does Not Have an Accurate Inventory of Its PCB-Contaminated Equipment/first paragraphwe were informed that this was a piece of PCB contaminated equipment.....and not on the plant's inventory of PCB equipment.	Disagree	The piece of equipment that failed was not PCB contaminated. The fire spread to component(s) that was PCB-contaminated, resulting in the dispersion of PCBs.
24.	15	TVA Faces Significant Risk From the Continued Use of PCB Equipment/ TVA Does Not Have an Accurate Inventory of Its PCB-Contaminated Equipment/second paragraph	TVA's elimination strategy contains.....	Disagree	This section of the OIG report referencing TVA's elimination strategy should be deleted. This information was developed by the Policy Staff as an internal working document and was never finalized nor approved. Currently, each SBU is in the process of developing their PCB elimination strategy and cost estimates. The last paragraph on "TVA is currently performing preliminary work..." is an accurate assessment of the status in this area. As noted earlier, the PCB Working Group is leading the effort to identify data gaps and develop a detailed PCB contaminated inventory by September 30, 2015.
25.	15	Recommendations, No. 1(a)expedite the removal of PCB equipment byproviding dedicated funding	Agree	For FPG PCB removal projects were identified as a separate line item in the current Business Plan proposal. Final determination is pending finalization of the Business Plan. Additionally, FPG is implementing a capital budget allocation process that separates PCB removal projects from other plant projects as a dedicated program.

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					For NPC, project management funding has been requested for PCB reduction projects at SQN as well as BFN. Approval pending for FY12 budget/spend plans.
26.	15	Recommendations, No. 1 (b)expedite the removal of PCB equipment bydeveloping a standard methodology for assessing risk of PCB equipment to prioritize its removal.	Agree	SBU's currently use factors such as location, age, PCB concentration, and other asset maintenance processes to assess the risk of PCB equipment. However, better communication and standardization could clarify TVA's overall risk.
27.	15	Recommendations, No. 2	...require regular inspections of PCB equipment and take immediate actions to remediate identified problems...	Disagree	What is meant by PCB Equipment? Regulations already require that inspections are conducted regularly for PCB Transformers and leaks or spills identified from equipment must be promptly addressed. SBU operational personnel are trained and understand expectation to respond to any observed leaks or releases of PCBs. If the recommendation is aimed at other equipment than PCB Transformers, SBU operational risks do not warrant placing additional non-regulatory required inspections on potential contaminated equipment. The TVA sites are in compliance with the regulatory requirements.
28.	15	Recommendations, No. 3expedite the efforts to determine its PCB-contaminated inventory in order to prioritize and allocate funding for the removal of this equipment.	Agree	Current inventory efforts are not funded and lack of funding could impede this effort. The recommendation should include dedicated funding for identification of PCB-contaminated inventory. The inventories will be a significant effort for the SBU's; and to expedite, dedicated funding will be necessary.
29.	15	Recommendations/ last sentence	...TVA should treat all fires as if they involve PCBs until determined otherwise.	Disagree	TVA should treat fires on a case-by-case basis. TVA routinely tests for PCBs in fires involving electrical equipment. Past experience is that TVA can determine the concentration of the equipment involved in such fires in an expeditious manner. Suggest changing the sentence to: "TVA should treat all fires involving electrical equipment as if they involve PCBs until determined otherwise." FPG Fire Brigade personnel are aware of the electrical equipment that contains PCBs and take appropriate precautions for fires in these areas.