

**SHAUN D. LEDGERWOOD**  
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**Dr. Ledgerwood** is an expert in the analysis of manipulative, fraudulent or anti-competitive behavior in energy, financial, securities and commodities markets. He specializes in performing analyses relevant to the proof/disproof of fraudulent or manipulative behavior in response to government or private investigations, enforcement actions and litigation; the analyses of competitive interactions within and across physical and financial markets; liability and damage analyses pursuant to matters involving contracts; and issues relevant to regulation, ratemaking and taxation. His 27 years of experience as an economist and attorney provides clients with unique insight into matters involving litigation, especially in harmonizing and aligning economic analyses to address the legal issues presented.

As a former economist and attorney for the Office of Enforcement for the Federal Energy Regulatory Commission, he evaluated manipulative behavior within and across wholesale electricity and natural gas markets, assisting the agency's enforcement actions against Energy Transfer Partners, L.P., Amaranth Advisors, LLC, Constellation Energy Commodities Group, and several other investigations. He led the agency's pilot project for energy market surveillance of wholesale natural gas and electricity markets, a prelude to the creation of the Division of Analytics and Surveillance. Based on this experience, he developed an analytic framework for detecting and analyzing manipulative behavior, which has been published extensively in academic, legal and trade journals and is used as the foundation for compliance, surveillance, and to support or defend against legal actions brought under fraud-based or "artificial" price anti-manipulation rules or the antitrust laws.

He has testified as an expert witness in federal court and before state utility commissions, and has filed expert reports in enforcement actions, administrative proceedings and litigation before the FERC, state commissions, U.S. Federal District Court and the Queen's Bench in Alberta, Canada. As an Adjunct professor, he taught undergraduate, graduate and legal courses in microeconomic theory, law and economics, regulation, antitrust and contractual/tortious remedies at the University of Oklahoma Department of Economics, College of Law, and Price College of Business. He also served as an Affiliated Faculty member at the Georgetown University Public Policy Institute.

Dr. Ledgerwood holds a Ph.D., M.A., and B.A. in Economics from the University of Oklahoma and a J.D. from the University of Texas (Austin).

#### **AREAS OF EXPERTISE**

- Market Manipulation Detection, Analysis, Compliance and Litigation
- Analysis of Liability and Damages in Tort, Contracts and Fraud
- Analyses in Support of Antitrust and Competitive Issues in Regulated Industries
- Utility Regulatory Policy and Ratemaking
- Valuation of Regulated Assets
- Environmental Policy and Regulation

## EXPERIENCE

### MARKET MANIPULATION DETECTION, ANALYSIS, LITIGATION AND COMPLIANCE

#### *Defense against Allegations of Market Manipulation*

Dr. Ledgerwood assists clients, regulatory agencies, and other experts on matters involving alleged manipulative activity in commodity and financial markets. He specializes in the analysis of acts that can trigger a manipulation (uneconomic trading, outright fraud, and the exercise of market power) and their nexus to potential manipulation targets such as financial derivatives or physical index positions. He has published extensively on this subject since joining Brattle in January 2011.

- **Support of Internal Investigation.** Assisting client and its external counsel with the analysis of generator offers that inadvertently might have violated tariff thresholds set for those units. Analysis is evaluating whether such events occurred, identifying their cause, and determining whether they resulted in any market effects.
- **Support of Client Defense to Manipulation Claim.** Providing support for client alleged to have economically withheld resources from a generation capacity market. Analysis seeks to determine whether the units were offered above cost (a prerequisite for withholding) and, if so, whether the withholding involved fraudulent behavior that would be violative of the agency's anti-manipulation rule.
- **Support of Client Defense to Manipulation Claims.** Assisting a natural gas firm accused of withholding natural gas capacity to benefit the value of its affiliated generation resources. Effort centers on testing the robustness of results produced from a series of econometric analyses purportedly used to support allegations of cross-market manipulation.
- **Support of Client under Investigation.** Assisting a physical generator with a non-public investigation of its unit offers of energy into an RTO. Analysis is focusing on whether the offers reflected attempted withholding or the attempt to garner out-of-market payments in a manner violative of the agency's anti-manipulation rule.
- **Successful Defense of Client under Investigation.** Assisted a client under investigation for various physical power trades made across several RTOs. The analyses presented to agency staff demonstrated that the flows were executed for their own stand-alone profitability and that there was no evidence of manipulative behavior or harm to the market, leading the agency to drop its investigation.
- **Assisted Internal Investigation.** Assisted a client concerned that various trades placed into an RTO over time could be questioned as "uneconomic" and thus fraudulent under the agencies' market manipulation rules. These transactions may have led to various financial benefits and/or out-of-market payments that could be alleged to be potential manipulation targets. The analysis evaluated the trading data to determine whether intentionally uneconomic trades were in fact placed into the market and, if so, whether those trades distorted market outcomes. While no such trades were found, this analysis provided the client and its counsel with an understanding of the agency's potential arguments against it and the potential liability involved.

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- **Support of Client under Investigation.** Assisted European firm under investigation for the suspicious trading of energy futures contracts prior to and during a settlement period. Analysis provided to assist client's response to the exchange's inquiries and to assess potential liability under the applicable market manipulation rules.
- **Support of Client under Investigation.** Assisting an electricity trader and firm accused of manipulating the value of financial transmission rights using physical transactions claimed by the agency to be uneconomic. Analysis is using trade data, agency findings and other available data to evaluate the trader's liability and potential harm given the agency's "best case" against him. A framework-based analysis is being used to examine available economic and behavioral evidence to evaluate assertions as to the manipulation's components and the trader's intent.
- **Support of Client under Investigation.** Assisting a large electric utility in defending against agency allegations that intentionally-uneconomic and/or fraudulent offers of its generators were used to garner out-of-market payments. Analyses supporting the client's position show that its unit offers were in fact economic and maximized profits from the firm's energy sales exclusive of the out-of-market payments received.
- **Successful Defense of Client under Investigation.** Assisted client alleged to have engaged in prohibited transactions in the California ISO. Analysis proved that the company flowed physical power when the economics dictated it could do so profitably, and likewise reversed those transactions financially based on legitimate profit-seeking motivations. The agency investigating the matter closed the case with no further action against the company.
- **Successful Defense of Client under Investigation.** Assisted client alleged to have engaged in uneconomic physical transactions across RTOs to benefit financial positions. Analysis proved that the company's physical power flows were typically uncorrelated with the directionality of its financial positions and that those positions which could directionality benefit lacked sufficient financial leverage to make the manipulation profitable overall. The investigation was closed with no action taken against the company.
- **Support of Client under Investigation.** Assisted a large electricity trader in evaluating its potential exposure given an agency investigation into the industry's use of virtual bidding to affect the value of financial transmission rights. Analysis used the trader's internal trading records and publically available data from the RTO to evaluate whether the behavior gave rise to potential liability under the FERC's anti-manipulation rule. Where suspect behavior was found, additional trading data and client records were reviewed to determine whether the trading at issue served a stand-alone legitimate business purpose, thus blunting agency assertions of manipulative intent. The investigation was terminated with no action against the company.
- **Support of Client under Investigation.** Assisted a trader to defend against allegations of violations of the FERC's anti-manipulation rule. Provided the client with an expert report explaining why the behavior alleged served a stand-alone legitimate business purpose, specifically avoided manipulative outcomes, adhered to the results that the agency explicitly contemplated in its prior orders, and generally served to enhance the efficiency of the market as intended given the instruments involved.

