



Synapse
Energy Economics, Inc.

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REGULATORY DIVISION
STATE OF WV

**Proposal to Provide
Consulting Services in
Connection with the Merger
Application filed by
Apco and Wpco**

**Submitted to the Consumer Advocate
Division of the Public Service
Commission of West Virginia**

February 29, 2012



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Table of Contents

1.	INTRODUCTION & OVERVIEW OF SYNAPSE	1
2.	CONFLICT OF INTEREST STATEMENT	2
3.	SCOPE OF WORK	3
4.	PROJECT SCHEDULE AND COSTS.....	5
5.	PROJECT TEAM AND QUALIFICATIONS	7
6.	SELECT RELATED PROJECTS.....	11
	APPENDIX A: CONSULTING BID FORM.....	18
	APPENDIX B: PROJECT TEAM RESUMES	19

1. Introduction & Overview of Synapse

Synapse Energy Economics, Inc. (Synapse) is pleased to present this proposal to the Consumer Advocate Division of the West Virginia Public Service Commission (CAD) to provide consulting services regarding the proposed merger of two American Electric Power (AEP) companies: Appalachian Power Company (Apco) and Wheeling Power Company (Wpco) (collectively, the Companies). The goal of our analyses will be to help the CAD determine if the proposed merger would be beneficial for West Virginia ratepayers, particularly residential ratepayers.

The key component of our analyses will be the preparation of two integrated resource plans (IRPs), one for Apco and Wpco operating on a stand-alone basis, and one for Apco and Wpco operating on a merged basis. In preparing these IRPs, we would begin with many of the inputs that the Companies used to prepare their IRPs, but we expect to assess supply-side and demand-side resource options the Companies have not considered in addition to those they have considered. The goal of the two IRPs is to determine the conditions, if any, under which Apco and Wpco operating on a merged basis would be more beneficial to West Virginia than Apco and Wpco continuing to each operate on a stand-alone basis. The key metric for each IRP will be total revenue requirements.

Synapse is especially well-suited to provide CAD with these services. In addition to our extensive general experience reviewing and preparing IRPs, we are currently preparing a very similar analysis of an AEP company in Kentucky. Synapse is currently reviewing an application by Kentucky Power to recover the cost of retrofitting its Big Sandy coal unit 2 in order to comply with tighter Environmental Protection Agency (EPA) regulations. Our review is examining other possible options, including construction of a gas-fired combined cycle plant and purchasing power, over the Company's 30-year planning horizon. Our analysis will determine which option, or resource portfolio, is most likely to have the lowest expected value of revenue requirements under a range of possible future scenarios. Those scenarios reflect various key input assumptions whose values are uncertain over that 30-year period. These assumptions include the annual load to be served by fossil generation, which might be affected by the impacts of renewable generation and efficiency; natural gas prices; and the possibility of carbon regulation. We are reviewing the projections for "AEP East" that the Company prepared using the Strategist model, and are also re-running the Strategist model in order to calculate the revenue requirements of alternative resource strategies under a range of future scenarios. In late 2011, Synapse completed two other relevant long-term electricity resource planning projects in Kentucky: one investigating the potential impacts of a renewable and energy efficiency portfolio standard, and one evaluating utility planning and expenditures. Descriptions of these projects are provided in Section 6 of this proposal.

The Synapse team for this project has direct experience with IRP issues in both the electric and natural gas industries, and a comprehensive understanding of the critical issues associated with IRP. The senior staff members of our project team—including Rick Hornby, Bruce Biewald, and Dr. David White—each have more than 25 years of demonstrated experience in analyzing these issues for regulators, consumer advocates, and environmental organizations. Our project team has:

- Extensive experience with reviewing and preparing forecasts of energy and demand;



- A comprehensive understanding of the technical, economic, and environmental attributes of generation resources, both conventional and new, fossil fuel based and renewable;
- Developed and reviewed estimates of savings from energy efficiency and demand response programs, and the costs of implementing those programs;
- Analyzed and testified on environmental costs associated with electric energy generation and consumption, including the implications of CO₂ emissions;
- Prepared risk and sensitivity analyses of various resource plans under a range of alternative assumptions and scenarios; and
- Assessed various methodologies and criteria used to select the optimal mix of demand-side and supply-side resources to include in the recommended IRP.

Descriptions of Synapse projects related to integrated resource planning and merger proceedings are provided in Section 6 of this proposal, "Select Related Projects."

About Synapse

Synapse Energy Economics was founded in May 1996 to specialize in consulting on electric industry regulatory, restructuring, and environmental issues. Our firm provides research, testimony, reports, and regulatory support to consumer advocates, environmental organizations, regulatory commissions, state energy offices, and others. Synapse's professional staff has more than 200 years of combined experience in studying the electricity industry, and we are frequently at the forefront of electricity industry regulation and restructuring debates. Synapse is managed by its President and Founder Bruce Biewald, Vice President and Chief Operating Officer Ezra Hausman, and Vice President Tim Woolf.

Synapse works for a wide range of clients throughout the United States, including environmental groups, public utility commissions and their staff, governmental associations, public interest groups, attorneys general, offices of consumer advocates, foundations, and federal governmental organizations such as the EPA and the Department of Energy.

Synapse has extensive experience in reviewing and preparing IRPs. This includes an understanding of the capital and operating costs of conventional, renewable, and energy efficiency resources, the lead times associated with bringing those resources into service, and the environmental regulations that will affect their operations. It also includes experience with wholesale markets for electric energy and capacity, and with running production cost models. Finally, Synapse has experience with merger-related issues, such as consumer protection and merger savings allocation between ratepayers and shareholders.

2. Conflict of Interest Statement

Synapse is not aware of any current or future conflict of interest with respect to this contract. Before bidding on any future work related to the substance or stakeholders associated with this contract, Synapse will consult with the CAD to ensure that there are no real or perceived conflicts of interest.

3. Scope of Work

On behalf of CAD, Synapse proposes to provide consulting services, analysis, and expert testimony regarding the proposed merger of Apco and Wpco, and the benefits of such a merger to West Virginia ratepayers. Consulting services that are budgeted in this proposal include:

- 1) Review the Companies' forecasts of peak demand and annual energy requirements;
- 2) Review previous and supplemental filings in the merger case (No. 11-1775-E-P) and Wpco and Apco filings related to procurement and integrated resource planning;
- 3) Develop discovery questions to the Companies and review responses thereto;
- 4) Develop input assumptions, including identifying supply-side and demand-side resources the Companies have failed to consider and assumptions for those resources;
- 5) Project revenue requirements if Apco and Wpco continue to operate on a stand-alone basis;
- 6) Project revenue requirements to West Virginia ratepayers if Apco and Wpco merge;
- 7) Assess uncertainties and risks with estimated merger savings;
- 8) Develop conclusions and recommendations;
- 9) Prepare testimony in support of resource cost analysis;
- 10) Respond to discovery on direct testimony;
- 11) Attend hearings; and
- 12) Review and, as necessary, rebut analysis and testimony put forth by the Companies or other parties in Case No. 11-1775-E-P.

Following we provide more detail about our proposed approach to each task.

- 1) Synapse will review and analyze the Companies' most recent, relevant forecasts of peak demand and energy requirements. These will include forecasts the Companies provide in supplemental testimony and in response to information requests put forth by CAD and the other parties in Case No. 11-1775-E-P. We will also review forecasts from the 2010 AEP East IRP and the September 2009 Apco IRP to identify any major inconsistencies.
- 2) Synapse will review and analyze the Companies' most recent, relevant filings related to procurement and IRP. These will include filings the Companies provide in supplemental testimony and in response to information requests put forth by CAD and the other parties in Case No. 11-1775-E-P, as well as relevant AEP filings at FERC. We have identified several key filings, including the Companies' December 16, 2011 Joint Petition for Evaluation of a Possible Merger of Appalachian Power Company and Wheeling Power Company, with exhibits (Joint Petition), and the Companies' responses to information requests put forth by CAD. For information on procurement and integrated resource planning, Synapse will review and extract data from the 2010 AEP East IRP, the 2009 Apco IRP, and other documents.
- 3) To the extent not already requested by CAD or other parties in Case No. 11-1775-E-P, Synapse will develop requests for information to the Companies, and review the

Companies' responses to those questions relating to the current Joint Petition and the Companies' supplemental filing, when available.

- 4) Synapse will develop input assumptions for modeling. This will include working closely with the CAD to identify reasonable supply-side and demand-side resources the Companies have failed to consider, and developing assumptions for those resources. Input assumptions are the key to an IRP. We would review each key input assumption, including projected retail energy requirements, annual energy and peak demand, reserve margin, mix and characteristics of existing capacity, projected capacity retirements and additions, projected fuel prices, and projected environmental compliance costs.
 - A key input assumption will be the source of future power supply for Wpco on a stand-alone basis. The Companies maintain that its existing full requirements purchase agreement will not continue after the restructuring of AEP in Ohio.
 - We will draw on various sources, including our current review of Kentucky Power Company's options. Our analysis of supply-side resources will include new and existing conventional and renewable resources specific to the region. Synapse will consider AEP's fossil fuel generation resources, as listed in the Companies' responses to CAD B-1 (Attachment 6) and CAD B-2, and the likely environmental retrofit costs that these units may incur to comply with upcoming U.S. EPA regulations. For renewable energy potential, costs, and performance, we will review existing data and estimates for West Virginia and Virginia from the 2010 AEP East IRP and from other sources such as the U.S. DOE National Renewable Energy Lab. Synapse will draw on existing estimates of energy efficiency potential and cost in West Virginia and Virginia, and in Wpco and Apco's territories to the extent available, as well as the performance of existing efficiency programs in the area. We note that, according to the 2010 AEP East IRP, as of 2010 Apco was not tapping energy efficiency resources.
- 5) Synapse will project revenue requirements to West Virginia ratepayers if Apco and Wpco do not merge, i.e. the stand-alone basis. Synapse will project resource costs of additional procurement, new generation, and demand-side options using Strategist, the production costing model that AEP uses to prepare its IRPs. Strategist provides projections of capacity, energy, production costs, and revenue requirements associated with those production costs. Synapse acquires Strategist under license.
 - We will begin by running Strategist for the Companies' proposed resource portfolio in order to replicate the Companies' projections and benchmark our analyses.
 - We will then run Strategist for an alternative portfolio consisting of a broader range of supply-side and demand-side resources.
 - We will use Strategist to test the performance of the Companies' proposed resource portfolio and our alternative portfolio under a range of possible future scenarios in order to determine which resource portfolio would have the lowest expected value of revenue requirements.

- 6) Synapse will project revenue requirements to West Virginia ratepayers if Apco and WpcO do merge, i.e. the merged basis. Again we will use Strategist to make these projections for the Companies' proposed resource portfolio and our alternative portfolio under a range of possible future scenarios as described in item 5 above.
- 7) Synapse will use the results from items 5 and 6 to assess the uncertainties and risks associated with the resource portfolios for Apco and WpcO operating on a stand-alone basis and on a merged basis. Our assessment will identify how those results might affect West Virginia ratepayers and the conditions under which any adverse effects could be mitigated, if not avoided entirely.
- 8) Synapse will develop conclusions and recommendations regarding the possible benefits and risks of the proposed merger.
- 9) Synapse will prepare direct written testimony based on the research and analysis described above. We expect that Rick Hornby will be the primary expert witness, with possibly one other expert witness to provide additional technical support for the resource cost analysis. The testimony will describe assumptions and methodologies used in the resource cost analysis, the results of the analysis, and the implications of the results.
- 10) Synapse will respond to information requests on the direct testimony and on the analysis, if the procedural schedule to be set by the Commission for Case No. 11-1775-E-P leaves the opportunity for discovery questions on other parties' testimony.
- 11) Rick Hornby will attend hearings as the primary expert witness. If another expert witness provides direct written testimony, that witness will also attend hearings if required.
- 12) Synapse will review and, as necessary, rebut analysis and testimony put forth by the Companies or other parties in Case No. 11-1775-E-P.

4. Project Schedule and Costs

Our project team is ready to begin work immediately. The hourly charge rates for the project team are as follows: Rick Hornby \$240, Bruce Biewald \$250, David White \$220, Alice Napoleon \$180, Kenji Takahashi \$180, and Rachel Wilson \$180. These rates include all the costs that will be billed to the client, including travel, expenses, and \$17,000 for a Strategist license fee.

Table 1 below provides an approximate breakdown of the staff that will be assigned to the various tasks associated with this project, and the costs associated with each task and staff member. We expect that actual staff assignments will depend upon the specific details and timing of the task. The total proposed budget for this scope of work is \$97,880. Synapse is open to modifying the scope of work and associated budget to best meet the CAD's needs in this matter.

Synapse's "Consulting Bid Form" is provided in this proposal as Appendix A.

Table 1. Proposed Budget

Hourly Rate (US\$/Hr)	Hornby	White	Takahashi	Wilson	Napoleon	Biewald	Total
	\$240	\$220	\$180	\$180	\$180	\$250	
Staff Effort - Hours, Total							
1. Review the Companies' peak demand and energy requirements forecasts;	4	8		8			20
2. Review previous and supplemental filings in the merger docket (11-1775-E-P) and Wpco and Apco filings related to procurement and integrated resource planning;	8	8	8	8	8		40
3. Develop discovery questions to the Companies and review responses thereto;	8	4	8	8	8		36
4. Develop inputs to analysis of supply- and demand-side resource costs, including assessment of probable environmental retrofit costs;		16	8	16		4	44
5. Project costs to West Virginia ratepayers if Apco and Wpco do not merge;		8		32			40
6. Project costs to West Virginia ratepayers if Apco and Wpco merge;		8		32			40
7. Assess uncertainties and risks with estimated merger savings;	8	16		16		4	44
8. Develop conclusions and recommendations;	8	8		8		4	28
9. Prepare testimony in support of resource cost analysis;	24	8	8	16	8	4	68
10. Respond to discovery on direct testimony;	8	8	8	8	8		40
11. Attend hearings; and	24						
12. Review and, as necessary, rebut analysis and testimony put forth by the Companies or other parties in Case No. 11-1775-E-P.	24	4	4	8	8	4	52
	116	96	44	160	40	20	452
Staff Costs - \$							
1. Review the Companies' peak demand and energy requirements forecasts;	\$960	\$1,760	\$0	\$1,440	\$0	\$0	\$4,160
2. Review previous and supplemental filings in the merger docket (11-1775-E-P) and Wpco and Apco filings related to procurement and integrated resource planning;	\$1,920	\$1,760	\$1,440	\$1,440	\$1,440	\$0	\$8,000
3. Develop discovery questions to the Companies and review responses thereto;	\$1,920	\$880	\$1,440	\$1,440	\$1,440	\$0	\$7,120
4. Develop inputs to analysis of supply- and demand-side resource costs, including assessment of probable environmental retrofit costs;	\$0	\$3,520	\$1,440	\$2,880	\$0	\$1,000	\$8,840
5. Project costs to West Virginia ratepayers if Apco and Wpco do not merge;	\$0	\$1,760	\$0	\$5,760	\$0	\$0	\$7,520
6. Project costs to West Virginia ratepayers if Apco and Wpco merge;	\$0	\$1,760	\$0	\$5,760	\$0	\$0	\$7,520
7. Assess uncertainties and risks with estimated merger savings;	\$1,920	\$3,520	\$0	\$2,880	\$0	\$1,000	\$9,320
8. Develop conclusions and recommendations;	\$1,920	\$1,760	\$0	\$1,440	\$0	\$1,000	\$6,120
9. Prepare testimony in support of resource cost analysis;	\$5,760	\$1,760	\$1,440	\$2,880	\$1,440	\$1,000	\$14,280
10. Respond to discovery on direct testimony;	\$1,920	\$1,760	\$1,440	\$1,440	\$1,440	\$0	\$8,000
11. Attend hearings; and	\$5,760	\$0	\$0	\$0	\$0	\$0	\$5,760
12. Review and, as necessary, rebut analysis and testimony put forth by the Companies or other parties in Case No. 11-1775-E-P.	\$5,760	\$880	\$720	\$1,440	\$1,440	\$1,000	\$11,240
Total: Including Estimated Travel Costs and Strategist License	\$27,840	\$21,120	\$7,920	\$28,800	\$7,200	\$5,000	\$ 97,880



5. Project Team and Qualifications

The project team will include the following members:

- Rick Hornby – project manager, expert in resource planning
- Bruce Biewald – expert in resource planning and merger proceedings
- Dr. David White – expert in resource cost projections, economic analysis, and modeling
- Alice Napoleon – research and analysis
- Kenji Takahashi – research on energy efficiency
- Rachel Wilson – expert in Strategist model, including developing inputs and running various scenarios

Below we offer short bios for each member of the proposed project team. Full resumes are available in Appendix B.

