

Bruce Edward Biewald, Chief Executive Officer

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SUMMARY

- Expert testimony on energy, economic, and environmental issues in more than 100 utility regulatory proceedings in 26 states and two Canadian provinces, in cases before State and Federal Courts, and in proceedings of the Federal Energy Regulatory Committee and the Nuclear Regulatory Commission's Atomic Safety and Licensing Board.
- Co-author of more than 100 reports, including studies for the Electric Power Research Institute, the US Department of Energy, the US Environmental Protection Agency, the Office of Technology Assessment, the New England Governors' Conference, the National Association of Regulatory Utility Commissioners, and the United Nations Framework Convention on Climate Change.
- Papers published in the Electricity Journal, the Energy Journal, Energy Policy, Public Utilities Fortnightly, and numerous conference proceedings.
- Invited to speak by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers; American Society of Mechanical Engineers; Energy Foundation; International Atomic Energy Agency; the Latin American Energy Association (OLADE); National Association of Regulatory Utility Commissioners; National Association of State Utility Consumer Advocates; National Consumer Law Center; the Swedish Environmental Protection Agency (SNV); the US Environmental Protection Agency; the European Federation of Clean Air and Environmental Protection Associations; and others.

PROFESSIONAL EXPERIENCE

Synapse Energy Economics, Inc., Cambridge, MA. *Founder and Chief Executive Officer*, 1996 – present.

Advise clients on issues of energy economics, environmental impacts, and electric industry regulation. Provide litigation support and expert testimony, author reports, and lead a professional staff of 27 engineers, scientists, policy experts, and economists, conducting many dozens of consulting assignments each year. Areas of expertise include: electric power system planning, air emissions, climate change policy, market power, mergers and acquisitions, generation asset valuation and divestiture, nuclear and fossil power plant costs and performance, renewable resources, power supply contracts and performance standards, green marketing of electricity, nuclear plant decommissioning and radioactive waste issues, environmental externalities valuation, environmental compliance planning, energy conservation and demand-side management, electric power system reliability, avoided costs, dispatch modeling, economic analysis of power plants and resource plans, portfolio management, risk analysis, and risk management.

Tellus Institute, Boston, MA. *Senior Scientist and Manager of the Electricity Program*, 1989 – 1996;
Research Associate and Associate Scientist, 1980 – 1988.

Responsible for research and consulting on all aspects of electric system planning, regulation, and restructuring.

EDUCATION

Massachusetts Institute of Technology, Cambridge, MA

Bachelor of Science in Architecture, Building Technology, and Energy Use in Buildings, 1981

Harvard University Extension School, Cambridge, MA

Graduate courses in micro and macroeconomics, 1989 – 1990

REPORTS

Knight, F., S. Fields, S. Jackson, W. Ong, N. R. Santen, B. Biewald, E. A. Stanton. 2015. *Multi-State Compliance with the Clean Power Plan in CP3T*. Synapse Energy Economics for the National Association of State Utility Consumer Advocates.

Vitolo, T., P. Luckow, S. Fields, P. Knight, B. Biewald, E. A. Stanton. 2015. *Lower Electric Costs in a Low-Emission Future*. Synapse Energy Economics.

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Luckow, P., E. A. Stanton, S. Fields, B. Biewald, S. Jackson, J. Fisher, R. Wilson. 2015. *2015 Carbon Dioxide Price Forecast*. Synapse Energy Economics.

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Fields, S., E. A. Stanton, P. Knight, B. Biewald, J. Daniel, S. Jackson, E. Karaca, J. Rosenkranz, K. Takahashi. 2014. *Alternate Scenarios for 111(d) Implementation in North Carolina*. Synapse Energy Economics for the Southern Environmental Law Center.

Wilson, R., B. Biewald, D. White. 2014. *Review of BC Hydro's Alternatives Assessment Methodology*. Synapse Energy Economics for BC Hydro.

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White, D., B. Biewald. 2014. *Findings Regarding the NSPI 2014 Load Forecast*. Synapse Energy Economics for the Nova Scotia Utility and Review Board.

Luckow, P., E. A. Stanton, B. Biewald, S. Fields, S. Jackson, J. Fisher, F. Ackerman. 2014. *CO₂ Price Report, Spring 2014: Includes 2013 CO₂ Price Forecast*. Synapse Energy Economics.

Fisher, J., P. Knight, E. A. Stanton, and B. Biewald. 2014. *Avoided Emissions and Generation Tool (AVERT): User Manual*. Version 1.0. Synapse Energy Economics for the U.S. Environmental Protection Agency.

White, D. E., M. Chang, B. Biewald. 2013. *State Energy Efficiency Embedded in Annual Energy Outlook Forecasts: 2013 Update*. Synapse Energy Economics for the US Environmental Protection Agency.

Luckow, P., E. A. Stanton, B. Biewald, J. Fisher, F. Ackerman, E. Hausman. 2013. *2013 Carbon Dioxide Price Forecast*. Synapse Energy Economics.

Knight, P., E. A. Stanton, J. Fisher, B. Biewald. 2013. *Forecasting Coal Unit Competitiveness: Coal Retirement Assessment Using Synapse's Coal Asset Valuation Tool (CAVT)*. Synapse Energy Economics for Energy Foundation.

Knight, P., B. Biewald, J. Daniel. 2013. *Displacing Coal: An Analysis of Natural Gas Potential in the 2012 Electric System Dispatch*. Synapse Energy Economics for Energy Foundation.

Fagan R., J. Fisher, B. Biewald. 2013. *An Expanded Analysis of the Costs and Benefits of Base Case and Carbon Reduction Scenarios in the EIPC Process*. Synapse Energy Economics for The Sustainable FERC Project.

Hornby R., P. Chernick, D. White, J. Rosenkranz, R. Denhardt, E. Stanton, J. Glifford, B. Grace, M. Chang, P. Luckow, T. Vitolo, P. Knight, B. Griffiths, B. Biewald. 2013. *Avoided Energy Supply Costs in New England: 2013 Report*. Synapse Energy Economics for Avoided-Energy-Supply-Component (AESC) Study Group.

Wilson R., B. Biewald. 2013. *Best Practices in Electric Utility Integrated Resource Planning: Examples of State Regulations and Recent Utility Plans*. Synapse Energy Economics for Regulatory Assistance Project.

