

**COMMONWEALTH OF VIRGINIA  
BEFORE THE  
STATE CORPORATION COMMISSION**

**APPLICATION OF )  
)  
TRANS-ALLEGHENY INTERSTATE LINE )  
COMPANY )  
)  
For certificates of public convenience )  
and necessity to construct facilities: )  
500 kV Transmission Line from )  
Virginia-West Virginia Boundary to )  
Virginia Electric and Power Company )  
Transmission Line #580 )**

**CASE NO. PUE-2007-00033**

**REBUTTAL TESTIMONY OF  
DR. JAY ZARNIKAU**

**February 5, 2008**

1    **I.    INTRODUCTION**

2    **Q.**    PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

3    **A.**    My name is Jay Zarnikau. My business address is 1515 Capital of Texas Hwy, South,  
4           Suite 110, Austin, Texas, 78746.

5    **Q.**    BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

6    **A.**    I am the president of Frontier Associates LLC. We provide consulting assistance to  
7           energy consumers, electric and gas utilities, and government agencies on topics related to  
8           energy economics and pricing, utility cost allocation and rate design, forecasting,  
9           resource planning, energy efficiency program design and evaluation, and energy and  
10          regulatory policy. We also manage a number of energy efficiency programs, including  
11          new home construction energy efficiency programs and air conditioner replacement  
12          programs for utilities, and lighting retrofit projects for hotel chains around the country.

13   **Q.**    PLEASE STATE BRIEFLY YOUR EDUCATIONAL BACKGROUND AND  
14          PROFESSIONAL QUALIFICATIONS.

15   **A.**    I have a Ph.D. degree in Economics from the University of Texas. I completed  
16          undergraduate studies in Business Administration and Economics at the State University  
17          of New York and McGill University in Canada.

18          From 1983 through 1991, I was employed by the Public Utility Commission of Texas,  
19          where I served as the Manager of Economic Analysis from 1985 through 1988; as the  
20          Assistant Director of the Electric Division from 1987 to 1988; and as the Director of the

1 Electric Utility Regulation from 1988 to 1991. From 1991 through 1993, I held a faculty-  
2 level research position at The University of Texas College of Engineering Center for  
3 Energy Studies. I served as a vice president at Planergy, Inc. from 1992 to 1999. Since  
4 1999, I have been president of Frontier Associates LLC.

5 I have written a number of reports and journal articles on the topics of energy policy, rate  
6 design, energy efficiency, demand response, and electric utility restructuring. I currently  
7 teach graduate-level classes in statistics at the University of Texas as a part-time Visiting  
8 Professor at the LBJ School of Public Affairs and in the College of Natural Sciences.

9 My resume, which is attached to this rebuttal testimony as TrAILCo Rebuttal Exhibit JZ-  
10 1, describes in greater detail my educational background and prior work experience.

11 **Q.** ON WHOSE BEHALF ARE YOU APPEARING IN THIS PROCEEDING?

12 **A.** I am appearing on behalf of Trans-Allegheny Interstate Line Company (“TrAILCo”).

13 **Q.** WHAT IS THE PURPOSE OF YOUR REBUTTAL TESTIMONY IN THIS  
14 PROCEEDING?

15 **A.** My rebuttal testimony explores whether the transmission facilities (*i.e.*, the 502 Junction  
16 to Loudoun line) proposed by TrAILCo in this proceeding and similar proceedings in  
17 West Virginia and Pennsylvania could be displaced if Allegheny Power were to  
18 aggressively implement demand side management (“DSM”) programs. Specifically, my  
19 testimony rebuts certain statements contained in the testimony of Piedmont  
20 Environmental Council witness Daniel Violette, Staff of the Virginia State Corporation  
21 Commission (“Staff”) witnesses Nicolas Puga and Songhoon (Spencer) Yang, Fauquier

1 County Board of Supervisors witness Lamine Mili, and Virginia's Commitment LLC  
2 witness Ren Orans. In addition, my testimony addresses statements made at various  
3 public hearings regarding the ability to displace the proposed transmission facilities  
4 through DSM.

5 **Q.** WILL THE USE OF VARIOUS TERMS IN YOUR REBUTTAL TESTIMONY BE  
6 CONSISTENT WITH THE DEFINITIONS ASSIGNED TO THOSE TERMS IN THE  
7 TABLE OF NOMENCLATURE ATTACHED TO TRAILCO'S APPLICATION AS  
8 EXHIBIT 2?

