



Memorandum from the Inspector General, ET 4C-K

August 3, 2010

TVA Board of Directors

FINAL REPORT – INSPECTION 2007-11402 – REVIEW OF TVA'S ENVIRONMENTAL PERFORMANCE RESULTS

Attached is the final report which answers the basic question of "How is TVA doing in regard to environmental performance." This report incorporates informal comments on this report, which were provided by Anda A. Ray, Senior Vice President, Environment & Technology.

This review is the fourth in a series that will provide an independent assessment of TVA's performance in key areas. The Office of the Inspector General will issue reports annually on TVA's environmental performance as well as its financial, operational, and customer relations performance. These reports are intended to give an objective assessment to the Board of Directors and Congress regarding TVA's performance and to highlight significant challenges facing TVA.

This report will be placed on our Web site and delivered to members of Congress. Please advise us of any sensitive information in this report that you recommend be withheld.

We would be happy to brief you on this report. If you have specific questions about this report, please contact Ben R. Wagner, Deputy Inspector General, at (865) 633-7500 or Robert E. Martin, Assistant Inspector General, Audits and Inspections, at (865) 633-7450.

Richard W. Moore

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OIG File No. 2007-11402

Office of the Inspector General
Review of TVA's Environmental
Performance Results
August 3, 2010

Inspection 2007-11402



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EXECUTIVE SUMMARY

This is the fourth in a series of reviews to assess how the Tennessee Valley Authority (TVA) is performing in key strategic areas: (1) customer relations, (2) financial, (3) operational, and (4) environmental stewardship. Each of these reviews is intended to provide an objective evaluation of TVA's performance for each strategic area and to present the attendant significant management challenges facing TVA.

This report provides a high-level evaluation of TVA's "environmental performance." Specifically, we reviewed TVA's strategic goals and objectives focusing our evaluation on:

- The environmental impact of TVA's coal ash management practices.
- TVA's performance with respect to 12 industry benchmarks under the Global Reporting Initiative framework.

In conducting this review we (1) assessed environmental performance, including key performance measures, (2) evaluated TVA's results relative to available benchmark information, and (3) identified key management challenges that could affect how successful TVA is in achieving these strategic objectives.

In evaluating TVA's environmental-performance results, we considered, where appropriate, how TVA's results compare to (1) those of other utilities and/or applicable entities and (2) the goals TVA sets for itself, as shown in Figure 1. We also considered TVA's initiatives for improving future performance.

Figure 1

RESULTS	4-5 Star Good	2-3 Star Fair	1 Star Poor
How do TVA's results compare to (1) those of other utilities and (2) the goals it sets for itself?	<ul style="list-style-type: none"> • Measured results compare favorably with peer group for most of the key metrics. • Measured results achieve TVA's goals. 	<ul style="list-style-type: none"> • Measured results compare favorably with peer group for several of the key metrics. • Measured results achieve a portion of TVA's goals. 	<ul style="list-style-type: none"> • Measured results compare favorably with peer group for few of the key metrics. • Measured results do not achieve TVA's goals.

More information regarding our objectives, scope, and methodology can be found in the Objective, Scope, and Methodology section, located in Appendix C.

Summary of Findings

Overall, TVA's results in the area of environmental performance are mixed. In summary:

- The ash spill at the Kingston Fossil Plant represented one of the largest environmental disasters in U.S history and demonstrated TVA's poor performance in managing coal ash. The ash spill released 5.4 million cubic yards of coal ash containing a number of toxic substances into the environment. As we reported previously, the culture surrounding the management of coal ash at TVA reflected a culture that coal ash was unimportant and relegated to the status of garbage at a landfill. There was very little recognition of the potential hazard to the public and the environment.ⁱ TVA is now taking steps to clean up the spill, assess the stability of other ash ponds, and improve ash management practices. More importantly, TVA has taken effective steps to address the cultural problems that led to the spill.
- TVA recently changed its approach to measuring its environmental performance. It now measures twelve (12) industry-accepted metrics identified by the Global Reporting Initiative and six (6) measures for which there are not good industry benchmarks.
- Through the production of energy by its coal-fired plants, TVA produces a large amount of air pollutants. While it has made advances in the reduction of air emissions over the last several decades, TVA, along with other utilities, is still a polluter based on the nature of its business. TVA has incurred high capital investments to comply with evolving environmental requirements, and the future costs of compliance and pending legislation addressing air pollution and climate change will continue to put upward pressure on power rates.
- We assigned TVA a rating of "fair" for measures related to clean energy generation and renewable generation. This assessment is achieved in large part due to TVA's hydro production efforts. However, pending standards may remove the use of hydro production as counting toward a renewable generation source. Additionally, hydro production is not consistent due to fluctuating precipitation.

ⁱ Office of the Inspector General, Inspection Report 2008-12283-02, Review of the Kingston Fossil Plant Ash Spill Root Cause Study and Observations about Ash Management, July 23, 2009, <http://oig.tva.gov/PDF/09rpts/2008-12283-02.pdf>.

- TVA performs in the middle of the pack compared to its peers with respect to measures such as number of “Reportable Environmental Events,”ⁱⁱ amount of environmental fines, generation of low-level radioactive waste, and office materials recycled. However, TVA lags other utilities in the removal of polychlorinated biphenyl equipment. In two other categories TVA performs comparatively well. Those are the amount of coal combustion products recycled and the Certified Clean Marinas category.
- It is important to note that TVA faces many significant management challenges in incorporating into its operations effective environmental amelioration measures.
- We have included in this report a discussion of the top five challenges that affect the area of environmental performance including (1) the increased environmental regulations related to sulfur dioxide (SO₂), nitrogen oxide (NO_x), mercury, carbon dioxide (CO₂), and coal combustion waste disposal; (2) the cleanup of the Kingston Fossil Plant ash spill; (3) the remediation or improving stability of the ash and gypsum impoundments at TVA fossil plants; (4) the mandated renewable portfolio standards; and (5) the ability to maintain TVA’s current low-cost of power while meeting environmental regulations.

The following discussion provides the basis for our conclusions.

Management Comments on Draft Report

In response to our request for comments, a review of the draft report was performed by Environment and Technology and other TVA organizations. Management’s substantive comments addressed three topics: (1) clarification of benchmark definitions; (2) disagreement with the report referencing the Kingston Fossil Plant ash spill as “one of the largest environmental disasters in U.S. history;” and (3) the distinction between “environmental penalties” and “environmental fines.” Specifically, TVA management:

- Requested that a more descriptive and comprehensive definition of benchmarkability be included in the report. The definition was incorporated into the report and additional clarification added.
- Disagreed with the characterization of the Kingston ash spill as “one of the largest environmental disasters in U.S. history.” TVA management’s justification states that “The event was large in terms of the amount of ash released and arguably ‘disastrous’ in terms of financial or reputational impact; it is not supportable to state that the event was one of the most environmentally

ⁱⁱ Reportable Environmental Events (REEs) are defined as environmental events at a TVA facility or elsewhere caused by TVA or TVA contractors that violate regulatory requirements and trigger oral or written notification to, or enforcement action by, a regulatory agency. REEs include Notice of Violations, Spills to Water, Clean Water Act Nonconformances, and Reportable Quantity Releases when it is a violation of a regulatory requirement.

disastrous in history.” While we considered TVA management’s comments, we deemed no change to the report was warranted.

- Stated that the report should refer to environmental "penalties" rather than "fines." Management concluded that “Use of the word ‘fines’ inaccurately suggests that TVA has been convicted of crimes.” While we recognize management’s concern, the benchmark performance metric and supporting data was titled and characterized as “Environmental Fines.” We also state in the report that “The Environmental Fines indicator refers to the amount paid to a regulatory agency in connection with a regulatory enforcement action.” Thus, the report was not changed.

Management’s complete substantive comments are included in Appendix D of this report. TVA management also provided some administrative or clarifying comments for our consideration. These technical comments were reviewed and incorporated as appropriate.

BACKGROUND

TVA operates the nation's largest public power system. The study, *Benchmarking Air Emissions*,¹ published May 2008, noted that based on 2006 plant ownership and emissions data, TVA was the third largest generator of power and fourth largest generator of power using coal in the United States. The report focused on four power plant pollutants for which public emissions data are available: SO₂, NO_x, mercury, and CO₂. The report notes that in 2006, power plants were responsible for 70 percent of SO₂ emissions, 20 percent of NO_x emissions, 68 percent of mercury air emissions, and 40 percent of CO₂ emissions in the U.S.

The study further explains that these pollutants are associated with significant environmental and public health problems, including acid deposition, i.e., the amalgamation of air pollutants that cause the acidification of earth and water; global warming; fine particle air pollution; mercury deposition, i.e., air-borne mercury particles deposited to the ground; nitrogen deposition, i.e., air-borne nitrogen particles deposited to the ground; ozone smog; and regional haze.²

One of the three parts of TVA's mission is to "Act as steward of the Valley's natural resources." TVA's environmental strategy states that "TVA's overarching Environmental Policy objective is to provide cleaner, reliable, and still-affordable energy, support sustainable economic growth in the Tennessee Valley, and engage in proactive environmental stewardship in a balanced and ecologically sound manner." TVA created related objectives in six key areas (1) mitigating climate change, (2) improving air quality, (3) protecting and improving water resources, (4) promoting sustainable land use, (5) minimizing waste, and (6) managing natural resources.

TVA Recently Changed Its Approach to Measuring Environmental Performance

The TVA Board has raised questions regarding TVA's environmental performance. In order to better assess environmental performance and provide scorecard-type information to the Board, TVA management decided to use the Global Reporting Initiative (GRI) framework to develop a set of measures to allow more effective benchmarking of TVA's environmental performance.

¹ *Benchmarking Air Emissions of the 100 Largest Electric Power Producers in the United States*, issued May 2008 – The report is the product of a collaborative effort among Ceres, Incorporated, the Natural Resources Defense Council, the Public Service Enterprise Group, and PG&E Corporation.

² SO₂ and NO_x contribute to acid rain, regional haze, and fine particle air pollution. Acid rain damages trees and crops, acidifying soils, lakes, and streams. Regional haze impairs visibility. Fine particle air pollution is linked to respiratory illness and other ailments. NO_x emissions are also associated with nitrogen deposition and ground-level ozone. Nitrogen deposition can impair water quality, and ground-level ozone can trigger respiratory problems. Mercury air emissions deposited to lakes and ponds are converted by certain microorganisms to a highly toxic form of the chemical. This accumulates in fish and shellfish, as well as birds and mammals that feed on the fish. Humans are exposed to the mercury when they eat the fish. CO₂ is the most prevalent of the human-caused greenhouse emissions. Greenhouse gases (or global warming pollutants) trap heat in the atmosphere, and at elevated concentrations, lead to global climate change.

The GRI framework specifies the principles and indicators that organizations can use to measure and report their economic, environmental, and social performance. The environmental portion of the GRI includes a broad array of topics including, but not limited to, an organization's impact on ecosystems, land, air, and water. The GRI framework includes environmental indicators that cover performance related to inputs (e.g., material, energy, and water) and outputs (e.g., emissions, effluents, and waste). In addition, the reporting framework covers performance related to environmental compliance and other relevant information such as environmental expenditures and the environmental impacts of products and services.

TVA identified 12 benchmarks they categorized as industry-accepted and 6 benchmarks that they identified as industry soft. TVA's Environment and Technology personnel provided benchmarking information for each of the industry-accepted and industry soft measures. In general, industry-accepted measures are those with a minimum of seven comparable data points³ (seven plus TVA's information equals eight data points), from which quartile comparisons can be made, with all data points coming from utility companies and/or nonutility business entities with like processes. The age of the data is preferably within a three-year range, but no more than five years removed from the current year.

The 12 industry-accepted benchmarks that range from benchmarks pertaining to air emissions to the cleanliness of marinas can be seen in Appendix A.

TVA has also identified six indicators that they consider industry soft measures. These measures are supported by GRI and deemed important for environmental assessment purposes. Industry soft measures are defined as those with less than seven comparable data points, and/or the way in which the data is accrued at the benchmarked entities is questionable and inconsistent. The benchmarked data may also be considered soft if the data comes from a third-party mechanism such as an industry study or consultant, but the data may be difficult to verify. The benchmarked data may also be considered soft if the information is non-quantitative, yet industry agreed upon, or if the data is five or more years old.⁴

These measures have limited data available for benchmarking from other companies. However, TVA captures information and reports it to the TVA Board.

The soft measures and their definitions can be seen in Appendix B.

³ TVA stated that in some cases, fewer than seven data points may be considered industry acceptable.

⁴ Comments provided by TVA management in reference to this report included definitions for probable benchmark and no benchmark. Probable benchmark is defined as no benchmark data has been identified to date; however, there is significant indication that soft and/or industry-accepted comparable data does exist. No benchmark is defined as no benchmark data has been identified to date, and there is low likelihood that soft or industry-accepted-benchmark data will be uncovered.

TVA COAL ASH MANAGEMENT



The Kingston Fossil Plant coal ash spill of December 22, 2008, in which 5.4 million cubic yards of ash poured onto adjacent land and into the Emory River is one of the largest environmental disasters in U.S. history. As the TVA Office of the Inspector General reported in detail, TVA's poor coal ash management practices and management culture led to an event that overshadows TVA's positive environmental, conservation, and performance achievements.

When the dike breached at Kingston Fossil Plant, the slurry mixture of ash and water traveled onto adjacent lands and into the waterways of the Emory River destroying and/or damaging homes, personal property, and community infrastructure. The initial environmental impact included damage to the neighboring ecosystems, killing and/or damage to wildlife and habitats, the shutdown of river operations and recreation, increased flood risk, and deposit of coal ash components onto the land and into the river system.

The Kingston Fossil Plant ash spill has focused attention on the largely ignored question of how to best dispose of coal combustion waste. This is now a pressing national environmental concern. This event has sparked legislative proposals and the prospect of more stringent regulations. Environmental groups and the electric power industry are engaged in a continual debate over regulatory proposals pertaining to coal ash and the potential health effects. Fueling the regulation debate is the fact that like other natural and man-made materials, coal ash does contain elements that can be toxic under certain circumstances. Coal by-products contain toxins such as mercury, arsenic, lead, chromium, and selenium. Although industry has claimed that fly ash is neither toxic nor poisonous, this is disputed. Some sources represent that exposure to fly ash through skin contact, inhalation of fine particle dust, and drinking water may well represent health risks. The National Academy of Sciences noted in a 2006 publication, *Managing Coal Combustion Residues In Mines*, that "the presence of high contaminant levels in many CCR (coal combustion residue) leachates may create human health and ecological concerns at or near some mine sites over the long term."

While TVA remains responsible for performing a comprehensive cleanup, the Kingston Fossil Plant ash spill was of such magnitude that TVA and the Environmental Protection Agency (EPA) agreed that the cleanup response should be conducted under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) authority. This was done to ensure appropriate response actions are taken as necessary to protect human health and the environment, to provide for a structured process for public involvement, and to ensure that the response actions satisfy all federal as well as state environmental requirements.

Specifically, TVA, the Tennessee Department of Environment and Conservation (TDEC), and the EPA responded jointly to provide an immediate response to the emergency caused by the release. As response activities progressed beyond the initial response phase, TVA, TDEC, and EPA determined that based on the magnitude of the environmental event and EPA's specialized expertise in responding to large-scale environmental events, site cleanup would be conducted under direct and primary EPA oversight.

