

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In Re: Application for)
Determination of Need for)
an Intrastate Natural Gas)
Pipeline by SunShine)
Pipeline Partners)
_____)

Docket No.: 920807-GP
Filed: March 8, 1993

DIRECT TESTIMONY
OF
PETER S. FOX-PENNER
FOR
SUNSHINE PIPELINE PARTNERS



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DOCKET NO. 920807-GP
DIRECT TESTIMONY OF
PETER S. FOX-PENNER
ON BEHALF OF SUNSHINE PIPELINE PARTNERS

I. INTRODUCTION AND QUALIFICATIONS

Q. Please state your name and address.

A. My name is Peter S. Fox-Penner. My business address is 200 Clarendon Street, Suite 4300, Boston, Massachusetts 02116.

Q. What is your occupation?

A. I am an economist and a Vice President of Charles River Associates, an economics and management consulting firm with offices in Boston, Massachusetts and Washington, D.C. Charles River Associates specializes in analyses related to business decision-making, economic litigation, and regulatory proceedings. In addition, Charles River Associates provides general management and economic consulting services.

Q. Please summarize your education and professional experience relevant to this proceeding.

A. My education and professional experience has concentrated on economic and business issues in the

1 energy industries generally and electric and gas
2 utilities in particular. I hold a B.S. in
3 electrical engineering and an M.S. in mechanical
4 engineering from the University of Illinois, as
5 well as a Ph.D. in economics from the Graduate
6 School of Business at the University of Chicago.
7 At the University of Chicago my primary area of
8 study was industrial organization and regulation.
9 During and after my studies at the University of
10 Illinois, I was employed as a research engineer in
11 the University's Energy Research Group. My work
12 focused on economic and business issues in
13 regulated industries. Before entering the Ph.D.
14 program at the University of Chicago, I was Chief
15 (Research) Engineer at the Illinois Governor's
16 Office of Consumer Services, an agency devoted
17 exclusively to participation in utility regulatory
18 matters. My education, employment history, and
19 publications are described more completely in
20 Exhibit No. PFP-1.

21 Q. What are your duties at Charles River Associates?

22 A. My duties at Charles River Associates include
23 conducting and supervising studies of the electric
24 and gas utility industries, including demand
25 forecasts and integrated resource planning studies.

1 I have participated in studies of this nature for
2 several regulatory agencies, the U.S. Department of
3 Energy, the Edison Electric Institute, the Electric
4 Power Research Institute, the Gas Research
5 Institute, and various gas and electric utilities.
6 I have also authored a number of books and
7 publications on topics relating to energy and
8 environmental economics and regulation.

9 Q. Have you previously testified as an expert witness?

10 A. I have testified as an expert witness or authored
11 filings before the Federal Energy Regulatory
12 Commission, federal and state courts, and before
13 public utility commissions in Illinois,
14 Pennsylvania, California, Kansas, and Missouri.

15 II. PURPOSE OF TESTIMONY

16 Q. Please state the purpose of your testimony.

17 A. I have been asked by counsel for the SunShine
18 Pipeline Partnership (SPP) to prepare a long-range
19 forecast of natural gas demand by customers other
20 than electric generators, i.e. residential,
21 commercial, and industrial customers in the State
22 of Florida. of natural gas.

23 Q. Does this exhibit represent your complete testimony
24 in this proceeding?

25 A. No, it does not. This exhibit contains my

1 qualifications, a statement of purpose, and a
2 description of my approach to forecasting future
3 natural gas demand in Florida. The results and
4 conclusions of my analysis will be filed in the
5 near future.

6 Q. Please describe your approach to forecasting
7 residential, commercial, and industrial natural gas
8 demand in Florida over the next twenty years.

9 A. My approach to forecasting long-term natural gas
10 demand in these Florida markets involves several
11 components. First, I will assemble and analyze a
12 number of forecasts of Florida economic and
13 demographic activity, energy prices, energy
14 availability, and other "forecast drivers."
15 Second, I will analyze new gas and electric end use
16 technologies, such as natural gas vehicles and gas
17 air conditioning, to determine the impact of these
18 new technologies on future gas demand. Third, I
19 will construct a set of forecasting equations, or
20 "models," for each of the three sectors
21 (residential, commercial, and industrial). These
22 models will be combined with forecasts of economic
23 variables to predict statewide sales of natural gas
24 by sector during the next two decades.