A. Project Team Bios

Rick Hornby – Project Manager

Rick Hornby is a senior consultant at Synapse Energy Economics. He has worked in the energy industry since 1976 as a regulatory consultant, senior civil servant, and project engineer. Mr. Hornby's primary areas of focus are resource planning and ratemaking in the electricity and natural gas industries. He has provided expert testimony and litigation support on these IRP issues in over 120 proceedings on behalf of utility regulators, consumer advocates, environmental groups, energy marketers, gas producers, and utilities.

Mr. Hornby has a Master of Science in Technology and Policy from the Massachusetts Institute of Technology and a Bachelor of Industrial Engineering from Dalhousie University. Prior to joining Synapse, Mr. Hornby was a Principal with CRA International, formerly Tabors Caramanis & Associates. He also held positions as Director of the Energy Group and Manager of the Natural Gas Program at the Tellus Institute (formerly Energy Systems Research Group). Earlier in his career he served as Assistant Deputy Minister of Energy in the Nova Scotia Department of Mines and Energy and as a Member of the Canada-Nova Scotia Offshore Oil and Gas Board. Mr. Hornby has also been a project engineer responsible for energy management programs in industry.

Since joining Synapse in 2006, Mr. Hornby has analyzed a range of electricity resource planning and ratemaking issues for staff of regulatory commissions, consumer advocates and environmental groups. Examples of his current and recent resource planning cases, described in section 6, include:

- Evaluation of Kentucky Power Company application for recovery of cost of FGD and other EPA regulation compliance measures at Big Sandy coal plant (Project Manager, witness);
- Potential Impacts of a Renewable and Energy Efficiency Portfolio Standard in Kentucky (Project Manager, editor);

- Avoided Energy Supply Cost Study 2011 for New England (Project Manager, editor);
- Evaluation of Oklahoma Gas & Electric wind power purchase agreements and associated Windspeed Transmission Project (Project Manager, witness); and
- Avoided Costs for ACEEE Clean Energy Studies of Ohio, Virginia, Arkansas, North Carolina and South Carolina (Project Manager).

Bruce Biewald

Bruce Biewald is the president of Synapse Energy Economics. Since 1980, he has analyzed the electricity industry and has advised state agencies, consumer and environmental advocates, utilities, and others on issues related to the production and consumption of energy. Mr. Biewald has testified in more than one hundred cases including utility regulatory proceedings in twenty-five states, the Federal Energy Regulatory Commission, the Nuclear Regulatory Commission's Atomic Safety and Licensing Board, two Canadian provinces, and in State and Federal Courts.

Mr. Biewald has co-authored more than one hundred reports, including studies for the Electric Power Research Institute, the U.S. Department of Energy, the U.S. Environmental Protection Agency, the Office of Technology Assessment, the New England Governors' Conference, the New England Conference of Public Utility Commissioners, the National Association of Regulatory Utility Commissioners, and the United Nations Framework Convention on Climate Change. Mr. Biewald's papers have been published in the *Electricity Journal*, *Energy Journal*, *Energy Policy*, *Public Utilities Fortnightly*, and numerous conference proceedings.

Mr. Biewald's recent work includes consulting on electric industry restructuring, stranded costs, system benefits, market power, mergers and acquisitions, generation asset valuation and divestiture, power plant costs and performance, renewable resources, power supply contracts and performance standards, green marketing of electricity, environmental disclosure, nuclear plant decommissioning and radioactive waste issues, climate change policy, environmental externalities valuation, energy conservation and demand-side management, electric power system reliability, and electricity market simulation modeling for price forecasting and market power analysis. Mr. Biewald's recent projects include consulting to the United Nations Framework Convention on Climate Change (UNFCCC), the U.S. Department of Energy, the U.S. Department of Justice, the U.S. Environmental Protection Agency, and the Federal Trade Commission.

Prior to founding Synapse, Mr. Biewald was with Energy Systems Research Group (later Tellus Institute) where he consulted on a wide range of electric system regulatory and economic issues. Mr. Biewald studied architecture and building technology at MIT.

Dr. David White

David White is a senior consultant with Synapse Energy Economics. The primary focus of his work is the technical analysis and modeling of electricity system operations and expansion, electricity industry regulation, energy efficiency programs, renewable resource technologies, and clean air regulations and policies.

Dr. White has modeled most of the North American Electric Reliability Council (NERC) regions in the United States and Canada. Many of these projects have involved examining proposed

mergers and their potential effects on market power and market prices. A recent focus has been on the analysis of long-term generation expansion plans and the role of uncertainty in those analyses.

Dr. White's recent work includes consulting on electric industry restructuring, stranded costs, system benefits, market power, mergers and acquisitions, generation asset valuation and divestiture, power plant costs and performance, renewable resources, power supply contracts and performance standards, green marketing of electricity, environmental disclosure, climate change policy, environmental externalities valuation, energy conservation and demand-side management, electric power system reliability, and electricity market simulation modeling for price forecasting and market power analysis.

He holds a PhD in Engineering Systems from the Massachusetts Institute of Technology and BS and MS degrees in Physics. He has analyzed energy systems and been involved with computer modeling since the mid-1970s, including five years at the MIT Energy Laboratory. Dr. White worked with Energy Systems Research Group (later Tellus Institute) where he had a lead in developing many computer modeling systems for energy and environmental analysis.

Alice Napoleon

As an associate at Synapse Energy Economics, Alice Napoleon conducts economic and policy analysis of electric system and emissions regulations. Her areas of expertise include policies targeting air and water emissions, including criteria and hazardous air pollutants, greenhouse gases, and coal combustion wastes. She facilitated and provided expert analysis for Colorado, South Carolina, and Maryland demand side resource policy working groups to recommend, develop, and quantify costs and benefits of possible state actions to reduce greenhouse gas emissions. Additional past project work includes researching policies and trends that impact ambient PM_{2.5}, analyzing economic drivers of electric system emissions, and proposing policies for mitigating these emissions in and around New York City. She also conducted a sweeping review of emissions allowance markets, emissions price projections, and the economic and policy developments that impact these markets.

In addition to emissions-related topics, her work at Synapse has included projects focused on electricity and coal market data, models, and projections, as well as economic and policy developments that impact these markets. She has provided expert analysis on demand-side resource policies and ratemaking; integrated resource planning; renewable resource policies, costs and potentials; mergers and market power; risk management policies; Regional Transmission Organization processes and markets; and provider-of-last-resort and regulated power procurement. In the regular course of her work, Ms. Napoleon researches demographic and economic data, federal and state regulations, rulemakings and legal precedent; writes reports, discovery questions and responses, and expert testimony; and conducts analysis in support of testimony.

She previously worked at Resource Insight, Inc. where she supported investigations of electric, gas, steam, and water resource issues, primarily in the context of reviews by state utility regulatory commissions. In this capacity, she surveyed state-level policies promoting renewables and electric and gas demand side management, conducted research and analysis on the benefits and avoided

costs of repowering coal-fired plants, participated in drafting an Energy Plan for New York City, and compiled a comparison of ISO-level generation and transmission planning processes.

Ms. Napoleon also helped to structure solicitations for wholesale competitive power supply to serve aggregated municipal load; calculated market-price benchmarks for analysis of power-supply bids, using market and regulated prices for energy, capacity, ancillary services, transmission and ISO services, load shape, and losses; surveyed the development and structure of competitive markets, jurisdictional cost allocation, and performance standards; and conducted discounted cash flow analysis for generation asset valuation. These projects involved drafting discovery questions and responses, formal objections, comments, and testimony; collaboratively writing and editing reports; and managing data, case filings, and discovery.

Before joining the staff of Resource Insight, Ms. Napoleon completed an internship with the Cities for Climate Protection Program in which she compiled energy consumption data to calculate total greenhouse-gas emissions and analyzed economic conditions for green-power initiatives. She also worked as both a teaching assistant and a research assistant at the University of Massachusetts at Amherst. She holds an MA in Public Administration from the University of Massachusetts at Amherst and a BA in Economics from Rutgers University.

Kenji Takahashi

Kenji Takahashi is an associate at Synapse. He conducts economic, environmental, and policy analysis of electric system technologies, policies, and regulations associated with both supply and demand side resources, and frequently assists in writing related reports and testimony. He has significant experience in the analysis of energy efficiency measures and programs, demand response, integrated resource plans, renewable energy portfolio standards, and distributed generation.

Mr. Takahashi's recent focus has been in two areas. First, he has evaluated the design and performance of utility energy efficiency programs in the United States. Second, he assisted the states of Alaska, Colorado, Florida, Maryland, and South Carolina with developing and analyzing state climate change action plans. He is currently involved in a long-term project for the state of Massachusetts, and helping the state develop and analyze policies and programs to meet the state's GHG emission reduction goals.

Prior to joining Synapse, Mr. Takahashi was a Research Associate at the Center for Energy and Environmental Policy (CEEP) of the University of Delaware. He has also held research intern positions for the Delaware Division of Public Advocate and for the Resources for the Future. At these organizations he gained extensive research experience in the field of distributed energy resource policy and electric utility regulation and restructuring. Mr. Takahashi holds an MA in Urban Affairs and Public Policy with a concentration in energy and environmental policy from the University of Delaware and a BA in Law with a concentration in public administration from Kansai University in Osaka, Japan.

Rachel Wilson

Rachel Wilson is an associate with Synapse Energy Economics, where she conducts research and assists in writing testimony and publications. Her work focuses on a variety of issues related

to electric utilities, including federal and state clean air policy; emissions from electricity generation; environmental compliance technologies, strategies, and costs; integrated resource planning; valuation of environmental externalities from power plants; and the nexus between water and energy.

Prior to joining Synapse, Ms. Wilson worked for an economic and business consulting firm where she focused on issues of energy, the electric industry, and coal production. She was also a research assistant at the Yale Center for Environmental Law and Policy and was responsible for collecting and processing data on corporate and environmental strategy. Ms. Wilson holds a Master of Environmental Management from Yale University and a Bachelor of Arts in Environment, Economics, and Politics from Claremont McKenna College.

Examples of her current and recent resource planning cases, described in section 6, include:

- Evaluation of Kentucky Power Company application for recovery of cost of FGD and other EPA regulation compliance measures at Big Sandy coal plant (review Company Strategist runs, re-run Strategist for alternative assumptions regarding load and supply resources, witness);
- Evaluation of Louisville Gas & Electric and Kentucky Utilities (the Companies) application for certificates of public convenience and necessity to invest billions of dollars in existing coal-fired power plants to enable them to comply with new, tighter environmental regulations (review Company Strategist runs, re-run Strategist for alternative assumptions regarding load and supply resources, witness).
- Review of comments regarding potential Impacts of EPA regulations on coal-fired generation in Iowa. Ms. Wilson assisted the Iowa OCA by reviewing comments submitted in this docket and preparing comments to submit to the Board.
- Avoided Energy Supply Cost Study 2011 for New England (leader modeler);

6. Select Related Projects

Synapse is exceptionally well-qualified to provide the CAD with the consulting services outlined in the Scope of Work above. Below we provide descriptions of select ongoing, recent, and relevant Synapse project work, including details on associated clients.

A. Projects for the West Virginia Consumer Advocate Division

Stranded Costs and Divestiture of Generation Assets

Client: West Virginia Consumer Advocate Division

Synapse and Resource Insight assessed the stranded costs of American Electric Power and Allegheny Power. The results, including a discussion of divestiture of generation assets and the responsibility for stranded costs and gains, were presented in the testimony of Bruce Biewald before the West Virginia Public Service Commission in Case No. 98-0452-E-GI. Project completed in 1999.

Measures to Ensure Fair Competition and Protect Consumers in a Restructured Electricity Industry in West Virginia

Client: West Virginia Consumer Advocate Division

Synapse, with assistance from MacGregor Energy Consultancy, prepared a study of the following consumer protection measures: divestiture of generation, codes of conduct, licensing standards, reliability of distribution services, consumer education, and disclosure of information. The report was presented in the testimony of Tim Woolf before the West Virginia Public Service Commission, Case No. 98-0452-E-GI. Project completed in 1999.

B. Utility Resource Planning

Evaluation of Kentucky Power Company's (an AEP company) application for recovery of cost of FGD and other EPA regulation compliance measures at Big Sandy coal plant

Client: Sierra Club.

Kentucky Power Company has evaluated four alternative options for complying with EPA regulations to reduce air emissions and water pollution from its Big Sandy coal plant—installation of an FGD and other measures, retire and replace with new gas CC, repower as a gas CC, and retire and replace with purchased capacity and energy. Synapse is reviewing the Company's assumptions and evaluations. Project ongoing.

Potential Impacts of a Renewable and Energy Efficiency Portfolio Standard in Kentucky

Client: Mountain Association for Community Economic Development; Kentucky Sustainable Energy Alliance

Legislation introduced in the Kentucky General Assembly proposes to establish a Renewable and Energy Efficiency Portfolio Standard (REPS) for utilities in the state. Synapse estimated the potential impacts of a REPS on Kentucky's portfolio of electricity resources, average electric rates, and on the state's economy. Project completed January 2012.

Evaluation of Utility Planning and Expenditures in Kentucky

Clients: Sierra Club and the National Resource Defense Council

For this project, Synapse provided expert testimony, comments, and litigation support in three cases before the Kentucky Public Service Commission involving resource planning and environmental upgrade expenditures by Louisville Gas & Electric and Kentucky Utilities (the Companies). In two certificate of public convenience and necessity cases, Synapse reviewed and critiqued the Companies' proposals to invest billions of dollars in existing coal-fired power plants to make them compliant with potential environmental regulations that may apply to those plants. Synapse's comments on the Companies' 2011 Integrated Resource Plan (IRP) covered the modeling process and assumptions regarding energy efficiency, load forecasts, renewable energy, and other supply-side alternatives. In all of these cases, our review included factors influencing the decision to retire a plant versus the costs of bringing a plant into compliance with anticipated environmental regulations. Project completed in 2011.

Long Term Procurement Plan Rulemaking

Client: California Division of Ratepayer Advocates

Synapse is providing technical and expert witness services to the CA DRA in connection with the Long Term Procurement Plan proceeding affecting the three largest investor-owned utilities in

California. The proceeding embraces both updates to the rules for those plans and reviews of plans to be submitted in 2011 and 2012. Project ongoing.

Energy Efficiency and Integrated Resource Planning in Nevada

Client: Nevada Bureau of Consumer Protection

Synapse is assisting the Bureau of Consumer Protection in reviewing and critiquing Nevada Power and Sierra Pacific Power's energy efficiency programs and triennial integrated resource plans. Analysis will include the review of appropriate energy efficiency budgets, and the role of energy efficiency in complying with the state's renewable portfolio standard. This work may require providing expert testimony before the Nevada Public Utility Commission. Project ongoing.

Minnesota Power Integrated Resource Plan

Client: Minnesota Center for Environmental Advocacy

The purpose of this project was to provide comments on Minnesota Power's 2010 IRP after analyzing the Company's Strategist modeling results and presenting our own modeling scenarios and results. Synapse participated in several rounds of discovery questions asked to MN Power, replicated the five modeling scenarios analyzed by the Company, performed sensitivity analysis modeling on those scenarios, and created a "Synapse Reference Case." Synapse also modeled several retirement scenarios based on the Synapse Reference Case. Comments were due in September 2010 with rebuttal comments due one month later. Project completed in 2011.

Review of comments regarding potential impacts of EPA regulations on coal-fired generation in Iowa

Client: Iowa Office of Consumer Advocate

The Iowa Utilities Board opened Docket No. NOI-2011-0003 and requested comments on the ways in which federal environmental regulations will affect coal-fired power plants in the state. Synapse assisted the Iowa OCA in reviewing comments submitted in this docket, and in preparing comments to submit to the Board. Project completed in 2011.

2011 Avoided Energy Supply Cost Study

Client: AESC 2011 Study Group (New England efficiency program administrators)

Synapse and a team of subcontractors developed projections of marginal energy supply costs that would be avoided due to reductions in electricity, natural gas and other fuels resulting from energy efficiency programs offered to customers. The report provides projections of avoided costs of electricity and natural gas by year from 2012 through 2026 with extrapolations through 2041. In addition to projecting the costs of energy and capacity avoided directly by program participants, the report provides estimates of the Demand-Reduction-Induced Price Effect ("DRIPE") of efficiency programs on wholesale market prices for electric energy and capacity. The report also provides a projection of annual externality costs associated with emissions of CO₂. The 2011 AESC Study was sponsored by a group representing all of the major electric and gas utilities in New England as well as efficiency program administrators, energy offices and regulators. Project completed July 2011.