"Under the Administrative Order and Agreement on Consent (AOC) entered into by EPA Region 4 and TVA, EPA will oversee TVA's cleanup of the Kingston Fossil Plant ash spill, in consultation with TDEC, and will ensure that the cleanup of the site is comprehensive, based on sound scientific and ecological principles, moves quickly, and complies with all Federal and State environmental standards. Under the AOC, TVA commits to continue the removal of coal ash from the site in accordance with the CERCLA and the National Contingency Plan, and agrees to reimburse EPA for its oversight costs."⁵

As a result of the Kingston Fossil Plant ash spill:

- TVA contracted with Oak Ridge Associated Universities (ORAU) to provide community members and the local medical community with access to medical and toxicology experts.
- TVA is providing ORAU \$1 million a year over three years to encourage independent, peer-reviewed research that will help everyone better understand the properties of coal combustion by-products and develop technology for using them.
- New legislation and regulations are pending regarding coal ash management, including whether it now should be regulated as a hazardous waste.
- TVA has initiated a comprehensive evaluation of its other coal impoundments to assess stability and other relevant risks.
- TVA, in cooperation with EPA and TDEC, continues to monitor air and water in the Kingston, Tennessee, area.
- A variety of biological sampling in the vicinity of the spill is being conducted.
- TVA continues to investigate ecological pathways for any possible effects of fly ash contaminants, including longer-term effects from possible bioaccumulation.

Results from studies thus far show no significant impacts on either water quality in the rivers or on the fish, birds, and other organisms living within the vicinity of the spill. However, many concerns have been expressed over selenium. The *EPA Report on Selenium*, prepared for the Senate Environment and Public Works Committee Staff, found that, among other things, (1) surface water monitoring data

⁵ Source: Questions & Answers on the Administrative Order on Consent for the Tennessee Valley Authority Kingston Fossil Fuel Plant Release, <http://www.epakingstontva.com/EPA%20Order/Forms/AllItems.aspx>.

demonstrates that metals and metalloids are not readily leaching off the particles spilled into the Emory River, (2) TVA and TDEC monitoring data do not support the concept that dredging has elevated levels of selenium in the water enough to pose a risk to aquatic life, and (3) selenium levels in surface water suggest that no adverse ecological impacts in the river have occurred at this time. However, because of the significant lag time between selenium mobilization and biological response, the monitoring strategy should be a systemic effort to track accumulation over time.

TVA is now taking steps to clean up the spill, assess the stability of other ash ponds, and improve ash management practices as well as the culture surrounding it. The cleanup of the ash spill itself will cost TVA an estimated \$933 million to \$1.2 billion.⁶

TVA INDUSTRY-ACCEPTED BENCHMARKS⁷



Our review of 12 industry-accepted environmental benchmarks found that TVA's performance varied for the selected measures. However, we deem that when taken as a whole, TVA's overall environmental performance was fair. Specifically, the measured results compare favorably with peer groups for several of the key metrics and achieve a portion of TVA's goals. Following are our rating and support explanation for each of the industry-accepted benchmarks.

Air Emissions (Nitrogen Oxide, Sulfur Dioxide, and Carbon Dioxide)



TVA has made advances in the reduction of air emissions over the last several decades. Expenditures related to clean air projects during 2009 and 2008 were approximately \$172 million and \$274 million, respectively. These figures include expenditures in 2009 of (1) \$12 million to continue to reduce NO_x emissions through the installation of selective non-catalytic reduction ("SNCR") systems and (2) \$131 million for the installation of flue gas desulfurization systems ("scrubbers") to continue to reduce SO₂ emissions.

TVA has reduced SO₂ emissions by 84 percent since 1977 and NO_x ozone season emissions by 82 percent since 1995. These dates correspond to the period when

⁶ The estimated cleanup cost of \$933 million to \$1.2 billion does not include estimates for (1) fines or regulatory directive actions, (2) outcome of lawsuits, (3) future claims, (4) long-term environmental impact costs, (5) final long-term disposition of ash processing area, (6) associated capital asset purchases, (7) ash handling and disposition from current plant operations, and (8) remediating any discovered mixed waste during the ash removal process.

⁷ TVA measures are supported by the metrics identified by the GRI.

TVA initially introduced measures to reduce the respective emissions. At the same time, however, TVA has increased overall generation by 54 percent since 1975. Notwithstanding this generation increase, factors which have and/or will further contribute to TVA's reduction in SO₂ emissions and NO_x ozone season emissions include:

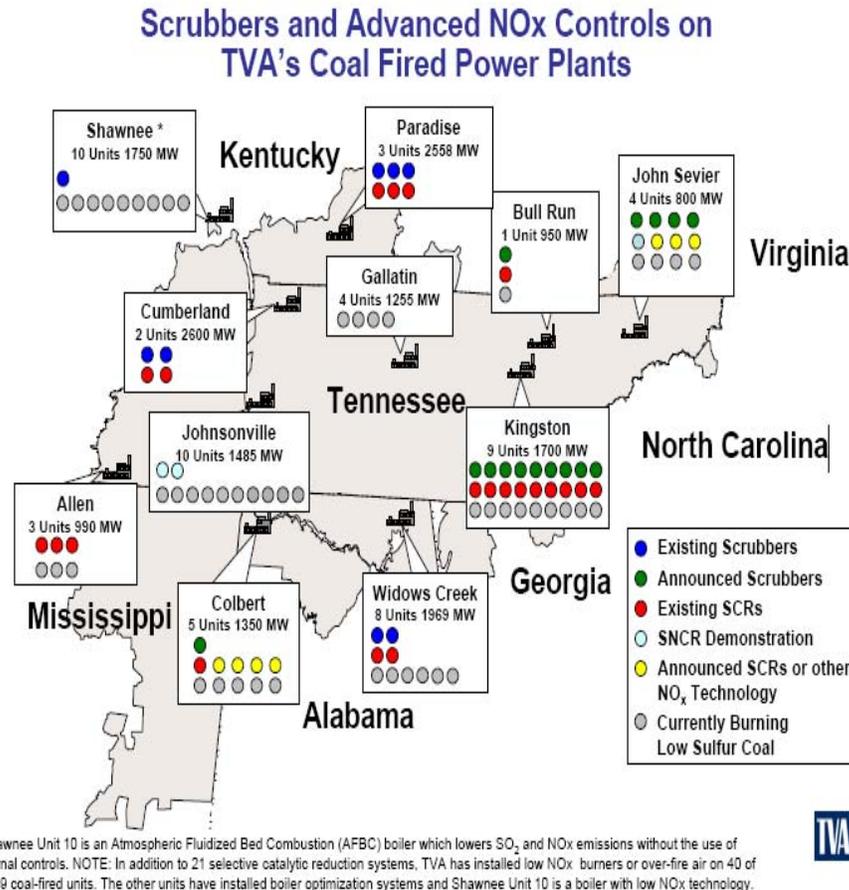
- Prior to fiscal year 2009, emission controls, such as scrubbers, for SO₂ had been installed in seven of TVA's largest fossil units. In December 2008, a scrubber was placed into operation at Bull Run Fossil Plant.
- Two scrubbers have been constructed at the Kingston Fossil Plant and will become operational when the plant begins producing power again. The targeted reduction in SO₂ emissions at Kingston is 98 percent.
- TVA Board approval has been obtained for the construction of additional scrubber equipment at the John Sevier Fossil Plant. The design of the scrubbers has not yet been finalized.
- TVA re-powered Unit 10 at its Shawnee Fossil Plant with Atmospheric Fluidized Bed Combustion⁸ thus reducing SO₂ on the unit.
- All but one (Shawnee Unit 10) of TVA's 59 fossil units have some form of combustion controls for the reduction of NO_x. However, Shawnee Unit 10 was re-powered with Atmospheric Fluidized Bed Combustion, which is a lower NO_x emitter, and therefore would not require separate combustion controls.

Additionally, from 1994 through 2005, TVA reduced, avoided, or sequestered more than 305 million tons of CO₂ under the Department of Energy's (DOE) Climate Challenge program. TVA has a goal of generating at least 50 percent of its power from low or zero carbon sources by 2020.

⁸ Atmospheric Fluidized Bed Combustion is a method of reducing SO₂ emissions by injecting limestone into the boiler which combines with the SO₂ to create a solid material which is later removed.

TVA's air emission controls are illustrated in Figure 2.

Figure 2 TVA's Emission Controls by Plant and Unit.



Source: TVA Today from July 31, 2008

TVA currently benchmarks air emissions for NO_x, SO₂, and CO₂ against 31 competitors using emission rates (i.e., tons/megawatt hour) as well as actual tons to determine performance. The emissions data is obtained from the Energy Velocity Database to which TVA subscribes. Based on information provided by Environment and Technology personnel for 2008, TVA was ranked in the bottom tier⁹ for total actual tons of emissions for NO_x, SO₂, and CO₂. For emissions rates, TVA was in the middle tier for SO₂ and CO₂, but in the bottom tier for NO_x.

⁹ For benchmarking purpose, TVA divided rankings into three tiers.

TVA's performance compared to its competitors is shown in Figure 3 below.

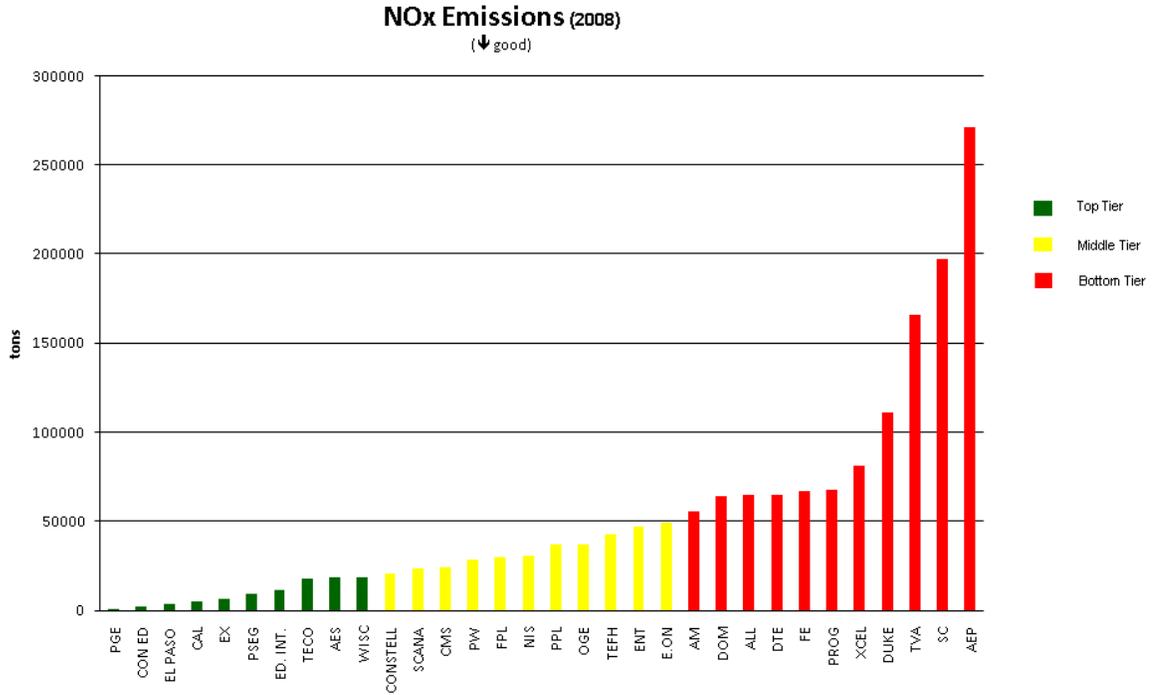
Figure 3 TVA's Performance on Air Emissions Compared to 31 Competitors for 2008.

Pollutant	Emissions in Tons		Emissions Rate	
	TVA Emits More	TVA Emits Less	TVA Emits More	TVA Emits Less
Nitrogen Oxides	29	2	21	10
Sulfur Dioxide	28	3	16	15
Carbon Dioxide	29	2	13	18

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

Figures 4, 6, and 8 graphically depict TVA’s performance for total tons of NO_x, SO₂, and CO₂ produced for 2008. Figures 5, 7, and 9 depict TVA’s performance for total tons of NO_x, SO₂, and CO₂ produced divided by megawatt hours.

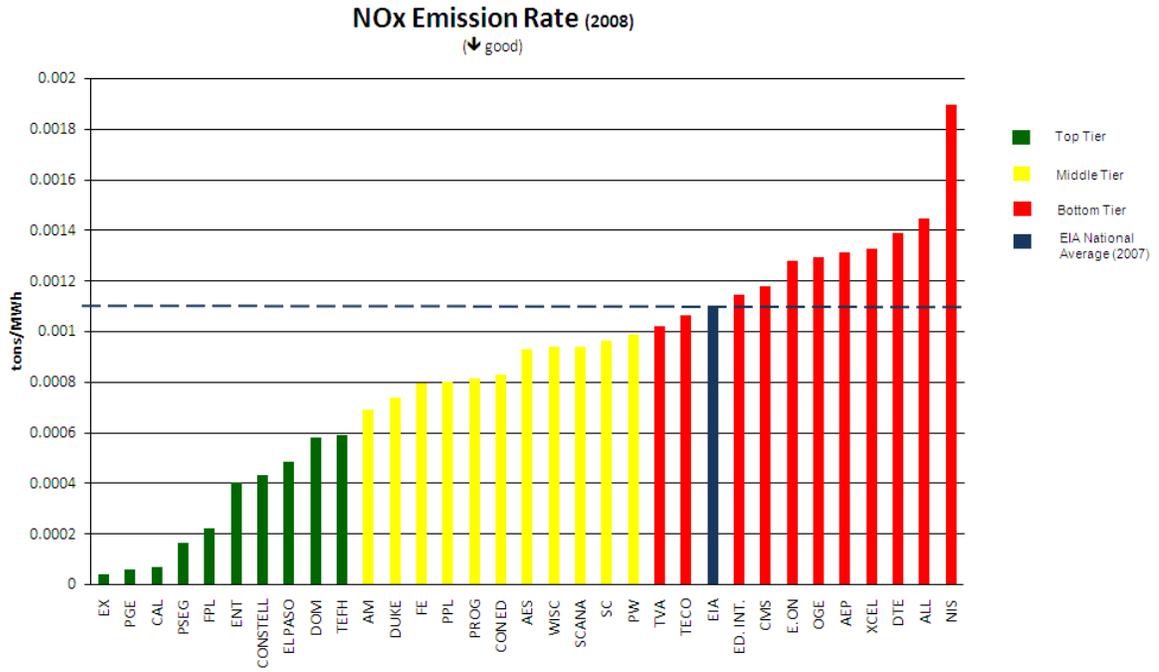
Figure 4¹⁰ Total Tons of NO_x Produced for 2008.



Source: TVA Benchmark Performance provided by Environment and Technology personnel.

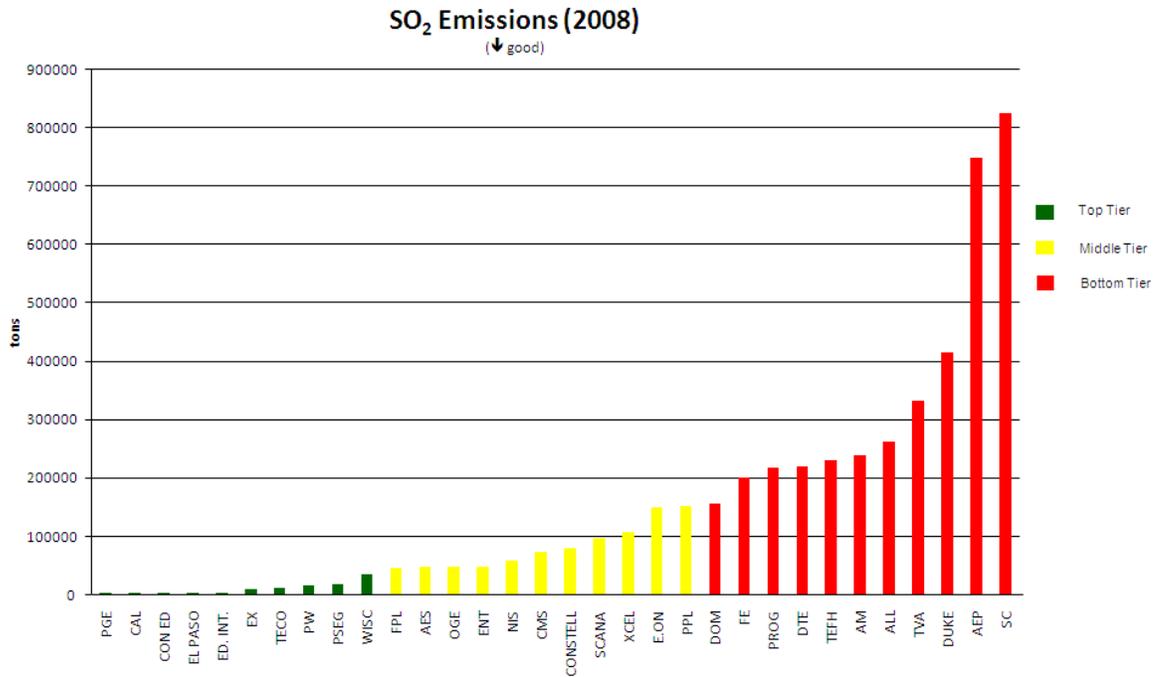
¹⁰ Arrows in Figures 4 through 27 indicate the direction of desired performance.

