IN THE DISTRICT COURT OF THE UNITED STATES
FOR THE WESTERN DISTRICT OF NORTH CAROLINA
ASHEVILLE DIVISION

STATE OF NORTH CAROLINA, ex rel. Roy Cooper, Attorney General, Plaintiff,	)	Case No.: 1:06CV20
vs.	)	
Tennessee Valley Authority, Defendant.	)	

EXPERT REPORT OF SUSAN F. TIERNEY, Ph.D.

The Financial Feasibility and Reasonableness of Reducing NO_x and SO_2 Emissions from TVA's Coal-Fired Power Plants

October 26, 2006

I. PROFESSIONAL QUALIFICATIONS, BACKGROUND AND SUMMARY OF OPINIONS

A. Qualifications

1. My name is Susan F. Tierney. I am a Managing Principal at Analysis Group, Inc. I have been involved in issues related to electric power markets and utility regulation and policy for 25 years as a regulator, policymaker, educator, and consultant. Over this period, I have been directly involved in issues that are relevant to this proceeding, including: air pollution control policy and regulation; regional power markets; electric industry structure and resource planning; and electric utility rate regulation.

2. For approximately the past eleven years, I have been a consultant to private companies and governmental and other organizations on a variety of economic and policy issues affecting the electric and natural gas industries. Prior to joining Analysis Group in July 2003, I was employed as a consultant at Lexecon, Inc., and its predecessor company, the Economics Resource Group, Inc.

3. Before becoming an energy consultant, I served in senior state and federal policy and regulatory positions for 13 years. Most recently, I was the Assistant Secretary for Policy at the U.S. Department of Energy from early 1993 through summer 1995, having been nominated by President Bill Clinton and confirmed by the Senate. Before that, I held senior positions in the Massachusetts state government as Secretary of Environmental Affairs (appointed by and serving under Governor William Weld, from early 1991 through early 1993); Commissioner of the Department of Public Utilities (now called the Massachusetts Department of Telecommunications and Energy) (appointed by and serving under Governor Michael Dukakis, from late 1988 through early 1991); Executive Director of the Energy Facilities Siting Council; and Senior Economist for the Executive Office of Energy Resources. As Secretary of Environmental Affairs, I chaired the Board of Directors of the Massachusetts Water Resources Authority (a publicly owned, state

corporation with bonding authority and ratemaking autonomy) at a time when that authority's water and sewer rates were being raised significantly as part of its federal-court-ordered compliance with water pollution control statutes and regulations. Recently, I served as chair of an ocean management task force at the request of Governor Mitt Romney, and wrote a report at the request of the Speaker of the Massachusetts legislature on natural gas markets in New England for the Special LNG Commission established by the General Court in 2006. I currently sit on several corporate and non-profit boards and commissions, including the National Commission on Energy Policy; the National Academy of Sciences' Committee on Enhancing the Robustness and Resilience of Electrical Transmission and Distribution in the United States to Terrorist Attack; and the Environmental Advisory Council of the New York Independent System Operator. Previously, I served on several industry boards and committees, including as a director of the Electric Power Research Institute; as a member of the Advisory Council of the Independent System Operator – New England; as a representative to committees of the North American Electric Reliability Council; and as a member of the U.S. Secretary of Energy's Electric Reliability Task Force.

4. Prior to my work in state and federal government, I was an Assistant Professor at the University of California (Irvine). I hold a Ph.D. in regional planning from Cornell University (1980) and a Master's degree in Regional Planning, also from Cornell University (1976). My complete vita is attached in Tierney Exhibit 1.

5. From my jobs as a government regulator and as a consultant to electric utilities and private companies engaged in the electric industry, I have extensive experience not only in the economics, regulation and evolution of the electric industry, but also in electric company investment financing, electric utility ratemaking treatment for capital investments and expenses, and electric company compliance with federal and state air quality programs.

6. As compensation for my preparation of this expert report, my firm is paid $515 an hour for my time.

B. Topics Addressed and Summary of Opinions

7. I have been asked by the Plaintiff, the State of North Carolina ("NC"), to testify in this case as to facts and opinions relating to various issues related to air pollution control investments by the Tennessee Valley Authority ("TVA").

8. To set up the foundations for my opinions, I discuss in Section II (1) TVA's current financial and operational context, including the company's structure, decision-making, and regulatory context, its power plant supply portfolio and rates, and its capital obligations, financing capacity and debt limits; and (2) how TVA's operational, regulatory, financial and market situation compares to those of neighboring electric utility companies. Section III describes the power plant cost and emissions information I rely upon and which has been provided by another witness for the Plaintiff who describes the remedy proposed by the Plaintiff (the "Proposed Remedy"). In Section IV, I discuss the financial feasibility and financial reasonableness of the Proposed Remedy in light of TVA's financial and operational situation, the cost of the Proposed Remedy to TVA, air pollution control compliance obligations TVA might otherwise face in future years, and the financial, operational, and emission control context of other power suppliers and utilities in states or regions neighboring TVA. Section V states my conclusions.

9. As background to my preparation of this expert report, I have reviewed and taken into consideration a number of documents, which are listed in Tierney Exhibit 2. Many of these documents were produced by the parties in this case; other documents I collected on my own from publicly available sources.

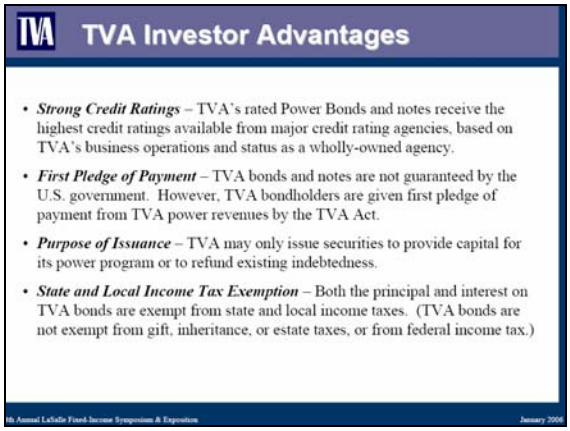
10. For the reasons stated below, I offer the following opinions:

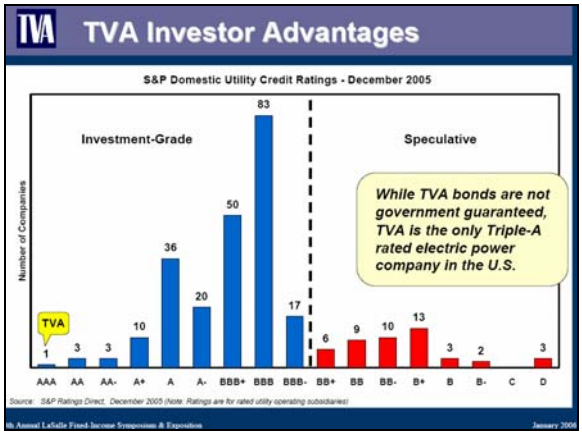
(a) TVA's current financial and operational context is very similar to that of many large vertically-integrated electric utilities in the U.S. with respect to size, contract and service obligations, system operational challenges, certain cost factors, generation technology and fuel supply options, etc.

(b) However, unlike other utilities, TVA enjoys certain clear and significant economic and financial benefits and advantages related to special service territory protections and guarantees, financing capability, generation portfolio and costs that arise in large part from the TVA's status as a federal power corporation entity. Specifically, various statutes (including the Tennessee Valley Authority Act, the Federal Power Act and the Energy Policy Act of 2005) combine in their effect to (i) prevent impingement on TVA's service territory from suppliers in neighboring regions that may wish to provide electricity service to retail customers within TVA's service territory, or the cooperatives and municipals that serve such customers; and (ii) in effect shield TVA from much of the state and federal rate regulatory oversight over ratemaking and the terms and conditions of electric transmission service experienced by neighboring investor-owned utilities. TVA has been and in my opinion will continue to be relatively insulated from efforts to introduce retail competition in certain states across the country, and to a large extent from federal regulatory efforts to establish large regional transmission system operators and institute standard electricity market designs. By law, TVA's enjoys unilateral authority to set its own rates, and must do so to assure that its rates cover its cost of providing electric service. TVA's statute and its revenues from the sales of electricity provide strong financial support for TVA's bonds, which are highly rated and enjoy certain tax exemptions. As a result of all of these circumstances, TVA has a low cost of capital compared to many other electric companies in neighboring states with whom it might potentially compete.

(c) These financial and economic advantages are viewed by TVA as a strength for the institution; for example, the following charts are from a 2006 TVA presentation to the investment community (see Figures 1-2, below; source of charts is TVA's website: http://www.tva.gov/finance/pdf/lasalle_presentation.pdf.)

Figures 1 and 2

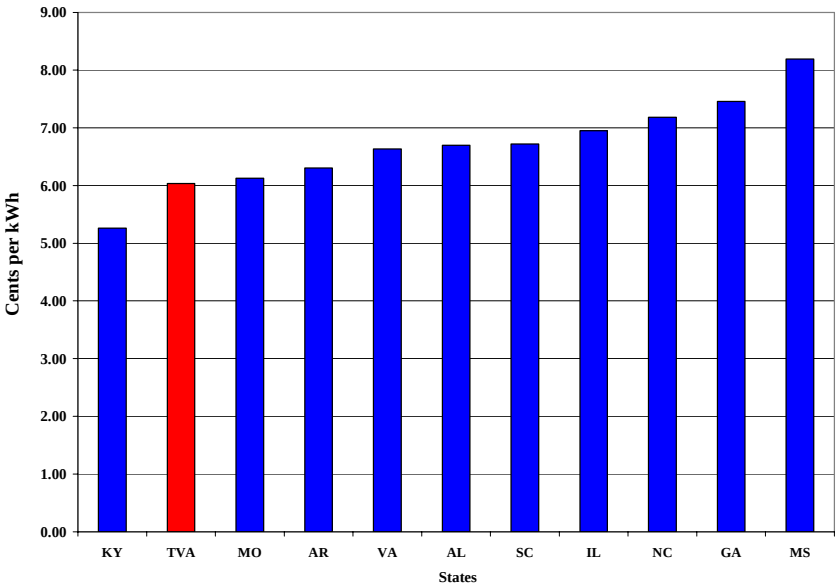




http://www.tva.gov/finance/pdf/lasalle_presentation.pdf

(d) The history of investment in TVA's current portfolio of electric generating facilities, and the unique ability of TVA to finance capital expenditures at low financing costs has allowed TVA to achieve low electricity production costs and maintain low electricity rates relative to the regional and national experience and consistent with TVA's objective of maintaining rates as low as feasible. Figure 3 show the low-cost electricity prices provided to consumers in the TVA service territory as compared to those in neighboring states (based on average retail prices in 2005, as described in my report).

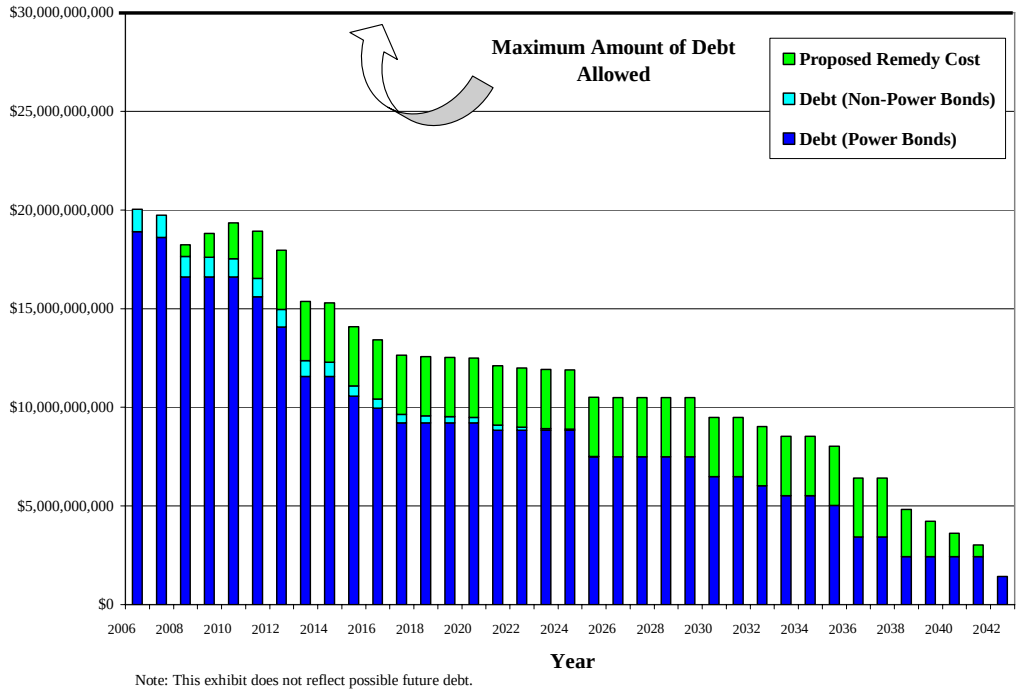
Figure 3
Average Retail Price – 2005



Source of data: U.S. Energy Information Administration ("EIA") Form-861.

(e) While TVA is currently subject to a statutory $30 billion dollar ceiling on evidences of outstanding indebtedness (primarily involving issuances of bonds), it currently operates well below this ceiling. As shown in Figure 4, assuming today's outstanding debt, TVA operates at least $10 billion below the ceiling in all future years, even taking into account new long-term debt associated with the Proposed Remedy. This condition is likely to continue to be true for the near- to mid-term. (In Figure 4, the debt ceiling is shown as the top horizontal line on the chart, with the "room" under the debt ceiling as the difference between that cap and the bars that represent debt; new debt associated with the Proposed Remedy is shown in green in the figure below.)

Figure 4
TVA's Outstanding Debt Relative to $30 Billion Ceiling
As of October 17, 2006



Note: This exhibit does not reflect possible future debt.