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- **Support of Defense to Market Manipulation Claims.** Assisted ETRACOM, LLC and trader Michael Rosenberg in defense against allegations of manipulation made by the FERC. Enforcement staff alleged the use of uneconomic convergence bids to manipulate the value of congestion revenue rights. Analysis demonstrated that ETRACOM engaged in the trades in pursuit of a legitimate hydroelectric trading strategy and not to benefit its financial positions, thus demonstrating that it had no manipulative intent. Case settled with no personal liability assessed to Mr. Rosenberg.
- **Internal Investigation of Suspicious Trading Activity.** Assisted a large physical market participant in assessing its potential liability with respect to specific trading strategies that potentially altered the value of related financial derivatives positions. We performed this analysis in cooperation with the client's external counsel to provide a clear, consistent understanding of the behavior that could be of concern, as well as meaningful perspectives as to how the client could improve compliance going forward.
- **Agency Self-Report.** Successfully assisted a major financial trading organization in preparing and submitting a self-report concerning legitimate physical and financial trading behavior that might have been misconstrued as manipulative. The analysis provided demonstrated that the traders in the case were not acting in concert, but that one trader independently placed speculative trades upon viewing a market event in which a different trader independently placed his own profit-seeking physical trades. The agency took no action against the market participant or traders.

### *Development of Compliance Programs, Best Practices Audits and Trade Surveillance*

Dr. Ledgerwood and his colleagues regularly work with traders, compliance personnel and executives to enhance their entity's compliance with the manipulation rules of various enforcement agencies. He meets with clients in cooperation with their external counsels to develop and conduct compliance program audits and develop Best Practices for manipulation-related and other regulatory compliance strategies. In the energy, financial, commodities and securities industries in the U.S. and EU, these increasingly require the establishment of customized internal trade surveillance systems to monitor for behavior of concern. We also assist clients and their counsel to evaluate the compliance implications of various trading strategies that are anticipated or are under consideration.

- **Development of Compliance Programs.** As firms' compliance needs adapts and evolve, we assist internal and external counsels and executives with compliance-related responsibilities strategic advice as to how to develop, maintain and improve their compliance programs.
  - **Audits/Best Practice Reviews.** In cooperation with external counsel, we assist firms with comprehensive audits of their regulatory compliance programs and recommendations for adopting Best Practices, including compliance with the relevant market manipulation laws. These efforts can include: audit, review and back-testing of any trade surveillance systems that are in place; review of training and documentation materials and schedules; document retention policies and requirements; vetting and documentation of trading strategies; Standards of Conduct training; and a review of risk management policies and procedures.
  - **Compliance Plans for Physical and Financial Electricity Trading Firms.** We assist in-house and external counsel in the development of compliance plans tailored to the specific trading operations relevant to their client's firms. Plans are to be distributed to and acknowledged by

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- trading, compliance and risk management personnel to further of the creation/maintenance of compliance programs consistent with each regulator's anti-manipulation rules.
- **Compliance-Based Risk Optimization Strategy.** We assist trading firms in wrestling with the decisions as to how to expand their trading activity by trading a more diverse set of physical and financial products while remaining certain of compliance with agency anti-manipulation and disruptive trading practice rules. These efforts are often linked with the development of trade surveillance systems, such that the costs of the increased compliance capabilities are partly offset by increased profitability of the client's trading business.
  - **Compliance Seminars:** Dr. Ledgerwood regularly provides compliance seminars to the trading and compliance staff of commodity trading firms in the U.S., Canada and EU. These seminars provide attendees with a holistic approach for understanding the types of behavior that regulators may view as manipulative (as well as behavior that is legitimate). A variety of approaches and formats can be used so as to continuously provide a "fresh" perspective to traders if the seminars are conducted over a period of time.
    - **Compliance Seminars for European Utilities and Commodity Trading Firms.** We deliver presentations to the traders, compliance personnel and executives of European electric utilities and commodities trading firms. We focus on issues related to withholding (generation), cross-market manipulation, gaming of market rules, uneconomic behavior, false or misleading information, the documentation of trading strategies, and creation of processes to assure compliance with REMIT, MAD, TFEU 101 and 102, and applicable national laws.
    - **Seminars for North American Utilities.** We regularly deliver presentations to the traders and executives of large electric and gas utilities with a substantial North American energy trading presences. Presentations to traders focus on identifying the types of behavior likely to be deemed suspicious by the FERC, CFTC or Canadian regulators. Presentations to the trading heads and compliance managers focus on to strategically detecting and deterring such behavior; executive sessions are interactive and focus on building a culture of compliance.
    - **Compliance Seminars for an International Bank.** Provided four days of compliance seminars for the traders, compliance personnel, and executives of a major banking institution with an extensive commodities trading unit. Focus was on the recognition of behavior likely to draw regulatory scrutiny under the fraud-based and "artificial" price anti-manipulation rules in place in the U.S. and Europe; understanding of the potential civil and criminal liability associated with violations of these rules; and mechanisms for establishing internal surveillance systems to detect such behavior.
    - **Compliance Seminar for Regulators in the Russian Federation.** Delivered a 3.5 hour web-based presentation to NP Market Council and the representatives of several Russian market participants, ministries and other regulators of the Russian electric markets.
    - **Anti-Manipulation Strategies for Small Trading Firms.** Dr. Ledgerwood regularly provides compliance seminars to small, boutique trading shops who seek to avoid manipulative trading but operate with limited compliance resources. These engagements tend to foster consulting relationships that evolve as the client's trading operations grow in scope and complexity.

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- **Anti-Manipulation Seminars for Law Firms and Trade Associations.** Dr. Ledgerwood performs seminars for attorneys and industry groups who seek fresh perspectives concerning how their clients are or could be impacted by changes to laws and regulatory postures concerning the application of anti-manipulation rules, anti-disruptive trading practices rules, antitrust law and other laws concerning fraud or the provision of false information in trading contexts.
- **Assistance with the Development of Internal Trade Surveillance Systems.** Assisting several market participants with their in-house builds of trade surveillance systems for improved compliance and profitability. The goal is to take meaningful steps to the creation of automated systems to screen for, detect and report potentially manipulative or fraudulent behavior, while avoiding excessive “false positives” and minimizing the risk of “false negatives.” For example:
  - **Screens to Detect Manipulation in Electricity Markets.** We design screens to assist U.S. and EU clients with the detection of a wide variety of behavior relevant to electricity, including the inappropriate withholding of generation to benefit related positions; the uneconomic or fraudulent offer of generation to garner out-of-market payments; use of uneconomic physical or virtual price-making trades to impact the value of price-taking positions; specific types of “gaming” behavior; and other types of trades (such as circular schedules, “sham” schedules or “wash-like” transactions) that could be viewed as manipulative.
  - **Screens to Detect Manipulation in Natural Gas Markets.** We assist clients to develop screens to detect suspicious trading of physical natural gas or physical basis to influence the value of indices priced from those trades, as well as the trading of futures, monthly or spot gas to influence value of financial derivatives, bilateral contracts or physical index positions. We also create screens designed to find potential cross-market manipulation between natural gas and electric assets, such as through capacity withholding or uneconomic gas sales to advantage generation, tolling agreements or related derivatives such as heat rate swaps.

### *Analyses in Support of Agency Investigations and Plaintiff's Actions*

During his time at Brattle and with the FERC, Dr. Ledgerwood has assisted agency investigations and enforcement actions related to the alleged manipulation of commodity markets. He also serves as an expert to support the analysis of manipulative behavior on behalf of plaintiff's actions.

- **Support of Agency Investigation.** Assisted a regulator investigating the alleged exercise of market power through withholding by a company that simultaneously held related derivatives contracts that could benefit from higher prices. Analysis determined that the exercise of market power was profitable on a stand-alone basis without the need of any additional profits garnered from the derivatives. As such, we demonstrated that no manipulation occurred, for the legal exercise of market power is neither fraudulent nor does it create an “artificial” price.
- **Support of Agency Analysis of a Suspected Market Manipulation.** Examined the behavior of several precious metals traders for specific trading days in which manipulative behavior was suspected to occur. Project involved analysis of various physical and financial positions in relation to emails and deposition transcripts provided by the agency sponsoring the work.

