

Metin Celebi

PRINCIPAL

Practice Leader: Electricity Litigation & Regulatory Disputes

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Dr. Celebi is an expert in electricity markets, resource planning, and the analysis of environmental and climate policy.

He has assisted clients in the areas of electricity litigation and regulatory disputes, including on the economic viability of coal-fired and nuclear power plants, wholesale power pricing, and market design. Dr. Celebi has also analyzed federal and state climate policies, environmental regulations, the role of hydrogen in reducing economy-wide greenhouse gas (GHG) emissions, generation plant valuation, and transmission cost allocation.

Dr. Celebi has provided expert testimony and declarations in a number of cases before the Supreme Court of the United States, district courts, and federal and state energy regulatory agencies. His testimonies have covered topics including the compliance burden of federal environmental regulations; economic damages in energy contract disputes; transmission cost allocation; excessive charges in long-term power contracts; causes of LMP spikes in PJM; and the allocation of ancillary services costs among market participants in ERCOT. He has also consulted and testified on matters related to coal plants, the recovery of undepreciated past investments, and the impact of coal plant retirements on wholesale energy prices.

AREAS OF EXPERTISE

- Electricity Litigation & Regulatory Disputes
- Electricity Wholesale Markets & Planning

PROFESSIONAL EXPERIENCE

- **The Brattle Group (2000–Present)**
 - Principal (2011–Present)
 - Senior Associate (2006–2011)
 - Associate (2000–2006)

- **London Economics, Inc. (1999–2000)**
Associate
 - **Boston College (1998–1999)**
Teaching Fellow, Microeconomics and Macroeconomics
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EDUCATION

- **Boston College**
PhD in Economics
 - **Bilkent University (Ankara, Turkey)**
MA in Economics
 - **Middle East Technical University (Ankara, Turkey)**
BS in Industrial Engineering
 - **Hebrew University**
Summer School in Economic Theory on Auctions and Market Design
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EXPERT TESTIMONY

- Before the Federal Energy Regulatory Commission, prepared direct testimony on behalf of the California Parties re: whether the prices in the long-term power contract executed in May 2001 between Shell and CDWR are unjust and unreasonable, and the appropriate amount of refunds to CDWR, Docket Nos. EL02-60-015, 018 and EL02-62-014, 017 (November 15, 2024).
- Before the Suffolk County Superior Court, expert report on behalf of the member institutions of Longwood Medical Energy Collaborative Inc. (LMEC) re: electricity pricing terms in utilities contracts between the LMEC members and MATEP LLC, and financial performance of MATEP over time, Case Nos. 2384-CV-01373, 2384-CV-01376, 2384-CV-01379, 2384-CV-01381, 2384-CV-01382, and 2384-CV-01385 (November 7, 2024).
- Before American Arbitration Association, report on behalf of Peabody COALSALES, LLC re: economic damages from an alleged breach of contract, and projected economic viability of a coal-fired power plant to operate during the term of the contract (November 1, 2024).
- Before the District Court Clark County, Nevada, expert report on behalf of Townsite Solar LLC re: reduction in financial exposure to spot wholesale power prices as a result of a power purchase contract involving a solar and battery storage facility in Nevada (October 4, 2024).