Wilson R., P. Luckow, B. Biewald, F. Ackerman, E. Hausman. 2012. *2012 Carbon Dioxide Price Forecast*. Synapse Energy Economics.

Biewald B., T. Vitolo, P. Luckow. 2012. *Comments Regarding KCP&L's 2012 IRP Filing*. Sierra Club, Synapse Energy Economics.

Fisher J., S. Jackson, B. Biewald. 2012. *The Carbon Footprint of Electricity from Biomass: A Review of the Current State of Science and Policy*. Synapse Energy Economics.

Chang M., D. White, P. Knight, B. Biewald. 2012. *Energy Benefits Resulting from the Investment of 2010 RGGI Auction Revenues in Energy Efficiency*. Synapse Energy Economics for Regulatory Assistance Project.

Fisher, J., C. James, N. Hughes, D. White, R. Wilson, B. Biewald. 2011. *Emissions Reductions from Renewable Energy and Energy Efficiency in California Air Quality Management Districts*. Synapse Energy Economics for California Energy Commission.

Keith G., B. Biewald, E. Hausman, K. Takahashi, T. Vitolo, T. Comings, P. Knight. 2011. *Toward a Sustainable Future for the US Power Sector: Beyond Business as Usual 2011*. Synapse Energy Economics for Civil Society Institute.

Chang M., D. White, E. Hausman, N. Hughes, B. Biewald. 2011. *Big Risks, Better Alternatives: An Examination of Two Nuclear Energy Projects in the US*. Synapse Energy Economics for Union of Concerned Scientists.

Hornby R., P. Chernick, C. Swanson, D. White, J. Gifford, M. Chang, N. Hughes, M. Wittenstein, R. Wilson, B. Biewald. 2011. *Avoided Energy Supply Costs in New England: 2011 Report*. Synapse Energy Economics for Avoided-Energy-Supply-Component (AESC) Study Group.

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Johnston L., E. Hausman., B. Biewald, R. Wilson, D. White. 2011. *2011 Carbon Dioxide Price Forecast*. Synapse Energy Economics.

Fisher J., R. Wilson, N. Hughes, M. Wittenstein, B. Biewald. 2011. *Benefits of Beyond BAU: Human, Social, and Environmental Damages Avoided Through the Retirement of the US Coal Fleet*. Synapse Energy Economics for Civil Society Institute.

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Kieth, G., B. Biewald, K. Takahashi, A. Napoleon, N. Hughes, L. Mancinelli, E. Brandt. 2010. *Beyond Business as Usual: Investigating a Future without Coal and Nuclear Power in the US* Synapse Energy Economics for Regulatory Assistance Project.

Hornby R., P. Chernick, C. Swanson, D. White, I. Goodman, B. Grace, B. Biewald, C. James, B. Warfield, J. Gifford, M. Chang. 2009. *Avoided Energy Supply Costs in New England: 2009 Report*. Synapse Energy Economics for Avoided-Energy-Supply-Component (AESC) Study Group.

Hausman, E., J. Fisher, L.A. Mancinelli, B. Biewald. 2009. *Productive and Unproductive Costs of CO₂ Cap-and-Trade: Impacts on Electricity Consumers and Producers*. Synapse Energy Economics for the National

Association of Regulatory Utility Commissioners, The National Association of State Utility Consumer Advocates (NASUCA), The National Rural Electric Cooperative Association (NRECA), The American Public Power Association (APPA).

Biewald B, D. White, J. Fisher, M. Chang, and L. Johnston. 2009. *Incorporating Carbon Dioxide Emissions Reductions in Benefit Calculations for Energy Efficiency: Comments on the Department of Energy's Methodology for Analysis of the Proposed Lighting Standard*. Synapse Energy Economics for New York State Attorney General.

Hurley D., K. Takahashi, B. Biewald, J. Kallay, and R. Maslowski. 2008. *Cost and Benefits of Electric Utility Energy Efficiency in Massachusetts*. Synapse Energy Economics for Northeast Energy Efficiency Council.

Hausman, E., J. Fisher, and B. Biewald. 2008 *Analysis of Indirect Emissions Benefits of Wind, Landfill Gas, and Municipal Solid Waste Generation*. Synapse Energy Economics for US Environmental Protection Agency.

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Hausman, E., B. Biewald, K. Takahashi. 2006. *The Deerfield Wind Project – Assessment of the Need for Power and the Economic and Environmental Attributes of the Project*. Synapse Energy Economics for PPM Energy.

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The Delaware Cabinet Committee on Energy with technical assistance from Synapse Energy Economics. 2006. *Ensuring Delaware's Energy Future: A Response to Executive Order Number 82*. Prepared for the Delaware Public Service Commission Staff.

E. Hausman, Bruce Biewald, K. Takahashi, D. Schlissel. 2007. *The Proposed Broadwater LNG Import Terminal Response to Draft Environmental Impact Statement and Update of Synapse Analysis*. Synapse Energy Economics for the Connecticut Fund for the Environment and Save The Sound by.

Biewald, B., E. Hausman, P. Peterson, D. White. 2006. *RPM 2006: Windfall Profits for Existing Base Load Units in PJM*. Synapse Energy Economics for the Pennsylvania Office of Consumer Advocate.

E. Hausman, P. Peterson, D. White, B. Biewald. 2005. *A RPM Case Study: Higher Costs for Consumers, Windfall Profits for Exelon*. Synapse Energy Economics for Illinois Citizens Utility Board.

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Biewald, B., G. Keith. 2005. *Methods for Estimating Emissions Avoided by Renewable Energy and Energy Efficiency*. Synapse Energy Economics for the US Environmental Protection Agency.

Steinhurst, W., R. McIntyre, B. Biewald, C. Chen, K. Takahashi. 2005. *Economic Impacts and Avoided Air Emissions from Renewable Generation and Efficiency Programs in New England*. Synapse Energy Economics for Regulatory Assistance Project.

White, D., B. Biewald. 2005. *Electric Price Forecasts for St. Lawrence Hydroelectric Generation*. Synapse Energy Economics for the International Joint Commission (IJC).

