

Philip Q Hanser is a principal of *The Brattle Group* and has over thirty years of consulting and litigation experience in the energy industry. His expertise ranges from utility industry structure and market power and associated regulatory questions, to specific operational and strategic issues, such as transmission pricing, generation planning, and tariff strategies. He is experienced in fuels procurement, environmental issues, forecasting, marketing and demand-side management, and other complex management and financial matters.

He has appeared as an expert witness before the U.S. Federal Energy Regulatory Commission (FERC), and numerous state public utility commissions, environmental agencies, Canadian utility boards, as well as arbitration panels, and in federal and state courts. He served for six years on the American Statistical Association's Advisory Committee to the Energy Information Administration (EIA). He is a member of IEEE (Institute of Electronics and Electrical Engineers), CIGRE (Conseil International des Grands Reseaux Electriques) and served on its Working Group C5-8, Working Group on Renewables and Energy Efficiency in a Deregulated Market.

Prior to joining *The Brattle Group*, Mr. Hanser held teaching positions at the University of the Pacific, University of California at Davis, and Columbia University, and served as a guest lecturer at the Massachusetts Institute of Technology, Stanford University, and the University of Chicago. He currently is a Senior Associate in the Mossavar-Rahmani Center for Business and Government at the Harvard Kennedy School. He has also served as the manager of the Demand-Side Management Program at the Electric Power Research Institute (EPRI). He has been published widely in leading industry and economic journals.

AREAS OF EXPERTISE

- ◆ *Analysis of Electricity Generation, Contracts, and Wholesale Markets*
- ◆ *Resource Planning and Procurement*
- ◆ *Environment*
- ◆ *Energy Efficiency, Demand-Side Management, and Renewables*
- ◆ *Analysis of Market Power*
- ◆ *RTO Design and Participation*
- ◆ *Forecasting and Weather Normalization*
- ◆ *Rate Design and Related Issues*
- ◆ *Transmission*
- ◆ *Plant Performance and Strategy*
- ◆ *Utility Financial Issues*

EXPERIENCE

Analysis of Electricity Generation, Contracts, and Wholesale Markets

- ◆ Provided expert testimony in Massachusetts state court on the impacts of alleged violations of a wholesale power contract on a supplier in ISO-NE.
- ◆ For the California Department of Water Resources, provided expert testimony in federal bankruptcy court with regard to the public interest standard to be applied to Calpine Corporation's rejection of its contracts. This assignment included a valuation of the contract over time through the use of a simulation model of the California market, as well as an assessment of the potential reliability implications for the California market.
- ◆ For the California Department of Water Resources and the California Attorney General's Office, provided expert testimony on damages resulting from Sempra Energy Resources breaches of its power purchase agreement in both arbitration hearings and before the California state court. Analyzed two years of hourly data on energy deliveries, market prices, ISO charges, and invoice charges to identify and evaluate performance violations and invoice overcharges. Assisted counsel in developing the theory of the case and provided general litigation support in preparation for and during arbitration.
- ◆ For Dominion Electric Marketing, Inc. (DEMI), provided assistance in their response to a complaint by United Illuminating (UI) regarding their wholesale supply contract. The dispute centered on the allocation of reliability must-run costs between UI as a load-serving entity and DEMI as wholesale supplier.
- ◆ For the California Department of Water Resources, reviewed the California ISO's proposed implementation of locational marginal pricing (LMP) and analyzed implications for "seller's choice" supply contracts. Developed a framework for quantifying the incremental congestion costs that ratepayers would face if suppliers delivered power to the lowest priced nodes, and estimated potential incremental contract costs using a third party's GE-MAPS market simulations. Made recommendations to the CAISO regarding how to address the issue.
- ◆ Provided expert testimony in Massachusetts state court on the damages incurred by a power plant developer as a result of alleged contractual violations by a supplier for a plant constructed in ISO-NE.
- ◆ For a Florida utility, provided a confidential expert report evaluating the benefits of the power from a co-generator and its potential rate implications, and assisted in the negotiation of a co-generation contract with a large industrial customer.
- ◆ Assisted a U.S. electric utility in the preparation of a bid proposal to an industrial firm for the leasing of a new power plant. The assignment included risk analysis of the proposal, assessment of financial and rate impacts, and market assessment of competitors' potential offerings.
- ◆ For a merchant generation company, provided testimony on the fairness of a resource procurement action.

Resource Planning and Procurement

- ◆ For the Edison Electric Institute, co-authored a report on the general inapplicability of standard financial portfolio theory to the resource portfolios of utilities.
- ◆ For the investor-owned utilities of Wisconsin, provided testimony before the Public Service Commission of Wisconsin on cost of capital issues for use in its statewide resource planning exercise.
- ◆ For an international development bank, evaluated generation resource needs for an Eastern European country as well as provided a determination of alternative means to meet those generation needs. This assignment included analysis of the impact of privatization on the country's economy, its import and export sectors, and future development of electricity and gas resources.
- ◆ For a western utility, developed an assessment its resource options, with a particular view towards future environmental regulation.
- ◆ For a southern utility, performed an assessment of the value of adding a gas-fired generating station.

Environment

- ◆ For an eastern U.S. utility with substantial coal-generating facilities, provided advice with regard to maintenance procedures and risk exposure to New Source Review standards under the Clean Air Act Amendments.
- ◆ For a western generator with substantial coal-generating facilities, provided assistance with regard to responding to allegations by the Environmental Protection Agency of failure to comply with the New Source Review standards under the Clean Air Act Amendments.
- ◆ For Illinois Power Company, provided expert testimony in federal court on the regulatory and rate base implications of the Clean Air Act Amendments, in support of the calculation of noncompliance economic damages arising from New Source Review.
- ◆ For a gas utility, assisted in the development of potential manufactured gas liabilities for use in insurance recovery and in estimating potential recovery under a variety of insurance allocation theories and estimated risk distribution.
- ◆ For a gas utility, assisted in the assessment of the announcement effect of environmental liabilities on its cost of capital. This assignment included estimation of changes in market betas for pre- and post- environmental liability announcement.