Integrated Resource Planning in Missouri

Client: Missouri Office of People's Counsel

Synapse assisted the OPC in reviewing and critiquing the integrated resource plan of Ameren Missouri. Synapse drafted a technical report addressing the following issues: energy efficiency potential and cost-effectiveness, renewable resource potential, costs and risks associated with

new nuclear projects, the costs to existing coal plants of new environmental regulations, and proper methodologies for selecting preferred resources plans. Project completed June 2011.

Appalachian Power Company Virginia IRP

Client: Southern Environmental Law Center

On behalf of the Southern Environmental Law Center, the Chesapeake Climate Action Network, Appalachian Voices, and the Virginia Chapter of the Sierra Club, Synapse provided expert testimony regarding the 2009 integrated resource plan filed by the Appalachian Power Company. Project completed in 2010.

Review and Analysis of Delmarva Power Integrated Resource Plan

Client: Delaware Public Service Commission Staff

Synapse evaluated the Integrated Resource Plan filing of Delmarva Power and Light. Synapse reviewed the way in which the plan complied or did not comply with state directives on integrated resource planning and provision of default service supply. Synapse also provided advice to the Commission on related issues with Delaware's RFP for new generation to be long-term contracted with Delmarva. The first phase of the project was completed in 2009, and a second phase was completed in 2010. Project completed in 2010.

Evaluation of Oklahoma Gas & Electric wind power purchase agreements and associated Windspeed Transmission Project

Client: Arkansas Public Service Commission Staff

Oklahoma Gas and Electric Company acquired the OU Spirit wind facility, entered two wind energy purchase agreements and built the Windspeed transmission line to access that new wind generation. Synapse analyzed, and provided testimony on, whether the OU Spirit project and two WEPA's were in the public interest, as well as on the need for and reasonableness of the Windspeed transmission line. Testimony filed November 2010 and March 2011.

Review of Dominion Virginia Power's IRP

Client: Southern Environmental Law Center

Synapse provided expert testimony on the IRP submitted to the Virginia PUC by Dominion. Key issues included energy efficiency programs, conservation voltage reduction and supply portfolios. Project completed June 2010.

Railbelt Integrated Resource Plan

Client: Alaska Conservation Alliance

Alaska Energy Authority hired Black and Veatch (B&V) to develop an IRP for the Railbelt region of Alaska. This is the region that covers the area from roughly Fairbanks to Seward and where the bulk of Alaska's population resides. B&V's IRP evaluated the resources it believes Alaska will require over the next 50 years to meet its energy demand. Synapse developed comments for the client that included an assessment of generation technologies (including renewables), their costs and benefits, transmission and reliability requirements, and what Alaska should consider in its resource planning. Project completed May 2010.

Review and Critique of FirstEnergy Companies' Proposed SSO Procurement

Client: Ohio Office of Consumer Counsel

Synapse, as a subcontractor to Resource Insight, Inc., provided expert testimony on portfolio

management alternatives to the Companies' proposed declining clock auction for rolling three-year, slice of system contracts. Project completed in 2010.

Carbon Constrained Electric System Integrated Resource Plan

Client: Nova Scotia Utility and Review Board

Synapse was retained to collaborate with Nova Scotia Power on an update to its Integrated Resource Planning process. The planning was done subject to a hard cap on system carbon dioxide emissions, and other constraints. The resulting reference plan included aggressive development of wind and biomass, and rapid ramp-up of energy efficiency programs. Project completed February 2010.

Analysis of Ontario Power Authority Integrated Power System Plan

Client: Pollution Probe

This project reviewed, critiqued, and provided expert testimony on distributed generation and demand response aspects of Ontario Power Authority's proposed "Integrated Power System Plan." Project completed 2010.

Sierra Pacific Integrated Resource Planning Case

Clients: Environmental Defense, Western Resource Advocates

Synapse prepared testimony related to carbon price and escalation of construction costs for coal plants. Synapse testified before the Nevada Public Service Commission regarding our findings, and developed a report based on our testimony. Project completed September 2008.

Mississippi Integrated Resource Plan Testimony

Client: Sierra Club

The Sierra Club retained Synapse to provide testimony on the proper goals, approach, and methods for IRP preparation by Mississippi's electric utilities. Synapse provided prefiled and oral testimony on IRP, supply planning, T&D issues, energy efficiency and load control, and related topics in the Mississippi Commission's generic proceeding on resource planning. Project completed in 2008.

Integrated Resource Planning in Arkansas

Client: Arkansas Public Service Commission Staff

Synapse assisted the General Staff of the Arkansas Public Service Commission to address resource planning and power procurement issues. Synapse reviewed the filings made by each of the four investor-owned electric utilities in Arkansas for compliance. As part of this review, Synapse evaluated each utility's financial and production costing models, energy supply forecasting, demand analysis, load forecasting, and other pertinent data and issues. Project completed in June 2005.

C. Utility Merger Proceedings

Analysis of Acquisition of Constellation Energy Group

Client: Maryland Office of the People's Counsel

Synapse was hired to review issues with the acquisition of Constellation Energy Group (including Baltimore Gas and Electric Company) by Electricite de France. Our analysis focused on risks and financial impacts associated with the Calvert Cliffs nuclear station. Project completed in 2010.

Proposed Peoples Gas Merger

Client: Illinois Citizens Utility Board

Review of service quality issues associated with proposed merger of utilities. Project completed December 2006.

Review of the Proposed Merger Between Exelon Corporation and Public Service Enterprise Group

Client: New Jersey Division of the Ratepayer Advocate

Synapse investigated the market power effects of the proposed merger between Exelon Corporation and Public Service Enterprise Group. Synapse's analysis included running CRAI's CASM model, re-running delivered price test analysis by petitioners' witness Frame, and modeling of market power impacts using ELMO. The results of Synapse's analyses were presented in affidavits to FERC and testimony before the New Jersey Board of Public Utilities. The companies terminated the proposed merger on September 16, 2006. Project completed in October 2006.

Market Power Analysis of a Proposed Merger Between Constellation and FPL

Client: Maryland Office of the People's Counsel

Synapse worked with Resource Insight to analyze the market power implications of a proposed merger. We ran the CASM model to estimate the Herfindahl-Hirschman Indexes for various scenarios with and without the merger. Project completed in March 2006.

Review of Duke-Cinergy Merger

Client: Citizens Action Coalition of Indiana

On behalf of the Citizens Action Coalition of Indiana, Synapse reviewed a number of aspects of the proposed Duke-Cinergy merger to gauge its impact on PSI's retail ratepayers. The analysis included a comparison of existing ratepayer protections in place since the 1994 merger that created Cinergy, a critique of the proposed merger savings allocation between ratepayers and shareholders, and recommendations for PSI to strengthen energy efficiency commitments and maintain customer service and reliability post-merger. Testimony was filed before the Indiana Utility and Regulatory Commission on November 8, 2005. Project completed in January 2006.

Review of MidAmerican's Proposed Acquisition of PacifiCorp

Client: Utah Committee of Consumer Services

Synapse teamed with Larkin & Associates and Resource Insight to evaluate MidAmerican Energy Holdings Company's (MidAmerican) proposed acquisition of PacifiCorp from owner Scottish Power. The overall objective of this assignment was to develop an assessment of the proposed acquisition from a consumer standpoint.

Issues that we analyzed included: What would the new PacifiCorp corporate structure look like in terms of local presence and control? What are the financial and economic risks involved? And what would MidAmerican do for customers in terms of generation, transmission and distribution investment strategy? Further, if there were significant risks, were there certain conditions or alternatives that would mitigate those risks and make the acquisition more favorable for consumers? To answer these questions, Synapse reviewed the company filing, participated in the review of discovery, and participated in settlement negotiations. Project completed in January 2006.

Analysis of Proposed Rate Increase

Client: Illinois Citizens Utility Board

Synapse conducted an analysis of electricity price trends in the ComEd service territory with and without a proposed merger and legislated rate increase. Synapse also applied the REMI model to estimate the employment and other economic impacts associated with the rate increase. Project completed in December 2003.

Review of the Proposed Merger of AEP and CSW

Clients: Environmental Law and Policy Center, Citizens Action Coalition of Indiana, Hoosier Environmental Council, Ohio Citizen Action, Ohio Environmental Council

Synapse conducted an analysis of the market power implications of the proposed merger, the air emissions of the combined companies, and the barriers to entry faced by potential market entrants. The results were presented in the testimony of Bruce Biewald in FERC Docket Nos. EC98-40-00, et al. Project completed in 1999.

Appendix A: Consulting Bid Form

Following is Synapse's completed Consulting Bid Form for this proposal. Please note that the hourly rates listed below have been "loaded" to include all expenses, per the RFQ. These rates include travel expenses and \$17,000 for a Strategist license fee.

PSC12530 – CONSULTING BID FORM			
Employee/Title	Not to Exceed Number of Hours*	Hourly Rate	Extended Price
Rick Hornby, senior consultant	116	\$240	\$27,840
Bruce Biewald, president	20	\$250	\$5,000
David White, senior consultant	96	\$220	\$21,120
Alice Napoleon, associate	40	\$180	\$7,200
Kenji Takahashi, associate	44	\$180	\$7,920
Rachel Wilson, associate	160	\$180	\$28,400
		Total	\$97,880

Bidder / Vendor Information:

Name: Synapse Energy Economics, Inc.
 Address: 485 Massachusetts Ave, Suite 2
 Cambridge, MA 02139
 Phone #: 617-661-3248
 Email Address: admin@synapse-energy.com

Contact Coordinator Information:

Name: Rick Hornby, project manager
 Address: Same as above
 Phone #: 617-453-7043
 Email Address: rhornby@synapse-energy.com

The Consultant will not be reimbursed for hours that exceed the total hours for each Employee/Title.

Appendix B: Project Team Resumes

James Richard Hornby

Senior Consultant

Synapse Energy Economics, Inc.

485 Massachusetts Ave., Suite 2, Cambridge, MA 02139

(617) 453-7043 • fax: (617) 661-0599

www.synapse-energy.com

rhornby@synapse-energy.com

PROFESSIONAL EXPERIENCE

Synapse Energy Economics, Inc., Cambridge, MA.

Senior Consultant, 2006 to present.

Provides analysis and expert testimony regarding planning, market structure, ratemaking and supply contracting issues in the electricity and natural gas industries. Major projects regarding alignment of financial incentives with aggressive pursuit of energy efficiency by electric and gas utilities include testimony on the “save-a-watt” approach proposed by Duke Energy in North Carolina, Indiana and South Carolina. Major projects regarding proposals for advanced metering infrastructure (smart grid or AMI) and dynamic pricing include testimony in the Baltimore Gas and Electric case. Resource planning cases include the development of long-term projections of avoided costs of electricity and natural gas in New England for a coalition of utility program administrators in 2007, 2009, and 2011.

Charles River Associates (formerly Tabors Caramanis & Associates), Cambridge, MA.

Principal, 2004-2006, Senior Consultant, 1998-2004.

Expert testimony and litigation support in energy contract price arbitration proceedings and various ratemaking proceedings. Productivity improvement project for electric distribution companies in Abu Dhabi. Analyzed market structure and contracting issues in wholesale electricity markets.

Tellus Institute, Boston, MA.

Vice President and Director of Energy Group, 1997-1998.

Manager of Natural Gas Program, 1986-1997.

Presented expert testimony on rates for unbundled retail services, analyzed the options for purchasing electricity and gas in deregulated markets, prepared testimony and reports on a range of gas industry issues including market structure, strategic planning, market analyses, and supply planning.

Nova Scotia Department of Mines and Energy, Halifax, Canada.

Member, Canada-Nova Scotia Offshore Oil and Gas Board, 1983-1986.

Assistant Deputy Minister of Energy 1983-1986.

Director of Energy Resources 1982-1983

Assistant to the Deputy Minister 1981-1982

Nova Scotia Research Foundation, Dartmouth, Canada, Consultant, 1978-1981.

Canadian Keyes Fibre, Hantsport, Canada, Project Engineer, 1975-1977.

Imperial Group Limited, Bristol, England, Management Consultant, 1973-1975.

EDUCATION

M.S., Technology and Policy (Energy), Massachusetts Institute of Technology, 1979.

B.Eng., Industrial Engineering (with Distinction), Dalhousie University, Canada, 1973

TESTIMONY

Jurisdiction	Company	Docket	Date	Issue
Nova Scotia	Heritage Gas	NG-HG-R-11	September 2011	Cost allocation and rate design
Arkansas	Oklahoma Gas & Electric	10-109-U	May 2011 and June 2011	advanced metering infrastructure (AMI)
Texas	Texas-New Mexico Power	PUC 38306	April 2011	advanced metering infrastructure (AMI)
Arkansas	Oklahoma Gas & Electric	10-067-U	March 2011	Windspeed transmission line
Pennsylvania	PECO Energy	M-2009-2123944	December 2010 and January 2011	Dynamic Pricing
Arkansas	Oklahoma Gas & Electric	10-073-U	November 2010	Wind power purchase agreement
Indiana	Vectren Energy Delivery of Indiana	Cause No. 43839	July 2010	Sales Reconciliation Adjustment
Alaska	Enstar Natural Gas	U-09-069 and U-09-070	March 2010	Rate Design
Pennsylvania	Allegheny Power	M-2009-2123951	March 2010 and October 2009.	Smart meters / advanced metering infrastructure (AMI)
Massachusetts	All Massachusetts regulated electric and gas utilities	D.P.U. 09-125 et al.	December 2009	Avoided Energy Supply Costs in New England

J. Richard Hornby**Synapse Energy Economics, Inc.**

Jurisdiction	Company	Docket	Date	Issue
Pennsylvania	Metropolitan Edison Company	M-2009-2123950	October 2009.	Smart meters / AMI
Maryland	Potomac Electric Power	No. 9207	October 2009 and July 2011.	Smart meters / AMI
Maryland	Baltimore Gas and Electric	No. 9208	October 2009 and July 2010.	Smart meters / AMI
New Jersey	Jersey Central Power & Light	EO08050326 and EO08080542	July 2009	Demand response programs
Minnesota	CenterPoint Energy	G-008/GR-08-1075	June 2009.	Conservation Enabling Rider
South Carolina	Progress Energy Carolinas	2008-251-E	January 2009.	Compensation for efficiency programs
North Carolina	Progress Energy Carolinas	No. E-2 sub 931	December 2008.	Compensation for efficiency programs
Maine	Central Maine Power	2007 – 215	October 2008.	Smart meters / AMI
North Carolina	Duke Energy Carolinas	E-7 Sub 831	June 2008	Compensation for efficiency programs (save-a-watt)
Indiana	Duke Energy Indiana	No. 43374	May 2008.	Compensation for efficiency programs (save-a-watt)
Pennsylvania	PECO Energy Company	P-2008-2032333	June 2008.	Residential Real Time Pricing pilot
Arkansas	Entergy Arkansas	06-152-U Phase II A	October 2007	Interim tolling agreement and proposed allocation of Ouachita Power capacity

J. Richard Hornby

Synapse Energy Economics, Inc.