Biewald, B., D. White, G. Keith, T. Woolf. 2004. *A Responsible Electricity Future: An Efficient, Cleaner and Balanced Scenario for the US Electricity System*. Synapse Energy Economics for the National Association of State PIRGs.

Biewald B., W. Steinhurst, D. White, A. Roschelle. 2004. *Electricity Prices in PJM: Comparison of Wholesale Power Costs in the PJM Market to Indexed Generation Service Costs*. Synapse Energy Economics for PJM Interconnection, L.L.C.

Biewald, B., T. Woolf, A. Roschelle, W. Steinhurst. 2003. *Portfolio Management: How to Procure Electricity Resources to Provide Reliable, Low-Cost, and Efficient Electricity Services to All Retail Customers*. Synapse Energy Economics for Regulatory Assistance Project and Energy Foundation.

Keith, G., B. Biewald, D. White, F. Zalcman. 2003. *A Clean Electricity Strategy for the Hudson River Valley*. Synapse Energy Economics and Pace Law School Energy Project for the Hudson River Foundation.

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Biewald, B., C. Chen, A. Sommer, W. Steinhurst, and D. E. White. 2003. *Comments on the RPS Cost Analyses of the Joint Utilities and the DPS Staff*. Synapse Energy Economics for the Renewable Energy Technology and Environment Coalition.

Keith, G., B. Biewald, D. White, and M. Drunsic. 2003. *Modeling Demand Response and Air Emissions in New England*. Synapse Energy Economics for the US Environmental Protection Agency.

Keith, G., B. Biewald, D. White, A. Sommer and C. Chen. 2003. *Cleaner Air, Fuel Diversity and High-Quality Jobs: Reviewing Selected Potential Benefits of an RPS in New York State*. Synapse Energy Economics for the Renewable Energy Technology and Environment Coalition.

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Johnston, L., G. Keith, T. Woolf, B. Biewald, and E. Gonin. 2002. *Survey of Clean Power and Energy Efficiency Programs*. Synapse Energy Economics for the Ozone Transport Commission.

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Peterson, P., B. Biewald, L. Johnston, E. Gonin, and J. Wallach. 2001. *Best Practices in Market Monitoring: A Survey of Current ISO Activities and Recommendations for Effective Market Monitoring and Mitigation in Wholesale Electricity Markets*. Synapse Energy Economics for the Maryland Office of People's Counsel, the Pennsylvania Office of Consumer Advocate, the Delaware Division of the Public Advocate, the New Jersey Division of the Ratepayer Advocate, and the Office of the People's Counsel of the District of Columbia.

Biewald, B., D. White, and M. Ramiro. 2001. *Electricity Market Analysis of Coal Waste Regulations: An Illustrative Midwest Case Study*. Synapse Energy Economics for US Environmental Protection Agency.

Biewald, B., L. Johnston, J. A. Ramey, P. Peterson, D. White. 2001. *The Other Side of Competitive Markets: Developing Effective Load Response in New England's Electricity Market*. Synapse Energy Economics for the Maine Department of Attorney General and the Maine Office of the Public Advocate.

Biewald, B., D. Allen, D. White, N. Talbot, P. Kirshen, L. K. Martin, P. Chernick, R. Brailove. 2001. *Valuation of the Bellows Falls Hydroelectric Generating Station as of April 2001*. Synapse Energy Economics, Martin Appraisal Service, and Resource Insight for the Vermont Department of Taxes.

Biewald, B., L. Johnston, and D. Schlissel. 2001. *Room to Breathe: Why the Massachusetts Department of Environmental Protection's Proposed Air Regulations Are Compatible With Electric System Reliability*. Synapse Energy Economics for MASSPIRG and Clean Water Fund.

Synapse Energy Economics. 2001. *Repowering the Midwest: A Plan for Cleaning Up the Electricity Industry in America's Heartland*. Prepared for the Environmental Law and Policy Center and a coalition of Midwest environmental organizations.

Allen, D., B. Biewald, and D. Schlissel. 2001. *Generator Outage Increases: A Preliminary Analysis of Outage Trends in the New England Electricity Market*. Synapse Energy Economics for the Union of Concerned Scientists.

Woolf, T., B. Biewald, and D. Allen. 2000. *Marginal Price Assumptions for Estimating Customer Benefits of Air Conditioner Efficiency Standards: Comments on the Department of Energy's Proposed Rules for Central Air Conditioners and Heat Pump Energy Conservation Standards*. Synapse Energy Economics for the Appliance Standards Awareness Project.

Gibbs, B., and B. Biewald. 2000. *Transmitting Windpower from the Dakotas to Chicago: A Preliminary Analysis of a Hydrogen Transmission Scenario*. Synapse Energy Economics for the Environmental Law and Policy Center, with funding from the Leighty Foundation.

Biewald, B., D. Allen, D. White, N. Talbot, P. Kirshen, L. K. Martin, P. Chernick, R. Brailove. 2000. *Valuation of Hydroelectric Generating Facilities on the Connecticut and Deerfield Rivers in Vermont*. Synapse Energy Economics, Martin Appraisal Service, and Resource Insight for the Vermont Department of Taxes.

Biewald, B., J. Cavicchi, T. Woolf, D. Allen. 2000. *Use of Selective Catalytic Reduction For Control of NOx Emissions From Power Plants in the US*. Synapse Energy Economics for the OntAIRio Campaign.

Woolf, T., B. Biewald, and D. White. 1999. *Electricity Market Distortions Associated With Inconsistent Air Quality Regulations*. Synapse Energy Economics for the Project for Sustainable FERC Energy Policy.

Brailove, R., P. Chernick, S. Geller, B. Biewald, and D. White. 1999. *Avoided Energy-Supply Costs for Demand-Side Management Screening in Massachusetts*. Resource Insight and Synapse Energy Economics for the AESC Study Group.

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Synapse Energy Economics, Environmental Futures, Inc., and Tellus Institute. 1998. *New England Tracking System*. Prepared for the New England Governors' Conference, Inc., funded by a grant from the US Environmental Protection Agency.

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Biewald, B., D. E. White, and W. Steinhurst. 1997. *Horizontal Market Power in New England Electricity Markets: Simulation Results and a Review of NEPOOL's Analysis*. Synapse Energy Economics for the New England Conference of Public Utility Commissioners. Draft published as Vermont DPS Technical Report No. 39.

