

FREDERICK H. PICKEL

SUMMARY

Dr. Pickel has over thirty years of experience in the gas and electric industries, as well as with government, in the US and abroad. He has assisted firms with new business development including acquisitions, energy procurement, integrated business risk analysis, adapting regulatory policies to new business environments, and business strategy, planning and implementation “from concept to contracts” in both the gas and electricity industries.

He is president of Wilshire Energy Consulting Group Inc. He was a vice president at Tabors Caramanis & Associates, with a “big five” accounting firm’s business risk management and utility consulting teams, Southern California Gas and its affiliates, New England Electric, SRI International's Decision Analysis Group and the Federal Power Commission.

He negotiated and managed some of the first independent power contracts, designed programs for incentive regulation, and testified as an expert on contract defaults in international arbitrations. He co-authored the first academic paper on electricity real-time pricing and its implications for electricity deregulation. Dr. Pickel has appeared as an expert witness in numerous proceedings, typically on issues involving power and gas contracting, pricing, and valuation.

Fred has evaluated electricity and gas supply portfolios with associated cost and risk management options for numerous major commercial, industrial, and government electricity and gas users and utilities. The issues have ranged from contract negotiation and litigation to information system integration. These have involved many “first of kind” deals in both electricity and gas. He has closed, negotiated, advised on, or provided testimony on energy purchase and sales for more than \$20 billion in agreements.

Dr. Pickel holds a Ph.D. in engineering/economic systems analysis, an M.S. in operations research, and an M.S. in civil engineering from the Massachusetts Institute of Technology. He received a B.S. with distinction in engineering and economics from Harvey Mudd College, Claremont, California, where he has also served on its Board of Trustees.

EDUCATION

Ph.D., Engineering/Economic Systems Analysis, Massachusetts Institute of Technology, Cambridge, Massachusetts. Program combined finance and economics, decision analysis and management science, and energy technology and policy, 1982.

M.S., Operations Research and M.S. in Civil Engineering, Massachusetts Institute of Technology, Cambridge, Massachusetts, 1978.

B.S. with distinction, in Engineering & in Economics. Economics through Pomona College, Harvey Mudd College, Claremont, California, 1974

Executive Education Programs

Managing People & Managing Organizational Change, Wharton, 1992.

Merger Program, Kellogg Graduate School of Management, Northwestern University, 1988.

Strategic Planning, Wharton School of the University of Pennsylvania, 1987.

EXPERIENCE HIGHLIGHTS

2004 – Present. President, Wilshire Energy Consulting Group Inc., a consulting company assisting clients in the gas and electric industries, as well as with government, in the US and abroad, with energy procurement issues from energy usage information management (in direct access and traditional markets from manual to web-based information systems) through negotiations to demand response programs, new energy project development including loan guarantees, IPP/cogeneration contract and tariff issues, energy market structuring and assessment, business planning and risk management, and expert testimony in the gas and electric utility industries. Coordinate teams of senior experts and supporting consultants in high profile projects.

2009 – Present. Consultant, Loan Guarantee Program, U.S. Department of Energy. Consulting expert on regional electricity markets, purchase power agreements, and interconnection/transmission issues, assisting loan application/ origination review/financing.

1999 – 2004. Vice President, Tabors Caramanis & Associates. Product and business development in a variety of areas including implementation of real-time pricing, combinatorial auctions for transmission and electricity markets, power marketing and trading in the electric industry, cogeneration and alternative energy, cost/ risk management for major energy users (including data management from early web-based systems), and expert testimony on energy supply/demand issues and power and gas contract termination, valuation, and interpretation before regulators, arbiters, and courts.

1994 – 1999. Director, Energy Business Risk Management, Business Risk Management Competency Development Center, National Utility

Consulting Group, and Venture Associates units, Arthur Andersen, Los Angeles, California. Established electricity marketing practice in leading energy utility business planning consulting group. Assisted clients in exploring opportunities in power marketing, including strategy, implementation, change management, and business and price risk management in North and South America for Canadian, U.S., and European clients. Also assisted participants in changing U.S. and U.K. gas market with gas supply strategies. Evaluated trading and market risks in corporatization/ privatization initiatives in Canada, Hungary, and Egypt. Reviewed strategy for utility in severe business decline, testifying on restructuring. Guided major North American utilities in integrated, strategic business risk analyses of key units. Assisted numerous industrial, commercial, and government clients with electricity and gas procurement strategies, related management information systems (from manual to multi-state / multi-site systems integrated with financial systems), and negotiations. Supervised combined consultant and middle-management client teams of over 60 professionals on high-profile business planning and enterprise risk initiatives.

