Memorandum from the Inspector General, ET 4C-K

November 23, 2009

TVA Board of Directors

FINAL REPORT – INSPECTION 2007-11400 – REVIEW OF TVA'S OPERATIONAL PERFORMANCE RESULTS

Attached is the final report which answers the basic question of "How is TVA doing in regard to operational performance." This report incorporates informal comments on this report, which were provided by William R. McCollum Jr., Chief Operating Officer.

This review is the third 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 operational performance as well as its financial, environmental, 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

HRK:JP
Attachment
cc (Attachment):
Peyton T. Hairston Jr., WT 7B-K
Tom D. Kilgore, WT 7B-K
John E. Long Jr., WT 7B-K
William R. McCollum Jr., LP 6A-C
David Ross Mould, WT 7B-K
Emily J. Reynolds, OCP 1L-NST
OIG File No. 2007-11400

Tennessee Valley Authority
Office of the Inspector General

Inspection Report

REVIEW OF TVA'S OPERATIONAL PERFORMANCE

Inspection 2007-11400
November 23, 2009

TABLE OF CONTENTS

Executive Summary i

Reliability ii
Efficiency ii
Safety ii
Management Challenges iii

Background 1

System Reliability 4

TVA Performs Well on Four Key Reliability Measures 4
TVA's Capacity Reserve Margin is Appropriate but Declining 8

System Efficiency 10

TVA's Results Mixed on Five Key Measures of Generating Asset Performance 11
TVA's Delivered Cost of Power is Relatively Low 21
TVA's Non-Fuel Operations and Maintenance Costs are Relatively High 23

System Safety 28

Management Challenges 31

Aging Generation Fleet and Transmission System 31
Potential Problems for TVA in Attracting and Retaining Skilled Workers 32
Meeting an Increased Demand for Power 33
Legacy Culture 36

Objective, Scope, and Methodology 38

EXHIBITS

Exhibit 1: Power Supply From TVA-Owned Generation Facilities for the Years Ended September 30, 2004–2008 (Millions of Kilowatt-Hours) 2
Exhibit 2: TVA's Key "Winning Performance" Metrics 3
Exhibit 3: Load Not Served Benchmark, 3-Year Averages for 2005–2007 5
Exhibit 4: Connection Point Interruption Benchmark, 3-Year Averages for 2005–2007 6
Exhibit 5: System Average Interruption Frequency Index for Calendar Year 2006 7
Exhibit 6: System Average Interruption Duration Index, Delivery Point for Calendar Year 2006 7
Exhibit 7: Demand for TVA Power for the 10-Year Period Ending July 2006 (in Megawatts) 9
Exhibit 8: Fossil Power Group Equivalent Availability Factor 2003–2006 Benchmark Data 12
Exhibit 9: TVA Pumped-Storage Equivalent Availability Factor Compared to Industry 13
Exhibit 10: TVA Conventional Hydropower Equivalent Availability Factor Compared to Industry 14
Exhibit 11: TVA Nuclear Power Group Unit Capability Factor Compared to Industry, Third Quarter 2008 15
Exhibit 12: TVA's Nuclear Power Group Unit Capability Factor Compared to Industry Benchmarks, 2004–2008 16
Exhibit 13: Fossil Power Group Equivalent Forced Outage Rate 2004–2006 Benchmark Data 17
Exhibit 14: TVA Pumped-Storage Hydropower Equivalent Forced Outage Rate Compared to Industry 18
Exhibit 15: TVA Conventional Hydropower Equivalent Forced Outage Rate Compared to Industry 19
Exhibit 16: Nuclear Power Group Forced Loss Rate Third Quarter 2008 Institute of Nuclear Power Operations Cycle Average 20
Exhibit 17: Unplanned Automatic SCRAM Trend, 2004–2008 21
Exhibit 18: Delivered Cost of Power 2005–2007 Benchmark Data 22
Exhibit 19: Delivered Cost of Power Trends, 2004–2007 23

EXHIBITS (cont.)

Exhibit 20: Total Non-Fuel Operations and Maintenance Per Megawatt-Hour Sales Trend, 2000–2008 25
Exhibit 21: Retail Rate Benchmark Data 27
Exhibit 22: Safe Workplace 2007 Edison Electric Institute Benchmark Data – 62 Utilities 29
Exhibit 23: 2008 Supply Mix and Cost 35
Exhibit 24: Cumulative Market Price Increases for Purchased Power 36

EXECUTIVE SUMMARY

This is the third in a series of inspections to assess how the Tennessee Valley Authority (TVA) is performing in four 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 "operational performance." Specifically, the report assesses the performance of TVA's power system in three key areas:

- System reliability,
- System efficiency, and
- System safety.

In conducting this review we: (1) assessed key performance measures and their alignment with the key strategic objectives, (2) evaluated TVA's performance relative to key performance indicators by using target metrics and available benchmark information, and (3) identified key management challenges confronting TVA.

In evaluating TVA's operational performance results, we considered how TVA's results compare to (1) those of others and (2) the goals TVA sets for itself, as shown in the table below. We also considered TVA initiatives for improving future performance.

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?	• Measured results compare favorably with peer group for most of the key metrics. • Measured results achieve TVA's goals.	• Measured results compare favorably with peer group for several of the key metrics. • Measured results achieve a portion of TVA's goals.	• 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. In addition, TVA's Chief Operating Officer (COO) was provided a draft of this report for review and requested to provide formal or informal comments. The COO provided some informal comments for consideration, which we addressed in the report.

Summary of Findings

TVA's performance is positive with respect to system reliability and safety. However, system efficiency could be improved. In summary:

- **Reliability:** One of TVA's primary responsibilities is to serve as a reliable and cost competitive source of electric power to its customers. TVA has performed exceptionally well in terms of system reliability, delivering electric service with 99.999 percent reliability. TVA also performed better than the industry at large in all its key reliability performance metrics. In addition, TVA has maintained an adequate capacity reserve margin, which has contributed to this strong reliability performance. However, the reserve margin is declining at a time when establishing higher levels of reserves is being considered, as new industry prudency standards are being promulgated. To respond to this condition, TVA must either augment its inventory of generating capacity or have a more pronounced reliance on the wholesale market. Both options hold management challenges related to the cost of power and capital deployment.

- **Efficiency:** System efficiency is a measure of the effectiveness of TVA's expenditures on the operations and maintenance of its generation fleet. Additional focus in this area is warranted. Specifically, higher than average forced outage rates, especially for its fossil units, have negatively impacted TVA's system efficiency performance. In addition, while TVA's delivered cost of power ranked in the second quartile of a selected peer group, its average non-fuel operations and maintenance costs ranked only in the third quartile. High operations and maintenance costs coupled with low plant availability combined to depress TVA's efficiency metrics. Two things clearly impacted TVA's efficiency performance:

  - **An Aging Fossil Generation Fleet** – As units age, their operations and maintenance costs rise, especially as significant capital expenditures are required to replace aging equipment. Environmental retrofit and related costs contribute materially to the higher cost profile of older units. Additionally, outages with their attendant costs also occur more frequently with an aging fleet.

  - **Reduced Availability of Hydroelectric Power** – TVA's delivered cost of power has been affected by the reduced availability of its hydroelectric power. The drought conditions experienced in the TVA region during 2007 and 2008 created operating conditions that reduced generating output from these facilities.

- **Safety:** TVA ranked in the first quartile based on the number of recordable injuries per 200,000 hours worked as based on data provided by the Occupational Safety and Health Administration and comparable data provided by the 2007 Edison Electric Institute Benchmark Data. However, the recent

death of a contractor employee involved in the Kingston Fossil Plant ash spill cleanup effort emphasizes to us that safety must be the first priority in everything we do.

Furthermore, the recent ash spill at the Kingston generating station also serves as a reminder that safety management includes risk assessment, and risk mitigation protocols as well. These programs should identify risks that may later manifest themselves into conditions that are capable of exposing TVA's employees, customers, and neighbors to environmental hazards and other safety matters. TVA is in the process of reviewing and revising its enterprise risk assessment program, with one of its objectives being to drive the risk management culture down into the organization so risks can be identified at the plant level.

- **Management Challenges:** TVA faces many significant management challenges in attaining and maintaining operational excellence. They include:

  - **An Aging Generation Fleet and Transmission System** – Management actions are necessary to resolve capital, operational expense, environmental, and safety issues associated with an aging hydroelectric, fossil, and nuclear generation fleet and transmission system. This is already a primary concern that has affected TVA's current performance, and ramifications of this condition will intensify in the future.

  - **An Aging Work Force** – Replacing an aging workforce over time to ensure that the institutional knowledge of the existing workforce that has contributed so substantively to dependability and safety is not lost but rather is transferred into the new employee base.

  - **Generation Mix** – Meeting generation supply needs with a different mix of generation sources to respond to both the increasing demand for power and more stringent environmental constraints that may be imposed through future legislation targeted at, among other things, reducing greenhouse gas emissions, implementing requirements for coal ash management and disposal, controlling mercury and carbon releases, and increasing renewable portfolio standards.

  - **Management Culture** – Identifying and addressing directly any underlying resistance to TVA policies and procedures across the enterprise. As we noted in a recent report on conditions surrounding the ash slide at Kingston,[i] for TVA to avoid other such events, the culture at TVA must be accurately assessed, compliance with new policies and procedures must be measured with appropriate metrics, and employees must be educated to think differently about TVA business, operational, and safety practices. Based on

[i] Inspection 2008-12283-02, Review of the Kingston Fossil Plant Ash Spill Root Cause Study and Observations About Ash Management.

an independent investigation conducted by McKenna Long & Aldridge (McKenna), which was commissioned by the TVA Board and the Office of the Inspector General (OIG) inspection following the Kingston ash spill, the TVA Board directed management to develop an extensive remediation plan to ensure best practices in areas such as governance and accountability, corporate culture, and organizational effectiveness. The remediation plan seeks to eliminate deficiencies in systems, standards, controls, and corporate culture identified by the OIG and McKenna.

BACKGROUND

The United States is facing an economic and energy crisis that poses significant challenges to the Tennessee Valley Authority (TVA). TVA is in the throes of making strategic decisions that will effect generations of Valley residents. TVA's performance must be all the more transparent to all its stakeholders, and a high-performing, competitive, and forward-thinking TVA is more critical now than ever before. TVA's strategic decisions are likely to be subjected to greater scrutiny by Congress and the public due to the reputational harm inflicted both by the Kingston ash spill in December of 2008 and by the way the cause of the spill was presented as a technical matter without discussion of internal contributing factors, as discussed in the Office of the Inspector General (OIG) Inspection report *Review of Kingston Fossil Plant Ash Spill Root Cause Study and Observations About Ash Management*.[1] The Kingston fly ash spill will continue to exert financial and operational pressures on TVA. TVA estimates the range of likely costs for remediation of the Kingston spill to be between $933 million and $1.2 billion. This range could change significantly depending on whether new coal ash laws and regulations are implemented at the state or federal level.

The performance and reliability of TVA's assets are important not only for the financial health of TVA, but failure could result in health, safety, and environmental impacts. The strategic challenges facing TVA are complex and can best be addressed by fostering a shared vision with all its stakeholders, including management, employees, and customers. Such a shared partnership with transparent information flow, when executed in a structured and disciplined management program with well defined execution tactics, will contribute to improved operating performance and other primary determinates for sustainability.

TVA operates the nation's largest public power system. TVA's power generating facilities in operation at September 30, 2008, included 29 conventional hydroelectric sites, 1 pumped-storage hydroelectric site,[2] 11 coal-fired sites, 3 nuclear sites, 11 combustion turbine sites,[3] 2 diesel generator sites, 1 wind

[1] As has been widely reported in the media, on December 22, 2008, a dike failed at Kingston, allowing approximately 5 million cubic yards of water and coal fly ash to flow out onto approximately 300 acres, primarily Watts Bar Reservoir and shoreline property owned by the U.S. and managed by TVA. TVA had originally estimated 50 acres of property not managed by TVA had been affected by the spill. Fly ash is a by-product of a coal-fired plant and, according to Tennessee Department of Health, may contain the following metals: arsenic, beryllium, cadmium, chromium, lead, selenium, thallium, and vanadium.

[2] The plant works like a large storage battery. During periods of low demand, water is pumped from Nickajack Reservoir at the base of the mountain to the reservoir built at the top. It takes 28 hours to fill the upper reservoir. When demand is high, water is released via a tunnel drilled through the center of the mountain to drive generators in the mountain's underground power plant.

[3] TVA is constructing an additional combined cycle facility, Lagoon Creek Combined Cycle, which is currently scheduled to be in service in June 2010 and will have a summer net capability of 540 megawatts. Also, engineering and procurement of equipment is under way for the conversion of the Gleason simple cycle site to a combined cycle site. This conversion is expected to add approximately 375 megawatts of summer net capability and to be completed in January 2012.

energy site, 1 digester gas site (methane),[4] 1 biomass cofiring site,[5] and 15 solar energy sites. In addition, TVA acquires power under power purchase agreements of varying duration as well as short-term contracts of less than 24-hour duration (spot market).

Exhibit 1 summarizes TVA's net generation in millions of kilowatt-hours by generating source and the percentage of all electric power generated by TVA for the years indicated.

Exhibit 1: Power Supply From TVA-Owned Generation Facilities for the Years Ended September 30, 2004–2008 (Millions of Kilowatt-Hours)

	2008		2007		2006		2005		2004	
Coal-fired	98,752	62%	100,169	64%	99,598	64%	98,361	62%	94,618	61%
Nuclear	51,371	33%	46,441	30%	45,313	29%	45,156	28%	46,003	30%
Hydroelectric	6,685	4%	9,047	6%	9,961	6%	15,723	10%	13,916	9%
Combustion turbine and diesel generators	1,386	<1%	705	<1%	613	<1%	595	<1%	278	<1%
Renewable resources	39	<1%	27	<1%	36	<1%	47	<1%	35	<1%
Total	158,233	100%	156,389	100%	155,521	100%	159,882	100%	154,850	100%

Source: TVA Annual Report Pursuant to Section 13, 15(d), or 37 of the Securities Exchange Act of 1934 for the Fiscal Year Ended September 30, 2008, Page 15.