Energy Efficiency, Demand-Side Management, and Renewables

- ◆ For a large utility in the southern United States, prepared expert report investigating alternative cost allocation approaches for generation capacity, fuel, and demand-side management (DSM) costs, both through a review of the methods, surveys of practice, as well as the financial impacts on the utility. The cost allocation assessment included cost allocation across jurisdictions as well as within a jurisdiction.
- ◆ For Central Vermont Public Service, provided expert testimony on the impact of its DSM programs before the Vermont Public Service Board.
- ◆ For Ameren/UE's Illinois subsidiaries, provided expert testimony on the potential for gas DSM and resulting potential rate implications.
- ◆ For a northeastern utility, developed an assessment of the potential penetration rate of microturbines. For the utility service territories under consideration, evaluated the back-up generation rates and connection charges likely to be incurred for such systems to determine customer costs and benefits.
- ◆ For a utility located in WECC procuring renewable resources, provided a system integration study for a range of renewable project proposals. Used production costing and power flow models to estimate the "deliverability" of various proposals, including estimating the LMP prices and the potential congestion costs. Ranked the proposed renewable power projects by their estimated benefits and costs and delivered a formal presentation to the utility's executives at the completion of the project.
- ◆ For a power marketer and developer of independent power projects in Great Britain, assisted in the preparation of comments on proposals by the UK pool regarding the role of demand-side bidding and the pricing of transmission losses.
- ◆ For a Texas utility, provided expert testimony regarding breach of contract claims made against it by an industrial participant in an energy efficiency project. Reviewed the energy efficiency impacts of program. Calculated the net present value of the project in relation to various rate options and market prices.
- ◆ For Connecticut Light and Power, provided testimony in support of an application for a Certificate of Environmental Compatibility and Public Need for the construction of a 345-kV electric transmission line and reconstruction of an existing 115-kV electric transmission line. At issue was the use of distributed resources to substitute for the proposed lines.

Analysis of Market Power

- ◆ For the California Parties, provided litigation support and testimony regarding manipulation of energy and ancillary service market prices and the outage behavior of gas fired power plants during 2000-01. The proceeding, before the Federal Energy Regulatory Commission, involved Enron, Dynegy, Mirant, Reliant, Williams, and other suppliers in the U.S. and Canada. The

analyses focused on the use by suppliers of generation outages to affect market prices through physical withholding, as well as the use of pricing to yield economic withholding.

- ◆ For the California Parties, provided litigation support and testimony regarding Enron's transmission and ancillary services market manipulation strategies, including 'Death Star' and 'Get Shorty.'
- ◆ For Southern California Edison, submitted testimony before the FERC describing the implications of manipulation of gas market prices on the electricity market.
- ◆ For Sierra Pacific Resources Company, provided expert testimony before the Public Utilities Commission of Nevada and the FERC regarding the market power implications of generation asset divestiture required for the merger of Sierra Pacific Power and Nevada Power Company. Developed a Cournot market model to assess the market power implications of selling off alternative groupings of generation.
- ◆ For the Pennsylvania-New Jersey-Maryland Interconnection, LLC (PJM), co-authored annual report on the state of its markets. The report included an assessment of the market's competitiveness and potential structural deficiencies, and identified potential instances of market abuse.
- ◆ For PJM, developed an ensemble of metrics for assessing market power in its markets. The metrics included an early warning system to permit PJM interventions into market abuse at the earliest possible stage.
- ◆ For PJM, developed software for unilateral market power assessment and assisted PJM in its preliminary implementation. Its use was demonstrated with an incident involving potential market power abuse by PJM members.

RTO Design and Participation

- ◆ For Northeast Utilities, provided testimony before the FERC with regard to the economics of imposing local installed capacity (LICAP) requirements on ISO-NE. Also provided expert testimony before the FERC in support of its applications for market-based rate authority.
- ◆ For NSTAR, provided testimony before the FERC on several matters: first, the necessity of imposing bid caps on the New England electricity market; second, replacement energy rates for generators when transfer capability into a transmission-constrained zone was reduced because of system upgrades; and third, the appropriateness of granting market-based rate authority to a generator in a transmission-constrained zone. Developed a Cournot market model to forecast the potential impact on market prices in the transmission-constrained zone in which the majority of NSTAR's service territory is located.
- ◆ For Nevada Power Company, provided expert testimony before the FERC for its market-based rate authority application.

- ◆ For Otter Tail Power Company, provided an affidavit to the FERC assessing how the Midwest ISO's proposed Transmission and Energy Market Tariff would affect Otter Tail Power, both operationally and financially. Based on the strategies that were pursued by some market participants during the 2001 California electricity market crisis, demonstrated the potential to pursue similar strategies in MISO and harm Otter Tail and its customers.
- ◆ For Edison Mission Energy's subsidiary Midwest Gen, provided expert testimony to the FERC for its market-based rate authority application.
- ◆ For a Midwest utility, examined the implications of differing configurations of the independent system operator (ISO) on potential market power concerns. The issue particularly examined was the question of seams and how different ISO configurations affected the costs of transactions.
- ◆ Co-authored a report for the New York Independent System Operator assessing the reliability implications of modifying its rules regarding installed capacity.
- ◆ Submitted testimony to the Public Utilities Commission of Texas (PUCT) regarding a proposed rule to allocate costs of procuring replacement reserves to market participants in ERCOT.
- ◆ For the Edison Electric Institute, authored a report on standard market design and its implications for utilities within regional transmission organizations.