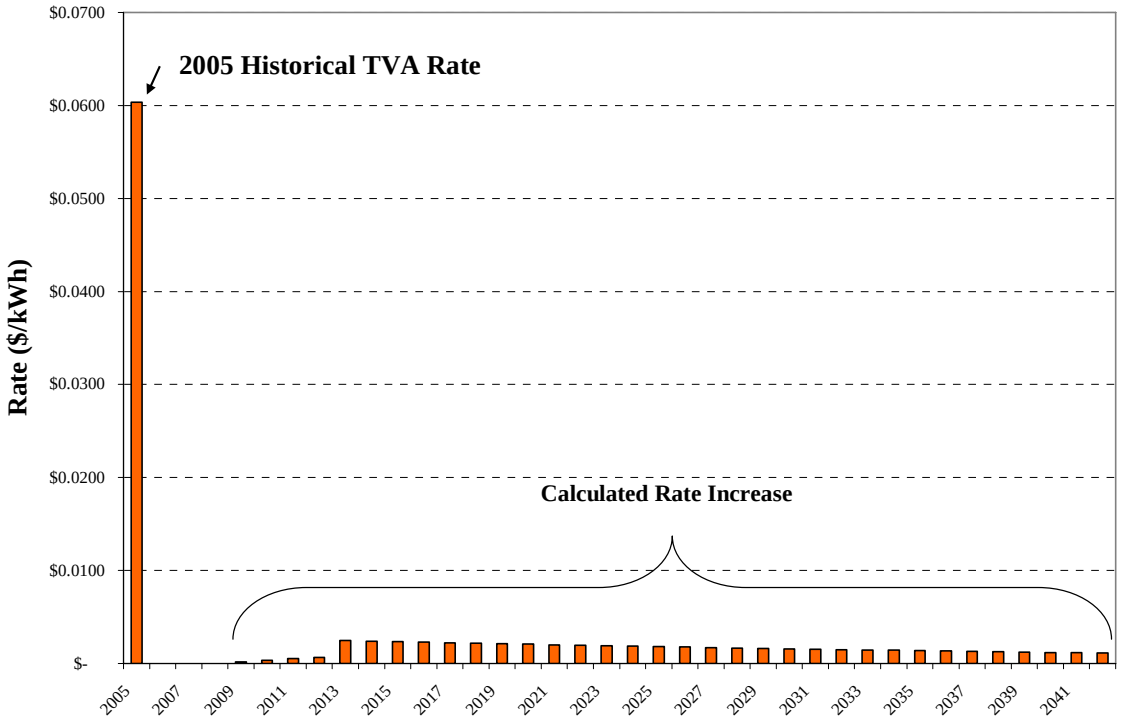
Source: Bloomberg, accessed October 17, 2006.

(f) Based on my review of (i) TVA's existing statutory limits on indebtedness, its ability to raise capital and its low cost of raising capital, (ii) its requirement to set rates sufficient to cover its cost of providing service, (iii) the relatively low level of current TVA rates, (iv) the protected market and regulatory contexts within which TVA operates, and (v) the magnitude of the likely capital and operating costs of

the Proposed Remedy, I conclude that it is financially feasible for TVA to raise and expend the funds necessary to meet the pollution control requirements proposed as a remedy in this case, and to recover in rates the costs associated with such investments. Consequently, based on my review of TVA's current financial situation, its debt and ratemaking context, the ability of TVA to finance the incremental capital costs of the Proposed Remedy, and the ability of TVA to set rates sufficient to cover the annual interest, depreciation and operating expenses associated the Proposed Remedy, I conclude that the Proposed Remedy is financially feasible. TVA has the means to fund the incremental costs associated with the Proposed Remedy.

(g) The TVA Act requires TVA to charge rates to cover the costs of providing power supply to its customers, and it does so without supervision by state or federal regulators. Presumably, therefore, if the Proposed Remedy is imposed on TVA and TVA complies with the court order by, among other things, financing necessary capital improvements and operating expenditures, then TVA will need to raise rates to cover the costs of the pollution reduction measures, of the money borrowed to pay for it and of the annual expenses needed to operate the measures. This ratemaking outcome is financially feasible for TVA in that the estimated impact on rates is small, with annual impacts less than 2.5 mills per kWh at their peak impact and much lower in most other years. The incremental impact of the Proposed Remedy on TVA rates is shown in Figure 5, with a peak impact of 4% of the 2005 rate level in a handful of years and with far lower impacts in the 30+ year period assumed to be needed to recover the capital costs of the Proposed Remedy through rates.

Figure 5
Estimated Impact of the Proposed Remedy on TVA Rates



(h) My opinion that it will be feasible for TVA to finance and recover the costs of the Proposed Remedy is informed by various unique features of the market, business and regulatory environment in which TVA operates its power system. TVA's electricity rates are among the lowest in the country, including among neighboring systems themselves well known for their own low power costs. TVA will continue to enjoy economic advantages in the market place, in light of its low cost of capital, autonomous ratemaking authority, and service-territory protections. Even if there were political, statutory and/or regulatory changes in the future that lessened those advantages, there would still be significant legal, timing and economic impediments to competitors seeking to attract TVA customers to leave the system and buy power from an alternative supplier during the next few years, when the highest potential rate impacts associated with the Proposed Remedy would take place. And most of those other likely potential competitors to supply power to TVA customers will likely face significant

requirements (and costs) to reduce emissions from their own coal-fired power plants in the future.

(i) For these reasons, I conclude that the Proposed Remedy is both financially feasible *and* reasonable.

II. TVA's ORGANIZATIONAL AND FINANCIAL STRUCTURE AND CURRENT CONDITIONS

11. I have been asked by the Plaintiff to consider the financial, ratemaking, and regulatory context for TVA in order to evaluate the potential impact on TVA's financial and economic conditions of the remedy proposed by the Plaintiff in this case. While in many ways, TVA carries out its electric operations in a way quite similar to most other electric utilities in the U.S., there are a number of features unique to TVA and relevant to this review, including considerations of statutory authorities affecting TVA's decision-making structure, its functional responsibilities, its service territory protections, opportunities for and constraints on its capital financing and investment recovery, and its ability to adjust its revenue recovery through periodic rate adjustments. In this section I provide an overview of the relevant authorities and limitations that bear on these questions.

A. TVA – Overview of the Power System Functions, Governance and Finances

1. TVA Power System

12. TVA was created in 1933 by the federal Tennessee Valley Authority Act (the "TVA Act"). TVA is a wholly owned corporate entity of the U.S. Government, charged with providing electric power and a variety of flood-control, industrial development and other services to the Tennessee Valley region.

13. Focusing on its electric power functions, TVA provides wholesale electricity supply and transmission service under wholesale contracts to 158 municipal and cooperative electric distribution utilities ("Distributors") in a service territory that spans a multi-state region, including most of Tennessee, northern Alabama,

southwestern Kentucky, northeastern Mississippi, and small portions of Georgia, North Carolina, and Virginia. (TVA 2005 Information Statement, page 3-4.) The term "service territory" is typically used in the electric industry to denote the geographical region within which a given utility (1) is obligated to meet the electrical demand of all current and future retail electricity customers, and (2) is guaranteed protections against impingement on their service territory (for service to retail customers) from other potential suppliers of electricity. TVA operates in an equivalent but distinct "service territory" structure. TVA is primarily a wholesale supplier of electricity, but supplies virtually all of its power to the TVA Distributors within a service territory established and maintained by federal law. The TVA Distributors in turn are required to purchase from TVA, and to resell to retail customers on terms and at rates essentially the same as the rates charged the TVA Distributors by TVA. For present purposes, the most important element of this relationship is the service territory guarantee provided by the TVA Act, and the prohibition on the sale of electricity within this service territory by entities other than TVA. In addition to TVA Distributors, TVA sells power to certain large industrial and federal government customers.

14. TVA serves a population of more than 8 million people, or approximately 3 percent of the U.S.'s 300 million population. TVA's contracts with its power Distributors specify various terms and conditions, including in most instances the electricity rates that may be charged to retail consumers. Although rates may vary over time, including as a result of changes in the underlying cost to produce power, these charges must comply with the intention of the TVA Act to provide electricity supply at "rates as low as are feasible." (TVA 2005 Information Statement, pages 3-5; TVA Act, Section 15(d)(f).)

15. TVA's wholesale contracts to supply power to local Distributors include provisions requiring the Distributor to provide many years of advance notice before leaving the TVA system to take supply from another entity. In essence, these contracts provide that in the absence of issuance of a notice of termination, another year is automatically added to the term at the anniversary of the contract. (TVA 2005 Information Statement, page 4.) Ninety-eight of TVA's Distributors, representing

over 50% of TVA's operating revenues in 2005, have contracts with a 5-year notice requirement. Another 48 Distributors (accounting for 28% of TVA operating revenues) have contracts with 10-year notice; and five distributions must give notice 15 years in advance it they want to terminate the TVA contract. As of the end of 2005, a total of 9 of the 158 Distributors had given TVA notice to terminate their power contracts, with 7 of these notices (with sales amounting to 3% of TVA's operating revenues in 2005) remaining in effect. (TVA 2005 Information Statement, page 4.)

16. In current budget and revenue planning as of the summer of 2006, TVA has assumed that its electricity sales to customers will increase by 2.1% from 2006 to 2007, although recent prior years have projected slightly lower growth rates more in the range of 1.4% per year. (http://www.tva.gov/finance/pdf/07_rate_review_presentation.pdf; TVA 2005 Information Statement, pages 6, 29.)

17. TVA operates a portfolio of hydroelectric, nuclear, coal-fired, oil-fired, natural gas-fired, and certain renewable resource electric generating facilities to meet the needs of the electric power Distributors and other wholesale electric customers within its service territory. With nearly 34,000 megawatts ("MW") of generating capacity, TVA's electric system is one of the nation's largest. (TVA 2005 Information Statement, pages 8, 10.). Typically, two-thirds of TVA's total power supply is produced at its 11 coal-fired power stations. (Id., page 8.) In 2005, TVA's coal-fired power plants produced approximately 98 billion kWh, or approximately 5 percent of total electricity produced by all coal power plants in the U.S. (Id.; EIA, *Electric Power Annual* 2005, Table ES1, showing approximately 2,013 billion kWh coal-fired electricity generated in the U.S. in 2005.)

2. TVA's Status as a federally owned Electric Utility

18. As a creature of the federal government, TVA's activities and structure are subject to past and future acts of Congress. TVA's statutory foundations make it similar in certain ways to other electric utilities and different from them in others.

19. For example, under the Federal Power Act ("FPA"), TVA is not a "public utility" like most of the other large electric utility companies in the U.S. As such, the TVA is not subject to the broad oversight and regulation by the Federal Energy Regulatory Commission ("FERC"). On the other hand, TVA is an "electric utility," and has recently become subject to more limited FERC authority under a narrow set of FPA sections, which relate principally but not exclusively to the provision of transmission service. (TVA 2005 Information Statement, page 3.)

20. Unlike other public utilities and many electric utilities that may sell electricity outside of their local service territory, the TVA Act imposes limits on TVA's ability to sell outside of the power supply "footprint" that it occupied as of July 1, 1957. (TVA 2005 Information Statement, page 3.) This constraint has sometimes been described as a "fence" around the TVA footprint, outside of which neither TVA nor the local Distributors of its power may sell power. (TVA 2005 Information Statement, page 57.) At the same time, there are also limits under the FPA which affect the ability of others to sell to customers inside of the TVA "fence." There is a so-called "Anti-Cherrypicking Provision" of the FPA which provides that FERC cannot order TVA to deliver power from an outside source to a customer if the power would be consumed within TVA's service territory. Other electric companies do not enjoy this protection against wholesale competition. While this provision could be modified in the future by act of Congress, this provision is viewed by TVA as minimizing its exposure to loss of customers. (TVA 2005 Information Statement, page 57.)

21. Under the TVA Act, TVA is governed by a nine-member Board of Directors, whose members are appointed by the President and confirmed by the U.S. Senate for five-year terms. The TVA Act gives the TVA Board the sole responsibility for setting the rates that TVA charges for selling its power; this fact distinguishes TVA from investor-owned utilities in the U.S. whose rates are regulated by state and/or federal regulators.

3. TVA Financial Conditions and Constraints

22. The TVA Act also requires that TVA charge rates for sales of electricity that are adequate to cover, among other things, operation, maintenance and administration of TVA's power system; for capital requirements necessary to meet the needs and requirements of owning, operating and maintaining the system; and for certain payments to state, local and the federal government.

23. In 2005, TVA's operating revenues totaled $7.794 billion, of which $7.704 billion resulted from TVA's electric power program. In the same year, operating expenses amounted to $6.503 billion, with net interest expense of $1.242 billion. TVA's short-term and long-term financial obligations totaled $25.783 billion in 2005 (including but not limited to debt obligations). (TVA 2005 Information Statement, pages 24-26.)

24. The average rates charged by TVA to retail customers and Distributors are among the lowest in the nation. Using public information from the U.S. Energy Information Administration, TVA's average rate (electric revenue per kWh) was 6.04 cents/kWh in 2005, or approximately 75% of the U.S. average rate of 8.14 cents/kWh in 2005. (EIA Form-861; US data from EIA, *Electric Power Annual 2005*, Figure 7.4.)

25. TVA manages its budget and finances to supply its customers' growing demand for reliable electricity at lowest feasible cost. As part of this, TVA has a number of costs, including purchasing fuel for its plants and wholesale power from other power suppliers; making investments to add new power production capability to its system, to maintain existing power plants, to reduce pollution at its generating facilities, to improve the reliability of its transmission system; and carrying out other obligations such as funding its workforce's pension-related costs, making required payments in lieu of taxes to states and counties in which TVA conducts its power operations, and payments to the U.S. Treasury to repay the federal government's initial investment to establish the TVA power system. (http://www.tva.gov/finance/pdf/3-06_presentation_investors.pdf.) During its most recent annual budget and rate-making cycle in 2006, TVA pointed out that

its current rates reflect significant and rapid increases in fuel and purchased power expenses in recent years, although TVA's forecasts for 2007 reflect a more moderate increase in such costs with the restart of the Browns Ferry nuclear Unit 1 (with its own capital cost of $1.9 billion). (http://www.tva.gov/finance/pdf/07_rate_review_presentation.pdf)

26. During July 2006, TVA's Board of Directors approved a 4.5% rate reduction in conjunction with a new "fuel cost adjustment mechanism" to go into effect on October 1, 2006. The fuel adjustment clause will allow TVA to automatically adjust rates up or down as fuel and purchased power costs rise and fall (http://www.tva.gov/news/releases/julsep06/board_approves.htm). According to TVA, this new "rate reduction is worth approximately $405 million to TVA customers in the 2007 fiscal year. The Board also approved a 2007 fiscal year budget with projected revenues of $9.3 billion."