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- **Damages Related to the Western Power Crisis.** Supported expert testimony in proceedings before the FERC seeking refunds from sellers into the California PX, the California ISO, and the bilateral markets in the Pacific Northwest in the aftermath of the Energy Crisis of 2000-2001.
- **Investigation of Market Manipulations within Electricity Markets.** While at the FERC, assisted several public and non-public investigations involving trading behavior alleged to set physical power prices to benefit financial positions, the values of which are tied to that physical price. Developed analytic yardsticks to support the legal standard of proof required by the FERC's anti-manipulation statute and established evidence showing intent to manipulate and the negation of erroneous affirmative defenses concerning the legitimate business purpose of such trades. These cases included:
  - *Deutsche Bank Energy Trading.* Provided analysis and opinions related to the investigation of an alleged manipulation of Congestion Revenue Rights using physical power trades.
  - *Constellation Energy Commodities Group.* Provided the conceptual framework used for the analysis of Constellation's allegedly uneconomic trading of physical and virtual trades asserted to have benefitted the value of its financial transmission rights and other related derivatives positions.
  - *Louis Dreyfus Energy Services.* Used publically available price data to demonstrate a bias evident at the Velva trading node during the months when the company was alleged to have used virtual bids to manipulate the value of its financial transmission rights.
  - *Barclays Bank.* Provided conceptual validation for staff's theory of market manipulation regarding the alleged use of uneconomic or fraudulent physical trades to boost the value of the company's financial swaps.
  - *Lake Erie Loop Flow Analysis.* Provided statistical analysis of various combinations of physical trades that were believed to have caused heightened loop flows around Lake Erie in 2008 and assisted the production of staff's report concerning the behavior.
- **Investigation of Market Manipulations within Natural Gas Markets.** In investigations of suspected market manipulations of the wholesale natural gas markets, evaluated whether trading entities accumulated portfolios of financial instruments tied to one or more physical pricing points, analyzed how such aggregated positions provided evidence of the incentive to manipulate, and demonstrated how attempts to alter physical prices could be shown to prove manipulative intent.
  - *Energy Transfer Partners, L.P. (ETP).* Worked with staff attorneys and analysts to assist staff expert witnesses in developing their direct and rebuttal testimonies. Also prepared for and participated in the depositions of expert witness for ETP.
  - *Amaranth Advisors, LLC et al. (Brian Hunter).* Worked extensively with staff's expert witness to develop his direct and rebuttal testimonies.

*Market Monitoring and Oversight*

While working with the Division of Energy Market Oversight (DEMO) at the FERC, Dr. Ledgerwood led the agency's pilot project for energy market surveillance of wholesale natural gas and electricity markets. In this role, he assisted the Commission in developing screens and procedures that would be useful for market monitoring and surveillance, contributing to the blueprint of what would eventually become the Division of Analytics and Surveillance. Since joining Brattle, he has used these skills to assist several other agencies outside of the U.S. in their market monitoring efforts.

- **Assistance to Western Australian Regulator.** Worked for the electric regulator for Western Australia to assist with the development of screens for the detection of anticompetitive behavior in its future capacity market design. In addition to building screens to detect for the exploitive use of market power, we advised the regulator to include screens to detect for intentionally-uneconomic behavior designed to suppress prices in benefit to market participants who are “net short” buyers in the capacity market.
- **Assistance to Canadian Electricity Market Monitor.** Worked for the market monitoring unit of a provincial regulator to assist it with the implementation of its anti-manipulation rules. The project involved the application of Dr. Ledgerwood's framework to various scenarios cited by the market monitor as potentially in violation of the rules, as well as develop processes and procedures to monitor for and detect manipulative activity and enforce the rules if violations were confirmed.
- **Assistance to the Italian Natural Gas Market Monitor.** Retained by the Italian electricity and natural gas market monitor to conduct a study to assist that agency in implementing its data surveillance responsibilities under REMIT and other applicable European competition laws. The study presented a comprehensive evaluation of the data that is and will be available to the market monitor, the types of manipulative and/or anticompetitive behavior that the market monitor should seek to detect, and the tools the market monitor can employ to screen the available data for the types of behavior identified.
- **Analysis of Potential Carbon Market Manipulations.** Assisted studies to evaluate the potential exposure of the proposed California and EU cap and trade markets to manipulative activity.
- **Assessment of Electricity Market Surveillance Methodologies.** Helped to identify the marginal benefits and costs associated with obtaining, compiling, and analyzing data from a variety of existing and potential new sources available to the FERC. Inherent to this effort was the development of an understanding as to what linkages may be formed between data of varying transparencies and value. Made recommendations regarding the priority of the surveillance efforts that the FERC should pursue.

ANALYSIS OF LIABILITY AND DAMAGES IN TORT, CONTRACTS AND FRAUD

Dr. Ledgerwood works for defendants and plaintiffs to various actions involving assessments of liability and damages related to contractual disputes and allegedly-fraudulent behavior. In tort cases, he has used statistical and discounted cash flow techniques to determine the amounts owed due to discriminatory behavior or from losses arising from wrongful termination or wrongful death.



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- **Traders Seeking Payment of Contractual Bonuses.** Provided direct and rebuttal reports in support of traders who sought recovery of unpaid bonuses withheld by their former employer. The bonuses were withheld based on traders' settlements of manipulation charges alleged by the FERC, in which they neither admitted nor denied liability for the acts alleged. Reports focused on the economic reasonableness of these settlements as rational, cost-minimizing choices given the high cost of defending against a FERC manipulation cases, refuting the employer's assertions that the settlements were indicative of the traders' guilt and thus provided a valid basis upon which the bonuses could be withheld.
- **Analysis of Disclosures of Material, Non-Public Information.** Retained by a regulator to examine whether non-public information disclosed by the employees of an exchange to an external broker was material, as measured through trading subsequent to the disclosures and its price impact on the market. Analysis made use of statistical analyses and event studies to evaluate causation and measure any price impacts, if discernable.
- **Support of Expert Testimony Involving Coal Transportation Contracts.** Provided support for expert witness testimony concerning the economics of rail transportation contracts for the transportation of coal in the face of multiple coal plant closures in the face of new regulatory environmental compliance obligations. Economic analysis determined whether the closure of the affected units were caused by the new regulations or by unfavorable economics created by the availability of inexpensive natural gas.
- **Evaluation of Applicability of Research Tax Credit.** Evaluated if contracts that involved specialized and unique research were "funded" in the context of I.R.C. § 41(d)(4)(H) and Treas. Reg. § 1.41-4A(d). Case required the evaluation of various contractual provisions to determine whether the risk of non-performance due to the research was borne by the buyer or seller of these contracts. Filed an expert report and furnished live testimony at a mediation session held in Miami, Florida on 11/21/11.
- **Defense against Allegations of a Pump and Dump Scheme.** Assisted expert witness in preparing a report defending against allegations of client's assemblage of an over-the-counter stock position and subsequent "pumping" of the stock through fraudulent statements and uneconomic trades. Allegations were proven false using trading records of the accused using market data to demonstrate that the client's trades did not fit the fact pattern alleged in the plaintiff's complaint.
- **Support of Action for Fraudulent Distressed Asset Sales.** Assisted expert witnesses in preparing reports supporting the IRS in pursuing taxes owed for a fraudulent tax shelter involving the sale of a portfolio of distressed foreign assets. Assisted the preparation of rebuttal reports in response to testimonies of expert witnesses on behalf of the defense.
- **Damages for Wrongful Termination.** The defendant in this case was sued by a former employee claiming wrongful termination due to age-based discrimination. Used company and macroeconomic data to show the employee's termination was based upon economically justifiable grounds. Additionally, performed an analysis to determine the damages owed had evidence of discrimination prevailed.