9 **A.** Yes. In addition, I may define other terms in my rebuttal testimony.

10 **II. SUMMARY OF CONCLUSIONS**

11 **Q.** PLEASE SUMMARIZE YOUR CONCLUSIONS.

12 **A.** I have concluded that the aggressive implementation of a comprehensive set of energy  
13 efficiency and DSM programs by Allegheny Power would not be a reasonable substitute  
14 for the planned transmission line from the 502 Junction Substation to Loudoun County,  
15 Virginia, in light of the level of demand reduction that would be required and the  
16 timeframe in which these transmission facilities are needed.

17 **Q.** PLEASE DESCRIBE THE ORGANIZATION OF YOUR REBUTTAL TESTIMONY  
18 IN THIS PROCEEDING.

19 **A.** My testimony is organized as follows:

- 1           • Section III explores both the value and the limitations of relying upon DSM as an  
2           alternative to transmission facilities.
- 3           • Section IV demonstrates that it would not be feasible to displace the transmission  
4           facilities proposed by TrAILCo in this proceeding through an aggressive  
5           implementation of DSM programs, due to the timing and magnitude of the resource  
6           need.
- 7           • Section V comments on some specific statements contained in the testimonies of  
8           various witnesses.

9   **III.   DSM AS A RESOURCE**

10 **Q.**   PLEASE DEFINE THE TERM “DSM” AS IT IS USED IN THIS REBUTTAL  
11       TESTIMONY.

12 **A.**   “DSM” refers to actions taken by a utility to manage the demand for electricity. Such  
13       actions might include programs or pricing strategies designed to affect the level or  
14       temporal pattern of electricity consumption.

15       DSM encompasses the concepts of “energy efficiency” and “demand response.” “Energy  
16       efficiency” may be thought of as improvements in the technical efficiency of end use  
17       devices or systems, while “demand response” efforts are designed to foster the shifting or  
18       cycling of loads.

19 **Q.**   DO YOU AGREE WITH THE GENERAL CONTENTION THAT THERE ARE  
20       OPPORTUNITIES TO REDUCE DEMAND IN THE AREAS WHICH WILL BE

1           SERVED BY THE TRANSMISSION FACILITIES PROPOSED BY TRAILCO IN  
2           THIS PROCEEDING, AS SUGGESTED IN THE DIRECT TESTIMONY OF  
3           WITNESSES VIOLETTE, ORANS, AND MILI?

4   **A.**    Yes. I have no doubt that there are numerous opportunities for demand reduction and  
5           energy conservation in the areas to be served by these facilities and in the PJM market in  
6           general. However, as discussed later in my testimony, I am concerned that some  
7           information provided by these witnesses may overstate the potential for DSM, or that  
8           they may fail to fully appreciate the difficulties in establishing significant and effective  
9           programs.

10 **Q.**    VARIOUS WITNESSES SUGGEST THAT DSM CAN BE USED TO DISPLACE THE  
11           NEED FOR TRANSMISSION FACILITIES IN A COST-EFFECTIVE MANNER. DO  
12           YOU AGREE WITH THIS CONTENTION?

13 **A.**    I agree that, in many situations, DSM can play a valuable role in reducing the rate of  
14           growth in the demand for electricity, thus sometimes potentially delaying or deferring the  
15           need for additional transmission infrastructure. This is not one of those times, however.  
16           Moreover, there are a number of limitations to the use of DSM as an alternative to  
17           transmission investments that also must be considered.

18 **Q.**    PLEASE IDENTIFY THOSE LIMITATIONS.

19 **A.**    These limitations include:

- 20           •    The “lead time” required to plan and “build up” a DSM program.

- 1           • The uncertainties inherent in relying upon customer behavior and customer  
2           participation in voluntary programs to meet a resource need.

3 **Q.** PLEASE COMMENT ON THE LEAD TIME NECESSARY TO PLAN, IMPLEMENT,  
4           AND BUILD UP A DSM PROGRAM INTO A SIGNIFICANT SYSTEM RESOURCE.