1993 – 1994, President, Virtual Energy Corporation, Los Angeles, California, an affiliate of TCA. Founded gas and electric industry consulting firm specializing in corporate strategy, new business development, gas & electricity supply portfolios & risk management, and negotiation & regulatory support. Firm developed expertise in electricity marketing & links to gas markets and, in association with ABB and Merrimack Energy, the potential for new DC transmission projects.

1984 – 1993, Southern California Gas Company, Los Angeles, California, and other Pacific Enterprises affiliates:

- Gas Acquisition Policy Manager, SoCalGas. Managed gas supply policy and analysis group for largest US gas utility, recommending gas acquisition and interstate transmission service policies with \$1-2 billion per year supply cost. Proposed and supervised a marketing research & strategy review for gas sales services. Developed and implemented new gas acquisition policy; supported as witness before PUC. In team, developed incentive regulation proposal for gas costs, including NYMEX futures-based price indexing. Altered strategy. Cut gap between system gas cost and spot market. Negotiated key changes in supply and transportation service, dropped traditional supplier, added nearly \$2 billion in new supplies, restructured and extended pipeline service, and expanded access into a key new supply basin. Supervised over 10 managers, professionals, and support staff.
- Manager of Strategy and Development, Pacific Enterprises. Responsible, in a small team reporting to CFO, for strategic planning and corporate development activities for \$5 billion holding company. Coordinated strategic plans for oil & gas exploration, pipeline, gas distribution utility, and alternative energy subsidiaries. Assisted key executives with major business strategy review for gas utility, which faced deregulation and new competitive threats. Led evaluation of growth opportunities. Initiated and reviewed merger & acquisition and

start-up opportunities for energy businesses in local gas distribution, oil & gas exploration, and independent power project development. Provided independent industry analyses to parent management.

- Director of Business Development and Energy Sales, Pacific Energy. Manager of Power Sales. Worked in a team that developed this independent power company's first two hydro projects. Closed new and workout agreements on hydro, geothermal, and landfill gas. Negotiated electricity and landfill gas sales agreements with public and private buyers for new and existing alternative energy projects from Hawaii to Maine and Florida. Supervised a group of 3 professionals and support staff.

1979 - 1984, Administrator, Special Energy Projects, reporting to VP / General Counsel (1981-84), Consultant to Vice President / Associate General Counsel. New England Electric, Westborough, Massachusetts. Managed alternative energy development for long-range electric utility supply, including the first U.S. Qualifying Facility. Energy purchases grew from \$3 million in 1980 to 1/3 of company's new supplies in 1990's. Negotiated energy purchases from non-utility power producers and agreements for utility-owned alternative energy and district heating projects with forecast \$40 million savings. Directed alternative energy regulatory activities in 3 states; legislative and regulatory expert witness. Instituted and obtained regulatory approval on new tariff for cogenerators.

1976 - 1977, Management Consultant, SRI International, Decision Analysis Group, Menlo Park, California. Analyzed coal procurement and mine development strategies for a major electric utility. Evaluated federal incentives for shale oil and HTGR.

1974 - 1975, General Engineer, Federal Power Commission. Compared regional US energy patterns; installed econometric system. Assisted in project reviews on first cogeneration and alternative energy supply studies.

1975 - 1976, 1977-1981, Research and Teaching Assistant, Massachusetts Institute of Technology, Cambridge, Massachusetts: Energy Laboratory & Parsons Water Resource Laboratory. Researched industrial cogeneration and its impact on electric utility planning and tariff policy (dissertation topic); real-time pricing for electricity and transmission service; water supply in less developed countries; regional land-use/water quality planning. Instructed in courses on mathematical optimization and engineering systems analysis, supervising other teaching support.

MAJOR PROJECTS

Evaluated energy supply cost and risk management options for numerous major electricity, natural gas, and steam users and utilities. The issues have ranged from information system development to contract negotiation and litigation. These have involved many “first of kind” deals and disputes in electricity, natural gas, and steam – negotiating or advising on over \$20 billion in contractual arrangements.