Figure 5¹¹ Total Tons of NO_x Produced Per Megawatt Hour for 2008.



Source: TVA Benchmark Performance provided by Environment and Technology personnel.

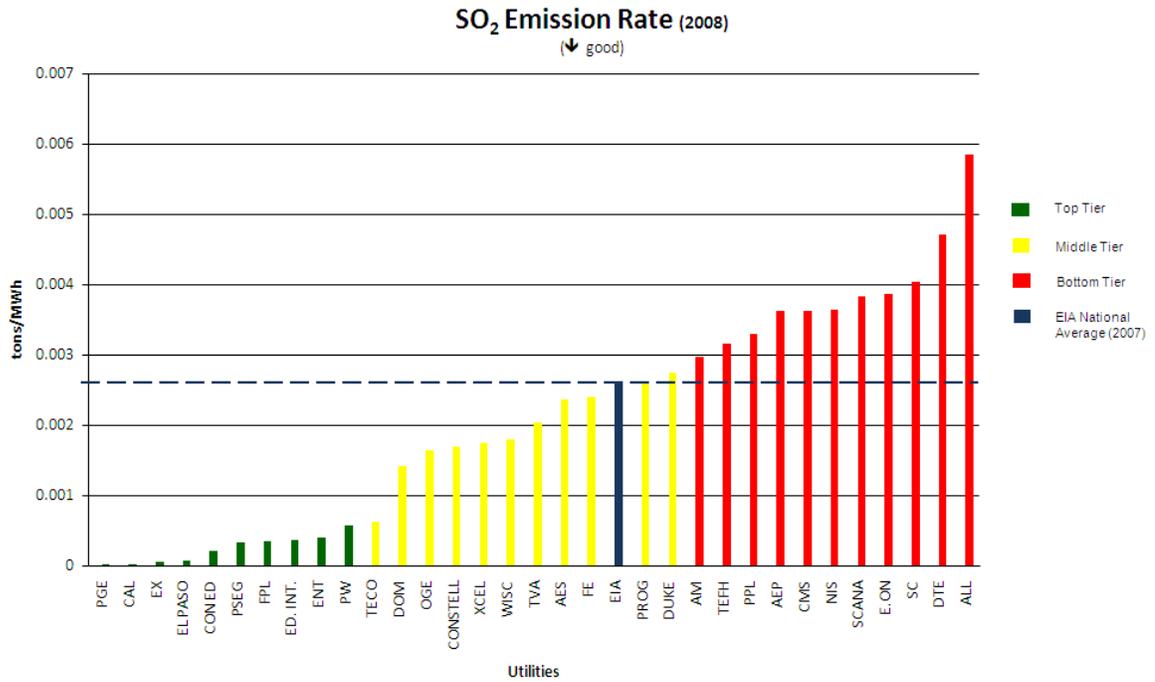
Figure 6 Total Tons of SO₂ Produced for 2008.



Source: TVA Benchmark Performance provided by Environment and Technology personnel.

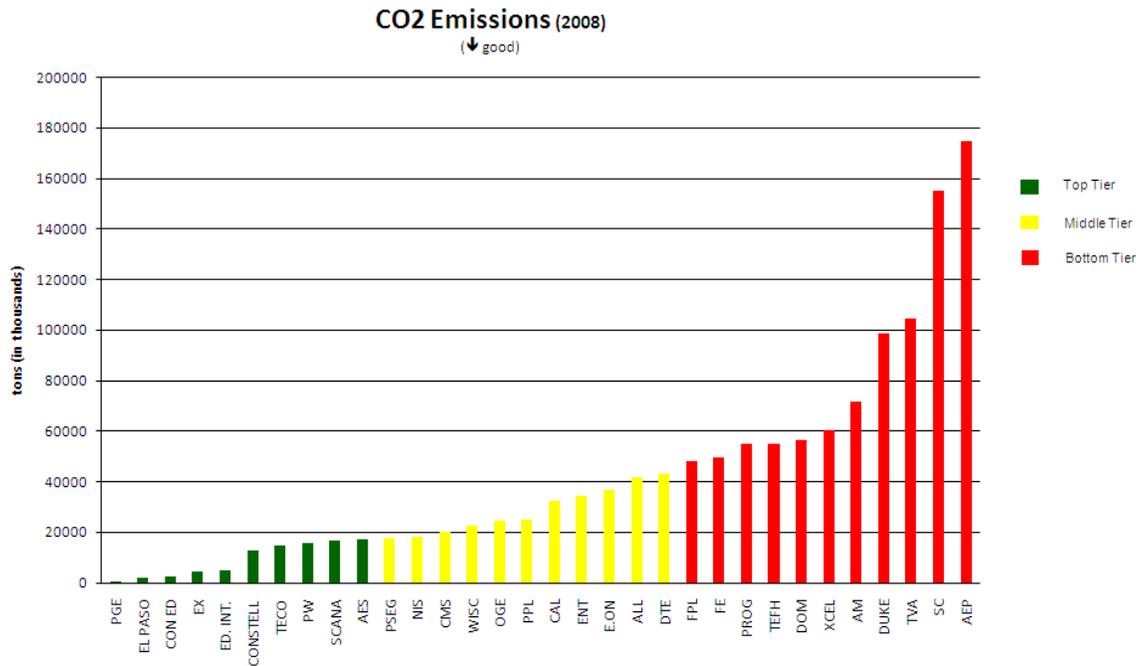
¹¹ EIA is the Energy Information Administration which provides the national average for emissions rates.

Figure 7 Total Tons of SO₂ Produced Per Megawatt Hour for 2008.



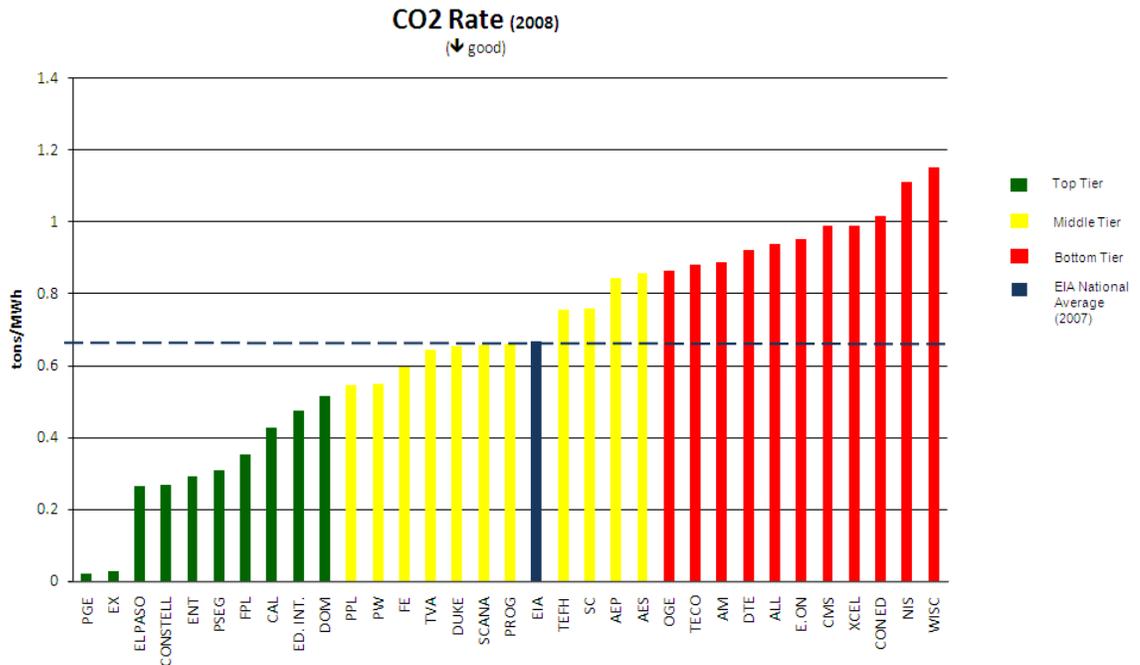
Source: TVA Benchmark Performance provided by Environment and Technology personnel.

Figure 8 Total Tons of CO₂ Produced for 2008.



Source: TVA Benchmark Performance provided by Environment and Technology personnel.

Figure 9 Total Tons of CO₂ Produced Per Megawatt Hour for 2008.



Source: TVA Benchmark Performance provided by Environment and Technology personnel.

Renewable and Clean Energy Generation

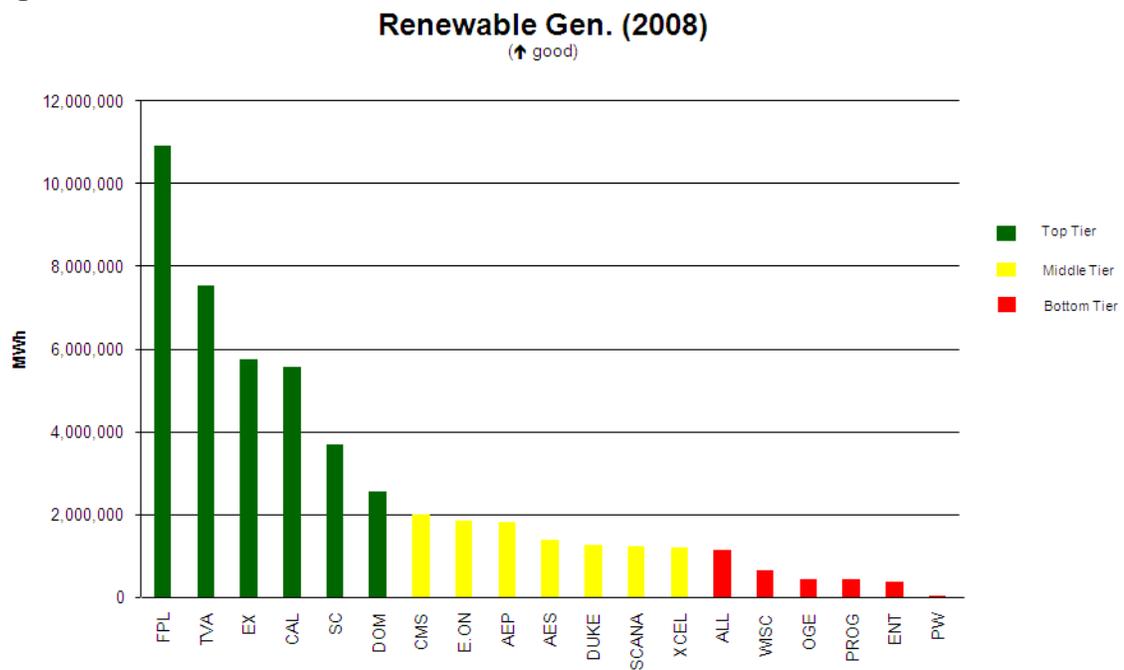


Renewable Generation

TVA defines renewable generation as sustainable and often naturally replenishing sources such as hydro, wind, solar, methane, biomass, and geothermal. TVA appears to have done well in renewable generation when compared to 18 other electric utilities based on total renewable generation, i.e., when you include hydro, however not as well when considering renewable generation as a percentage of total generation for 2008.¹² TVA is the second best performer based on total renewable generation and is a middle tier performer based on renewable generation as a percentage of total generation with six utilities having better performance under this measure.

Figure 10 shows TVA as compared to 18 other utilities based on total renewable generation. Figure 11 shows TVA compared to 18 other utilities based on renewable generation as a percentage of total generation.

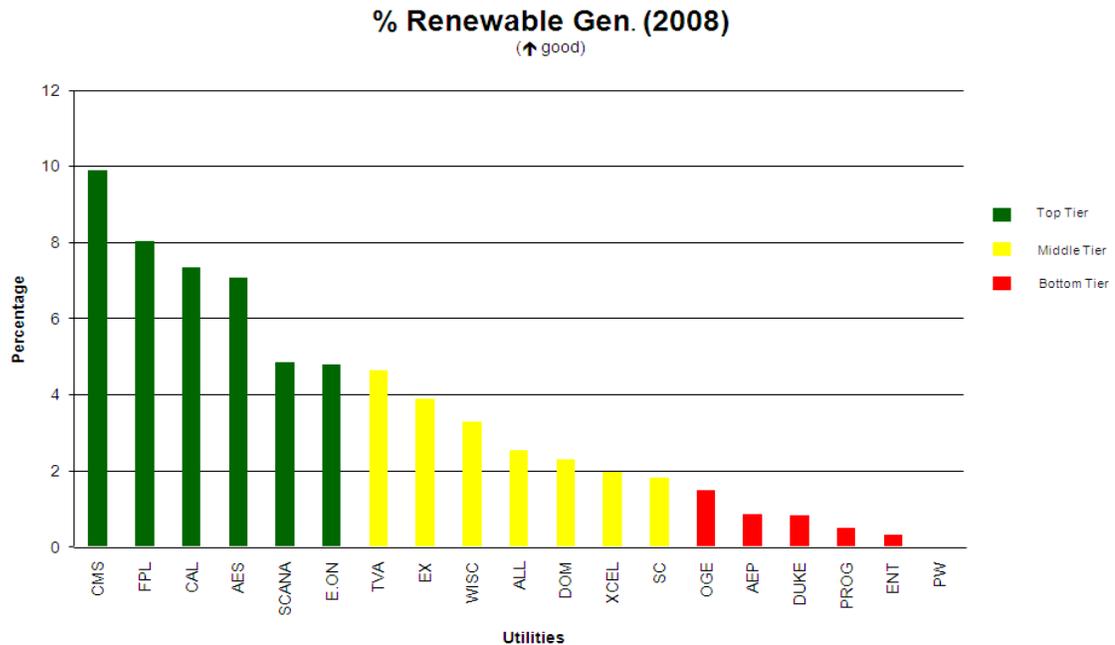
Figure 10



Source: TVA Benchmark Performance provided by Environment and Technology personnel.

¹² Benchmarking information was taken from the Energy Velocity Database.

Figure 11

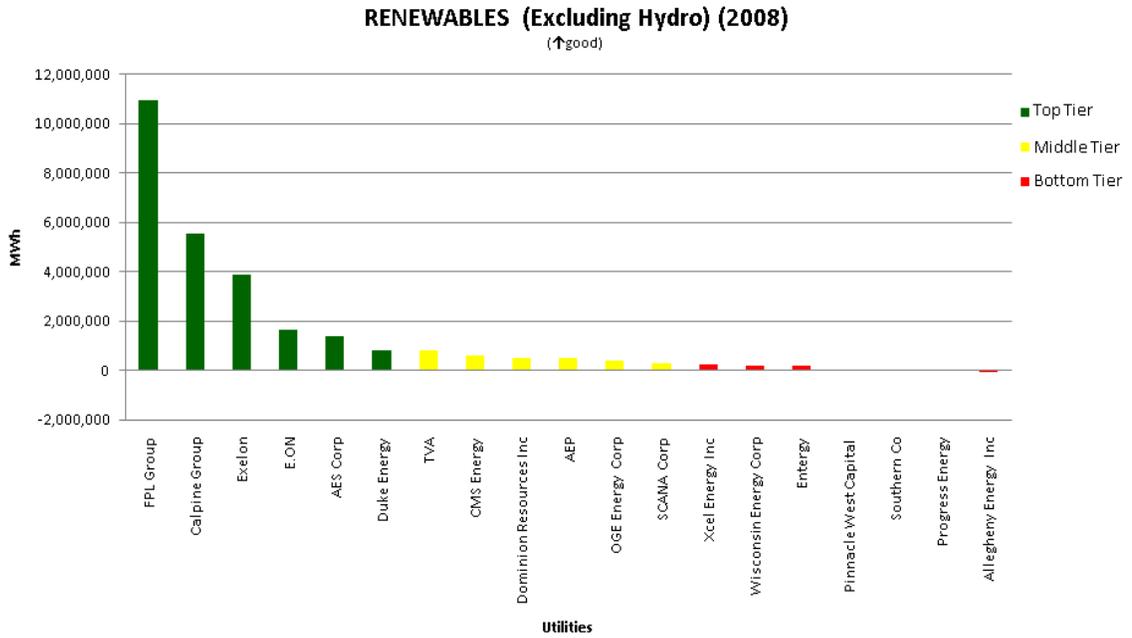


Source TVA Benchmark Performance provided by Environment and Technology personnel.