Forecasting and Weather Normalization

- ◆ For Florida Power and Light Co., provided testimony before the Florida Public Service Commission with regard to its forecasting methodology.
- ◆ For an electric utility in the Southeast, reviewed the existing weather normalization process and diagnosed problems with weather data and regression models. Developed alternative daily and monthly normalization models, improved degree-day specification, selection of weather stations, and regression specification to double prediction accuracy and improve stability of normalization process.
- ◆ For PJM, conducted a review of models for forecasting peak demand and re-estimated new models to validate recommendations. Models were developed for 18 individual transmission zones as well as for the entire PJM system.
- ◆ For a Southwestern utility, developed models for forecasting monthly sales and loads for residential, commercial and industrial customer classes using primary data on customer loads, weather conditions, and economic activity.
- ◆ For the Public Service Company of New Mexico, provided expert testimony before the Public Utilities Commission of New Mexico regarding the forecasted growth of the El Paso, Texas and Juarez, Mexico markets and their electricity requirements.

- ◆ For a Southeastern utility, developed a model for forecasting monthly demand that incorporated the impacts of its significantly declining housing market and which served as the basis for its treasurer's revenue forecast.

Rate Design and Related Issues

- ◆ For a utility in PJM, performed a marginal cost/avoided cost study to be used in evaluating its demand-side management energy efficiency programs, demand responsive rates, and seasonal and time-of-use rates. Included geographic-specific assessment of marginal distribution and transmission costs.
- ◆ For intervenors in Toronto Hydro Electric System Limited (THESL), provided testimony on cost allocation issues with regard to THESL's suite metering program.
- ◆ For Ameren/UE's Missouri subsidiary provided expert testimony on its rate design before the Missouri Public Utility Commission. Assisted the development of company witnesses' rationale for the choice of cost of service allocation method, developed benchmarks for the rate increase against similarly situated utilities, as well for other commodities' escalations, and evaluated proposed demand-side management programs and rate options.
- ◆ For Ameren/UE's Illinois subsidiaries, provided expert testimony on the potential for gas demand-side management. The testimony discussed potential rate implications of such programs on the revenue of the utilities.
- ◆ For the Edison Electric Institute, co-authored a series of papers with regard to issues facing utilities. The reports covered the issues of fuel adjustment clauses, mitigating large rate increase impacts, and the Energy Policy Act of 2005.
- ◆ For a U.S. electric utility, assisted in the valuation of generation assets for use in its testimony on stranded costs. This included development a financial model to determine the generation assets' market value, development of a convolution algorithm to convert market scenarios into a probability distribution of asset values, and statistical analysis of the relationship of the utility's generation assets' operating costs in comparison to its competitors. The assignment also included testimony preparation, interrogatories, and rebuttals.
- ◆ For the City of Vernon, California, submitted testimony to the FERC regarding its revenue requirements for transmission.
- ◆ For the Edison Electric Institute, served as an instructor in the Advanced Rates School on the topics of cost allocation, rate design, and marginal costs.
- ◆ For the ISO-NE, served as instructor on retail cost allocation and ratemaking.

Transmission

- ◆ For Hydro Québec, provided testimony before the Régie d'Énergie regarding the conformance of its Open Access Transmission Tariff with U.S. FERC regulations.
- ◆ Before staff members of the FERC, assisted in the development of a review of the implications of the restructuring in transmission assets' cost of capital.
- ◆ For a power marketer and developer of independent power projects in Great Britain, assisted in the preparation of comments on proposals by the UK pool regarding the pricing of transmission losses and the role of demand-side bidding.
- ◆ For a European transmission company, provided an analysis of the likely development of the European electricity market. Also assessed market implications for the transmission company of modifications to the transmission grid.
- ◆ For Hydro Québec, provided expert testimony before the Régie d'Énergie regarding whether a set of privately held transmission facilities constituted a looped transmission system and, thus, was subject to requests for transmission service.

Plant Performance and Strategy

- ◆ For the Keystone-Conemaugh Project Office, performed a benchmarking analysis to identify the areas in which Keystone and Conemaugh coal units were better performing or under-performing compared to other units with similar characteristics. This involved comparing the historical operational and cost performance of the Keystone and Conemaugh coal units against their peer groups; identifying the areas where the performance of the Keystone and Conemaugh coal units were above and below the average quartile of their peer groups; and developing metrics and methodologies to combine the results of individual comparisons across the operational and cost performance assessments.
- ◆ For a U.S. electric utility, assisted in the development of a legislative and regulatory strategy with regard to restructuring. This assignment included generation asset valuation in a competitive market, development of stand-alone transmission and distribution rates under cost-of-service and performance-based regulation, and estimation of stranded costs.

Utility Financial Issues

- ◆ For the Edison Electric Institute, co-authored a report on the general inapplicability of standard financial portfolio theory to the resource portfolios of utilities.
- ◆ For a gas utility, assisted in the assessment of the announcement effect of environmental liabilities on its cost of capital. This assignment included estimation of changes in market betas for pre- and post- environmental liability announcement.