- Assisted in numerous electric, gas, chilled water, and steam supply efforts and disputes for major multi-site public and private energy buyers, including evaluation, tariff interpretation, and negotiations. The issues often involved customer-owned or collocated generation and cogeneration facilities.
- Large commercial, industrial, and government end-user supply plans often must be based on limited existing information and systems. Developed strategies for information management improvements from manual to multi-state/ multi-site systems integrated with financial systems to early web-based direct access and demand monitoring systems. Guided development of requirements, selection of updates and new information technology, and outsourcing options for large commercial, industrial, electric and gas utility, IPP, and government clients.
- Led consulting effort for major regional government council to develop electricity purchasing aggregation program for over 100 local governments in Texas at the first stage of the state’s electricity deregulation.

Testified on electricity, natural gas, and steam economics and contract issues in public utility, federal regulatory, state and federal court, and international and domestic arbitration venues. Contract issues included contract valuation, termination, relative risks, and interpretation.

- Expert testimony in a Canadian/U.S. international arbitration on an electricity contract termination and valuation, supporting a successful \$100 million judgment in favor of client.
- Assembled expert witness team appointed by the Government of India to support India’s defense in the world’s largest investment treaty arbitration (as of 2005). The over \$6 billion dollar claim concerned the Dabhol electricity power station in Maharashtra, which was built by a US consortium led by Enron, GE and Bechtel. The claim was brought by Mauritian subsidiaries of the US corporations under a Bi-Lateral Investment Treaty between Mauritius and India, and was settled by India for \$305 million just prior to hearings.
- Evaluated cross-border power and gas economics in support of a new generation facility proposed for Vancouver Island, British Columbia. The testimony addressed issues related to gas vs. electricity price relationships, new plant dispatch, load management, and evaluation of utility capital project strategies in two separate proceedings before the B.C. Utilities Commission.

- Assisted a major petrochemical manufacturer in evaluating alternatives in a dispute on steam contract issues related to a cogeneration facility and testified in arbitration. Client was successful in defense of a key counterclaim, and was awarded fees.
- Assisted a landowner/trust on geothermal royalty negotiations.

Provided expertise on regional electricity markets, purchase power agreements, and interconnection and transmission issues to US Department of Energy Loan Guarantee Program, assisting loan origination and financing documentation processes.

- In early review, assisted loan guarantee assessments on future electricity market conditions and greenhouse gas trade-offs for nuclear facilities in multiple regional markets.
- Assisted loan origination and financing process for individual large-scale solar and other renewable energy projects on market assessment, purchase power agreement, and transmission and interconnection issues.

Guided a number of major North American energy companies in integrated business risk analyses of their bulk power, transmission, distribution, R&D, wholesale pool, gas purchasing, and new business units.

Assisted clients in gas investment and purchasing strategies along with review of transportation tariffs issues.

- Evaluated and negotiated gas acquisition, transportation and supply agreements, investments, marketing, and regulatory incentive programs for local gas distributors, electric generators, and major gas using clients.
- Reviewed the interplay of non-core (utility and large industrial) and core (commercial and residential) use with the use of short-term and long-term storage in a major gas utility, supporting the need for increased short-term injection/withdrawal capacity.
- Critiqued gas transportation tariffs, and supported the preparation of testimony illustrating the price impact of new capacity and its benefits for the market and users.
- Assisted a gas utility in severe business decline with an analysis of business alternatives.
- Expert testimony on flaws in proposed design of firm access rights for supply into a major gas transmission/ distribution system and in approach for off system gas sales, especially for new LNG supplies.

Evaluated investment and strategic opportunities in energy utility industry restructuring for clients in the gas and electric industries, including: utilities trying to retain customers and create new businesses; equipment manufacturers and independent power marketers examining new business, marketing, and alliance and acquisition strategies; and governments and regulators attempting to drive or manage the industry.

- Led several utilities and gas marketers in the development of strategies and business planning efforts intended to establish and implement

electricity marketing groups. This has included electricity and gas price risk strategies, processes, change management, and controls reviews and plans, in conjunction with the Arthur Andersen derivatives and trading teams.