Jurisdiction	Company	Docket	Date	Issue
Washington	Avista Utilities	UE-070804 and UG-070805	September 2007.	Cost allocation, rate design
Arkansas	Entergy Arkansas	06-152-U	January 2007.	Need for load-following capacity
Michigan	Consumers Energy Company	U-14992	December 2006.	Proposed sale of Palisades nuclear plant and associated power purchase
Connecticut	Connecticut Natural Gas Corporation	06-03-04PH01	November 2006.	Gas supply strategy and proposed rate recovery
Michigan	Consumers Energy Company	U-14274-R	October 2006.	Purchases from Midland Cogeneration Venture Limited Partnership
Illinois	WPS Resources and Peoples Energy Corporation	Docket No. 06-0540	October and December 2006.	Service quality metrics and benchmarks
Arizona	Arizona Public Service	E-01345A-05-0816	August 2006 and September 2006.	Hedging strategy and base fuel recovery amount
Ontario	Transalta Energy Corporation versus Bayer Inc.	Private arbitration	January 2006.	Price for steam under a 20-year contract
Nova Scotia	Nova Scotia Power vs Shell	Private arbitration	October 2005.	New natural gas price under a 10-year supply contract
New York	Consolidated Edison of New York, New York State Electric and Gas	Case 00-M-0504	September and October 2002.	Rates for unbundled supply, distribution, metering and billing services

Jurisdiction	Company	Docket	Date	Issue
New Jersey	Public Service Electric and Gas	BPU Docket GM00080564	April 2001.	Proposed transfer of gas contracts to an unregulated affiliate and supply contract associated with that transfer.
Nova Scotia	Sempra	NSUARB-NG-SEMPRA-SEM-00-08	February 2001.	Proposed distribution service tariff rates including market-based rates
New Jersey	Generic proceeding	BPU Docket EX99009676	March 2000.	Design and pricing of unbundled customer account services
United States of America	Bonneville Power Administration	BPA Docket WP-02	November 1999.	Functionalization of communication plant
South Carolina	South Carolina Electric and Gas	99-006-G	October 1999.	Purchased gas costs
New Jersey	Public Service Electric & Gas, South Jersey Gas, New Jersey Natural Gas and Elizabethtown Gas	GO99030122- GO99030125	July and September 1999.	Service unbundling policies and rates
Maine	Northern Utilities Inc.	Docket 97-393	September and December 1998.	Rate redesign and partial unbundling
Pennsylvania	Peoples Natural Gas	R-00984281; A-12250F0008	May 1998.	Purchased gas costs and proposal to transfer production assets to affiliate

Jurisdiction	Company	Docket	Date	Issue
New Jersey	Rockland Electric Company	BPU E09707 0465 OAL PUC-7309-97 BPU E09707 0464 OAL PUC-7310-97	January and March 1998.	Rate unbundling
New Jersey	Jersey Central Power & Light d/b/a GPU Energy.	BPU E09707 0459 OAL PUC- 7308-97 BPU E09707 0458 OAL PUC-7307-97	November 1997.	Rate unbundling
Pennsylvania	Equitable Gas Company	R-00963858	June and July 1997.	Rate structure proposals
Pennsylvania	Peoples Natural Gas Company	R-00973896 and A-0012250F-0007	May 1997.	Purchased gas costs, proposal to transfer producing assets to CNG Producing Company and proposed Migration Rider
South Carolina	South Carolina Pipeline Corporation	97-009-G	April 1997.	Reasonableness of proposal to acquire additional pipeline capacity
FERC	Transcontinental Gas Pipeline	RP95-197-001; RP97-71-000	March 1997.	Review of proposed rolled-in ratemaking for Leidy Line incremental facilities
Arkansas	Arkla	95-401-U	September 1996.	Gas purchasing and transportation plan
Maine	Northern Utilities Inc. and Granite State Gas Transmission	95-480; 95-481	April 1996	Precedent Agreement for LNG Storage Service and PNGTS Transportation Service
Rhode Island	ProvGas	2025	November 1995	Settlement Agreement

Jurisdiction	Company	Docket	Date	Issue
Pennsylvania	T.W. Phillips Gas and Oil	R-953406	October 1995	Cost allocation, rate design
Illinois	Northern Illinois Gas	95-0219	August 1995	Cost allocation, rate design
Pennsylvania	Columbia Gas of Pennsylvania	R-953316	May 1995	Purchased gas costs
Pennsylvania	Peoples Natural Gas	R-943252	May 1995	Cost allocation, rate design
South Carolina	South Carolina Pipeline Corporation.	94-007-G	April 1995	1994 purchased gas costs
Pennsylvania	National Fuel Gas Distribution Corp	R-943207	March 1995	1995 Purchased Gas Adjustment filing
Pennsylvania	UGI Utilities	R-00943063	December 1994	FERC Order 636 transition cost tariff
South Carolina	South Carolina Electric and Gas Co.	94-008-G	October 1994	1994 Purchased Gas Adjustment
Oklahoma	Public Service of Oklahoma	PUD 920 001342	September and November 1994	Gas supply strategy, transportation and agency services and rate mechanism
Pennsylvania	Pennsylvania Gas and Water	R-943078	September 1994	Market Sensitive Sales Service
Massachusetts	Generic proceeding	D.P.U. 93-141-A	September 1994	Policies on interruptible transportation and capacity release

J. Richard Hornby

Synapse Energy Economics, Inc.

Jurisdiction	Company	Docket	Date	Issue
Hawaii	HELCO	7259	August 1994	DSM programs for competitive energy end-use markets, multi-attribute analysis
Pennsylvania	Pennsylvania Gas and Water	R-00943066	July 1994	1994 Purchased Gas Adjustment
Pennsylvania	Pennsylvania Gas and Water	R-942993; R-942993 C0001-C0004	May 1994	Take-or-Pay Cost Recovery
Pennsylvania	Columbia Gas of Pennsylvania	R-943001	May 1994	Cost allocation, rate design
Pennsylvania	Columbia Gas of Pennsylvania	R-943029	May 1994	1994 Purchased Gas Adjustment; Negotiated Sales Service
Pennsylvania	Peoples Natural Gas	R-932866; R-932915	March 1994	Cost allocation, rate design
Kansas	Generic proceeding	180; 056-U	February 1994	IRP rules for gas utilities
Arizona	Citizens Utility Company Arizona Gas Division	E-1032-93-111	December 1993	Cost allocation, rate design
Hawaii	HECO	7257	December 1993	Residential sector water heating program
Hawaii	GASCO	7261	September 1993	IRP
Pennsylvania	Pennsylvania Gas and Water	R-932655; R-932655 C001; R-932655 C002	September 1993	Balancing service
Pennsylvania	Pennsylvania Gas and Water	R-932676	July 1993	1993 Purchased Gas Adjustment filing

Jurisdiction	Company	Docket	Date	Issue
Rhode Island	Providence Gas Company	2025	April 1993	IRP
Pennsylvania	Equitable	I-900009; C-913669	March 1993	Charges for transportation service and cost allocation methods in general
Arkansas	Arkla Energy Resources, Arkansas Louisiana Gas	92-178-U	August 1992	Gas cost and purchasing practices
Colorado	Generic proceeding	91R-642EG	August 1992	Gas integrated resource planning rule
Pennsylvania	Pennsylvania Gas and Water	R-00922324	July 1992	1992 Purchased Gas Adjustment filing
Pennsylvania	Peoples Natural Gas Company	R-922180	May 1992	Cost allocation, rate design
Michigan	Consumers Power Company	U-10030	April 1992	Gas Cost Recovery Plan, role of demand-side management as a resource in five-year forecast and supply plan
Pennsylvania	T.W. Phillips	R-912140	March 1992	1992 Purchased Gas Adjustment
FERC	Columbia Gas Transmission and Columbia Gulf Transmission	RP91-161-000 et al RP91-160-000 et al.	February 1992	Cost allocation, rate design
Arkansas	Arkla Energy Resources	91-093-U	February 1992	Base cost of gas
New Hampshire	Energy North Natural Gas	DR90-183	January 1992	Cost allocation, rate design

Jurisdiction	Company	Docket	Date	Issue
Arizona	Southwest Gas Corporation	U-1551-89-102 & U-1551-89-103; U-1551-91-069	September 1991	Gas Procurement Practices and Purchased Gas Costs
Maryland	Baltimore Gas and Electric	8339	July 1991	Cost allocation, rate design
Rhode Island	Bristol and Warren Gas	1727	June 1991	Gas procurement
New Mexico	Gas Company of New Mexico	2367	June 1991	Gas transportation policies
Pennsylvania	T.W. Phillips	R-911889	March 1991	Gas supply
Michigan	Michigan Gas Company	U-9752	March 1991	Gas Cost Recovery Plan
Arkansas	Arkla	90-036-U	August and September 1990	Gas supply contracts, including Arkla-Arkoma transactions
Arizona	Southern Union Gas	U-1240-90-051	August 1990	Cost Allocation and Rate Design
Utah	Mountain Fuel Supply	89-057-15	July 1990	Cost Allocation and Rate Design
Pennsylvania	Equitable Gas Company	R-901595	June 1990	Cost Allocation and Rate Design
West Virginia	APS	90-196-E-GI ; 90-197-E-GI	May 1990	Coal supply strategy
Pennsylvania	T.W. Phillips Gas and Oil Co.	R-891572	March 1990	Purchased Gas Costs

Jurisdiction	Company	Docket	Date	Issue
Colorado	Generic proceeding	89R-702G	January 1990	Policies and rules for gas transportation service
Arizona	Generic proceeding	U-1551-89-102 and U-1551-89-103	October 1989	Regulatory Oversight of Purchased Gas Costs
Rhode Island	Narragansett Electric Company	1938	October 1989	Sales Forecast, Cost Allocation, rate design
Pennsylvania	Pennsylvania Gas and Water	R891293	July 1989	Purchased Gas Costs
Pennsylvania	Columbia Gas of Pennsylvania	R891236	May 1989	Take-or-Pay Cost Recovery
New Jersey	Elizabethtown Gas Company	GR 88081-019	December 1988 and February 1989	Take-or-Pay Cost Recovery
Montana	Montana-Dakota Utilities	87.7.33; 88.2.4; 88.5.10; 88.8.23	December 1988	Gas Procurement, Transportation Service Gas Adjustment Clause
New Jersey	South Jersey Gas Company	GR 88081-019 and GR 88080-913-	November 1988 and February 1989	Take-or-Pay Cost Recovery
New Jersey	Public Service Electric and Gas	GR 88070-877	October 1988 and February 1989	Take-or-Pay Cost Recovery
District of Columbia	District of Columbia Natural Gas	Formal Case 874	September 1988	Gas Acquisition, Gas Cost Allocation, take or pay-costs; Regulatory Oversight

J. Richard Hornby

Synapse Energy Economics, Inc.

Jurisdiction	Company	Docket	Date	Issue
Illinois	Generic proceeding	88-0103	July 1988	Take-or-Pay Cost Recovery
West Virginia	Generic proceeding	240-G	June 1988	Gas Transportation Rate Design
Pennsylvania	Pennsylvania Gas & Water	R-880958	June 1988	Purchased Gas Adjustment
Utah	Mountain Fuel Supply	86-057-07	March 1988	Gas Transportation Rate Design
South Carolina	South Carolina Electric and Gas	87-227-G	September 1987	Gas Supply and Rate Design
Arizona		U-1345-87-069	September 1987	Fuel Adjustment Clause

Bruce Edward Biewald

President

Synapse Energy Economics, Inc.
485 Massachusetts Ave., Suite 2, Cambridge, MA 02139
(617) 453-7022 • fax: (617) 661-0599
www.synapse-energy.com
bbiewald@synapse-energy.com

PROFESSIONAL EXPERIENCE

Synapse Energy Economics, Inc., Cambridge, MA. President, 1996 to present.

Consulting on issues of energy economics, environmental impacts, and utility regulatory policy, including 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, 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 to 1996, Research Associate and later Associate Scientist, 1980-1988.

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

EDUCATION

Massachusetts Institute of Technology,
BS 1981, Architecture, Building Technology, Energy Use in Buildings.
Harvard University Extension School,
1989/90, Graduate courses in micro and macroeconomics.

SUMMARY OF TESTIMONY, PUBLICATIONS, AND PRESENTATIONS

Expert testimony on energy, economic, and environmental issues in more than one hundred utility regulatory proceedings in twenty six states and two Canadian provinces, in cases in 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 one hundred reports, including studies for the Electric Power Research Institute, the U.S. Department of Energy, the U.S. 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 American Society of Heating, Refrigerating, and Air-Conditioning Engineers, American Society of Mechanical Engineers, International Atomic Energy Agency, National Association of Regulatory Utility Commissioners, National Association of State Utility Consumer Advocates, National Consumer Law Center, the Latin American Energy Association (OLADE), the Swedish Environmental Protection Agency (SNV), the U.S. Environmental Protection Agency, the European Federation of Clean Air and Environmental Protection Associations, and others.

TESTIMONY

United States District Court of Appeals for the District of Columbia Circuit (Case 11-1315) United States Environmental Protection Agency v. Luminant Generation Company, LLC – October 2011

Declaration on the use of probabilistic computer models to properly analyze system reliability, with regard to the Cross-State Air Pollution Rule (CSAPR).

Nova Scotia Utility and Review Board – April 2011

Testimony on community-based feed-in tariffs for renewable energy.

United States District Court for the Middle District of Louisiana (Civil Action No. 09-CV-100-RET-CN) United States v. Louisiana Generating LLC – October 2010

Rebuttal report on the use of computer models for electric system planning and projections of generating unit operations, including PROMOD simulation of power system dispatch. Also deposition 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 – June 2010

Declaration on the use of computer models for electric system planning and projections of generating unit operations. Also second declaration 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 – December 2009

Expert report on use of computer models for electric system planning and projections of generating unit operations. Also rebuttal report in May 2010, and deposition in June 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 – October 2008

Expert report on use of computer models for electric system planning, capital investment planning and economic analysis, and projections of generating unit operations.

Nova Scotia Utility and Review Board – August 2008

Review of rate case issues; power plant depreciation and load forecasting.

Nova Scotia Utility and Review Board – March 2008

Review of Nova Scotia Power Inc.'s demand-side management plan.

Indiana Utility Regulatory Commission (Cause Nos. 43114 and 43114S1) – May 2007

Review of IGCC Plant Proposal by Duke Energy Indiana and Vectren Testimony of Synapse Witnesses. Also cross answering testimony later in the month.

California Public Utilities Commission (Docket No. R.06-02-013) – March 2007

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.

New Jersey Board of Public Utilities (Docket No. EM05020106) – November and December 2005 and March 2006

Joint testimony with Bob Fagan and David Schlissel on the market power implications of the proposed merger between Exelon Corp. and Public Service Enterprise Group.

Indiana Utility Regulatory Commission (Cause Nos. 42861) – October 2005

Vectren (SIGECO) environmental compliance planning, including climate change policy and carbon price forecasting, energy efficiency and renewables as compliance options, and cost recovery issues.

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 – September 2005

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.

United States District Court for the Southern District of Indiana (Civil Action No. IP99-1693 C-M/S, United States v. Cinergy – May 2005

Expert 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. Also, rebuttal report in September.

Federal Energy Regulatory Commission (Docket No. EC05-43-000) – April 2005

Market power analysis of the proposed merger of Exelon Corporation and Public Service Enterprise Group Incorporated. (Joint affidavit with David Schlissel.)

Nuclear Regulatory Commission Atomic Safety and Licensing Board (Docket No. 52-007-ESP and ASLBP No. 04-821-01-ESP) – April 2005

Affidavit on the environmental impacts and economic costs of a proposed new nuclear power project and alternatives.

Indiana Utility Regulatory Commission (Cause Nos. 42622 and 42718) – March 2005

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.

National Research Council, Division on Engineering and Physical Sciences, Board on Energy and Environmental Systems (Project No. BEES-J-03-03-A) – March 2005

Alternatives for replacing the generation of the Indian Point Energy Center nuclear facility.

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) – June 2002
Declaration on confidential business information and competitive harm.

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

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

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

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

New Jersey Board of Public Utilities (Docket No. EM01050308) – September 2001
Analysis of the proposed merger between Conectiv and PEPCo. Also, surrebuttal testimony in November. (Joint testimony with David Schlissel.)

Indiana Utility Regulatory Commission (Cause No. 41954) – June 2001
System planning and joint operation in a partially deregulated context.

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

Federal Energy Regulatory Commission (Docket No. ER01-200-001) – April 2001
Termination of the Cinergy Operating Agreement, treatment of merger savings, and affiliate relationships. Also cross-answering testimony in April.

New Jersey Board of Public Utilities (Docket No. EM00110870) – April 2001
Analysis of the proposed merger between FirstEnergy and GPU. Also, supplemental testimony in April. (Joint testimony with David Schlissel.)

Vermont Public Service Board (Dockets Nos. 6120 and 6460 – March 2001
Used and useful policy issues, electricity market prices, and above market costs of the purchase from Hydro Quebec. Also, surrebuttal testimony in April.

United States District Court for the Northern District of New York (Civil Action No. 00-CV-1738) – January 2001
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.

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

Illinois Commerce Commission (Docket No. 00-0361) – July 2000

Review of ComEd's funding for nuclear power plant decommissioning.

California Public Utilities Commission (Rulemaking 99-10-025) – July 2000

Distributed generation and related rate design issues. Also, rebuttal testimony in August.

Massachusetts Department of Environmental Protection – July 2000

Comments on reliability implications of proposed emission standards for power plants.

Arkansas Public Service Commission (Docket No. 00-048-R) – June 2000

Requirements for electricity market power analyses.

United States District Court for the Middle District of North Carolina (1:99CV00033) – March 2000

Expert report on replacement power costs in Carolina Power & Light Company vs. Yuasa Exide, Inc.