25 Q. Does this complete this portion of your testimony

1 in this proceeding?

2 A. Yes, it does.

PETER S. FOX-PENNER - Vice President

Ph.D. Economics, Graduate School of Business, The University of Chicago
M.S. Mechanical Engineering (Energy Policy), University of Illinois
B.S. Electrical Engineering, University of Illinois

Dr. Fox-Penner is an economist with an engineering background and almost 20 years of experience in energy policy, regulation, and environmental economics. He has advised numerous public and private clients in settings that include expert testimony, complex economic litigation, confidential management-level assignments, public conferences and seminars, and publications. He is a seasoned administrator of large, complex research efforts and a skilled speaker and writer. He is familiar with most of the technical models and methods of analysis in use in the energy and environmental policy arenas.

During his career, Dr. Fox-Penner has researched, written, and/or consulted on a broad range of energy and environmental topics:

Energy and Environmental Policy

- Energy taxes
- Pollution permits and trading schemes
- Energy input-output modeling
- Net energy and process analysis
- Energy conservation - economics and policy
- Energy externalities
- Nuclear power: economics, litigation, and regulation
- Natural resource damages assessments
- Energy security policies and the strategic petroleum reserve
- Oil industry economics

Regulatory Economics and Industrial Organization

- Economics of vertical integration
- Price cap regulation
- Affiliate transactions and self-dealing
- Conservation incentive ratemaking
- Antitrust issues in utility mergers and acquisitions

- Lost profits calculations

Transportation Energy Use

- Mode-specific transportation energy studies
- Economics and marketing of alternative fuel vehicles
- Mode split elasticity studies
- Environmental and energy policy analyses

Gas, Electric, Telephone, and Water Utilities

- Load and sales forecasting; price elasticity studies
- Financial modeling
- Demand-side management programs – regulatory policies
- Competitive bidding programs
- Integrated resource planning
- Economics and regulation of electric power transmission
- New customer service rules
- Economic, financial, and regulatory aspects of nonutility generators

SELECTED PAST ASSIGNMENTS AND RESEARCH PROJECTS IN THESE AREAS

Gas, Electric, Telephone, and Water Utilities

- Dr. Fox-Penner directed the preparation and filing of an extensive study of line extension policies for one of the nation's largest natural gas distribution companies.
- Dr. Fox-Penner directed research and taught a workshop on new product marketing for one of the nation's largest natural gas utilities.
- Dr. Fox-Penner is the author of *Electric Power Transmission and Wheeling: A Technical Primer*. This introductory text, published by the Edison Electric Institute, is one of the few nontechnical descriptions of electric power transmission economics available to the public.
- Dr. Fox-Penner is project manager for a multiyear study of electric power bidding systems sponsored by the Electric Power Research Institute. This project examined utility experience with electric power solicitations in detail and published a

comprehensive industry sourcebook on the subject in Summer 1990.

- Dr. Fox-Penner has been an expert witness in several private lawsuits involving the nonutility power generation industry.
- Dr. Fox-Penner has presented expert testimony before the Illinois Commerce Commission on the financial incentives to engage in least-cost planning and the role of bidding systems in utility resource procurement. Many of the recommendations made by Dr. Fox-Penner have been adopted in a stipulation signed by all parties to the proceeding.
- Prior to coming to CRA, Dr. Fox-Penner directed a multiyear forecasting effort by a team of experts into the methods and data associated with long-range electric forecasts. In addition to presenting expert testimony, he led the team in preparing a 10-year peak-load forecast for the Commonwealth Edison service territory. In order no. 80-0706, the Illinois Commerce Commission endorsed the team's forecast and methodological suggestions.
- For a governmental agency, Dr. Fox-Penner prepared a long-range price forecast for a rural electric utility using accounting/forecasting software. Dr. Fox-Penner used proprietary financial simulation software to forecast future rates and led an effort to redesign the software to incorporate demand price elasticities. This study was released by the governmental agency and played a role in the renegotiation of construction financing for the rural electric system. This assignment preceded Dr. Fox-Penner's employment at CRA.
- Dr. Fox-Penner has advised several utilities on the design or administration of power purchase RFPs. In these assignments, he has led or directly participated in every phase of the power purchase process, from conceptual strategy through contract negotiation.
- In connection with a regulatory review of least-cost planning, Dr. Fox-Penner analyzed the analysis and management of the planning function of a major East Coast electric utility. The review process included extensive management interviews as well as the analytic review of the forecasting, planning, and human resource administration activities of the company.