- ◆ For the investor-owned utilities of Wisconsin, provided testimony before the Public Service Commission of Wisconsin on cost of capital issues for use in its statewide resource planning exercise.
- ◆ For the developer of a synthetic natural gas plant in Indiana, provided testimony before the Indiana Utility Regulatory Commission on the appropriate approach to assessing financial risk for the plant.
- ◆ For the developer of a synthetic natural gas plant in Illinois provided a series of testimonies before the Illinois Commerce Commission on the appropriate cost of equity for the plant.
- ◆ For the developer of a synthetic natural gas plant in Illinois, provide testimony before the Illinois Construction Development Board on the appropriate range of capital costs an operations and maintenance expenses.

Other Energy Experience

- ◆ For the Edison Electric Institute, conducted annual workshop for Electric Rate Advanced Course, “Introduction to Efficient Prices,” University of Wisconsin, Madison, July 2009 - Present.
- ◆ For the Edison Electric Institute, conducted annual workshop for Electric Rate Advanced Course, “Rate Class Cost Allocation,” University of Wisconsin, Madison, July 2009 - Present.
- ◆ For the Edison Electric Institute, conducted annual workshop for Electric Rate Advanced Course, “Ratemaking by Objective: It Can Be Done,” University of Wisconsin, Madison, July 2009 - Present.
- ◆ For the Edison Electric Institute, conducted Pre-Course Workshop for Electric Rate Advanced Course, “Traditional Embedded Costing and Pricing Concepts,” University of Wisconsin, Madison, July 26, 2009.
- ◆ For the Edison Electric Institute, conducted workshop for Electric Rate Advanced Course, “Unbundling Methodologies,” University of Wisconsin, Madison, July 26, 2009.
- ◆ For the Edison Electric Institute, conducted webinar “Long-Term Energy Forecasts: Challenges and Approaches,” June 17, 2009.
- ◆ For the Indiana Energy Conference, presented “It Ain’t Your Father’s IRP, Meeting Today’s Challenges,” October 2, 2008.
- ◆ For the NEPOOL Forecasting Committee Summer Meeting, presented “I’m a Forecaster – And You Can Too!,” July 17, 2008.
- ◆ For the Electric Power Research Institute (EPRI), developed and directed a research program to provide electric utilities the following capabilities: marketing research, pricing and rate design, integrated resource planning, capital budgeting, environmental impacts of electric utilities and

end-use technologies, load research, forecasting, and demand-side management through software tools, database development, and technology development. Assisted in the development of the Load Management Strategy Testing Model (LMSTM), enhancements to the Electric Generation Expansion Analysis Model (EGEAS). Co-wrote reports on the environmental impacts of electric technologies, environmental externalities, cost-benefit analysis of evaluation of DSM programs, rate design and costing, integrated resource planning, impacts of interruptible and curtailable loads, product differentiation, activity-based costing, DSM program evaluation, and others.

- ◆ For EPRI, served as project manager of the Edison Electric Institute (EEI), National Rural Electric Cooperatives Association (NRECA), American Public Power Association (APPA), and National Association of Regulatory Utility Commissioners (NARUC) jointly sponsored Electric Utility Rate Design Study (EURDS). Represented the Institute before various regulatory commissions, federal agencies, and utility executives. Also for EPRI, served on the Environmental Protection Agency's advisory committee for the Clean Air Act Amendments and as the operating agent for Annex IV, Improved Methods for Integrating Demand-Side Options into Utility Resource Planning, of the International Energy Agency Agreement on Demand-Side Management.
- ◆ For a California utility, supervised short- and long-term forecasts of sales and peak demand for use in resource and corporate planning. Supervised and helped prepare forecast documentation for public hearings before the California Energy Commission and represented the utility to the Commission on the forecast. Supervised the design and implementation of long-term strategic planning and financial models, and prepared both marginal and embedded cost of service studies for the utility and assisted in their use for the design of customer rates. Evaluated the impact of energy conservation programs and legislation on long-term system resource requirements. Designed and implemented the residential survey of appliance holdings and commercial customer equipment survey.

TESTIMONY AND REGULATORY FILINGS

Before the Régie De L'Énergie, Prepared Direct Testimony of Philip Q Hanser on Behalf of Hydro-Québec Distribution regarding their Application for Approval of Characteristics of Wind Service Integration and Analysis Chart for the Acquisition of a Service Integration of Wind, R-3848-2013, June 2013.

Before the Federal Energy Regulatory Commission, Prepared Direct Testimony of Philip Q Hanser on Behalf of NV Energy Operating Companies regarding whether use of a 12-CP cost allocation method is appropriate for the NV Energy transmission system from a cost allocation perspective, May 2013.

Before the Commonwealth of Massachusetts Department of Public Utilities, "Review and Analysis of Service Quality Plan Structure In the Massachusetts Department of Public Utilities Investigation Regarding Service Quality Guidelines for Electric Distribution Companies and Local Gas Distribution Companies," with David E. M. Sappington and William P. Zarakas, as part of the Initial Comments of National Grid, DPU12-120, March 2013.

Before the Bonneville Power Administration, Direct Testimony of Philip Q Hanser, John D. Martinsen, Felicie NG, James M. Russell, and Paul Wrigley on Behalf of Benton County Public Utility District No. 1, Iberdrola Renewables, LLC, Tacoma Power, Seattle City Light, and Snohomish County Public Utility District No. 1, Docket No. BP-14-E-JP12-01, January 28, 2013.

Before the Illinois Commerce Commission, Report of Philip Q Hanser on Behalf of Chicago Clean Energy, LLC, on the Reasonableness of Chicago Clean Energy's Cost of Equity, October, 2011; Supplemental Report on Behalf of Chicago Clean Energy, LLC, November, 2011; Response Report of Philip Q Hanser on Behalf of Chicago Clean Energy, November, 2011, Certified Affidavit on Behalf of Chicago Clean Energy, LLC, December 2011.