5 **A.** Just as transmission investments involve some planning, permitting, and construction  
6           time, DSM programs require lead time for market research, planning, regulatory  
7           approval, and start-up activities. One significant difference between the two resources is  
8           that the full capacity of a transmission line or substation may be available once the  
9           project is complete. DSM programs, on the other hand, normally require some “ramp  
10          up” time and some time for the cumulative effects of the program to build up into a  
11          significant system resource. Some programs can be implemented fairly quickly. But  
12          some programs take longer than others to achieve significant impacts. Consequently, it  
13          can take a number of years for a comprehensive set of programs to contribute a  
14          significant level of demand reduction.

15          The following steps would normally be required:

- 16          • Market research to identify specific energy efficiency opportunities.
- 17          • Cost-benefit analyses, to determine which energy efficiency opportunities might  
18          be exploited through a utility program in a cost-effective manner (e.g., at a cost  
19          lower than comparable supply-side investments).
- 20          • Review of program design and program delivery options.

- 1           •       Program design to establish incentive levels or promotional mechanisms, targeted  
2                    levels of participation and impacts, marketing channels, and evaluation plans.  
3                    This may involve further cost-benefit analyses.
- 4           •       Staffing and program management, including the establishment of databases,  
5                    contracts, and internal procedures.
- 6           •       Program rollout, including marketing and outreach.

7           Of course, these steps are in addition to any regulatory review processes, such as  
8                    approval by this Commission, which is uncertain as to process, timing and outcome.

9           It is my understanding that the regulatory timetable for approving DSM programs  
10                   proposed by utilities in Virginia is open-ended, and that obtaining the necessary  
11                   approvals can require considerable time. For example, in the processing of Virginia  
12                   Electric and Power Company's application for DSM pilot programs (PUE-2007-00089),  
13                   public comments were solicited and the application was reviewed by the Corporation  
14                   Commission's Staff and these activities have required significant time. This implies that  
15                   it would be difficult, if not impossible, to achieve significant demand reduction through  
16                   DSM programs by 2011.

17   **Q.**   PLEASE COMMENT ON THE UNCERTAINTIES INHERENT IN RELYING UPON  
18           CUSTOMER BEHAVIOR AND CUSTOMER PARTICIPATION IN VOLUNTARY  
19           PROGRAMS TO MEET A RESOURCE NEED.

1 A. Because DSM programs tend to rely upon voluntary participation by energy consumers,  
2 there is considerable uncertainty inherent in estimating or projecting future program  
3 impacts. Some of this uncertainty can be minimized through careful market research and  
4 planning. However, the efficacy of a demand reduction program that relies upon  
5 consumer behavior is likely to remain much more uncertain than the performance of  
6 transmission infrastructure.

7 **Q.** WHAT HAS BEEN THE TRACK RECORD OF OTHER UTILITIES THAT HAVE  
8 ATTEMPTED TO RELY UPON DSM PROGRAMS AS A MEANS OF DISPLACING  
9 THE NEED FOR TRANSMISSION INVESTMENTS?

10 A. The record has been mixed at best. Programs have been implemented in Connecticut and  
11 Long Island with some success but at great cost. In 2006, two efforts in Texas met with  
12 little success. American Electric Power sought to reduce demand in a transmission-  
13 constrained area of the Rio Grande Valley by 5 MW, but only achieved a 1 MW demand  
14 reduction through a load management program (all from a single customer). CenterPoint  
15 Energy sought demand reduction in a transmission-constrained portion of its network in  
16 Houston, but failed to sign up any customers to its targeted load management program.

17 **Q.** ARE THERE OTHER PROBLEMS INHERENT IN ANY ATTEMPT TO USE DSM  
18 TO DISPLACE THE NEED FOR THE TRANSMISSION FACILITIES PROPOSED  
19 BY TRAILCO IN THIS PROCEEDING?

1 A. Yes. The demand for electricity outside of areas served by Allegheny Power is partially  
2 responsible for the need for the proposed transmission facilities. Consequently, the  
3 growth in demand and DSM efforts of a number of utilities has an effect on the need for  
4 the proposed line. Yet, TrAILCo has little or no influence on the DSM efforts of those  
5 neighboring utilities.

6 **Q.** WOULD INITIATIVES TO LAUNCH DSM PROGRAMS BY OTHER UTILITIES  
7 THAT MIGHT BENEFIT FROM THIS LINE FACE CHALLENGES SIMILAR TO  
8 THOSE THAT YOU HAVE REPORTED HERE?