Illinois Commerce Commission (Docket No. 99-0115) – September 1999

Review of ComEd's nuclear power plant decommissioning cost estimates.

West Virginia Public Service Commission (Case No. 98-0452-E-GI) – August 1999

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.

Mississippi Public Service Commission (Docket No. 96-UA-389) – August 1999

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.

Connecticut Department of Public Utility Control (Docket No. 99-03-36) – July 1999

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.

Connecticut Department of Public Utility Control (Docket No. 99-03-35) – July 1999

United Illuminating Company standard offer service, market prices for electricity and the influence of market power, simulation analysis of the New England electricity market.

Utah Public Service Commission (Docket No. 98-2035-04) – June 1999

Cost savings expectations for the proposed merger of PacifiCorp and Scottish Power.

Washington Utilities and Transportation Commission (Docket No. UE-981627) – June 1999

Cost savings expectations for the proposed merger of PacifiCorp and Scottish Power and assessment of whether the merger is in the public interest.

Federal Energy Regulatory Commission (Docket Nos. EC98-40-00, et al.) – April 1999

Horizontal market power and barriers to entry in consideration of the proposed merger of American Electric Power Company and Central and South West Corporation.

Connecticut Department of Public Utility Control (Docket No. 99-03-04) – April 1999

Market power, market prices, and simulation modeling as related to the application of United Illuminating Company for recovery of stranded costs.

Connecticut Department of Public Utility Control (Docket No. 99-02-05) – April 1999

Market power, market prices, and simulation modeling as related to the application of Connecticut Light & Power Company for recovery of stranded costs.

Maryland Public Service Commission (Case No. 8797) – January 1999

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.

Maryland Public Service Commission (Case No. 8795) – December 1998

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.

Maryland Public Service Commission (Cases Nos. 8794 and 8804) – December 1998

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.

Vermont Public Service Board (Docket No. 6107) – September 1998

Excess capacity, used & useful, and the economics of Green Mountain Power's purchase from Hydro Quebec.

Mississippi Public Service Commission (Docket No. 96-UA-389) – September 1998

Analyses of market concentration and market power, behavior of affiliated companies, need for an independent system operator.

California Public Utilities Commission (Application No. 97-12-020) – July 1998

Nuclear power plant decommissioning and radioactive waste disposal. Also, rebuttal testimony in August.

Federal Energy Regulatory Commission (Docket No. EC97-46-000) – June 1998

Affidavit on market power implications of the proposed merger between Allegheny Power System and Duquesne Light Company.

New Jersey Board of Public Utilities (Docket Nos. EX4120585Y, EO97070460, and EO97070463) – March 1998

Economic and environmental benefits of energy efficiency, including estimation of marginal air emissions from the PJM System. (Joint testimony with Nathanael Greene, Edward Smeloff, and Thomas Bourgeois.)

Vermont Public Service Board (Docket No. 6018) – February 1998

Excess capacity and the economics of Central Vermont Public Service Company's purchase from Hydro Quebec.

Public Service Commission of Maryland (Case No. 8774) – February 1998

Market power implications of the APS-DQE merger.

Federal Energy Regulatory Commission (Docket Nos. OA97-237-000 and ER97-1079-000) – January 1998

Market power in New England electricity markets.

British Columbia Utilities Commission – November 1997

British Columbia Hydro and Power Authority Wholesale Transmission Services Application.

Pennsylvania Public Utility Commission (Docket R-00973981) – November 1997

West Penn Power Company Restructuring Plan. Environmental disclosure, consumer education, and allocation of default customers.

Pennsylvania Public Utility Commission (Docket R-00974104) – November 1997

Duquesne Light Company Restructuring Plan. Environmental disclosure, consumer education, nuclear decommissioning, and allocation of default customers. Also surrebuttal testimony in December 1997.

Mississippi Public Service Commission (Docket No. 97-UA-496) – November 1997

Petition of Mississippi Power Company for a Certificate of Public Convenience and Necessity Authorizing Construction of a Generating Plant in Jackson County.

Pennsylvania Public Utility Commission (Docket Nos. R-00973953 and P-00971265) – November 1997

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. Allocation of default customers.

Vermont Public Service Board (Docket No. 5983) – October 1997

Excess capacity and the economics of Green Mountain Power Company's purchase from Hydro Quebec. Also rebuttal testimony in December 1997 and supplemental rebuttal testimony in January 1998.

Pennsylvania Public Utility Commission (Docket No. R-00973953) – September 1997

Joint petition for partial settlement of PECO Energy Company's proposed restructuring plan and application for a qualified rate order. Environmental disclosure, nuclear decommissioning and spent fuel.

Pennsylvania Public Utility Commission (Docket No. R-00974009) – September 1997

Pennsylvania Electric Company's Restructuring Plan. Environmental disclosure, customer education, and nuclear issues.

Pennsylvania Public Utility Commission (Docket No. R-00974008) – September 1997

Metropolitan Edison Company's Restructuring Plan. Environmental disclosure, customer education, and nuclear issues.

Indiana Legislature, Regulatory Flexibility Committee -- September 23, 1997.

Testimony on "Electric Industry Restructuring To Benefit Consumers and the Environment: Stranded Costs, Nuclear Issues, and Air Emissions."

Pennsylvania Public Utility Commission (Docket No. R-00973954) – June 1997

Pennsylvania Power & Light Company's Restructuring Plan. Environmental disclosure, customer education, PJM market structure, nuclear decommissioning and spent fuel, rate design for stranded cost recovery. Also, surrebuttal testimony in August.

Pennsylvania Public Utility Commission (Docket No. R-00973953) – June 1997

PECO Energy Company's Restructuring Plan. Environmental disclosure, PJM market structure, nuclear decommissioning and spent fuel.

New York Public Service Commission (Case 96-E-0897) -- April 1997

Consolidated Edison Company's Plans for Electric Rate Restructuring. Analysis of market power in the New York City load pocket.

Pennsylvania Public Utility Commission (Docket No. R-00973877) -- February 1997

Application of PECO Energy Company for Issuance of a Qualified Rate Order. Nuclear power plant decommissioning costs, stranded cost recovery, and securitization.

New Hampshire Public Utilities Commission (DR 96-150) -- November 1996

Electric industry restructuring, including stranded costs, industry structure, market power, and nuclear issues.

Massachusetts Department of Public Utilities (96-100) -- July 1996

Nuclear plant stranded costs and decommissioning.

Vermont Public Service Board (5854) -- July 1996

Electric industry restructuring, including stranded costs, industry structure, and environmental protection.

Ontario Energy Board (H.R. 23) -- June 1995

Electricity rate options (joint evidence with John Stutz).

Pennsylvania Public Utility Commission (R-00943271) -- April 1995

Discount rates and system benefits charge.

Colorado Public Utilities Commission (94A-516A) -- January 1995

Construction of new generating resources.

Public Service Commission of Nevada (94-9002) -- November 1994

Environmental and health impacts of a proposed power plant.

Nuclear Decommissioning Finance Committee of New Hampshire (93-001) -- September 1994

Seabrook decommissioning cost, spent fuel storage, and cost collection methodology (joint testimony with William Dougherty).

Public Service Commission of Wisconsin (6630-CE-197 and 6630-CE-209) -- September 1994

Point Beach externalities, economics, spent fuel storage, and aging (joint testimony with William Dougherty).

British Columbia Utilities Commission -- August 1994

Greenhouse gas emissions and environmental externalities policy

Public Service Commission of Wisconsin (05-EI-14) -- February 1994

Cost of decommissioning Point Beach and Kewaunee nuclear power plants. Also, rebuttal and surrebuttal testimony in February.

Delaware Public Service Commission (91-39) -- September 1992

Nuclear and fossil power plant performance targets.

Massachusetts Department of Public Utilities (91-131) – December 1991

Internalization of environmental externalities, greenhouse gas valuation and policy.

Massachusetts Department of Public Utilities (91-131) – October 1991

Environmental externalities valuation, emissions effects and global warming.

Massachusetts Department of Public Utilities ((89-141, 90-73, 90-141, 90-194 and 90-270) – December 1990

The incorporation of environmental externalities in specific utility RFPs.

Massachusetts Department of Public Utilities (90-55) – June 1990

Costs and benefits of high-efficiency gas heating equipment.

Massachusetts Department of Public Utilities (86-36-G and 89-239) – March 1990

Environmental externalities of electric resources.

Florida Public Service Commission (890973-E1) – January 1990

Integrated energy planning, power plant emissions, and nuclear plant performance.

Pennsylvania Public Utilities Commission (R-891364) – October 1989

Generating capacity requirements of the Philadelphia Electric Company and the Pennsylvania-New Jersey-Maryland Interconnection.

Maryland Public Service Commission (8199) – October 1989

Performance standards for coal, oil, and nuclear power plants.

Michigan Public Service Commission (U-9172) – April 1989

Economic analysis of the Palisades Power Purchase Agreement. Ratepayer impacts, incentives, and implications for plant operation and decommissioning.

Pennsylvania Public Utility Commission (P-870216, P-880283, P-880284, and P-880286) – March 1989

Allegheny Power System planning and avoided costs.

Michigan Public Service Commission (U-8880) – February 1988

Detroit Edison Company power supply costs, economics of Fermi “buy-back” purchase, nuclear fuel expense, oil costs, and power transactions.

Michigan Public Service Commission (U-8866) – December 1987

Consumers Power Company power supply costs, including projections of oil prices and purchased power costs.

Pennsylvania Public Utility Commission (R-850220) – September 1987

Economic analysis of West Penn Power Company’s participation in the Bath County Pumped Storage Project, and Allegheny Power System capacity reserve requirements. Also, surrebuttal testimony in October.

Arizona Corporation Commission (U-1345-85-367) – February 1987

Palo Verde decommissioning cost.

Michigan Public Service Commission (U-8545) – December 1986

Consumers Power Company power costs, projected cost of oil and purchased power, economic evaluation of the Big Rock Point nuclear unit.

Public Service Commission of Indiana (38045) – November 1986

Northern Indiana Public Service Company system reliability and excess capacity.

California Public Utility Commission (84-06-014 and 85-08-025) – July 1986

Diablo Canyon decommissioning cost and collection issues.

Michigan Public Service Commission (U-8042R) – June 1986

Review of Consumers Power Company system operations during 1985 and economic evaluation of the Big Rock Point nuclear unit.

Michigan Public Service Commission (U-8291) – April 1986

Detroit Edison Company power supply costs, application of a multi-area dispatch model.

Michigan Public Service Commission (U-8286) – February 1986

Consumers Power Company power supply costs, application of a multi-area dispatch model.

Maine Public Service Commission (85-132) – January 1986

Standard and long term rates for cogeneration and small power production. Surrebuttal testimony in February.

Arkansas Public Service Commission (84-249-U) – June 1985

Impact of the Grand Gulf nuclear unit upon Arkansas Power and Light Company and Middle South Utilities electricity production costs.

Kentucky Public Service Commission (8666) – February 1984

Production costing modeling issues.

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Big Risks, Better Alternatives: An Examination of Two Nuclear Energy Projects in the U.S., prepared for the Union of Concerned Scientists by Max Chang, David White, Ezra Hausman, Nicole Hughes, and Bruce Biewald. October 6, 2011.

Avoided Energy Supply Costs in New England: 2011 Report, prepared for Avoided-Energy-Supply-Component (AESC) Study Group by Rick Hornby, Paul Chernick, Dr. Carl Swanson, Dr. David White, Jason Gifford, Max Chang, Nicole Hughes, Matthew Wittenstein, Rachel Wilson, and Bruce Biewald. July 21, 2011.

Equipment Price Forecasting in Energy Conservation Standards Analysis Comments, submitted to the US Department of Energy on behalf of the Natural Resources Defense Council and the Appliance Standards Awareness Project. By Tim Woolf, Vladlena Sabodash, and Bruce Biewald. March 24, 2011.

2011 Carbon Dioxide Price Forecast. By Lucy Johnston, Ezra Hausman, Bruce Biewald, Rachel Wilson, and David White. February 11, 2011.

Benefits of Beyond BAU: Human, Social, and Environmental Damages Avoided through the Retirement of the U.S. Coal Fleet, prepared for Civil Society Institute by Jeremy Fisher, Rachel Wilson, Nicole Hughes, Matthew Wittenstein, and Bruce Biewald. January 25, 2011.

Electricity Energy Efficiency Benefits of RGGI Proceeds: An Initial Analysis, prepared for Regulatory Assistance Project by Max Chang, David White, Lucy Johnston, and Bruce Biewald. October 5, 2010.

Beyond Business as Usual: Investigating a Future without Coal and Nuclear Power in the U.S., prepared for Civil Society Institute by Geoffrey Keith, Bruce Biewald, Kenji Takahashi, Alice Napoleon, Nicole Hughes, Lauri Mancinelli, and Erin Brandt. May 11, 2010.

Co-Benefits of Energy Efficiency and Renewable Energy in Utah, prepared for State of Utah Energy Office by Jeremy Fisher, Rachel Wilson, Maximilian Chang, Jennifer Kallay, and Chris James of Synapse, and Jon Levy, Yurika Nishioka, and Paul Kirshen. March 24, 2010.

Avoided Energy Supply Costs in New England: 2009 Report, prepared for AESC/Massachusetts Avoided Energy Supply Components Study Group by Rick Hornby, David White, Bruce Biewald, Chris James, Ben Warfield, and Max Chang of Synapse, and Paul Chernick, Carl Swanson, Ian Goodman, Bob Grace, and Jason Gifford, August 21, 2009.

Productive and Unproductive Costs of CO2 Cap-and-Trade: Impacts on Electricity Consumers and Producers, prepared for National Association of Regulatory Utility Commissioners, National Association of State Utility Consumer Advocates, National Rural Electric Cooperative Association, and American Public Power Association by Ezra Hausman, Jeremy Fisher, Lauri Mancinelli, and Bruce Biewald, July 15, 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, prepared for New York State Attorney General by Bruce Biewald, David White, Jeremy Fisher, Max Chang, and Lucy Johnston, May 13, 2009.

Cost and Benefits of Electric Utility Energy Efficiency in Massachusetts, prepared for the Northeast Energy Efficiency Council by Doug Hurley, Kenji Takahashi, Bruce Biewald, Jennifer Kallay, and Robin Maslowski, August 1, 2008.

Analysis of Indirect Emissions Benefits of Wind, Landfill Gas, and Municipal Solid Waste Generation, prepared for U.S. Environmental Protection Agency by Ezra Hausman, Jeremy Fisher, and Bruce Biewald, July 23, 2008.

Don't Get Burned: The Risks of Investing in New Coal-Fired Generating Facilities, prepared for Interfaith Center on Corporate Responsibility by David Schlissel, Lucy Johnston, Jennifer Kallay, Christopher James, Anna Sommer, Bruce Biewald, Ezra Hausman, and Allison Smith, February 26, 2008.

Tufts Cove Waste Heat Recovery Project, prepared for the Nova Scotia Utility and Review Board by Bruce Biewald, Bill Powers, and Ben Warfield, December 4, 2007 and revised August 4, 2008.

Avoided Energy Supply Costs: 2007 Final Report, prepared for AESC / Massachusetts Avoided Energy Supply Components Study Group by Rick Hornby, Carl Swanson, David White, Paul Chernick, Bruce Biewald, and Jennifer Kallay, August 10, 2007.

The Deerfield Wind Project – Assessment of the Need for Power and the Economic and Environmental Attributes of the Project, prepared for PPM Energy by Ezra Hausman, Bruce Biewald, and Kenji Takahashi, August 1, 2006.

Portfolio Management: Tools and Practices for Regulators, prepared for the National Association of Regulatory Utility Commissioners by William Steinhurst, David White, Rick Hornby, Alice Napoleon, Amy Roschelle, and Bruce Biewald, October, 2006.

Incorporating Energy Efficiency into the ISO New England Forward Capacity Market: Ensuring the Capacity Market Properly Values Energy Efficiency Resources, prepared for Conservation Services Group by Paul Peterson, Doug Hurley, Tim Woolf, and Bruce Biewald, June 5, 2006.

Ensuring Delaware's Energy Future: A Response to Executive Order Number 82, prepared for the Delaware Public Service Commission Staff by the Delaware Cabinet Committee on Energy with technical assistance from Synapse Energy Economics, March 8, 2006.

The Proposed Broadwater LNG Import Terminal Response to Draft Environmental Impact Statement and Update of Synapse Analysis, prepared for the Connecticut Fund for the Environment and Save The Sound by Ezra Hausman, Bruce Biewald, Kenji Takahashi, and David Schlissel, January 22, 2007.