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- **Damages for Wrongful Termination.** Represented Xerox against a claim by a laid-off employee of gender-based discrimination in her termination. Used company-specific and macroeconomic data to demonstrate that the layoff was not gender-specific and that damages were inappropriate. Additionally, performed an analysis to determine the actual damages owed should evidence of gender-based discrimination prevail. Case tried as Jane Johnson v. Xerox Corporation, Bill Collins, Rick Hall, Kerry Summers, Ja Ann Alderman and Cathy Shuffield; Northern District of Oklahoma; Case No. 02-CV-596 H (J). Verdict for Xerox.
- **Damages for Wrongful Termination.** In a matter involving wages lost as a result of alleged disability-based discrimination and the termination of the employee at a local hospital, prepared expert testimony on behalf of the defendant regarding lost wages and the appropriateness of punitive damages.
- **Support of Action for Breach of Contract and Patent Infringement.** Assisted witness in preparing an expert report supporting plaintiff's claims of contractual breach involving fuel oil testing technology subject to patent.
- **Damages for Wrongful Termination.** Statistical analyses were used to depict the presence of gender-based discrimination among group of faculty at a major university. Assisted another witness in preparing expert testimony for this purpose.
- **Damages for Wrongful Death.** This case required a determination of the future earnings stream for a popular local television sportscaster killed in a plane crash. Used a discounted cash flow methodology to project the future earnings stream of the decedent and to provide a sensitivity analysis of that stream give various alternative assumptions.

### ANALYSES IN SUPPORT OF ANTITRUST AND COMPETITIVE ISSUES IN REGULATED INDUSTRIES

Dr. Ledgerwood has performed market analyses to support administrative or legal proceedings for a variety of market sectors, including studies to support petitions before the FERC or other regulatory authorities. His work has been used to support bond ratings, for market penetration studies in advance of acquisitions, or as evidence to be used in hearings before legislative bodies. He has also assisted the preparation of testimony for actions brought under the Sherman and Clayton Antitrust Acts, as well as under state below-cost sales laws or franchise-related entry restrictions. His work includes cases on behalf of plaintiffs and defendants to such proceedings.

- **Antitrust Damages Related to Alleged Natural Gas Manipulation.** Supporting a Brattle expert in defining the relevant market in an antitrust case involving the alleged manipulation of natural gas indices during the Western Power Crisis. The issue turns on the definition of market power when the recoupment of losses derives from sources outside of the physical market.
- **Analysis of Contractual Obligations of Capacity Contracts.** Evaluated a chain of contracts related to capacity ownership of a power plant shared between a municipality and electric cooperative. Case involved issue of which party was entitled to the revenues from surplus energy sold available out of the plant given different definitions of excess capacity provided by different generations of the underlying contracts.

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- **Analysis of Proposed Construction of Combined-Cycle Plant.** Assisted client analysis in support of determining the cost of new entry associated with a proposed power plant to be located in the eastern U.S. Analysis included the consideration of market rules, legislation, and the historic filings of various market participants with respect to the minimum offer price rule of PJM and other rules used in eastern capacity markets.
- **Support of Expert Testimony Involving Merger.** Provided support for expert witness testimony regarding a proposed merger of two utilities. Evaluated the merger applicants' expert testimonies concerning the efficiencies to be derived from the merger. Assisted the development of testimony evaluating concerning these efficiencies.
- **Analysis of Entry Strategy into U.S. Market.** Prepared a report for a major European construction firm seeking to determine best strategies for entry into U.S. HVAC construction. Study began with an overall examination of entry strategy (i.e., acquisition, merger, joint venture, or new entry) and geographic location, and culminated in a comprehensive entry strategy. Analysis involved a survey of potential acquisition targets.
- **Texas Electric Cooperatives Intervention into ERCOT Transition to Competitive Markets.** Submitted filings in support of TEC's positions concerning the potential for market abuse within ERCOT given the impending transition to a competitive imbalance energy market using locational marginal pricing. Commented upon projected market outcomes resulting from proposed rules by the Texas Public Utility Commission and critiqued comments made by other market stakeholders engaged in the proceedings.
- **Economic Evaluation of Alternatives Concerning Coal Generating Station.** Prepared an economic, environmental, and engineering evaluation of the potential benefits derived from reopening the Dean H. Mitchell coal plant. This included estimating the construction and operating costs of alternate repowering configurations to offer alternatives to rebuilding the plant. Environmental cost estimates were then used to evaluate options which would avoid the need for new source review. Estimated the profitability of these options using forecasted fuel prices, weather, and financing costs, resulting in discounted cash flow analyses that were subjected to sensitivity analyses for robustness.
- **Intervention Regarding the Application of Southwestern Public Service for Cost-Based Rates.** This case required a market concentration analysis using HHIs to establish the existence of high market concentration within the Southwestern Public Service control area. Dr. Ledgerwood supported and contributed filings before the FERC indicating that said market concentrations were significantly higher than those within the zonal regions of ERCOT, wherein competition had commenced. Performed additional analysis using the Supply Margin Assessment methodologies prescribed by the FERC.
- **Fuel Plan for Combined-Cycle Power Plant.** This analysis examined the demand profile for natural gas of existing units and planned future units at a combined-cycle generating facility. The study included regional analyses of the transportation and storage capacity within the region, analysis of gas supply, projections of the delivered cost of gas, and a discussion of fuel management issues under the existing contracts. The resulting fuel plan was used to support the bond rating of the plant owner.

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- **Damages for Antitrust Violations in Beauty Supply Market.** In this case, a local beauty supply company sued a large national chain for miscellaneous violations of the antitrust laws pertaining to the market foreclosure of plaintiff's generic brands. Supported the analyses and testimony required to demonstrate the injury to competition and damages claimed.
- **Intervention into FERC Conference on Supply Margin Assessment.** Assisted in the preparation of comments concerning the applicability of the Supply Margin Assessment proposed by the FERC in replacement of the "hub and spoke" Delivered Price Test based upon the 1992 U.S. Department of Justice Merger Guidelines. This analysis focused on how utilities with high market shares operating in highly concentrated markets could pass the proposed Supply Margin Assessment and thereby avoid mitigation.
- **Intervention into the Application of Southwestern Public Service for Cost-Based Rates.** Assisted analysis of market concentration in the SPS control area using HHIs. Supported filings before the FERC comparing market concentrations in the region to those within the congestion zones within ERCOT to demonstrate relative market power.
- **Damages for Antitrust Violations in Discount Grocery Market.** Assisted a local grocer facing predation by large national chain in all phases of analysis and resulting testimony to establish the predatory behavior and to assess damages associated therewith.
- **Estimation of Future Stranded Costs in Texas.** Analyzed financial data and comparable asset sales to determine the amount of stranded costs that would be incurred by generators in Texas upon the commencement of retail competition. This report was submitted to the Texas Legislature and recommended total estimated costs that were ultimately used as the basis for exit charges applied for affected utilities.
- **Intervention into the AEP/CSW Merger.** Assisted in the analysis of the merger application of American Electric Power and Central South West Corp. for intervention based upon market power concerns. The analysis included a review of market concentration provided by AEP and the production of interrogatories for associated witnesses.
- **Defense of Payphone Service Provider against Antitrust Claims.** The client in this engagement was accused of monopolizing the market for pay phone services by several independent payphone service providers. Assisted in the creation of analysis and testimony designed to show the complimentary nature of payphones and cell phones, thereby asserting the defendant's lack of market power within the broader product market.
- **Damages for Water Utility Condemnation.** Provided expert report regarding the monies owned for the condemnation of a water utility's service territory by a municipality. The analysis included estimating damages for customers affected by the territorial exclusion, as well as future customers projected to be served. Damages were assessed based upon the incremental loss of revenues from those customer's needed to support the debt load of the utility's outstanding bond issues, future capital upgrades, and expansions and identifiable annualized fixed expenses.
- **Antitrust Damages in Automobile Transportation Market.** The client was a hauler of automobiles suing an auto auction house for foreclosing access to the auction floor. Assisted in the study of the product and geographic dimensions of the affected market to support plaintiff's case.