Before the Louisiana Public Service Commission, Direct Testimony of Philip Q Hanser on Behalf of Calpine Corporation, Docket No. U-31971, November 22, 2011. (Testimony withdrawn as part of the settlement between Calpine and Entergy.)

Before the Illinois Construction Development Board, Supplemental Report of Philip Q Hanser on Behalf of Chicago Clean Energy, LLC, on the Reasonableness of Chicago Clean Energy's Estimate of Capital Costs, November, 2011. Supplemental Report of Philip Q Hanser on Behalf of Chicago Clean Energy, LLC, on the Reasonableness of Chicago Clean Energy's Estimate of Operations and Maintenance Expenses, November 2011.

Before the Indiana Utility Regulatory Commission, Rebuttal Testimony of Philip Q Hanser on Behalf of Indiana Gasification, LLC, IURC Cause No. 43976, June 2011.

Before the Federal Energy Regulatory Commission, Supplemental Comments, Re: Notice of Proposed Rulemaking regarding Demand Response Compensation in Organized Wholesale Energy Markets," Docket Nos. RM10-17-000 and EL09-68-00, October 4, 2010, May 13, 2010.

Before the Régie De L'Énergie, Prepared Expert Report of Philip Q Hanser on Behalf of Hydro-Québec TransÉnergie ("HQT"), Regarding HQT's Methodology for ATC Coordination, June 2010.

Before the Commonwealth of Massachusetts Trial Court, in the matter of MASSPOWER v. Massachusetts Municipal Wholesale Electric Company (MMWEC), Civil Case No. 07-3243 BLS2; Testified on behalf of MMWEC regarding the management and ownership of investor-owned utilities (“IOUs”), MMWEC, and municipal light departments (“Municipals”) in Massachusetts before and after the passage of the Electric Industry Restructuring Act of 1997, as well as the impact of electric industry restructuring in Massachusetts on IOUs, MMWEC, and Municipals with respect to contract buyouts, March 2010.

Before the Ontario Energy Board, in the Matter of Toronto Hydro-Electric System Limited’s 2010 Electricity Distribution Rate Application, Prepared Witness Statement on Behalf of the Smart Sub-Metering Working Group, December 15, 2009.

Before the Superior Court of the State of California for the County of San Diego, Case No. GIC 789291, for the Office of the Attorney General of the State of California on Behalf of California Department of Water Resources, Prepared Second Addendum Report to Expert Report of Philip Q Hanser, September 30, 2009.

Before the Florida Public Service Commission on Behalf of Florida Power and Light Company, Prepared Rebuttal Testimony of Philip Q Hanser, Docket No. 080677-EI, August 6, 2009.

Before the Federal Energy Regulatory Commission on Behalf of the City of Vernon, California, Prepared Petition for Declaratory Order and Request for Waiver of Filing Fee of City of Vernon, California, Docket No. EL09-___-000, July 15, 2009.

Before the Régie De L’Énergie, Prepared Supplemental Expert Report of Philip Q Hanser on Behalf of Hydro-Québec TransÉnergie, in Response to Newfoundland and Labrador Hydro’s Complaint P-110-1692, June 2009.

Before the Federal Energy Regulatory Commission, on Behalf of The People of the State of California, *ex rel.* Edmund G. Brown Jr., Docket No. EL09-__ (“Brown Complaint”), Direct Testimony of Philip Q Hanser regarding emergency purchases the state authorized the California Energy Resources Scheduling Division of the California Department of Water Resources (“CERS”) to make when the California investor-owned utilities (IOUs) could not purchase the power needed to serve their customers, May 22, 2009.

Before the Florida Public Service Commission on Behalf of Florida Power and Light Company, Prepared Direct Testimony of Philip Q Hanser, Docket No. 080677-EI, April 23, 2009.

Before the Superior Court of the State of California for the County of San Diego, Case No. GIC 789291, for the Office of the Attorney General of the State of California on Behalf of California Department of Water Resources, Prepared Addendum to Expert Report of Philip Q Hanser, March 31, 2009.

Before the Pennsylvania Public Utility Commission on Behalf of Pennsylvania Electric Company, Prepared Rebuttal Testimony of Philip Q Hanser and Metin Celebi Concerning the Causes and Pricing of Transmission Congestion, Docket No. P-2008-2020257, January 16, 2009, March 10, 2009.

Before the Régie De L'Énergie, Prepared Expert Report of Philip Q Hanser on Behalf of Hydro-Québec TransÉnergie, in Response to Newfoundland and Labrador Hydro's Complaints P-110-1565, P-110-1566, P-110-1597, P-110-1678, and P-110-1692, December 2008.

Before the Pennsylvania Public Utility Commission, Docket No. P-2008-2020257, on Behalf of Pennsylvania Electric Company, Prepared Direct Testimony of Philip Q Hanser Concerning the Causes and Pricing of Transmission Congestion, July 30, 2008.

Before the Régie De L'Énergie, Prepared Affidavit on Behalf of Hydro-Québec Regarding the Public Availability of SIS Reports Performed by a Transmission Provider, June 19, 2008.

Before the Federal Energy Regulatory Commission, Docket No. EL08-__-000, Prepared Direct Testimony on Behalf of the City of Vernon's Revised Transmission Revenue Requirement Filing with the FERC, April 3, 2008.

Before the Régie De L'Énergie, Prepared Expert Report on Behalf of Hydro-Québec TransÉnergie to Assess Whether the Transmission Facilities Owned by ELL may be Considered as a "Radial Generator Lead," Case No. R-3636-2007, March 13, 2008.