27. Unlike investor-owned utilities that raise capital through both debt and private equity markets and instruments, and then collect revenues from customers to recover a return of and on these investments and other operating costs, TVA has no equity and can raise capital only through a variety of short- and long-term debt instruments. TVA calls a particular set of these debt instruments "Evidences of Indebtedness" (which in this report I call "TVA Debt" or "Debt"). These include "Power Bonds" (debt instruments to provide capital for TVA's power program), "Discount Notes" and "Other Indebtedness" – none of which are obligations of or guaranteed by the United States of America. Interest and principal on this TVA Debt are repaid through revenues TVA collects from its power program. (TVA 2005 Information Statement, 2005, cover page and pages 18-20.)

28. The TVA Act currently authorizes TVA to issue and sell bonds, notes and other evidences of indebtedness, in an amount not exceeding $30 billion outstanding at any one time to assist in financing its power program. (TVA Act, Sec. 15d.(a).)

29. As of October, 2006, TVA has outstanding total Debt of approximately $20 billion. Maturities on this current Debt follow a schedule, currently reported to be: $0.3 billion of Debt matures in 2007; $2.0 billion in 2008; $1.0 billion in 2011; $1.6

billion in 2012; $2.6 billion in 2013; $1.2 billion in 2015; $0.65 billion in 2016; and $0.78 billion in 2017. The remaining current Debt matures after 2056. (Bloomberg, accessed on October 17, 2006.)

30. To finance its operations and investments, TVA has managed a portfolio of debt and cash, including undertaking refinancing to obtain capital at lower interest rates. (http://www.tva.gov/finance/pdf/07_rate_review_presentation.pdf) TVA has touted its cost-control and debt reduction program for the value it says it provides in terms of improved financial health and flexibility in the future. (http://www.tva.gov/finance/pdf/lasalle_presentation.pdf) TVA forecasts an improving trend in interest and debt service coverage ratios. (http://www.tva.gov/finance/pdf/07_rate_review_presentation.pdf)

31. In its 2005 Information Statement to investors, TVA reported that among its six long-term Strategic Objectives are the following three relating to financing and costs: meeting customers' needs with affordable, reliable electric power; continuing the trend of debt reduction and reducing the level of total financing obligations in order to create more financial flexibility for the future business environment; and reducing TVA's delivered cost of power relative to the market. (TVA 2005 Information Statement, page 63.) With regard to debt reduction, TVA reported that its strategic plan "recommends a reduction target of at least $3 billion to $5 billion in debt over the next ten to 12 years but notes that debt-reduction targets will be updated annually depending on TVA priorities and changing market conditions. TVA anticipates that accelerated debt reduction can be achieved through continued emphasis on cost reduction, increased productivity, asset improvements to increase performance, further limiting capital projects where appropriate, and rate adjustments and rate changes consistent with market and power-supply conditions." (TVA 2005 Information Statement, page 66.) TVA also stated that due to "the uneven nature of TVA's expenditures both for expense and capital cost, the amount of total financing obligations that TVA can retire will vary in each year as a function of its margin on power sales, its ability to control its operating costs, and requirements for capital. Capital requirements generally can be broken down into base capital needed to sustain existing plants,

environmental capital such as the funds required to build facilities that reduce emissions on TVA's fossil fleet, and growth capital such as that needed for increasing the capacity of TVA's generating plants and transmission grid." (TVA 2005 Information Statement, page 28.)

32. While TVA Debt is not guaranteed by the United States, the TVA Act requires TVA to "charge rates for power which will produce gross revenues sufficient to provide funds" to cover the following costs, and to do so in certain prescribed ways so as to protect bondholders and the federal government's investment in the system:

> "for operation, maintenance, and administration of its power system; payments to States and counties in lieu of taxes; debt service on outstanding bonds...; payments to the Treasury as a return on the appropriation investment...[and] ...the repayment sums; and such additional margin as the Board may consider desirable for investment in power system assets, retirement of outstanding bonds in advance of maturity, additional reduction of appropriation investment, and other purposes connected with the Corporation's power business having due regard for the primary objectives of the Act, including the objective that power shall be sold at rates as low as are feasible." TVA Act, Section Sec. 15d.(f)

33. The financial assurances associated with its own ratemaking authority contribute to a relatively strong financial foundation for TVA. Further, TVA has stated that its "capital structure is composed primarily of debt and reflects a strong credit rating and investor confidence, both of which are important to TVA's financial health." (TVA 2005 Information Statement, page 31.)

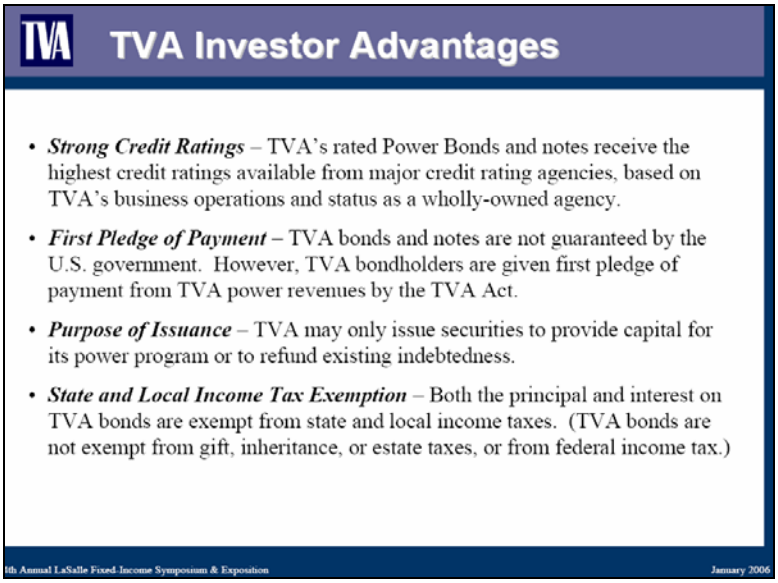
34. As of March 30, 2006, TVA bonds were rated "Aaa" by Moody's Investors Service and "AAA" by Standard and Poor's and Fitch Ratings. (TVA 2005 Information Statement, page 31.) At that time, TVA issued $1 billion of 50-year global power bonds and announced that this was the "lowest coupon rate ever" on "what records indicate is the largest 50-year transaction ever for a U.S. agency or corporate issuer." (http://www.tva.gov/news/releases/janmar06/50yr_bond.htm)

35. As measured by its most recent long term Power Bond coupon rate, TVA's cost of capital is 5.5 percent (Bloomberg, accessed October 17, 2006). While income derived from debt issued by TVA is subject to federal income taxation and various other federal tax consequences, it is exempt from taxes imposed by any state or

local taxing authority except estate, inheritance, and gift taxes. (http://www.tva.gov/news/releases/ janmar06/50yr_bond.htm; TVA 2005 Information Statement, page 20.)

(b) These financial and economic attributes are viewed by TVA as an advantage. For example, the following charts from a 2006 TVA presentation to the investment community highlight TVA's financial uniqueness and strength. (see Figures 1-2, and 6, below; http://www.tva.gov/finance/pdf/lasalle_presentation.pdf.)

Figures 1 and 2



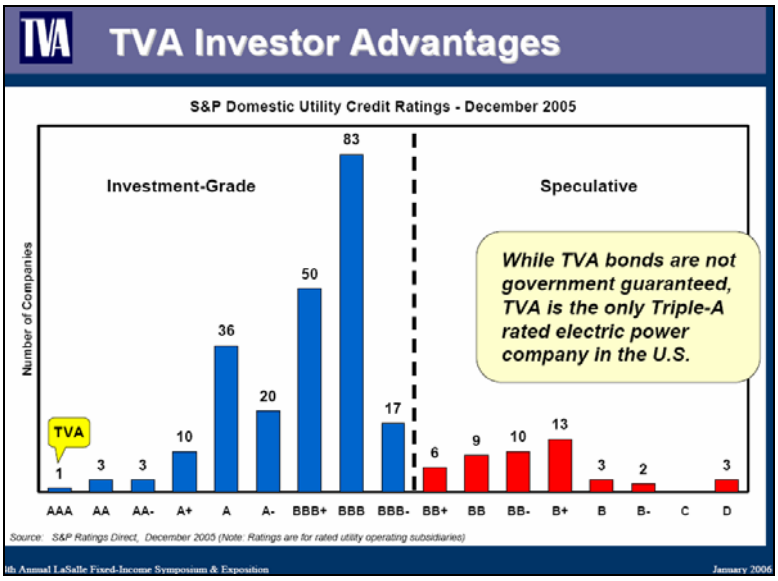
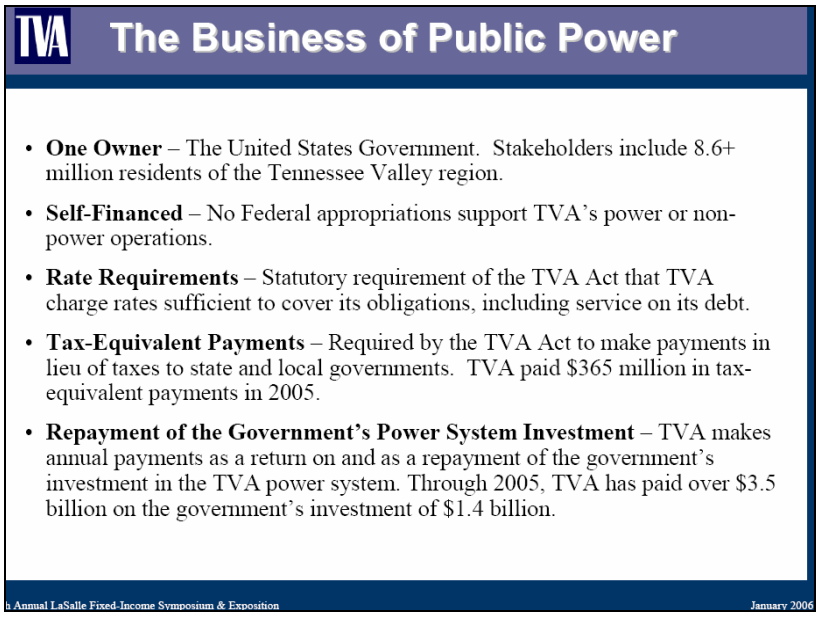


Figure 6

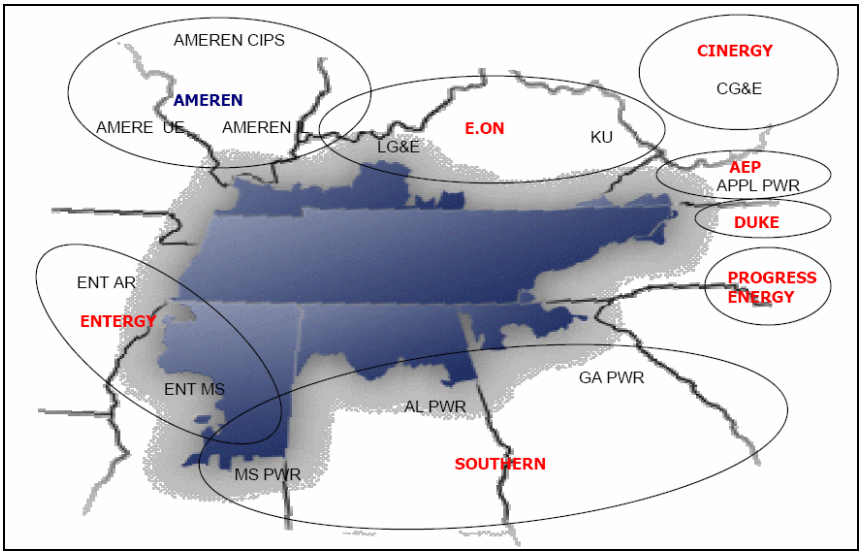


B. TVA in comparison to other electric utility companies

36. From its beginnings, TVA has been different from and similar to many other large power companies in the electric industry.

37. On the one hand, as an electric generation and transmission provider supplying wholesale power under contract to a wide array of customers, it is quite similar to many large and small vertically-integrated electric utilities, including ones that operate in its region. As shown in Figure 7, below, TVA is shown in the center of the map, surrounded by these large neighboring electric utility companies. The latter include: Duke Energy companies in North and South Carolina, and Indiana (including the former Cinergy Companies); Progress Energy companies in North Carolina; the Southern Company utilities in Alabama and Georgia; Entergy utility companies in Mississippi and Arkansas; Ameren utility companies in Illinois; E.On utility companies (e.g., Louisville Gas & Electric Company) in Kentucky; and American Electric Power companies in West Virginia and other Midwest states. (http://www.tva.gov/finance/pdf/midyear_rate_review_2006.pdf) Like TVA, these other major electric utilities have either long-term public service obligations and/or contractual commitments to provide power to consumers.