- Dr. Fox-Penner has conducted economic and financial evaluations of several cogeneration projects on behalf of facility developers and electric utilities. These assignments included evaluations of the propriety of economic and financial assumptions, financial modeling, and analysis of contracts and negotiation strategies.
- Dr. Fox-Penner served as a consultant to a state governmental agency on the issue of local measured service in the telephone industry. This assignment was completed prior to 1986.
- Dr. Fox-Penner led CRA's efforts to assist a Southeastern U.S. electric utility with a large regulatory "build vs. buy" proceeding.
- For a utility in the Western United States, Dr. Fox-Penner assisted in the design and evaluation of demand-side bids.

Energy and Environmental Policy

- Dr. Fox-Penner assisted in the analysis of natural resource damages associated with the *Exxon Valdez* oil spill.
- For a client in the natural resources industry, Dr. Fox-Penner assisted in the preparation of a strategic marketing plan. The plan included regional assessments of the market for fossil fuels and econometric demand and price forecasts.
- Dr. Fox-Penner assisted in the development of extensive oil trading and oil market data in connection with litigation involving the trading activities of a Fortune 20 oil company.
- Dr. Fox-Penner has participated in a number of regulatory proceedings pertaining to the costs and benefits of investments in nuclear power and has served as an expert witness on numerous occasions. The issues he has addressed in these proceedings include nuclear capital budgeting, nuclear decommissioning costs and financing methods, and the benefits of a contract-based transfer of construction costs and ownership.
- For the U.S. Department of Energy, Dr. Fox-Penner has directed several assignments related to international energy policy and U.S. petroleum use. These assignments have examined international oil consumption, the policies of IEA member

countries, international oil transportation, emergency minimum operating requirements, the financial effects of rapid oil price run-ups, methods of indexing the value of U.S. petroleum stockpiles, and alternative release policies and mechanisms for the U.S. Strategic Petroleum Reserve.

- Dr. Fox-Penner has studied the welfare and efficiency implications of cost-benefit tests commonly used to evaluate DSM programs.

Regulatory Economics and Industrial Organization

- Dr. Fox-Penner managed the analysis of a multimillion dollar antitrust claim brought by a nonutility generation firm against a regulated public utility. The case presented somewhat unusual issues in the area of market definition and vertical foreclosure.
- Dr. Fox-Penner has advised the executives of a large U.S. electric utility in matters pertaining to a \$2 billion merger with another electric utility entity. In addition to providing boardroom-level advice, Dr. Fox-Penner served as an expert witness on behalf of the company in the United States Bankruptcy Court, District of New Hampshire. CRA's economic conclusions in this proceeding were endorsed by the court in its findings in docket no. 88-00043.
- Dr. Fox-Penner is an expert on the history and impacts of the Public Utilities Regulatory Policy Act of 1978 (PURPA). His work in this area includes his 1989 doctoral dissertation, several academic journal articles, and numerous presentations at industry conferences, including the 1989 Biennial Regulatory Information Conference of the National Regulatory Research Institute.
- Dr. Fox-Penner played a major role in the direction of economic research in securities litigation surrounding the largest municipal bond default on record. In an effort extending over two years, his responsibilities included economic research, computer modeling, assistance at depositions, and witness preparation.
- Dr. Fox-Penner has participated in the estimation of damages in a number of civil proceedings. He is familiar with econometric methods of damage estimation and is acquainted

with many of the prominent econometric software packages in use today.