Before the American Arbitration Association, Case No. 74Y1980019606MAVI, Prepared Rebuttal Report on Behalf of the California Department of Water Resources to Evaluate the Reports that William Hogan, Jeffrey Tranen, and Ellen Wolfe Provided on Behalf of Sempra Generation, June 4, 2007.

Before the American Arbitration Association, Case No. 74Y1980019606MAVI, Prepared Expert Report on Behalf of the California Department of Water Resources to evaluate certain claims made by the California Department of Water Resources ("DWR") in its Demand for Arbitration regarding the performance of Sempra Energy Resources, now known as Sempra Generation, under the Energy Purchase Agreement between the parties, and to calculate amounts that Sempra would owe to DWR assuming liability is established, May 14, 2007.

Before the United States Bankruptcy Court, Northern District of Ohio, Eastern Division, Case Nos. 01-44007 Through 01-44015, Prepared Expert Report in Regard to McKesson's Inventory Reclamation in the Phar-Mor Bankruptcy, March 9, 2007.

Before the Public Utility Commission of Texas, Docket No. 33416, Prepared Rebuttal Testimony on Behalf of Constellation New Energy, Inc.'s Appeal and Complaint of ERCOT Decision to Approve PRR 676, PRR 674 and Request for Expedited Relief, January 11, 2007.

Before the Public Utility Commission of Texas, Docket No. 33416, Prepared Direct Testimony on Behalf of Constellation NewEnergy, Inc. to analyze and discuss the flaws and potential negative impacts of the allocation methods under Protocol Revision Request ("PRR") 676 which relates to procurement costs for Replacement Reserve Service ("RPRS") and Out of Merit Capacity, November 22, 2006.

Before the American Arbitration Association, Case No. GIC 789291, Prepared Rebuttal Report on Behalf of California Department of Water Resources vs. Sempra Energy Resources, July 11, 2006.

Before the State Office of Administrative Hearings, Prepared Expert Report on Behalf of TXU Energy Solutions, Regarding their Demand-side Management Program and the Difference Between the Actual and Projected Savings in the Energy Bill of University of Texas, July 7, 2006.

Before the Missouri Public Service Commission, Case No. ER-2007-0002, Prepared Direct Testimony on Behalf of Union Electric Company with Regard to Ameren UE's Rate Design Proposals, July 5, 2006.

Before the Superior Court of the State of California for the County of San Diego, Case No. GIC 789291, for the Office of the Attorney General of the State of California on Behalf of California Department of Water Resources, Prepared Expert Report, June 9, 2006.

Before the Superior Court of the State of California, J.C.C.P. Nos. 4221, 4224, 4226 and 4228, Prepared Declaration in Support of California State Agencies' Opposition to Motion on Shortened Time and Motion in Support of Preliminary Approval of Class Action Settlement, June 8, 2006.

Before the Superior Court of the State of California, J.C.C.P. Nos. 4221, 4224, 4226 and 4228, Prepared Declaration in Support of California State Agencies' Opposition to Proposed Publication Notice, January 13, 2006.

Before the United States Bankruptcy Court, Case No. 05-60200 (BRL), Prepared Declaration on Behalf of Calpine Corporation with Regard to the Public Interest Standard for the Rejection of the Contract, December 30, 2005.

Before the FERC, Docket No. EL05-76-001, Prepared Direct Testimony on Behalf of Dominion Energy Marketing, Inc. (DEMI), regarding a dispute between DEMI and The United Illuminating Company as to which party is responsible for paying certain costs associated with Reliability Must-Run agreements under a December 28, 2001 Power Supply Agreement between the two parties, December 5, 2005.

Before the American Arbitration Association, Case No. 74Y1980019304VSS, Prepared Expert Report on Behalf of California Department of Water Resources vs. Sempra Energy Resources with Regard to Damages from Multiple Contract Breaches, May 2005.

Before the FERC, Docket No. EL03-180-000, Prepared Supplemental Testimony on Behalf of the California Parties with Regard to Enron's Circular Scheduling and Paper Trading Gaming Practices, January 31, 2005.

Before the FERC, Docket No. ER96-496-010, *et al.*, Prepared Affidavit on Behalf of Northeast Utilities Service Company and Affiliated Companies' Market-based Rate Authorization, September 27, 2004, Revised December 9, 2004.

Before the Connecticut Siting Board, Docket 217, Prepared Testimony on Behalf of Connecticut Light and Power in support of its application for a Certificate of Environmental Compatibility and Public Need for the construction of a 345-kV electric transmission line and reconstruction of an existing 115-kV electric transmission line between Connecticut Light and Power Company's Plumtree Substation in Bethel, through the Towns of Redding, Weston, and Wilton, and to Norwalk Substation in Norwalk, Connecticut, November, 2004.

Before the FERC, Docket No. ER04-691-000, Prepared Affidavit on Behalf of Otter Tail Power Company (OTP) Regarding Problems that May Result from the Implementation of MISO's Markets Tariff in OTP's Region, May 7, 2004.

Before the FERC, Docket No. ER03-563-030, Prepared Joint Affidavit with Judy W. Chang on Behalf of Devon Power LLC, *et al.*, March 24, 2004.

Before the FERC, Docket No. EL03-180-000, Prepared Direct Testimony on Behalf of the California Parties with Regard to Enron's Circular Scheduling and Paper Trading Gaming Practices, February 27, 2004.

Before the Commonwealth of Massachusetts, Case No. 99-6016, Prepared Expert Report on Behalf of Alstom Corporation and Black and Veatch vs. Meriden Corporation, LLC, Review of "*Value of the Meriden Power Project*," January 9, 2004.