According to Environment and Technology, TVA is in the top tier in renewable generation because of hydro generation. However, Environment and Technology also noted that pending standards related to renewable generation may exclude hydro generation as a renewable source. According to TVA's 2009 Form 10-K Annual Report to the Securities and Exchange Commission, renewable power excluding hydro account for less than 1 percent of TVA's total generation. Furthermore, consistent hydro generation is not always possible due to precipitation fluctuations. TVA's Environmental Policy noted that TVA faces a barrier for implementing more Renewable Energy Sources as the Valley has a limited supply of renewable energy to support carbon and clean-energy initiatives.

Figure 12 shows TVA as compared to 18 other utilities based on total renewable generation excluding hydro generation for all utilities shown.

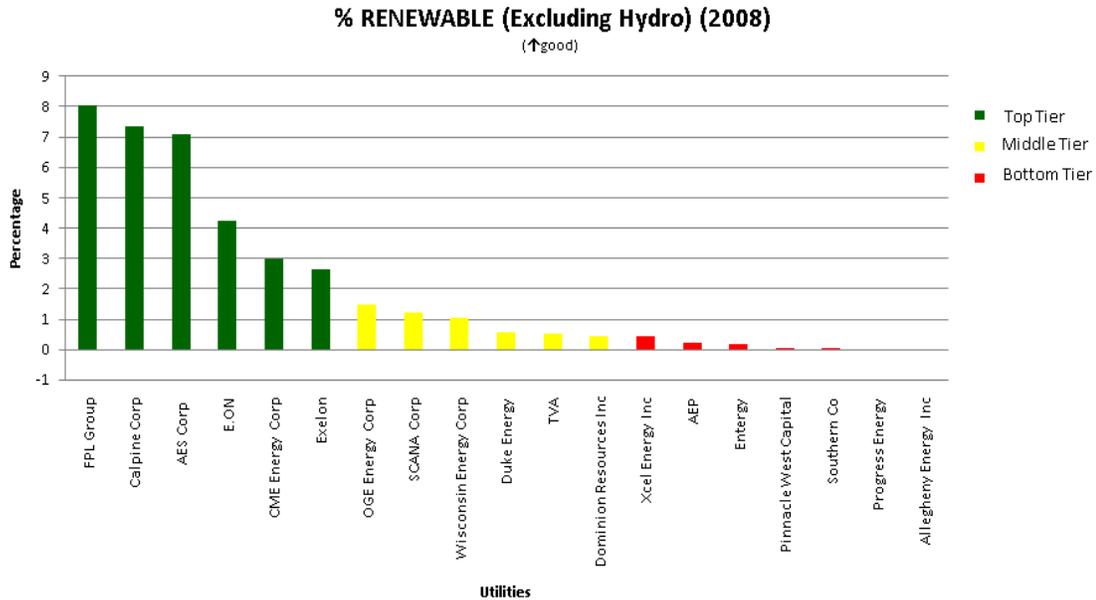
Figure 12



Source: Developed by OIG based on data in TVA Benchmark Performance provided by Environment and Technology personnel.

Figure 13 shows TVA compared to 18 other utilities based on renewable generation as a percentage of total generation excluding hydro generation for all utilities shown.

Figure 13



Source: Developed by OIG based on data in TVA Benchmark Performance provided by Environment and Technology personnel.

Renewable generation is important to TVA because it is part of TVA's environmental objective for Climate Change Mitigation. TVA reports that meeting the remaining load growth through lower-carbon-emitting energy sources is a critical success factor to renewable generation. Additionally, TVA expects mandated renewable energy standards to be enacted in the future. TVA did implement the Green Power Switch Program in 2000. The program offers consumers renewable energy options from Tennessee Valley regional sources, including wind, solar, and methane gas. The program enters its tenth season with 114 distributors, nearly 12,000 residential, and more than 500 commercial buyers. Renewable energy purchases are sold in \$4 blocks of 150 kilowatt-hours a month. Renewable energy sources funded through this program include (1) solar installations at schools, museums, and theme parks around the region, (2) turbines at TVA's Buffalo Mountain Wind Park, (3) a wastewater methane operation at TVA's Allen Fossil Plant, and (4) a methane gas operation at a landfill.

We also noted that the recent execution of seven renewable wind energy contracts should add an additional 1,380 megawatts (MWs) of renewable generation. Power delivery is subject to applicable environmental requirements and the securing of transmission paths. Specifically:

- In October 2009, TVA entered into two 20-year contracts for the purchase of up to 450 MWs of renewable wind energy from wind farms located in North Dakota and South Dakota. Power under these contracts is scheduled to be delivered beginning in 2012.
- In November 2009, TVA entered into two 20-year contracts for the purchase of renewable wind energy from Illinois. The two contracts are expected to provide a total of up to 350 MWs from wind projects located in Illinois, both beginning in January 2012.
- In December 2009, TVA entered into two 20-year contracts for the purchase of renewable wind energy from Kansas and Illinois. One of these contracts will provide up to 165 MWs of wind energy from a wind project in Kansas, beginning as early as January 2012. The other contract is for the delivery of up to 300 MWs from Illinois, which began delivering power to TVA in May 2010.
- In February 2010, TVA entered a 20-year contract for up to an additional 115 MWs of renewable wind energy from Iowa beginning in September 2010.

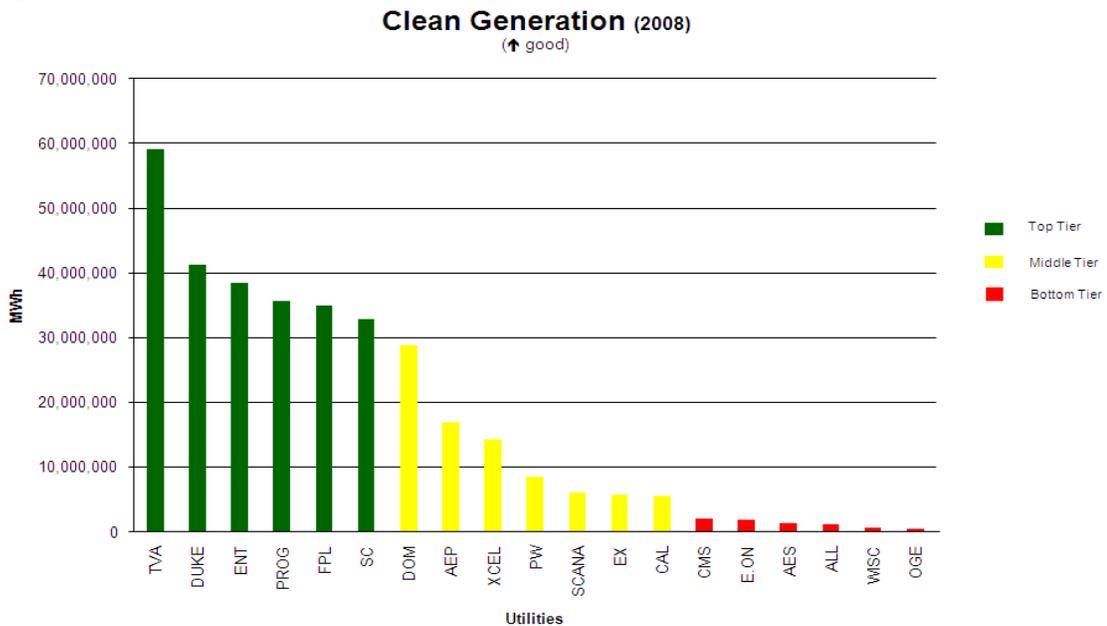
Construction is scheduled or under way on all of these projects.

Clean Energy Generation

TVA refers to Clean Energy Generation as electrical generation from zero or low-carbon sources including nuclear, renewable sources (including hydro), and other nonfossil sources such as waste heat. TVA also appears to have done well in clean energy generation when compared to 18 other electric utilities based on clean energy generation and clean energy generation as a percentage of total generation for 2008. Benchmarking information was taken from the Energy Velocity Database. TVA reported they are the Best-in-Class Performer based on clean energy generation, but not the very top performer when benchmarked by percentage of generation. However, they are still top tier when benchmarked by percentage of generation. TVA is in the middle tier when purchased power agreements are included.

Figure 14 shows TVA as compared to 18 other utilities based on total clean energy generation.

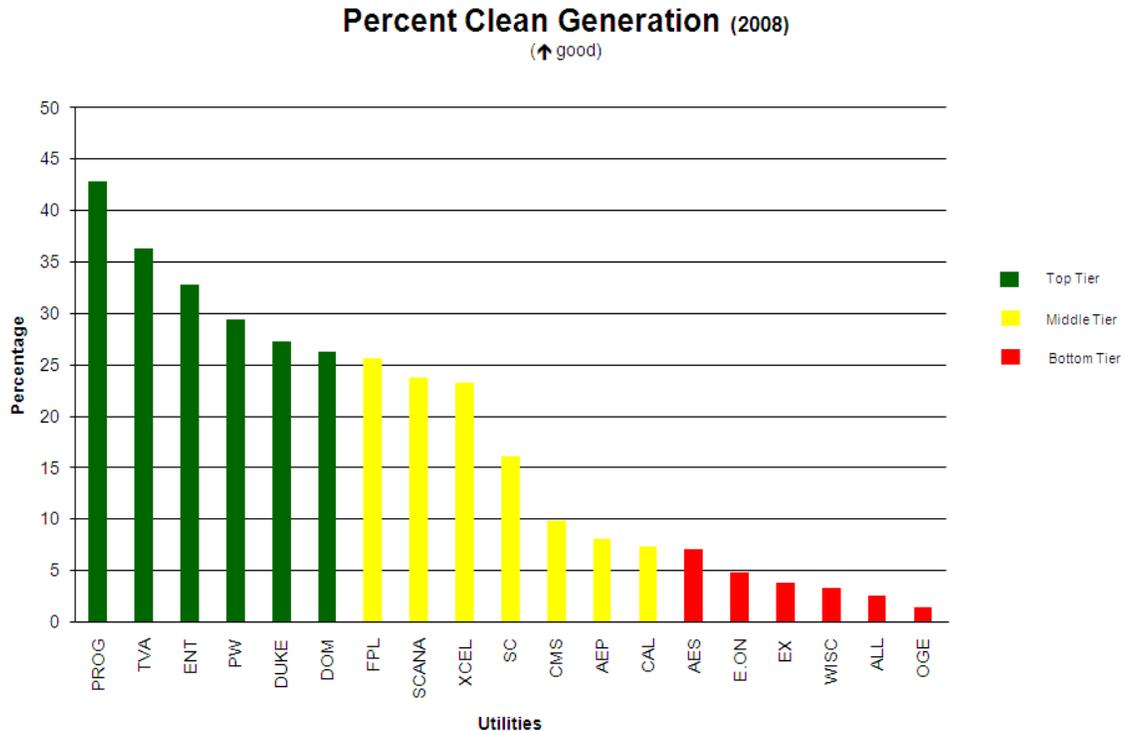
Figure 14



Source: TVA Benchmark Performance provided by Environment and Technology personnel.

Figure 15 shows TVA as compared to 18 other utilities based on total clean energy generation as a percentage of total generation.

Figure 15

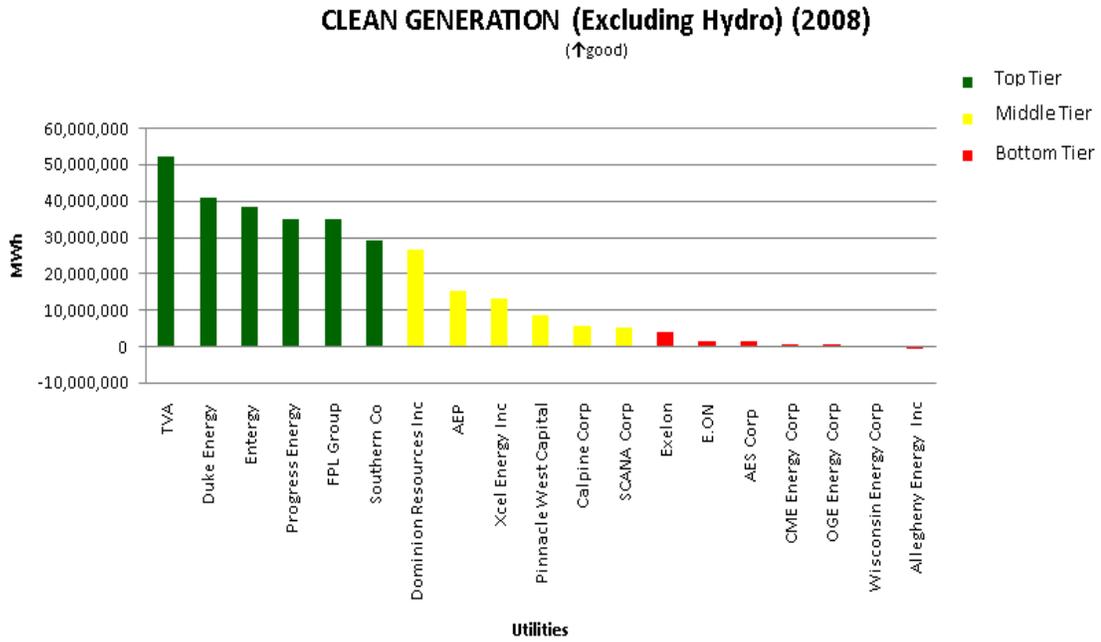


Source: TVA Benchmark Performance provided by Environment and Technology personnel.

TVA, in its 2008 Environmental Policy, forecasted clean energy generation to account for more than 50 percent of total generation by 2020. At the time the policy was written, approximately 30 percent of TVA's generation came from non-carbon emitting sources. TVA expects legislation to be passed that will restrict carbon emissions, which causes clean energy to be more important in the future. Clean energy generation faces the same uncertainties as renewable generation regarding consistent hydro production and TVA's lack of renewable energy sources.

Figure 16 shows TVA as compared to 18 other utilities based on total clean energy generation excluding hydro production for all utilities shown.

