



INTERNATIONAL

IRA SHAVEL

Ph.D. Mathematics, State University of New York at Stony Brook

S.M. Operations Research, Massachusetts Institute of Technology

M.S. Mathematics, Courant Institute of Mathematical Sciences

B.S. Mathematics, City College of New York

Dr. Ira H. Shavel has 30 years of experience in the energy industry, with a concentration in the economics and operation of the U.S. electric power system, generation and transmission investment, and environmental strategy. Dr. Shavel's clients include generation and transmission companies, natural gas pipeline companies, marketers, developers, industry research groups, and federal agencies.

Dr. Shavel developed several models of North American power systems, including the ICF Integrated Planning Model ("IPM"). Most recently he led the development of Charles River Associates' National Energy and Environment Model ("NEEM") and was instrumental in the integration of NEEM with the Multi-Region National Macroeconomic Model.

Dr. Shavel has testified in FERC and state regulatory proceedings. He co-directed major assignments that helped the Kansas City Power & Light and the Southern Company develop environmental reports for their shareholders. He is a co-author of a report on the design of California's policies to limit greenhouse gas emissions. Dr. Shavel holds a doctorate from the State University of New York at Stony Brook in mathematics and an SM in Operations Research from the Massachusetts Institute of Technology.

PROFESSIONAL EXPERIENCE

2001–Present	Vice President, Charles River Associates
1996–2001	Vice President, Putnam Hayes and Bartlett, and PHB Hagler Bailly
1995–1996	Senior Vice President, Applied Automated Engineering Corporation
1979–1995	Vice President, ICF-Kaiser Consulting Group

LITIGATION/REGULATORY

- Performed a benefit-cost analysis of the International Transmission Company's Green Power Express and filed testimony at the FERC (*Green Power Express LP*, FERC Docket No. ER09-681-000).
- Expert witness regarding Sierra Pacific's plan to add a combined cycle unit at its Tracy station. (Before the Public Utilities Commission of Nevada, *Application of Sierra Pacific Power Company for Approval of the Eighth Amendment to the Action Plan of its 2005-2024 Integrated Resource Plan to Approve Construction of the Tracy Combine Cycle Project, its Designation as a Critical Facility and the Proposed Incentive Mechanism for Ratemaking Purposes*. Docket No. 05-8004, November 2005.)
- Expert witness regarding reporting of Pacific Northwest transactions to the FERC. (*In the Matter of: Enron Power Marketing, Inc*, Docket Nos. EL03-180-29, et al.)

- Expert witness for the Tennessee Valley Authority in a class action suit alleging that Tennessee Valley Authority overcharged a class of interruptible customers in the summer of 1998. (*Johns Manville v. Tennessee Valley Authority*, No. 2:99-CV-2294-VEH-HGD.)
- Expert witness regarding the benefits of Public Service of Colorado's proposed DC transmission line between Colorado and Kansas in support of a Certificate of Public Convenience and Necessity. (Before the Public Utilities Commission of the State of Colorado, *In The Matter of the Application of Public Service Company of Colorado for a Certificate of Public Convenience and Necessity for the Construction of a 345 KV Transmission Line*, Docket No. 00A-600E, May 2002.)
- Expert witness regarding an analysis of transmission system usage in the eastern US. (*Midwest Independent Transmission System Operator, Inc., et al.* Docket No. EL02-111; *Ameren Services Company, et al.*, Docket No. EL03-212; *Midwest Independent Transmission System Operator, Inc. et al.*, Docket No. EL04-135-000, before the Federal Energy Regulatory Commission, October 1, 2004 and October 22, 2004.)
- Directed analysis and litigation support for both FERC and civil proceedings for two California generators. The assignments included participation in settlement discussions with FERC staff.
- Directed the damages analysis for an expert witness in Cedar Bay Generating Company vs. Florida Power and Light. Provided an affidavit in support of a motion for sanctions and contempt, and was subsequently deposed in connection with the affidavit.
- Co-directed the FERC "Appendix A" market power analysis in support of AEP's FERC and state filings in connection with its proposed merger with CSW.
- Directed the market revenue and variable costs analysis for Potomac Electric Power Company's stranded cost case.
- Directed the market revenue and variable costs analysis for PECO Energy's restructuring and qualified rate order cases. Prepared testimony and responded to interrogatories and data requests.
- Conducted an analysis for a large eastern utility to screen potential merger partners for FERC Order 592 "Appendix A" failures.

GENERATION ECONOMICS

- Directed a board-level corporate positioning strategy for a merchant generation company faced with multiple challenges including impending carbon polices and poor overall market conditions.
- Directed an analysis of the value of a merchant plant development company for a potential purchaser. This analysis focused on the value of the developer's assets and organization as part of the client's broader strategy to develop a large electric power portfolio.
- Worked for a utility's senior management to analyze the potential market for a share of a nuclear asset. This analysis formed the basis for the company's negotiations with prospective purchasers.
- Analyzed the economics of a major pipeline project to serve a Northeast generating station for senior management of an interstate natural gas pipeline company.
- Analyzed the market and regulatory environments for numerous potential purchasers of generation asset.
- Co-directed the development of the infrastructure for a bulk power trading organization, including a tactical computer system and databases to support trading in the Eastern Interconnection. Worked with traders to identify long- and short-term sales and wheeling opportunities.
- Directed a study of least-cost options for the development of the Russian power system. Produced an integrated assessment of the need for investment in the system for use by

international financial institutions in evaluating funding requests, and by the State Department in negotiating the shutdown of unsafe reactors.