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Biewald, B. 1999. "How Green is Green? Verifying Energy Advertising Claims." Presentation at the New England Conference of Public Utility Commissioners Symposium in Bretton Woods, NH, May 25, 1999.

Biewald, B. 1999. "Consumer Perspectives on Market Power – Case Studies from New England, New York, PJM, and Mississippi." Presentation at IBC Conference on Market Power in Washington DC, May 24, 1999.

Biewald, B. 1998. "Grandfathering and Environmental Comparability." Presentation at the National Association of Regulatory Utility Commissioners 1998 Summer Committee Meetings in Seattle, WA, July 26, 1998.

Biewald, B. 1998. "Tracking Electricity in the New England Market." Presentation at the National Association of Regulatory Utility Commissioners 1998 Summer Committee Meetings in Seattle, WA, July 26, 1998.

Biewald, B. 1998. "Tracking Electricity in the New England Electricity Market." Presentation at the National Council on Competition and the Electricity Industry National Executive Dialogue on Customers' Right to Know in Chicago, IL, May 13, 1998.

Biewald, B. 1998. "Comparable Environmental Regulations in a Restructured Electricity Industry: The Grandfathering Effect." Presentation at the National Association of Regulatory Utility Commissioners meeting in Washington, DC, March 1, 1998.

Biewald, B. 1998. "Market Power in Electricity Generation." Presentation at the National Consumer Law Center Conference in Washington, DC, February 9, 1998.

Biewald, B. 1997. "Electricity Market Power in New England." Presentation at the Massachusetts Electric Industry Restructuring Roundtable in Boston, MA, December 15, 1997.

Biewald, B. 1997. "Wind Power Development and Air Quality." Presentation at the National Wind Coordinating Committee New England Wind Issues Forum in Boston, MA, November 7, 1997.

Biewald, B. 1997. "Market Power." Invited speaker at the National Association of State Utility Consumer Advocates meeting in Boston, MA, November 12, 1997.

Biewald, B. 1997. "Distortions to Future and Current Competitive Electric Energy Markets Due to Grandfathering Environmental Regulations of Electric Power Plants." Presentation at the National Association of Regulatory Utility Commissioners meeting in Boston, MA, November 9, 1997.

Biewald, B. 1997. "Electric Industry Restructuring as if the Environment Mattered." Presentation for the Boston Area Solar Energy Association, October 9, 1997.

Biewald, B. 1997. "Modeling Market Power in Electricity Generation." Invited speaker at the National Association of Regulatory Utility Commissioners meeting in San Francisco, CA, July 22, 1997.

Biewald, B. 1997. "Performance-Based Regulation in a Restructured Electric Industry." Presentation at National Association of Regulatory Utility Commissioners meeting in San Francisco, CA, July 20, 1997.

Biewald, B. 1997. "State Initiatives and Regional Issues." Presentation at the New England Governors' Conference Workshop on Restructuring and Environmentally Sustainable Technologies in Warwick, RI, March 25, 1997.

Biewald, B. 1996. "Stranded Costs." Invited speaker at the National Association of State Utility Consumer Advocates meeting in San Francisco, CA, November 1996.

Biewald, B. 1996. "Nuclear Power Plant Decommissioning Costs and Electricity Restructuring." Presentation at the Nuclear Decommissioning Trusts Conference in New York City, November 18, 1996.

Biewald, B. 1996. "Stranded Costs." Invited speaker at the Indiana Utilities Regulatory Commission Forum in Indianapolis, IN, November 1, 1996.

Biewald, B. 1996. "Electric Industry Restructuring and the Environment." Presentation at the Indiana Energy Conference in Indianapolis, IN, October 10, 1996.

Biewald, B. 1996. "Small Customers in a Restructured Electricity Industry: Transaction Costs, Advanced Metering Technologies and Aggregation Options." Presentation at the Consumers' Energy Conference in South Portland, ME, July 1996.

Biewald, B. 1996. "Electric Generation Market Power in New England." Presentation at the New England Conference of Public Utility Commissioners in Manchester Village, VT, May 1996.

Biewald, B. 1996. "Advanced Metering for Residential Customers on Electricity Restructuring." Presentation at the National Consumer Law Center's 10th Annual Conference in Washington, DC, February 1996.

Biewald, B. 1996. "Market Power," "Environmental Aspects of Restructuring," and "Market Access for Small Customers." Presentations at Vermont Public Service Board workshops on electricity restructuring, January and February 1996.

Biewald, B. 1995. "Environmental Impacts of Energy: Sustainability and Social Costing." Presentation at the British Columbia Utilities Commission Workshop, Vancouver, BC, March 1995.

Biewald, B. 1995. "Competition and Economic Efficiency." Presentation at the National Council on Competition and the Electric Industry, December 1995.

Biewald, B. 1993. "Compliance Planning Under Regulatory Uncertainty." Presentation at the US Environmental Protection Agency Opportunities Conference: Energy Efficiency and Renewable Energy in Washington, DC, June 1993.

Biewald, B. 1993. "Energy and Sustainability." Presentation at the Hydro-Quebec Conference at Hampshire College in Amherst, MA, April 1993.

Biewald, B. 1992. "Environmental Externalities." Invited speaker at ASME ECO World Conference in Washington, DC, June 1992.

Biewald, B. 1992. Invited speaker before the Association of Energy Engineers in Boston, MA, February 1992.

Biewald, B. 1991. "Acid Rain Abatement Optimization Model." Presentation to the Swedish Environmental Protection Agency in Solna, Sweden, November 1991.

Biewald, B. 1990. "Integrated Resource Planning." Presentation before the Boston Gas Company, July 1990.

Biewald, B. 1990. "Methods for Calculating Electric System Avoided Costs." Training provided to energy planners and policy makers from five Southeast Asian countries sponsored by US Agency for International Development and administered by the Institute of International Education, May 1990.

Biewald, B. 1988. Invited Speaker at the National Association of State Utility Consumer Advocates Mid-Year Meeting in Annapolis, MD, June 1988.

Biewald, B. 1988. Invited Speaker at the Conference on New Developments in Nuclear Decommissioning Costs and Funding Methods sponsored by the Northeast Center for Professional Education in Washington, DC, April 1988.