- Provided strategic advice for a large northeastern U.S. transmission and distribution utility.
- Assisted a large utility in evaluating organizational alternatives for its retail, generation, and independent power marketing activities.
- Developed market-based transfer pricing system for power supply and transmission & distribution services between new strategic business units of major west coast utility, which also supported business unit shareholder value analysis.
- Guided a major Canadian utility in the use of FERC standards on transmission tariff issues in development of a “comparable access” tariff.
- Surveyed business opportunities for electricity marketing and trading activities in the U.S., U.K., Argentina, and Europe.
- Assisted the Egyptian Electricity Authority initiate restructuring of its electricity sector with the first competitive bid for electricity supply.
- Advised Hungarian Energy Office on EU Directive for electricity markets and access.
- Co-authored paper with leading Wharton and MIT experts on the restructuring and unbundling of electric industry and its benefits, comparing pool and bilateral trading.
- Explored potential for new DC transmission linkages between key US and foreign markets, especially links between growth areas and new gas sources.
- Assessed regional North American generation business opportunities for an international generation developer and operator.
- Assisted a utility in risk and cost analysis that evaluated and implemented changes to its electricity supply portfolio for its customers under extreme market conditions.
- Assisted in the evaluation of gas and electric storage investment opportunities. Evaluated storage operating strategies and the interplay of gas and electric operations with integrated storage.
- Reviewed current organized and bilateral electricity market structures in all US regions, assisting US federal agency in preparation for a report on the changing US electric utility industry.

Innovator in demand response / real-time pricing programs for electric customers:

- Expert witness supporting a large, multi-site commercial customer group in tariff hearings related to demand response proposals at CPUC.

- Assisted equipment / systems supplier in reviewing current and historical electric customer demand response and real-time pricing programs, including tariffs, levels of demand response, and potential market scale.
- In late 1970's, he co-authored the first academic paper on electricity real-time pricing and its implications for electricity deregulation.

Managed gas supply policy and analysis group for largest US gas utility, recommending gas and interstate transmission procurement policies.

- Negotiated key changes in gas supply and transportation service for major gas utility, dropping major traditional supplier. Negotiated or developed policy guidelines for purchase of over \$5 billion in gas supplies and transportation services.
- Developed in team effort an incentive regulation proposal for gas costs, including NYMEX futures-based price indexing, which has been adopted by SoCalGas and approved by the CPUC.
- Expert testimony and reviews on energy purchasing.

Worked in a team that developed an early independent power company's first two hydro projects, one in a unique joint venture with an electric utility. Consummated new and workout agreements on hydro, geothermal, and landfill gas projects from California to Maine and Florida.

Responsible, in a small team reporting to CFO, for strategic planning and corporate development activities for \$5 billion holding company.

- Assisted key executives with major business strategy review for largest US gas utility, which faced new competitive threats. Led evaluation of growth opportunities.
- Coordinated strategic plans for oil & gas exploration, pipeline, gas distribution utility, and alternative energy subsidiaries.
- Initiated and reviewed merger & acquisition and start-up opportunities for energy businesses in local gas distribution, oil & gas exploration, and independent energy development.

Managed alternative energy development for long-range electric utility supply for one of the Northeast's leading electric utilities.

Appointed to Governor's Commission on Cogeneration, Commonwealth of Massachusetts, first in U.S. to recommend state cogeneration policy.

Participated in the Keystone II public policy forum on restructuring electric transmission.

Has been an invited speaker and author on electricity marketing, gas supply strategy, independent power, electric industry restructuring and cogeneration.

REPRESENTATIVE CLIENTS

Energy users

Catholic Healthcare West	SABIC (was GE Plastics)
First Interstate Bank	Simon Property Group
Harrah's	Tenneco Corporation
Harvard Medical Area Service Co	Total Petrochemical
Los Angeles County	Upper Blackstone Water Pollution Abatement District
Lowe's	William Wilson & Associates

Publicly-owned utilities

BC Hydro	Egyptian Electricity Authority
Bord Gáis Éireann	Hydro Quebec
Chelan Washington Public Utility District	Ontario Hydro
East Bay M.U.D.	Powerex Corp.