- Instructor for a course on electric utility economics designed for the management of a major U.S. electric utility.

TRANSMISSION ECONOMICS

- Led a study of the implication for customers and generators of different Independent Electricity System Operator of Ontario Export Transmission Service tariffs.
- Helped develop a PJM financial transmission right (“FTR”) bidding strategy for a participant in the PJM FTR auctions.
- Analyzed MISO congestion patterns and the impact of these patterns on the market margins for the asset owner’s generation units. The assignment included an assessment of the transmission upgrades that might improve the owner’s financial position.
- Analyzed the consumer benefits of a transmission expansion versus a new generation unit in New England. Benefits included system reliability as well as the cost of power.
- Directed the analysis of the cost and benefits of two potential Midwest transmission projects in support of the acquisition of a transmission system.

ENVIRONMENTAL ANALYSES

- Assisted a merchant generation company facing US EPA enforcement make a decision about installing SO₂ and NO_x controls in preparation for negotiations with EPA.
- Co-authored an Electric Power Research Institute report on California’s climate policy. (“Economic Analysis of California Climate Initiatives: An Integrated Approach,” Electric Power Research Institute, 2007).
- Co-directed major assignments to assist the Kansas City Power & Light and the Southern Company develop environmental reports for their shareholders
- Advised the Utility Air Regulatory Group on New Source Review issues.
- Directed a peer-reviewed global climate change study for the Tennessee Valley Authority. Evaluated the impact of different forms of CO₂ control policies in terms of costs and rate impacts for the Tennessee Valley Authority and, more broadly, for U.S. electric utilities and their customers. Presented results to White House and Department of Energy staff.
- Co-authored a workbook on greenhouse gas accounting commissioned by the Electric Power Research Institute. Options analyzed included conservation, cogeneration, and reforestation.
- Co-directed a study for the Edison Electric Institute of the cost of climate policies on U.S. electric utilities.

POWER SYSTEM MODELING

- Developed several detailed models of the North American (including Canadian) and the Russian power systems. Managed both development of the computer software and data assembly. These models are used to forecast market prices, value assets, and estimate the future development of the power system under study. The suite of models includes: the ICF Integrated Planning Model, the ICF Coal and Electric Utilities Model, a confidential system designed to support energy trading in the eastern United States, and CRA’s North American Electricity and Environment Model (“NEEM”).

- Developed extensive expertise with the GE MAPS, GE MARS, and Ventyx's PROMOD and PROSYM models. Applications have included market price forecasting, asset valuation, and stranded cost analysis.

PUBLICATIONS

"A Consistent Framework for Measuring Extra High Voltage Transmission Benefits and Costs" (with Barclay Gibbs and Ralph Luciani). Federal Energy Regulatory Commission Technical Conference on Planning Models and Software, Washington, DC, June 10, 2010

"Economic Analysis of California Climate Initiatives: An Integrated Approach" (with P. Bernstein, D. Montgomery, T. Rutherford, A. Smith and S. Tuladhar), Electric Power Research Institute, 2007

"Integrated Electric Power and Heat Planning in Russia: The Fossil-Nuclear Tradeoff" (with J. Blaney), *Fourth International Conference on Nuclear Engineering: Conference Proceedings*, March 1996.

"The Dynamic Energy and Greenhouse Emissions Evaluation System" (with D. Klein, J. Haydel, P. Custode, D. Carter, B. Schillo, and J. Golden), *International Association for Energy Economists, 15th Annual North American Conference Proceedings*, October 1993.

"Carbon Taxes and Carbon Limits Are Not the Same" (with D. Klein, D. Doyle, and J. Golden), *International Association for Energy Economists, 15th Annual North American Conference Proceedings*, October 1993.

"The Environmental and Economic Value of DSM: A National Level Assessment" (with J. Haydel, D. Kathan, and S. Daryanani), *Proceedings of the ACEEE 1992 Summer Study on Energy Efficacy in Buildings*.

"A Short-term Fuel Purchasing and Inventory Model for Electric Utilities" (with C. Hoff Stauffer and G. Vicinus), in Benjamin Lev (ed.), *Production Management: Methods and Studies*, North Holland, 1987.

"Investment Planning for HydroThermal Power System Expansion: Stochastic Programming Employing the Dantzig Wolfe Decomposition Principle" (with A.P. Sanghvi), *IEEE Transactions on Power Systems*, Vol. PWR51, No. 2, May 1986.

"Incorporating Explicit Loss Load Probability Constraints for Power System Capacity Planning" (with A.P. Sanghvi), *Journal of Electrical Power and Energy Systems*, Vol. 6, No. 4, 1984.