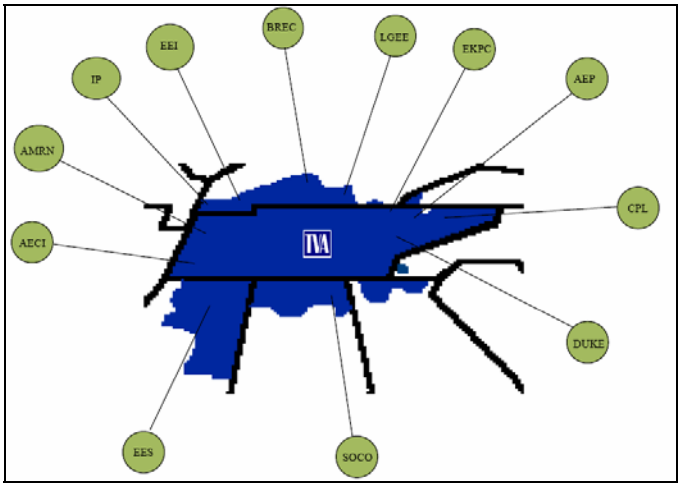
Figure 7
The TVA Power System and Neighboring Electric Utility Systems



Source: http://www.tva.gov/finance/pdf/midyear_rate_review_2006.pdf

38. From a technical point of view, the TVA power system uses generating and transmission equipment comparable to those owned and operated by other utilities. TVA's system is physically interconnected with many of these neighboring electric systems, as shown in Figure 8 below. Most of these neighboring utilities own and operate a mix of power plants similar to those in the TVA power system. Many – like the Duke Energy utility companies, Progress Energy Companies, the Southern Companies, the Entergy Companies, E.ON's Louisville Gas & Electric and Kentucky Utilities – own and operate a mix of power plants similar to TVA's in terms of a significant amount of generation from coal-fired power plants. TVA, like these other utilities, is subject to various air quality requirements affecting these power plants. In the future, for example, these utilities will probably face significant regulatory requirements and either investments and/or expenditures to reduce emissions from their coal-fired power plants which would likely put some pressure on their rates.

Figure 8
TVA's Transmission Interconnections with Neighboring Electric Systems



Notes : The abbreviations above are : "AEP" – American Electric Power; "AMRN" – Ameren; "BREC" – Buckeye Rural Electric Coop; "CPL" – Carolina Power and Light Company; "Duke" – Duke Energy; "EES" – Entergy ; "EKPC" – Eastern Kentucky Power Company; "IP" – Illinois Power; "LG&E" – Louisville Gas & Electric; "SOCO" – Southern Company, Source: http://www.tva.com/power/pdf/2005/Welcome_2005.pdf

39. For example, these utilities operate in states that are subject to the upcoming Clean Air Interstate Rule ("CAIR"), issued by the U.S. Environmental Protection Agency ("EPA") and that regulates sulfur dioxide ("SO_2") and nitrogen oxides ("NO_x") from coal-fired power plants in the Eastern U.S. Although the CAIR program is currently subject to certain legal challenges that could stop or delay its implementation, and state plans for implementation of CAIR have not been finalized, it is possible that these uncertainties will be resolved and TVA could become subject to certain requirements related to emissions of NO_x and SO_2 under CAIR in the future. If implemented as the rule now stands, CAIR would allow TVA and owners of other affected power plants to comply through (among other things) use of a substantial number of "banked" (or stockpiled) emissions allowances, which could delay actual emissions reductions for years, and/or purchasing from other parties emissions allowances sufficient to cover emissions, rather than limiting emissions to any particular level.

40. On the other hand, TVA's status as a federal power corporation established by act of Congress provides TVA with various financial and economic advantages relative to these other electric utilities. These advantages derive in large part from TVA's

governance structure that gives the TVA the ability to self-finance and set its own rates without supervision from federal or state rate regulators; its financing authorities, under which it may issue debt instruments at low cost of capital and with certain tax advantages for investors; and its statutory protections that allow TVA to carry out its business without real competition from other companies.

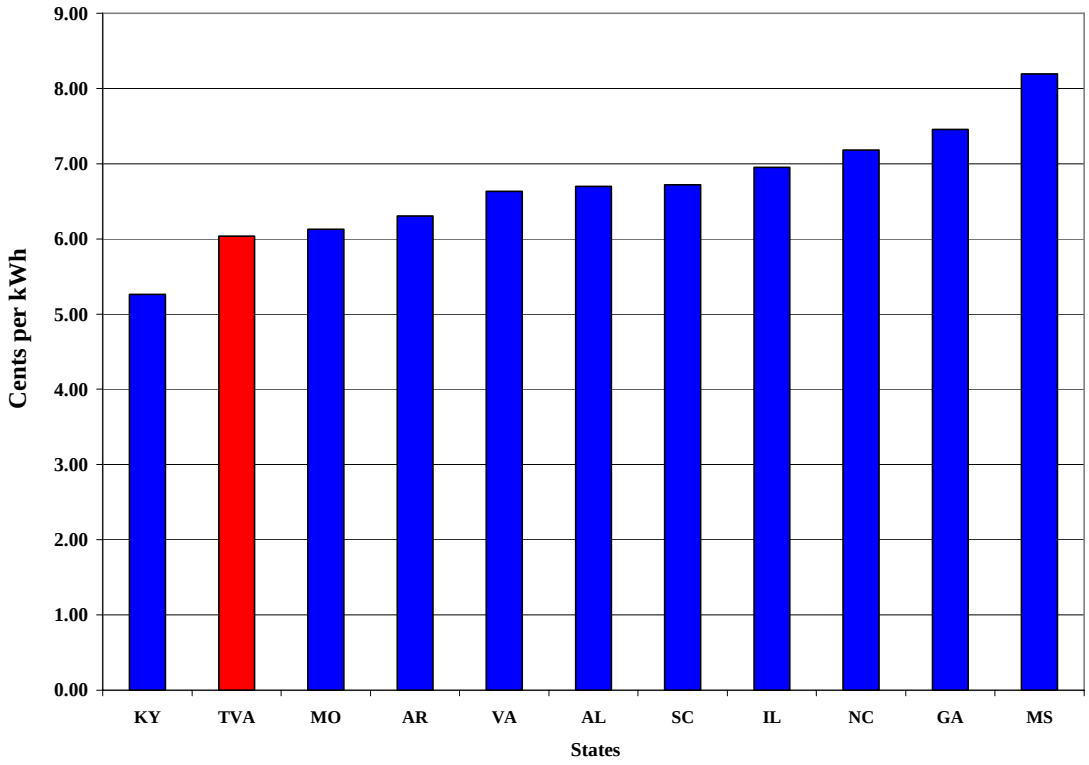
41. In 2005, TVA's average electricity price of 6.04 cents/kWh compares favorably not only to the national average price of 8.14 cents/kWh in 2005, but also to rates in neighboring states. Among its close-by states, TVA's electricity price is second lowest, after Kentucky, as shown in Table 1 and Figure 3.

Table 1
Average Retail Electricity Price –
TVA, Neighboring States, U.S. – 2005

State	Cent/kWh*
Alabama	6.70
Arkansas	6.30
Georgia	7.45
Illinois	6.95
Kentucky	5.26
Missouri	6.13
Mississippi	8.19
North Carolina	7.18
South Carolina	6.72
Virginia	6.64
TVA	**6.04**
U.S.	8.14

* based on revenue/kWh. Note: States where TVA serves load do not reflect the TVA portion of rates. Source: EIA Form-861; US data from EIA, *Electric Power Annual 2005*, Figure 7.4.

Figure 3
Average Retail Price – 2005

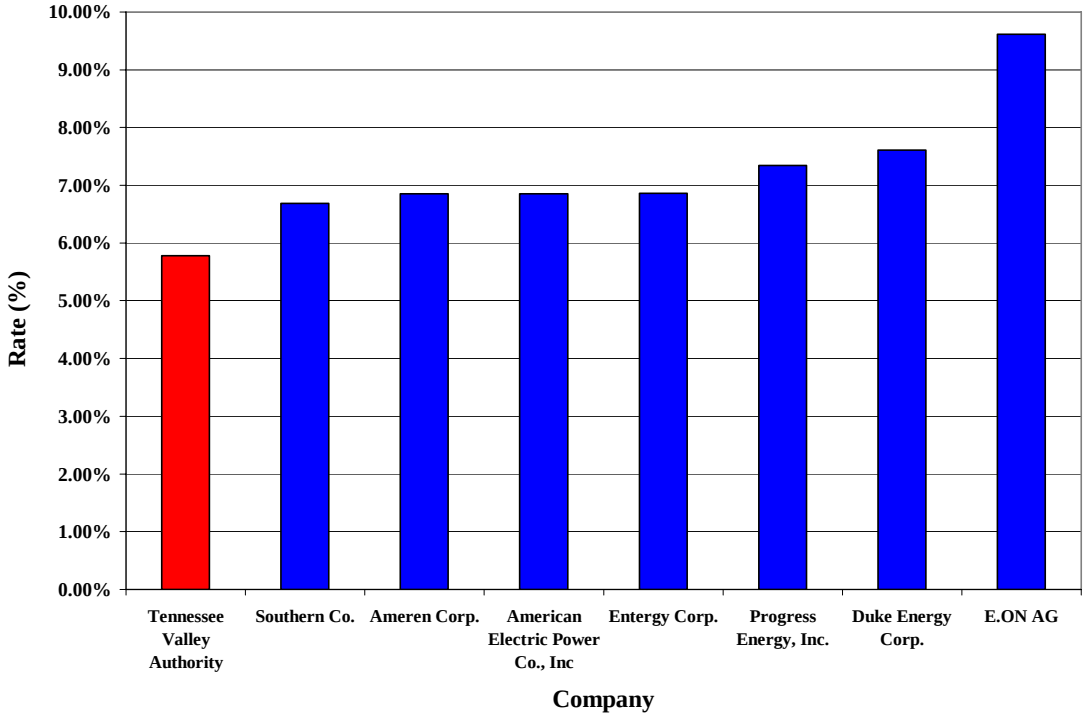


Note: States where TVA serves load do not reflect the TVA portion of rates. Source: EIA Form-861

42. Electricity prices in these states will continue to experience change in the future, in part due to the changes in the cost of fuel to produce power. Like TVA – now that it has a fuel adjustment clause mechanism that allows a pass-through to customers of increases and decreases in fuel cost costs and purchased power expenses – many of the other utilities in neighboring states also have fuel adjustment clause mechanisms and have been passing through recent changes in the cost of fuel. (For example, in Figure 7, the neighboring systems whose names are shown in red are ones that have fuel adjustment clauses.)

43. As shown in Figures 2 and 3 (above) and 9 (below), TVA enjoys relatively strong bond ratings, low cost of capital and low electricity prices (defined here as revenue/kWh).

Figure 9
TVA and Neighboring Electric Utility Companies –
Comparison of Cost of Capital



Note: Financing Costs are the Weighted Average Cost of Capital (WACC); or Weighted Average Coupon Rate for TVA.

Source: Bloomberg, accessed October 25, 2006.

44. TVA's current rate position makes it relatively strong in terms of how its power supplies compare to those of other utilities, especially from the vantage point of a TVA Distributor or customer seeking to switch underlying electricity provider for a competitive supplier (e.g., to leave TVA to try to find another supplier offering better rates). Few suppliers offer lower rates than TVA. And TVA has been and in my opinion will continue to be relatively insulated from many state and federal initiatives to have created competitive pressures on electric utilities in some parts of the U.S. As recently as August 2005, Congress reaffirmed as part of the Energy Policy Act of 2005 the FPA's Anti-Cherrypicking provisions. These provisions protect TVA from a federal regulatory order by FERC that would have otherwise required TVA to provide transmission to another entity for the purpose of provide power to a customer inside the TVA footprint. While it is possible that at some

point in the future this provision might be removed or its effect diminished – thus creating greater pressure that TVA might lose customers or customer loads to other power suppliers – this outcome is unlikely any time soon.

45. In short, in my opinion there is little risk in general that the combined electrical load associated with the demands of TVA's Distributor, industrial and other customers will decrease over time, and instead will likely continue to grow as predicted by TVA. I conclude this based on my review of the conditions that would need to be met before a substantial number of Distributors or industrial customers could and would exit the TVA system, and based on my expectation that there will not be any significant steps towards greater retail or wholesale competition in a way that would materially and adversely affect TVA operations, service territory designations, or rights and obligations to serve all providers of electric service to retail customers within TVA's service territory any time soon, if at all.

III. PROPOSED REMEDY AND BASE-CASE SCENARIOS

46. The Plaintiff in this case has asked that this court require TVA to comply with a remedy so as to meet emission reductions for NO_x and SO_2 that are comparable to the emission control requirements of the North Carolina Smokestacks Act ("CSA"). I am relying on the Expert Report of Dr. James Staudt for a description of the Plaintiff's Proposed Remedy, estimated capital costs for installing pollution control equipment on TVA's coal-fired power plants, and projected power plant operating conditions (including emissions levels and incremental operating and maintenance costs) associated with the remedy. (U.S. District Court for the Western District of North Carolina Asheville Division, *State of North Carolina, ex rel., Roy Cooper, Attorney General, Plaintiff, v. Tennessee Valley Authority, Defendant*, Expert Report of Dr. James E. Staudt, October 16, 2006 ("Staudt Report").)

47. Dr. Staudt has projected two cases for TVA's coal-fired generation portfolio in the year 2013: (a) a "CSA Equivalent case" – with estimated operating conditions, emissions of NO_x and SO_2, and emission control costs for the Proposed Remedy, and (b) a "Base Case" – with estimated operating conditions and emissions that

would prevail absent the Proposed Remedy. In short, the Base Case represents operation of TVA's generation resources without the installation of the additional control measures that would be in operation in the CSA Equivalent (or Proposed Remedy) case. I have not independently estimated pollution control costs or emission reduction strategies for the purpose of my testimony in this case.