9 A. Yes. New DSM programs undertaken by other utilities would require planning and a  
10 ramp-up period. For many utilities, regulatory approvals are required before a utility can  
11 undertake a new program.

12 **IV. DEMAND SIDE MANAGEMENT INITIATIVES WITHIN THE ALLEGHENY**  
13 **POWER SERVICE AREA CANNOT AFFECT THE NEED FOR THE 502**  
14 **JUNCTION TO LOUDOUN LINE**

15 **Q.** BASED ON YOUR REVIEW OF THE TESTIMONY OF WITNESSES VIOLETTE,  
16 ORANS, MILI, PUGA, AND YANG, DO ANY OF THESE WITNESSES CONCLUDE  
17 THAT DSM CAN FULLY DISPLACE THE NEED FOR THE TRANSMISSION  
18 FACILITIES PROPOSED BY TRAILCO IN THIS PROCEEDING?

19 A. Dr. Orans maintains that demand response applied at a regional level could provide a  
20 practical and cost-effective solution for the Doubs line overloading problem. But he has

1 not provided any analysis to support this contention. He suggests that load reduction  
2 scenarios involving demand response should be studied by Dominion.

3 Dr. Violette notes the progress that the PJM market is making toward demand response  
4 and energy efficiency and correctly notes that there is substantial remaining potential.  
5 Yet he properly falls short of concluding that demand response or other forms of DSM  
6 could fully displace the need for TrAIL.

7 Professor Mili suggests that an alternative to TrAIL would be to “provide financial  
8 incentives (i.e., reduced pricing) to industrial customers to lower their demand during  
9 peak hours.” (Mili at 16). Yet, he did not include in his testimony any analysis of the  
10 feasibility of using this approach to displace TrAIL.

11 Mr. Puga and Dr. Yang concluded that the demand reduction scenarios that they had  
12 considered in their independent analysis were not feasible.

13 **Q.** IS IT POSSIBLE TO DISPLACE THE NEED FOR THE PROPOSED LINE FROM  
14 THE 502 JUNCTION SUBSTATION TO THE LOUDON SUBSTATION IN  
15 LOUDOUN COUNTY, VIRGINIA?

16 **A.** No. According to the rebuttal testimony of TrAILCo witness Hozempa, a peak demand  
17 reduction of 36%, or 829.4 MW, in the Allegheny Power Transmission Zone would be  
18 required by 2011 to eliminate the need for this line. According to Mr. Hozempa’s  
19 testimony, this is approximately one-third of the total Potomac Edison Company load,  
20 plus some West Penn Power Company load in Pennsylvania. In my judgment, it would  
21 be virtually impossible to reduce demand by this magnitude within this timeframe by

1           relying upon DSM programs. To the best of my knowledge, achieving such a high level  
2           of demand reduction in such a short period of time in a utility system of this size would  
3           be unprecedented

4   **V.   FURTHER COMMENTS REGARDING THE TESTIMONIES OF ORANS AND**  
5   **VIOLETTE**

6   **Q.**   ON P. 72 OF HIS DIRECT TESTIMONY, DR. ORANS NOTES THAT IT WOULD BE  
7           UNREASONABLE TO ASSUME THAT RETAIL ELECTRICITY CUSTOMERS IN  
8           VIRGINIA COULD THEMSELVES SOLVE THE DOUBS LINE'S OVERLOADING  
9           PROBLEM VIA DEMAND RESPONSE, AND SUGGESTS THAT A MORE  
10          RELEVANT QUESTION IS "DOES DEMAND RESPONSE PROVIDE A  
11          PRACTICAL AND COST-EFFECTIVE SOLUTION WHEN APPLIED AT A  
12          REGIONAL LEVEL TO SOLVE A REGIONAL PROBLEM?" PLEASE COMMENT  
13          ON DR. ORANS' POINT.

14   **A.**   I have not studied whether it would be technically feasible for a more aggressive *regional*  
15          demand response initiative to fully displace the need for TrAIL, and thus I cannot  
16          respond to Dr. Orans' contention that this scenario would indeed solve the reliability  
17          problem. However, even if this were technically feasible, I believe that an aggressive  
18          regional demand response initiative would face a number of practical challenges. It  
19          would prove difficult for this Commission or any other state commission to require the  
20          creation of the necessary utility programs in other states. The creation of such programs  
21          is outside of the control of any parties to this proceeding. As I have noted earlier,

1 regulatory approvals are necessary before many of the utilities in this region could offer  
2 new programs, and the approval processes can often be lengthy and cumbersome.  
3 Consequently, I am highly skeptical that an aggressive coordinated regional demand  
4 response initiative could be implemented within the short timeframe in which the TrAIL  
5 project is needed.