- Dr. Fox-Penner has assisted in proceedings before the Federal Trade Commission and the Association of State Attorneys General. He is familiar with the application of economic doctrine to mergers, trade practices, and other matters of commercial and antitrust law.
- On behalf of a large Northeastern utility, Dr. Fox-Penner led a unique study that analyzed the process of obtaining wholesale power via negotiation and bidding. This study was filed in compliance with an order of the Massachusetts DPU and provided to regulatory agencies in the four other New England states.
- Dr. Fox-Penner has analyzed wholesale electric power system acquisitions for the purposes of determining changes in market power, as mandated by procedures established by the U.S. Federal Energy Regulatory Commission.

Transportation Energy Use

- Dr. Fox-Penner directed a large examination of the market potential for vehicles fueled by natural gas on behalf of a large California public utility.
- For a private client, Dr. Fox-Penner was a member of a team that examined the energy benefits of producing gasohol from a newly patented process. The results of this study were published in *Science Magazine* (November 16, 1979).
- In a series of assignments, Dr. Fox-Penner has analyzed the energy costs and benefits of a number of passenger and freight transportation modes using a national energy input-output model. This work was conducted on behalf of the U.S. Department of Energy and its predecessors prior to Dr. Fox-Penner's employment at CRA.
- Before coming to CRA, Dr. Fox-Penner appeared as an expert witness on the energy costs of railroad transportation in a matter before the Interstate Commerce Commission.
- Dr. Fox-Penner has examined regulatory policies issues involving the interface between utility regulation and

environmental regulation in the context of mobile source air emissions policies.

TESTIMONIAL EXPERIENCE

Dr. Fox-Penner appeared as an expert witness in the following proceedings:

- **Interstate Commerce Commission AB-19 (1977)**
Administrative Action: Railroad Abandonment Application
Subject of Testimony: Energy requirements for truck and rail transportation
Sponsor: B&O Concerned Citizens Committee
- **Illinois Commerce Commission 79-0071 (1979)**
Action: Request for Construction-Work-In-Progress Rates
Subject: Nuclear plant capital costs
Sponsor: Prairie Alliance
- **Illinois Commerce Commission 80-0706 (1980-1981)**
Action: Investigation into Commonwealth Edison's Construction Program
Subjects: a) introduction and defense of independent utility peak-load forecast; b) analysis of air conditioner appliance saturation; and c) analysis of natural gas prices
Sponsor: Senior Citizen's Advisory Council of Cook County
- **Illinois Commerce Commission 82-0010 (1982)**
Action: Approval of Utility Financing Plan
Subject: Analysis of utility capital budgets
Sponsor: Governor's Office of Consumer Services
- **Illinois Commerce Commission 82-0152 (1983)**
Action: Application for Increased Rates
Subject: Cost/benefit analysis of construction program continuation
Sponsor: Village of Buffalo, Illinois
- **Illinois Commerce Commission 84-0472 (1986)**
Action: Approval of Power Coordination (Pooling) Agreement
Subject: Cost/benefit analysis of Illinois participation in power pool
Sponsor: Village of Buffalo, Illinois

- **Illinois Commerce Commission 89-0034 (1989)**
Action: Least-Cost Planning, Statewide Proceedings
Subject: Role of bidding and conservation incentives in least-cost planning
Sponsor: Governor's Office of Consumer Services
- **United States Bankruptcy Court, District of New Hampshire, Case No. 88-00043**
Action: Confirmation hearing regarding the merger of Northeast Utilities and Public Service New Hampshire
Subject: Economics of the bulk power market relative to consumer choices under the merger
Sponsor: Northeast Utilities
- **Pennsylvania Public Utility Commission Docket No. P-890366**
Action: Request for approval of a competitive procurement system for nonutility generation (NUG)
Subject: Propriety and design of competitive procurements ("bidding systems") for NUGs
Sponsor: Metropolitan Edison
- **State of Michigan Circuit Court, Iron County, Case No. I-88-3985-CK**
Action: Private suit between cogeneration developer and steam host
Subject: Nature of transactions between cogenerators, steam hosts, and utilities
Sponsor: Indeck Power Equipment Company
- **U.S. Federal Energy Regulatory Commission, Docket EC91-2-000
State Corporation Commission of the State of Kansas, 174-155-U
Missouri Public Service Commission, Case No. EM-91-213**
Action: Merger of Kansas Power and Light and Kansas Gas & Electric
Subject: Economic aspects of the proposed merger
Sponsor: Kansas Power and Light

OTHER PROFESSIONAL EXPERIENCE

Professorial Lecturer, Center for Energy and Environmental Studies, Boston University, 1989-1992.