RPM 2006: Windfall Profits for Existing Base Load Units in PJM, prepared for the Pennsylvania Office of Consumer Advocate by Bruce Biewald, Ezra Hausman, Paul Peterson, and David White, February 2, 2006.

An RPM Case Study: Higher Costs for Consumers, Windfall Profits for Exelon, prepared for Illinois Citizens Utility Board, by Ezra Hausman, Paul Peterson, David White, and Bruce Biewald, October 18, 2005.

Considering Climate Change in Electric Resource Planning: Zero is the Wrong Value, by Lucy Johnston, Amy Roschelle, Ezra Hausman, Anna Sommer, and Bruce Biewald, Rev 3, September 30, 2005.

Using Electric System Operating Margins and Build Margins in Quantification of Carbon Emission Reductions Attributable to Grid Connected CDM Projects, a Synapse Energy Economics, Inc. report for the United Nations Framework Convention on Climate Change, September 19, 2005.

Methods for Estimating Emissions Avoided by Renewable Energy and Energy Efficiency, a Synapse Energy Economics, Inc. report for the U.S. Environmental Protection Agency by Bruce Biewald and Geoff Keith, July 8, 2005.

Economic Impacts and Avoided Air Emissions from Renewable Generation and Efficiency Programs in New England, a Synapse Energy Economics, Inc. report for the Regulatory Assistance Project by William Steinhurst, Robert McIntyre, Bruce Biewald, Cliff Chen, and Kenji Takahashi. April 15, 2005.

Electric Price Forecasts for St. Lawrence Hydroelectric Generation, prepared for the International Joint Commission (IJC) by David White and Bruce Biewald, March 11, 2005.

A Responsible Electricity Future: An Efficient, Cleaner and Balanced Scenario for the US Electricity System, a Synapse Energy Economics, Inc. report for the National Association of State PIRGs, by Bruce Biewald, David White, Geoff Keith, and Time Woolf. June 11, 2004.

Electricity Prices in PJM: Comparison of Wholesale Power Costs in the PJM Market to Indexed Generation Service Costs, a Synapse Energy Economics, Inc. report prepared for the PJM Interconnection, L.L.C., by Bruce Biewald, William Steinhurst, David White, and Amy Roschelle. June 3, 2004.

Reply Comments in Docket No. 2004-147: Strategies for Procuring Residential and Small Commercial Standard Offer Supply in Maine, a Synapse Energy Economics, Inc. report prepared for the Maine Office of Public Advocate by Amy Roschelle, Bruce Biewald, and Paul Peterson. April 21, 2004.

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Modeling Demand Response and Air Emissions in New England, a Synapse Energy Economics, Inc. report prepared for the U.S. Environmental Protection Agency, by Geoff Keith, Bruce Biewald, David White, and Mike Drunsic, August 2003.

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Transmitting Windpower from the Dakotas to Chicago: A Preliminary Analysis of a Hydrogen Transmission Scenario, a Synapse Energy Economics report prepared for the Environmental Law and Policy Center, with funding from the Leighty Foundation, by Barclay Gibbs and Bruce Biewald, September 8, 2000.

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Use of Selective Catalytic Reduction For Control of NOx Emissions From Power Plants in the U.S., a Synapse Energy Economics report for the OntAIRio Campaign, February, 2000.

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“Economics of Electric Sector CO₂ Emissions Reduction: Making Climate Change Policy that People Can Live With,” presentation at the NASUCA 2008 Annual Meeting, November 18, 2008.

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“Demand Response in Electricity Markets,” presented at the National Association of State Utility Consumer Advocates Mid-Year Meeting in Santa Fe, New Mexico, June 18, 2001.

Presentation on “Repowering the Midwest: The Clean Energy Development Plan for the Heartland,” at the National Wind Coordinating Committee Upper Midwest Transmission Workshop, Minneapolis, Minnesota, May 1, 2001.

“Observations on New England’s Electricity Markets,” National Regulatory Research Institute Market Power Conference, Columbus, Ohio, April 10, 2001.

Presentation on “Derailing Coal: The Economics of Coal-Fired Electricity Generation in the U.S.,” Tax Shift Strategy Meeting, Washington, D.C., December 2, 2000.

Presentation on “Repowering the Midwest: A Clean Energy Development Plan for the Heartland,” presentation with Howard Learner at the National Association of Regulatory Utility Commissioners Annual Meeting, San Diego, California, November 14, 2000.

Presentation on “Electricity in New England: Market Imperfections of Failure?” at National Association of State Utility Consumer Advocates Annual Meeting, San Diego, California, November 13, 2000.

Presentation on “How Green is Green? Verifying Energy Advertising Claims,” at the New England Conference of Public Utility Commissioners Symposium, Bretton Woods, New Hampshire, May 25, 1999.

Presentation on “Consumer Perspectives on Market Power – Case Studies from New England, New York, PJM, and Mississippi,” IBC Conference on Market Power, Washington DC, May 24, 1999.

Presentation on “Grandfathering and Environmental Comparability,” at the National Association of Regulatory Utility Commissioners 1998 Summer Committee Meetings, Seattle, July 26, 1998.

Presentation on “Tracking Electricity in the New England Market,” at the National Association of Regulatory Utility Commissioners 1998 Summer Committee Meetings, Seattle, July 26, 1998.

Presentation on “Tracking Electricity in the New England Electricity Market,” at the National Council on Competition and the Electricity Industry National Executive Dialogue on Customers’ Right to Know, Chicago, May 13, 1998.

Presentation on “Comparable Environmental Regulations in a Restructured Electricity Industry: The Grandfathering Effect,” National Association of Regulatory Utility Commissioners meeting in Washington, D.C., March 1, 1998.

Presentation on “Market Power in Electricity Generation,” National Consumer Law Center Conference, Washington, D.C., February 9, 1998.

Presentation on “Electricity Market Power in New England,” Massachusetts Electric Industry Restructuring Roundtable, Boston, December 15, 1997.

Presentation on wind power development and air quality, National Wind Coordinating Committee New England Wind Issues Forum, Boston, November 7, 1997.

Invited speaker on market power, National Association of State Utility Consumer Advocates meeting in Boston, November 12, 1997.

Presentation on “Distortions to Future and Current Competitive Electric Energy Markets Due to Grandfathering Environmental Regulations of Electric Power Plants,” National Association of Regulatory Utility Commissioners meeting in Boston, November 9, 1997.

Presentation on “Electric Industry Restructuring as if the Environment Mattered,” Boston Area Solar Energy Association, October 9, 1997.

Invited speaker on “Modeling Market Power in Electricity Generation,” National Association of Regulatory Utility Commissioners meeting in San Francisco, July 22, 1997.

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

Presentation on "State Initiatives and Regional Issues," New England Governors' Conference Workshop on Restructuring and Environmentally Sustainable Technologies, Warwick, Rhode Island, March 25, 1997.

Invited speaker on stranded costs, National Association of State Utility Consumer Advocates meeting in San Francisco, November 1996.

Presentation on "Nuclear Power Plant Decommissioning Costs and Electricity Restructuring," Nuclear Decommissioning Trusts conference, New York City, November 18, 1996.

Invited speaker on stranded costs, Indiana Utilities Regulatory Commission Forum, Indianapolis, November 1, 1996.

Presentation on "Electric Industry Restructuring and the Environment," at the Indiana Energy Conference, Indianapolis, Indiana, October 10, 1996.

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

Presentation on "Electric Generation Market Power in New England" to New England Conference of Public Utility Commissioners, Manchester Village, Vermont, May 1996.

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

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

Presentation on "Environmental Impacts of Energy: Sustainability and Social Costing" to British Columbia Utilities Commission Workshop, Vancouver, BC, March 1995.

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

Presentation on "Compliance Planning Under Regulatory Uncertainty," to EPA "Opportunities Conference: Energy Efficiency and Renewable Energy," Washington, DC, June 1993.

Presentation on "Energy and Sustainability" to Hydro-Quebec Conference, Hampshire College, Amherst, Massachusetts, April 1993.

Invited Speaker on environmental externalities, ASME "ECO World" conference in Washington, DC, June 1992.

Invited Speaker, Association of Energy Engineers, Boston, Massachusetts, February 1992.

Presentation of Acid Rain Abatement Optimization Model to the Swedish Environmental Protection Agency, Solna, Sweden, November 1991.

Presentation on Integrated Resource Planning to Boston Gas Company, July 1990.

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

Invited Speaker, National Association of State Utility Consumer Advocates (NASUCA) Mid-Year Meeting, Annapolis, Maryland, and June 1988.

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

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PROFESSIONAL EXPERIENCE

Synapse Energy Economics, Inc., Cambridge, MA. Senior Consultant, 1996 to present.

Consulting on issues of energy economics, environmental impacts, and utility regulatory policy, including electric industry restructuring, electric power system planning, performance-based regulation, stranded costs, system benefits, market power, mergers and acquisitions, generation asset valuation and divestiture, nuclear and fossil power plant costs and performance, renewable resources, green marketing of electricity, environmental disclosure, climate change policy, environmental externalities valuation, energy conservation and demand-side management, electric power system reliability, avoided costs, fuel prices, dispatch modeling, economic analysis of power plants and resource plans, and risk analysis.

G-W Associates, Arlington, MA. Principal, 1985 to present.

Engineering and environmental analysis. Design and development of computer software for scientific and engineering analysis. Design and implementation of database systems. Consulting on management information systems and operations research applications. Training and documentation for computer applications.

Tellus Institute, Boston, MA. Associate Scientist, 1980 to 1986.

Participated in a number of electrical demand forecast studies, specializing in the evaluation of the potential for energy conservation and co-generation. Developed methodologies and computer programs for evaluating energy conservation policies.

Developed a computer modeling system (LEAP) for evaluating the resource needs of developing countries. Participated in international energy planning studies and conducted training programs in a number of African and European countries.

Massachusetts Institute of Technology Energy Laboratory, Cambridge, MA. Research Associate, 1975 to 1980. Participated in a several energy policy studies which evaluated the future demand and supply for electricity in the United States. Designed and developed a mathematical programming model of the U.S. coal and electric utility industries.

EDUCATION

Massachusetts Institute of Technology, Ph.D. Civil/Environmental Engineering.

Case-Western Reserve University, M.S. Physics.

The University of Akron, B.S. Physics.

SUMMARY OF RELEVANT EXPERIENCE

Dr. White has modeled most of the North American Electric Reliability Council (NERC) regions in the United States and Canada. Many of these projects have involved examining proposed mergers and their potential effects on market power and market prices. A recent focus has been on the analysis of long-term generation expansion plans and the role of uncertainty in those analyses.

Dr. White's recent work includes consulting on electric industry restructuring, stranded costs, system benefits, market power, mergers and acquisitions, generation asset valuation and divestiture, power plant costs and performance, renewable resources, power supply contracts and performance standards, green marketing of electricity, environmental disclosure, climate change policy, environmental externalities valuation, energy conservation and demand-side management, electric power system reliability, and electricity market simulation modeling for price forecasting and market power analysis.

PUBLICATIONS

Findings Regarding the NSPI 2011 Load Forecast, Prepared for Nova Scotia Utility and Review Board by David White and Bruce Biewald. December 2011.

Potential Impacts of a Renewable and Energy Efficiency Portfolio Standard in Kentucky, Prepared for the Mountain Association for Community Economic Development & the Kentucky Sustainable Energy Alliance by R. Horny, D. White, T. Vitolo, T. Comings and K. Takahashi. December 2011.

Big Risks, Better Alternatives: An Examination of Two Nuclear Energy Projects in the U.S. Prepared for Union of Concerned Scientists by Chang M, White D, Hausman E, Hughes N, Biewald B. October 2011.

Avoided Energy Supply Costs in New England: 2011 Report. Prepared for AESC 2011 Study Group (New England Efficiency Program Administrators) by Hornby R, Chernick P, Swanson C, White D, Gifford J, Chang M, Hughes N, Wittenstein M, Wilson R, Biewald B. July 2011.

New Jersey 2011 Fixed Price Basic Generation Service Auction, Prepared for the NJ DRA by David White, Robert Fagan and Alice Napoleon. February 2011.

Electricity Energy Efficiency Benefits of RGGI Proceeds: An Initial Analysis. Prepared for Regulatory Assistance Project by Chang M, White D, Johnston L, and Biewald B., October 2010..

2011 Carbon Dioxide Price Forecast, prepared by Lucy Johnson, Ezra Hausman, Bruce Biewald, Rachel Wilson, and David White, February 11, 2011.

Electricity Energy Efficiency Benefits of RGGI Proceeds: An Initial Analysis, prepared for Regulatory Assistance Project by Max Chang, David White, Lucy Johnston, and Bruce Biewald, October 5, 2010.

Avoided Energy Supply Costs in New England: 2009 Report, prepared by Rick Hornby, David White, Bruce Biewald, Chris James, Ben Warfield, and Max Chang of Synapse, and Paul Chernick, Carl Swanson, Ian Goodman, Bob Grace, and Jason Gifford, October 23, 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, prepared by Bruce Biewald, David White, Jeremy Fisher, Max Chang, and Lucy Johnston, May 13, 2009.

An Assessment of Santee Cooper's 2008 Resource Planning, prepared by David Schlissel, Rachel Wilson, Lucy Johnston, and David White, April 22, 2009.

Wholesale Natural Gas Prices in New England, prepared by Rick Hornby, David White and Paul Peterson, August 2008.

Energizing Virginia: Efficiency First, by the American Council for an Energy-Efficient Economy (ACEEE). Utility avoided cost forecasts by David White and Rick Hornby of Synapse, September 2008.

Synapse 2008 CO2 Price Forecasts, prepared by David Schlissel, Lucy Johnston, Bruce Biewald, David White, Ezra Hausman, Chris James and Jeremy Fisher, July 2008

Advanced Metering Infrastructure- Implications for Residential Customers in New Jersey, prepared for New Jersey Division of the Ratepayer Advocate by Rick Hornby, Charles Salamone, Stu Perry, David White, Kenji Takahashi, July 8, 2008.

Review of AmerenUE February 2008 Integrated Resource Plan, prepared by Rick Hornby, Jeff Loiter, Phil Mosenthal, Tom Franks, Bob Fagan and David White, June 2008.

Forecast of New England Forward Capacity Market (FCM) Clearing Prices 2008 – 2017, prepared by Doug Hurley, David White, Rick Hornby, May 2008.

Impacts of Distributed Generation on Wholesale Electric Prices and Air Emissions in Massachusetts, prepared by Michael W. Drunsic, David White and Rick Hornby, March 2008.

Risk Analysis of Procurement Strategies for Residential Standard Offer Service, prepared by Jonathan Wallach & Paul Chernick of Resource Insight and David White & Rick Hornby of Synapse, March 2008.

Increasing Demand Response in Maine, prepared by Rick Hornby, Chris James, Kenji Takahashi, Dr. David White, January 2008.

Avoided Energy Supply Costs in New England: 2007 FINAL REPORT, prepared Rick Hornby, Dr. Carl V. Swanson, Michael Drunsic, Dr. David E. White, Paul Chernick, Bruce Biewald and Jennifer Kallay, September 2007.

ISO New England Scenario Analysis Companion Report Constructing a Future that Meets Regional Goals, prepared by Paul Peterson, Doug Hurley, and David White, August 2007.

Climate Change and Power: Carbon Dioxide Emissions Costs and Electricity Resource Planning, prepared by Lucy Johnston, Ezra Hausman, Anna Sommer, Bruce Biewald, Tim Woolf, David Schlissel, Amy Roschelle and David White, March 2007.

LMP Electricity Markets: Market Operations, Market Power, and Value for Consumers, prepared by Ezra Hausman, Robert Fagan, David White, Kenji Takahashi, and Alice Napoleon for the American Public Power Association, February 2007.

Ensuring Delaware's Energy Future: A Response to Executive Order No. 82, prepared by the Delaware Cabinet Committee on Energy with technical assistance at Synapse Energy Economics from William Steinhurst, Bruce Biewald, David White, Kenji Takahashi, Alice Napoleon, Amy Roschelle, Anna Sommer and Ezra Hausman, March 8, 2006.

Mohave Alternatives and Complements Study: Assessment of Carbon Sequestration Feasibility and Markets, a Sargent & Lundy and Synapse Energy Economics, Inc. report prepared for Southern California Edison by Anna Sommer and William Steinhurst, February 2006.

Potential Cost Impacts of a Renewable Portfolio Standard in New Brunswick, prepared by Tim Woolf, David White, Cliff Chen and Anna Sommer for the New Brunswick Department of Energy, October 2005.