6 **Q.** DOES THIS CONCLUDE YOUR REBUTTAL TESTIMONY?

7 **A.** Yes. However, I reserve the right to file such additional testimony as may be necessary  
8 or appropriate.

9

**Jay Zarnikau, PhD**  
President, Frontier Associates LLC  
1515 S. Capital of Texas Hwy  
Suite 110  
Austin, TX 78746  
Phone: (512) 372-8778  
Fax: (512) 372-8932  
email: jayz@frontierassoc.com

## PROFESSIONAL EXPERIENCE

- 1999- President, Frontier Associates, Austin, Texas**  
Responsible for providing assistance in the design and implementation of energy efficiency programs, utility resource planning, electricity pricing, rate analysis/design, program evaluation, demand forecasting, and energy policy. Also assists industrial and commercial energy consumers in rate negotiations and energy procurement activities.
- 1992-1999 Vice President, Planergy, Austin, Texas**  
Responsible for providing assistance in the design and implementation of energy efficiency programs, and providing consulting assistance in the areas of utility resource planning, electricity pricing, program evaluation, demand forecasting, and energy policy.
- 1991-1993 Manager of Energy Strategies Research Program, The University of Texas at Austin Center for Energy Studies, Austin, Texas**  
Held faculty-level research position. Served on dissertation and thesis committees. Supervised independent study projects.  
Responsible for the oversight of research projects in the areas of utility resource planning, regulation, electricity pricing, and policy analysis.  
Coordinated a study of the technical and achievable potential for energy efficiency savings in Texas.  
Program Manager for EPRI-sponsored effort to develop a new integrated resource planning framework and model.
- 1983-1991 Director of Electric Utility Regulation (from 1988 to 1991), Economist (1983 to 1988) Public Utility Commission of Texas, Austin, Texas**  
Supervised a professional staff of over fifty accountants, economists, and engineers responsible for analyzing regulatory and technical issues and providing

recommendations to the Commission. Prepared and defended testimony in over twenty proceedings on topics including: load forecasting, rate design, cogeneration, system planning, demand-side management program impacts, billing determinants, wheeling, and computer modeling.

**1982-1983      Research Associate, Bureau of Business Research, University of Texas at Austin, Austin, Texas**

Assisted in maintenance of statewide economic-demographic forecasting model, prepared projections for state legislature and state agencies, and conducted studies to determine the value of various mineral resources in Texas.

**EDUCATION**

Ph.D. (1990) and M.A. (1983) in Economics, University of Texas at Austin

Fields completed in Econometrics, Resource Economics, and Micro Modeling

B.S. in Business Administration and Economics, State University of New York, Oswego, New York, May 1981

McGill University, Montreal, Quebec, 1979-1980

**PUBLICATIONS AND RESEARCH PAPERS**

***Refereed Journals:***

“Aggregate Consumer Response to Wholesale Prices in the Restructured Texas Electricity Market,” forthcoming in Energy Economics. 2007. With Ian Hallett.

“Industrial Energy Consumer Response to Wholesale Prices in the Restructured Texas Electricity Market,” with Greg Landreth, Ian Hallett, and Subal Kumbhakar. Energy -- the International Journal. 2007.

“Trends in Prices to Commercial Energy Consumers in the Competitive Texas Electricity Market,” Energy Policy. 2007. With Marilyn Fox and Paul Smolen.

“Testing Functional Forms in Energy Modeling: An Application of the Bayesian Approach,” Energy Economics, 2006. With Ni Xiao and Paul Damien.

“Consumer Demand for ‘Green Power’ and Energy Efficiency,” Energy Policy, 2003.

“Functional Forms in Energy Demand Modeling,” Energy Economics, 2004.

“When Different Types of Energy Resources are Aggregated for Use in Econometric Studies, Does the Aggregation Approach Matter?,” Energy Economics, 1999.

“Will Tomorrow’s Energy Efficiency Indices Prove Useful in Economic Studies?,” The Energy Journal, 1999.