"Fuel Diversification, Stockpiling, and System Inter Connection Strategies for Minimizing Power System Vulnerability to Energy Shortages" (with A.P. Sanghvi and M.H. Wagner), in Benjamin Lev (ed.), *Energy Models and Studies*, North Holland, 1982.

"Procedures for Planning for Power System Vulnerability: An Optimization Model for Resource Planning Under Uncertainty" (with R. Spann, and A.P. Sanghvi), *IEEE Transactions on Power Apparatus and Systems*, Vol. 101, No. 5, June 1982.

"A Class of Algebraic Surfaces of General Type Constructed from Quaternion Algebras," *Pacific Journal of Mathematics*, Vol. 76, No. 1, 1978.

"On Surfaces Obtained from Quaternion Algebras Over Real Quadratic Fields," *Bulletin of the American Mathematical Society*, Vol. 82, No. 5, September 1976.

PRESENTATIONS

"Alternative Power: The Alternatives," (with B Gibbs), *1st Power & Alternative Energy Law Conference*, Houston TX, April 22, 2008.

"Greenhouse Gas Policy Analysis: A Hybrid Top-Down, Bottom-Up Approach" (with P. Bernstein and D. Montgomery), *Electric Utilities Environmental Conference*, Tucson, AZ, 23-25 February 2007.

"Environmental Allowance Pricing," *Winter Workshops on Energy Law*, sponsored by Energy & Mineral Law Foundation, Fort Myers Beach, FL, 26-28 January 2006.

"Developing Least-Cost New Capacity Plans Under Uncertainty" (afternoon session) and "Developing Least-Cost Multi-Pollutant Control Strategies Under Uncertainty" (morning session), *Power Plant Emissions Reduction Technologies & Strategies: Coal Sustainability Under New Environmental Regulations*, sponsored by INFOCAST, Washington, DC, 5-7 October 2005.

"Quantifying Key Decision Factors Across the Spectrum from Retirement to Plant Improvements" (with P. Spinney, NeuCo), *EPRI Workshop on Improving Operation Flexibility*, Hot Springs, VA, 1-3 October 2003.

"Incorporating Energy and Environmental Regulation into a Real Options Framework" (with S. Konar and M. Van Belle), *Valuing Electric Power Assets & Companies: Using Real Options Methodology*, sponsored by INFOCAST, Orlando, FL, 4-7 December 2000.

"Market-Oriented, Multi-Pollutant Approaches to Environmental Management: The Utility Perspective" (with J. Speyer), *EEI Fall 2000 Legal Conference*, Amelia Island, Florida, 15-18 October 2000.

"Transmission Pricing Issues for RTOs" (with S. Henderson), *Congestion Pricing and Forecasting*, sponsored by INFOCAST, Chicago, IL, 21-23 June 2000.

"Forecasting Power Prices in Deregulated Markets," *Merchant Plant Development & Finance*, sponsored by INFOCAST, Houston, TX, 29-31 March 2000.

Chaired a conference on New NO_x Regulations and Power Generation in Competitive Markets, sponsored by INFOCAST, Washington, DC, 3-5 November 1999.

"Pricing for Capacity," *Electricity Market Pricing Conference* sponsored by EUCI, Vail, CO, 9-11 August 1999.

Chaired (and presented at) a conference on *New NO_x Regulations and Power Generation in Competitive Markets*, sponsored by INFOCAST, Washington, DC, 29-30 April 1999.

"Designing an Optimal Strategy" (with M. Chupka, J. Letzelter, and C. Mann), *Workshop on the Cost of NO_x Controls*, at the *New NO_x Regulations and Power Generation in Competitive Markets Conference*, sponsored by INFOCAST, Washington, DC, 29-30 April 1999.

"Strategies for Maximizing the Value and Profitability of Operationally Constrained Plants," *The 3rd Merchant Plant Development Conference*, sponsored by INFOCAST, Chicago, IL, 22-24 March 1999.

"Market Price Forecasting," *Developing & Financing Merchant Power Plants: Pre-Conference Workshop*, sponsored by IBC USA Conferences, Inc., Washington, DC, 3-5 June 1998.

"Locational Pricing and Contracting in Bid-Based Power Pools" (with J. Graves, S. Henderson, and P. O'Rourke), *Progressive Contracting Techniques*, sponsored by IBC USA Conferences, Inc., Washington, DC, 4-5 May 1998.

"Environmental Regulation and Asset Values in Competitive Markets" (with M. Chupka), *Public Utilities Reports Seminar*, sponsored by *Public Utilities Fortnightly*, Phoenix, AZ, 30 April - 1 May 1998.

"Valuing Generating Assets in a Deregulated Environment" (with R. Borlick), *Conference on Market Price Forecasting*, sponsored by IBC USA Conferences, Inc., San Francisco, CA, 9-10 March 1998.

"Valuing Energy Projects in a Deregulated Environment," *Conference on Market Price Forecasting*, sponsored by IBC USA Conferences, Inc., Washington, DC, 23-24 October 1997.

"Valuing Energy Projects in a Deregulated Environment," *Purchased Power Contracts Conference*, sponsored by IBC USA Conferences, Inc., Washington, DC, 27-28 January 1997.