- Before the United States Court of Appeals for the Eight Circuit, declaration on behalf of Clean Water Action, Sierra Club, Waterkeeper Alliance, Inc., Natural Resources Defense Council, Inc., Environmental Integrity Project, Pennenvironment, Inc. and Prairie Rivers Network re: economics of coal-fired electric generating units in the U.S. and the potential impacts of EPA’s Effluent Limitations Guidelines and Standards rule on the U.S. coal fleet (August 16, 2024).
- Before the United States Court of Appeals for the District of Columbia Circuit, declaration on behalf of Environmental and Public Health Respondent-Intervenors re: economics of coal-fired electric generating units in the U.S. and the potential impacts of EPA’s GHG Rule on the U.S. coal fleet (June 7, 2024).
- Before the Supreme Court of the United States, declaration on behalf of Public Interest Respondents re: compliance requirements and flexibility to choose among compliance options under the EPA’s Good Neighbor Plan for the 2015 Ozone National Ambient Air Quality Standard (October 26, 2023).
- Before the Iowa Utilities Board, direct and rebuttal testimony on behalf of Interstate Power and Light Company re: reasonableness of IPL continuing to fully recover the remaining net book value of Lansing Generating Station Unit 4, a coal-fired generating unit, after the unit’s retirement (October 12, 2023 and May 13, 2024).
- Before the United States Court of Appeals for the Sixth Circuit, declaration on behalf of Conservation Groups re: compliance requirements and flexibility to choose among compliance options under the EPA’s Good Neighbor Plan for the 2015 Ozone National Ambient Air Quality Standard (September 5, 2023).
- Before the United States Court of Appeals for the District of Columbia Circuit, declaration on behalf of Environmental and Public Health Intervenors re: compliance requirements and flexibility to choose among compliance options under the EPA’s Good Neighbor Plan for the 2015 Ozone National Ambient Air Quality Standard (August 18, 2023).
- Before the District Court 165th Judicial District, Harris County, Texas, prepared expert report on behalf of Peaker Power, LLC re: economic damages from the counterparty’s violation of heat rate call option contracts by exceeding the annual cap on exercise hours during Storm Uri in February 2021 (July 25, 2022).
- Before the Federal Energy Regulatory Commission (FERC), prepared answering testimony on behalf of Tri-State Generation and Transmission Association, Inc. re: the appropriate approach to determine the contract termination payment from a departing member (February 4, 2022, March 25, 2022).

- Before the United States District Court for the Western District of North Carolina Charlotte Division, direct and rebuttal expert reports on behalf of NTE Energy re: discounts provided by Duke Energy Progress (DEP) to City of Fayetteville in its wholesale power supply contract and the impacts on competition as well as on rates being charged to DEP's other wholesale and retail customers (January 14, 2022, February 18, 2022).
- Before the Public Service Commission of Wisconsin, prepared direct testimony on behalf of Wisconsin Power and Light Company re: appropriateness of WPL continuing to recover as a regulatory asset the undepreciated past investments at the Edgewater 5 coal unit after its proposed retirement in 2022 (May 27, 2021).
- Before Québec Régie de l'énergie, prepared direct testimony and oral testimony in hearing on behalf of Hydro-Québec Trans-Énergie (HQT) re: the adequacy of the categories used by HQT to classify its transmission investments and HQT's treatment of transmission losses in transmission planning (March 7, 2019).
- Before the Public Service Commission of Kentucky, prepared direct testimony on behalf of Big Rivers Electric Corporation re: economic viability of Station Two coal plant (May 1, 2018).
- Before the United States District Court Eastern District of Missouri Eastern Division, expert report on behalf of Ameren Missouri re: impacts of proposed mandates to install emission control equipment at Rush Island coal plant on revenue requirements and economic viability of the plant, Case No. 4:11 CV77 RWS (April 23, 2018 and April 27, 2018).
- Before the Superior Court of the State of Arizona, expert report on behalf of Vieste SPE, LLC and Vieste Energy LLC re: projected long-term wholesale power prices in Arizona (January 30, 2017 and February 21, 2017).
- Before the Federal Energy Regulatory Commission (FERC), prepared direct testimony on behalf of the California parties re: economic burden imposed by the prices in two long-term contracts that the California Department of Water Resources (CDWR) signed with Shell and Iberdrola during the California energy crisis (May 19, 2015 and October 6, 2015).
- Before the Public Service Commission of Wisconsin, pre-filed rebuttal and surrebuttal testimony on behalf of Wisconsin Public Service Corporation re: the impacts of pending coal plant retirements and environmental retrofits on energy and capacity prices in the MISO market region (December 14, 2012 and January 11, 2013).