Fellow, Center for the Study of the Economy and the State, 1986.

Teaching Assistant (Industrial Organization), University of Chicago Graduate School of Business, 1985-1986.

Chief Engineer, Governor's Office of Consumer Services, Chicago, 1980-1983. Performed utility regulatory research and regulatory litigation analysis, formulated case strategy, presented expert witness testimony, and supervised witnesses.

Research Engineer, Office of Vice Chancellor for Research, University of Illinois, Urbana, 1977-1980. Maintained and operated national economic model. Performed policy analysis, edited and authored research proposals and publications, and provided research supervision.

Research Assistant, Center for Advanced Computation, University of Illinois, 1974-1977.

PROFESSIONAL ACTIVITIES

Member, Advisory Board, Center for National Policy
Associate Member, American Bar Association (Energy and Natural Resources and Antitrust)
Member, American Economic Association, International Association of Energy Economists; International Association of Environmental and Resource Economists; Association of Energy Engineers; Association of Demand-Side Management Professionals.

HONORS AND AWARDS

Who's Who in the East (1991, 1992)
Fellow, Center for the Study of Economy and the State, University of Chicago.
MIT Institute Fellowship.
Earle C. Anthony Fellowship.
Union Carbide Fellowship.
Michigan Annual Giving Scholarship.

Illinois State Scholar.
National Merit Scholar.
Sigma Tau Beta.
Phi Kappa Phi.
Eta Kappa Nu.

SELECTED PUBLICATIONS

"Total Quality Environmental Management in the Auto Industry: An Alternative to CAFE?" *Total Quality Environmental Management* (forthcoming, Spring 1993).

"Contracting Incentives in Electricity Generation Fuel Markets." With Karen Palmer, David Simpson, and Michael Toman, with the assistance of Gayle Killam. Arlington, VA: Public Utility Reports Press, 1992.

"Energy Utilities and Low-Pollution Vehicles: Economic and Competitive Issues." Mimeo, Charles River Associates, December 1992.

"Comparative Employment Impacts of Infrastructure Options." Mimeo, Charles River Associates, December 1992.

"Quality Maintenance and Monitoring in Price-Cap Regulation." Mimeo, Charles River Associates, Second Revision for Publication, June 1992.

"The Welfare Economics of Utility Conservation (DSM) Programs." May 1992.

"Due Diligence and the Demand for Electricity: A Cautionary Tale." With F.M. Fisher, J.E. Greenwood, William G. Moss, and Almarin Phillips. *Journal of Industrial Organization* 7 (1992): 117-149.

"The Future History of DSM - a Colloquy." *The Electricity Journal* 4 (December 1990): 46-49.

"Bidding Update." With Mark Horton and Peter Spinney. *Cogeneration & Resource Recovery* 9, no. 7 (November/December 1990): 6-11.

"Bid Policies Overhauled." With Edward Kee. *Cogeneration & Resource Recovery* 9, no. 7 (November/December 1990): 14-15.

"Cogeneration After PURPA: Energy Conservation and Industry Structure." *Journal of Law and Economics* 33 (October 1990): 517-552.

Competitive Procurement of Electric Utility Resources (EPRI CU-6898s). With Paul D. O'Rourke and Peter J. Spinney. Palo Alto, CA: Electric Power Research Institute, July 1990.

"Is Deintegrated Electric Generation Efficient? A Proposed Empirical Research Framework." *Proceedings of 13th Annual International Conference of the International Association of Energy Economists*. Copenhagen, Denmark, June 1990.

"On the Relationship Between the Need for Externality Corrections and the Point of Market Intervention." Prepared for International Society for Ecological Economics, Washington, D.C., May 23, 1990.