An RPM Case Study: Higher Costs for Consumers, Windfall Profits for Exelon, a Synapse Energy Economics, Inc. prepared for Illinois Citizens Utility Board, by Ezra Hausman, Paul Peterson, David White, and Bruce Biewald, October 18, 2005.

Electric Price Forecasts for St. Lawrence Hydroelectric Generation, prepared for the International Joint Commission (IJC) by David White and Bruce Biewald, February 2005.

Capacity for the Future: Kinky Curves and Other Reliability Options, by Paul Peterson, David White, Amy Roschelle and Bruce Biewald, December 2004.

A Responsible Energy Future, prepared for the state Public Interest Research Groups (PIRGs) by Bruce Biewald, David White, Geoff Keith and Tim Woolf, July 2004.

Electricity Prices in PJM: A Comparison of Wholesale Power Costs in the PJM Market to Indexed Generation Service Costs, prepared for The PJM Interconnection, L.L.C. by Bruce Biewald, William Steinhurst, David White and Amy Roschelle, June 2004.

A Balanced Energy Plan for the Interior West, prepared for the Hewlett Foundation Energy Series, in collaboration with Western Resource Advocates and Tellus Institute, May 2004.

Comments on the RPS Cost Analyses of the Joint Utilities and the DPS Staff, a Synapse Energy Economics, Inc. report prepared for the Renewable Energy Technology and Environment Coalition by Bruce Biewald, Cliff Chen, Anna Sommer, William Steinhurst, and David E. White. September 2003.

Modeling Demand Response and Air Emissions in New England, a Synapse Energy Economics, Inc. report prepared for the U.S. Environmental Protection Agency, by Geoff Keith, Bruce Biewald, David White, and Mike Drunsic, August 2003.

Cleaner Air, Fuel Diversity and High-Quality Jobs: Reviewing Selected Potential Benefits of an RPS in New York State, a Synapse Energy Economics, Inc. report prepared for the Renewable Energy Technology and Environment Coalition by Geoff Keith, Bruce Biewald, David White, Anna Sommer and Cliff Chen. July 2003.

The New England Experiment: An Evaluation of the Wholesale Electricity Markets, a Synapse Energy Economics, Inc. report provided to the Connecticut Office of Consumer Counsel, Maine Office of the Public Advocate, and New Hampshire Office of Consumer Advocate, by Paul Peterson, David White, Bruce Biewald, and Cliff Chen, June 2003. ***A Clean Energy Plan for the Interior West***, prepared for the Land and Water Fund of the Rockies, with Tellus Institute, Ron Lehr and Jayson Antonoff, forthcoming.

Air Quality in Queens: Cleaning Up the Air in Queens County and Neighboring Regions, prepared for a collaboration of Natural Resources Defense Council, Keyspan Energy, and the Coalition Helping to Organize a Kleaner Environment, May 2003.

The Maryland Renewable Portfolio Standard: An Assessment of Potential Cost Impacts, prepared for the Maryland Public Interest Research Group, March 2003.

Powering the South: A Clean and Affordable Energy Plan for the Southern United States, prepared with and for the Renewable Energy Policy Project and a coalition of Southern environmental advocates, January 2002.

Updated Avoided Energy-Supply Costs for Demand-Side Management Screening in Massachusetts, a Resource Insight report for the AESC Study Group, by Paul Chernick, Susan Geller, Bruce Biewald, and David White, December 2001.

Updated Avoided Energy-Supply Costs for Demand-Side Management Screening in Massachusetts, a Resource Insight report for the AESC Study Group, by Paul Chernick, Susan Geller, Bruce Biewald, and David White, November 2001.

Electricity Market Analysis of Coal Waste Regulations: An Illustrative Midwest Case Study, a Synapse Energy Economics report prepared for US Environmental Protection Agency by Bruce Biewald, David White, and Montserrat Ramiro, October 2001.

New Jersey Board of Public Utilities (Docket No. EM01050308), Analysis of the proposed merger between Conectiv and PEPCo, September 2001.

New Jersey Board of Public Utilities (Docket No. EM00110870), Analysis of the proposed merger between FirstEnergy and GPU, April 2001.

Vermont Public Service Board (Dockets Nos. 6120 and 6460), Used and useful policy issues, electricity market prices, and above market costs of the purchase from Hydro Quebec, March 2001.

Repowering the Midwest: The Clean Energy Development Plan for the Heartland, prepared for the Environmental Law and Policy Center and a coalition of Midwest environmental advocates, February 2001.

Marginal Price Assumptions for Estimating Customer Benefits of Air Conditioner Efficiency Standards, comments on the Department of Energy's proposed rules for efficiency standards for central air conditioners and heat pumps, on behalf of the Appliance Standards Awareness Project, December 2000.

Massachusetts Department of Environmental Protection – July 2000

Comments on reliability implications of proposed emission standards for power plants.

Arkansas Public Service Commission (Docket No. 00-048-R) – June 2000

Requirements for electricity market power analyses.

West Virginia Public Service Commission (Case No. 98-0452-E-GI) – August 1999

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.

Connecticut Department of Public Utility Control (Docket No. 99-03-36) – July 1999

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.

Connecticut Department of Public Utility Control (Docket No. 99-02-05) – April 1999

Market power, market prices, and simulation modeling as related to the application of Connecticut Light & Power Company for recovery of stranded costs.

Maryland Public Service Commission (Case No. 8797) – January 1999

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.

Maryland Public Service Commission (Case No. 8795) – December 1998

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.

Vermont Public Service Board (Docket No. 6107) – September 1998

Excess capacity, used & useful, and the economics of Green Mountain Power's purchase from Hydro Quebec.

Avoided Energy-Supply Costs for Demand-Side Management Screening in Massachusetts, a

Resource Insight report for the AESC Study Group, by Rachel Brailove, Paul Chernick, Susan Geller, Bruce Biewald, and David White, July 7, 1999.

Stranded Nuclear Waste: Implications of Electric Industry Deregulation for Nuclear Plant Retirements and Funding for Decommissioning and Spent Fuel, by Bruce Biewald and David White, January 15, 1999.

The Role of Ozone Transport In Reaching Attainment in the Northeast: Opportunities, Equity and Economics, a Synapse Energy Economics report for the Northeast States for Coordinated Air Use Management, by Tim Woolf, David White, Bruce Biewald, and William Moomaw, July 1998.

Grandfathering and Environmental Comparability: An Economic Analysis of Air Emission Regulations and Electricity Market Distortions, a Synapse Energy Economics report for the National Association of Regulatory Utility Commissioners, by Bruce Biewald, David White, Tim Woolf, Frank Ackerman, and William Moomaw, June 11, 1998.

Analysis of Market Power in the APS and Duquesne Service Territories, prepared for the Maryland Office of People's Counsel, by Bruce Biewald and David White, February 9, 1998.

Horizontal Market Power in New England Electricity Markets: Simulation Results and a Review of NEPOOL's Analysis, prepared for the New England Conference of Public Utility Commissioners, by Bruce Biewald, David E. White, and William Steinhurst, June 11, 1997 (a draft was published as Vermont DPS Technical Report No. 39 in March, 1997).

Full Environmental Disclosure for Electricity: Tracking and Reporting Key Information, a Regulatory Assistance Project report funded by the Pew Charitable Trusts, the Joyce-Mertz Gilmore Foundation, the U.S. EPA, and the U.S. DOE, by David Moskovitz, Tom Austin, Cheryl Harrington, Bruce Biewald, David E. White, and Robert Bigelow, March 1997.

"Follow the Money: A Method for Tracking Electricity for Environmental Disclosure," Bruce Biewald, David White, and Tim Woolf, *The Electricity Journal*, May 1999.

New England Tracking System, a methodology for a region-wide electricity tracking system to support the implementation of restructuring-related policies, prepared for the New England Governors' Conference, with Environmental Futures and Tellus Institute, October 1998.

"Implications of Premature Nuclear Plant Closures: Funding Shortfalls for Nuclear Plant Decommissioning and Spent Fuel Transportation and Storage," Bruce Biewald and David White, prepared for the United States Association for Energy Economics and International Association for Energy Economics, 19th Annual North American Conference, Albuquerque, NM, October 1998.

"Counting the Costs: Scientific Uncertainty and Valuation Perspective in EXMOD," Stephen Bernow, Bruce Biewald, William Dougherty, and David White, presented at technical meeting of the International Atomic Energy Agency, Vienna, Austria, December 1995.

New York State Environmental Externalities Cost Study, a Hagler Bailly Consulting report prepared for the Empire State Electric Energy Research Corporation (ESEERCO), by R.D. Rowe, C.M. Lang, L.G. Chestnut, D.A. Latimer, D.A. Rae, S.M. Bernow, D.E. White, Oceana Publications, December 1995.

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Associate

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PROFESSIONAL EXPERIENCE

Synapse Energy Economics, Inc., Cambridge, MA. Associate, July 2008 – present; Research Associate, April 2005-July 2008.

- Facilitate working groups to recommend and develop possible state actions to reduce greenhouse gas emissions in Colorado, South Carolina, and Maryland.
- Provide quantitative and qualitative expert analysis, including cost/benefit analysis, in support of demand side resources policy working groups and a utility consumer advocate.
- Research historical emissions of criteria pollutants, hazardous air pollutants, greenhouse gases, coal combustion wastes, and other pollutants. Analyze regulations thereof and monitor policy developments. Research and develop potential state and local emissions mitigation strategies, such as for reducing ambient fine particulates in New York City.
- Monitor and analyze electricity, coal, and emissions allowance market data, models, and projections, as well as economic and policy developments that impact these markets.
- Research costs of renewable resources, cooling technologies, and emissions controls.
- Conduct surveys of regional, state, and utility policies and practices in ratemaking for energy efficiency, power procurement, risk management, and fuel diversity policies.
- Research federal, regional, and state case histories on power plant siting and operations, power supply procurement, renewable portfolio standards, integrated resource planning, market power, and reliability compensation.
- Write and edit reports, expert testimony, and discovery questions and responses.

Resource Insight, Inc., Arlington, MA. Research Assistant, 2003-2005.

Responsible for conducting research and analysis on electric, gas, steam, and water resource issues. Conducted discounted cash flow analysis for asset valuation; developed market-price benchmarks for analysis of power-supply bids using market and regulated prices for energy, capacity, ancillary services, transmission, and ISO services and adjusting for load shape, assignment of transmission rights, and losses. Prepared discovery responses, formal objections, comments, and testimony; collaboratively wrote and edited reports; created and formatted exhibits. Participated in drafting an Energy Plan for New York City. Edited solicitation for competitive power supply to serve aggregated municipal load.

University of Massachusetts, Amherst, MA. Teaching Assistant, 2001- 2002.

Developed and taught lessons on applied math to a diverse group of incoming graduates; tutored students in microeconomic theory and cost benefit analysis; graded weekly problem sets and memoranda.

International Council for Local Environmental Initiatives, Berkeley, CA. Cities for Climate Protection Intern for the City of Northampton, MA, 2001.

Compiled primary and secondary source data on energy consumption and solid waste generation by the municipal government, city residents, and businesses; applied emissions coefficients to calculate total greenhouse gas (GHG) emissions; identified current and planned municipal policies that impact GHG emissions; researched the predicted effects of global warming locally; gathered public feedback to provide acceptable and proactive policy alternatives. Composed a GHG emissions inventory describing research findings; wrote and distributed a policy report and press releases; gave newspaper and radio interviews; addressed public officials and the public during a televised meeting.

University of Massachusetts, Amherst, MA. Research Assistant, 2000-2001.

Located federal data sources, identified changes, and updated a research database to evaluate the Habitat Conservation Program; proofread articles and white papers; composed a literature review on land use modeling. Collaboratively administered, tested, and proposed interface enhancements for a web-based data warehouse of regional habitat change research; formally presented the system to an independent research group.

Court Square Data Group, Inc., Springfield, MA. Administration Manager, 1998-2000.

Analyzed profitability and diversity of income sources; managed cash flow, expense, and income data; created budgets; devised and implemented procedures to increase administrative efficiency; implemented new accounting system with minimal disruption to workflow.

Project Administrator, 1996-1998.

Coordinated implementation of software features; identified opportunities for future development; monitored problem resolution; wrote and coordinated production of a user's manual and questionnaires; edited technical proposals and a business plan.

EDUCATION

University of Massachusetts, Master of Public Administration, 2002

Rutgers University, BA in Economics, New Brunswick, NJ, 1995

Syracuse University, Syracuse, NY, 1994

PUBLICATIONS

Beyond Business as Usual: Investigating a Future without Coal and Nuclear Power in the U.S., prepared for the Civil Society Institute by Keith G., Biewald B., Takahashi K., Napoleon A., Hughes N., Mancinelli L., and Brandt E, May 11, 2010.

Assessing the Multiple Benefits of Clean Energy: A Resource for States, prepared for U.S. Environmental Protection Agency by U.S. Environmental Protection Agency with research and editorial support from Stratus Consulting, Synapse Energy Economics, Summit Blue, Energy and Environmental Economics, Inc., Demand Research LLC, Abt Associates, Inc., and ICF International, February 1, 2010.

Economic Impacts of Restricting Mountaintop/Valley Fill Coal Mining in Central Appalachia, prepared for Sierra Club, and Appalachian Center for the Economy and the Environment by Napoleon A., and Schlissel D., August 25, 2009.

The Real Costs of Cleaning Up Nuclear Waste: A Full Cost Accounting of Cleanup Options for the West Valley Nuclear Waste Site, prepared for Citizens' Environmental Coalition by Napoleon A., Fisher J.I., Steinhurst W., Wilson M., Ackerman F., and Resnikoff M., December 15, 2008.

Quantifying and Controlling Fine Particulate Matter in New York City, prepared for Coalition Helping Organize a Kleaner Environment, Natural Resources Defense Council (NRDC), and Reliant Energy by Napoleon A., Keith G., Komanoff C., Gutman D., Silva P., Schlissel D., Sommer A., Chen C., Roschelle A., Levy J., and Kinney P., August 28, 2007.

Arkansas Electric Generation Fuel Diversity: Implementation of EPAct 2005 Amendments to PURPA Section 111 (d), prepared for Arkansas Public Service Commission Staff by Drunsic M., Napoleon A., Hausman E.D., and Horny J.R., July 20, 2007.

LMP Electricity Markets: Market Operations, Market Power, and Value for Consumers, prepared for American Public Power Association by Hausman E., Fagan R., White D., Takahashi K., and Napoleon A., February 5, 2007.

Portfolio Management: Tools and Practices for Regulators, prepared for National Association of Regulatory Utility Commissioners by Synapse Energy Economics, Inc., October 1, 2006.

Energy in the Northern Forest Region: A Situation Analysis, prepared for Northern Forest Center and The North Country Council by Steinhurst W., Napoleon A., and Takahashi K., May 1, 2006.

Ensuring Delaware's Energy Future: A Response to Executive Order Number 82, prepared for Delaware Public Service Commission Staff by the Delaware Cabinet Committee on Energy with technical assistance from Synapse Energy Economics and others, March 8, 2006.

Mohave Alternatives and Complements Study: Assessment of Carbon Sequestration Feasibility and Markets, a Sargent & Lundy and Synapse Energy Economics, Inc. report prepared for Southern California Edison by Sommer A., and Steinhurst W., February 2006.

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PROFESSIONAL EXPERIENCE

Synapse Energy Economics Inc, Cambridge, MA. Associate, 2004-present.

Analyze technologies, policies, and regulations associated with supply and demand side energy resources. Assess potentials of electric and natural gas energy efficiency measures. Examine economic and environmental implications of clean energy policies and programs associated with energy efficiency, demand response, distributed generation, and renewable energy. Examine ratemaking issues such as standby rates for distributed generation and decoupling rate mechanisms for energy efficiency measures. Investigate electricity and natural gas market price trends and fluctuations. Prepare expert testimony and reports for regulatory proceedings.

Center for Energy and Environmental Policy, University of Delaware, Newark, DE. Research Associate, 2002- 2004. Researched the market potential of distributed resources under different electric distribution rate designs (Report prepared for Conectiv Power Delivery Company). Investigated the potential of the Clean Development Mechanisms (CDM) in Asian developing countries and the Japanese government's policy for CDM. Contributed to a market penetration study for photovoltaic technologies in comparison with the predicted oil production from the oil reservoirs in the Arctic National Wildlife Refuge (Report prepared for Astropower, Inc.). Analyzed the installation of PV and generation-set options for the Assateague Beach Coastal Guard Station at the Assateague Island National Seashore (Maryland) (Report prepared for the U.S. National Park Service).