- Before the District of Columbia Office of Tax and Revenue, affidavit on behalf of Pepco Energy Services re: categorization of electricity as a tangible property versus a service for determining the eligibility of electricity sales for exemption from sales tax (July 15, 2011).
- Before the Pennsylvania Public Utilities Commission, Docket No. P 2008 2020257, rebuttal and surrebuttal testimony on behalf of Pennsylvania Electric Company re: causes and pricing of transmission congestion in Wellsboro area in PJM (January 16, 2009 and March 10, 2009) (with P. Hanser).
- Before the Public Utilities Commission of Texas, Docket 33416, affidavit supporting Constellation New Energy's request for expedited hearing re: allocation of replacement reserve costs in ERCOT (November 8, 2006).

SELECTED CONSULTING EXPERIENCE

ENERGY LITIGATION AND REGULATION

- For California Parties, provided direct testimony on a long-term energy contract signed during the western energy crisis in 2001. Evaluated whether the prices in the long-term power contract executed in May 2001 between Shell and CDWR are unjust and unreasonable, and calculated the appropriate amount of refunds to CDWR.
- For the member institutions of Longwood Medical Energy Collaborative Inc. (LMEC), provided expert report on the electricity pricing terms in utilities contracts between the LMEC members and MATEP LLC, and analyzed the financial performance of MATEP over time including MATEP's operating cash flow and debt service coverage ratio.
- For Townsite Solar LLC, provided expert testimony before District Court of Clark County, Nevada regarding reduction in financial exposure to spot wholesale power prices in the western U.S. power market during the nighttime hours as a result of a power purchase contract involving a solar and battery storage facility in Nevada.
- For PacifiCorp, provided analyses and presented in stakeholder meetings regarding the utilities' financial exposure to 3rd party damages claims from catastrophic wildfire events and potential alternatives in mitigating customers' cost exposure to such events. Evaluated customer benefits over time from using various insurance options to cover against different layers of the risk tranches, including available commercial insurance, self insurance, and a catastrophic wildfire fund.
- For an electric utility, supported testimony and managed the Brattle team to evaluate the prudence of the utility's decision in the past to uprate an existing nuclear power plant instead of building a new gas-fired power plant for meeting the projected supply needs to serve its customers.
- For a coal producer, provided litigation support to estimate potential economic damages from an alleged breach in a long-term coal supply agreement.
- For the owner of two gas-fired peaking generation plants in Texas, provided expert testimony before the District Court 165th Judicial District, Harris County, Texas regarding a dispute in a heat rate call option (HRCO) contract with Shell Energy North America. Estimated economic damages from the counterparty's violation of the HRCO contracts by exceeding the annual cap on exercise hours during Storm Uri in February 2021, and assessed the economic value of the cancellation clause in the HRCOs.

- For Calpine, managed a team of consultants to support expert testimony in a bankruptcy court regarding ERCOT wholesale power prices during a February 2021 storm when extreme weather conditions caused nearly half of Texas to lose power for several days. The testimony from a Brattle expert explained why the high power prices were consistent with the scarcity pricing mechanism and market design in ERCOT, and such prices reflected, or even understated, the value of loss load during the scarcity conditions.
- For NTE Energy, provided expert testimony on discounts provided by Duke Energy Progress (DEP) to City of Fayetteville in North Carolina in its long-term wholesale power supply contract, and the resulting impacts on wholesale competition as well as on rates being charged to DEP's other wholesale and retail customers.
- For Tri-State Generation and Transmission Association, Inc., provided expert testimony before the FERC regarding the appropriate economic principles to determine the contract termination payment from a departing member.
- For a generation owner in ERCOT region, managed a team of consultants to prepare expert testimony and provide economic litigation support in a bankruptcy proceeding regarding the real-time energy prices during the winter Storm Uri in February 2021.
- For the owner of a paper mill in Minnesota, provided economic litigation support in an arbitration dispute regarding the pricing terms of a steam supply contract with an electric utility that operated a cogeneration facility.
- For a co-owner of a nuclear power plant project in the Southeast United States, evaluated the prudence of past decisions to start and continue construction until the project was eventually terminated. These investment decisions by the co-owners of the project were subject to multiple lawsuits regarding the appropriateness of recovering past investment costs from the utility's customers. Evaluated the ranges of long-term outlooks on major market fundamentals and project costs as of past decision points to assess the projected economics of continuing the project against options involving termination and replacement by other new resources.
- For the owner of a coal plant in the eastern United States, developed an expert testimony in an arbitration proceeding regarding a *force majeure* claim for non-performance in supplying a pre-determined volume of coal combustion byproducts under a long-term contract. Evaluated the drivers of the historical reductions in generation output and the accompanying byproducts, and the impacts of the drivers outside the control of the plant owner on the supply of byproducts under the contract.