Before the FERC, Docket No. EL03-159-000, Prepared Declaration on Behalf of The California Parties, Re: Gaming Activities Of Modesto Irrigation District, October 2003.

Before the FERC, Docket No. ER03-118-000, Prepared Affidavit on Behalf of Otter Tail Power Company For Otter Tail Power Company, Assessing how the Midwest ISO's Proposed Transmission and Energy Market Tariff will Affect Otter Tail Power both Operationally and Financially, September 15, 2003.

Before the Pennsylvania Environmental Hearing Board, New Jersey Department of Environmental Protection vs. Pennsylvania Department of Environmental Protection and Lower Mount Bethel Energy, LLC, Docket No. 2001-280-C, Prepared Expert Report on Behalf of Pennsylvania Power and Light, May 2, 2003.

Before the FERC, Docket No. EL00-95-069, Prepared Rebuttal Testimony on Behalf of Southern California Edison for the California Parties Regarding Manipulation of Energy and Ancillary Service Market Prices and the Outage Behavior of Gas Fired Power Plants, March 20, 2003.

Before the FERC, Docket No. EL00-95-069, Prepared Testimony on Behalf of Southern California Edison for the California Parties Regarding Manipulation of Energy and Ancillary Service Market Prices and the Outage Behavior of Gas Fired Power Plants, February 24, 2003.

Before Southern District Court of Illinois, Docket No.99-833-MBR, Prepared Expert Report for Department of Justice, Environmental Protection Agency vs. Illinois Power Company and Dynegy Midwest Generation Regarding the Likely Rate Treatment of Pollution Control Equipment Expenditures, July 29, 2002.

Before the FERC, Docket No. ER99-3693-000, Prepared Direct Testimony on Behalf of Edison Mission Energy and Edison Mission Marketing and Trading, Inc. on Behalf of Midwest Generation's Application for Market-based Rate Authority, April 1, 2002.

Before the FERC, Docket No. ER01-890-000, Prepared Rebuttal Testimony on Behalf of NSTAR on the Appropriate Rates for Generators During Transmission Upgrades or Enhancements Requiring Substantial and Sustained Reduction in Transfer Capability, September 21, 2001.

Before the FERC, Docket No. EL01-79-000, Prepared Affidavit on Behalf of NSTAR, in its Intervention of the Granting of Market-based Rate Authority to Sithe, May 2001.

Before the FERC and the Public Utilities Commission of Nevada, Docket No. EC0-173-000, Prepared Affidavit on Behalf of Sierra Pacific Resources Company, Regarding the Market Power Implication of Generation Asset Divestiture Required for the Merger of Sierra Pacific Power and Nevada Power Company, February 23, 2001.

Before the California Energy Commission, Prepared Expert Report on Behalf of Calpine Corporation, Socioeconomic Resources: Economic Benefits of the Metcalf Energy Center, October 27, 2000.

Before the FERC, Docket No. EL00-83-000, Prepared Affidavit on Behalf of NSTAR with Regard to the Necessity of Imposing Bid Caps on the New England Electricity Market, June 23, 2000.

Before the FERC, Docket No. ER99-2338-001, Prepared Direct Testimony on Behalf of Nevada Power Company in Support of the Divestiture of its Generation Assets, June 24, 1999.

Before the FERC, Docket No. ER99-2338-001, Prepared Direct Testimony on Behalf of Nevada Power Company in Support of the Divestiture of its Generation Assets, March 30, 1999.

Before the Vermont Public Service Board, Docket No. 6018, Prepared Rebuttal Testimony on Behalf of Central Vermont Public Service Corporation on the Impact of its Demand-side Management Programs, April 10, 1998.

Before the New Mexico Public Utility Commission, Case No. 2769, Prepared Direct Testimony on Behalf of the Public Service Company of New Mexico Regarding Forecasted Growth of the El Paso and Juarez, Mexico Markets, 1997.

Before the FERC, Docket No. RP95-363-015, Prepared Affidavit on Behalf of Southern California Edison Describing the Implications for the Electricity Market of the Manipulation of Gas Market Prices, 1996.

Before the Public Service Commission of Wisconsin, Docket No. 05-EP-7, Prepared Direct Testimony on Behalf of Investor-owned Utilities of Wisconsin on the Utilities Cost of Capital, May 8, 1995.

ACADEMIC HISTORY

Senior Associate in the Mossavar-Rahmani Center for Business and Government, Harvard Kennedy School	2012-
Guest Lecturer, Energy Laboratory Short Courses, Massachusetts Institute of Technology, Cambridge, MA	1997-1998
Visiting Lecturer, Department of Economics, University of California, Davis; Davis, CA	1981-1982
Assistant Professor, Departments of Economics and Mathematics, University of the Pacific, Stockton, CA	1975-1980
Ph.D. Candidacy Requirements Completed, Columbia University, NY	1975
Phil.M. (Economics and Mathematical Statistics) Columbia University	1975
A.B. (Economics and Mathematics) The Florida State University, FL	1971
Time Series and Econometric Forecasting, University of California at Berkeley Engineering Extension Course	September 1979
Data Analysis and Regression, American Statistical Association Short Course, San Diego, CA	August 1978

PROFESSIONAL RELATIONSHIPS

<i>Association of Energy Service Professionals</i> , Board Member	1991-1995
<i>Journal of ADSMP</i> , Editor	1995
<i>American Statistical Association</i>	1974-current
Member of ASA Committee on Energy Statistics	1993-1999
<i>Conseil International des Grands Reseaux Electriques (CIGRE)</i>	2005-current
Working Group C5-8, Working Group on Renewables and Energy Efficiency in a Deregulated Market	2008-2009
<i>Institute of Electrical and Electronics Engineers (IEEE)</i>	1986-current

HONORS

Teaching Incentive Award, University of the Pacific	1979
Teaching Assistantship in Econometrics, Columbia University	1974
National Science Foundation Research Traineeship	1972 – 1974
Undergraduate and Graduate Research Assistantships, Florida State University	1968 – 1972
Omicron Delta Epsilon, Economics Honor Society	1971

PUBLICATIONS AND PRESENTED PAPERS

“Annual Report on Wholesale Market Prices and Trends in the Metropolitan Edison Company, Pennsylvania Electric Company, Pennsylvania Power Company and West Penn Power Company Service Area,” (with Attila Hajos and Charles Russell), prepared for Met-Ed, Penelec, Penn Power and West Penn Power, July 2013.