According to the 2007 TVA Strategic Plan, TVA's strategic objective for operations is to: **"Improve performance to be recognized as an industry leader."** Critical success factors in the plan include:

- Delivering reliable electric power generation and transmissions products and services;
- Benchmarking the industry's best performers to develop metrics for top-quartile performance;
- Making nuclear safety the overriding priority for each nuclear facility and for each individual associated with it;
- Continuing to reduce the impacts of TVA's operations on the environment;
- Serving as a responsible steward of the Tennessee River system; and
- Applying science and technological innovation to improve operational performance.

[4] The Allen Methane project co-fires wastewater-treatment digester gas (methane) with coal. The use of methane fuel eliminates the consumption of more than 20,000 tons of coal per year, reducing regional and local pollution.

[5] Cofiring is the use of two or more different fuels (e.g., wood and coal) simultaneously in the same combustion chamber of a power plant.

As shown in Exhibit 2, as part of its "Winning Performance" incentive plan, TVA currently has identified four key performance metrics to monitor TVA's performance toward successful implementation of its strategy.

Exhibit 2: TVA's Key "Winning Performance" Metrics

Measures	Definition
TVA Key Environmental Metrics (Index)	This measure will be addressed in detail in a separate report focusing on TVA's environmental performance as discussed above.
TVA Megawatt Demand Reduction (Megawatts/Reduced)	Measure of total incremental megawatt demand reduction potential from TVA-initiated energy efficiency and demand reduction activities, programs, projects, and pilots. The demand for TVA power has increased, at peak periods, by 23 percent over the past ten years. TVA seeks to exercise leadership in promoting conservation and encouraging the wise use of electricity.
TVA Demand Reduction ($$$ Per Kilowatt Reduced)	Quarterly measure of cumulative annual expenditures for energy efficiency and demand response activities divided by cumulative annual demand reduction potential identified.
TVA Equivalent Availability Factor (Percent)	Measure of actual available generation from all TVA Coal, Combined Cycle & Nuclear generating assets in a given period compared to maximum availability. According to TVA management, this measure is used to provide a simple, yet effective, measure of asset performance.

Source: TVA 2009 Balanced Scorecard.

In addition, TVA's performance has been rated in several categories for evaluating how TVA ranks against its peers. These include ratings of TVA's system reliability, efficiency, and safety.

SYSTEM RELIABILITY

Reliability for an electric system is, most simply, the extent to which consumers can obtain electricity from the system in the amount they want. In order to provide electricity to consumers in a reliable manner, organizations that generate and transmit electricity must ensure that the generating and transmission line capacities are adequate to meet demand. Most disturbances that affect consumers are caused by either plant shutdowns or adverse weather conditions affecting the electric distribution system. The cost of avoiding system outages is very high.

The TVA transmission system is one of the largest in North America. The system delivered nearly 176 billion kilowatt-hours of electricity in 2008 and has operated with 99.999 percent reliability over the last nine years in delivering electricity to customers. To the extent federal law allows access to the TVA transmission system, the TVA transmission organization offers transmission services to others to transmit power at wholesale in a manner that is comparable to TVA's own use of the transmission system. According to management, TVA has also adopted and operates in accordance with a published Standards of Conduct for Transmission Providers and appropriately separates its transmission functions from its marketing functions.

TVA Performs Well on Four Key Reliability Measures

TVA uses the SGS[6] Transmission Reliability Benchmarking Study for reliability data. Based on data from this study and on data calculated from this study by TVA personnel, TVA performed in top quartile or better in the following four key performance measures: load not served, connection point interruption frequency, system average interruption frequency index, and system average interruption duration index:

- For the period 2005-2007, TVA performed within the top decile on load not served, which is a measure of the magnitude and duration of transmission system outages that affect TVA customers, expressed in system minutes (see Exhibit 3). In fact, only one of the peer group participants performed better than TVA in this respect. Load not served excludes major events due to storms [load not served = (percent of total load not served) multiplied by (number of minutes in the period)].

- For the period 2005-2007, TVA performed in the top decile on connection point interruption frequency, which measures reliability from TVA's customer's

[6] SGS Statistical Services Inc. provides clients detailed, customized analysis of transmission and distribution reliability data. SGS is an SAS Institute ® Alliance Affiliate Member.

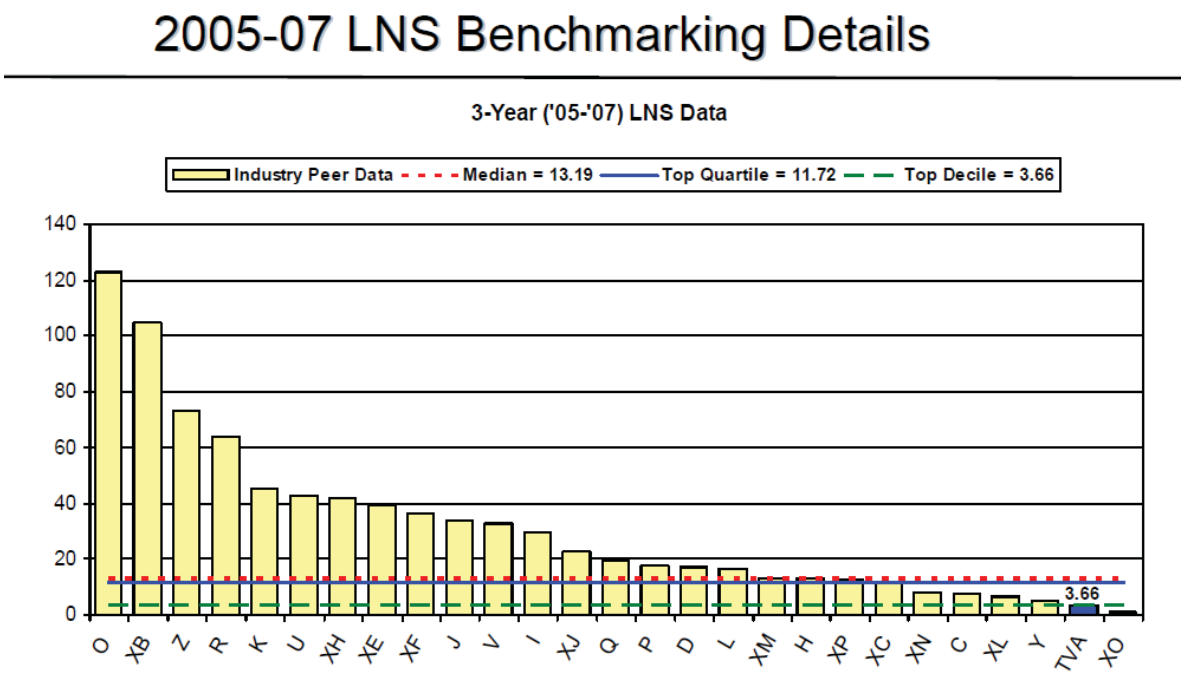
perspective (see Exhibit 4). It tracks interruptions of power, including momentary, at customer connection points caused by the transmission system [connection point interruption = number of interruptions/number of connection points (number of interruptions includes all interruptions regardless of duration)]. Connection point interruption excludes interruptions during declared major storms and is lightning normalized.

- For 2006, TVA performed 19 percent better than top quartile on the system average interruption frequency index, which is commonly used as a reliability indicator by electric power utilities (see Exhibit 5). System average interruption frequency index is the average number of sustained interruptions that a customer would experience and is calculated as total number of sustained customer interruptions divided by total number of customers served.

- For 2006, TVA performed 38 percent better than top quartile on system average interruption duration index, which is commonly used as a reliability indicator by electric power utilities (see Exhibit 6). System average interruption duration index is the average outage duration for customers served and is calculated as sum of all sustained customer interruption durations in minutes divided by total number of customers served.

Charts depicting this performance are shown below.

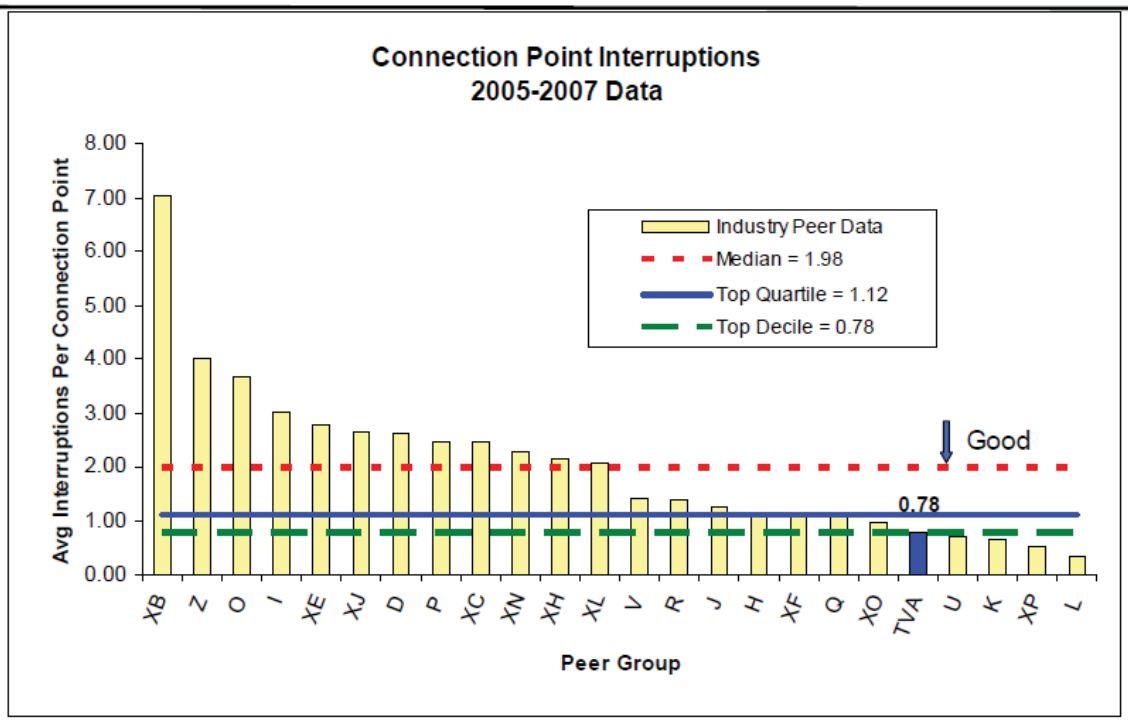
Exhibit 3: Load Not Served (LNS) Benchmark, 3-Year Averages for 2005-2007



Source: 2008 SGS Transmission Reliability Benchmarking Study Included in TVA Benchmarking Update, January 23, 2009, Page 40.

Exhibit 4: Connection Point Interruption Benchmark, 3-Year Averages for 2005–2007

2005-2007 CPI Benchmarking Update

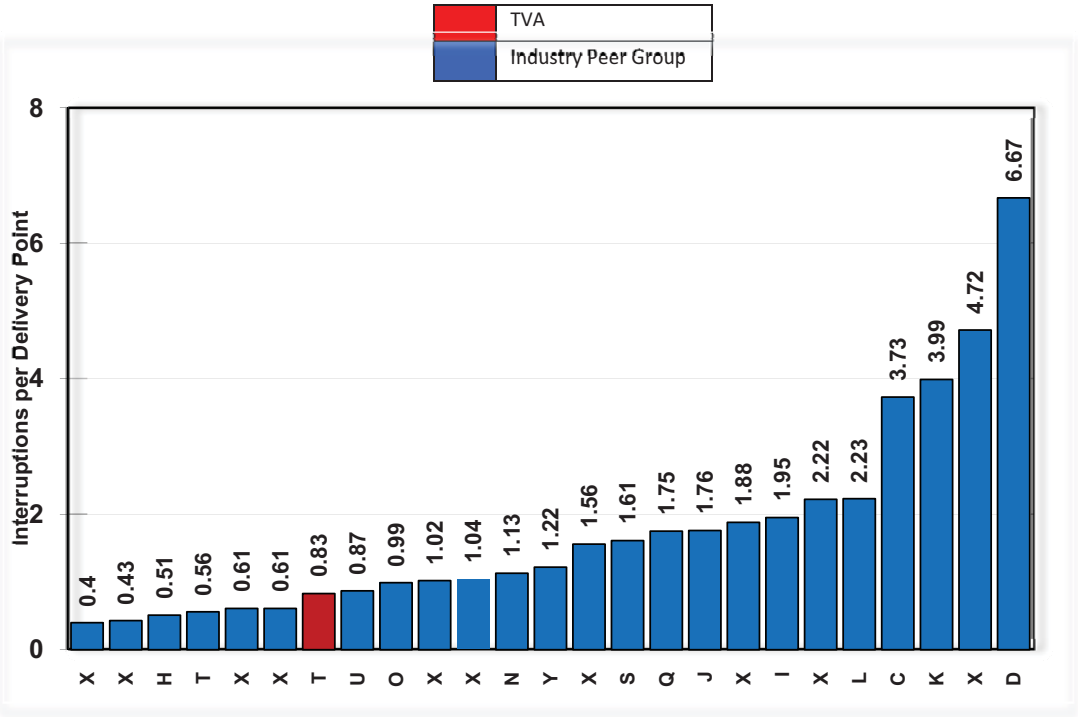


Observations:

- TVA was within top decile CPI in 2005-2007 study based on number of connection points.
- TVA was 5th out of 24 utilities.