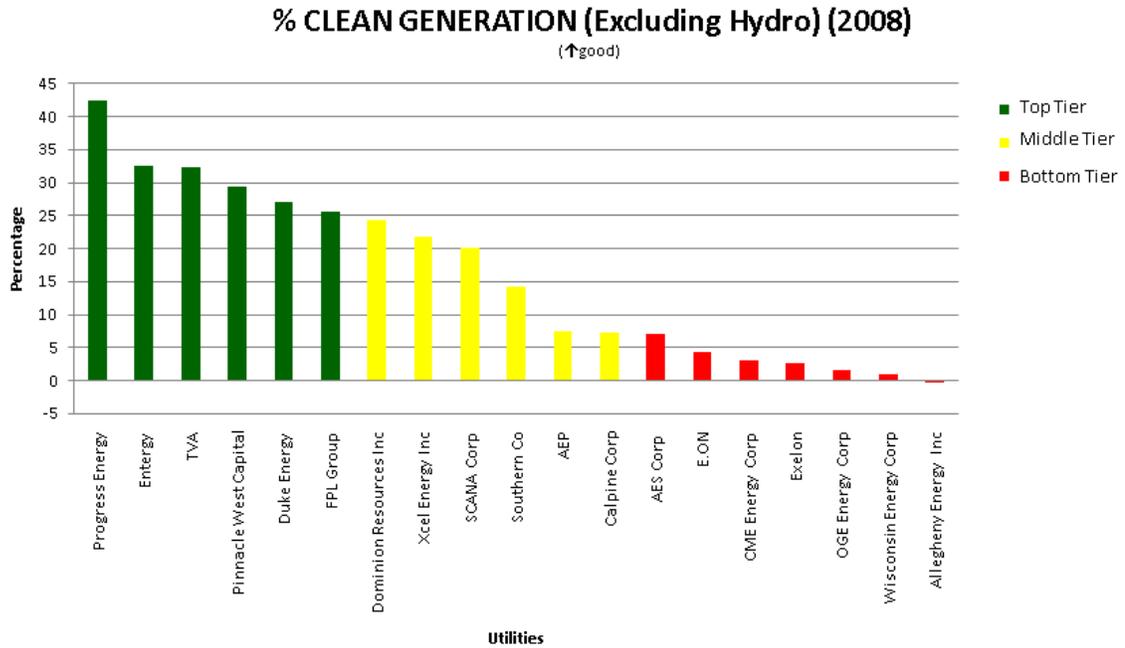
Figure 16



Source: Developed by OIG based on data in TVA Benchmark Performance provided by Environment and Technology personnel.

Figure 17 shows TVA as compared to 18 other utilities based on total clean energy generation as a percentage of total generation excluding hydro production for all utilities shown.

Figure 17



Source: Developed by OIG based on data in TVA Benchmark Performance provided by Environment and Technology personnel.

Reportable Environmental Events and Environmental Fines



Reportable Environmental Events

A Reportable Environmental Event (REE) is an environmental event at a TVA facility or elsewhere caused by TVA or TVA contractors that violates regulatory requirements and triggers oral or written notification or enforcement action by a regulatory agency. REEs include Notice of Violations, Spills to Water, Clean Water Act Nonconformances, and Reportable Quantity Releases when it is a violation of a regulatory requirement. The measurement is based solely on the number of events, not their significance.

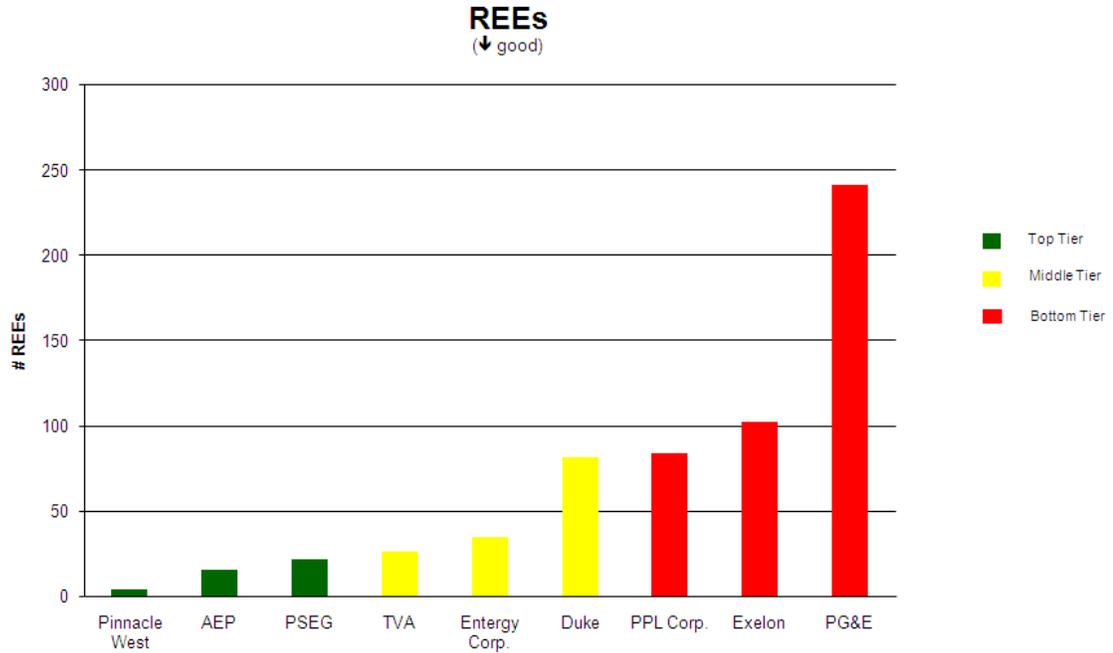
In the 2008 Environmental Policy, TVA stated that they remain committed to complying with environmental laws and regulations. TVA's goal is to reduce the occurrence of REEs, thereby increasing compliance, safety, and overall environmental performance while reducing environmental impacts.

When benchmarked against eight U.S. companies, TVA fell into the middle tier for the number of REEs, but top tier based on total generation. However, it should be noted that the information for each company was not for the same time period. According to TVA, information was from 2008 for four of the companies, 2007 for three of the companies, and 2006 for two of the companies. Additionally, the comparison was made on "REE-like"¹³ items found in utilities' annual reports.

¹³ REE is a TVA term, thus benchmark data is collected by reviewing other company annual reports for environmental events that would be classified as an REE had it been a TVA event.

Figure 18 shows TVA as compared to eight other utilities based on number of REEs.

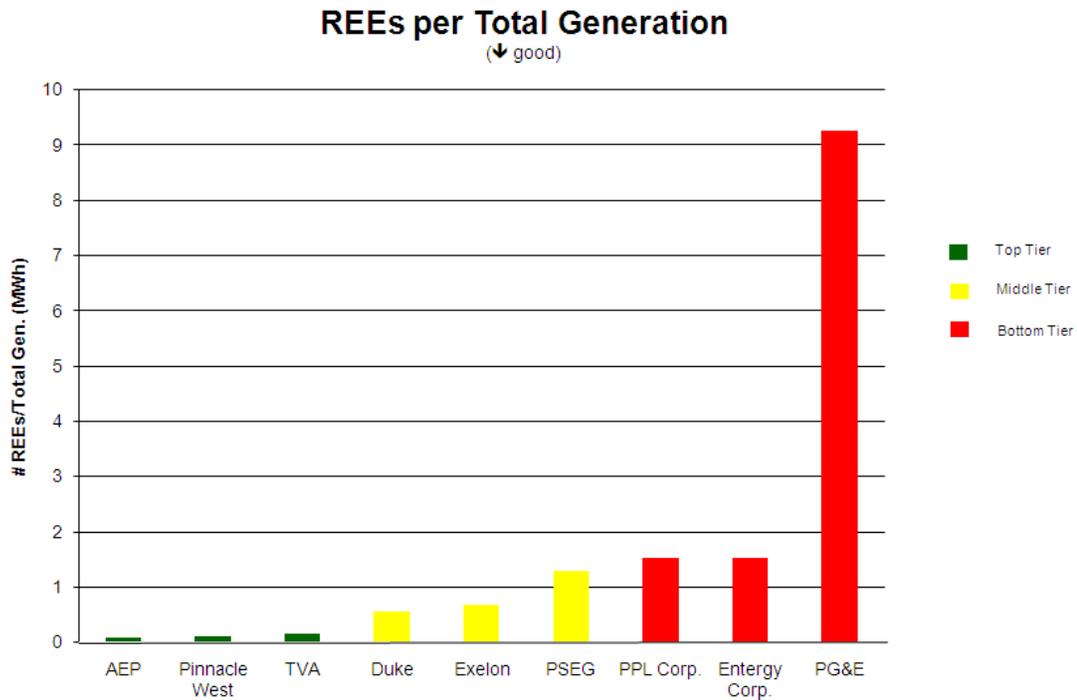
Figure 18 Total Number of Reportable Environmental Events.



Source: TVA Benchmark Performance provided by Environment and Technology personnel.

Figure 19 shows TVA as compared to eight other utilities based on number of REEs as a percentage of total generation.

Figure 19



Source: TVA Benchmark Performance provided by Environment and Technology personnel.

TVA's number of REEs remained relatively constant from fiscal year (FY) 2005 to FY 2008 ranging from 20 to 27, but increased significantly in FY 2009 to 43. One of TVA's largest REEs occurred in FY 2009, when a major dike failure at the TVA Kingston Fossil Plant released approximately 5.4 million cubic yards of coal ash containing toxic materials onto surrounding land and into the Emory River.

TVA has stated that they are committed to restoring the area and cleaning up the spill. As of May 23, 2010, TVA has removed more than 3 million cubic yards, which had spilled into the Emory River and related bays and slough east of Dike 2. TVA will store the remaining 2 million cubic yards of ash on-site. As of May 23, 2010, TVA has shipped more than 2 million tons of ash off-site for disposal using special procedures to ensure ash dust does not become a problem during shipping.

TVA has worked with the EPA and TDEC to monitor air and water in the surrounding area. TVA has five fixed-location monitoring stations around the plant and spill site and one off-site monitor. These stations measure particulates in the air, and the samples have indicated that air quality is better than the National Ambient Air Quality Standards. Test results from EPA and TDEC have shown results consistent with TVA's results. Additionally, all three agencies have

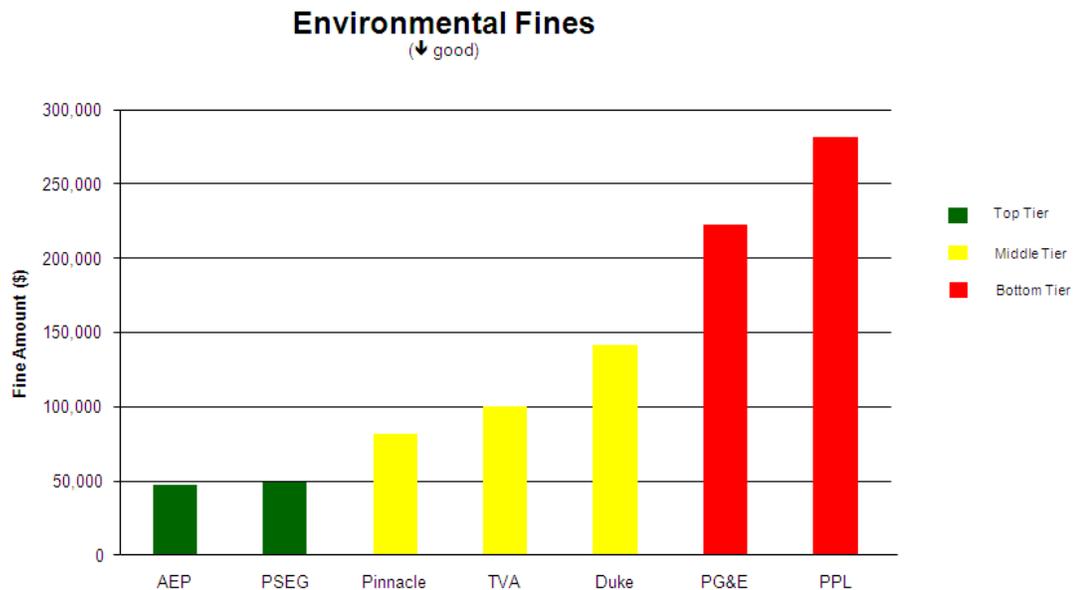
conducted testing on public drinking water supplies, public wells, and river water. Public drinking water test results continue to meet drinking water quality standards.

Environmental Fines

The Environmental Fines indicator refers to the amount paid to a regulatory agency in connection with a regulatory enforcement action. TVA benchmarked data for six other companies using information found in their annual reports. TVA determined it ranked in the middle tier of the comparison group. As with REEs, it should be noted that the data for each company was not for the same time period. According to TVA, information was from 2008 for two of the companies, 2007 for three of the companies, and 2006 for two of the companies.

Figure 20 shows TVA as compared to six other utilities based on the dollar amount of Environmental Fines.

Figure 20



Source: TVA Benchmark Performance provided by Environment and Technology personnel.

TDEC recently announced that they have fined TVA \$11.5 million for "its catastrophic coal ash release" at the Kingston Fossil Plant.

Low-Level Radioactive Waste

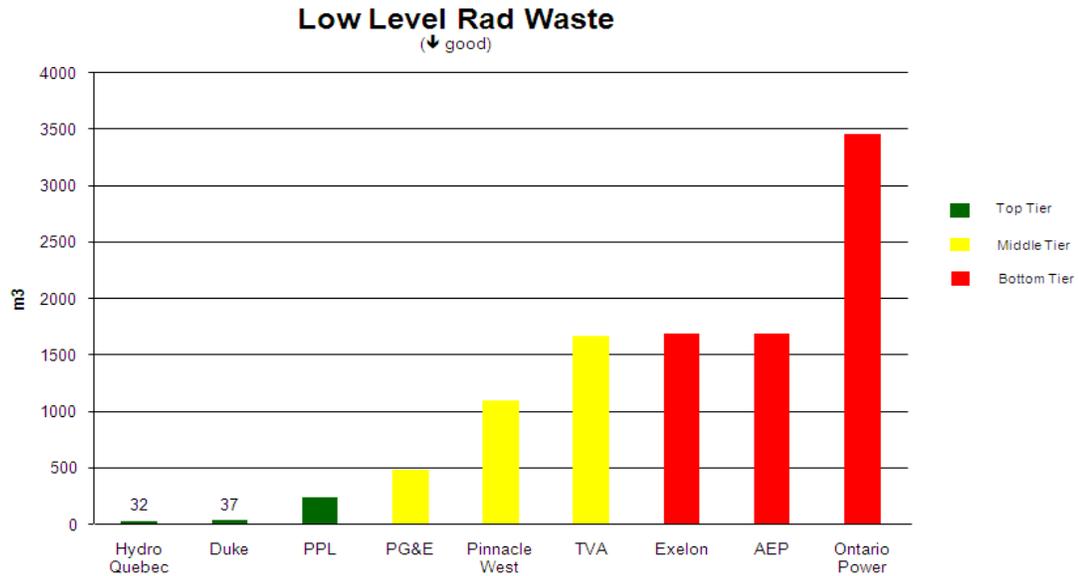


Radioactive waste must be disposed of properly in licensed disposal facilities. The number of available disposal facilities and the disposal volume capacity is limited. TVA considers minimizing low-level radioactive waste critical to its overall objective of minimizing waste. Low-level waste includes items that have become contaminated with radioactive material or have become radioactive through exposure to neutron radiation. These low-level radioactive wastes include ion-exchange resins, compactable and non-compactable trash when contaminated, mechanical filters, tank residue, and irradiated reactor components.¹⁴ The radioactivity can range from just above background levels found in nature to very highly radioactive in certain cases such as parts from inside the reactor vessel in a nuclear power plant.

TVA benchmarked itself against eight utilities with respect to the amount of low-level radioactive waste generated. As shown in Figure 21, this benchmarking showed TVA to be in the middle tier in terms of volume of low-level radioactive waste generated. TVA's benchmarking also showed TVA is in the middle tier when comparing low-level radioactive waste generated to power generated as shown in Figure 22. However, it should be noted that the information for each utility was not for the same time period. According to TVA, information for four of the utilities came from 2008, three of the utilities came from 2007, and one came from 2006.