- For Hydro-Québec Trans-Énergie (HQT), provided expert testimony before Québec Régie De l'énergie on the adequacy of the categories used by HQT to classify its transmission investments and HQT's treatment of transmission losses in transmission planning. Provided expert opinions before the regulator on the adequacy of HQT's investment categories in allocating the investment costs across different categories for multi-objective projects. Compared the HQT practices against those adopted by other system operators in the United States and Canada.
- For investors in refined coal production facilities in the United States, managed several consulting teams in supporting expert testimonies submitted before a United States Tax Court on the economic rationale and requirements behind the refined coal production tax credit, and on the operational and environmental permitting risks for the investors of refined coal production facilities.
- In an international arbitration dispute involving a coal mine in South America, co-managed a team to support expert report on the economic damages associated with a change in royalty structure. The analysis included the impact of royalty terms on the incentives for increasing mine production and on royalty payments to the government, under base outlook and sensitivities for projected international coal prices, mine cost structure, and discount rates.
- In a coal bankruptcy case regarding the qualification of a coal supply contract under the safe harbor provisions in the United States Bankruptcy Code, assisted an electric utility to evaluate the effectiveness of a long-term coal supply agreement as a hedge against regional fuel and power prices, including alternative coal prices and the more volatile prices of natural gas and wholesale power.
- In a large litigation case before the FERC, provided testimony on the economic burden imposed by the prices in two long-term contracts that the California Department of Water Resources (CDWR) signed with Shell and Iberdrola during the California energy crisis. Estimated the "down the line" economic burden by comparing the payments under the contracts to prices in comparable contracts and market prices after the end of the dysfunction. Assessed whether the contract prices could be explained by the expected future market fundamentals in the California power markets by using DAYZER market simulation software for the near-term and expected cost of installing and operating a new generation unit for the long-term.

- For estimating breach-of-contract damages, managed a team to support expert testimony in a high-profile international arbitration case. Brattle team built and ran simulation models to forecast power prices and GHG allowance prices in California and the rest of the western states through 2050, accounting for very short-term operational effects as well as long-term capacity expansion needs. The simulation models covered all of the states in the full Western Electricity Coordination Council (WECC) region to capture California's dependency on imports from other areas and changes in price and availability of these imports over time. The modeling team evaluated the impact of GHG policies, RPS policies, changes in load forecasts, changes in hydro conditions, and changes in natural gas prices over time on the power and GHG allowance prices. The simulation models were benchmarked against historical unit dispatch and near term power price forwards to replicate actual market operations and expectations. The Brattle team used the resulting range of power price forecasts under expected range of future market conditions to estimate damages, including an options framework to simulate plant operations and show the threshold conditions for economic shutdown.
- In a New Source Review (NSR) litigation case, analyzed whether the repairs conducted in several coal-fired generation plants should have been expected to result in significant increases in emissions of certain pollutants. The major disagreements were on the choice of baseline emissions and the level of expected impact from the repairs.
- For a group of municipal electric utilities in Massachusetts buying energy from a generating facility under a long-term contract, assisted in evaluating their net benefits from requesting must-run operation of the facility relative to the operations chosen by the seller. The engagement also included a comparison of municipal utilities and investor-owned utilities with respect to their incentives under the Massachusetts Electric Restructuring Act to buy out their power purchase contracts.
- Helped a client in the western United States in a litigation case involving allegations of market power and market dysfunction affecting the prices and other terms of various long-term electricity purchase and sale contracts.
- Managed multiple cases related to estimation of damages resulting from early termination of power contracts.