TESTIMONY

Missouri Public Service Commission (CASE NO.: ER-2012-0174): Surrebuttal Testimony Regarding the Retirement or Retrofit of the LaCygne and Montrose Generating Stations. On behalf of Sierra Club. October 2012.

United States Court of Appeals for the District of Columbia Circuit (Case 11-1375) Southwestern Public Service Company v. U.S. Environmental Protection Agency and Lisa P. Jackson, Administrator, U.S. Environmental Protection Agency: Declaration on the use of probabilistic computer models to properly analyze system reliability, with regard to the Cross-State Air Pollution Rule (CSAPR). On behalf of Sierra Club. October 27, 2011.

United States Court of Appeals for the District of Columbia Circuit (Case 11-1315) United States Environmental Protection Agency v. Luminant Generation Company, LLC: Declaration on the use of probabilistic computer models to properly analyze system reliability, with regard to the Cross-State Air Pollution Rule (CSAPR). On behalf of Sierra Club. October 6, 2011.

Nova Scotia Utility and Review Board: Testimony in the matter of an Application of Nova Scotia Power Incorporated for approval of certain revisions to its Rates, Charges, and Regulations regarding community-based feed-in tariffs for renewable energy. On behalf of The Nova Scotia Utility Review and Board Staff. August 7, 2008.

United States District Court for the Middle District of Louisiana (Civil Action No. 09-CV-100-RET-CN) United States v. Louisiana Generating LLC: Rebuttal report and deposition on the use of computer models for electric system planning and projections of generating unit operations, including PROMOD simulation of power system dispatch. October 2010 and January 2011.

United States District Court for the Eastern District of Michigan (Case 2:10-cv-13101-BAF-RWS) United States v. DTE Energy Company: Declarations on the use of computer models for electric system planning and projections of generating unit operations. June 2010 and November 2010.

United States District Court for the North District of Alabama (Civil Action No. 2:01-CV-00152-VEH) United States v. Alabama Power Company: Expert report, rebuttal report, and deposition on the use of computer models for electric system planning and projections of generating unit operations. December 2009, June 2010, and May 2010.

United States District Court for the Eastern District of Kentucky, Lexington Division (Case 5:05-cv-0075-KSF) United States v. Kentucky Utilities Company: Expert report on use of computer models for electric system planning, capital investment planning and economic analysis, and projections of generating unit operations. October 2008.

Nova Scotia Utility and Review Board: Review of rate case issues; power plant depreciation and load forecasting. On behalf of The Nova Scotia Utility and Review Board Staff. August 2008.

Nova Scotia Utility and Review Board: Filed evidence reviewing of Nova Scotia Power Inc.'s demand-side management plan. On behalf of The Nova Scotia Utility and Review Board Staff. March 17, 2008.

Indiana Utility Regulatory Commission (Cause Nos. 43114 and 43114S1): Direct and cross testimony regarding the Review of IGCC Plant Proposal by Duke Energy Indiana and Vectren. On behalf of Citizens Action Coalition of Indiana, Save the Valley, Valley Watch, and Sierra Club. May 2007.

California Public Utilities Commission (Docket No. R.06-02-013): Joint testimony with William Steinhurst and Rick Hornby on electric utility long-term planning and procurement, including procurement strategy, treatment of carbon dioxide emissions, credit and collateral policies, customer risk tolerance, and resource needs. March 2007.

New Jersey Board of Public Utilities (Docket No. EM05020106): Joint direct, surrebuttal, and supplemental testimony with Bob Fagan and David Schlissel on the market power implications of the proposed merger between Exelon Corp. and Public Service Enterprise Group. On behalf of New Jersey Division of the Rate Counsel Staff. November 2005, December 2005, and March 2006.

Indiana Utility Regulatory Commission (Cause Nos. 42861): Vectren (SIGECO) environmental compliance planning, including climate change policy and carbon price forecasting, energy efficiency and renewables as compliance options, and cost recovery issues. October 2005.

United States District Court for the Eastern District of Kentucky, Lexington Division (Civil Action No.04-34-KSF) United States v. East Kentucky Power Cooperative: Expert report on state regulation of electric utilities, use of computer models for system planning, capital investment planning and economic analysis, and projections of generating unit operations. September 2005.

United States District Court for the Southern District of Indiana (Civil Action No.IP99-1693 C-M/S) United States v. Cinergy: Expert report and rebuttal report on state regulation of electric utilities, forecasting sales and resource requirements, use of computer models for system planning, capital investment planning and economic analysis, projections of generating unit operations, and the relationship between generator availability and output. May 2005 and September 2005.

Federal Energy Regulatory Commission (Docket No. EC05-43-000): Joint affidavit with David Schlissel regarding market power analysis of the proposed merger of Exelon Corporation and Public Service Enterprise Group Incorporated. On behalf of New Jersey Division of the Ratepayer Advocate. April 2005.

Nuclear Regulatory Commission Atomic Safety and Licensing Board (Docket No. 52-007-ESP and ASLBP No. 04-821-01-ESP): Affidavit on the environmental impacts and economic costs of a proposed new nuclear power project and alternatives. On behalf of Environmental Law and Policy Center. April 2005.

Indiana Utility Regulatory Commission (Cause Nos. 42622 and 42718): Public Service Company of Indiana environmental compliance planning, including cost estimates for emission control technologies, climate change policy and carbon price forecasting, energy efficiency and renewables as compliance options, power plant retirement economics, and cost recovery issues. March 2005.

National Research Council, Division on Engineering and Physical Sciences, Board on Energy and Environmental Systems (Project No. BEES-J-03-03-A): Alternatives for replacing the generation of the Indian Point Energy Center nuclear facility. March 2005.

Georgia Public Service Commission (Docket No. 18300-U): Georgia Power Company's cost of service study, treatment of electrical distribution equipment, and proposed rates for the Metropolitan Atlanta Rapid Transit Authority. October 2004.

Maine Public Utilities Commission (Docket No. 2004-147): Filed joint expert report *Reply Comments in Docket No. 2004-147: Strategies for Procuring Residential and Small Commercial Standard Offer Supply in Maine* with Amy Rochelle and Paul Peterson. On behalf of the Maine Office of Public Advocate. April 21, 2004.