48. I have been asked to consider the potential financial impact of the Proposed Remedy on TVA, in light of its existing financial conditions, regulatory setting, and ratemaking contexts. In order to carry out such an assessment, I rely on Dr. Staudt's estimation of the capital cost and annual operating cost of the Proposed Remedy, along with his modeling of TVA emissions in 2013 under the Proposed Remedy and Base-Case scenarios. Specifically, for the purposes of my analysis, I rely upon the following data from the testimony of Dr. Staudt: (1) an aggregate incremental capital cost of approximately $3 billion (2006$) for installation of pollution control equipment to comply with the Proposed Remedy, with installations made in sufficient time over a five-year period from 2008-2012 to ensure TVA's compliance with the Proposed Remedy starting in 2013; (2) an annual expense of incremental materials, energy and labor costs associated with operation and maintenance of the installed pollution control equipment of approximately $222 million; and (3) a minimum useful life of 30 years for the pollution control equipment. (Staudt Report, pages 5, 13-14.) (Dr. Staudt's cost estimates are in 2006 dollars; I have used the same convention in my own report, so that all descriptions or estimates of cost are in 2006 dollars unless otherwise stated.)

49. I use these data, along with public information on TVA finances and certain assumptions and calculations, to develop a schedule of capital expenditures associated with the Proposed Remedy and calculations of the impact of these expenditures on TVA's debt levels, interest expenses, annual costs, and rate impacts. In Section IV, I discuss these estimated cost and other impacts of the Proposed Remedy on TVA in light of TVA's current financing conditions and rates.

IV. FINANCIAL FEASIBILITY AND FINANCIAL REASONABLENESS OF THE PROPOSED REMEDY

50. To assist the court in determining whether the Proposed Remedy is both financially feasible and reasonable if it were imposed on TVA, I evaluate whether and to what extent TVA is able to absorb the costs of the Proposed Remedy.

51. Previously in Section II, I discussed a number of TVA's unique attributes that give it an advantage in financing and ratemaking and which have produced relatively low electricity rates for TVA's consumers. These features include various authorities established in federal law, various service territory protections, various opportunities for low-cost capital financing and revenue recovery, and ability to modify revenue recovery through periodic rate adjustments. Using that information as a foundation, in this section I summarize my analysis of the impact on TVA of the Proposed Remedy, in terms of TVA's ability to raise needed capital through issuance of debt and the implications of doing so for TVA's rates. I further discuss what such impacts would likely mean, in terms of the comparative attractiveness of TVA's rates, relative to those charged by other major electric utilities in neighboring states that might otherwise be viewed as competing sources of supply for the electricity Distributors now served under long-term contract by TVA.

52. I use this analysis to reach conclusions below as to the feasibility and reasonableness of the Proposed Remedy: that is, whether TVA technically can absorb these costs (i.e., whether it is financially feasible); and whether TVA can absorb these costs without raising rates so high in comparison to those charged by neighboring electric utility system that TVA would lose a material share of customer load, leaving the remaining customers to bear an unreasonable cost burden (i.e., whether the Proposed Remedy is reasonable). The former "feasibility" question focuses on TVA's ability to finance the capital costs. The latter "reasonableness" question focuses on resulting rates for TVA and how they would compare with rates likely to be in place for the major electric utility companies in the neighboring region, along with the larger market and regulatory

context for considering whether TVA's electric service will otherwise be under greater competitive pressures in the future.

A. Financial Feasibility - TVA's Ability to Fund the Proposed Remedy

53. There are two principal mechanisms through which TVA funds the cash and capital requirements of its power system and any associated costs, such as installation and operation of required pollution control equipment. These two mechanisms are (a) the setting and charging of rates for the sale of electricity, and (b) the issuance of debt. In this section, I analyze the feasibility of raising money for the Proposed Remedy through raising capital in debt markets and setting rates to recover these capital and operating costs associated with the Proposed Remedy. For the first issue, I summarize TVA's current statutory and/or regulatory limits on capital financing and debt, TVA's opportunity for and cost of raising capital through issuing debt, and how the financing impact of the Proposed Remedy compares with TVA's current debt schedule, expected capital expenditures, and the current debt ceiling. Second, I review the rates that TVA currently charges for electricity service, and how the potential impact on rates of the Proposed Remedy compares with the current level of TVA rates.

1. TVA's Ability to Finance the Proposed Remedy

54. TVA finances capital investments in its power system as needed to meet its contractual obligations to provide reliable electric supply at lowest feasible rates. TVA does so by making investments in new and/or replacement generation and transmission facilities (known as plant or capacity), providing for system upgrades and improvements and maintenance and repairs of existing plants and providing credit support for long-term purchases of power from other electric suppliers. These actions reflect a variety of requirements set forth not only in the TVA Act, but also other statutes, regulations and other legal actions, such as those imposing federal and state environmental requirements that cause TVA to invest in and install pollution control and other power system equipment.

55. Major capital improvements to TVA's power supply and delivery system are made by or under the authority of the TVA Board, and under the management leadership of TVA's Chief Executive Officer, presumably based on system planning forecasts; business considerations; regulatory, technical and legal requirements; policy, political and other judgments; and other criteria.

56. The cost to TVA of financing capital investments is primarily related to the coupon rates of the bonds issued by the Authority. As a corporation wholly owned by the United Sates, TVA itself has no equity. Unlike most of the investor-owned utilities that operate in states within the Southeast region of the U.S., and which finance investments through both debt and equity markets, TVA raises capital to finance the investments and operations of its power system largely through issuance of Power Bonds of varying terms and certain other debt instruments. At any point in time and without further approvals to allow otherwise, outstanding TVA obligations on certain defined types of debt must fall under the $30 billion limit established by Congress. (TVA Act, Section 15(d).) In addition, TVA raises funds through internal cash generation, and various customer prepayments and lease-leaseback arrangements. (TVA 2005 Information Statement, page 31.)

57. TVA's average cost of capital is driven primarily by the average coupon rate on outstanding bonds. As of October 17, 2006, the weighted average coupon rate on outstanding bonds was 5.78% (Bloomberg, accessed October 17, 2006). The last rate at which TVA raised long-term debt was 5.5% as of October 13, 2006 (Id.). This shows the strength of TVA's credit ratings.

58. As shown previously in Table 1 and Figures 1 and 2, TVA's cost of debt compares favorably with those of other major electric utilities (including those in its neighborhood) who lack TVA's advantages of certain tax exemptions on bonds, the unilateral ability to set rates without regulatory oversight and the requirement to access capital in both debt and more expensive equity markets.

59. Currently, TVA is operating well below its mandated debt ceiling of $30 billion on a total amount of outstanding bonds, notes or other evidences of indebtedness. TVA has reported that as of September 30, 2005, it had approximately $20.67

billion in long-term debt (TVA 2005 Information Statement, page 25). In April 2006, TVA issued an additional $1 billion in long-term bonds. As recently as October 13, 2006, TVA issued further long-term debt (Bloomberg, accessed October 17, 2006). Based on these information sources, which indicate, among other things, repayment schedules, maturities of outstanding debt, I estimate that TVA currently has outstanding total long-term debt of approximately $20 billion. Therefore, there is currently room within this $30 billion debt ceiling to accommodate the financing of the incremental $3.0 billion capital cost estimate for the Proposed Remedy, as estimated by Dr. Staudt, were it be to fully absorbed today – or upon the receipt of an order adopting the Proposed Remedy by the court

60. In light of a more likely scenario, which would involve spreading the financing of that $3.0 billion capital costs across several years into the future, I have analyzed the financing implications of Dr. Staudt's capital cost estimates, assuming that installation of the equipment would occur over a multi-year period following a decision of this court in 2007. In order to estimate the financial impact of the Proposed Remedy and then to compare the financing implications of those costs to existing debt levels, I make the following assumptions and calculations:

(a) Based on Dr. Staudt's estimate, I assume that the full $3.0 billion amount of capital costs necessary for the Proposed Remedy would be spent evenly over a five-year period from 2008 through 2012. This is the period in which, Dr. Staudt has informed me, he assumes that the development, equipment ordering and purchase, and construction of the Proposed Remedy would take place. Consequently, for the purposes of calculation, I assume that the full amount ($3 billion) of costs will be spread out equally (i.e., 20% of $3 billion a year, or $600 million annually in 2006$) over the five years 2008 – 2012.

(b) I assume that each year's capital expenditure will be financed through the issuance of additional debt in the form of Power Bonds. I assume that during each of the five years of the installation period, TVA would issue bonds for one-fifth of the capital cost. I further assume that the term of the bonds issued for this purpose will have a term that spans the installation period and the 30 years of

useful life of the pollution control equipment (as provided to me by Dr. Staudt). I assume that during the construction period, interest of bonds is fully paid each year (in effect, through ratemaking that allows for recovery of funds used during construction).

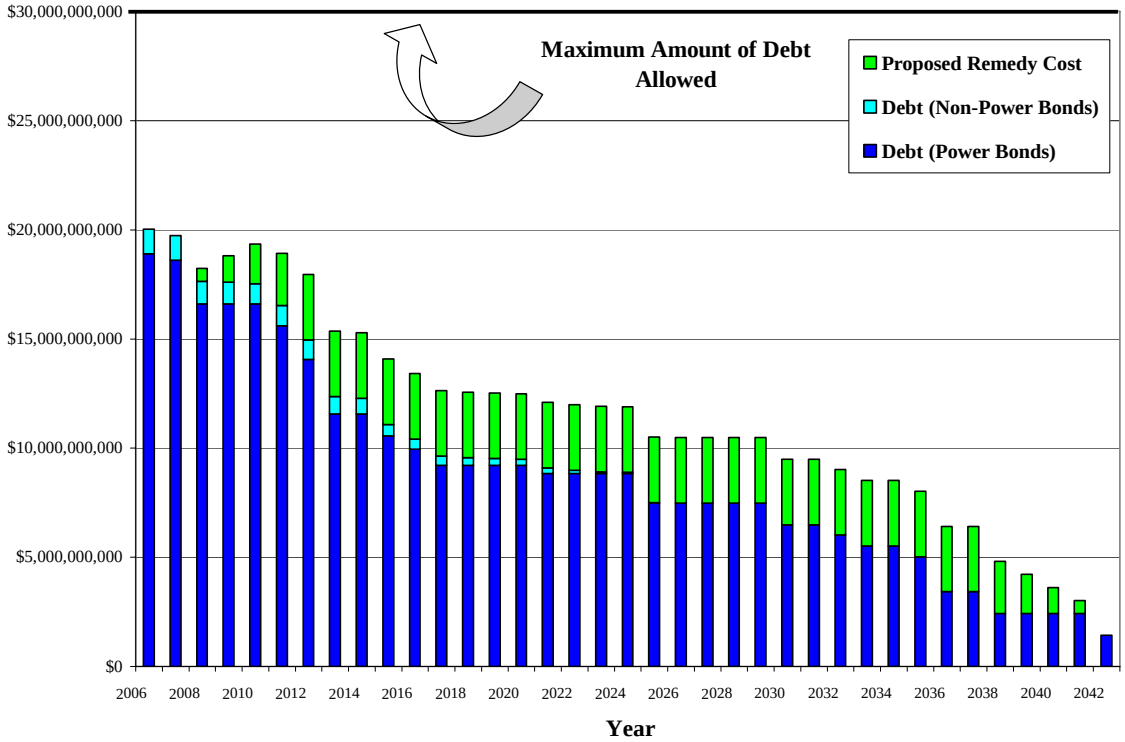
(c) To establish TVA's existing debt levels, I rely on current debt for TVA as reported in Bloomberg, including outstanding amounts and maturity dates (Bloomberg, accessed on October 17, 2006). Bloomberg-reported debt amounts closely match the amounts identified by TVA on its website and in its most recent Information Statement ("TVA: Investment Opportunities," Tennessee Valley Authority, http://www.tva.gov/finance/opportun/index.htm; TVA 2005 Information Statement, e.g., page 25), with differences primarily related to the amount of debt that has matured in 2006.

61. The results are shown in Figure 4, which presents an outlook for TVA's annual long-term debt levels, based on what is known today with regard to TVA's Power Bonds and other debt, along with the incremental $3.0 billion assumed to be issued in new bonds to cover the capital investment associated with the Proposed Remedy. The annual debt levels associated with Power Bond debt that exists today is indicated in the dark-blue portion at the bottom of each bar on the chart. TVA's existing non-Power Bond debt is shown in the relatively small turquoise blue portion of the bars. The incremental bonding associated with new debt to finance the Proposed Remedy (as outlined by Dr. Staudt) is shown in green, at the top of each bar. Together, these existing and incremental amounts are stacked together and compared against the company's current ceiling on outstanding debt ($30 billion, the maximum value on the y axis). As can be seen from the Figure, today and going forward, there is substantial room under TVA's current ceiling on outstanding debt for the financing of capital expenditures required to meet the Proposed Remedy.

62. I note that Figure 4 shows my estimate of future annual bonding levels, based on today's obligations. While this pattern of debt retirement is consistent with TVA's long-term debt reduction strategy, I would expect it to understate the amount of debt that will actually exist in future years, as TVA makes decisions in the future to

issue additional bonds to finance its other capital and operating needs for its power system. Presumably, if the Proposed Remedy were in place, TVA would have to make its business and financing decisions with knowledge of the requirement to have financed the $3.0 billion in incremental requirements associated with the Proposed Remedy.

Figure 4
TVA's Outstanding Debt Relative to $30 Billion Ceiling
As of October 17, 2006



Note: This exhibit does not reflect possible future debt.

Source: Bloomberg, accessed October 17, 2006.

63. Based on my review of TVA's description of current debt, as outlined above, and TVA's expected major near-term capital investments, I conclude that there is substantial room – in excess of $10 billion in future years – within the current debt limit for issuances of additional bond, notes or other forms of debt.