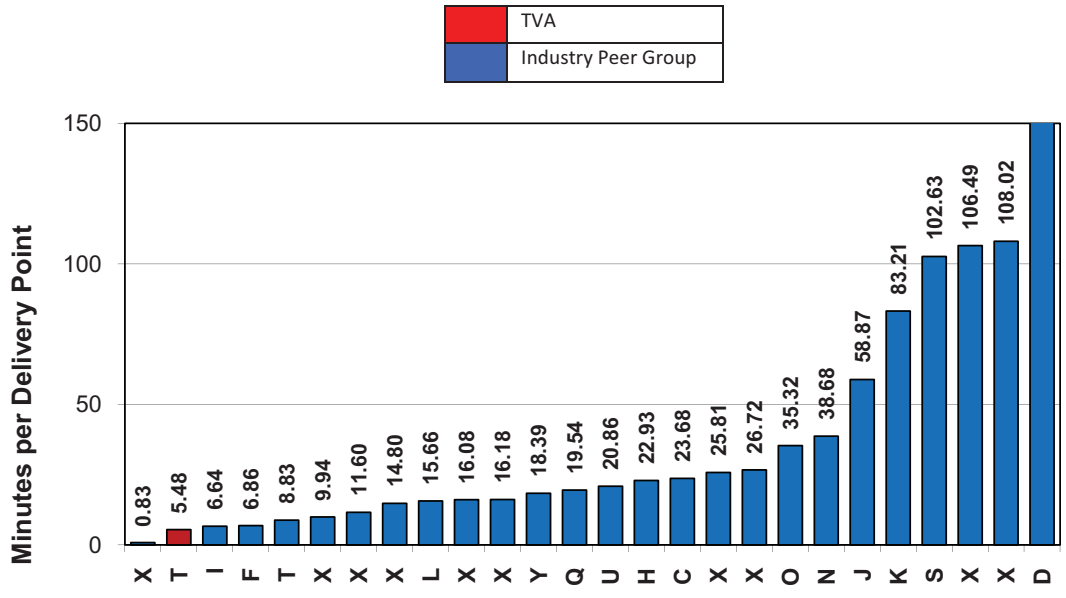
Source: 2008 SGS Transmission Reliability Benchmarking Study Included in TVA Benchmarking Update, January 23, 2009, Page 22.

Exhibit 5: System Average Interruption Frequency Index for Calendar Year 2006



Source: SGS Statistical Services Inc., 2007 Transmission Reliability Benchmarking Survey, Page 51.

Exhibit 6: System Average Interruption Duration Index, Delivery Point for Calendar Year 2006



Source: SGS Statistical Services Inc., 2007 Transmission Reliability Benchmarking Survey, Page 66.

TVA's Capacity Reserve Margin is Appropriate but Declining

Another commonly used measure in planning for adequate generating capacity reliability is capacity margin. Capacity margins indicate "the amount of generating capacity available to provide for scheduled maintenance, emergency outages, system operating requirements, and unforeseen electricity demand." They offer one of the simplest indications of how much generating capacity would be available above the projected peak demand if all capacity were online. Generating capacity should contain a reserve margin sufficient to cover unforeseen events such as temperature variations, higher than anticipated demands, and unplanned generation outages. Reserve margins that are too low indicate a greater risk of being unable to serve load from its own capacity and would either have to purchase energy, with attendant cost considerations, from the market if it is available, or risk unserved load if market-based power is not available. Alternatively, margins that are too high indicate poor planning by building more capacity than is needed to serve load, raising costs to its customers.

The historical reserve margin over the past five years in TVA's plan has been approximately 15 percent of the total TVA medium load forecasted demand. "A 15% reserve margin, calculated on firm needs, is in alignment with the reserve margins established by other entities in the utility industry, which range from 12% to 18%." While TVA is not subject to most Federal Energy Regulatory Commission regulations, the 2005 Energy Policy Act gave the Federal Energy Regulatory Commission full regulatory authority over the North American Electric Reliability Council reliability rules with enforcement ability. However, according to TVA officials, based on new operating reserve requirements, TVA is evaluating the risks and the drivers behind a proposed reserve margin change to 18 percent.

As shown in Exhibit 7, TVA's demand for power has increased since 1997, and forecasts showed reserve margins dropping below 15 percent in 2009. However, these forecasts were before the economic downturn. According to TVA management, the current economic conditions have resulted in a significant drop in demand, both for energy and capacity. Management further concluded that TVA is actually in pretty good shape for reserves this year and next. However, this decline does not take away the need to deal with reserve margins for the future, but it does give TVA a little more time to work on the issues.

Exhibit 7: Demand for TVA Power for the 10-Year Period Ending July 2006 (in Megawatts)

Source: *InsideTVA*, "Planning Today for Tomorrow's Power," March 2007.

SYSTEM EFFICIENCY

To achieve peak efficiency in the operations of its systems, TVA needs to hold unplanned outages to a minimum while managing its controllable costs to where they are competitive with other utilities. TVA must balance the need for reliability and cost control and get value for every dollar spent.

We assessed TVA's operational reliability/performance by looking at five key measures. Specifically, these measures were an overall TVA or strategic business unit Winning Performance Scorecard measurement in fiscal year 2008 and/or 2009. As discussed below, we found mixed results with regard to the five key measures we used, which are also used by TVA management to gauge performance in achieving system efficiency targets. The measures we used are:

- Equivalent availability factor, which is the ratio of actual available generation from all TVA-generating assets in a given period compared to maximum availability.[7] This is TVA's most prominent efficiency measure and is used to assess fossil and hydropower assets.

- Unit capability factor, a measure similar to equivalent availability factor, which TVA uses to assess its nuclear assets. Unit capability factor, which is the industry standard measure for nuclear efficiency, is the ratio of actual available generation compared to maximum available.

- Equivalent forced outage rate, which is the ratio of unplanned energy losses during the period compared to the maximum availability, excluding planned outages. TVA uses this measure to assess fossil and hydropower assets.

- Forced loss rate, which is the ratio of unplanned energy losses during the period compared to the maximum availability, excluding planned outages. TVA uses this measure to assess its nuclear assets.

- Unplanned automatic plant shutdowns, known as "SCRAMs"[8] or "trips" in the industry. SCRAMs are measured in terms of the number of unplanned automatic shutdowns that occur per 7,000 reactor critical hours.

[7] While the measurement used at the TVA level is a system-wide measure, equivalent availability factor performance is also measured for TVA's fossil and hydro generating groups.

[8] SCRAM stands for safety control rod axe man. The Nuclear Regulatory Commission defines SCRAM as the sudden shutting down of a nuclear reactor, usually by rapid insertion of control rods, either automatically or manually by the reactor operator.

To assess how TVA is managing its controllable costs with regard to system efficiency, we focused on TVA's delivered cost of power and non-fuel operations and maintenance expenses. As we discuss below, delivered cost of power was relatively low while non-fuel operation and maintenance expenses were relatively high.

TVA's Results Mixed on Five Key Measures of Generating Asset Performance

TVA's performance has been mixed on five key measures of generating asset performance: equivalent availability factor, unit capacity factor, equivalent forced outage rate, forced loss rate, and unplanned automatic SCRAMs. The results of TVA's benchmarking efforts with respect to these five key measures are highlighted in the following sections.

Equivalent Availability Factor Benchmarking Results

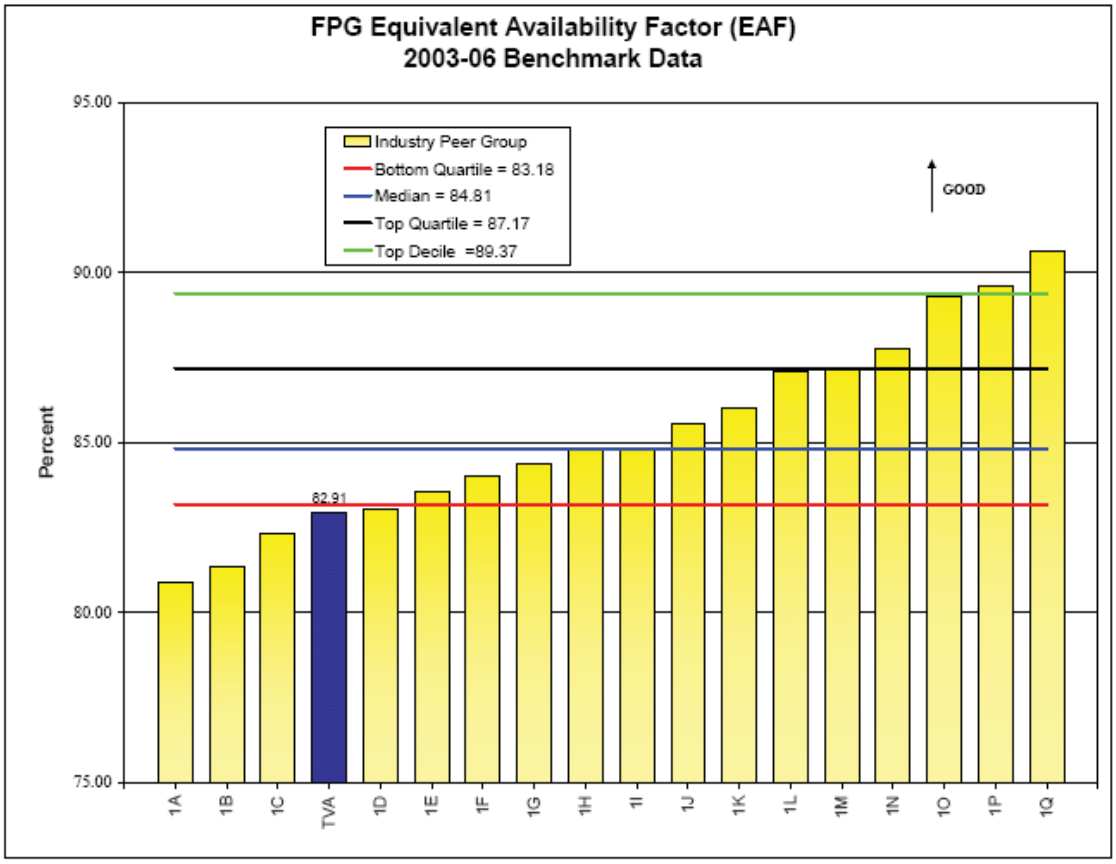
With respect to the equivalent availability factor measure, TVA's fossil assets performed below their peers, while TVA's hydropower assets had mixed results. From 2005-2007, pumped storage performed above top quartile in only one of the years, while conventional hydro[9] performed below top quartile all three years.

TVA has used information provided for the Federal Energy Regulatory Commission to compare TVA fossil fleet equivalent availability factor performance to a peer group that included 18 fossil utilities near the TVA service area.

[9] Conventional hydropower includes all units operated by TVA excluding the pumped-storage facility.

As shown in Exhibit 8, the performance of TVA's overall fossil fleet was in the bottom quartile over the four-year period 2003-2006.

Exhibit 8: Fossil Power Group (FPG) Equivalent Availability Factor 2003-2006 Benchmark Data

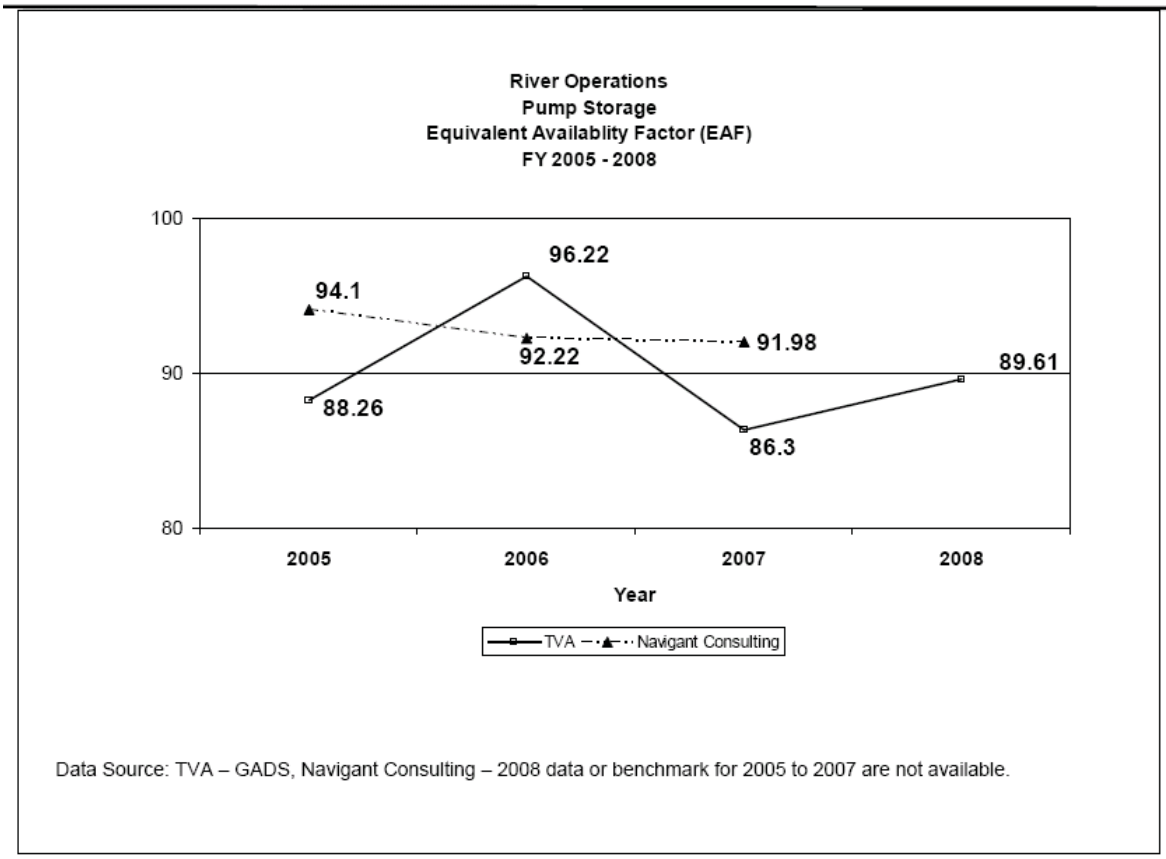


Source: TVA Benchmarking Summary Update, January 23, 2009, Page 13.