"Utility Regulation and DSM: Rethinking the Regulatory Boundaries." With Peter J. Spinney. Conference presentation. *DSM Bidding: Challenges and Opportunities*, Albany, New York, April 12, 1990.

Self-Dealing and Utility Generation Purchases: Precedents and Options. Boston, MA: Charles River Associates, January 1990.

"Regulating Independent Power Producers: Lessons of the PURPA Approach." *Resources and Energy* 12 (1990): 117-141.

Electric Power Transmission and Wheeling: A Technical Primer. Washington, D.C.: The Edison Electric Institute, 1990.

"IPP Bidding: The View From Today's Utilities." *Proceedings of the Third Annual Conference, American Cogeneration Association*, September 25-27, 1989.

"The Impact of Federal Cogeneration Legislation on Electric Utilities." Ph.D. dissertation, Graduate School of Business, The University of Chicago, August 1989.

"Purchasing Independent Generation: The Case for Negotiated Contracts." With Mary Smith. *Utility Opportunities in New Generation* (EPRI CU-6605). Palo Alto, CA: Electric Power Research Institute, June 1989.

"Least-Cost' Utility Regulation and Traditional Ratemaking: What's the Difference?" Mimeo, Charles River Associates, May 1989.

"An Econometric Analysis of the Impacts of PURPA Enforcement Differentials." *Proceedings of the Sixth NARUC Biennial Regulatory Information Conference*. National Regulatory Research Institute, September 1988.

"Allowing for Regulation in Forecasting Load and Financial Performance." *Public Utilities Fortnightly* (January 7, 1988).

"Price Formula Issues Associated with SPR Release Programs." Prepared for the Office of Energy Emergencies, U.S. Department of Energy, 1988.

"The Immediate Consequences of an Oil Supply Emergency for the Financial Markets and Major User Groups." Prepared for the Office of Energy Emergencies, U.S. Department of Energy, 1988.

"The Choice to Cogenerate: An Econometric and Regulatory Analysis." Curriculum paper, Graduate School of Business, The University of Chicago, Summer 1985.

"Independent Load Forecast for the Commonwealth Edison Service Territory." With others. Governor's Office of Consumer Services, Chicago, June 1981. ICC Docket No. 80-0706.

"The Norwegian Power Planning Process." Institute for Environmental Studies, University of Oslo, Norway, 1981.

"A 1972 Energy and Labor Commodity-Commodity Input-Output Model." With R. Herendeen. Energy Research Group, University of Illinois, Urbana, IL, March 1980.

"A Dynamic Input-Output Analysis of Net Energy Effects in Single Fuel Economics." Energy Research Group Document 274, March 1980. Reprinted in *Energy Systems and Policy* 5, no. 2 (1981).

"Correspondence Between the EDIO Input-Output Model and the ERG-90 and 360-Order Input-Output Model." Energy Research Group, University of Illinois, Urbana, IL, March 1980.

"Energy and Labor Cost of Alternative Coal-Electric Fuel Cycles." With J. Kurish. Energy Research Group, University of Illinois, Urbana, IL, February 1980.

"Handbook of Research Techniques." Energy Research Group Technical Memo 123. Revised December 1979.

"A Structure of the Electric Utility Industry, 1990." Energy Research Group Technical Memo 121, November 1979.

"Calculation of Alpha in the Determination of Primary Energy" With B. Hannon and R. Herendeen. Energy Research Group, University of Illinois, Urbana, IL, November 1979.

"Gasohol: Does It or Doesn't It . . . Produce Positive Net Energy?" With R.S. Chambers, R.A. Herendeen, and J.J. Joyce. *Science* 206, no. 4420 (November 1979): 789-795.

"Notes of the Bechtel ESPM/ERG I/O Bridge for Operating (Annual) and Capital (Investment) Costs, Purchasers Prices, 1978." Energy Research Group Technical Memo 119, August 1979.

"Transformation of Brookhaven National Laboratories 110-Order I/O Data into ERG-Usable Form." Energy Research Group Technical Memo 118, July 1979.

"1967-1977 Price Indices for Use with the Energy Research Group Energy Input-Output Policy Models." Energy Research Group Technical Memo 117, June 1979.