64. While Figure 4 reveals that there is currently substantial room under TVA's current debt ceiling to accommodate the financing required for the Proposed Remedy, I also considered it important to review the possibility that future debt levels for

investments not related to the Proposed Remedy could increase by an amount that would significantly alter this observation. As noted above, Figure 4 reflects in blue the current level of TVA debt, and how this level would decrease as this debt matures over time. However, this current schedule of debt does not reflect capital costs that TVA may – and likely will – need to finance in the future to grow and modernize the TVA system in a manner sufficient to meet future system load obligations in a reliable manner. In this respect, the key question is whether TVA would need to issue new debt for these various capital projects in an amount larger than the difference between (1) the total of current debt schedules plus that estimated for the Proposed Remedy, and (2) the currently debt ceiling of $30 billion at any point in time. In my opinion, it is highly unlikely that TVA would need to finance additional capital expenditures to a level that, combined with financing for the Proposed Remedy, would approach the current ceiling on debt. While TVA does not make public its long-term expectations of future capital expenditures, I have considered a number of relevant factors in coming to this conclusion, including (a) current levels of TVA indebtedness, (b) the absolute magnitude of the "space" for incurrence of additional debt over time, as represented in Figure 4, (c) a review of recent information statements and ratemaking presentations, particularly with respect to expectations for future capital expenditure needs and capital financing options, (d) a knowledge of the ability of the TVA Board and Management to exercise a high degree of discretion to strategically manage its financing requirements within the $30 billion outstanding debt limit, and (e) my professional experience and judgment concerning the drivers of utility capital expenditures.

65. In short, it appears that TVA currently has substantial room under the current $30 billion debt ceiling to accommodate the costs and financing requirements of the $3 billion Proposed Remedy, even taking into account the estimated incremental debt that would be incurred for the Proposed Remedy.

66. Recent TVA statements of expectations for capital expenditures going forward – at least over the next few years – reflect both an increase for certain ongoing needs, and a decrease in existing annual capital expenditures, with expected amounts

well below the room that would otherwise exist under the current debt ceiling level. Specifically, TVA conducts an ongoing review of its construction expenditures and financing programs, including consideration of load growth, environmental regulations, inflation, major projects, availability and cost of external capital sources, and the potential for changing industry structures. Based at least in part on such reviews, TVA's current estimate of future planned construction expenditures for property, plant, and equipment additions include a decrease in the expenditures for the restart of Browns Ferry Unit 1 (from over $400 million now incurred in 2005 and 2006, to $81 million in 2007 and zero in 2008); additional expenditures for "Clean Air" investments of roughly $200 million to $300 million annually; and additional transmission and capital project expenditures on the order of $600 million to $900 million annually through 2010. Even with a financing of the costs of the Proposed Remedy, TVA would have significant room under the Debt cap to undertake a significant level of other projects (some of which might even include projects that overlap with what Dr. Staudt has proposed as part of the Proposed Remedy). (TVA 2005 Information Statement, page 38; http://www.tva.gov/finance/pdf/ lasalle_presentation.pdf ; http://www.tva.gov/finance/pdf/3-06_presentation_ investors.pdf ; http://www.tva.gov/finance/pdf/07_rate_review_ presentation.pdf ; http://www.tva.gov/finance/pdf/presentation_presreport_ board_mtg_9-26-2006.pdf.)

67. Based on my review of the factors discussed in this section, I conclude that it is feasible for TVA to finance the incremental costs of the Proposed Remedy without jeopardizing either TVA's compliance with the current $30-billion debt ceiling requirement, or the funding of future capital investment needs to continue TVA's investment in and safe and reliable operation of its transmission and/or generation assets at lowest feasible costs.

2. TVA's Ability to Support the Proposed Remedy in Rates

68. In order to review the potential impact of the Proposed Remedy on TVA rates, I calculate its incremental impact on rates and then consider that impact in light of

TVA's current average rate levels. My calculation takes into consideration recovery of original capital cost (or financed capital investment) as well as annual operations and maintenance expenses associated with operation of the new pollution control equipment as part of the affected power plants.

69. Dr. Staudt has estimated that annual equipment operation and materials expenses would be $222 million. (Staudt Report, page 5, rounded from original estimate.) I include this directly in my estimate of potential rate charges.

70. In order to estimate the annual amounts to be recovered in rates for the Proposed Remedy's capital expenses, I start with Dr. Staudt's estimate of $3.0 billion (2006$) in capital outlays. Assuming, as directed by Dr. Staudt, that TVA would spend this money in even amounts by TVA over a five-year period (2008-2012), this means that there would be an approximate $600 million (2006$) capital expense per year for 5 years, starting in 2008 and ending in 2012 before the equipment went into service in 2013.

71. I then make the following assumptions for the purpose of calculating recovery of these costs in TVA rates:

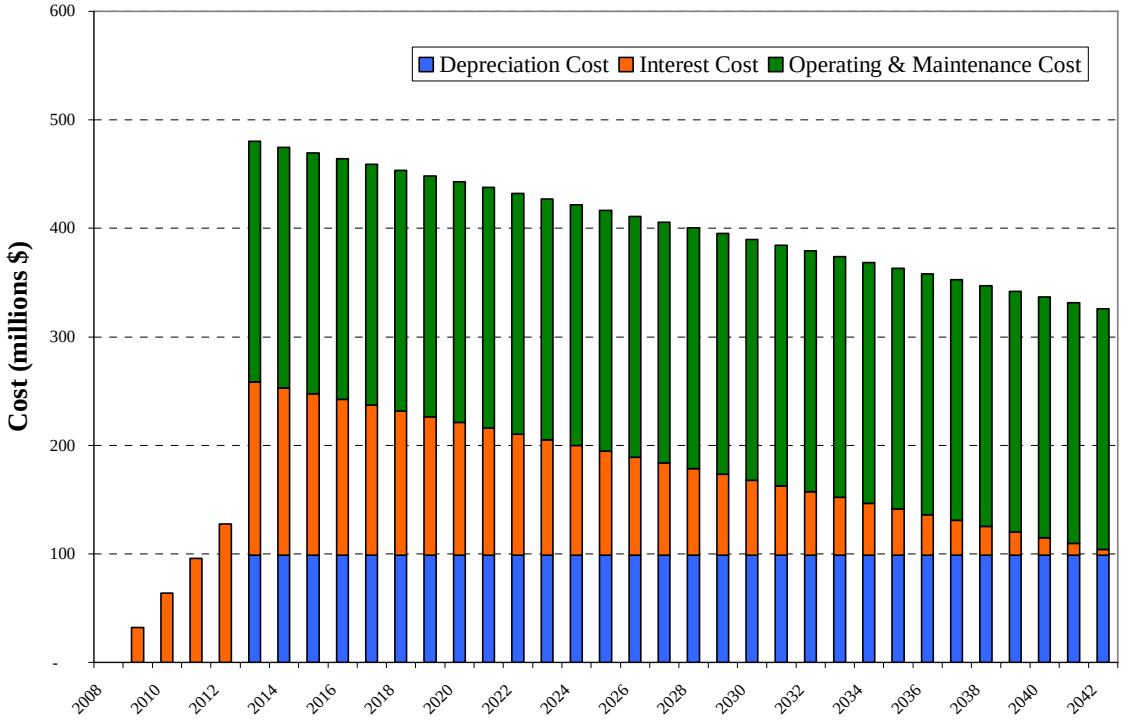
(a) The $600 million annual capital cost in each year from 2008 through 2012 is fully financed through the issuance of five $600-million bonds each of which has a term long enough to cover the 30-year life of the equipment as well as the construction period. That means that the first bond for $600 million is assumed to be issued in 2008, with a term that is 35 years; the second $600 million bond is assumed to have a term of 34 years, staring in 2009; and so forth, through five bond issuances of $600 million each.

(b) For rate calculation purposes, I assume that the equipment starts being depreciated when it goes into service in 2013, and I use a straight-line depreciation assumption over a 30-year period. Setting rates at a sufficient level to cover incremental depreciation expenses allows for recovery of the principal on the debt issued to finance the Proposed Remedy's investment costs.

(c) Interest paid annually on the outstanding debt associated with the Proposed Remedy's $3.0 billion capital cost is calculated at an assumed coupon rate equivalent to the current marginal rate for new TVA bonds – which most recently was 5.5%.

(d) Figure 10 presents the resulting total annual costs of the Proposed Remedy including the estimated depreciation and interest expense for each year (through 2042) for the capital expenditures associated with the Proposed Remedy, added to Dr. Staudt's estimate of annual operation and maintenance costs ($222 million). The first five years show rising costs associated with TVA incurring interest on the bonds over the 2008-2012 period. Once the new pollution controls go into effect starting in 2013, then each year's charges reflect a combination of depreciation expenses, interest expenses and operations and materials expenses. Due to the assumed retirement of the principal on the debt in parallel with the collection of depreciation charges in rates, the annual interest charges on outstanding debt decline over time.

Figure 10
Incremental Interest, Depreciation and Operating Expenses for TVA Associated with the Proposed Remedy



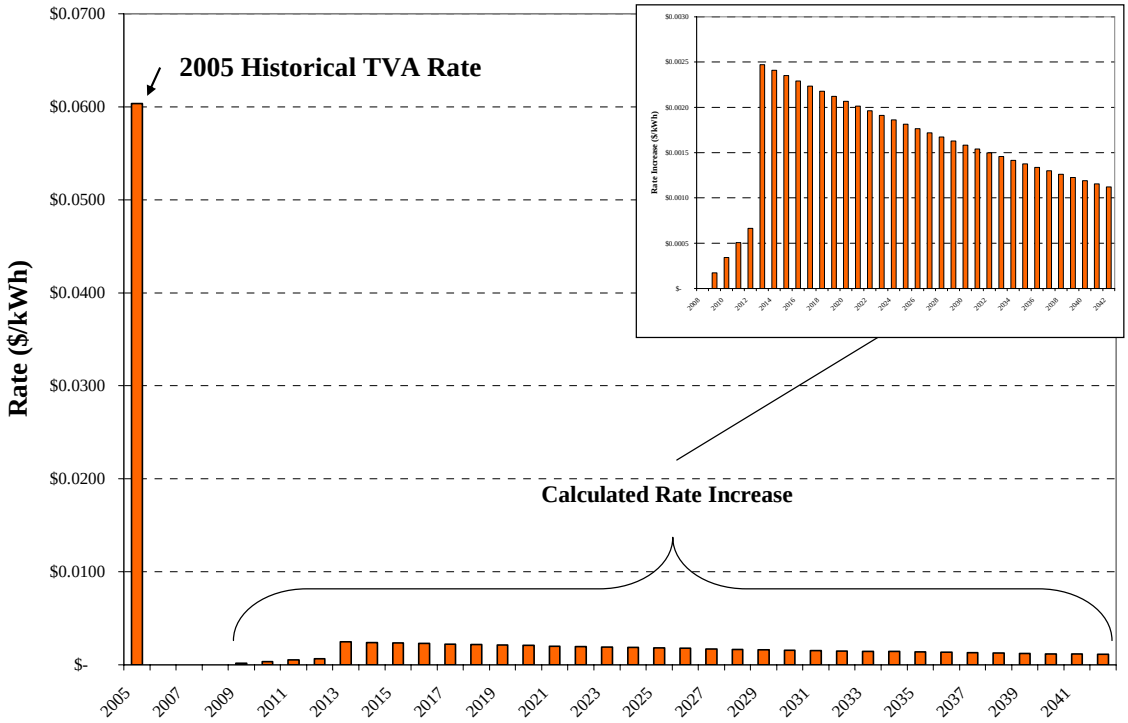
72. Using these annual amounts of dollars to be recovered in TVA rates, I then divide the total annual incremental costs by estimates of TVA's annual sales of electricity (in kWh). This provides a cent/kWh estimate of the approximate incremental impact of the Proposed Remedy on TVA rates.

73. For annual kWh sales, I used 2005 total kWh sales as reported by TVA, and assumed sales would grow over the forecast period (i.e., through 2042) at an annual rate of growth of 1.4%, the rate of growth that TVA projects through 2007. (TVA 2005 Information Statement, pages 6, 26.) The results, presented in the upper right hand chart of Figure 11, are on the order of 1-3 mills/kWh (equivalent to one-tenth to three-tenths of a cent per kWh). The Proposed Remedy's incremental rate impact tracks the pattern shown in Figure 10. Should electricity sales grow more rapidly than assumed, this curve would overstate the

increases, as the cost of the equipment is spread over greater electricity sales volumes.

74. In order to put these incremental rate impacts into context, I have compared them to current electricity prices, also shown in Figure 11. In the main portion of the figure and along the left-hand side, I have shown TVA's 2005 average electricity rate of approximately 6.04 cents/kWh. Using the same scale as the current average electricity price, I have shown the Proposed Remedy's annual incremental impact on rates.

Figure 11
Estimate of Rate Impact of the Proposed Remedy



75. As can be seen in Figure 11, the estimated rate impact of the Proposed Remedy is a small fraction of the rates currently charged by TVA. My estimate shows that even at the highest annual incremental impact of less than 2.5 mills/kWh, this would amount at most to a 4% increase as of 2013, relative to average rates in 2005. Assuming for the purposes of this discussion that cost recovery tracked cost

incurrence on a dollar-for-dollar basis, then rates would begin to rise by a small fraction (approximately 0.3%), starting in the year after the Proposed Remedy was imposed (2008, when interest on debt is assumed to start to be paid), and then rise gradually over the next five years to a "peak" incremental impact of 4% by the time the incremental pollution control equipment went into operation. On average, the rate impacts will be lower than 4% and are within the reasonable range seen in the utility industry.

76. Additionally, I note that Dr. Staudt points out that his cost estimate includes many conservative assumptions, based on an assumed compliance scenario that would call for installing pollution control equipment on each coal plant. As Dr. Staudt notes, there may be more cost-effective ways for TVA to comply with the Proposed Remedy's emissions reduction requirements than the compliance approach set out by Dr. Staudt.

77. Based upon my review of Dr. Staudt's cost estimate and the relatively-small size of the incremental rate impacts associated with those costs, I conclude that it will be feasible for TVA to set rates in order to recover these costs. This conclusion is based on the following factors: my understanding that TVA's statute (the TVA Act) and bond resolutions require that it adopt and charge rates sufficient to recover the costs of providing electric service; my assumption that if the court imposes the Proposed Remedy on TVA, then these costs would be incorporated into the full set of costs necessary to provide electric service at lowest feasible cost (i.e., one of TVA's statutory objectives); my view that TVA's Board and Management will manage overall financing requirements and costs for the power program, along with appropriate ratemaking techniques so as to adopt rate changes in ways that attempt to mitigate overall adverse impacts on consumers' rates; my personal experience in utility ratemaking (as a state regulator of the rates of investor-owned electric, natural gas and water utility companies, and as the Chairman of the Board of a state water authority); and my professional experience in observing the ability of utilities to charge – and ratepayers to absorb – incremental rate impacts of the level indicated here. I conclude that it will be feasible for TVA to recover in rates the incremental costs of the Proposed Remedy.