Investor-owned utilities

CILCO	Nova Scotia Power
Duke Energy	Public Service Colorado
Edison International	PSEG
Endesa	Sempra/SoCalGas
First Energy	Unicom
Florida Power & Light	Washington Gas Light
National Grid USA	Wild Goose Gas Storage

Independent generators

American National Power	ThermoElectron
Invenergy	

Governments / regulators

City of Corona	Hungarian Energy Office
City of Chula Vista	US Dept of Energy/ Energy Information Admin.
Government of India	US Dept of Energy/CFO/Loan Guarantee Program
Houston-Galveston Area Council	US Rural Utilities Service

Energy traders or fuel suppliers

BHP Billiton LNG International	Westcoast Energy
Enron	Zeigler Coal
Valero	

Equipment Vendors

ABB
GE Power Systems

Schlumberger

Law firms

Baker Botts
Bracewell & Giuliani
Boies, Schiller & Flexner
Borden Ladner Gervais
Lawson Lundell

Liskow & Lewis
Manatt Phelps Phillips
Schwabe, Williamson & Wyatt
Thompson & Knight
Watson Farley & Williams

Other

Electric Consumers Resource Council
Whittier Trust Company

SELECTED PUBLICATIONS

Books, Book Chapters, and Monographs

Cogeneration: Its Benefits to New England, with other Members of the Governor's Commission on Cogeneration, Ronald M. Ansin, Chairman, final report to Michael S. Dukakis, Governor. Boston, MA: Commonwealth of Massachusetts, October 1978 (also NTIS #TID-29435).

“Unbundling the U.S. Electric Power Industry: A Blueprint for Change,” Tabors Caramanis & Associates, March 1995 with Tabors, Fernando, Kleindorfer, and Robinson, sponsored by Enron Capital and Trade Resources. Also published by University of Pennsylvania Wharton Risk Management and Decision Processes Center as Working Paper 95-03-05.

“Power Marketing Transforms the U.S. Wholesale Electricity Business: the Growth of Electricity Marketing in the U.S.” Published in **Fundamentals of the Global Power Industry**, Petroleum Economist in association with Arthur Andersen, London, January 1999.

Articles and Reviews

“Homeostatic Utility Control,” **IEEE Transactions on Power Apparatus and Systems**, Vol. PAS-99, No. 3, May/June 1980 (with F. C. Schweppe, R. D. Tabors, J. L. Kirtley, H. R. Outhred, and A. J. Cox).

“Money Power and Trade: What You Never Knew About the Western Energy Crisis.” **Public Utilities Fortnightly**, Vol. 139, No. 9, May 1, 2001 (with S. A. Van Vactor).

Sidebar comments in “The Western Energy Market: Inherent Risks and Market Solutions” by Jeffrey D. Roark. Published by the Western Power Trading Forum, March 2003 (available at www.ksg.harvard.edu/hepg/).

Technical Reports

“Cogeneration in the U.S.,” SMOR/SMCE thesis, Mass. Inst. of Tech., MIT Energy Laboratory Technical Report No. MIT-EL78-039, NTIS PB-83-196535, 1978.

“Cogeneration and Utility Planning,” doctoral dissertation, Mass. Inst. of Tech., MIT Energy Laboratory report #MIT-EL82-015, NTIS PB-83-167783, 1982.

Selected Conference Presentations

“Why Did the Role of Cogeneration Diminish?” invited paper, Sixth Energy Technology Conference, Washington, DC, 1979.

“An Assessment of the Rhode Island District Heating Study,” with the assistance of I. Olikier and W. Buffa, presented at the 75th International District Heating Association Conference, Bretton Woods, NH, June, 1984. Published in the Proceedings of the 76th IDHA Conference.

“Long-Term Contracts, Options, and the Core LDC Gas Supply Portfolio for Southern California,” invited speaker, Sixth New Mexico Natural Gas Conference, Santa Fe, May 1993.

“Evaluating Opportunities Arising in the New Electricity Market,” invited speaker, Power Marketing & Brokering Conference, Sponsored by The Center for Business Intelligence, Chicago, July 1996

“Whither Wholesale Power Markets: What Do Gains by Marketers Indicate For Future?” speaker and conference chairman, Infocast’s Wholesale Power Markets Conference, Las Vegas, Nevada, February 1997

“Derivatives and the New Energy Markets: Linking the New Tools with Business Strategy & Processes,” invited speaker, The Power Marketing Association’s Third Annual Electric Rate Derivatives Conference, Scottsdale, Arizona, March 1997

“Retail Excess? Meshing Wholesale Trading and Commercial Customers,” speaker and conference co-chairman, Buying & Selling Electricity in The New Age Western Power Market conference, Las Vegas, Nevada, December 1997