“Reducing Utility Rate Shocks,” (with Lawrence Kolbe), *Public Utilities Fortnightly*, June 2013.

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“ISO Markets, Operations and Settlements,” SNL Inside Utility Accounting Program, Charlotte, North Carolina, October 17, 2012.

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“What Price, GHGs?: Calculating the implied value of CO₂ abatement in green energy policies,” (with Mariko Geronimo), *Public Utilities Fortnightly*, Volume 150, October 2012.

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“Framework for Assessing Capex and Opex Forecasts as Part of a “Building Blocks” Approach to Revenue/Price Determinations,” (with Paul R. Carpenter, Toby Brown, and Pinar Bagci), Australian Energy Market Commission, June 2012.

“State Regulatory Hurdles to Utility Environmental Compliance,” *The Electricity Journal*, Vol. 25, Issue 3, April 2012.

“Riding the Wave: Using Demand Response for Integrating Intermittent Resources” (with Kamen Madjarov, Warren Katzenstein, and Judy Chang in *Smart Grid: Integrating Renewable, Distributed and Efficient Energy*, F.P. Sioshansi, ed. (New York: Academic Press, 2011).

“Policy Challenges Associated with Renewable Energy Integration,” 2011 *MITEI Symposium: Managing Large-Scale Penetration of Intermittent Renewables*, (with Judy Chang, Kamen Madjarov and Peter Fox-Penner).

“Marginal Cost Analysis in Evolving Power Markets: The Foundation of Innovative Pricing, Energy Efficiency Programs, and Net Metering Rates” (with Metin Celebi), *The Brattle Group, Inc. 2010 No. 2* (Energy).

“Assessing Ontario’s Regulated Price Plan: A White Paper,” (with Ahmad Faruqui, Ryan Hledik and Jenny Palmer), *The Brattle Group, Inc.*, December 8, 2010.

“Renewable Integration Model Presentation,” (with Judy Chang), California Public Utilities Commission (CPUC) California Long-Term Procurement Plan Workshop, San Francisco, California, August 25, 2010.

“On Dynamic Prices: A Clash of Beliefs?,” *The Electricity Journal*, Vol. 23, Issue 6, July 2010.

“Virtual Bidding: The Good, the Bad and the Ugly” (with Metin Celebi and Attila Hajos), *The Electricity Journal*, Vol. 23, Issue 5, June 2010.

“Renewable Integration Model and Analysis,” (with Judy Chang, Kamen Madjarov, Ross Baldick, and Antonio Alvarez), IEEE 2010 Transmission and Distribution Conference and Exposition, New Orleans, Louisiana, April 21, 2010.

“Utility Supply Portfolio Diversity Requirements” (with Frank Graves), *The Electricity Journal*, Vol. 20, Issue 5, June 2007.

“Electric Utility Automatic Adjustment Clauses Revisited: Why They Are Needed More Than Ever” (with Frank Graves and Greg Basheda), *The Electricity Journal*, Vol. 20, Issue 5, June 2007.

“Rate Shock Relief” (with Frank Graves and Greg Basheda), *Electric Perspectives*, May/June 2007.

“Rate Shock Mitigation” (with Frank Graves and Greg Basheda), prepared for Edison Electric Institute, May 2007.

“Wire We Here? Coal in the West,” Law Seminars International, Coal in the West Conference, Denver, Colorado, March 30, 2007.

“Electric Utility Automatic Adjustment Clauses: Benefits and Design Considerations” (with Frank Graves and Greg Basheda), Edison Electric Institute, August 2006.

“Can Wind Work In An LMP Market?” (with Serena Hesmondhalgh and Dan Harris), *Natural Gas & Electricity*, November 2005.

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“Does SMD Need a New Generation of Market Models? Or How I Learned to Stop Worrying and Enjoy Carrying a Pocket Protector,” SMD Conference, Washington, D.C., December 5, 2002.

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Ten EPRI reports and approximately 20 articles in EPRI Reports and Conference Proceedings.

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“Transfer Function Estimation Using TARIMA,” *SAS User’s Group International, 1982 Proceedings*. Cary, North Carolina: SAS Institute. Inc., 1982.

“Invited Editorial Response to Behavioral Community Psychology: Integrations and Commitments,” by Richard Winett, *The Behavior Therapist* 4(5), Convention, 1981.

Statistics Through Laboratory Experiences (with D. Christianson and D. Hughes), Stockton, CA: University of the Pacific 1976-1977.

“Unsolved Advanced Problem,” *American Mathematical Monthly*, May 1975.

“Multiattribute Utility Theory and Earthquake Mitigation Policy” (with T. Munroe), Western Economic Association Conference, June 1978.

“Introduction to Multivariate Data Analysis Techniques,” Bureau of Applied Social Research, Columbia University, New York, NY, 1973.

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