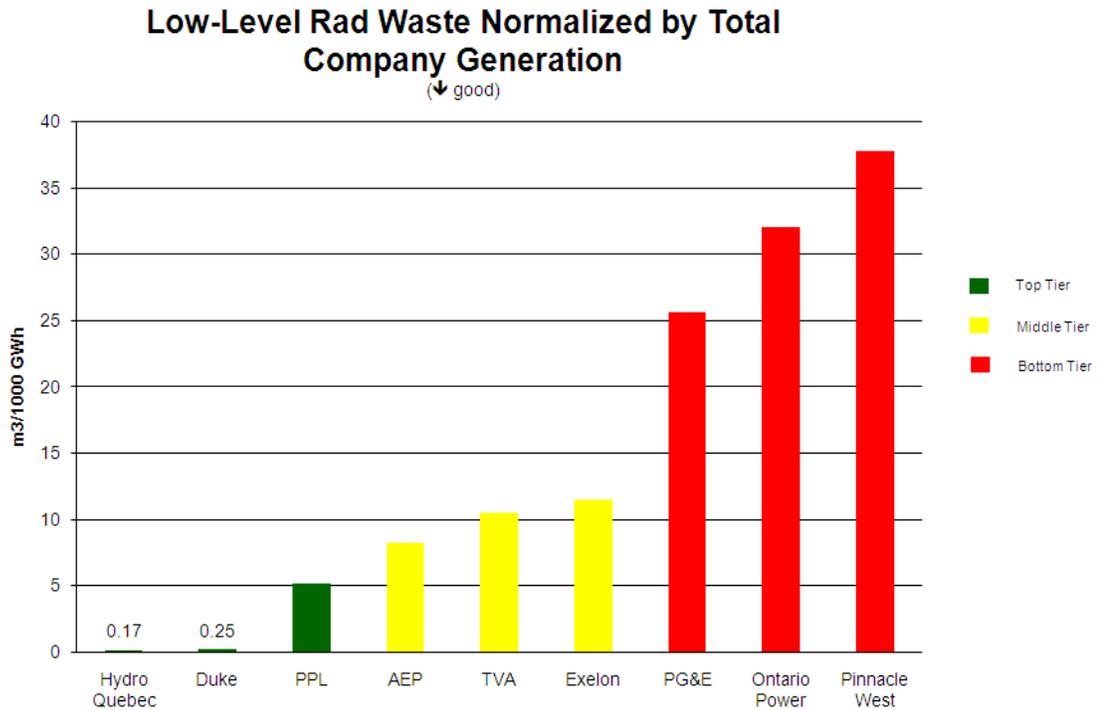
¹⁴ Irradiated reactor components, while included in the definition of low-level radioactive waste, are currently stored on-site and have not been processed as low-level radioactive waste nor sent for disposal at this time. These components were not included in the analysis of Figures 21 and 22.

Figure 21



Source: TVA Benchmark Performance provided by Environment and Technology personnel.

Figure 22¹⁵



Source: TVA Benchmark Performance provided by Environment and Technology personnel.

¹⁵ This chart normalizes low-level radioactive waste generation by total company GWh generation; however, nuclear power is the only source of this waste. TVA Nuclear noted that TVA provides a "greener" footprint using the total company GWh generation rather than using Gwh generation solely from nuclear power.

Office Recyclables

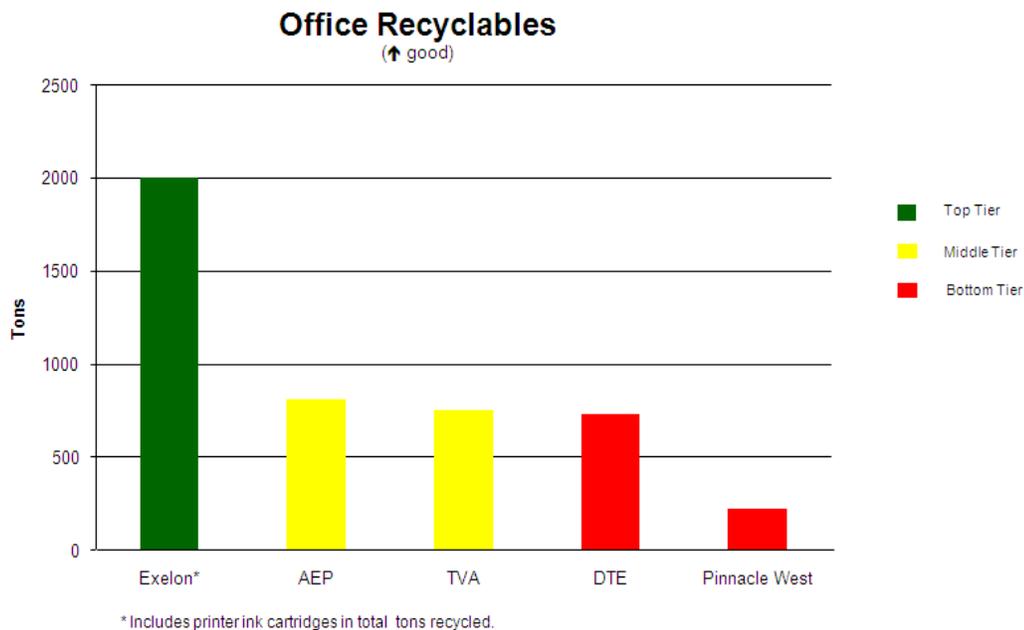


The Office Recyclables measurement tracks the amount of recyclable materials coming from office-type environments. This includes paper, glass, aluminum, cardboard, plastic, and steel from cans. Increasing Office Recyclables is part of TVA's environmental objective for Waste Minimization.

TVA was able to gather office recyclable data from four other utilities' annual reports, in which TVA ranked in the middle tier.¹⁶ However, it should be noted that the information for each utility was not necessarily for the same time period and one of the utilities included printer ink cartridges in the tons recycled whereas the others did not. According to TVA, information for two of the utilities came from 2008 and two came from 2007. Data for 2008 was used for TVA.

Figure 23 shows TVA in comparison to four other utilities.

Figure 23



Source: TVA Benchmark Performance provided by Environment and Technology personnel.

¹⁶ There is no measure of office recyclables as a percentage of total trash generated due to a lack of information on total trash generated.

Elimination of Polychlorinated Biphenyls from Large Equipment



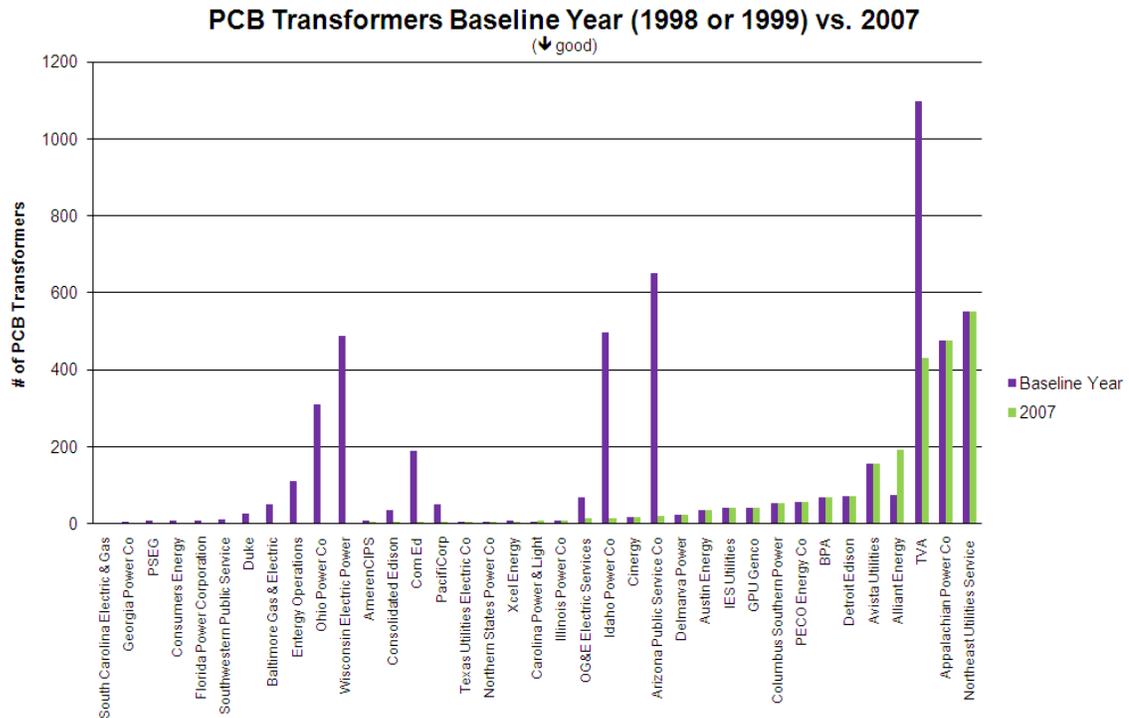
The use, remediation, and disposal of polychlorinated biphenyls (PCBs) are regulated under the Toxic Substance Control Act (TSCA). Under TSCA, electrical equipment is regulated as “PCB” (greater than 500 parts per million (ppm)) or “PCB-Contaminated” (50 to 499 ppm), with the ≥ 500 ppm regulations being the most restrictive and burdensome. TVA’s 2008 Environmental Policy directs TVA to further reduce the risk of PCB releases to the environment by eliminating the use of PCB in large electrical equipment.

On April 7, 2010, in the Federal Register, EPA published an Advanced Notice of Proposed Rule Making. It includes a potential requirement that all ≥ 50 ppm PCB electrical equipment be phased out by 2025 in keeping with the Stockholm Convention Treaty.

TVA fared poorly when benchmarking itself against 36 other electric utilities with respect to the number of transformers containing greater than 500 ppm of PCBs.

As shown in Figure 24, TVA ranked near the bottom despite reducing its number of transformers with greater than 500ppm PCBs from 1,130 in 1998 to 416 in 2007.¹⁷ 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 24



Source: TVA Benchmark Performance provided by Environment and Technology personnel.

TVA has acknowledged the following key issues relating to PCB transformers.

- 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 their PCB equipment, the market demand for and number of PCB disposal companies have decreased. Consequently, PCB disposal costs are increasing.
- The longer TVA utilizes PCB equipment, the higher the risk of catastrophic failure.

¹⁷ According to TVA officials, TVA has further reduced this number to approximately 370 such transformers, as of August 2009.

Coal Combustion Products Utilized

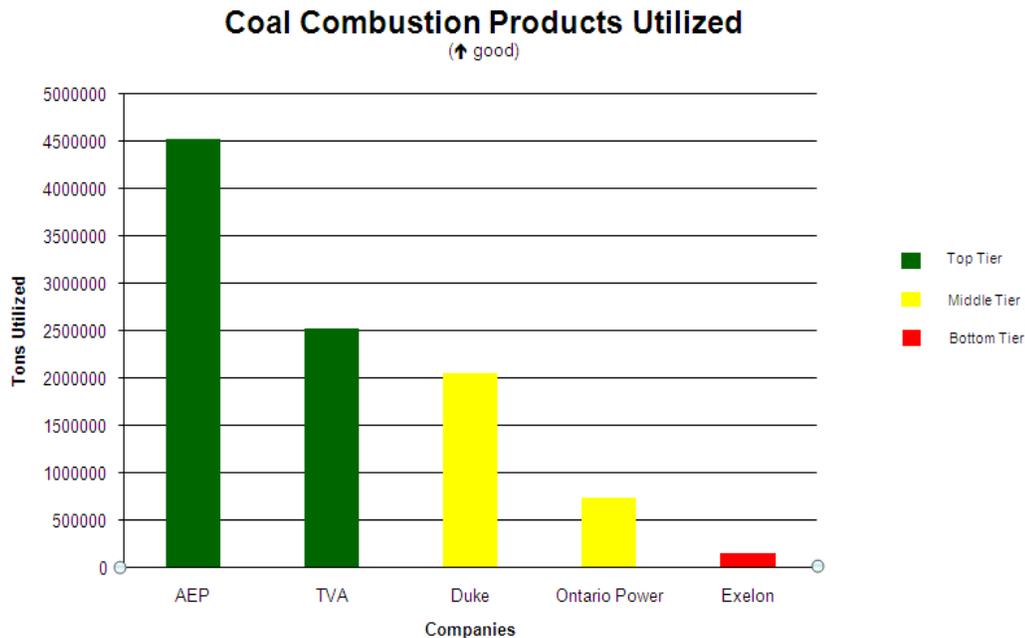


TVA defines coal combustion products utilized as the amount of coal products from fossil plants (e.g., fly ash, bottom ash, and scrubber gypsum) recycled, rather than disposed of. Coal combustion products utilized is important because it is part of TVA's environmental objective for Waste Minimization. By utilizing coal combustion products, TVA is avoiding disposal costs and in some cases generating revenue.

TVA reports that their amount of coal combustion products utilized has been better than the national average every year since 2001. TVA obtained data related to the national average from the American Coal Ash Association. Additionally, TVA benchmarked against four utilities based on information found in their respective annual reports. TVA was in the top tier for total coal combustion products utilized, but when the data was normalized using generation, TVA was in the middle tier. It should be noted that the information for each utility was not for the same time period.

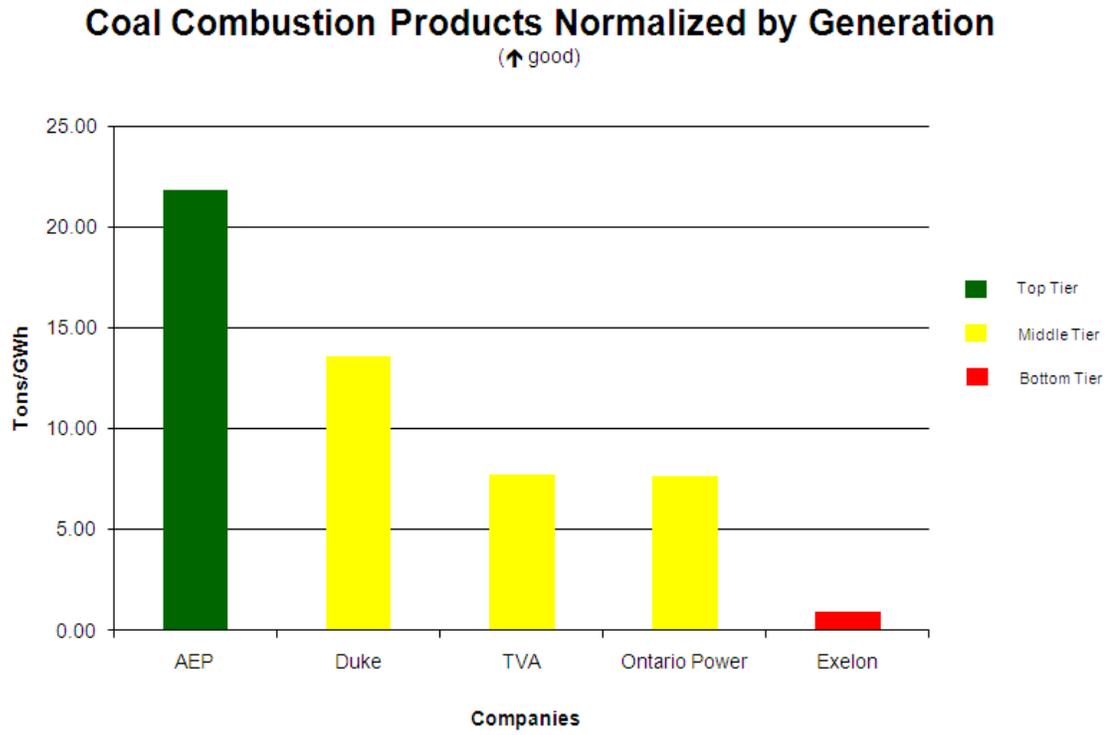
Figure 25 shows TVA as compared to four other companies based on the amount of coal combustion products utilized. Figure 26 shows TVA as compared to four other companies based on the amount of coal combustion products utilized as a percentage of total generation.

Figure 25



Source: TVA Benchmark Performance provided by Environment and Technology personnel.

Figure 26



Source: TVA Benchmark Performance provided by Environment and Technology personnel.

Certified Clean Marinas



The Certified Clean Marinas indicator measures the annual percentage of marinas¹⁸ participating in the Tennessee Valley Clean Marina Initiative (CMI). The Tennessee Valley CMI is a regional, voluntary program developed by TVA Resource Stewardship and its watershed partners to promote sound, environmentally responsible marina and boating practices.

TVA tracks this measure because the initiative encourages environmentally responsible marina and boating practices throughout the Tennessee Valley. The objectives of the CMI are to:

- Reduce water pollution and erosion caused by recreational boating and marina operation.
- Encourage marina-sponsored boater education.
- Increase coordination among agencies.
- Provide incentives for creative and proactive marina operators.