“Repositioning in the Electric Industry: Power Marketers Takeover Wholesale, Retail on Brink,” Infocast Fifth Annual Power Industry Forum, Tucson, Arizona, March 1998

“Wholesale Electricity Update: Shake-Out Underway,” invited speaker, McGraw-Hill Power Market Week’s 5th Annual “Day of the Trader” Conference, New Orleans, December 1998

“Overview of Load Management Services,” speaker and conference chairman, Infocast’s Conference on New Business Opportunities in Load

Management Services for Commercial and Industrial Customers, Las Vegas, January 2001, and Santa Monica, May 2001

“Market-Driven Demand Reduction & Load Management,” with E. Hausman, Infocast’s Conference on Power Crisis in the West, San Diego, February 13-14, 2001

“Energy Crisis in California & West,” private client briefing presentation, Spring / Summer 2001

“Load Management Services in the Market: Creating Opportunities in Texas,” Infocast’s Conference on “Texas Power Game,” Houston, Texas, September 11-12, 2001

“Managing the Energy Costs in California,” invited speaker, Valley Industry & Commerce Association’s Thirteenth Annual Business Forecast Conference, Los Angeles, October 26, 2001

“Buying Energy for Large Users and Other Failures of Expectations,” invited speaker, Platt’s 8th Annual “Day of the Trader” Conference, Las Vegas, December 6, 2001

“Creating Opportunities in Texas: How Large Customers are Making the Texas Market Work for Them,” Infocast’s Conference on “Texas Power Game,” Houston, Texas, May 14-15, 2002

“Managing Energy Costs and Risks from a Customer’s Business Planning Perspective,” invited speaker, Energy Bar Association/West Annual Meeting, Napa, California, September 29, 2002

“New Position of Natural Gas-Fired Generation in North America,” invited speaker, Second Annual B.C. Power Summit, Vancouver, British Columbia, September 10, 2004

“California and the WECC: View on Both Sides of the Border, Past, Present, and Future” with Richard Tabors, CRA International, Third Annual B.C. Power Summit, Vancouver, British Columbia, December 7, 2005.

“New Ins & Outs for the Gas Market” invited speaker and acting chairman, Strategic Research Institute’s 6th Annual LNG Economics & Technology Conference, Houston, Texas, January 30, 2006.

“Pricing Issues for Wind in Light of Shale Gas and Other External Forces” invited speaker, Electricity Markets Pre-Conference Seminar, AWEA Windpower 2011 Conference, Anaheim, California, May 22, 2011.

TESTIMONY AND REGULATORY COMMENT

Testimony

Testimony before the Commonwealth of Massachusetts, Department of Public Utilities on avoided energy costs on behalf of Massachusetts Electric Company, approx. 1982 through 1984.

Testimony submitted to the state of New Hampshire Public Utility Commission on avoided energy costs for Granite State Electric, approx. 1983.

Testimony before the state of Rhode Island and Providence Plantations legislative committee on energy on solid waste to energy facility development on behalf of Narragansett Electric, approx. 1983.

Testimony before the State of California Public Utilities Commission on gas acquisition reasonableness review on behalf of Southern California Gas Company, annual reviews for 1989/90, 1990/91, 1991/92, 1992/93, 1990 through 1993.

Testimony before the Public Service Commission of the Commonwealth of Puerto Rico on “Economic Analysis for San Juan Gas on behalf of San Juan Company (File O264), June 1997.

Deposition testimony in case before the Circuit Court for Palm Beach County, Florida on independent power contracts on behalf of Florida Power & Light (Case No. CL-97-00171-AF) 2000.

Deposition testimony in case before the United States District Court Middle District of Florida Orlando Division, on independent power contracts on behalf of Florida Power & Light (Case No. 99-317-CIV-ORL-19C).

Testimony submitted to the State of California Public Utilities Commission commenting on market power issues supporting the divestiture of PG&E hydro facilities on behalf of East Bay Municipal Utility District in “Application of Pacific Gas and Electric Company To Market Value Hydroelectric Generating Plants” January 2001

Testimony submitted to the Federal Energy Regulatory Commission in a complaint by City of Corona v. Southern California Edison Company regarding a refusal to interconnect transmission (Docket No. EL02-126-000), September 2002.

Testimony before the City Council of Corona, California on ratepayer savings scenarios related to development of a municipal utility, December 2002.