The benchmarking for hydropower assets is divided into two groups, pumped storage and conventional. As shown in Exhibit 9, for 2005-2007, TVA's pumped storage hydro facilities performed above top quartile in 2006, but below top quartile in 2005 and 2007 for equivalent availability factor measurements.

Exhibit 9: TVA Pumped-Storage Equivalent Availability Factor (EAF) Compared to Industry

Pump Storage EAF Trend Benchmarking



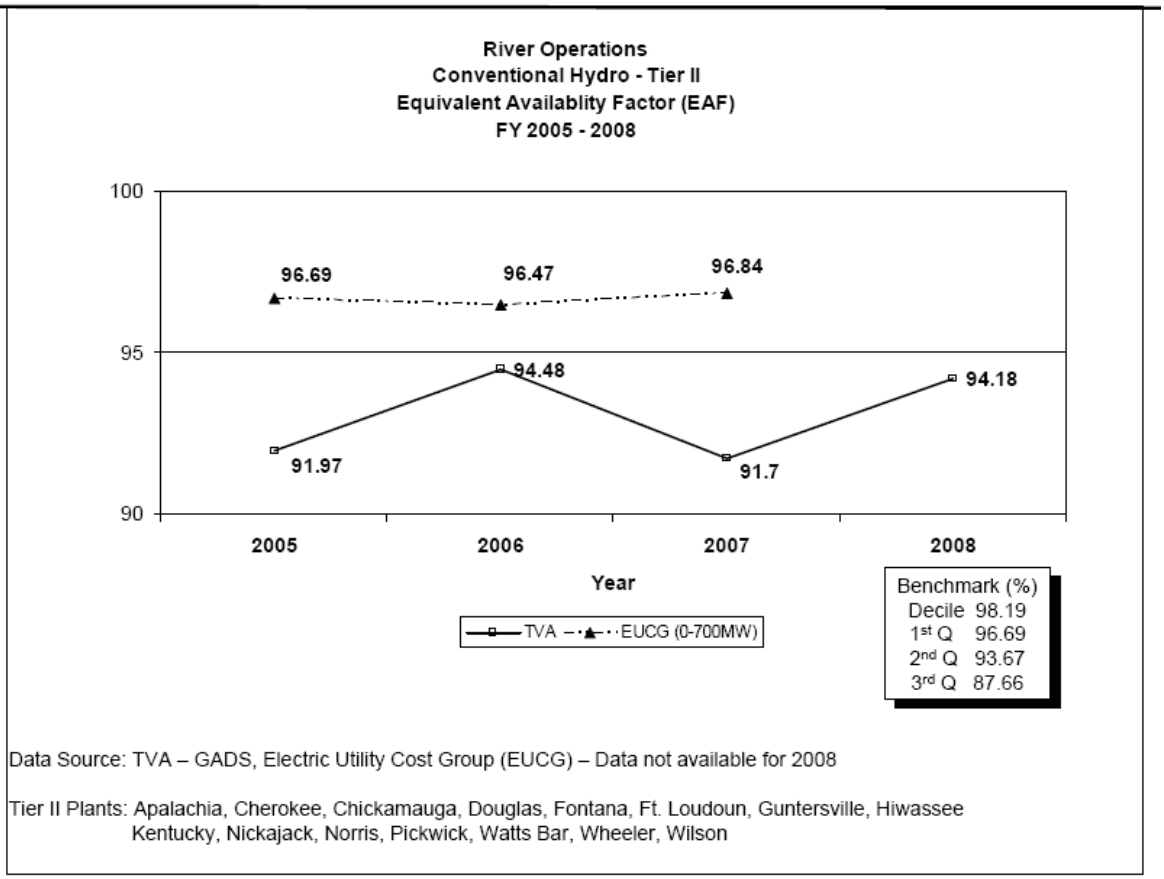
** The Navigant Consulting line represents top quartile performance.*

Source: TVA Benchmarking Update, January 23, 2009, Page 155.

TVA's conventional hydro facilities performed below top quartile all three years (2005-2007), as shown in Exhibit 10.

Exhibit 10: TVA Conventional Hydropower Equivalent Availability Factor (EAF) Compared to Industry

Conventional Hydro EAF Trend Benchmarking



Data Source: TVA – GADS, Electric Utility Cost Group (EUCG) – Data not available for 2008

Tier II Plants: Apalachia, Cherokee, Chickamauga, Douglas, Fontana, Ft. Loudoun, Guntersville, Hiwassee Kentucky, Nickajack, Norris, Pickwick, Watts Bar, Wheeler, Wilson

** The EUCG (0-700MW) line represents top quartile performance.*

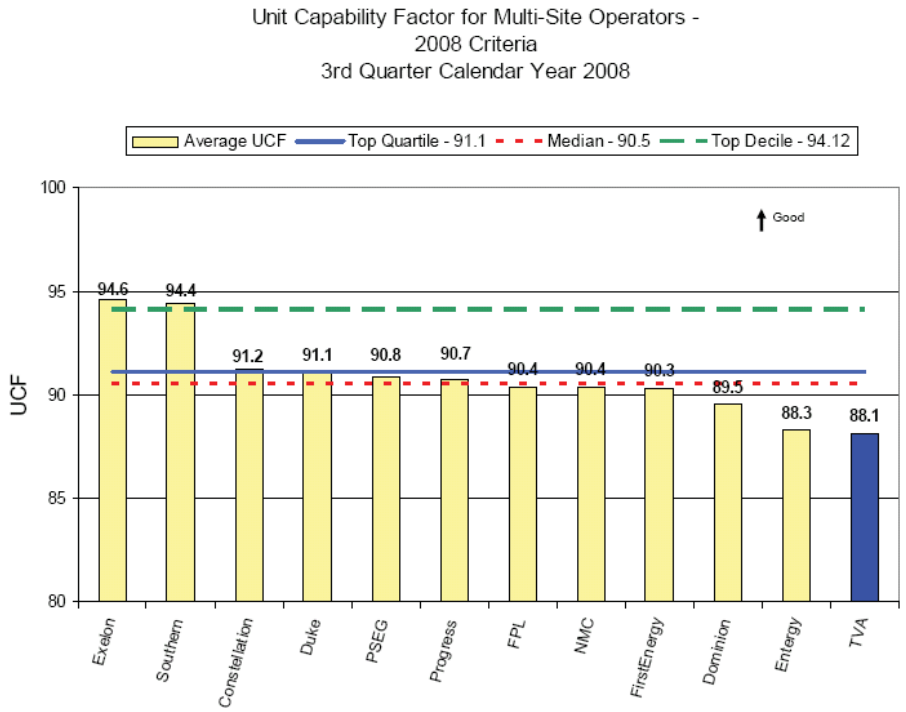
Source: TVA Benchmarking Update, January 23, 2009, Page 153.

Unit Capability Factor Benchmarking Results

For nuclear assets, the industry-accepted measure is the unit capability factor, which is the ratio of actual available generation within a given period compared to the maximum availability. While this is similar to equivalent availability factor, the major difference between the two is that the unit capability factor excludes coastdown[10] and seasonal derates,[11] which are considered outside plant management's control.

When compared to a peer group of multisite operators in 2008, TVA performed in the bottom quartile for unit capability factor, as shown in Exhibit 11 below.

Exhibit 11: TVA Nuclear Power Group Unit Capability Factor (UCF) Compared to Industry, Third Quarter 2008



Unit capability factor is the ratio of actual available generation within a given period compared to maximum availability
Observations:
- The Peer Group includes only multi-site nuclear operators
- TVA was in the bottom quartile

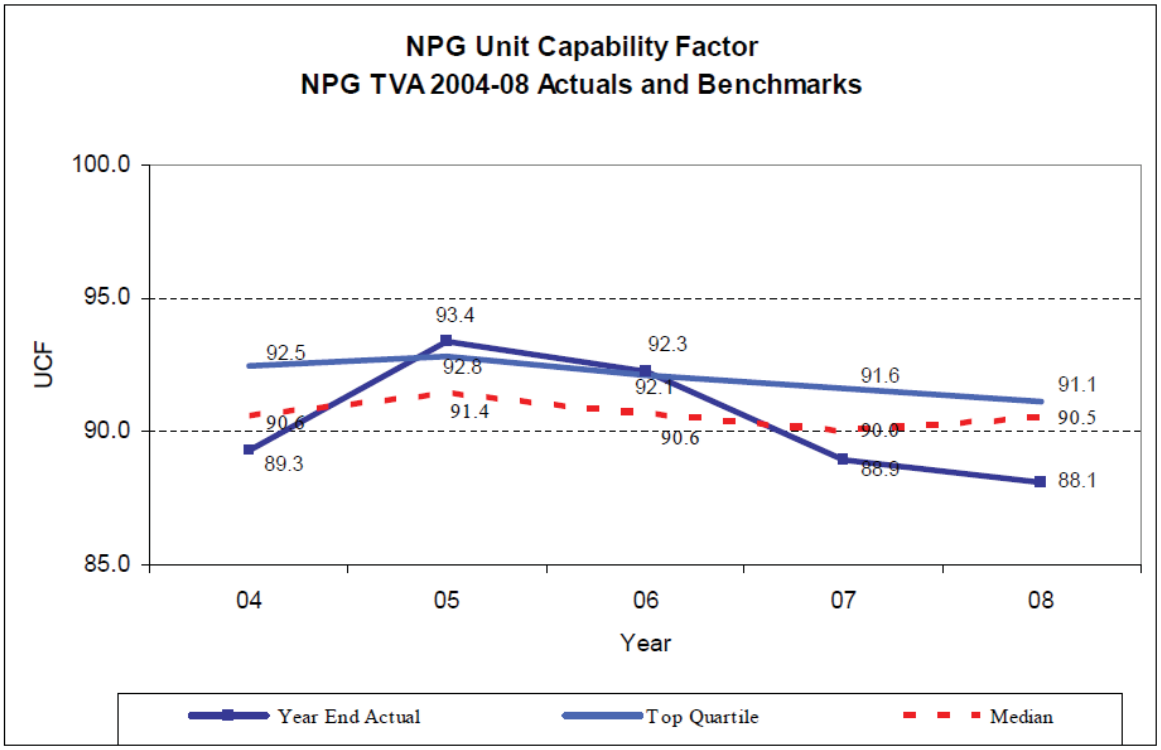
Source: TVA Benchmarking Summary Update, January 23, 2009, Page 13.

[10] Coastdown is a function of fuel design. Core loads are designed so that units essentially start to run out of fuel before the scheduled refueling outage and consequently reactor power starts to decline. This extracts more energy from the fuel which reduces fuel costs. The cost of the lost electrical generation is weighted against fuel cost savings to optimize the coastdown period (typically one or two weeks).

[11] It is not uncommon during the hot summer months for some of TVA's fossil and nuclear plants to have to derate, or reduce power output, to meet river-temperature limits set by the states.

Exhibit 12 shows TVA's Nuclear Power Group unit capability factor trends for 2004-2008. While TVA performed in the top quartile for 2005 and 2006, they fell below the median in 2007 and 2008.

Exhibit 12: TVA's Nuclear Power Group Unit Capability Factor (UCF) Compared to Industry Benchmarks, 2004-2008



Source: TVA Benchmarking Summary Update, January 23, 2009, Page 136.

The decline in performance from fiscal year 2006 through fiscal year 2009 was characterized by TVA Nuclear as being a combination of Browns Ferry Nuclear Plant performance being less than stellar and other plant issues. In summary, (1) outage schedules were not met, (2) adequate root cause analyses on SCRAMs were not performed to prevent recurrence, (3) there was a lack of focus on equipment reliability, and (4) Browns Ferry Nuclear Plant was impacted in fiscal year 2007 by environmental issues and the extended power uprate project. In addition, in fiscal year 2006, Watts Bar Nuclear Plant was worse than Browns Ferry Nuclear Plant Units 1 and 2 combined due to:

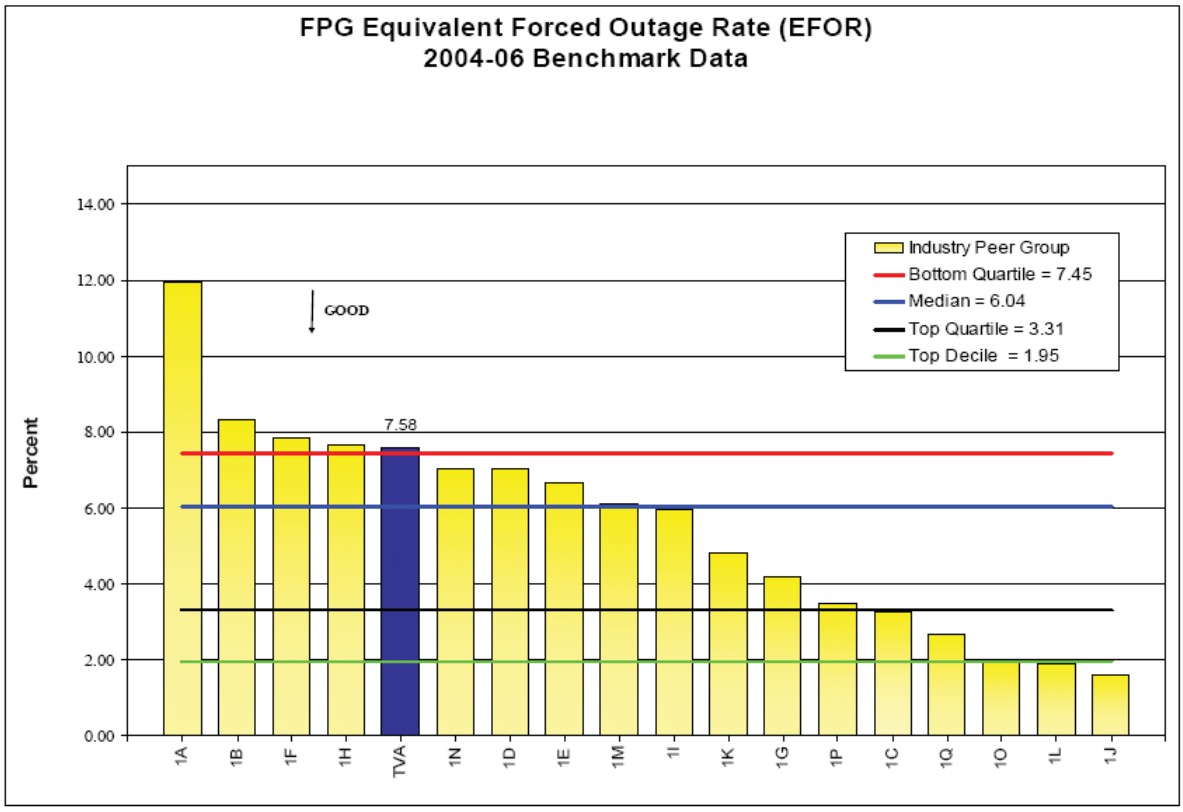
- Their turbine and exciter issues.
- An 80-day steam generator outage that impacted the unit capability factor.