"Considerations of Energy Cost and Versatility in Choosing Optimal Stockpile Forms." *Resources Policy* 5, no. 2 (June 1979): 414-448.

"Direct Energy Transactions Matrix for 1971." Energy Research Group, University of Illinois, Urbana, IL, June 1979.

"The Acoustic Specification and Design of a Modern Recording Studio." *Journal of the Audio Engineering Society* (June 1979).

"An Energy Conservation Tax: Impacts and Policy Implications." With Bruce Hannon and Robert Herendeen. Energy Research Group Document 267, January 1979. Reprinted in *Energy Systems and Policy*.

"Considerations of Energy Cost and Versatility in Choosing Optimal Stockpile Forms." *Resources Policy* 5 (1979): 414-448.

"New Hybrid 1971 Energy Intensities." With R.A. Herendeen and T. Milke. *Energy* 4 (1979): 469-473.

"Cynics, Martyrs, and the Value of Energy Conservation." *Science and Public Policy* 5 (1978): 105-110.

"Background Energy Cost Calculations for ACR Gasohol Production." With Jack Joyce. Report to ACR Processes, Inc., November 1977.

"Net Energy Effects and Resource Depletion: An All-Nuclear Economy." With Clark Bullard and Donna Amado. Center for Advanced Computation Document 238, September 1977.

"Net Energy Effects and Resource Depletion: An All-Oil Economy." With Donna Amado. Center for Advanced Computation Document 231, April 1977.

"Standardization of Energy Accounting Techniques." Center for Advanced Computation Technical Memo 83, January 1977.

"Energy Analysis Handbook." With Clark Bullard and David Pilati. Center for Advanced Computation Document 214, October 1976. Also published by the Energy Research and Development Administration as *Energy Analysis: Handbook for Combining Process and Input-Output Analysis* (October 1976, ERDA 77-61). Also published in *Resources and Energy* (June 1979).

"Stockpile Optimization and Versatility Consideration for Strategic and Critical Materials." With Jaap Spek. Center for Advanced Computation Document 217, May 1976.

"Energy Requirements and Aerosol and Alternative Packaging: A Case Study." Center for Advanced Computation Document 204, February 1976. 2nd revision, July 1976.

"The Energy Research Group Resource Energy-Employment Model and Its Uses in Stockpile Policymaking." With Bruce Hannon. Report to the Office of Preparedness, General Services Administration, July 1975.

"The Coal Future: Capital and Fuel Cycle Energy Costs of a 1000 MW Nuclear Reactor." Appendix B to Michael Rieber's Center for Advanced Computation Document 163, May 1975.

"Summary of Techniques Used for Calculating the Energy Costs of Constructing a Commercial Nuclear Reactor." Center for Advanced Computation Technical Memo, April 1975.

"The Dollar, Energy and Labor Impact of 1971 Regular Route Intercity Bus Transportation." Center for Advanced Computation Technical Memo 31, July 1974.

"Energy Intensity of Motorcycle Travel." Center for Advanced Computation Technical Memo 30, July 1974.

"Energy Intensity of Electric Commuter Railways." Center for Advanced Computation Technical Memo 24, June 1974. Reprinted as "Total Energy and Labor Requirements for an Electric Commuter Railroad." *Energy* 3 (1978): 539-542.

"Energy and Labor Intensity of 1971 Motor Freight Transportation." Center for Advanced Computation Technical Memo 44, April 1974. Reprinted in *Resources and Energy* 1 (1978): 375-395.

CONFERENCE/SEMINAR PARTICIPATION

Panelist, "The Three 'Es' Under Clinton," NRECA 51st Annual Meeting, Dallas, TX, February 17, 1993

"Balancing Utility and ESCO Contract Risks." Presented at 9th Annual NAESCO Conference, *The Many Faces of DSM*, Washington, D.C., November 5, 1992.

Invited paper discussant, "What Environmentalists Need from Economists," Tufts University, Boston, MA, November 1992.

Panel Moderator, Natural Gas Procurement Strategies, Association of Energy Engineers Annual Conference, Boston, MA, June 1992.

Panel Moderator, Alternative Fuel Vehicles Conference, the Management Exchange, Washington, D.C., April 1992.