COAL PLANT ECONOMICS – VIABILITY, RETIREMENTS, AND MARKET IMPACTS

- For Peabody COALSALES, LLC, evaluated the projected economic viability of a coal-fired power plant in the MISO wholesale power markets as of various times in the past, and

estimated the economic damages as a result of an alleged breach of a contract to supply coal for that coal-fired power plant.

- For the Center for Applied Environmental Law and Policy, co-authored a report to explain the key challenges and opportunities in maintaining a reliable bulk transmission system in the United States electric industry experiencing fundamental change. The report identified: (1) the key trends that have been changing the electricity system and their major drivers; (2) how each trend can support and/or stress various aspects of system reliability; (3) the reforms designed to respond to these reliability effects, and the extent to which the foregoing trends would or would not accelerate the need for such reforms; and (4) in the scenario where reliability reforms are not prioritized to keep pace with industry trends, how compliance flexibilities built into federal environmental regulations (which partly contributes to some industry trends) could help in maintaining reliable system operations nonetheless.
- For environmental and clean energy groups, submitted declarations before the United States Court of Appeals for the District of Columbia Circuit and the Sixth Circuit regarding compliance requirements and flexibility to choose among compliance options under the EPA's Good Neighbor Plan (GNP Rule) for the 2015 Ozone National Ambient Air Quality Standard.
- For the Center for Applied Environmental Law and Policy, co-authored a report on the recent history of changes in the United States coal generation fleet and explained factors contributing to the decrease in coal-fired generation capacity over the past 20 years. The report also summarized the state of market fundamentals and regulations as of 2023 affecting the economics of coal plants in the United States as well as their near- and medium-term outlook. The report explained that provisions in the Inflation Reduction Act (IRA) that increased the economic attractiveness of clean energy resources prompted some coal plant owners to re-examine the options for their coal fleet.
- For Interstate Power and Light Company (IPL), provided expert testimony before the Iowa Utilities Board regarding the reasonableness of IPL continuing to fully recover the remaining net book value of Lansing Generating Station Unit 4, a coal-fired generating unit, after the unit's retirement at the end of May 2023. Specifically, the testimony reviewed (i) the prudence of IPL's decisions to make major capital investments at Lansing 4 since 2010, based on the then-projected cost-effectiveness of those investments as approved through the Emissions Plan and Budget (EPB) process by the Board; and (ii) the reasonableness of the modeling approach and results in IPL's Clean Energy Blueprint resource plan analysis in

2020 that evaluated the expected cost savings of the retirement of Lansing 4 and the addition of 400 MW of solar generation.

- For Alliant Energy, co-authored a report to describe rail service issues observed in the United States in 2022 and the impacts on coal use in the electric sector. During this period, acute logistical and capacity challenges in rail transportation limited many coal shippers' ability to deliver critical inputs to electric utilities. Rail service delivery issues were widespread throughout the country across many industries with shippers experiencing slower train speed, increased delays, poor on-time performance, and inability to satisfy demand for rail shipments.
- For Wisconsin Power and Light Company (WPL), provided expert testimony before the Public Service Commission of Wisconsin on the appropriateness of WPL continuing to recover as a regulatory asset the undepreciated past investments at the Edgewater 5 coal unit after its proposed retirement in 2022. Reviewed and analyzed the prudence of WPL's past decisions to make those investments and its proposal to retire the unit and replace it with new renewable resources. Explained that longstanding and economically well-justified principles and standards in the utility industry strongly indicated that prudent investments should be fully recoverable from customers, even if they eventually proved less economic than initially projected.
- For an electric utility operating in multiple states, reviewed the utility's draft internal planning studies for evaluating the future cost savings for its customers from early retirements of some coal units. Provided feedback on the reasonableness of the modeling approach and key assumptions of the utility's internal modeling team, suggested potential improvements, and estimated the impacts of the suggested changes on the future cost savings from early retirements of the coal units.
- For the Public Service Company of New Mexico (PNM), managed a team to evaluate the prudence of retiring the San Juan Generation Station (SJGS) and replacing it with renewables and gas peakers, with securitization of remaining undepreciated and adjustment costs. Helped PNM to demonstrate the prudence of its proposed plan based on the findings that i) the expected cost savings and risk reductions of PNM's plan outweighed the option retrofitting the plant with carbon capture, utilization, and storage (CCUS); and ii) securitization was a beneficial approach for providing full cost recovery at low cost to customers, as the state moved to fully clean electricity. The New Mexico Public Regulation Commission ruled in favor of PNM, allowing the utility to abandon SJGS and to securitize up to \$360.1 million of unrecovered investments and adjustment costs.