Delaware Division of Public Advocate, Wilmington, DE. Research Intern, 2003.

Researched and wrote reports on states' policies regarding (1) energy efficiency/load management programs in order to identify cost-effective programs for implementation in Delaware; (2) electric standard offer service/default service (rate designs) for those who do not choose alternative suppliers under the deregulation process; (3) electric universal service and system benefit charges for protecting consumers from risks associated with electricity restructuring; and (4) Contributions and Advances-in-Aid-of-Construction for water supply extensions.

Resources for the Future, Washington DC. Research Intern, 2002. Investigated current and planned wind power capacity for the United States. Analyzed the EPA and EIA market models to estimate technical and economic potential of wind power in the United States. Researched the status of renewable energy supply in Japan's electricity sector (Prepared for the Economic and Social Research Institute, Cabinet Office, Government of Japan).

Citizens' Alliance for Saving the Atmosphere and the Earth (CASA), Osaka, Japan. Volunteer, 1999-2001. Worked as a newsletter writer, editor and event organizer. Wrote a report on the first experimental biomass energy facility in Japan and the photovoltaic system at Yagi Junior High School in Kyoto, Japan. Participated in a research project to investigate renewable energy potential and policies in Japan. Wrote a report on problems of nuclear power plants affecting communities in Fukui prefecture, Japan.

EDUCATION

MA in urban affairs and public policy with a concentration in energy and environmental policy, Center for Energy and Environmental Policy, University of Delaware, Newark, DE, 2003. Master's thesis: *Policies to Support Distributed Resources under Different Electricity Restructuring Models*. Courses on energy economics, energy and environmental policy, electricity policy and planning, political economy of environment, solar electric technology, cost-benefit and decision making analyses, and geographic information system.

BA in law with a concentration in public administration, Kansai University, Osaka, Japan, 2000.

AWARDS/SCHOLARSHIPS

- Director's Citation, Department of Urban Affairs and Public Policy, University of Delaware, May 2003.
- NEC scholarship for an environmental education leader-training program funded by one of the leading Japanese computer companies, NEC, November 2000.

CONFERENCES

- Build Boston 2010 on Residential Design and Construction, November 17, 2010
- ACI New England Conference 2010, October 6, Sturbridge, MA
- The 2010 ACEEE Summer Study on Energy Efficiency in Buildings, August 18-20, 2010 in Pacific Grove, CA
- NESEA BuildingEnergy 10 Conference, March 8-10, 2010
- Presenter at the 2009 EEDAL (Energy Efficiency in Domestic Appliances and Lighting) conference, June 24, 2009 in Berlin Germany
- Presenter at the 2008 ACEEE Summer Study on Energy Efficiency in Buildings, August 21, 2008 in Pacific Grove, CA
- Tufts University Clean Distributed Energy Workshop, June 8, 2006 in Medford, MA
- The 2006 Northeast Energy Efficiency Summit, May 17 in Boston, MA
- The 2006 Distributed Generation & Interconnection Conference held by DTE Energy, April 26-28, 2006 in Detroit, MI
- Discussant at the World Bank Expert Workshop on CDM methodologies and Technical Issues Associated with Power Generation and Power Saving Activities, December 3, 2005 in Montréal, Canada

- United Nations Climate Change Conference at its eleventh session / Twenty-third sessions of the Subsidiary Bodies and COP/MOP 1, November to 9 December 2005 in Montréal, Canada

PUBLICATIONS

Demand Side Resource Potential: A Review of Global Energy Partners' Report for Midwest ISO. Prepared for Project for Sustainable FERC Energy Policy, September 3, 2010.

Beyond Business as Usual: Investigating a Future without Coal and Nuclear Power in the U.S. Prepared for Civil Society Institute, May 11, 2010.

Review of Utility-Owned Distributed Generation Models for New York. Presented by Kenji Takahashi at the Northeast CHP Initiative Meeting, April 13, 2010.

Assessing the Multiple Benefits of Clean Energy: A Resource for States Prepared for U.S. Environmental Protection Agency, February 1, 2010.

North Dakota Energy Efficiency Potential Study Report Prepared for Plains Justice, December 1, 2009.

South Dakota Energy Efficiency Potential Study Report Prepared for Plains Justice, December 1, 2009.

The Costs of Increasing Electricity Savings through Utility Efficiency Programs: Evidence from US Experience, proceeding of the 2009 EEDAL (Energy Efficiency in Domestic Appliances and Lighting) conference, held in Berlin, Germany in June 2009

No Need to Wait: Using Energy Efficiency and Offsets to Meet Early Electric Sector Greenhouse Gas Targets. Prepared for Environmental Defense, May 1, 2009.

The Sustainability and Costs of Increasing Efficiency Impacts: Evidence from Experience to Date. Proceedings and presentation of the 2008 ACEEE Summer Study on Energy Efficiency in Buildings, August 20, 2008.

Cost and Benefits of Electric Utility Energy Efficiency in Massachusetts. Prepared for Northeast Energy Efficiency Council, August 2008

Advanced Metering Infrastructure- Implications for Residential Customers in New Jersey. Prepared for New Jersey Division of the Ratepayer Advocate, July 8, 2008.

Increasing Demand Response in Maine. Prepared for Staff of the Maine Public Utilities Commission, January 4, 2008

LMP Electricity Markets: Market Operations, Market Power, and Value for Consumers.

Prepared for American Public Power Association, February 5, 2007.

A Comprehensive Process Evaluation of Early Experience under New York's Pilot Program for Integration of Distributed Generation in Utility System Planning.

Prepared for the New York State Energy Research and Development Authority., forthcoming Fall 2006

Integrated Portfolio Management in a Restructured Supply Market.

Report co-authored by Resource Insight, prepared for Ohio Consumers' Counsel, June 30, 2006.

Energy in the Northern Forest Region: A Situation Analysis.

Prepared for Northern Forest Center, May 1, 2006.

Ensuring Delaware's Energy Future: A Response to Executive Order Number 82.

Report by the Delaware Cabinet Committee on Energy prepared with technical assistance from Synapse Energy Economics and others, March 8, 2006.

The Proposed Broadwater LNG Import Terminal - An Analysis and Assessment of Alternatives.

Prepared for Connecticut Fund for the Environment, March 2, 2006.

The Glebe Mountain Wind Energy Project: Assessment of Project Benefits for Vermont and the New England Region.

Report prepared on behalf of Glebe Mountain Wind Energy, LLC., February, 2006.

The Deerfield Wind Project: Assessment of the Need for Power and the Economic and Environmental Attributes of the Project.

Report prepared on behalf of Deerfield Wind, LLC., January, 2006

Study of Potential Mohave Alternative/Complementary Generation Resources.

Pursuant to CPUC Decision 04-12-016, prepared for Southern California Edison, February 3, 2006.

Rate Structures for Customers with Onsite Generation: Practice and Innovation.

Prepared for National Renewable Energy Laboratory, December 1, 2005.

Feasibility Study of Alternative Energy and Advanced Energy Efficiency Technologies for Low-Income Housing in Massachusetts.

Prepared for The Low-Income Energy Affordability Network, Action for Boston Community Development, and Action Inc., August 2005.

Electric Energy Efficiency and Renewable Energy in New England: An Assessment of Existing Policies and Prospects for the Future.

Prepared for the Regulatory Assistance Project, May 2005

Policy Options to Support Distributed Resource Options.

Prepared for Conectiv Power Delivery. Newark, DE: Center for Energy and Environmental Policy, January 2005.

The Searsburg/Readsboro Wind Project: An Analysis of Project Economics and An Analysis of Need.

Prepared for enXco Inc., October, 2004

Electricity, Renewables, and Climate Change: Searching for a Cost-Effective. Washington D.C.: Resources for the Future, May 2004.

The Clean Development Mechanism and Energy Efficiency Upgrades in Developing Countries: The Case of the Residential Sector in Selected Asian Countries. Proceedings of the 3rd International Conference on Energy Efficiency in Domestic Appliances and Lighting. Turin, Italy, October 1-3, 2003.

TESTIMONY

Assisted in the preparation of "Testimony on New Jersey Natural Gas Company's Proposed Energy Efficiency Program." Testimony of David Nichols, prepared for New Jersey Division of the Ratepayer Advocate, July 9, 2010.

Assisted in the preparation of "Testimony on Philadelphia Gas Works' Proposed Energy Efficiency Plan." Testimony of David Nichols, prepared for Pennsylvania Office of Consumer Advocate, March 26, 2010.

Assisted in the preparation of "Testimony Regarding Florida Demand Side Management Policy and Planning." Testimony of William Steinhurst, prepared for Natural Resources Defense Council, and Southern Alliance for Clean Energy, July 6, 2009.

Assisted in the preparation of "Testimony Regarding Interstate Power and Light Company's Proposed Energy Efficiency Program." Testimony of Chris James, prepared for Community Coalition, and Plains Justice, August 29, 2008.

Assisted in the preparation of "Testimony Regarding Nova Scotia Power Inc's Demand Side Management Plan." Testimony of Bruce Biewald and David Nichols, prepared for Nova Scotia Utility and Review Board, March 17, 2008.

Assisted in the preparation of "Testimony on Review of the Nevada Power Company's Demand Side Management Plan in the 2006 Integrated Resource Plan". Testimony of Tim Woolf, prepared for Nevada Bureau of Consumer Protection, September 13, 2006.

Assisted in the preparation of "Review of Pacific Gas and Electric's Application to Establish a Demonstration Climate Protection Program and Tariff Option. Testimony of Amy Roschelle, prepared for The Utility Reform Network (TURN), May 5, 2006.

Assisted in the preparation of "Testimony Regarding the Sierra Pacific Power Company's Gas Demand-Side Management Plan." Testimony of Timothy Woolf, prepared for Nevada Bureau of Consumer Protection, February 22, 2006.

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PROFESSIONAL EXPERIENCE

Synapse Energy Economics Inc., Cambridge, MA. Associate, 2010 – present, Research Associate, 2008 – 2010.

Performs consulting, conducts research, and assists in writing testimony and reports on a wide range of issues relating to electric utilities, including federal and state clean air policies; emissions from electricity generation; environmental compliance technologies, strategies, and costs; integrated resource planning; valuation of environmental externalities from power plants; and the nexus between water and energy. Uses optimization and electricity dispatch models, including Strategist, PROMOD, and PROSYM/Market Analytics, to conduct analyses of utility service territories and regional energy markets.

Analysis Group, Inc., Boston, MA. Associate, Energy Practice, 2007 - 2008.

Supported an expert witness asked to opine on various topics in the electric industry as they applied to merchant generators and provided incentives for their behavior in the late 1990s and early 2000s. Analyzed data related to coal production on Indian land and contractual royalties paid to the tribe over a 25 year period to determine if discrepancies exist between these values for the purposes of potential litigation. Examined Canadian policies relating to carbon dioxide, and assisted with research on linkage of international tradable permit systems. Managed analysts' work processes and evaluated work products.

Senior Analyst Intern, Energy Practice, 2006 - 2007.

Supported an expert witness in litigation involving whether a defendant power company could financially absorb a greater investment in pollution control under its debt structure while still offering competitive rates. Analyzed impacts of federal and state clean air laws on energy generators and providers and built a quantitative model showing the costs of these clean air policies to the defendant over a 30 year period. Built a financial model calculating impacts of various pollution control investment requirements. Researched the economics of art; assisted in damage calculations in arbitration between an artist and his publisher.

Yale Center for Environmental Law and Policy, New Haven, CT. Research Assistant, 2005 – 2007.

Gathered and managed data for the Environmental Performance Index, presented at the 2006 World Economic Forum. Interpreted statistical output, wrote critical analyses of results, and edited report drafts. Part of the team that produced *Green to Gold*, an award-winning book on corporate environmental management and strategy. Managed data, conducted research, and implemented marketing strategy.

CERES, Boston, MA. Student Consultant, Spring 2006.

As part of a four-person team, made strategic recommendations on all aspects of messaging and engagement to encourage corporate directors to act on the issue of climate change. First strategic recommendation was sustainable governance forums, which were profiled in New York Times article “Global Warming Subject for Directors at Big Companies” on September 21, 2006.

Marsh Risk and Insurance Services, Inc., Los Angeles, CA. Risk Analyst, Casualty Department, 2003 – 2005.

Evaluated Fortune 500 clients’ risk management programs/requirements and formulated strategic plans and recommendations for customized risk solutions. Supported the placement of \$2 million in insurance premiums in the first year and \$3 million in the second year. Utilized quantitative models to create loss forecasts, cash flow analyses and benchmarking reports. Completed a year-long Graduate Training Program in risk management; ranked #1 in the western region of the US and shared #1 national ranking in a class of 200 young professionals.

EDUCATION

Yale School of Forestry & Environmental Studies, Master of Environmental Management, New Haven, Connecticut, 2007.

Concentration in Law, Economics, and Policy with a focus on energy issues and markets.

Claremont McKenna College, Bachelor of Arts in Environment, Economics, Politics (EEP) Claremont, California, 2003.

cum laude and EEP departmental honors.

School for International Training Quito, Ecuador. Spring 2002.

Semester abroad studying Comparative Ecology. Microfinance Intern – Viviendas del Hogar de Cristo in Guayaquil, Ecuador.

SKILLS AND ACCOMPLISHMENTS

Microsoft Office Suite, Lexis-Nexis, Platts Energy Database, Strategist, PROMOD, and PROSYM/Market Analytics, some SAS and STATA.

Competent in oral and written Spanish.

Hold the Associate in Risk Management (ARM) professional designation.

PUBLICATIONS AND PRESENTATIONS

Johnston, L., and R. Wilson. *Global Best Practices: Strategies for Decarbonizing Electric Power Supply*. Prepared for Regulatory Assistance Project (RAP). December 14, 2011.

Hornby, R., P. Chernick, C. Swanson, D. White, J. Gifford, M. Chang, N. Hughes, M. Wittenstein, R. Wilson, and B. Biewald. *Avoided Energy Supply Costs in New England: 2011 Report*. Prepared for the Avoided-Energy-Supply-Component (AESC) Study Group. July 21, 2011.

Wilson, R. and Paul Peterson. *A Brief Survey of State Integrated Resource Planning Rules and Requirements*. Prepared for the American Clean Skies Foundation. April 28, 2011.

Johnston, L., E. Hausman., B. Biewald, R. Wilson, and D. White. *2011 Carbon Dioxide Price Forecast*. February 11, 2011.

Fisher, J., R. Wilson, N. Hughes, M. Wittenstein, and B. Biewald. *Benefits of Beyond BAU: Human, Social, and Environmental Damages Avoided Through the Retirement of the US Coal Fleet*. Prepared for the Civil Society Institute. January 25, 2011.

Peterson, P., V. Sabodash, R. Wilson, and D. Hurley. *Public Policy Impacts on Transmission Planning*. Prepared for Earthjustice, December 21, 2010.

Fisher, J., S. Levy, Y. Nishioka, P. Kirshen, R. Wilson, M. Chang, J. Kallay, and C. James. *Co-Benefits of Energy Efficiency and Renewable Energy in Utah*. Prepared for the State Energy Office of Utah, March 2010.

Wilson, R. "The Energy-Water Nexus: Interactions, Challenges, and Policy Solutions." Presented at the National Drinking Water Symposium 2009, October 2009.

Fisher, J., C. James, L. Johnston, D. Schlissel, R. Wilson, *Energy Future: A Green Alternative for Michigan*. Prepared for Natural Resources Defense Council and Energy Foundation, August 2009.

Schlissel, D., R. Wilson, L. Johnston, D. White, *An Assessment of Santee Cooper's 2008 Resource Planning*. April 2009.

Schlissel, D., A. Smith, R. Wilson, *Coal-Fired Power Plant Construction Costs*. July 2008.

TESTIMONY

Kentucky Public Services Commission. Direct testimony before the Commission on behalf of Sierra Club and Natural Resources Defense Council. Testimony included discussion of STRATEGIST modeling relating to the applications of Kentucky Utilities Company, and Louisville Gas and Electric Company for Certificates of Public Convenience and Necessity, and approval of its 2011 compliance plan for recovery by environmental surcharge. September 16, 2011.

Minnesota Public Utilities Commission. Rebuttal testimony before the Commission on behalf of Izaak Walton League of America, Fresh Energy, Sierra Club, and Minnesota Center for Environmental Advocacy. Testimony described STRATEGIST modeling performed in the docket considering Otter Tail Power's application for an Advanced Determination of Prudence for BART retrofits at its Big Stone plant. September 7, 2011.

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