Presenter, American Water Works Association. Conservation Committee Workshop, Austin, TX, January 1992.

"The Future History of DSM." Plenary presentation, 5th National Demand-Side Management Conference, Boston, MA, August 1, 1991.

"Quality Monitoring and Price Cap Regulation." Ameritech Workshop on Regulation, University of Illinois, Urbana, IL, April 15, 1991.

"Visibility of the Buy Strategy - Bulk Power Transfers: Solution or Fatal Attraction?" The Management Exchange, *The Buy vs. Build Decision Conference*, Washington, D.C., March 22, 1991.

Attendee, U.S.-Japan Energy Policy Consultations, Atlantic Council of the United States, U.S. State Department, November 6-8, 1990.

"Industrials and Electric Utilities: Your Stake in the Future of Power." McGraw-Hill *Industrial and Utilities Conference*, Chicago, IL, October 22, 1990.

"Competitive Resource Procurement." With Paul O'Rourke and Peter Spinney. CRA/EPRI BIDMET Workshop Conference, Denver, CO, October 10, 1990.

"Is Deintegrated Electric Generation Efficient? A Proposed Empirical Research Framework." Presentation for the 13th Annual International Conference of the International Association for Energy Economics - Integrated Energy Markets and Energy Systems - Lessons and Perspectives, Copenhagen, Denmark, June 19, 1990.

"Competitive Resource Procurement: Where Are We Going?" Presentation to the EEI Interconnection Arrangements Committee, Richmond, VA, April 20, 1990.

"Utility Regulation and DSM: Rethinking the Regulatory Boundaries." Presentation with Peter Spinney. *DSM Bidding: Challenges and Opportunities*, Albany, NY, April 12, 1990.

Electric Policy Symposium, sponsored by Columbia University's Center for Law and Economic Studies, Columbia University, New York, NY, April 6, 1990.

"An Introduction to Competitive Power Procurement." Presentation to the Center for Regulatory Studies, Workshop on Competitive Bidding, Chicago, IL, May 9, 1990.

"Is Deintegrated Electricity Efficient?" Presentation, *Resources for the Future*, Washington, D.C., February 14, 1990.

Chaired session, Cogeneration IPPs - Current Developments, sponsored by the Association of Energy Engineers as part of the 12th World Energy Engineering Congress, October 25, 1989.

EPRI BIDMET Workshops, Chicago, IL, October 18, 1989.

Moderator for the Market Perspectives 5 session: "Managing the Risks of Participating in Bidding. The American Cogeneration Association and Cogeneration & Independent Power Coalition of America's (ACA/CIPCA) 3rd Annual Meeting and Exposition: *Competitive Power in the Nineties and Beyond*, San Francisco, CA, September 25, 1989.

Panel on least-cost utility regulation, NASUCA Conference, Columbus, OH, June 15, 1989.

Seminar on electric power transmission, RETSIE Conference, Santa Clara, CA, June 19, 1989.

"Purchasing Independent Generation: The Case for Negotiated Contracts." Presentation with Mary Smith, EEI/EPRI Utility Opportunities for New Generation, Boston, MA, June 29, 1989.

"The Effects of the Public Utility Regulatory Policies Act of 1978 (PURPA)." Presentation, departmental workshop, The Wharton School of Business, Philadelphia, PA, December 8, 1988.

Participated in "The Outlook for IPPs in Washington" panel, the Independent Power Producers of New York (IPPNY) 3rd Annual Meeting, Albany, NY, December 2, 1988.

"Resource Recovery: Evaluating the Development Benefits." Part of the "Waste-to-Energy Sales and Economic Development" session, the National League of Cities *Resource Recovery in Transition* Conference, Arlington, VA, November 15, 1988.

Co-chaired session on the Canadian Electric Power Trade, the American Cogeneration Association and Cogeneration & Independent Power Coalition of America (ACA/CIPCA) 2nd Annual Meeting and Exposition, Chicago, IL, September 26, 1988.

"An Econometric Analysis of the Impacts of PURPA Enforcement Differentials." Presentation at the Sixth NARUC Biennial Regulatory, Columbus, OH, September 15, 1988.