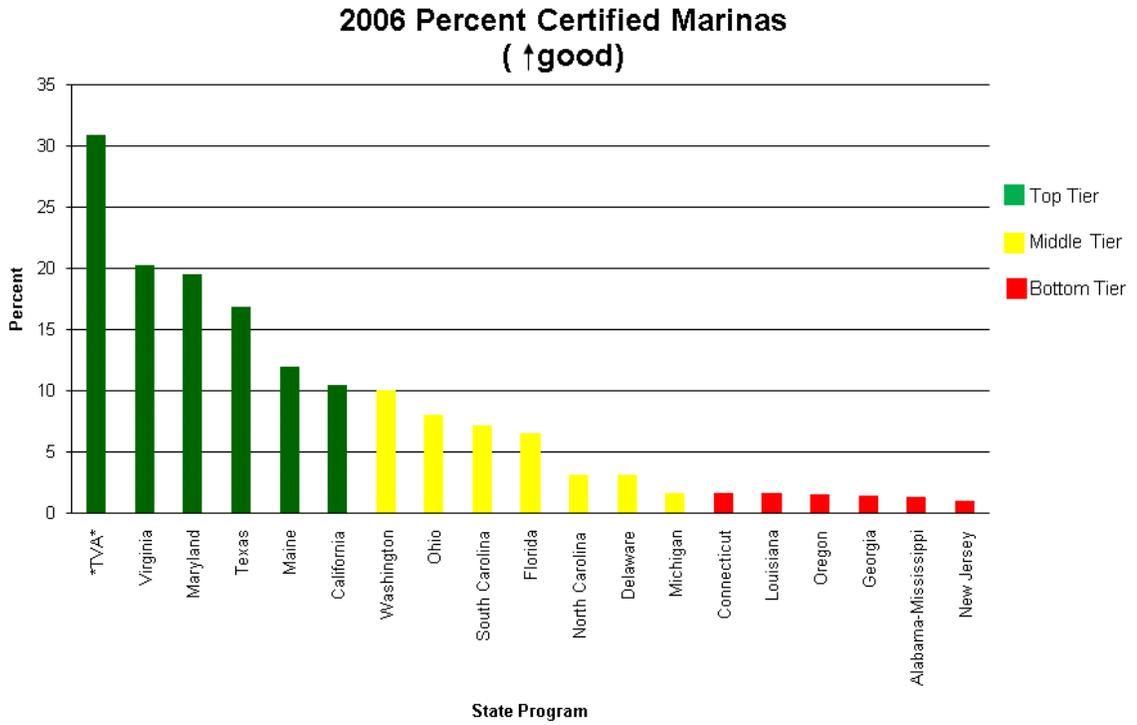
This measure aligns with TVA's environmental objective for Water Resource Protection and Improvement. While TVA classified this measure as an industry acceptable one, it should be noted that the benchmarking peer group is comprised of 18 state run, not electric utility managed, Clean Marina programs across the U.S.

TVA is the top performer when the percentage of clean marinas compared to total number of marinas is considered. Additionally, TVA is in the top tier for total number of certified marinas. The benchmarking data came from *Marina Dock Age* magazine in December 2006.

¹⁸ TVA defines a marina as a commercial water-based facility (public or private) that supplies wet or dry storage for recreational watercrafts for a fee or for purchase where staff provides or sells one or more boating-related services and/or products.

Figure 27 shows TVA’s position for Certified Clean Marinas compared to 18 state programs.

Figure 27



Source: TVA Benchmark Performance provided by Environment and Technology personnel.

MANAGEMENT CHALLENGES

Key elements in maintaining and improving TVA's environmental performance include being responsive to new environmental legislation and regulations, maintaining TVA's position as a steward of the Tennessee Valley, and managing the cost of complying with future legislation and regulations. While TVA's current retail rates are generally below market as discussed in our first report in this series and TVA has the authority to set its own rates and thus mitigate some risks by increasing rates, it is possible that partially or completely eliminating one or more of these risks through rate increases might adversely affect TVA commercially or politically. Therefore, it is important to note that TVA faces many significant management challenges in maintaining and improving its environmental performance.

No analysis of TVA management challenges would be complete without recognizing that the Kingston Fossil Plant coal ash spill surfaced cultural problems within TVA that likely extend beyond the management of coal ash. TVA is currently engaged in initiatives to address culture issues that may impact every segment of TVA's operations. Culture is a reflection of a corporate mindset and a part of the change that is occurring at TVA is a review of compliance processes along with education of TVA employees to alter the corporate mindset. This change has implications for how TVA employees see environmental compliance issues. This is perhaps TVA's single largest challenge in becoming a more responsible environmental steward.

The top challenges pertaining to TVA's environmental performance include: (1) increased environmental regulations related to SO₂, NO_x, mercury, CO₂, and disposal of coal ash; (2) cleanup of the Kingston Fossil Plant ash spill; (3) the remediation or stability improvement at TVA fossil plant ash and gypsum impoundments; (4) mandated renewable portfolio standards; and (5) the ability to maintain TVA's current low cost of power while meeting environmental regulations.

Increased Environmental Regulations

TVA's power generation activities, like those across the utility industry and in other industrial sectors, are subject to federal, state, and local environmental statutes and regulations. Major areas of regulation affecting TVA's activities include air quality control, water quality control, and management and disposal of solid and hazardous wastes. TVA has incurred, and expects to continue to incur, substantial capital and operating and maintenance costs to comply with evolving environmental requirements primarily associated with the operation of TVA's 59 coal-fired generating units. While these evolving requirements will impact the operation of existing and new coal-fired and other fossil-fuel generating units across the industry, it is highly likely that environmental requirements placed on the operation of these generating units, including TVA's, will continue to become more restrictive.

As indicated in TVA's FY 2009 Securities and Exchange Commission 10-K filing, TVA is subject to risks from existing and proposed federal, state, and local environmental laws and regulations including, but not limited to, the following:

- TVA may incorrectly anticipate the cost of compliance with existing and proposed environmental laws and regulations.
- TVA may be forced to consider shutting down some older facilities because it may be uneconomical for TVA to install the necessary equipment to comply with future environmental laws.
- TVA may be responsible for on-site liabilities associated with the environmental condition of facilities that it has acquired or developed, regardless of when the liabilities arose and whether they are known or unknown.
- TVA may be unable to obtain or maintain all required environmental regulatory approvals. If there is a delay in obtaining any required environmental regulatory approvals or if TVA fails to obtain, maintain, or comply with any such approval, TVA may be unable to operate its facilities or may have to pay fines or penalties.

Several existing regulatory programs that apply to fossil-fuel units are becoming more stringent, and additional regulatory programs affecting fossil-fuel units were promulgated in 2005. These regulatory programs include the Clean Air Interstate Rule (CAIR) and the Clean Air Mercury Rule (CAMR).

Recent Court Rulings Regarding CAIR and CAMR Lead to Increased Uncertainty

CAIR required significant additional utility reductions of emissions of SO₂ and NO_x in the eastern half of the United States (including all of TVA's operating area), and CAMR established caps for overall mercury emissions in two phases with the first phase becoming effective in 2010 and the second in 2018. CAIR and CAMR were rejected in 2008 leading to increased uncertainty about emission reduction requirements and potential costs. CAIR has since been reinstated awaiting a potential replacement rule. In addition, there could be additional material costs if reductions of CO₂ are mandated.

Utility SO₂ emissions are currently regulated under the Federal Acid Rain Program and state programs designed to meet EPA's National Ambient Air Quality Standards (NAAQS) for SO₂ and fine particulate matter. Utility NO_x emissions continue to be regulated under state programs to achieve and maintain NAAQS for ozone, the Federal Acid Rain Program, the NO_x State Implementation Plan (SIP) Call Program, and the Regional Haze Program. In 2008, the EPA issued final rules which adopted more stringent NAAQS for ozone.

TVA had previously estimated its total capital cost for reducing emissions from its power plants from 1977 through 2010 would reach \$5.5 billion, of which \$5.3 billion had already been spent as of September 30, 2009. TVA estimates that compliance with future Clean Air Act and mercury requirements, not including CO₂,

could lead to additional costs of \$4.9 billion in the decade beginning in 2011. TVA is now faced with uncertainty regarding future legislation to be enacted for these emissions, and increasingly stringent regulations will continue to result in significant capital and operating costs. If future legislative, regulatory, or judicial actions lead to more stringent emission reduction requirements, TVA's cost of power will be further impacted.

CO₂ Greenhouse Gas Emissions

CO₂ emissions from existing power plants are not currently regulated at the federal level. EPA's 2006 greenhouse inventory showed power plant CO₂ emissions were 29 percent higher than they were in 1990. The United States Supreme Court found in April 2007 that EPA has clear statutory authority to regulate greenhouse gases. This ruling opened up the possibility for regulation of power plant greenhouse gas emissions under the existing Clean Air Act. If legislation is passed pertaining to CO₂ air emissions, TVA will incur significant costs and there will most likely be substantial rate increases to distributors and therefore in all probability to TVA Valley consumers of electric power as well.

Legislation has been introduced in Congress to require reductions of CO₂ and, if enacted, will result in significant additional costs for TVA and other utilities with coal-fired generation. TVA was the first utility to participate in "Climate Challenge," a Department of Energy (DOE) sponsored voluntary greenhouse gas reduction program. In the past decade TVA has reduced, avoided, or sequestered over 305 million tons of CO₂. TVA also participates in DOE's Climate VISION program to help meet a national goal of reducing the greenhouse gas intensity of the United States by 18 percent from 2002 to 2012.

TVA has taken and is continuing to take significant voluntary steps to reduce the carbon intensity of its electric generation, including the recovery of Browns Ferry Unit 1, planned power uprates of certain nuclear units, the planned completion of Watts Bar Unit 2, and the completion of the hydroelectric modernization program. TVA has also applied to the Nuclear Regulatory Commission for a Combined License for two advanced nuclear reactors at the Bellefonte Nuclear Plant near Hollywood, Alabama, and the reactivation of the construction permits for the existing Bellefonte Nuclear Units 1 and 2, although no decision has been made to build the reactors.

Management reports TVA intends to make decisions that consider fuel mix and assets that are low or zero carbon emitting resources. In addition to these activities, TVA is incorporating the possibility of mandatory carbon reductions and a renewable portfolio standard (RPS) into its long-range planning and will continue to monitor legislative and regulatory developments related to CO₂ and a RPS to assess any potential financial impacts as information becomes available.

Coal Combustion Wastes

EPA determined in May 2000 that coal combustion and certain related wastes disposed of in landfills and surface impoundments are not regulated as hazardous waste. As part of this determination, the EPA committed to developing nonhazardous management standards for the waste. In 2007, the EPA issued a Notice of Data Availability in which it requested public comment on whether the information in the notice should affect the EPA's decisions as it continued to follow up on the commitment to develop management standards. After the Kingston Fossil Plant ash spill, the EPA announced that it had plans to issue new regulations for the management of coal combustion wastes.

These proposed new regulations were issued by EPA on May 4, 2010. The proposed new rule would increase the regulation of coal combustion waste surface impoundments, including regulation of coal ash under the Resource Conservation and Recovery Act (RCRA). The proposal calls for public comment on two options. One option will regulate coal ash management under RCRA Subtitle C which creates a comprehensive program of federally enforceable requirements for waste management and disposal. The other option includes remedies under RCRA Subtitle D which gives the EPA the authority to set performance standards for waste management facilities and would be enforced primarily through citizen suits. These regulations may require TVA to make additional capital expenditures, increase their operating and maintenance costs, or lead to shutting down certain facilities.

As part of their planned actions, the EPA (1) gathered coal ash impoundment information from electrical utilities nationwide, (2) is conducting on-site assessments to determine structural integrity and vulnerabilities, and (3) has made recommendations for facilities where assessments have been completed. Tennessee has enacted a law providing that any new coal ash disposal facility or expansion of existing facilities have a liner and a final cap. TVA has announced plans to convert remaining wet ash and gypsum facilities to dry storage and disposal. These projects have a projected cost of \$1.5 to \$2 billion.

Kingston Ash Spill Cleanup

As described above, the Kingston Fossil Plant ash spill resulted in a large quantity of ash released into the Emory River and onto surrounding land. TVA has committed to the cleanup and restoration of the river and affected areas. The estimated cost ranges from \$933 million to \$1.2 billion.¹⁹ There are various environmental entities providing guidance and oversight to TVA in its efforts.

TVA faces the challenge of cleaning the area without causing more harm. For example, TVA has designated ash recovery in waters directly east of the ash

¹⁹ The estimated cleanup cost of \$933 million to \$1.2 billion does not include estimates for (1) fines or regulatory directive actions, (2) outcome of lawsuits, (3) future claims, (4) long-term environmental impact costs, (5) final long-term disposition of ash processing area, (6) associated capital asset purchases, (7) ash handling and disposition from current plant operations, and (8) remediating any discovered mixed waste during the ash removal process.

storage area as "time-critical" because removing it quickly reduces the chance that the ash will move downstream, restores flow, reduces flood risk, and allows for recreation to resume in selected areas.

TVA also faces the challenge of restoring its damaged reputation with local residents and businesses. TVA has provided a \$43 million grant to the Roane County Economic Development Foundation to help offset the impact of the spill and the site-recovery operations. TVA has also provided medical screenings for area residents who believe their health may have been affected by the spill.

TVA Fossil Plant Ash and Gypsum Impoundments

As a result of the Kingston Fossil Plant ash spill, TVA began a comprehensive assessment of its ash and gypsum impoundments. These assessments, with the support of contractors, included (1) geotechnical explorations; (2) stability, hydrologic, and hydraulic analysis; and (3) remediation engineering and workplan development, and conceptual designs. As issues have been identified, workplans have been developed and, in many cases, the actual work has been initiated or completed. However, an extensive list of required remediation activities has been developed and is being added to as needed. TVA faces the challenge of addressing all needed ash and gypsum impoundment improvements and raising the factor of safety to its newly adopted standard of 1.5 for static slope stability, which is in accordance with industry-accepted practices as prescribed by many including the United States Army Corps of Engineers.

TVA has said it is committed to be an industry leader in the management of coal combustion by-products and has developed a plan to:

- Convert the six coal burning plants using wet fly-ash handling systems to dry systems.
- Convert the wet bottom-ash systems at all 11 TVA coal burning plants to dry storage.
- Close 18 existing ash and gypsum ponds and build 4 gypsum dewatering facilities.

The projected cost of TVA's plan over 8 to 10 years is \$1.5 to \$2 billion. However, the capital projects are subject to completion of environmental reviews and obtaining needed regulatory approvals, which adds to the challenges. TVA has stated that this plan will eliminate the classification of any TVA impoundment as a high-hazard risk, as in accordance with National Dam Safety Guidelines.²⁰

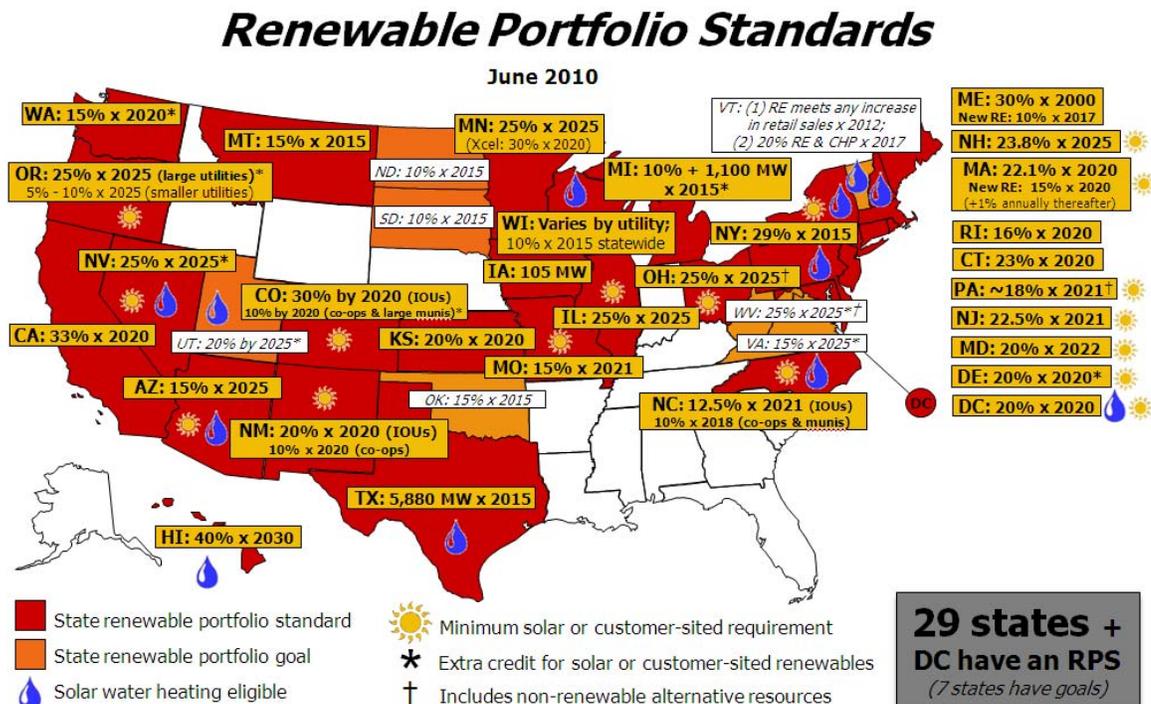
²⁰ The National Dam Safety Guidelines "High" hazard classification is based on the possible consequences if an impoundment fails and is not an assessment of the structural integrity of an impoundment or the likelihood that the impoundment will fail.