Testimony in an international commercial arbitration between Powerex Corp. and Alcan Inc. regarding methodology and calculation of \$100

million power contract termination payment (American Arbitration Association No. 50-198-T161-02), December 2002.

Testimony submitted to the Federal Energy Regulatory Commission on behalf of Powerex Corp. on overall electric energy shortages in the WECC during 2000-2001 (San Diego Gas & Electric Company v. Sellers of Energy And Ancillary Services Into Markets Operated by the California Independent System Operator California and the California Power Exchange, Dockets No. EL00-95-000, EL00-95-048, EL00-95-075, and Investigation of Practices of the California Independent System Operator and the California Power Exchange, Dockets No. EL00-98-000, EL00-98-042, EL00-98-063), March 3, 2003.

Testimony before the British Columbia Utilities Commission on behalf of BC Hydro/ Vancouver Island Energy Corporation regarding gas vs. electricity price relationships, load management, and evaluation of utility capital project strategies in the Application for a Certificate of Public Convenience & Necessity for the Vancouver Island Generation Project (Order G-55-03), June 2003.

Testimony before the British Columbia Utilities Commission on behalf of BC Hydro regarding dispatch of a combined cycle generation plant located on Vancouver Island in the BC Hydro Call for Tenders for Capacity on Vancouver Island Review of Electricity Purchase Agreement, Project No. 3698354, January 2005.

Testimony before the State of California Public Utilities Commission on behalf of Indicated Commercial Parties regarding Applications of Pacific Gas and Electric Company, San Diego Gas & Electric Company, and Southern California Edison Company for Authority to Implement Default CPP Rate Options For Large Customers, (A. 05-01-016, A.05-01-017, A.05-01-018), February 2005. Second round testimony submitted October 2005.

Testimony submitted on behalf of the Government of India to an international arbitration tribunal under a business investment treaty between Mauritius and India and under UNCITRAL arbitration rules between subsidiaries of General Electric and Bechtel as claimants and the Government of India as respondent regarding the Enron Dabhol generation and LNG facilities, May 2005.

Testimony submitted to the State of California Public Utilities Commission on behalf of the County of Los Angeles regarding a self-service supply option for existing governmental cogeneration in rulemakings related to integration in electric utility resource planning and pricing for qualifying facilities (R.04-04-003, R.04-04-025), August 2005.

Testimony submitted to the State of California Public Utilities Commission on behalf of BHP Billiton LNG International Inc. regarding the proposals by SoCalGas and SDG&E for firm gas access into their systems and off-system deliveries from their systems, especially from new supply sources (A.04-12-025 Phase II), July 2006.

Testimony in a private commercial arbitration between a petrochemical manufacturer and a cogeneration facility regarding steam contract interpretation and economics of steam dispatch and unit commitment, March 2008.

Testimony in a commercial arbitration between a regional public utility group and an independent power facility regarding contract interpretation and valuation (American Arbitration Association), June 2009.

Testimony Contributed To

Testimony before the Maine Public Utilities Commission by Bangor Hydroelectric on applications for the approval of a long-term hydroelectric purchase contract and transfer of assets, 1986.

Testimony before the State of California Public Utilities Commission on Application of Southern California Gas Company for Expedited Approval of Five Long-Term Supply Agreements, (A.91-04-038) 1991.

Testimony before the California Public Utility Commission, en banc hearings on industry restructuring, September, 1994, sponsored by Enron Capital and Trade Resources.

ACTIVITIES AND AFFILIATIONS

Harvey Mudd College, 1986-present. Board of Trustees, 1989-1992 and 2007-2010 Member of "Campaign Cabinet" and chair of alumni sub-committee for college's 5 year \$75 million fund raising effort, supporting two new majors and college's financial base (1989-1994). Presidential Selection Committee (1987-1988). Governor, Alumni Board: Elected member (1986-present); Treasurer (1988-1989, 2007-2008, 2010-present); President (2005-2007). Alumni representative on Board of Trustees Development Committee (2002-present).

Elected representative on City of Los Angeles' Greater Wilshire Neighborhood Council (2010-present).

International Association for Energy Economics; IEEE Power Engineering Society; Energy Bar Association, non-attorney member; National Science Foundation Scholarship; Society of Sigma Xi.

Governor's Commission on Cogeneration, Commonwealth of Massachusetts. Appointed to first committee in US to recommend state cogeneration policy (1977-1978).

CONTACT INFORMATION

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