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- **Damages for Non-Payment under Utility System Lease.** Determined the value of historical payments owed under the terms of a valid lease for a distribution system owned by a development authority, wherein the last payments were made in 1994 and the basis for measuring those payments (a load-measuring meter) was removed that same year. Filled the time gap using known average monthly per-customer energy demand data and surrogate data for the number of customers served borrowed from city sewage accounts for the development authority's region. An econometric analysis was then used to determine the stream of payments owed. Client received a settlement for all payments due under the lease.
- **Damages for Price Squeeze and Vertical Restraint of Trade.** Hired as an expert in case involving an upstream supplier of minerals raising input prices and disrupting the regularity of supply to injure a downstream service provider to benefit its own downstream subsidiary.
- **Market Analyses to Support Franchise Applications.** Assisted in performing analyses and production of testimony pertaining to the applications of clients to obtain franchises to enter the markets for automobiles and outboard boat motors. The presiding administrative authority approved both applications.
- **Analysis of Antitrust Applicability to Electric Generators.** Supported the preparation of a report to Texas Electric Cooperatives concerning the existing case law and market potential for mounting antitrust-based claims against generators perceived to abuse market power in wholesale power markets.

### UTILITY REGULATORY POLICY AND RATEMAKING

While working at the FERC and in his consultancies with Brattle and C.H. Guernsey & Company, Dr. Ledgerwood has used his background in law, economics, and knowledge of the energy sector to assist in resource planning and procurement and to address policy issues affecting his clients and the broader industry.

- **PJM FTR Netting Rule.** Assisting client in challenging effort by PJM to declare the current rule allowing the netting of counterflow and prevailing flow FTRs given underfunding unjust and unreasonable and replace it with a rule precluding netting and requiring counterflow holders to repay PJM for the entire target allocation of their counterflow portfolios. Affidavit points out an erroneous assumption made by PJM that FTR auction prices are based on the market's expectations of full funding; if this assumption fails to hold, then PJM's proposed rule will lead to an unjust and unreasonable outcome.
- **PJM FTR Forfeiture Rule.** Assisted client in challenging effort to expand the PJM Forfeiture Rule to other contexts. Affidavit focused on the inefficiencies presented by the existing rule and its lack of relevance given the active market monitoring performed by the Independent Market Monitor as a backstop to the rule.
- **Energy and Ancillary Services (E&AS) Offset.** Assisted client in challenging market monitor decision to calculate the E&AS offset (used to mitigate bids into the PJM capacity market) using the lesser of bid cost and unit cost. Method penalized generation resources that would bid into the market below cost in off-peak hours to prevent cycling.

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- **Analysis of Mitigation of Buyer-Side Capacity Market Bids.** Assisted expert in reviewing NYISO analyses and methodology used to implement its buyer-side Mitigation Exemption Test. Assisted the development of affidavit supporting the resulting findings.
- **Statistical Analyses in Support of Ratemaking & Cost of Service Studies.** Performed statistical comparisons of historic energy usage/loads to yield regression equations used to “normalize” test year loads using a comparison of actual and normal values for the dependent variables. These analyses were then used to evaluate how the test year should be adjusted to account for rate differentials amongst various service classes.
- **25-Year Analysis of Power Resources for Generation and Transmission Cooperative.** Performed the economic analysis for a long range plan of generation resources for a large electric utility in the eastern U.S. Compared the utility’s existing and planned future asset mix (including coal, nuclear, hydroelectric combined-cycle, combustion turbine, and purchased power) against planned load growth to determine when new resources would be required and what type would best suit the seasonal load duration curves in each future year.
- **Short-Term Load Forecast and Power Supply Analysis for Generation and Transmission Coop.** Used regression analyses to determine the relationship between weather and other dependent variables upon hourly loads for a G&T cooperative in Texas. Using Excel, hourly data for weather and prior loads were retrieved and the regressions applied to provide hourly forecasts up to two weeks from the date the model was run. The future loads were then compared to available resources and projected power prices to determine whether additional strips of energy would need to be purchased or whether the supplier would rely upon the spot market to serve its energy requirements.
- **Retail Power Contract Analysis and Reconstruction.** This engagement involved the analysis of existing retail agreements between a public power supplier and industrial customers served under direct retail contracts. Reconstruction of contractual terms and conditions allowed for a single contract to be used in all similar future agreements.
- **Load Forecasting.** Performed or supervised the performance of long-term economic forecasts of electric loads for clients including generation and transmission cooperatives, public power authorities, and associated distribution member systems. Data from sources including NOAA, the Bureau of Labor Statistics, the Department of Energy, and other demographic data derived from public and private sources used to forecast electrical energy usage and demands using econometric techniques. Sensitivity analyses were performed to account for extremes in weather conditions or in other dependent variables significant to the models forecasted.

### VALUATION ANALYSIS

Dr. Ledgerwood has performed analyses to determine the present value of the capital assets of utilities or other entities on the basis of comparable market based sales, the present value of projected income derived from the forecasted future life of the assets, and other valuations based upon the principles of original cost and replacement cost new less depreciation. He has performed sensitivity analyses to determine the viability of the valuations reached under a variety of scenarios. His work has focused on matters in the electrical, natural gas, telecommunications, and water/wastewater industries.

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- **Valuation of a Rural Wireless Telephone Company.** Team performed a valuation of a 20 percent interest in a Rural Service Area to be used for debt securitization. The valuation used discounted cash flow, comparable sales, and spectrum valuation methodologies to provide a band of values within which the interest could sell. This analysis was updated in 2015.
- **Evaluation of Privatization of University Utility Systems.** Led the team that produced a feasibility study to determine the potential value of and market interest in seven utility systems owned by a public university. Sensitivity analyses were used to produce a range of discounted cash flow models of the forecasted revenue streams produced by each system. These outcomes were then compared to the relative capital improvements and operating expenditures needed to modernize and run the systems in perpetuity. Significant consideration was given to the likely cost of capital required of potential bidders, which ultimately constrained the likelihood of successful privatization for several of the systems absent the payment of large subsidies by the university.
- **Evaluation of Procurement of the Sugar Creek Generating Station.** Led a cost-benefit analysis of the benefits derived from the purchase of the Sugar Creek power plant by NIPSCO. The analysis used recent sales of similar plants, construction costs, historic plant characteristics, future sales into MISO and PJM, and future difficulty in building other fossil projects.
- **Investigation of the Rates and Charges for Electric Service Provided by NIPSCO.** This was the first “inverse rate case” performed in the history of Indiana. It was designed to challenge the existing rates of Northern Indiana Public Service Company (Cause No. 41746, Indiana Utility Regulatory Commission). In direct testimony, Dr. Ledgerwood used a market-based valuation of the company’s generation, transmission, and distribution assets to challenge valuations asserted by the Company’s economic experts. In rebuttal, Dr. Ledgerwood directly critiqued the company’s expert’s analyses based upon replacement and reproduction costs.
- **Valuation of the Oklaunion Generating Station.** Team performed a valuation of a 7.8 percent interest in a coal-fired power plant targeted for acquisition. The valuation used a discounted cash flow methodology supported by fuel price projections and a variety of sensitivity adjustments to key variables.
- **Valuation of Indiana-American Water Company Inc.** This engagement involved a rate case intervention to determine the fair value the water and wastewater assets of Indiana-American Water Company (Cause No. 42029, Indiana Utility Regulatory Commission). Performed a market-based valuation of these assets to evaluate whether the client should protest the asset valuation proposed by the company in this case.
- **Valuation of the Assets of Citizen’s Utilities.** This was an acquisition feasibility study of the water, wastewater, electrical, natural gas, and telecommunications assets of Citizen’s Utilities sited in Arizona, California, Colorado, Hawaii, Illinois, Indiana, Louisiana, Ohio Pennsylvania, and Vermont. Assisted in the valuations performed using discounted cash flow and comparable sales of other utility assets.
- **Valuation of the Assets of North Carolina Power.** In a feasibility analysis for acquiring a portion of the transmission and distribution system of North Carolina Power, assisted valuation analysis using replacement cost less depreciation and performed an economic analysis centered on ratepayer effects and sensitivity studies pertaining to the valuation.