Texas Public Utility Commission (Docket No. 29526): Testimony and rebuttal testimony regarding issues in CenterPoint Energy Houston Electric LLC's true up filing, including environmental cleanup costs, excess mitigation credits, and construction work in progress. June 2004.

Texas Public Utility Commission (Docket No. 28818): Testimony regarding the Independent Transmission Operator proposal of Energy Gulf States Utilities, Inc. On behalf of The Office of Public Utility Counsel of Texas. April 2004.

Indiana Utility Regulatory Commission (Cause No. 42359): Testimony regarding the Public Service Company of Indiana rate making issues including the impact of trackers on risks to shareholders and customers, costs of environmental compliance, treatment of merchant plant investment and risk, and joint dispatch issues. On behalf The Citizen Action Coalition of Indiana. August 2003.

Nevada Public Utilities Commission (Docket No. 03-1014): Review of Sierra Pacific Power Company's risk management and procurement of electric power in the wholesale markets. April 2003.

Nevada Public Utilities Commission (Docket No. 02-11021): Review of Nevada Power Company's risk management and procurement of electric power in the wholesale markets. March 2003.

United States District Court for the Southern District of Illinois (Civil Action No. 99-833-MJR, United States v. Illinois Power Company and Dynegy Midwest Generation, Inc.): Expert rebuttal report and testimony regarding analysis and opinions on use of computer models for system planning, projections of generating unit operations, and the relationship between generator availability and output. October 2002 and August 2003.

State of Vermont, Windham Superior Court (Appeal of USGen New England, Inc. from 2001 Property Valuation by the Town of Rockingham): Electricity market prices and economic valuation of hydroelectric generating plant. September 2002.

United States District Court for the Middle District of North Carolina (Civil Action No. 1:00 CV 1262, United States v. Duke Energy Corporation): Joint expert report with Phil Hayet on use of computer models for system planning, projections of generating unit operations, and the relationship between generator availability and output. August 2002.

Indiana Utility Regulatory Commission (Cause No. 41746): Reply testimony on a rate case settlement agreement, dealing with issues including NiSource's financial condition, service quality, environmental commitment, and electric rate impacts. July 2002.

Connecticut Department of Public Utility Control (Docket No. 00-12-13RE01): Market power issues and market modeling regarding the proposed sale of Seabrook Nuclear Station to FPL Energy Seabrook, LLC. July 2002.

United States District Court for the Southern District of Indiana (Civil Action No. IP99-1692-C-M/S, United States v. Southern Indiana Gas and Electric Company): Declaration on confidential business information and competitive harm. June 2002.

Nevada Public Utilities Commission (Docket No. 02-2002): Review of Sierra Pacific Power Company's risk management and procurement of electric power in the wholesale markets. April 2002.

Vermont Public Service Board (Docket No. 6596): Used and useful policy issues, electricity market prices, and above market costs of the purchase from Hydro Quebec. March 2002.

Nevada Public Utilities Commission (Docket No. 01-11029): Review of Nevada Power Company's risk management and procurement of electric power in the wholesale markets. February 2002.

Vermont Public Service Board (Docket No. 6545): Economic analysis of the proposed sale of Vermont Yankee nuclear plant and an associated Purchased Power Agreement. January 2002.

New Jersey Board of Public Utilities (Docket No. EM01050308): Joint testimony with David Schlissel and surrebuttal testimony regarding the analysis of the proposed merger between Conectiv and PEPCo. On behalf of The State of New Jersey Division of the Ratepayer Advocate. September 2001 and November 2001.

Indiana Utility Regulatory Commission (Cause No. 41954): System planning and joint operation in a partially deregulated context. On behalf of Citizens Action Coalition of Indiana. June 22, 2001.

State of Vermont, Windham Superior Court (Dockets S 362-9-99 and S372-9-99): Deposition on electricity market prices and economic valuation of hydroelectric generating plant. May 2001.

Federal Energy Regulatory Commission (Docket No. ER01-200-001): Testimony and cross-answering testimony regarding the termination of the Cinergy Operating Agreement, treatment of merger savings, and affiliate relationships. April 2001.

New Jersey Board of Public Utilities (Docket No. EM00110870): Joint testimony with David Schlissel and supplemental testimony regarding the analysis of the proposed merger between FirstEnergy and GPU. On behalf of The State of New Jersey Division of the Ratepayer Advocate. April 2001.

Vermont Public Service Board (Dockets Nos. 6120 and 6460): Testimony and surrebuttal testimony regarding used and useful policy issues, electricity market prices, and above market costs of the purchase from Hydro Quebec. March 2001 and April.

United States District Court for the Northern District of New York (Civil Action No. 00-CV-1738): Affidavit on the issuance and trading of SO₂ emission allowances under the Title IV of the Clean Air Act, in Clean Air Markets Group v. George E. Pataki et al. January 2001.

Department of Energy (Docket No. EE-RM-500): Oral testimony on proposed rules for central air conditioner and heat pump energy conservation standards. December 2000.

Illinois Commerce Commission (Docket No. 00-0361): Review of ComEd's funding for nuclear power plant decommissioning. July 2000.

California Public Utilities Commission (Rulemaking 99-10-025): Direct and rebuttal testimony regarding distributed generation and related rate design issues. On behalf of On Behalf of The Utility Reform Network, Utility Consumers Action Network, and Natural Resources Defense Council (NRDC). July 2000 and August 2000.

Massachusetts Department of Environmental Protection: Comments on reliability implications of proposed emission standards for power plants. July 2000.

Arkansas Public Service Commission (Docket No. 00-048-R): Requirements for electricity market power analyses. June 2000.

United States District Court for the Middle District of North Carolina (1:99CV00033): Expert report on replacement power costs in Carolina Power & Light Company vs. Yuasa Exide, Inc. March 2000.

Illinois Commerce Commission (Docket No. 99-0115): Review of ComEd's nuclear power plant decommissioning cost estimates. September 1999.

West Virginia Public Service Commission (Case No. 98-0452-E-GI): AEP and Allegheny Power restructuring, market power, divestiture of generation, electric system market price modeling, statistical analysis of comparable sales, and responsibility for stranded costs and gains. On behalf of On Behalf of The Consumer Advocate Division. August 1999.