3. Conclusion on the Financial Feasibility of TVA Funding the Costs of the Proposed Remedy

78. Consequently, based on my review of TVA's current financial situation, its debt and ratemaking context, the ability of TVA to finance the incremental capital costs of the Proposed Remedy, and the ability of TVA to set rates sufficient to cover the annual interest, depreciation and operating expenses associated the Proposed Remedy, I conclude that the Proposed Remedy is financially feasible. TVA has the means to fund the incremental costs associated with the Proposed Remedy.

B. Financial Reasonableness

79. Finally, I now turn to the question of whether it is reasonable to impose this "financially feasible" Proposed Remedy on TVA. In this section, I assess this question in light of the regulatory, market, and environmental policy contexts within which TVA operates. First, I examine the possibility that even without the court's imposition of the Proposed Remedy, TVA will face expenditures associated with emission control requirements in the future; this analysis provide a more clear picture of what the true *incremental* impact of the Proposed Remedy might be. Second, I discuss TVA's "business" and "market" conditions, and consider TVA's rates with the context of the surrounding electric market. This analysis sheds light on the risk that TVA might face if the imposition of the Proposed Remedy had a material impact on customer demand (either by leading some customers to give termination notice and eventually leave the TVA power system, or by causing customers' electricity use to decrease relative to current projections) with the possible result that the costs of the Proposed Remedy had to be spread across a smaller TVA sales base. I review this risk in order to assess the likelihood that financing and rate impacts associated with the Proposed Remedy will be meaningfully different than that assumed in my feasibility assessment.

1. TVA's Exposure to Incremental NO_x and SO_2 Emissions Reduction Requirements and Costs, Even Without Imposition of the Proposed Remedy

80. My assessment of the feasibility of the Proposed Remedy assumed that all of the costs incurred by TVA to finance, install and operate new pollution control systems associated with the Proposed Remedy were incremental. That is, I assumed that in the absence of this court's decision to impose the Proposed Remedy, TVA would not incur similar new expenditures to control emissions of NO_x and SO_2 beyond "Base Case" emission levels and equipment investments presented by Dr. Staudt. (Staudt Report, page 19.)

81. It is possible, if not likely, however, that at some point during the time period I have examined in my analysis (roughly a 30-year period reflecting the useful life of the equipment installed as a result of the implementation of the Proposed Remedy), TVA will have to adopt some emissions reductions technologies and/or other strategies to reduce NO_x or SO_2 emissions from the TVA power system. If and when this occurred, some of the costs that I have "assigned" as incremental costs associated with the Proposed Remedy would have been incurred anyway. Stated otherwise, in the event that the Proposed Remedy were imposed, then TVA's cost to comply with later requirements (such as the Clean Air Interstate Rule) would be lower than they would otherwise be, had the Proposed Remedy not been implemented.

2. TVA's Exposure to Heightened Market and Business Risks With the Imposition of the Proposed Remedy

82. My assessment of the feasibility of the Proposed Remedy assumed, in effect, that the sales of power that provide revenues to TVA will continue to grow at an annual average rate of 1.4% going into the future. In this section, I review the market and regulatory conditions that govern the reasonableness of my assumption that TVA can absorb the effect on rates and revenues. In other words, I consider the question of whether TVA should be concerned that somehow implementation of the Proposed Remedy could result in a significant net change in electricity sales over time, in such a way as to adversely affect TVA's ability to

recover the costs of the Proposed Remedy. This outcome could occur and have a long-term sustained adverse impact if, for example, TVA's customers decided that it would be worth it economically to leave TVA's system and buy power from another competing utility company. TVA might, in that instance, be stuck with costs of prior investment that would have to be recovered through reduced amount of power sales, with the potential to further raise the rates of the customers remaining with TVA. In order to consider this type of risk, I compare TVA's regulatory conditions and rates with those in surrounding states, and assess the likely impact on TVA load and generation of potentially changing regulatory and market conditions.

83. As a general proposition, there are many factors that affect an electric company's level of sales. As part of a capital intensive industry that needs to have generating and transmission facilities in place in advance of customer need, electric utilities (like TVA) spend considerable effort to forecast demand for short-term and long-term periods of time. These forecasts affect business plans, investments, power sales and purchases, advanced purchases of fuel, and so forth. Rates are set for future periods based on assumptions about how much electricity will be sold. The basic equation for cost-of-service ratemaking for utilities is that costs divided by the amount of unit sales (e.g., kWh of electricity) produces the rate that must be charged to customers in order to produce revenues sufficient to cover costs. Understanding sales levels, and the factors that affect sales levels, is critical to utilities.

84. There are a number of factors that affect electricity sales (and therefore, utility revenues) from year to year. These include, for example, the weather (e.g., with hotter summers tending to lead to more use of air conditioners and more sales of electricity); economic development and growth (e.g., with a weak economy tending to produce less demand for electricity); technology change (e.g., with greater use arising with more electronic appliances in homes and offices); the utility's energy efficiency programs (e.g., encouraging consumers to install more efficient light bulbs); and so forth. Demand forecasts estimate future electricity

use (and sales) based on expectations about these factors in the future, and typically address "what if" conditions that could affect demand.

85. Some factors are less quantifiable and predictable than others; the impacts of some, such as major economic, legal and regulatory changes that can occur in the industry, are more difficult to estimate since they sometimes have little precedent. For example, a primary factor potentially affecting TVA's electricity sales outlook may be the potential at some point over the next decade for regulatory and/or legal changes in the service-territory protections now enjoyed by TVA. In effect, new electric industry competition laws and policies could be adopted by Congress (or federal utility regulators) that allow TVA to sell power to other wholesale and/or retail customers and, in turn, allow other wholesale power providers to market to wholesale and retail customers within the territory now served by TVA. Historically, TVA has been largely insulated from state and federal initiatives to provide for retail competition and/or to proactively facilitate greater wholesale competition through the establishment of large, centralized power system organizations and markets. TVA has identified factors that could cause future business conditions and financial results to differ materially from those in its forward-looking Information Statements, including "among other things, new laws, regulations, and administrative orders, especially those related to the restructuring of the electric power industry and various environmental matters; increased competition among electric utilities; changes to the Anti-Cherrypicking Provision…" (TVA 2005 Information Statement, page 1.) What are the chances that changes adverse to TVA will occur in the near future?

86. From approximately 1995 through 2000, many states in the country were considering, and some enacted, a restructuring of their electric industries and providing for competition in the provision of generation service to retail customers. TVA has monitored such activities and has attempted to assess the potential impact of retail competition on TVA's operations. (TVA 2005 Information Statement, e.g., pages 61-62.) Allowing retail competition has long been a concern to host electric companies when there are past investment costs made as part of service obligations to consumers which may become stranded and

unrecoverable if consumers are allowed to walk away from the system and take power from another supplier. In recent years, however, the landscape for continued evolution towards greater retail competition in the industry has dramatically changed. Since the early part of this decade, few or no states have actively continued efforts to move to retail competition, some that were considering it have decided to not go forward with it, and some that enacted retail competition have reversed course. The events during the 2000-2001 California crisis and Enron scandal, combined with fundamental changes in the price of certain fuels used to generate electricity (particularly natural gas), and associated dramatic increases in electricity prices in certain states and regions, have contributed to changing attitudes towards introducing greater retail competition in the electric industry.

87. At the wholesale level, for over a decade, the Federal Energy Regulatory Commission has taken various steps to encourage the formation of large independent system operators and/or regional transmission organizations ("RTO"), in part to facilitate greater competition in electric generation and transmission at the wholesale level. In some regions – particularly those that include states that have introduced industry restructuring and retail competition – RTOs have been established to provide for independent operation of the bulk power system and administration of competitive wholesale markets for energy, capacity and ancillary services. In other regions (including parts of the Southeast), states and/or the companies within them have not moved forward with significant restructuring of the industry at the wholesale level, and have not made significant progress towards the formation of RTOs. In fact, in recent years, FERC has scaled back its efforts to put into place large RTOs and standardized market designs across all regions of the country.

88. Current conditions nationally suggest that there is significantly less momentum for expanding retail competition and/or introducing wholesale structural reorganization, and I do not expect this trend to change any time soon. In addition, these conditions may be particularly true within the region in which TVA

operates. This part of the country did not undergo the kind of industry restructuring that occurred in states in some other parts of the U.S.

89. In sum, the conditions simply do not suggest that the introduction of retail competition or wholesale structural reorganization in the Southeast U.S. will happen any time soon, if ever.

90. This is particularly true for TVA (relative to other major electric utilities) which is in a unique position given the laws that protect TVA's service territory and govern its operations. TVA has been and will likely continue to be insulated from many state and federal initiatives like those that have created competitive pressures on electric utilities in some parts of the U.S. As recently as August 2005, Congress reaffirmed as part of the Energy Policy Act the Anti-Cherrypicking provisions of the Federal Power Act that protect TVA from a federal regulatory order requiring TVA to provide transmission to another entity for the purpose of provide power to a customer inside the TVA footprint. While it is possible that at some point in the future this provision might be removed or its effect diminished – thus creating greater pressure that TVA might lose customers or customer loads to other power suppliers – this outcome is unlikely any time soon.

91. Additionally, in order for surrounding utilities to serve retail customers or wholesale customers within TVA's service territory, or the distributors that serve retail customers in TVA's service territory, several events would need to occur first, each one of them likely involving lengthy regulatory proceedings, politically charged changes in law, and/or litigation. First, Congress would need to enact legislation to eliminate the Anti-Cherrypicking provision of the FPA, opening up TVA's service territory to competition (and presumably providing TVA the opportunity to sell power outside its service territory, a right it does not currently have). Second, legislation would need to be adopted to expand the scope of FERC jurisdiction over the terms and conditions of wholesale power transactions between TVA and other wholesale power suppliers and transmission companies. Third, rate case proceedings to establish rates and conditions for transmission services across TVA's power system.

92. Therefore, while it is not impossible that at some point in the future retail customers within TVA's service territory could have the opportunity to acquire retail service from a wholesale power supplier other than TVA, I do not expect this to be likely any time soon.

93. Even in the unlikely circumstance that political, legal, and regulatory conditions were to change materially in favor of introducing competition inside of TVA's service territory, it is not reasonable to assume that this outcome would produce a significant loss of TVA customer load to another power supplier, especially relative to current load levels. Any sales into TVA's service territory would need to out price TVA's power rates and overcome an additional charge for transmission across TVA's system. Also, were the policy environment to change so much that competitors became entitled to sell within the TVA footprint, it is likely that TVA would also be entitled to sell outside of the current fence surrounding the TVA system. Given TVA's relatively attractive rates compared to other power companies in the neighboring and interconnected regions (as shown on Table 1 and Figure 3), one might expect TVA to attract load, even if it lost some customers to other suppliers. Given that other owners of power plants in neighboring regions face the prospect of additional investment to respond to such things as CAIR, it is reasonable to expect that TVA's rates would be remain relatively attractive. It may be just as likely as not that TVA would add net customer load in the event that new competition policies were introduced in the power markets affecting TVA.

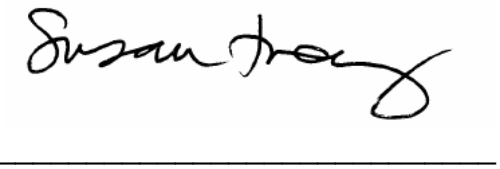
94. In short, there is little or no risk that the combined electrical load associated with the demands of TVA's Distributor, industrial and other customers will decrease materially over time; instead, it is at least as likely that future regulatory changes to allow increased competition would lead to net growth for the TVA power system, with revenues from power sales greater than that assumed in current forecasts of load growth. I conclude this based on my review of the conditions that would need to be met before a substantial amount of TVA load could consider leaving the TVA system, the opportunities that would be available to TVA to increase sales under such conditions, and the relative strength of TVA as an

competitive source of electricity supply compared to those entities that would be its most likely competitors. In any event, I have seen no credible information that would lead me to expect to see such significant movement towards greater retail or wholesale competition in a way that would materially and adversely affect TVA operations, service territory designations, or rights and obligations to serve all providers of electric service to retail customers within TVA's service territory.

95. In sum, the Proposed Remedy is not only financially feasible but financially reasonable, especially when I consider (a) the strong comparative financial advantages enjoyed by TVA in attracting capital at relatively low cost and in achieving relatively low electricity rates in its region, (b) the relatively small rate impact potentially associated with the Proposed Remedy, (c) the likelihood that implementing the Proposed Remedy will enable TVA to satisfy federal emission control requirements that may be imposed on TVA, and (d) the low likelihood that competition will be introduced in ways that adversely affect TVA's ability to sell electricity at levels comparable to those it experiences at present.

VI. CONCLUSION

For the reasons stated in this report, I conclude that the Proposed Remedy is both financially feasible and reasonable.



Susan F. Tierney, Ph.D.

October 26, 2006

Tierney Exhibit 1

Resume of

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Dr. Tierney, a Managing Principal at Analysis Group, is an expert on energy policy and economics, especially in the electric and gas industries. She has consulted to business, industry, government, and other organizations on energy markets, economic and environmental regulation and strategy, and energy facility projects. Her expert witness and business consulting services have involved industry restructuring, market analyses, wholesale and retail market design, contract disputes, resource planning and analysis, asset valuations, regional transmission organizations, the siting of generation and transmission and natural gas pipeline projects, natural gas markets, electric system reliability, and environmental policy and regulation. She has participated as an expert and advisor in civil litigation cases, regulatory proceedings before state and federal agencies, arbitrations, negotiations, mediations, and business consulting engagements.