“A Re-examination of the Causal Relationship between Energy Consumption and GDP,” Journal of Energy and Development, 1996.

"Can Different Energy Resources be Added or Compared?," Energy - The International Journal, 1995, Vol. 21, No. 6; with Philip Schmidt and Sid Guermouche.

“Advanced Pricing in Electrical Systems,” IEEE Trans. on Power Systems, 1995; with Martin Baughman and Shams Siddiqi.

"Integrating Transmission into IRP," IEEE Trans. on Power Systems, 1995; with Martin Baughman and Shams Siddiqi.

"Customer Responsiveness to Real-Time Pricing of Electricity," The Energy Journal, December 1990, Vol. 11, No. 4.

"Spot Market Pricing of Electricity," Forum for Applied Research and Public Policy, Winter 1990, Vol. 5, No. 4; with Martin Baughman and George Mentrup.

***Non-Refereed Journals, Proceedings, and Research Reports:***

“The Quest for Competitive Electricity Markets,” forthcoming in LBJ Journal of Public Affairs.

“Fostering Demand Response in Restructured Markets,” forthcoming in Competitive Electricity Markets: Design, Implementation and Performance, edited by Fereidoon P. Sioshansi.

“Will the Texas Market Succeed, Where So Many Others Have Now Failed?,” With Parviz Adib. Proceedings of the US Energy Association Conference. Houston. August 2007.

“Has Texas Achieved Too Much Demand Response?” 17<sup>th</sup> National Energy Services Conference Proceedings. January 2007.

“A Look Inside the Most Successful Restructured Electricity Market in North America: Texas,” Proceedings of IAEE Conference. Potsdam, Germany. May 2006.

“Texas: The Most Robust Restructured Electricity Market in North America,” in Electricity Market Reform: An International Perspective, Ed. Fereidoon Sioshansi and Wolfgang Pfaffenberger, Elsevier, 2007.

- “Changing Installation Practices of A/C Installers – Three Years of Results,” ACEEE Summer Study on Energy Efficiency in Building, 2006. With Mike Stockard and Phil Audet.
- “Using Demand Response Programs to Provide Operating Reserves in Wholesale Power Markets: A Case Study of the ERCOT Market,” US Energy Association’s Dialogue, 2006.
- “Do Industrial Energy Consumers Respond to Price Signals in the Restructured Texas Electricity Market?,” 15<sup>th</sup> National Energy Services Conference Proceedings, December 2004.
- “Will Tomorrow’s Restructured Markets Provide Opportunities to Better Determine the Value Of Demand-Side Resources?,” 14<sup>th</sup> National Energy Services Conference Proceedings, December 2003.
- “Energy Efficient Windows in the Southern Residential Windows Market,” ACEEE Summer Study Proceedings, with Alison Tribble, Kate Offringa, Bill Prindle, Dariush Arasteh, Arlene Stewart, and Ken Nittler. 2002.
- “The Window Market in Texas: Opportunities for Energy Savings and Demand Reduction,” Symposium on Improving Building Systems in Hot & Humid Climates, with Lauren Campbell, May 2002.
- “The Treatment of Demand-Side Resources in ERCOT’s Restructured Markets,” 12<sup>th</sup> National Energy Services Conference Proceedings, December 2001.
- “Electricity Resource Planning in Korea,” Discussion Paper, with Y.H. Kwun, 1999.
- “Agriculture: An Often-Overlooked Opportunity for Energy Conservation,” Strategic Planning for Energy and the Environment, with Alex Lee, 1997.
- “Energy Efficiency Opportunities in the Industrial Sector,” Energy Engineering, Vol. 93, No. 3, 1996; with Alex Lee.
- "Taking Advantage of Real-Time Pricing Programs to Reduce Energy Costs in Manufacturing," ACEEE Summer Study on Energy Efficiency in Industry Proceedings, August 1997.
- “Should Your Facility be Served Under a Real-Time Pricing Tariff?,” Energy Buyer’s Guide, December 1996.
- "Opportunities for Energy Efficiency in the Texas Industrial Sector," ACEEE Summer Study on Energy Efficiency in Industry Proceedings, August 1995; contributor.

"Measuring Negawatts," presentation to the Institute for Statistics and Decision Sciences, Duke University, 1994.

"Integrated Resource Planning in the United States," Proceedings of World Energy Council, Neptune, Romania, June 1994.