Equivalent Forced Outage Rate Benchmarking Results

Another key measure of generating asset performance is the equivalent forced outage rate, which is the ratio of unplanned energy losses during the period compared to the maximum availability, excluding planned outages. TVA measures outage performance for fossil and hydropower assets by using this measure. TVA's benchmarking shows that fossil assets have performed poorly compared to benchmarks. It further shows that hydropower assets have had mixed performance, with pumped-storage units performing well and the conventional units performing well below top quartile.

For the three-year period 2004-2006, TVA's benchmarking data shows that its fossil assets performed in the bottom quartile compared to 18 utilities near the TVA service area, as shown in Exhibit 13.[12]

Exhibit 13: Fossil Power Group (FPG) Equivalent Forced Outage Rate 2004-2006 Benchmark Data

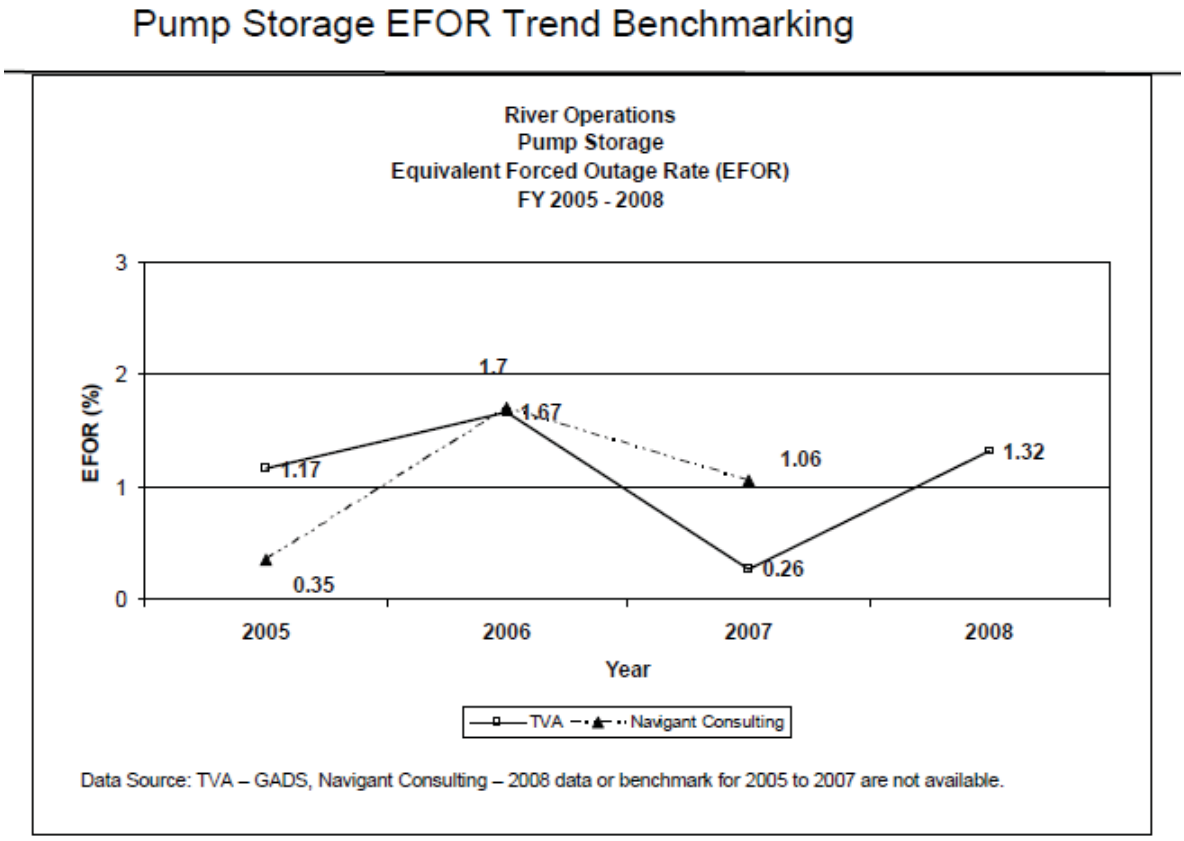


Source: TVA Benchmarking Summary Update, January 23, 2009, Page 14.

[12] Information contained in the chart was obtained from TVA. The data is blinded.

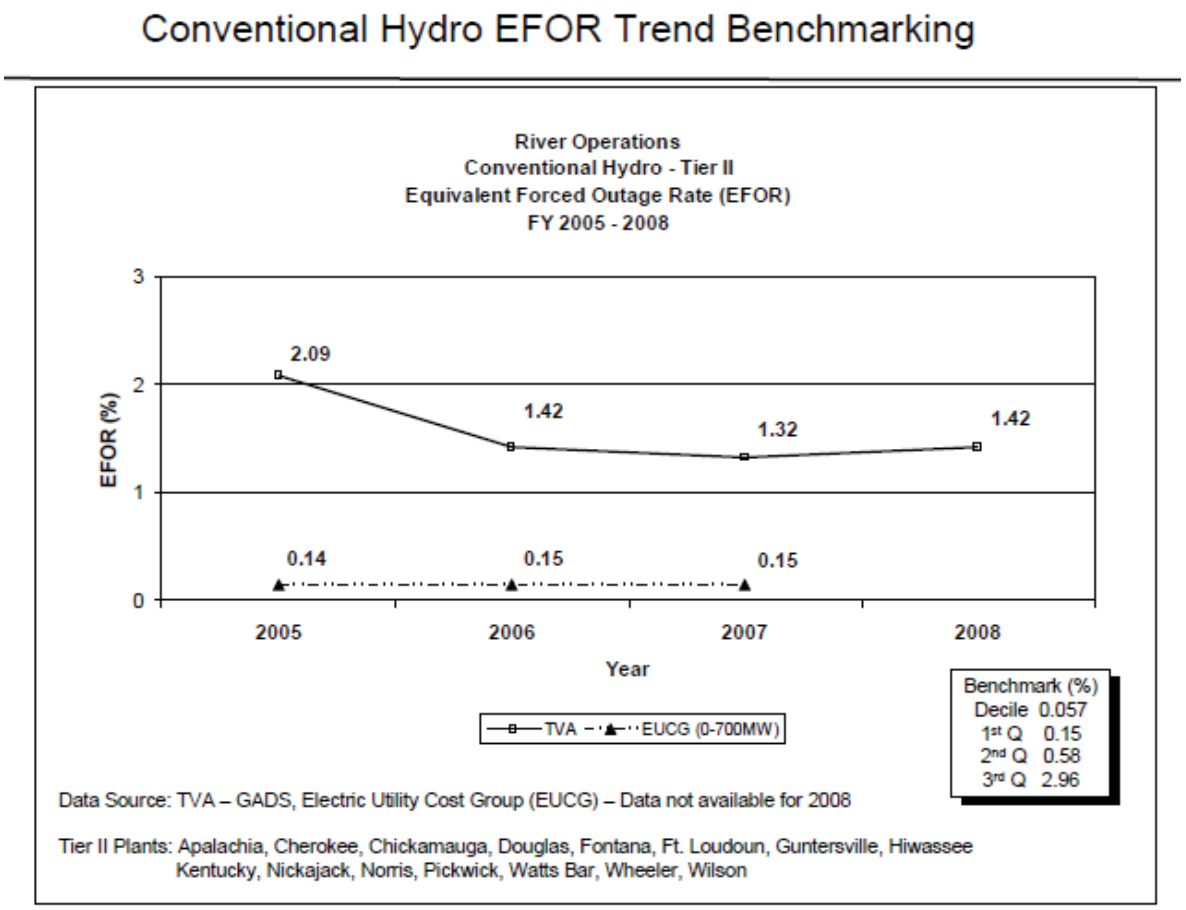
As with the equivalent availability factor measurement discussed above, the equivalent forced outage rate benchmarking for hydropower assets is divided into two groups, pumped storage and conventional. As seen in Exhibits 14 and 15, TVA's pumped-storage hydropower facilities performed in the top quartile compared to the industry in equivalent forced outage rate measurements two of the three years; however, conventional hydropower facilities did not reach top quartile in any of the three years.

Exhibit 14: TVA Pumped-Storage Hydropower Equivalent Forced Outage Rate (EFOR) Compared to Industry



Source: TVA Benchmarking Update, January 23, 2009, Page 154.

Exhibit 15: TVA Conventional Hydropower Equivalent Forced Outage Rate (EFOR) Compared to Industry



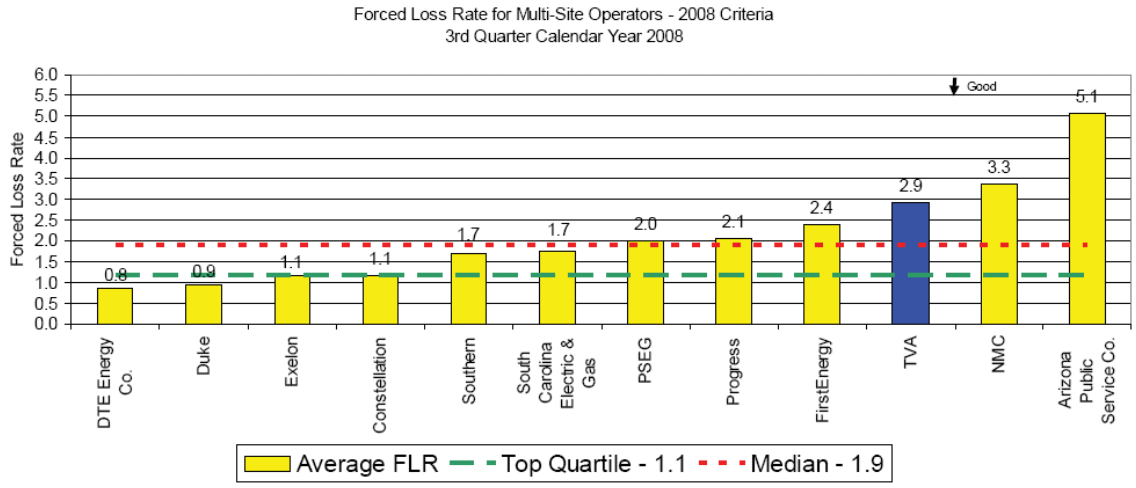
Source: TVA Benchmarking Update, January 23, 2009, Page 152.

Forced Loss Rate Benchmarking Results

For nuclear assets, TVA measures outage performance by using the forced loss rate which, as explained above, is the ratio of unplanned energy losses during the period compared to the maximum availability, excluding planned outages. Based on third quarter 2008 Institute of Nuclear Power Operations' data, TVA compared itself to a peer group that included all United States nuclear units. In this comparison, TVA ranked in the bottom quartile, as shown in Exhibit 16.

Exhibit 16: Nuclear Power Group Forced Loss Rate Third Quarter 2008 Institute of Nuclear Power Operations Cycle Average

Nuclear Power Group
Forced Loss Rate



Forced loss rate is the ratio of unplanned energy losses during the period compared to the maximum availability, excluding planned outages

Observations:

- The Peer Group includes only multi-site nuclear operators
- TVA was in the bottom quartile

Source: TVA Benchmarking Update, January 23, 2009, Page 16.