Mississippi Public Service Commission (Docket No. 96-UA-389): Review of Entergy Mississippi, Inc. and Mississippi Power Company stranded cost filings, divestiture of generation, statistical analysis of comparable sales, responsibility for stranded costs and gains. On behalf of Mississippi Attorney General's Office. August 1999.

Connecticut Department of Public Utility Control (Docket No. 99-03-36): Testimony regarding Connecticut Light and Power Company standard offer service, market prices for electricity and the influence of market power, simulation analysis of the New England electricity market. On behalf of Connecticut Office of Consumer Counsel. July 1999.

Connecticut Department of Public Utility Control (Docket No. 99-03-35): Testimony regarding United Illuminating Company standard offer service, market prices for electricity and the influence of market power, simulation analysis of the New England electricity market. On behalf of Connecticut Office of Consumer Counsel. July 1999.

Utah Public Service Commission (Docket No. 98-2035-04): Testimony regarding the cost savings expectations for the proposed merger of PacifiCorp and Scottish Power. On behalf of the Committee of Consumer Services. June 1999.

Washington Utilities and Transportation Commission (Docket No. UE-981627): Direct testimony regarding cost savings expectations for the proposed merger of PacifiCorp and Scottish Power and assessment of whether the merger is in the public interest. On behalf of The Public Counsel Section, Office of the Attorney General. June 1999.

Federal Energy Regulatory Commission (Docket Nos. EC98-40-00, et al.): Horizontal market power and barriers to entry in consideration of the proposed merger of American Electric Power Company and Central and South West Corporation. April 1999.

Connecticut Department of Public Utility Control (Docket No. 99-03-04): Market power, market prices, and simulation modeling as related to the application of United Illuminating Company for recovery of stranded costs. April 1999.

Connecticut Department of Public Utility Control (Docket No. 99-02-05): Market power, market prices, and simulation modeling as related to the application of Connecticut Light & Power Company for recovery of stranded costs. April 1999.

Maryland Public Service Commission (Case No. 8797): Direct testimony regarding the simulation analysis of the ECAR market and projected market prices for electricity for estimation of Potomac Electric Company's stranded generation costs and unbundled rates. On behalf of the Staff of the Public Service Commission of Maryland. January 1999.

Maryland Public Service Commission (Case No. 8795): Direct testimony regarding the simulation analysis of the PJM market and projected market prices for electricity for estimation of Delmarva Power and Light Company's stranded generation costs and unbundled rates. On behalf of the Staff of the Public Service Commission of Maryland. December 1998.

Maryland Public Service Commission (Cases Nos. 8794 and 8804): Direct testimony regarding the simulation analysis of the PJM market and projected market prices for electricity for estimation of Baltimore Gas and Electric Company's stranded generation costs and unbundled rates. On behalf of the Staff of the Public Service Commission of Maryland. December 1998.

Vermont Public Service Board (Docket No. 6107): Prefiled testimony regarding excess capacity, used & useful, and the economics of Green Mountain Power's purchase from Hydro Quebec. On behalf of The Vermont Department of Public Service. September 1998.

Mississippi Public Service Commission (Docket No. 96-UA-389): Direct testimony regarding the analyses of market concentration and market power, behavior of affiliated companies, need for an independent system operator. On behalf of the Mississippi Attorney General's Office. September 1998.

California Public Utilities Commission (Application No. 97-12-020): Testimony and rebuttal testimony regarding nuclear power plant decommissioning and radioactive waste disposal. July 1998 and August 1998.

Federal Energy Regulatory Commission (Docket No. EC97-46-000): Affidavit on market power implications of the proposed merger between Allegheny Power System and Duquesne Light Company. June 1998.

New Jersey Board of Public Utilities (Docket Nos. EX4120585Y, EO97070460, and EO97070463): Joint testimony with Nathanael Greene, Edward Smeloff, and Thomas Bourgeois regarding economic and environmental benefits of energy efficiency, including estimation of marginal air emissions from the PJM System. March 1998.

Vermont Public Service Board (Docket No. 6018): Excess capacity and the economics of Central Vermont Public Service Company's purchase from Hydro Quebec. February 1998.

Public Service Commission of Maryland (Case No. 8774): Market power implications of the APS-DQE merger. February 1998.

Federal Energy Regulatory Commission (Docket Nos. OA97-237-000 and ER97-1079-000): Market power in New England electricity markets. January 1998.

British Columbia Utilities Commission: British Columbia Hydro and Power Authority Wholesale Transmission Services Application. November 1997.

Pennsylvania Public Utility Commission (Docket R-00973981): Environmental disclosure, consumer education, and allocation of default customers in the West Penn Power Company Restructuring Plan. November 1997.

Pennsylvania Public Utility Commission (Docket R-00974104): Direct and surrebuttal testimony regarding environmental disclosure, consumer education, nuclear decommissioning, and allocation of default customers in Duquesne Light Company Restructuring Plan. November 1997 and December 1997.

Mississippi Public Service Commission (Docket No. 97-UA-496): Petition of Mississippi Power Company for a Certificate of Public Convenience and Necessity Authorizing Construction of a Generating Plant in Jackson County. November 1997.

Pennsylvania Public Utility Commission (Docket Nos. R-00973953 and P-00971265): Allocation of default customers in the Application of PECO Energy Company for approval of its restructuring plan and petition on Enron Energy Services Power, Inc. for approval of an electric competition and customer choice plan. November 1997.

Vermont Public Service Board (Docket No. 5983): Direct, rebuttal, and supplemental testimony regarding excess capacity and the economics of Green Mountain Power Company's purchase from Hydro Quebec. October 1997, December 1997, and January 1998.

Pennsylvania Public Utility Commission (Docket No. R-00973953): Testimony regarding environmental disclosure, nuclear decommissioning and spent fuel in the Joint petition for partial settlement of PECO Energy Company's proposed restructuring plan and application for a qualified rate order. September 1997.

Pennsylvania Public Utility Commission (Docket No. R-00974009): Testimony regarding environmental disclosure, customer education, and nuclear issues in Pennsylvania Electric Company's Restructuring Plan. September 1997.

Pennsylvania Public Utility Commission (Docket No. R-00974008): Testimony regarding environmental disclosure, customer education, and nuclear issues in Metropolitan Edison Company's Restructuring Plan. September 1997.