"Design and Implementation of a Demand Cooperative," Conference Proceedings: Demand-Side Management Opportunities and Perspectives in the Asia-Pacific Region, International Energy Agency, Seoul, November 1993.

"Real-Time Pricing of Electricity: An Assessment," in Proceedings of the Eleventh Annual Industrial Energy Technology Conference, Houston, September 1989; with Martin Baughman.

Opportunities for Energy Efficiency in the Texas Industrial Sector, for the Sustainable Energy Development Council, 1995; contributor and project leader.

Neoelectrification of Industry in the Information Age, for the Edison Electric Institute, 1994; with Philip Schmidt, Frederick T. Sparrow, and John Vanston.

Advanced Pricing in Electrical Systems, CES Discussion Paper, October, 1992; with Martin Baughman and Shams Siddiqi.

Comprehensive Electrical Systems Planning, Center for Energy Studies for the Electric Power Research Institute, 1994; with Martin Baughman and Shams Siddiqi.

Opportunities for Energy Efficiency in Texas, Center for Energy Studies, May 1992; with Bruce Hunn and other contributors.

## **OTHER ACTIVITIES**

Adjunct Lecturer and Visiting Professor, University of Texas LBJ School of Public Affairs. Taught graduate-level statistics classes during six of last nine semesters.

ERCOT Working Group on Demand Side Resources, Founder and Co-Chair (2001)

Board Member and Vice President for Publications, Association of Energy Services Professionals

Retail Energy Aggregators of Texas, Director, 2001-2003

State of Texas Energy Policy Partnership, Member, 1992

National Association of Regulatory Utility Commissioners Staff Subcommittee on Wheeling and Transmission, Member, 1990

Member of American Economic Association and International Association for Energy Economics (Vice President of local chapter).

Reviewer for International Energy Review, ACEEE Summer Study, Power Engineering Society, IEEE Transactions on Power Systems, Energy Economics, Energy Policy, and The Energy Journal

## TESTIMONY

*PUCT Docket No. 31540: Proceeding to Consider Protocols to Implement a Nodal Market in the Electric Reliability Council of Texas Pursuant to PUC Subst. R. 25.501.* Testimony before the Public Utility Commission of Texas (PUCT) on behalf of Nucor Steel and Chaparral Steel on demand side issues.

*Public Service Commission of South Carolina, Docket No. 2005-1-E: Progress Energy Carolinas, Inc. Annual Review of Base Rates for Fuel Costs.* Reviewed the utility's fuel costs and rates on behalf of a large industrial customer of the utility.

*Railroad Commission of Texas, Docket No. 9400: Application of TXU Gas Company for a Rate Increase.* Provided cost allocation and rate design testimony on behalf of a group of cities. Also provided testimony in a district court to support a Writ of Mandamus.

*U.S. Bankruptcy Court, Southern District, In re. Texas Commercial Energy, LLC, Case No. 03-20366-C-11.* Testified in support of a claim.

*Public Utility Commission of Texas (PUCT) Docket No. 23950: Petition of Reliant Energy to Establish Price to Beat Fuel Factor.* Presented (on the utility's behalf) a forecast of the Company's future sales of electricity.

*PUCT Docket No. 22537: Application of Reliant Energy HL&P to Implement Wholesale Power Service – General Land Office Rate Schedule.* Testified in support of tariff approval.

*PUCT Docket No. 22355: Application of Reliant Energy HL&P for Approval of Unbundled Cost of Service Rate.* Examined competitive opportunities that might be available to commercial and residential customers under various parties' rate design proposals.

*PUCT Docket No. 22349: Application of Texas-New Mexico Power Company for Approval of Unbundled Cost of Service Rate.* Requested (on behalf of the utility) funding for energy efficiency programs and system benefit fund programs.

*PUCT Docket No. 21527: Application of TXU Electric Company for Financing Order to Securitize Regulatory Assets.* Evaluated application on behalf of Nucor Steel.

*PUCT Docket No. 17942: Application for Approval of Time-of-Use Rate Options for TU Electric Company.* Analyzed utility proposal on behalf of Nucor Steel Company.

*PUCT SOAH Docket No. 473-96-0333: Application of TU Electric Company for Real-Time Pricing Proposal in Compliance with the Commission's Order in Docket No. 14570.* Analyzed the utility's filing on behalf of Nucor Steel Company.