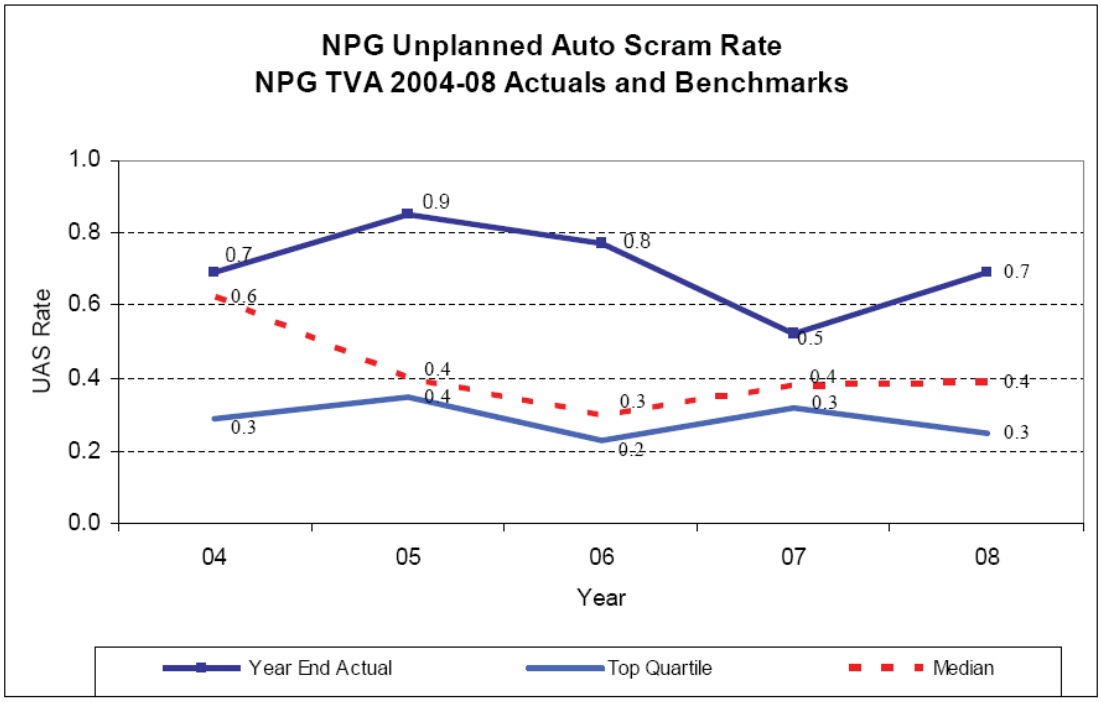
Unplanned Automatic SCRAMs Benchmarking Results

In addition to the key metrics, unit capability factor and forced loss rate, discussed above, TVA management also measures operational performance for nuclear assets by reviewing unplanned automatic SCRAMs. According to the Nuclear Energy Institute, "In the event of an imbalance in operations, the sophisticated safety systems of U.S. nuclear power plants are designed to shut down automatically well before any safety margins are exceeded. Unplanned automatic plant shutdowns, known as "SCRAMs" or "trips" in the industry, are very

infrequent." The metric used to measure these instances is the number of unplanned automatic SCRAMs that occur per 7,000 reactor critical hours.[13] Unplanned automatic shutdowns include automatic shutdowns SCRAMs resulting from a reactor event, an equipment failure, a spurious signal, or human error. Nuclear Energy Institute data shows that, for the 11-year period 1997-2007, median unplanned shutdowns ranged from a low of 0.42 per 7,000 critical hours in four of those years to 0.49 in 1997. Based on benchmarking data obtained from TVA, TVA performed below the median every year compared to the industry in the area of automatic SCRAMs for the years 2004-2008 (Exhibit 17).

Exhibit 17: Unplanned Automatic SCRAM (UAS) Trend, 2004-2008

2004-08 Unplanned Automatic Scram NPG Trend



Source: TVA Benchmarking Update, January 23, 2009, Page 189.

TVA's Delivered Cost of Power is Relatively Low

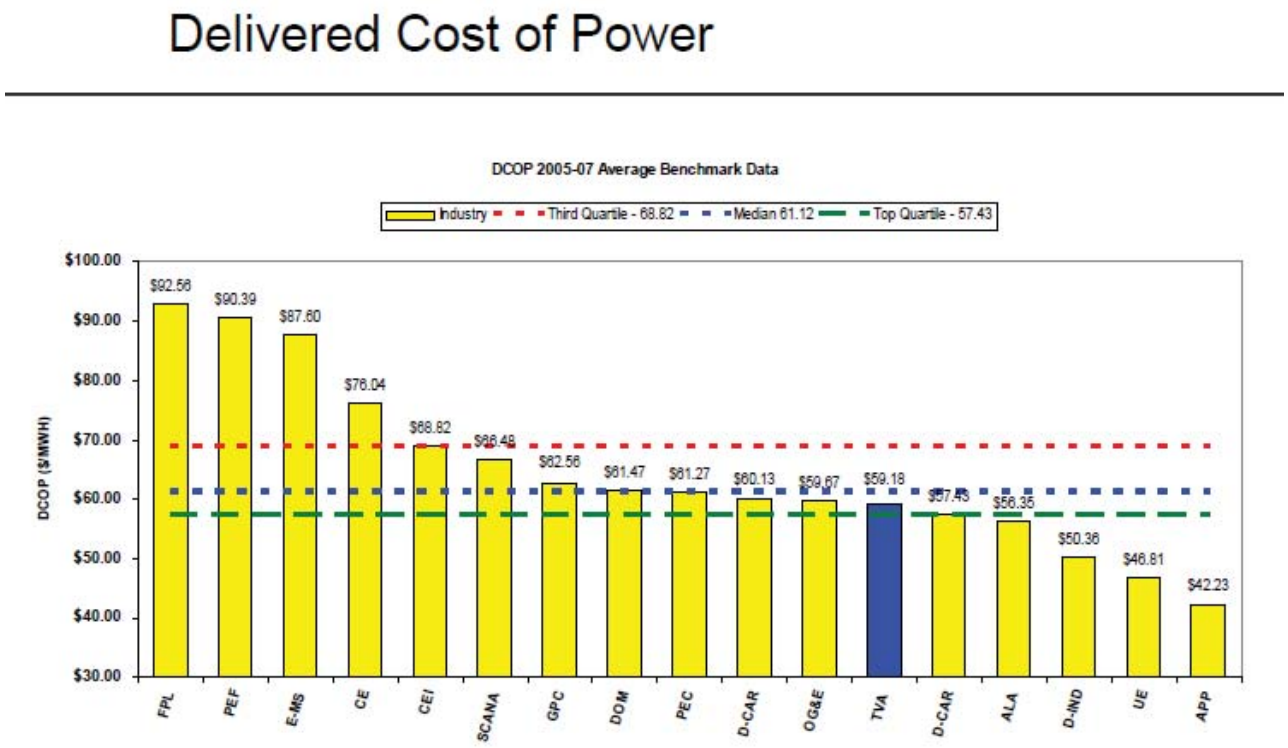
In addition to the plant performance measures used to gauge system efficiency discussed above, the costs to generate power should be considered. One measure of cost performance used at TVA is the delivered cost of power. In benchmarking its performance, TVA chose a peer group of all utilities no more than

[13] Criticality is the point at which a nuclear reaction is self-sustaining.

one wheel[14] away that also had holding company revenue greater than $3 billion. TVA used data supplied by utilities on the annual Federal Energy Regulatory Commission Form 1 filing to calculate delivered cost of power which represented total expenses, including distributor costs, for TVA to compare to the other utilities.

For the three-year period 2005-2007, TVA's performance was in the second quartile, as shown in Exhibit 18 below.

Exhibit 18: Delivered Cost of Power (DCOP) 2005-2007 Benchmark Data

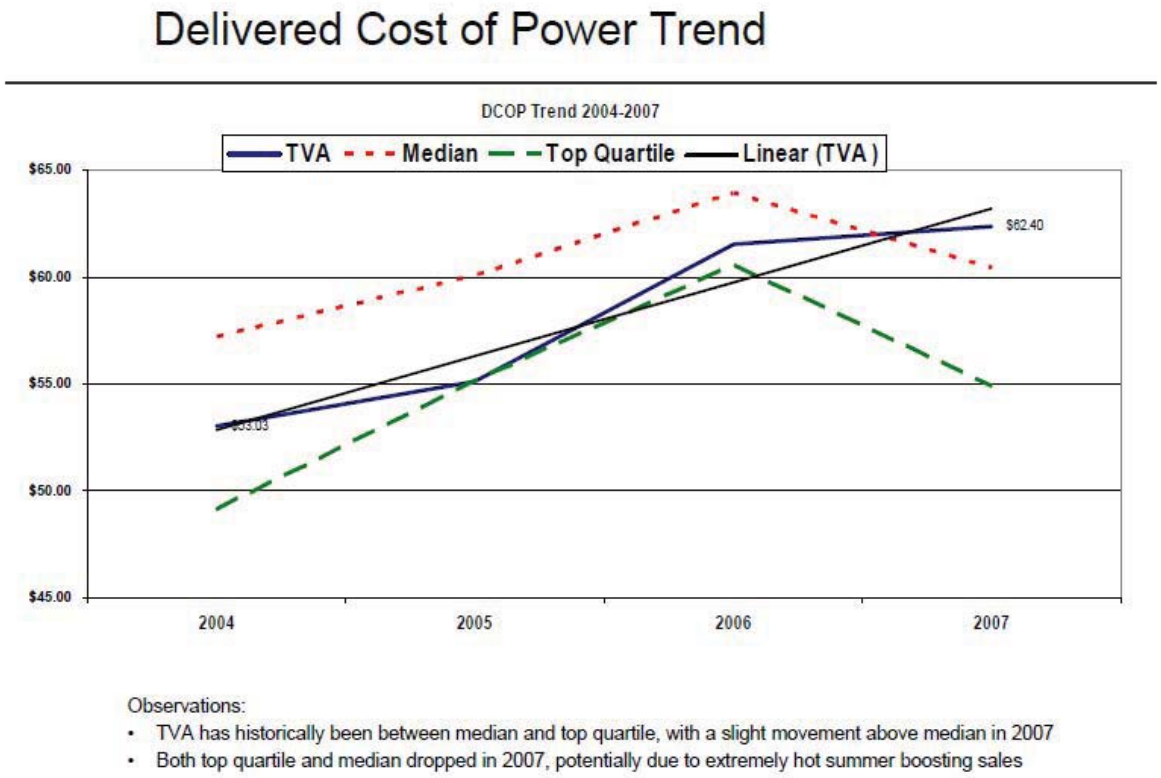


Source: TVA Benchmarking Update, January 23, 2009, Page 7.

[14] One wheel is defined as a movement of power across intervening hubs with each hub counting as one wheel. ComEd and TVA Hub Electricity Futures and Options: The Reference and Applications Guide, page 12.

As shown in Exhibit 19 below, TVA ranked in the second quartile for three years of the study and fell below the median the other year.

Exhibit 19: Delivered Cost of Power (DCOP) Trends, 2004-2007



Source: TVA Benchmarking Update, January 23, 2009, Page 8.

TVA's delivered cost of power has been impacted negatively over the last few years because of the limited availability of its lowest cost power, hydroelectric, due to the drought conditions experienced in the TVA region during 2007 and 2008. TVA reported in a drought update that "TVA generates as much power as possible with the water released to meet minimum flow requirements, but no additional water is released for the specific purpose of hydro generation—even though it means relying on more expensive coal-fired and nuclear generation or buying power from outside sources."

TVA's Non-Fuel Operations and Maintenance Costs are Relatively High

A key factor affecting TVA's delivered cost of power was higher than average non-fuel operations and maintenance costs, which are total operations and maintenance costs (excluding fuel cost adjustment costs). A January 23, 2009, TVA Benchmarking Update found TVA performed below the median when compared to other utilities. TVA management has stated that it wants to reduce

non-fuel operations and maintenance costs to that of top performers in the industry. Specifically, a sustainable performance improvement initiative calling for a $420 million reduction in non-fuel operations and maintenance expenditures over a three-year period is currently in progress. These targets will only be attainable if system efficiency is maximized.

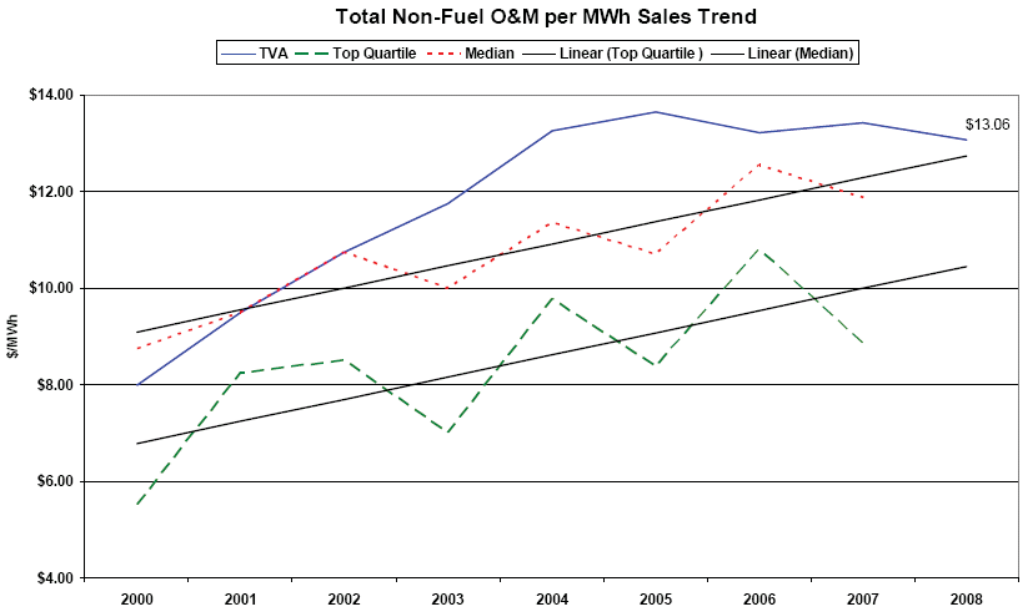
Maximizing system efficiency will require sound capital investment decisions. TVA management recognizes that past decisions limiting investments in capital improvements to TVA's assets caused operations and maintenance expenses to be higher. At the TVA Board of Directors meeting on August 20, 2009, the need to invest more in capital improvements, especially with respect to fossil fleet assets, was discussed and a budget to do so approved. This was reflected in the budget presentation by the Chief Financial Officer and discussed at the meeting.

TVA included in its fiscal year 2008 Winning Performance Balanced Scorecard a performance metric for non-fuel operations and maintenance. It did so in recognition that a "continued awareness and emphasis on monitoring and controlling non-fuel O&M [Operations and Maintenance] expenses is an important measure of competitiveness and allows TVA to position for future success."