Indiana Legislature, Regulatory Flexibility Committee: Testimony in the matter of Electric Industry Restructuring To Benefit Consumers and the Environment: Stranded Costs, Nuclear Issues, and Air Emissions. September 23, 1997.

Pennsylvania Public Utility Commission (Docket No. R-00973954): Direct and surrebuttal testimony regarding environmental disclosure, customer education, PJM market structure, nuclear decommissioning and spent fuel, rate design for stranded cost recovery in Pennsylvania Power & Light Company's Restructuring Plan. June 1997 and August 1997.

Pennsylvania Public Utility Commission (Docket No. R-00973953): Testimony regarding environmental disclosure, PJM market structure, and nuclear decommissioning and spent fuel in the matter of PECO Energy Company's Restructuring Plan. June 1997.

New York Public Service Commission (Case 96-E-0897): Testimony regarding the analysis of market power in the New York City load pocket in the matter of Consolidated Edison Company's Plans for Electric Rate Restructuring. April 1997.

Pennsylvania Public Utility Commission (Docket No. R-00973877): Testimony regarding the nuclear power plant decommissioning costs, stranded cost recovery, and securitization in the matter of the Application of PECO Energy Company for Issuance of a Qualified Rate Order. February 1997.

New Hampshire Public Utilities Commission (DR 96-150): Electric industry restructuring, including stranded costs, industry structure, market power, and nuclear issues. November 1996.

Massachusetts Department of Public Utilities (96-100): Nuclear plant stranded costs and decommissioning. July 1996.

Vermont Public Service Board (5854): Electric industry restructuring, including stranded costs, industry structure, and environmental protection. July 1996.

Ontario Energy Board (H.R. 23): Filed joint evidence with John Stutz regarding electricity rate options. June 1995.

Pennsylvania Public Utility Commission (R-00943271): Discount rates and system benefits charge. April 1995.

Colorado Public Utilities Commission (94A-516A): Construction of new generating resources. January 1995.

Public Service Commission of Nevada (94-9002): Environmental and health impacts of a proposed power plant. November 1994.

Nuclear Decommissioning Finance Committee of New Hampshire (93-001): Joint testimony with William Dougherty regarding Seabrook decommissioning cost, spent fuel storage, and cost collection methodology. September 1994.

Public Service Commission of Wisconsin (6630-CE-197 and 6630-CE-209): Joint testimony with William Dougherty regarding Point Beach externalities, economics, spent fuel storage, and aging. September 1994.

British Columbia Utilities Commission: Greenhouse gas emissions and environmental externalities policy. August 1994.

Public Service Commission of Wisconsin (05-EI-14): Direct, rebuttal, and surrebuttal testimony regarding the Cost of decommissioning Point Beach and Kewaunee nuclear power plants. February 1994.

Delaware Public Service Commission (91-39): Nuclear and fossil power plant performance targets. September 1992.

Massachusetts Department of Public Utilities (91-131): Internalization of environmental externalities, greenhouse gas valuation and policy. December 1991.

Massachusetts Department of Public Utilities (91-131): Environmental externalities valuation, emissions effects and global warming. October 1991.

Massachusetts Department of Public Utilities (89-141, 90-73, 90-141, 90-194 and 90-270): The incorporation of environmental externalities in specific utility RFPs. December 1990.

Massachusetts Department of Public Utilities (90-55): Costs and benefits of high-efficiency gas heating equipment. June 1990.

Massachusetts Department of Public Utilities (86-36-G and 89-239): Environmental externalities of electric resources. March 1990.

Florida Public Service Commission (890973-E1): Integrated energy planning, power plant emissions, and nuclear plant performance. January 1990.

Pennsylvania Public Utilities Commission (R-891364): Generating capacity requirements of the Philadelphia Electric Company and the Pennsylvania-New Jersey-Maryland Interconnection. October 1989.

Maryland Public Service Commission (8199): Performance standards for coal, oil, and nuclear power plants. October 1989.

Michigan Public Service Commission (U-9172): Testimony regarding economic analysis of ratepayer impacts, incentives, and implications for plant operation and decommissioning in the matter of the Palisades Power Purchase Agreement. April 1989.

Pennsylvania Public Utility Commission (P-870216, P-880283, P-880284, and P-880286): Allegheny Power System planning and avoided costs. March 1989.

Michigan Public Service Commission (U-8880): Detroit Edison Company power supply costs, economics of Fermi “buy-back” purchase, nuclear fuel expense, oil costs, and power transactions. February 1988.

Michigan Public Service Commission (U-8866): Consumers Power Company power supply costs, including projections of oil prices and purchased power costs. December 1987.

Pennsylvania Public Utility Commission (R-850220): Direct and surrebuttal testimony regarding the economic analysis of West Penn Power Company's participation in the Bath County Pumped Storage Project, and Allegheny Power System capacity reserve requirements. September 1987 and October 1987.

Arizona Corporation Commission (U-1345-85-367): Palo Verde decommissioning cost. February 1987.

Michigan Public Service Commission (U-8545): Consumers Power Company power costs, projected cost of oil and purchased power, economic evaluation of the Big Rock Point nuclear unit. December 1986.

Public Service Commission of Indiana (38045): Northern Indiana Public Service Company system reliability and excess capacity. November 1986.

California Public Utility Commission (84-06-014 and 85-08-025): Diablo Canyon decommissioning cost and collection issues. July 1986.

Michigan Public Service Commission (U-8042R): Review of Consumers Power Company system operations during 1985 and economic evaluation of the Big Rock Point nuclear unit. June 1986.

Michigan Public Service Commission (U-8291): Detroit Edison Company power supply costs, application of a multi-area dispatch model. April 1986.

Michigan Public Service Commission (U-8286): Consumers Power Company power supply costs, application of a multi-area dispatch model. February 1986.

Maine Public Service Commission (85-132): Direct and surrebuttal testimony regarding the standard and long term rates for cogeneration and small power production. January 1986 and February 1986.

Arkansas Public Service Commission (84-249-U): Impact of the Grand Gulf nuclear unit upon Arkansas Power and Light Company and Middle South Utilities electricity production costs. June 1985

Kentucky Public Service Commission (8666): Production costing modeling issues. February 1984.

Resume dated August 2015