Renewable Portfolio Standards

TVA has committed to investing in renewable energy sources. Currently, there are no federal mandates requiring utilities to produce a certain percentage of energy from renewable resources, however, TVA believes that it is likely to happen. Many states have proactively created their own requirements, called Renewable Portfolio Standards (RPS). As of June 2010, the only states TVA serves that have created an RPS are North Carolina, which has a mandatory program, and Virginia, which has a voluntary program.

Figure 28 shows states that have implemented RPS. TVA's Environmental Policy noted that TVA faces a barrier for implementing more Renewable Energy Sources as the Valley has a limited supply of renewable energy to support carbon and clean-energy initiatives.

Figure 28



Source: www.dsireusa.org

As stated by management, TVA and local public power companies, working in cooperation with the environmental community, developed the Green Power Switch program as a way to bring green power electricity that is generated by renewable resources such as solar, wind, and methane gas to Valley consumers. The Generation Partners Program of the Green Power Switch provides support and incentives for the installation of solar and wind generating facilities, as well as low impact hydro and biomass. For example, participants currently receive a \$1,000 incentive to help offset start-up costs.

As shown in Figure 29, TVA's generation from green power for the period January 2009 through December 2009 was only about 71.8 million kilowatt-hours. Renewable energy sold under TVA's Green Power Switch program cannot be used for compliance purposes such as meeting Renewable Portfolio Standards.

Figure 29 Green Power Sites and Generation for the period January 2009 through December 2009.

Green Power Switch Generation

Kilowatt-hours (kWh)

Solar Power Sites		Jan 09 – Dec 09
TVA-Owned Solar		212,690
Generation Partners (Solar)		535,160
Total solar generation		747,850

Wind power site		Jan 09 – Dec 09
Buffalo Mountain Wind Park		51,102,620
Generation Partners (Wind)		9,360
Total Wind Generation		51,111,980

Methane gas site		Jan 09 – Dec 09
City of Memphis Wastewater Treatment Facility		19,962,870

Green Power Switch Total Generation		71,822,700
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Source: www.tva.gov/greenpowerswitch

Ability to Maintain TVA's Current Low-Cost of Power

As noted in TVA's 2007 Strategic Plan, one of the three parts of TVA's mission is to supply reliable, affordable electricity to the Tennessee Valley region. Future changes in environmental legislation may make that difficult for TVA to do. As discussed above, TVA may be subject to increasingly stringent environmental requirements.

In the TVA Environmental Policy, TVA's President and Chief Executive Officer stated that future decisions regarding environmental areas could put upward pressure on electric prices. TVA has identified several goals that would help mitigate potential costs from environmental legislation. These include reducing load growth, adding renewable energy and low-carbon energy sources, and

potentially mothballing several older fossil units. However, TVA may find these hard to do in the face of increasing demand. While we recognize that demand for TVA's power has decreased significantly as a result of the current economic downturn, in the long term this situation will likely reverse itself. The environmental policy states that TVA's coal generation remains an important resource to meet TVA's mission to deliver low-cost power. However, as noted above, future greenhouse gas legislation could have a substantial impact on the rates to consumers.

Additionally, the cost of the Kingston Fossil Plant ash spill cleanup, estimated between \$933 million and \$1.2 billion, may impact the cost of power. However, actual costs could substantially exceed estimated costs if, among other things, TVA has to remove more ash than it anticipates, additional environmentally sensitive material is uncovered in the river sediment, delays of the ash removal process occur, or the methods of final remediation change.

Finally, TVA may be subject to increased costs due to litigation. For example, TVA is involved in a lawsuit filed by the State of North Carolina in connection with emissions from TVA's coal-fired power plants. TVA already has made capital expenditures to decrease emissions from some of the facilities, but the U.S. District Court for the Eastern District of North Carolina has ordered significant additional investments and compliance in a time frame that is shorter than TVA had originally planned. TVA's current estimate of costs to comply with the court order is \$1.7 billion, of which \$1.1 billion would be for unplanned investment. Management is evaluating alternatives that could change these amounts in the future. TVA appealed the court's decision and on July 26, 2010, the Fourth U.S. Circuit Court of appeals unanimously overturned the lower court's decision and also instructed the lower court in North Carolina to dismiss the case. North Carolina can either seek a rehearing before the full appeals court or appeal to the U.S. Supreme Court.

Definition of TVA's Industry-Accepted Benchmarks (2008)

Measures	Definition
Nitrogen Oxide (NO_x) Emissions	NO _x is measured by the number of tons emitted divided by megawatt hours. (NO _x Emissions aligns with TVA's environmental objective for Air Quality Improvement.)
Sulfur Dioxide (SO₂) Emissions	SO ₂ Emissions is measured by the number of tons emitted divided by megawatt hours. (SO ₂ Emissions aligns with TVA's environmental objective for Air Quality Improvement.)
Carbon Dioxide (CO₂) Emissions	CO ₂ Emissions is measured by the number of tons emitted divided by megawatt hours. (CO ₂ Emissions aligns with TVA's environmental objective for Climate Change Mitigation.)
Renewable Generation	Renewable Generation consists of sustainable and often naturally replenished generating sources such as hydro, wind, solar, methane, biomass, and geothermal. TVA monitors total renewable generation as well as total renewable generation as a percent of total generation. (Renewable Generation aligns with TVA's environmental objective for Climate Change Mitigation.)
Clean Energy Generation	Clean Energy Generation consists of zero or low carbon sources including nuclear, renewables (including hydro), and other nonfossil sources such as waste heat. TVA monitors total clean energy generation as well as total clean energy generation as a percent of total generation. (Clean Energy Generation aligns with TVA's environmental objective for Climate Change Mitigation.)
Reportable Environmental Events (REEs)	REEs is a measure of the total number of REEs. REEs are defined as environmental events at a TVA facility or elsewhere caused by TVA or TVA contractors that violates regulatory requirements and triggers oral or written notification to, or enforcement of action by, a regulatory agency. REEs include Notice of Violations, Spills to Water, Clean Water Act Nonconformances, and Reportable Quantity Releases when it is a violation of a regulatory requirement.

Measures	Definition
Environmental Fines	Environmental Fines are amounts paid to a Regulatory Agency in connection with a Regulatory Enforcement Action.
Low-Level Radioactive Waste	Low-Level Radioactive Waste is a measure of the total amount of low-level radioactive waste disposed of. This includes ion-exchange resins, compactable and non-compactable contaminated trash, mechanical filters, tank residue, and irradiated reactor components. (Low-Level Radioactive Waste aligns with TVA's environmental objective for Waste Minimization.)
Office Recyclables	Office Recyclables is a measure of the amount of recyclable materials coming from office-type environments. These include paper, glass, aluminum, cardboard, plastic, and steel from cans. (Office Recyclables aligns with TVA's environmental objective for Waste Minimization.)
Elimination of Polychlorinated Biphenyls (PCBs) from Large Equipment	Elimination of PCBs from Large Equipment is a measure of the reduction of TVA's PCB equipment. (Elimination of PCBs from Large Equipment aligns with TVA's environmental objective for Waste Minimization.)
Coal Combustion Products Utilized	Coal Combustion Products Utilized is a measure of the amount of coal combustion products (fly ash, bottom ash, and scrubber gypsum) recycled, rather than disposed of, from fossil plant sites. (Coal Combustion Products Utilized aligns with TVA's environmental objective for Waste Minimization.)
Certified Clean Marinas	Certified Clean Marinas measures the annual percentage of marinas participating in the Tennessee Valley Clean Marina Initiative (CMI). (Certified Clean Marinas aligns with TVA's environmental objective for Water Resource Protection and Improvement.)

Source: TVA Benchmark Performance provided by Environment and Technology personnel.

Definition of TVA's Industry Soft Measures (2008)

Measures	Definition
Energy Demand Reduction	Energy Demand Reduction is the measure of cumulative demand reductions, measured in megawatts, achieved through demand side management and efficiency programs which emphasize activities that reduce demand for TVA power. (Reducing Energy Demand aligns with TVA's environmental objective for Climate Change Mitigation.)
Minimum Flow	Minimum Flow is TVA's method to improve water quality at 29 locations to minimize adverse environmental impacts to aquatic life and supports potable water quality for Tennessee Valley citizens. Locations include dams and other river sites where minimum flow criteria have been established. (Minimum Flow aligns with TVA's environmental objective for Water Resource Protection and Improvement.)
Dissolved Oxygen (DO) Deficit Due to Forced Outages	Dissolved Oxygen Deficit Due to Forced Outages is a measure of the deficit of dissolved oxygen cause by forced outages of the aeration systems at 15 dams. For each of the 15 dams, when the aeration system is not available due to a forced outage and the dissolved oxygen falls below the established target, it is counted as "DO deficit due to forced outage." (Dissolved Oxygen Deficit Due to Forced Outages aligns with TVA's environmental objective for Water Resource Protection and Improvement.)
Reservoir and Tailwater Quality Gap	The Reservoir Water Quality Gap is an indicator of overall water quality conditions and health of major reservoirs operated by TVA. The Tailwater Quality Gap is an indicator of biological conditions downstream of selected TVA dams. (Reservoir and Tailwater Quality Gap aligns with TVA's environmental objective for Water Resource Protection and Improvement.)

Measures	Definition
Sulfur Hexafluoride (SF₆)	SF ₆ emission rate is defined as total emissions in lbs divided by total nameplate capacity (i.e., the total quantity of SF ₆ contained in electrical equipment). (SF ₆ aligns with TVA's environmental objective for Climate Change Mitigation.)
Land Health	Land Health is a measure of the amount of actively managed acres of reservoir land that meet desired condition as defined by the reservoir land management plan for that land. (Land Health aligns with TVA's environmental objective for Sustainable Land Use.)

Source: TVA Benchmark Performance provided by Environment and Technology personnel.

OBJECTIVE, SCOPE, AND METHODOLOGY

The objectives of our environmental performance review were to assess (1) how TVA evaluates and tracks performance (i.e., performance measures) and (2) TVA's overall performance (i.e., performance results). The scope of our review included any measures used by TVA to track environmental performance and industry best practices regarding environmental performance. To achieve our objectives, we:

- Interviewed key TVA personnel to determine:
 - How TVA currently measures environmental performance.
 - Whether TVA has implemented initiatives to improve performance.
 - Whether TVA currently benchmarks its environmental performance.
- Reviewed TVA's current strategic plan and performance goals to identify TVA's published strategic objectives, goals, and critical success factors.
- Analyzed information obtained through research and from Environment and Technology personnel to determine (1) what measures TVA currently uses to track environmental performance, (2) whether measures being used align with TVA's current strategic plan, and (3) how TVA is doing compared to the industry and the goals it set for itself.
 - We obtained documentation from key TVA personnel and/or TVA's Web site on TVA's environmental performance, including third-party benchmarking data. Other data and information was obtained from various sources, including published documents and competitors' publicly available information.

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

June 30, 2010

Richard W. Moore, ET 4C-K

DRAFT INSPECTION 2007-11402 - REVIEW OF TVA'S ENVIRONMENTAL PERFORMANCE RESULTS

Thank you for the opportunity to review Draft Inspection 2007-11402 - Review of TVA's Environmental Performance Results. In support of TVA's commitment to fulfilling its environmental responsibilities and meeting Environmental Policy objectives, it is very important that TVA's performance be adequately evaluated and measured. The Office of the Inspector General inspection report is a helpful element to support continuous improvement objectives in this area.

In response to your request for comments, a review was conducted by Environment and Technology staff, as well as other TVA organizations, including the Office of the General Counsel, Nuclear Generation, and Fossil Generation, Development and Construction. Comments from this collaborative review are attached for your consideration.

In addition to the substantive comments attached, a list of administrative or clarifying comments have been provided directly to Greg Jaynes, Deputy Assistant Inspector General, of your staff.

We compliment the professionalism exhibited by your staff during this environmental performance inspection. If you have questions, or if further clarification is needed, please contact me at (865) 632-8511.



Anda A. Ray
Senior Vice President
Environment and Technology
WT 11A-K

AAR:JJW
Attachment
cc (Attachment):

Kimberly S. Greene, WT 7B-K
Janet C. Herrin, WT 7A-K
Tom Kilgore, WT 7D-K
William R. McCollum, Jr., LP 6A-C
Ralph E. Rodgers, WT 6A-K
John M. Thomas III, MR 3A-C
EDMS, WT 11A-K

**Comments on Draft Inspection 2007-11402 -
Review of TVA'S Environmental Performance Results**

Page 2: The second paragraph discusses industry accepted and soft benchmarks. It is recommended that a more descriptive and comprehensive definition of benchmarkability be included, as follows:

Benchmark Definitions:

Industry Accepted Benchmark: A minimum of seven comparable data points (seven plus TVA's information = eight data points), from which quartile comparisons can be made, with all data points coming from utility companies and/or non-utility business entities with like processes. In some cases if there are fewer than seven companies, the benchmark data may be considered industry acceptable. Age of data is preferably within a three-year range, but no more than five years removed from current year.

Soft Benchmark: Less than seven comparable data points, and/or the way in which the data is accrued at the benchmarked entities are questionable and inconsistent. The benchmarked data may also be considered soft if the data comes from a third party mechanism such as an industry study or consultant, but the data may be difficult to verify. The benchmarked data may also be considered soft if the information is non-quantitative, yet industry agreed upon, or if the data is five or more years old.

Probable Benchmark: No benchmark data has been identified to date; however, there is significant indication that soft and/or industry accepted comparable data does exist.

No Benchmarks: No benchmark data has been identified to date, and there is low likelihood that soft or industry accepted benchmark data will be uncovered.

Page 3: The evidence does not support referring to the Kingston event as "one of the largest environmental disasters in U.S. history." While the Kingston event has been characterized this way in the past, it is perhaps not appropriate to continue to say this, given recent events and scientific data. The event was large in terms of the amount of ash released and arguably "disastrous" in terms of financial or reputational impact; it is not supportable to state that the event was one of the most environmentally disastrous in history. The following statement near the bottom of page 4 of the draft more accurately describes the environmental impacts: "Results from studies thus far show no significant impacts on either water quality in the rivers or on the fish, birds, and other organisms living within the vicinity of the spill." These results, together with the facts that the ash release was mostly confined to a relatively small area and most of the ash will eventually be recovered, suggest that there likely have been many events in U.S. history with far more disastrous environmental impacts.

Executive Summary, Page ii: The report should refer to environmental "penalties" rather than "fines." Environmental statutes typically distinguish between "penalties," which are civil sanctions issued by administrative agencies for regulatory violations, and "fines," which are punishments imposed by a court upon conviction of a crime. Use of the word "fines" inaccurately suggests that TVA has been convicted of crimes.