- For Big Rivers Electric Corporation, a municipal electric utility in the Midcontinent Independent System Operator (MISO) market region, provided expert testimony before the Kentucky state regulatory commission to evaluate the economic viability of an existing coal plant against the projected wholesale power prices in MISO. By using an in-house plant dispatch and commitment modeling tool, estimated the future annual capacity factor and variable costs of operating the plant, and compared the plant's avoidable future costs against the projected market prices of energy and capacity for the plant. Developed scenarios for future market prices by considering key uncertainties such as natural gas prices and potential pricing of CO₂ emissions. Estimated the savings from a potential early retirement of the coal plant.
- For an investor-owned electric utility in the MISO market region, provided expert testimony before a United States District Court to assess the potential for economic early retirement of a coal-fired plant under several scenarios including potential future requirements for retrofitting the plant with SO₂ emissions control equipment and future wholesale power market conditions. Estimated the likely impact of retrofits and early retirement on the utility's revenue requirements and retail rates.
- For an electric utility considering an early retirement for one of its coal plants, provided regulatory support to describe the changing economic viability of the existing coal plants in the United States wholesale power markets over the last decade. Conducted research on regulatory decisions in various state jurisdictions on recovery of past investments at retiring generation plants, and explained the perverse incentives on retirement decisions that would be created by disallowing prudently incurred past investments.
- For a merchant generation company in PJM, assessed the potential impacts of coal plant retirements on the future likely range of energy prices under key uncertainties for market fundamentals. The project team evaluated whether the recent price spikes under extreme weather and system conditions could be repeated in the future with increasing reliance on gas-fired generation plants.
- For an electric utility in Wisconsin, provided expert testimony on the likely changes in energy and capacity prices as a result of projected coal plant retirements and environmental retrofits in the MISO region. The analysis included a transparent model to estimate the impacts of retirements and retrofits on the regional supply curve and the impacts of nationwide coal retirements on natural gas prices. Reviewed the projected reserve margins in the MISO region with and without the coal retirements to evaluate the likely changes in capacity prices in the MISO region after 2016.

- Conducted a screening analysis of coal-fired units in the United States for a producer of biomass fuel that could be an alternative to burning coal in generating units in order to avoid or mitigate future compliance requirements with environmental regulations. The analysis compared the projected costs for each unit under the coal-fired operations (including the retrofit cost of environmental control equipment) against the costs under operations with the alternative fuel and the costs of replacement with a new gas-fired unit.
- For the American Coal Ash Association, conducted annual surveys for the production and use of coal combustion residuals in the United States. The Brattle team designed and implemented the survey circulated to coal generation plant operators and supplemented that information with Brattle's assessment of key market trends in the power industry. The results of the survey were published each year for consumption by energy and environmental agencies and industry analysts.
- For an investor, assessed the economic viability of selected merchant and regulated coal plants in the Midwest. The analysis focused on estimates of projected net revenues for merchant plants and cost of continued operations of the regulated coal plants against replacement power costs. In addition, estimated the projected capacity factor and coal use by each plant under selected future gas and CO₂ price sensitivities.
- Managed a case regarding the estimation of cost and performance benchmarks for two coal-fired generation plants in the eastern United States. Assessed their performance and cost by comparing them with similar coal plants in the country with respect to various performance metrics (heat rate, availability, forced outage rate, etc.) and cost metrics (fuel cost, maintenance costs, capital expenditure). Identified strong and weak points by using various definitions of total costs and key performance metrics and analyzed the tradeoff between good performance and high costs among peer group plants.