### ENVIRONMENTAL POLICY AND REGULATION

While at the FERC, Dr. Ledgerwood studied the likely resource requirements that would befall the Commission in the event that various bills under consideration became law. He has also worked in cooperation with state and regional efforts to implement and operate markets for renewable allowances. In a consulting role, he has led studies evaluating environmental impact and associated damages.

- **Analyses Regarding the Federal Regulation of Carbon Emissions.** Staff from seven offices joined to estimate the resources required of the FERC should it be tasked with oversight of the cash and derivatives markets for carbon emissions as envisioned by the Dingell-Boucher Cap-and-Trade bill. Dr. Ledgerwood's role was to assess the resource requirements of the enforcement provisions of the bill, requiring close coordination with the four Division Directors of the Office of Enforcement and their staffs. This effort was followed by analysis of the Waxman-Markey bill; however, the reduced Commission role (with oversight duties limited to the cash market) shifted focus to likely problems should the bill pass, such as frictions that could arise if the Commission were required to share oversight duties with the Commodity Futures Trading Commission.
- **Creation of a Federal Renewable Electricity Standard Program.** FERC staff met to estimate the resources required of the FERC in the event that the Commission was tasked with the establishment and oversight of a Renewable Electricity Standards program as specified in the Waxman-Markey bill passed by the House of Representatives in June 2008. This project was separated into two phases. In the first phase, Dr. Ledgerwood contributed as the lead for the Office of Enforcement, assessed the need for regulations to establish the RES program and the markets for Renewable Electricity Credits and Electricity Savings. The second phase, for which Dr. Ledgerwood served as team lead, estimated the resources that would be required across the Commission to implement and oversee the federal RES program.
- **Coordination with State and Regional Environmental Efforts.** To assist the FERC's efforts to track efforts to implement environmental programs, Dr. Ledgerwood met with several state programs and industry groups, as well as with regional groups such as RGGI. He represented the FERC in a consortium of federal regulatory agencies that advised California in its implementation and oversight of a carbon cap-and-trade system.
- **Economic Impact of Avoided Environmental Costs Caused Construction of Coal Units.** Assisted the economic and environmental evaluation of the expected pollution arising from operation of the coal-fired Holcomb Plant relative to other alternative energy sources. The focus was on the benefits of clean-coal technology versus less efficient sources.
- **Fines for Violations of Environmental Protection Agency Rules.** In this engagement, the client was a defendant to an action by the Environmental Protection Agency seeking to levy fines for non-compliance with anti-pollution orders. The EPA's complaint used the standard economic benefit model (BEN) to compute damages for economic savings from delaying or avoiding pollution control expenditures. However, the assumptions used in applying this model were erroneous. Used an updated model to demonstrate that the damages sought by the EPA were excessive, and furthermore that correction for errors in the model's application would reduce the damages to a de minimus level.



## ADDITIONAL PREVIOUS EXPERIENCE

### ATTORNEY AT LAW – 1990 TO PRESENT

### PROFESSORIAL DUTIES – 1985 TO 2012

- **Affiliated Faculty**, Georgetown University, Georgetown Public Policy Institute, 2010-2012
- **Adjunct Professor**, Univ. of Oklahoma Dept. of Advanced Programs, 2001-2011
- **Adjunct Professor**, University of Oklahoma Department of Economics, 1995-2011
- **Adjunct Professor of Law**, University of Oklahoma School of Law, 1995-1996
- **Graduate Teaching Assistant**, University of Oklahoma Department of Economics, 1989-1995
- **Undergraduate Teaching Assistant**, Univ. of Oklahoma Dept. of Economics, 1985-1986

## PUBLICATIONS AND WORKING PAPERS

- Working paper, “The Intersection of Antitrust and Market Manipulation Law,” coauthored with James Keyte, Guy Ben-Ishai and Jeremy Verlinda. Available at SSRN.
- Working paper, “The Economics of Detecting, Deterring and Proving Market Manipulation,” coauthored with Dan Harris.
- “Trade Surveillance Should not Deter Traders,” coauthored with John Tsoukalis. *Risk.net*, online article available at: <https://www.risk.net/comment/5376706/trade-surveillance-should-not-deter-traders>, December 2017.
- “Derivatives’ Roles in Manipulation,” coauthored with Jeremy Verlinda. *Futures and Derivatives Law Report*, v. 37, issue 9, pp. 9-13, October 2017.
- “Market Manipulation in Energy-Related Markets,” coauthored with Jeremy Verlinda. *Transportation, Energy and Infrastructure*, ABA Section of Antitrust, pp. 10-14, Summer 2017.
- “Building an Effective Trade Surveillance System: A Framework-Based Approach using Guidance from Two Recent FERC White Papers,” coauthored with John Tsoukalis. The Brattle Group, March 2017.
- “Enron’s California Schemes Haunt Regulators 15 Years Later,” coauthored with Gary Taylor. *Energy Risk Magazine*, January 2016.
- “D.C. Circuit Clarifies That SEC Need Not Show Market Impact in Manipulation Cases,” coauthored with Paul Hinton. *ABA Securities Journal*, December 2015.
- “Coscia Verdict Highlight Different Approaches to High-Frequency Trading,” coauthored with Paul Hinton. *Practice Points*, November 2015.
- *Market Power and Market Manipulation in Energy Markets: From the California Crisis to the Present*, coauthored with G. Taylor, P. Fox-Penner and R. Broehm. PUR, Inc., May 2015.
- “The Chasm between ‘Following the Rules’ and Manipulation,” *Energy Risk Magazine*, February 2015.
- “Market Manipulation Push is Widening the Compliance Gap,” coauthored with John Tsoukalis. *Risk.net*, January 2015.