Prior to joining Analysis Group, she was Senior Vice President at Lexecon. She has also served as the Assistant Secretary for Policy at the U.S. Department of Energy, appointed by President Bill Clinton and confirmed by the U.S. Senate. She was also Secretary for Environmental Affairs in Massachusetts under Governor William Weld, and Commissioner at the Massachusetts Department of Public Utilities, to which she was appointed by Governor Michael Dukakis. She was executive director of the Massachusetts Energy Facilities Siting Council. She served as chair of the Massachusetts Ocean Management Task Force, appointed by Governor Romney.

Dr. Tierney has authored numerous articles and speaks frequently at industry conferences. She serves on a number of boards of directors and advisory committees, including the National Commission on Energy Policy. She is chairman of the board of the Energy Foundation and the board of Clean Air – Cool Planet; a director of Catalytica Energy Systems Inc., the Northeast States Clean Air Foundation, and the Climate Policy Center; and a member of the Harvard Electric Policy Group, the Massachusetts Renewable Energy Trust Advisory Council, the Environmental Advisory Council of the New York Independent System Operator, and the China Sustainable Energy Program's Policy Advisory Council. She was previously chair of the Electricity Innovations Institute; a director of the Electric Power Research Institute and as member of the Advisory Council of the New England Independent System Operator. She has taught at the University of California at Irvine, and she earned her Ph.D. and M.A. degrees in regional planning at Cornell University and her B.A. at Scripps College.

EDUCATION

1980 Ph.D. in Regional Planning, Public Policy, Cornell University, Ithaca, NY
Dissertation: *Congressional policy making on energy policy issues*

1976 M.A., in Regional Planning, Public Policy, Cornell University, Ithaca, NY

1973 B.A. in Art History, Scripps College, Claremont, CA

1971-72 Studied Political Science, L'Institut d'Etudes Politiques, Paris, France

PROFESSIONAL EXPERIENCE

2003-present Analysis Group, Inc., Boston, MA
Managing Principal

1999-2003 Lexecon, Inc., Cambridge, MA (formerly The Economics Resource Group)
Senior Vice President

1995-1999 Economics Resource Group, Inc., Cambridge, MA
Principal and Managing Consultant

1993-1995 U.S. Department of Energy, Washington, DC
Assistant Secretary for Policy

1991-1993 Commonwealth of Massachusetts, Executive Office of Environmental Affairs, Boston
Secretary of Environmental Affairs

1988-1991 Commonwealth of Massachusetts, Department of Public Utilities, Boston
Commissioner

1984-1988 Commonwealth of Massachusetts, Energy Facilities Siting Council, Boston
Executive Director

1983-1984 Commonwealth of Massachusetts, Executive Office of Energy Resources, Boston
Senior Economist

1982-1983 Commonwealth of Massachusetts, Energy Facilities Siting Council, Boston
Policy Analyst

1982 National Academy of Sciences, Washington, DC
Researcher

1978-1982 University of California at Irvine, Irvine, CA
Assistant Professor

TESTIMONY SINCE 2000

- Several testimonies and depositions in confidential arbitrations and mediations.

- **MASSPOWER**
  Before the *Superior Court Department of the Trial Court of Suffolk County, Massachusetts, Massachusetts Municipal Wholesale Electric Company v. EPEC Independent Power 1 Company LLC, et. al., doing business as MASSPOWER*, Civil Action Number 05-02710 (BLS1), on MASSPOWER's performance under its power sales agreement to MMWEC, testimony and cross-examination at trial, October16-17, 2006.
- **Commonwealth Edison Company**
  Before the *Illinois Commerce Commission*, Proposed general increase in electric rates, general restructuring of rates, price unbundling of bundled service rates, and revision of other terms and conditions of service, Docket No. 05-0597, testimony under cross-examination, March 23, 2006.
- **Commonwealth Edison Company**
  Before the *Illinois House of Representatives, Electric Utility Oversight Committee*, on the Pay-as-Bid versus Uniform Price Auction Approach To Procurement of Wholesale Power for ComEd's Full-Requirements Customers, January 18, 2006, Springfield, Illinois.
- **Louisville Gas & Electric Company and Kentucky Utilities Company**
  Before the *Kentucky Public Service Commission*, Application of LG&E and KU to transfer functional control of their transmission assets, Case No. 2005-xxxx, Direct Testimony, November 19, 2005.
- **Western Massachusetts Electric Company**
  Before the *Superior Court Department of Norfolk County*, Massachusetts, *Alternative Power Source, Inc., v. Western Massachusetts Electric Company*, Civil Action No. 00-1967, on the allocation of costs related to transmission congestion in wholesale power contract for standard offer service. Deposition, October 15, 2001; testimony at trial, July 15, 2005.
- **Entergy Louisiana, Inc. and Entergy Gulf States Inc.**
  Before the *Louisiana Public Service Commission*, Application of Entergy Louisiana, Inc. for Approval of the Purchase of Electric Generating Facilities and Entergy Gulf States, Inc. for Authority to Participate in Contract for the Purchase of Capacity and Electric Power, Docket No. U27836, January 21, 2005.
- **Louisville Gas & Electric Company and Kentucky Utilities Company**
  Before the *Kentucky Public Service Commission*, Investigation Into The Membership of Louisville Gas and Electric Company and Kentucky Utilities Company In The Midwest Independent Transmission System Operator, Inc., Case No. 2003-00266, testimony at hearing, June 2005.

- **Entergy Services Inc.**
  Before the *Federal Energy Regulatory Commission,* Entergy Services Inc., et al., in support of the application for approval of market-based power purchase agreements under Section 205 of the Federal Power Act. Affidavit, February 28, 2003; Affidavit, March 31, 2003; Testimony, September 2003; Testimony at deposition, November 20, 2003; Deposition, May 27, 2004, and June 10-11, 2004; Testimony under cross-examination, July 19-23, 26-27, 2004.
- **Pacific Gas & Electric Company**
  Before the *California Public Utilities Commission*, In Re: Order Instituting Investigation into the ratemaking implications for Pacific Gas and Electric Company (PG&E) pursuant to the Commission's Alternative Plan of Reorganization under Chapter 11 of the Bankruptcy Code for PG&E, in the United States Bankruptcy Court, Northern District of California, San Francisco Division, In re Pacific Gas and Electric Company, Investigation 02-04-026, Testimony under cross-examination, September 12, 2003.
- **PP&L Global**
  Before the *New York Public Service Commission, Article X Siting Board*, on the economic and environmental benefits of the Kings Park Energy power plant. Prefiled direct testimony (with James Potter, Stephen T. Marron, David J. Kettler, and Thomas Conoscenti), January 2002; rebuttal testimony (with James Potter, Stephen T. Marron, William C. Miller, Jr., N. Dennis Eryou, and Robert W. Brown), October 23, 2002.
- **Connecticut Light & Power Company**
  Before the *Federal United States District Court, District of Connecticut, Connecticut Light & Power Company v. NRG Power Marketing Inc.,* on their standard offer service wholesale sales agreement. Deposition, September 27, 2002.
- **Cross-Sound Cable Company LLC**
  Before the *Connecticut Siting Council*, on the public benefits of the proposed Cross Sound Cable Project's *Application for a Certificate of Environmental Compatibility and Public Need*, Docket No. 208. Testimony under cross-examination, October 24-26, 29-30, 2001.
- **NRG Energy Inc. and Dynegy Holdings Inc.**
  Before the *Public Utilities Commission of Nevada*, In Re: petition of the Attorney General's Bureau of Consumer Protection to issue an Order staying further proceedings regarding divestiture of Nevada's electric generation assets and to open a docket to consider whether to issue a moratorium on divestiture in Nevada. Testimony under cross-examination..
  Before the *Public Utilities Commission of Nevada*, In Re: petition of the Attorney General's Bureau of Consumer Protection to issue an Order staying further proceedings regarding divestiture of Nevada's electric generation assets and to open a docket to consider whether to issue a moratorium on divestiture in Nevada, prepared direct testimony on behalf of Reid Gardner Power LLC and Clark Power LLC, April 3, 2001; testimony under cross-examination.

- **TransÉnergie U.S.**
  Before the *Connecticut Siting Council*, on the public benefits of the proposed Cross Sound Cable Project. Testimony, September 27, 2000; oral testimony under cross-examination, December 14, 2000; oral testimony January 9-11, 2001.
- **Reading Municipal Light Department**
  Before the *Massachusetts Energy Facilities Siting Board, Docket No. EFSB 97-4*, on the economics and need for a new natural gas pipeline, June 19, 2000; testimony under cross-examination September 19, 2000, September 21-22, 2000, October 5, 2000, and October 17, 2000.
- **Fitchburg Gas and Electric Light Company**
  Before the *Massachusetts Department of Telecommunications and Energy, Docket D.T.E. 99-66*, on gas and electric company rate design policy, testimony under cross-examination, January 14, 2000.
- **FirstEnergy Corp.**
  Before the *Public Utilities Commission of Ohio*, In the Matter of the Application of FirstEnergy Corp. on behalf of Ohio Edison Company, the Toledo Edison Company, and The Cleveland Electric Illuminating Company: for Approval of an Electric Transition Plan and for Authorization to Recover Transition Revenues (Case No. 99-1212-EL-ETP); for Approval of New Tariffs (Case No. 99-1213-EL-ATA); for Certain Accounting Authority (Case No. 99-1214-EL-AAM), on recovery of transition costs and calculation of the market value of generation assets. Deposition, April 7, 2000.

PUBLICATIONS AND ARTICLES

"A Cost-Benefit Assessment of Wholesale Electricity Restructuring and Competition in New England," co-authored with Dr. Matthew Barmack and Dr. Edward Kahn, May 2006; forthcoming, *Journal of Regulatory Economics*.

"In support of a Sound plan," Op Ed co-authored with John DeVillars, *Boston Globe*, April 23, 2006

"Let's Talk About the Weather: Interview with Susan Tierney on climate change risks that corporate boards of directors should know about and address," *Corporate Board Member Magazine*, January/February 2006.

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"Massachusetts' Pre-Approval Approach to Prudence in Massachusetts," *The Electricity Journal*, December 1990.

"Using Existing Tools to Pry Open Transmission—A New England Proposal," *The Electricity Journal*, April 1990.

"The Nuclear Waste Controversy," in D. Nelkin, *Controversy: The Politics of Technical Decisions*, Sage, 1977; 1984 (second edition).

DATAWARS: Computer Models in the Federal Government (with Kenneth L. Kraemer, Siegfried Dickhoven, and John Leslie King), Columbia University Press, 1987.

"The Evolution of the Nuclear Debate: The Role of Public Participation," *Annual Review of Energy*, 1978.

OTHER PROFESSIONAL ACTIVITIES

Presenter, Economic Issues, National LNG Forums, U.S. Department of Energy, Boston Massachusetts; Astoria, Oregon (2006)

Chair of the Technical Review Panel, Critical Infrastructure Protection Decision Support Systems (CIP-DSS), Argonne, Los Alamos and Sandia National Laboratories, 2006.

Member, National Academy of Sciences Committee on Enhancing the Robustness and Resilience of Electrical Transmission and Distribution in the United States to Terrorist Attack, 2005-present

Advisory Council member, New England Energy Alliance, 2005-present

Director, Electric Power Research Institute, 1998 to 2003, 2005-2006

Chair of the Laboratory Direction's Division Review Panel for the Environmental Energy Technologies Division, Lawrence Berkeley National Laboratory, 2005.

Member, New York Independent System Operator, Environmental Advisory Council, 2004-present.

Chair, Ocean Management Task Force to the Massachusetts Secretary of Environmental Affairs, 2003-2004.

Member, National Commission on Energy Policy, 2002 to present.

Member, Board of Directors, Catalytica Energy Systems Inc., 2001 to present

Co-Chair, RTO Futures: Regional Power Working Group, 2001-2002

Member, Advisory Committee, Carnegie Mellon Electricity Industry Center, 2001 to present

Member, Board of Directors, Climate Policy Center (formerly, Americans for Equitable Climate Solutions (SkyTrust)), 2001 to present

Chair, Board of Directors, Electricity Innovations Institute, 2002 to November 2004; Director, 2001 to 2002.

Member, Florida Energy 2020 Study Commission, Environmental Technical Advisory Committee, 2001

Chair of the Board of Directors, The Energy Foundation, 2000 to present; Vice-Chair, 1999-2000; Director, 1997 to present

Chair of the Board of Directors, Clean Air–Cool Planet: A Northeast Alliance, 2004 to present; director, 1999-2004; Chairman of the Board, 2004 to present.

Member, Policy Advisory Committee, China Sustainable Energy Project–A Joint Project of The Packard Foundation and The Energy Foundation, 1999 to present

Advisory Council member, Clean Air Task Force, 2002 to present

Director, NorthEast States Center for a Clean Air Future (formerly, Northeast States Clean Air Foundation), 1998 to present

Technical Advisor, Mid-Atlantic Area Council/PJM, Dispute Resolution Procedure, 1998

Member, ISO-New England Advisory Committee, 1998 to 2003

Director, The Randers Group (subsidiary of Thermo TERRATEK), 1997 - 2000

Director, MHI, Inc. , 1997 - 1999

Director, Thermo ECOTEK Corporation, 1996 - 1999

Member, United States Department of Energy, Electricity Reliability Task Force, 1996-1998

Member, Harvard Electricity Policy Group, 1993 to present

HONORS AND AWARDS

Distinguished Alumna Award, Scripps College, Claremont, CA, 1998

Award for Individual Leadership in Public Service, *The Energy Daily*, 1995

Special Recognition Award for Outstanding Contribution to the Industry, Cogeneration and Competitive Power Institute, Association of Energy Engineers, 1994

Leadership Award, National Association of State Energy Officials, 1994

Commencement Speaker and Honorary Doctorate of Laws, Regis College, Weston, MA, 1992.

TIERNEY EXHIBIT 2

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