For fiscal year 2008, TVA met its Non-Fuel Operations and Maintenance threshold goal, which is the minimum level of accomplishment to achieve winning performance, primarily due to lower operations and maintenance base, lower operations and maintenance projects, lower non-cash benefit expense, and lower non-cash pension financing costs. It was offset by higher workers' compensation costs, higher operations and maintenance outage, and lower power sales.

TVA management believes that operations and maintenance performance is an area that needs improvement and has given it a tremendous amount of attention over the last two years. As mentioned above, TVA executive management has established a Sustainable Performance Improvement initiative and has also established operations and maintenance spending targets for each business unit. This demonstrates that TVA is benchmarking external peer groups, has identified the one area where cost improvement is necessary, and has established a plan to address this area. In addition, TVA has kept operations and maintenance relatively flat over the past three years, as shown in Exhibit 20 below, despite significant investment activity, peak demand load growth, and compliance with new regulatory requirements during this period.

Exhibit 20: Total Non-Fuel Operations and Maintenance (O&M) Per Megawatt-Hour Sales Trend, 2000-2008



Source: TVA Benchmarking Update, January 23, 2009, Page 10.

TVA's adding non-fuel operations and maintenance as an incentivized measure to its fiscal year 2008 Winning Performance metrics indicated a focus on streamlining operations and controlling costs. The critical success factor associated with this item in the Strategic Plan is to "achieve top-quartile performance in non-fuel operations and maintenance expenses and then hold increases to be less than unit sales growth." However, we noted that non-fuel operations and maintenance is not an incentivized measure for fiscal year 2009.

While reducing operations and maintenance costs could make good financial sense, reducing spending in these areas has the potential to negatively affect operations, especially when combined with limited capital spending. Lowering the amount spent on operations and maintenance could delay projects which are

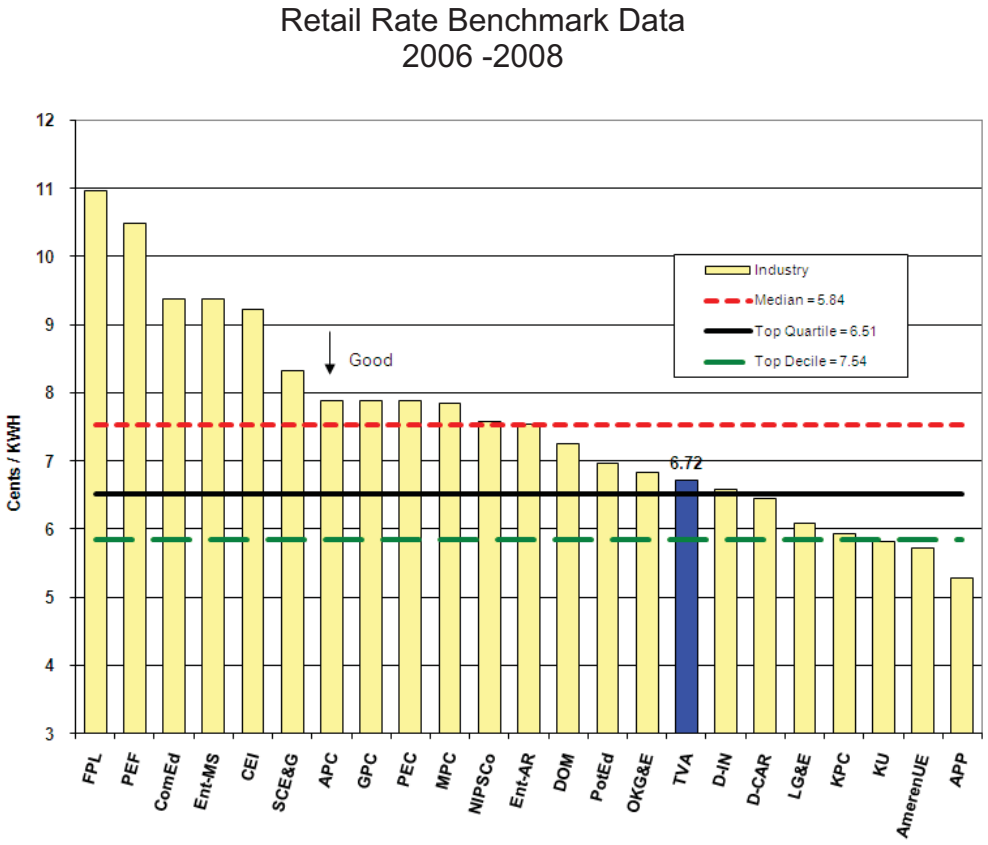
required to keep plants running effectively and efficiently. TVA must strive to maintain a balance between reducing non-fuel operations and maintenance costs and providing the funding necessary to adequately maintain its operations.

In commenting on a draft of this report, TVA Chief Operating Officer noted that, while non-fuel operations and maintenance costs are an important measure, it is also appropriate to evaluate TVA on a total cost basis. He said that non-fuel O&M rates are a focus TVA is working on, and progress in reducing O&M expenses is being made, but it is also appropriate to consider TVA's total cash outlay to maintain the existing generating assets. He further said that TVA's spending on total non-fuel O&M and maintenance capital (not counting new Clean Air additions) is less than TVA's peers on a spending per kilowatt-hour basis. He believes this accounts for some of the discrepancy between O&M ranking and EAF performance. Our review of recent TVA benchmarking data noted that TVA concludes that more capital spending is necessary to achieve top quartile in O&M.

We previously concluded in this report that TVA's delivered cost of power has been relatively low—which aligns with the COO's observations about consideration being given to total cash outlay. Also, in commenting on Inspection 2007-11399, Review of TVA's Financial Performance, management noted that assessments pertaining to TVA's cost containment should consider TVA's total cost outlays. We concluded in that review that non-fuel operation and maintenance costs and interest are important to consider in assessing TVA's cost containment performance, but it is also important to note how TVA's rates, which are cost-based, compare to those of others.

TVA's most recent retail rate benchmark data shows that its retail rates are just below the top quartile, as shown in Exhibit 21 below.

Exhibit 21: Retail Rate Benchmark Data



Source: Presentation Titled Historic O&M & Capital Spending, Finance, Strategy, Rates, and Administration Committee, Page 25.

SYSTEM SAFETY

TVA performed extremely well in regard to safety during 2008 and 2009. Safety is identified as a critical success factor in two of TVA's strategic objectives in the 2007 Strategic Plan, Operations and People. According to the Strategic Plan, "TVA stresses safety for all employees and also considers the public in all safety decisions. Concerns about safety move beyond the internal and extend to TVA's customers, their customers, and all other stakeholders. By creating a safe and positive environment for employees, fostering an environment of integrity and respect and providing proper tools and training, TVA will be better positioned to achieve its other strategic objectives."

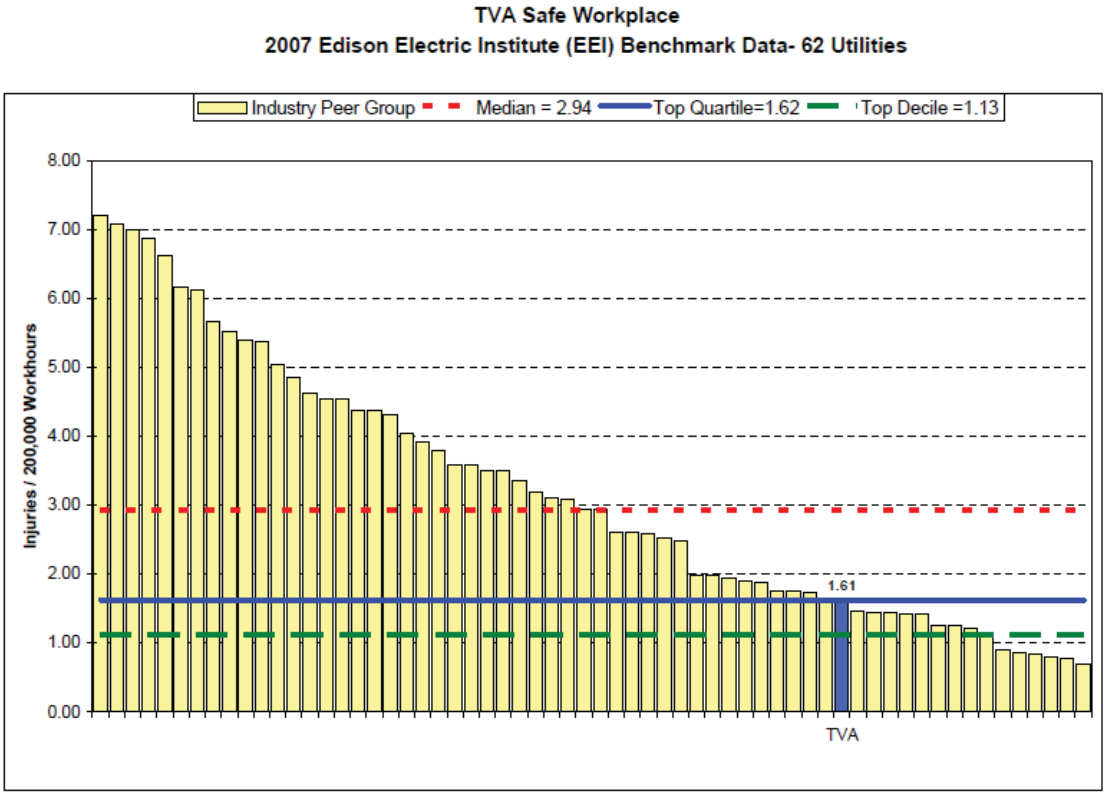
To incentivize TVA personnel to move toward improved safety, a measure of performance has been included in the Winning Performance incentive plan. The Safe Workplace metric is a rate-based measure of employee safety as measured by the number of Occupational Safety and Health Administration recordable injuries resulting in either a fatality, days away from work/lost time, restricted duty/job transfer, medical treatment, loss of consciousness, other significant work-related injury/illness diagnosed by a physician or other licensed health care professional per 200,000 employee-hours worked by both TVA employees and Staff Augmentation contractors.

According to TVA management, in benchmarking its safety performance against other utilities, TVA used data obtained from Edison Electric Institute and compared its performance to that of 61 other electric utilities with Occupational Safety and Health Administration comparable safety calculations.

In this comparison, TVA ranked in the first quartile, as shown in Exhibit 22.

Exhibit 22: Safe Workplace 2007 Edison Electric Institute Benchmark Data – 62 Utilities

2007 TVA Safe Workplace Benchmarking



Source: TVA Benchmarking Update, January 23, 2009, Page 48.

TVA's reported fiscal year 2008 recordable incident rate was 1.08.[15] The benchmark data for electric utilities from the Edison Electric Institute was mean=3.55, best quartile=1.96, and best decile=1.17. Through July of fiscal year 2009, TVA reports that the year-to-date recordable incident rate was 0.81, and both the month and year-end forecast continue to be favorable compared to the baseline goal. The July 29, 2008, Operations Update to the Finance, Strategy, Rates, and Administration Committee noted that the three power producing Strategic Business Units all include a safety-related initiative indicating TVA's focus on this area.

[15] Recordable incident rate is a rate-based measure of employee safety as measured by the number of Occupational Safety and Health Administration recordable injuries resulting in either a fatality, days away from work/lost time, restricted duty/job transfer, medical treatment, loss of consciousness, other significant work-related injury/illness diagnosed by a physician or other licensed health care professional per 200,000 employee-hours worked by both TVA and employees and staff augmentation contractors.

While TVA performed well compared to benchmarks in the area of safety, the recent ash spill at the Kingston Fossil Plant acts as a reminder that safety management also includes long-term and job-specific risk assessments. As we noted in our July 2009 report on the Kingston ash spill, TVA's enterprise risk management process did not identify ash ponds as a safety risk, despite internal knowledge of the risks associated with them.[16] Furthermore, on July 20, 2009, an accident claimed the life of a contract worker supporting the recovery efforts pertaining to the catastrophic ash spill.

TVA is currently in the process of revising its enterprise risk management process. An improvement plan was approved by the TVA's Enterprise Risk Council on January 26, 2009. Key improvement plan components include:

- Formalizing risk management policies;
- Embedding enterprise risk management process within planning processes;
- Streamlining the TVA risk governance structure by combining the Financial, Operational, and Strategic Risk Committees into one group called the Risk Management Steering Committee;
- Overhauling enterprise risk management mapping methodologies and risk assessment methodologies;
- Engaging key risk management functions and personnel in the enterprise risk management process;
- Enhancing risk analytics; and
- Making enterprise risk management information actionable.

To drive the risk management culture down into and across the organization, TVA is:

- Establishing TVA-wide training "Risk Management 101," to be offered in 2009;
- Drafting enterprise risk management guidelines to be used for risk identification, assessment, and development of risk management plans;
- Starting the enterprise risk assessment process with the Strategic Business Units, driving risk management further into the organization; and
- Planning to integrate risk management with major planning processes.

[16] Ibid, page iii.

MANAGEMENT CHALLENGES

According to TVA's current Strategic Plan, the keys to successful implementation of its operations strategy include reducing expenses and preventing non-fuel expenses from growing faster than sales, improving operational and environmental performance, and using benchmarked metrics to achieve top-quartile performance in key categories. Additionally, TVA management feels that it must continue to make nuclear safety the overriding priority in operations at all nuclear facilities.

Some of the more significant challenges facing TVA in implementing these changes include (1) TVA's aging generation and transmission assets, (2) potential problems for TVA in attracting and retaining skilled workers, (3) meeting an increased demand for power in an increasingly complex regulatory and market environment, and (4) TVA's legacy culture which resists compliance with appropriate standards and tends to cling to historical practices regardless of changed conditions.