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- “An Economic Evaluation of ‘Funding’ for Research Tax Credits,” coauthored with Darrell Chodorow. *Tax Notes*, v. 144, n. 13, pp. 1593-1602, September 2014.
- “How to Think about Market Manipulation,” coauthored with Mike Cragg. *Financier Worldwide*, May 2014.
- “Using Virtual Bids to Manipulate the Value of Financial Transmission Rights,” coauthored with Johannes Pfeifenberger. *The Electricity Journal*, v. 26, issue 9, pp. 9-25, November 2013.
  - An earlier version is available at SSRN.
- “Uneconomic Trading and Market Manipulation,” *Energy Risk Magazine*, p. 32, July 2013.
- “A Framework for the Analysis of Market Manipulation,” coauthored with Paul Carpenter. *Review of Law & Economics*, v. 8(1), pp. 253–295, September 2012.
  - An earlier version is available as “A Framework for Analyzing Market Manipulation” at SSRN.
- “A Comparison of Anti-Manipulation Rules in U.S. and EU Electricity and Natural Gas Markets: A Proposal for a Common Standard,” coauthored with Dan Harris. *Energy Law Journal* v. 33, No. 1, pp. 1-40, April 2012.
  - An earlier version is available at SSRN.
- “Rummaging through the Bottom of Pandora’s Box: Funding Predatory Pricing through Contemporaneous Recoupment,” coauthored with Wesley Heath. *University of Virginia School of Law: Virginia Law and Business Review*, v. 6, No. 3, pp. 509-568, April 2012.
  - An earlier version is available at SSRN.
- “Completing the Puzzle: Defining Manipulation under REMIT,” coauthored with Dan Harris. The Brattle Group, January 2012.
- “Market Manipulation in Wholesale Electricity Markets,” *Energy Law Journal*, v. 33, issue 1, Cyrillic translation.
- “Triggers and Targets: The Anatomy of Market Manipulation.” Available on SSRN, July 2011.
- “Market Manipulation without Market Power.” *Law360*, June 2011.
- “Defining Market Manipulation in a Post-REMIT World,” coauthored with Dan Harris, Bin Zhou and Pinar Bajci. The Brattle Group, June 2011.
- “Protecting Market Integrity by Defining Market Manipulation,” coauthored with Dr. Dan Harris, Dr. Bin Zhou, and Dr. Pinar Bagci. The Brattle Group, June 2011.
- “Losing Money to Increase Profits: A Proposed Framework for Defining Market Manipulation,” coauthored with G. Taylor, R. Broehm, and D. Arthur. The Brattle Group, March 2011.
- “Screens for the Detection of Manipulative Intent.” Available at SSRN, December 2010.
- Editor, “2008 State of the Markets Report” and contributing author to Section 6: Natural Gas Capacity Release and Electricity Transmission Reassignment, Division of Energy Market Oversight, Office of Enforcement, Federal Energy Regulatory Commission, August 2009.
- “Deregulated Electric Markets a ‘Target Rich’ Area for Antitrust Litigation.” *The Competitive Edge*, Vol. 1, No. 1, C. H. Guernsey & Company, February 1999.

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- "An Economic Model of Illegal Profit Deterrence and Corporate Punitive Damages," co-authored by William Clark and David Huettner, 9 *J. Forensic Economics* 325, Fall 1996.

### PRESENTATIONS

- Presenter, "How to Detect for Potential Market Manipulation." Presented at *Trade Surveillance & Market Compliance for Energy Trading Organizations*, a training conference hosted by Risk.net (Houston, TX), February 2018.
- Moderator, "FERC, CFTC and Private Enforcement Update." *EUCI Conference on Financial Transmission and Auction Revenue Rights* (Washington, DC), January 2018.
- Panelist, "A New Administration at FERC—What Will Their Views Be on Market Manipulation and Compliance?" Presented at *S&P Global/Platts 10th Annual Nodal Trader Conference* (New York, NY), October 2017.
- Trainer, "A Framework-Based Approach to Trade Surveillance." Presented at *Trade Surveillance & Market Compliance for Energy Trading Organizations*, a training conference hosted by Risk.net (Houston, TX), October 2017.
- Panelist, "Market Manipulation: When Is It an Antitrust Issue?" Hosted by the *ABA Section of Antitrust Law, Transportation and Energy Industries Committee*, July 2017.
- Panelist, "A Framework-Based Approach to Anti-Manipulation Surveillance." Presented at *Looking over the Horizon: Energy Trading Policy, Compliance and Enforcement Trends in Today's Evolving Regulatory Landscape*, a conference sponsored by K&L Gates and Ernst and Young (Houston, TX), April 2017.
- Panelist, "Interactions between Wholesale Electricity Markets and State Policy Objectives." Presented at *A Roundtable on the Upcoming FERC Technical Conference: RTO Markets and The State/Federal Divide*, sponsored by Sidley Austin (Houston, TX), March 2017.
- Panelist, "Interactions between Wholesale Electricity Markets and State Policy Objectives." Presented at *A Roundtable on the Upcoming FERC Technical Conference: RTO Markets and The State/Federal Divide*, sponsored by Sidley Austin (New York, NY), March 2017.
- Moderator, "Summary of the FERC White Papers on Compliance and Enforcement." *EUCI Conference on FTRs/CRRs/TCCs/TCRs* (Washington, DC), January 2017.
- Panelist, "FERC and CFTC Enforcement Developments in 2016." presented at *Dorsey & Whitney's Third Annual Federal Enforcement Forum* (Washington, DC), December 2017.
- Panelist, "'Spoofing' and Disruptive Futures Trading Practices: What Every Firm Needs to Know." Knowledge Group Webinar, November 2016.
- Panel Moderator, "Market Manipulation in the Financial & Energy Sectors: Can We Prevent the Next Wave of Abuses?" *Concurrences' Global Antitrust Economics Conference* (Chicago, IL), October 2017.
- Panelist, "Market Manipulation Enforcement: Some Economic Perspectives." Presented at the *Akin Gump Energy Enforcement Seminar* (Houston, TX), October 2016.
- Panelist, "Recent Developments at Aliso Canyon." Presented at the *Sidley Austin Roundtable* (New York, NY), May 2016.

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- Panelist, “Recent Developments at Aliso Canyon.” Presented at the *Sidley Austin Roundtable* (Houston, TX), April 2016.
  - Alternatively titled “Gas-Electric Issues Arising from Aliso Canyon Restrictions”
- Panelist, “Over-Enforcement versus Effective Enforcement in Manipulation Cases.” *Dorsey & Whitney’s Second Annual Federal Enforcement Forum* (Washington, D.C.), February 2016.
- Panelist, “A Framework for Understanding Market Manipulation.” *Energy Bar Association 2nd Annual Canadian Forum* (Calgary, Alberta), October 2015.
- Panelist, “CFTC and FERC Enforcement Trends and Developments.” *Reed Smith Energy and Commodities Conference* (Houston, TX), September 2015.
- Panelist, “What Trading Organizations Can Do to Proactively Manage Swaps Manipulation Risks.” *EUCI Conference on Financial Transmission Rights* (Washington, DC), July 2015.
- “Market Power and Market Manipulation in Energy Markets: From the California Crisis to the Present.” *UBS Securities, LLC Conference Call* (webinar), June 2015.
- Panelist, “Market Manipulation in Energy Markets.” *Georgetown Center for Business and Public Policy Symposium on Market Power and Market Manipulation in Energy Markets* (Washington, DC), May 2015.
- “A framework for the analysis of market manipulation.” *30th Annual EISG Conference* (Toronto, Ontario), May 2015.
- Panelist, “The State of Market Manipulation: Oversight & Enforcement in U.S. Electricity Markets.” *Gulf Coast Power Association’s 29<sup>th</sup> Annual Spring Conference and Exhibition* (Houston, TX), April 2015.
- “Differentiating a Legitimate Hedge from a Target for Manipulation.” *EUCI Conference on Integrating Energy Trading, Valuation, Market and Credit Risk Management* (Denver, CO), February 2015.
- “The Chasm between Following Market Rules and Fraud.” *Stanford University Program on Energy and Sustainable Development* (Palo Alto, CA), December 2014.
- Panelist, “A Framework for Market Manipulation Compliance and Enforcement.” *Dorsey & Whitney Enforcement Conference* (Washington, DC), November 2014.
- “A Framework for Surveillance and Detection of Market Manipulation.” *Council of European Energy Regulators Conference on Integrity and Transparency of Wholesale Energy Markets: WEM Task Force* (Milan, Italy), November 2014.
- Panelist, “Do Energy Market Speculators Manipulate Oil Prices?” *University of Oklahoma Price College of Business Faculty and Industry Roundtable* (Norman, OK), October 2014.
- Panelist, “FERC Enforcement: Cases of First Impression.” *Cadwalader, Wickersham & Taft* (Houston, TX), September 2014.
- Panelist, “Differentiating a FTR Hedge from a Target for Manipulation,” *EUCI Conference on Financial Transmission and Congestion Revenue Rights* (Washington, DC), July 2014.
- Keynote address, “A Framework for Market Manipulation Compliance and Enforcement.” *Schiff Hardin LLP Annual FERC Briefing* (Chicago, IL), May 2014.