*PUCT Docket No. 9491: Texas-New Mexico Power Company rate case.* Described applicable prudence standards and explored purchased power, cogeneration, and conservation as alternatives to the completion of the TNP One power plant project. Analyzed the utility's filing on behalf of PUCT Staff.

*PUCT Docket No. 6992 Remand: Texas-New Mexico Power Company power plant certification case.* Projected the costs of standby, wheeling, purchased power and cogeneration over a forty-year horizon, and explored purchased power, cogeneration, and conservation as alternatives to the completion of the TNP One power plant project. Analyzed the utility's filing on behalf of PUCT Staff.

*PUCT Docket No. 9300: TU Electric rate case.* Recommended changes to proposed tariffs for interruptible service and explored other rate design and system planning issues. Analyzed the utility's filing on behalf of PUCT Staff.

*PUCT Docket No. 8425: Houston Lighting and Power Company rate case.* Analyzed proposed tariffs for interruptible service, standby service, economic development rates and wheeling services, and recommended alternative rates and calculation methodologies. Analyzed the utility's filing on behalf of PUCT Staff.

*PUCT Docket No. 8422: Rita Blanca Cooperative tariff application.* Proposed some modifications to the design of a proposed economic development tariff. Analyzed the utility's filing on behalf of PUCT Staff.

*PUCT Docket No. 8363: El Paso Electric Company rate case.* Provided recommendations regarding future generation mix and total fuels expenses. Analyzed the utility's filing on behalf of PUCT Staff.

*PUCT Docket No. 7460: El Paso Electric Company rate case.* Reviewed the demand forecasts upon which the utility relied in its decision to participate in the Palo Verde nuclear project. Analyzed the utility's filing on behalf of PUCT Staff.

*PUCT Docket No. 7195/6755: Gulf States Utilities Company rate case.* Reviewed the demand forecasts upon which the utility relied in its decision to initiate the River Bend nuclear project. Analyzed the utility's filing on behalf of PUCT Staff.

*PUCT Docket No. 6992: Texas-New Mexico Power Company power plant certification case.* Projected the availability of purchased power and confirmed its viability as an alternative to the proposed TNP One power plant. Analyzed the utility's filing on behalf of PUCT Staff.

*PUCT Docket No. 6184: Economic Viability for South Texas Unit 2.* Analyzed the capabilities of various resource planning models to assist in selecting an appropriate means of determining the

reasonableness of completing a nuclear power plant construction project. Analyzed the utility's filing on behalf of PUCT Staff.

*PUCT Docket No. 8191: Cherokee County Electric Cooperative rate case.* Reviewed adjustments to test-year sales, demand, and numbers of customers data. Analyzed the utility's filing on behalf of PUCT Staff.

*PUCT Docket No. 6375: Central Power and Light Company rate case.* Reviewed adjustments to test-year sales, demand, and numbers of customers data. Critiqued the utility's long-term load forecast. Analyzed the utility's filing on behalf of PUCT Staff.

*PUCT Docket No. 6105: Central Power and Light Company Avoided Cost calculation.* Recommended rejection of the utility's long-term load forecast for the purpose of calculating long-run avoided costs. Analyzed the utility's filing on behalf of PUCT Staff.

*PUCT Docket No. 6064: Houston Lighting and Power Company Avoided Cost calculation.* Reviewed the utility's demand projections. Analyzed the utility's filing on behalf of PUCT Staff.

*PUCT Docket No. 5994: Inquiry into the rates paid by Houston Lighting and Power Company to Qualifying Facilities.* Projected future demand for electricity on the utility system and the need for firm cogeneration capacity. Analyzed the utility's filing on behalf of PUCT Staff.

*PUCT Docket No. 8015: Amendment to TU Electric's certificate for the Comanche Peak nuclear plant.* Reviewed the utility's future demand and capacity needs. Analyzed the utility's filing on behalf of PUCT Staff.

*PUCT Docket No. 6526: TU Electric Company power plant certificate case.* Reviewed the utility's demand projections. Analyzed the utility's filing on behalf of PUCT Staff.

*PUCT Docket No. 5568: Texas-New Mexico Power Company rate case.* Reviewed adjustments to test-year sales, demand, and number of customers data, and miscellaneous operations and maintenance expenses. Analyzed the utility's filing on behalf of PUCT Staff.