Aging Generation Fleet and Transmission System

TVA, like much of the electric utility industry, is dealing with the challenge of an aging infrastructure. TVA is faced with the challenge of maintaining and, in some cases, modernizing or rehabilitating its aging infrastructure in an environment which includes (1) increasing demands on the transmission system from new merchant plants,[17] open-access[18] requirements, and transmission wheeling;[19] (2) the need to maintain system reliability; (3) changing environmental requirements and legislation (e.g., Clean Air Requirements); and (4) the pressure to keep power rates low. At the same time, TVA (1) faces capital and operations and maintenance expenditure decisions, especially with regard to the fossil fleet, and (2) has opted to complete Unit 2 at Watts Bar Nuclear Plant and is studying the costs and benefits of completing units at Bellefonte Nuclear Plant.

Problems that can result from this aging infrastructure were reported by TVA management in its 2007 annual filing with the Securities and Exchange Commission when they noted that TVA was adversely affected in 2007 when the planned outage at Unit 3 of Paradise Fossil Plant to correct an issue with a turbine rotor took longer than expected. The unit was scheduled to be back on line by April 29, 2007, but did not return to service until June 7, 2007, due to more extensive repairs identified during the outage. During this outage, the site's

[17] A merchant power plant is a non-utility generation plant that sells electricity on a wholesale basis to other companies, who then sell the power on a retail basis to individual residential, commercial, and industrial customers. Under deregulation of electricity generation, the developer of a merchant power plant is not guaranteed a return on its investment and must compete in a free economic market to sell the power it can produce. Both peaking facilities and base-load facilities can operate as merchant power plants.

[18] Open access: A regulatory mandate to allow others to use a utility's transmission and distribution facilities to move bulk power from one point to another on a nondiscriminatory basis for a cost-based fee.

[19] Wheeling involves the transmission by an electric utility of electricity produced by another utility or generating company along its own distribution network.

generation was reduced by 1,026 megawatts. Because of the additional repairs and extended outage, TVA incurred approximately $7 million in unplanned repair costs and an additional $25 million in net replacement power purchase costs.

Potential Problems for TVA in Attracting and Retaining Skilled Workers

TVA management has recognized that as TVA employees retire and TVA faces competition for skilled workers, TVA may face problems attracting and retaining skilled workers to, among other things, operate and maintain TVA's generation and transmission facilities and complete large construction projects such as Watts Bar Nuclear Unit 2.

The reality of this situation is addressed in a ScottMadden[20] whitepaper where they state, "As a result of a shortage of qualified applicants and the changing nature of the demographic composition of the workforce, corporations are finding it increasingly hard to identify, attract, and retain skilled workers. This issue is of particular importance to the generation/utility industry, where a prolonged period of anticipated and actual restructuring and the partial transition to market-based competition led to hiring freezes. These freezes, coupled with changing demographics are now leading to an acute shortage of qualified young workers to replace an aging labor force."[21]

"At one end of the demographic spectrum, the workforce is getting older (ten percent of the workforce was born before 1946, and every day 10,000 boomers turn 55), and at the other end the workforce is getting younger. Moreover, the workforce in the middle, most of them aged between 40 and 50, is shrinking. This makes age differences more pronounced and generational hand-offs more complicated. For example, the imminent drop in the proportion of older, skilled workers due to retirement is expected to impact the workforce very significantly beginning around 2010. In addition, the number of retirees will double in the time period between 1995 and 2025, adding even more urgency to the matter."[22]

The Office of the Inspector General addressed the issue in its September 2006 report on Inspection 2006-513I – Review of TVA's Succession Planning. We found that much like the industry overall, the average age of a TVA employee was 47 in 2005 and around 46 in 2006. Documentation provided by TVA management stated that one-third of TVA's workforce could retire in the next five years. This

[20] ScottMadden is a general management consulting firm providing independent and objective counsel and specialized business services to large corporations.

[21] ScottMadden White Paper: Strategy for Managing Future Workforce in the Utility/Generation Industry Thinking, Best Practices and Labor Relations Innovations in Response to Changing Demographic Trends, Stuart M. Pearman, Partner, 2007, page 3.

[22] ScottMadden White Paper: Strategy for Managing Future Workforce in the Utility/Generation Industry Thinking, Best Practices and Labor Relations Innovations in Response to Changing Demographic Trends, Stuart M. Pearman, Partner, 2007, page 4.

posed and still does pose potential problems for TVA with knowledge retention, the timing of replacements, and ensuring adequate bench strength.

We found that TVA's succession planning initiatives at the time of our review included many recognized best practices, and TVA is a recognized best practice organization related to knowledge retention. For example, an article written in the July 24, 2006, issue of *Fortune* magazine addressing TVA's knowledge retention initiatives stated that (1) TVA has found a better way to pass on knowledge, and (2) John Deere, Chevron, and the World Bank have adopted many of TVA's methods. Our review found that, while TVA has taken actions to address the issues arising from an aging workforce, the implementation of TVA Corporate Human Resources initiatives by the business units could be improved.

Meeting an Increased Demand for Power

According to TVA management, TVA is the sole power provider for customers within its service area, and if demand for power in TVA's service area increases, TVA is obligated to take steps to meet this increased demand.

While we recognize that demand for TVA's power has decreased significantly as a result of the current economic downturn, [23] in the long term this situation will likely reverse itself. If so, then TVA may need to meet this increased demand by purchasing power from other sources, building new generation and transmission facilities, or purchasing existing generation and transmission facilities. Purchasing power from external sources, as well as acquiring or building new generation and transmission facilities, could negatively affect TVA's cash flows, results of operations, and financial condition. TVA management has stated that it intends to meet the need for additional power through a variety of means including (1) new generation, (2) purchased power, and (3) distributor-owned generation.

New Generation

TVA has taken actions to provide power supply in the years ahead by investing in nuclear and combustion turbine generation. On the nuclear side, TVA decided to complete the construction of Watts Bar Nuclear Unit 2. The completion of Watts Bar Nuclear Unit 2 is expected to occur in 2013 and cost approximately $2.5 billion. In addition, TVA recently completed restoring Browns Ferry Nuclear Plant Unit 1 to service, providing an additional 1,150 megawatts of baseload capacity. The cost to restore was about $1.84 billion through May 2008 (i.e., total

[23] As reported in TVA's third quarter 2009 10-Q filing with the Securities and Exchange Commission, the effects of the economic downturn are resulting in less demand for electric power. Sales of electricity in the nine months ended June 30, 2009, were about 7 percent below 2008 levels and could decline further if commercial and industrial employers continue to reduce production in response to the downturn. In the nine months ended June 30, 2009, directly served industrial sales were down approximately 17 percent compared to the same period of 2008, while municipal and cooperative sales experienced a nearly 4 percent decline compared to the same period of 2008. Given the continuing economic downturn, the decline in total sales for 2009 as compared to 2008 may be 7 to 8 percent.

project costs of $2.109 billion less allowance for funds used during construction of $269 million).

With respect to combustion turbine generation, in 2007 TVA acquired combustion turbine facilities that collectively provide 11 units and 1,296 megawatts of winter net dependable capacity. In addition, in September 2007, the TVA Board of Directors approved the acquisition and construction of a combined cycle facility in southwest Tennessee. The facility with an anticipated operation date of June 2010 is expected to have a planned winter net capacity of approximately 600 megawatts. Also, on April 3, 2008, TVA reported that it had agreed to purchase a three-unit, 810-megawatt combined-cycle combustion turbine facility for $461.3 million. On top of the purchase price, TVA will pay $5 million to terminate an existing operation and maintenance agreement at the facility. Finally, on June 4, 2009, the TVA Board approved construction of an 880-megawatt gas-fired power plant in northeast Tennessee. The new plant is expected to cost approximately $820 million.

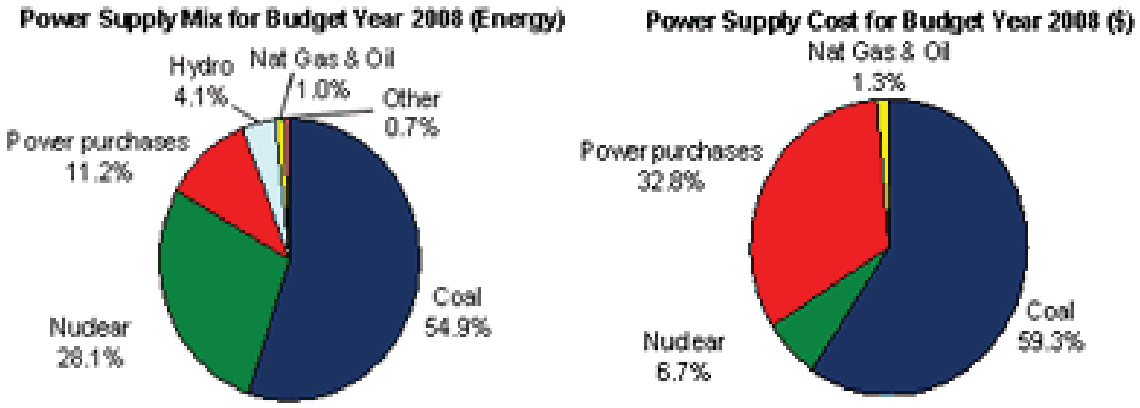
The cost of acquiring or building assets to meet demand and ensure reliability can be volatile. Market conditions, like the volatility of the price of construction materials and the potential shortage of skilled craft labor, clearly add uncertainties to the cost and schedule of new construction. Labor costs can increase if demand for individuals with generation asset construction knowledge and experience is high. Also, the costs of construction materials such as iron, steel, nickel, tungsten, cement, and crushed stone can vary significantly depending on market conditions.

Purchased Power

TVA management stated that purchasing power from others will likely remain a part of how TVA meets the power needs of its service area. TVA purchases power from other suppliers for two primary reasons—when TVA needs additional power to meet the Tennessee Valley's electric demand, or when other suppliers' costs are less than TVA's. In the latter case if temperatures to the north are not quite as hot during the summer as they are in the Valley, other suppliers may have less expensive resources available. When that occurs, TVA may be able to purchase power at a price that is cheaper than if it produced the power.

For fiscal year 2008, TVA planned on power purchases providing about 11.2 percent of its power supply mix as shown in Exhibit 23.

Exhibit 23: 2008 Supply Mix and Cost



Source: TVA Today, "A Look at Why TVA Purchases Power," August 1, 2008.

However, TVA management stated that purchased power made up 11.6 percent of the power TVA sold to customers in 2008. During the summer of 2008, TVA bought more than 1,000 megawatts of power on a daily basis—the equivalent of the capacity of a typical nuclear unit—to replace that lost hydro generation due to ongoing drought conditions.

The 2007 Strategic Plan established a goal of balancing production capabilities with power supply requirements within 5 percent. Achieving this goal will require TVA to reduce its reliance on purchased power. Because the majority of purchased power comes from natural gas plants, the price of purchased power has increased dramatically. When TVA planned its 2008 budget, it expected that purchased power would account for almost 33 percent of TVA's total fuel costs, which equates to about $1.2 billion for the year—or about $3.3 million per day. Since January 2007 those on-peak purchased power prices have increased by more than 75 percent.

Peak prices for June and July of 2008 were 63 percent higher on average than for the same months in 2007. TVA's purchased power totaled $701 million during the first six months of 2008, up $220 million from the same period in 2007. The dramatic rise in prices from December 2007 through July 2008 is shown in Exhibit 24 below.

Exhibit 24: Cumulative Market Price Increases for Purchased Power

Source: TVA Today, "A Look at Why TVA Purchases Power," August 1, 2008.

Legacy Culture

As noted in our recent report on conditions surrounding the ash slide at Kingston, attitudes and conditions at TVA's fossil plant that emanate from a legacy culture impacted the way TVA handled coal ash. Cultural issues have also been identified as contributing to findings in other OIG reviews. Over TVA's 75-year history, cultural traits have developed that if not identified and addressed can undermine the best policies and procedures. The importance of recognizing cultural limitations cannot be overemphasized.

For TVA's continued success, we believe the culture must be accurately assessed, compliance with new policies and procedures must be faithfully measured with appropriate metrics, and employees must be educated to think differently about TVA business, operational, and safety practices. As a result of reports from both McKenna Long & Aldridge and the OIG, TVA has recently begun implementing actions to assess the culture and drive change management. Specifically, TVA:

- Selected the firm of McKinsey & Company (McKinsey) to complete a detailed review of TVA's systems, standards, controls, and culture. The McKinsey review will include how to transform the organization, including governance and

accountability, organizational structure, operating policy and procedures, and institutional capabilities.

- Created a new organization, Corporate Governance and Compliance, to focus on three issues: (1) organizational effectiveness, (2) compliance, and (3) performance analysis.

- Launched its Organization Effectiveness Initiative, which aims to strengthen TVA's organizational capabilities to deliver on its mission and strategy, as well as to improve organizational effectiveness, cooperation, and engagement within TVA.

TVA is exhibiting a determined commitment to addressing the systemic cultural issues that have been identified. Both the methodology and the focus TVA is bringing to this problem indicate how seriously the issues raised are to TVA leadership. The OIG will track and report on the progress of this effort.

OBJECTIVE, SCOPE, AND METHODOLOGY

The objectives of our operational performance review were to assess (1) how TVA evaluates and tracks performance (i.e., performance measures), (2) whether TVA's performance indicators correlate to annual performance goals and TVA's Strategic Plan (i.e., alignment of performance measures), and (3) TVA's overall performance (i.e., performance results). The scope of our review included any measures used by TVA to track operational performance and industry best practices regarding operational performance. To achieve our objectives, we:

- Interviewed key TVA personnel to determine:
  - How TVA currently measures operational performance.
  - Whether TVA has implemented initiatives to improve performance.
  - Whether TVA currently benchmarks its operational 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 TVA personnel to determine (1) what measures TVA currently uses to track operational 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 the most current available documentation from key TVA personnel and/or TVA's Web site on TVA's operational performance, including third-party benchmarking data. Other data and information was obtained from various sources, including published documents and competitors' publicly available information.