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- Panelist, “A Framework for Market Manipulation Compliance and Enforcement.” Presented at *Akin Gump’s Conference on Enforcement* (New York, NY), May 2014.
- Chair & presenter, “Uneconomic trading as transactional fraud: EU compliance lessons from across the pond.” A Master Class presented at the *MarcusEvans Benchmarking Market Integrity and Transparency in Energy Trading Conference* (London, UK), April 2014.
- “Uneconomic trading as transactional fraud: EU compliance lessons from the US.” Presented to the Italian Association of Energy Traders (Milan, Italy), April 2014.
- “Understanding Market Manipulation.” Presented at EUCI’s conference on *Best Practices in Decision and Risk Analysis* (Philadelphia, PA), April 2014.
- Panelist, “Market Manipulation and Antitrust: Complements or Substitutes?” Presented to the New York City Bar Association Antitrust and Trade Regulation Committee (New York, NY), February 2014.
- “Market Manipulation and Antitrust: Complements or Substitutes?” Presented to the partnership of a major international law firm (New York, NY), February 2014.
- Panelist, “A Framework for Market Manipulation Compliance and Enforcement.” Presented at the *Energy Bar Association’s Enforcement Outlook* (Houston, TX), January 2014.
- Panelist, “A Holistic Approach to Manipulation Compliance and Enforcement.” Presented at the *LSI Buying & Selling Electric Power in the West Conference* (Seattle, WA), January 2014.
- “A Holistic Approach to Market Manipulation Compliance.” Presented to the traders and executives of a major U.S. utility trading electricity and natural gas, October 2013.
- “A Unifying Approach to Market Manipulation Compliance.” Presented to the executives, compliance officers and senior trading staff of a diversified international commodities trading firm (Houston, TX), September 2013.
- “A Holistic Approach to Market Manipulation Compliance.” Presented to the energy trading and compliance staff of a multinational financial institution (New York, NY), August 2013.
- “Using Virtual and Physical Trades to Manipulate the Value of Financial Transmission Rights.” *EUCI FTR Conference* (Washington, D.C.), July 2012.
- “A Unifying Approach to Market Manipulation Compliance.” Presented to the partners of a national law firm interested in applications to energy, commodities and securities trading (Washington, DC), July 2013.
- “An Example of Competing Interests in a Cross-Subsidization Program: PJM Capacity Market.” *Platts European Gas and Power Trading Conference* (London, UK), June 2013.
- “A Unifying Approach to Market Manipulation Compliance.” *Platts European Gas and Power Trading Conference* (London, UK), June 2013.
- Panelist, “Market Manipulation post Hunter vs. FERC: A Framework for Unified Analysis.” *Harvard Electricity Policy Group’s 71st Plenary Session* (Calgary, AB), June 2013.
- “A Perspective on Market Manipulation.” Presented to the traders and compliance staff of a major U.S. electricity trading company, May 2013.

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- “A Holistic Approach to Market Manipulation Compliance.” Presented to the partnership of WilmerHale (Brussels, Belgium), May 2013.
- “A Holistic Approach to Compliance: REMIT and the MAD.” Presented to the traders and compliance staff of a major European energy trading company, April 2013.
- “A Holistic Approach to Market Manipulation Compliance.” presented to the partnership of Shiff Hardin (Washington, DC), April 2013.
- Panelist, “ISO/RTO Financial Products and Recent Trends in FERC Enforcement.” Presentation sponsored by the Energy Bar Association Electricity Regulation Committee and the Compliance and Enforcement Committee (Washington, DC), April 2013.
- “Uneconomic Trading in Energy Markets: A Framework of Market Manipulation.” *Penn State Faculty Colloquy* (State College, Pennsylvania), April 2013.
- “Market Manipulation in Wholesale Electricity Markets.” Webinar presented to NP Market Council (regulator of wholesale electricity markets for the Russian federation), March 2013.
- “An Economic Approach to FERC Anti-Manipulation Compliance.” Presented to the compliance staff and traders of a major commercial energy trading company, March 2013.
- “Market Manipulation Cases in U.S. Wholesale Electricity and Natural Gas Markets.” *Bird & Bird Seminar on Market Abuse* (London, UK), February 2013.
- “Market Manipulation in Wholesale Electricity and Natural Gas Markets.” A webinar presented for the West LegalEd CLE program, January 2013.
- “Using Virtual Bids to Manipulate the Value of Financial Transmission Rights.” *USAEE/IAEE Annual Conference* (Austin, TX), November 2012.
- Panel Moderator, “Recent Market Violations and Their Repercussions on Compliance and Counterparty Risk.” *EUCI Conference on Credit & Counterparty Risk* (Baltimore, MD), November 2012.
- “An Economic Approach to FERC Anti-Manipulation Compliance.” Presented to the gas and electricity trading groups of a major utility’s trading group, November 2012.
- Panelist, “Meeting Cross-Border Requirements: Understanding Changing International Regulations and Ensuring Global Compliance.” *ACI Energy Trading Compliance and Regulatory Enforcement Conference* (Washington, DC), November 2012.
- Panel Moderator, “FERC’s Anti-Market Manipulation Rule and the Impact on Physical and Virtual Market Participants.” *EUCI FTR Conference* (Houston, TX), August 2012.
- “An Analytical Framework for Anti-Manipulation Compliance, Monitoring, and Enforcement.” *Marcus Evans Conference on European Energy Market Integrity: REMIT & Regulatory Compliance* (London, UK), April 2012.
- “Energy Trading Compliance and Enforcement Post Dodd-Frank: A Framework of Market Manipulation.” Presented to the partnerships of Dewey LeBoeuf and Cadwalader, Wickersham and Taft (Washington, DC), January and March 2012.
- “The Search for a Uniform Definition of Market Manipulation: A Proposed Framework.” *A Conclave Concerning the REMIT* (London, UK), October 2011.

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- “Manipulation of FTR Markets.” Presented to *EUCI’s Conference on Financial Transmission Rights* (Houston, TX), July 2011.
- “Triggers and Targets: A Framework for Analyzing Market Manipulation.” Presented to the American Gas Association (Washington, DC), July 2011.
- “A Framework for Defining Energy Market Manipulation,” presented to the *Bracewell & Giuliani LLP Energy Compliance Network* (Houston, TX), May 2011.
- Panelist, “Market Manipulation.” Presented at *Skadden’s 6th Annual Enforcement and Compliance Conference* (Washington, DC), February 2011.
- “The Impact of FERC’s Anti-Manipulation Statute on FTRs and Related Positions.” *EUCI’s Conference on Financial Transmission Rights* (Alexandria, VA), July 2010.
- “The Correlation of Energy Prices to Long-Term Interest Rates.” Delivered at the PACAF Command Financial Specialists Roundtable in coordination with the University of Oklahoma (Okinawa, Japan), August 2008.
- “Avoiding Dutch Disease: Diversification of the Azeri Economy Given the Discovery of Caspian Oil Reserves,” Training Session conducted with USAID and the Univ. of Oklahoma and presented to member of the Oil Ministry of Azerbaijan (Baku, Azerbaijan), August 1999.
- "Poland: A Case Study of Industrial Development within Eastern European Nations." Delivered at the Southwest Economic Association Conference (New Orleans, LA), March 1993.

### PROFESSIONAL AFFILIATIONS

- American Bar Association
- American Economic Association
- American Finance Association
- Federal Energy Bar Association
- Oklahoma Bar Association
- Phi Beta Kappa