RESOURCE PLANNING FOR ELECTRIC UTILITIES

- For an industry association, prepared a report on the potential role of clean hydrogen and other clean dispatchable resources in the future in a decarbonized electric system with a high penetration of variable renewable energy resources. The report summarized the findings and gaps in recent industry studies regarding the key attributes needed from clean dispatchable resources in such a system, including fast and sustained flexibility and ability to store energy across seasons. The report compared the effectiveness, availability and cost of clean hydrogen technologies against other clean dispatchable resources such as gas with carbon capture, small modular reactors, and long-duration storage.

- For the Clean Power Suppliers Association, performed a detailed review of the Carbon Plan, which is Duke Energy's recent integrated resource plan study on alternative resource portfolios to achieve 70% reduction in Duke Energy's North Carolina CO₂ emissions by 2030 relative to its 2005 emissions. Identified a number of modeling assumptions that made the comparison of costs across the portfolios flawed. Replicated the Carbon Plan modeling results through its GridSIM capacity expansion and production cost modeling software and simulated additional alternative portfolios that would result in lower future costs for Duke's customers.
- For Cypress Creek Renewables, prepared an economic study to analyze the generation costs and emissions impacts of a future resource mix for Duke Energy that achieved the requirements outlined in North Carolina's House Bill 951 (H951) and minimized the additional development of natural gas capacity. The study concluded that by shifting its resource mix from coal and gas resources to renewable energy and battery storage, Duke Energy could achieve over 70% GHG emissions reductions by 2030 (relative to 2005 emissions) while lowering generation costs. The study also found that use of securitization to finance the recovery of undepreciated past investment costs at some of the retiring coal plants was a major driver of the customer cost savings in addition to the avoided fixed operating and ongoing capital expenditures from early retirements.
- For a large Midwest utility serving electric and gas, assessed current and likely future industry developments with potential to create opportunities and risks for the regulated and nonregulated operations of the company. The key developments included emerging EPA air quality, water and ash regulations for power plants, potential climate policies, macroeconomic recovery, and smart grid technologies. In addition, conducted a comparison of the risks and cost of capital associated with regulated and unregulated businesses, including behind-the-meter renewable generation. Presented the findings of these assessments to the board of directors.
- Assisted a municipal electric utility in developing a least-cost strategy to comply with environmental regulations. Developed a screening tool to compare the economics of environmental retrofits against alternatives such as replacement with a new gas-fired combined cycle or relying on market purchases of energy and capacity to meet the retail load obligations. Presented the results of the economic analysis and potential hedging strategies to the executive management.
- Co-authored a chapter of an EPRI report on decision-making complexities and factors in utility resource planning and environmental compliance investment decisions. The chapter described how various metrics of cost and performance could be used by power industry

planners and executive decision makers, the limitations of those metrics and modeling techniques, and how this problem and modeling complexity may alter the type and timing of technology preferences. Some of the complexities were illustrated with examples on retire/retrofit choices for coal plants to comply with the environmental regulations and on decision-making for Carbon Capture and Sequestration (CCS) investment under CO₂ price volatility.

- Assisted an electric utility in the Midwest in their resource planning. Developed environmental regulation scenarios with the executives and experts at the utility, and assisted in modeling and reviewing the implications of regulatory and market scenarios on the least-cost strategy subject to meeting load, renewable energy standards, and capital constraints. The strategy options included retrofitting the coal-fired generation plants with necessary control equipment, retirement of coal-fired units and replacement with gas-fired units. Presented results to the utility executives.
- Assisted an electric utility in developing an Integrated Resource Plan under potential climate policy scenarios. The plan was developed by reviewing and choosing the best mix of supply side alternatives and demand side programs that would achieve the joint objectives of minimizing cost and mitigating CO₂ footprint subject to meeting the utility's obligation to serve its customers. The supply side options included combinations of conventional generation technologies, renewables and low CO₂ fossil fired generation, and new transmission investment.
- For a large independent generation company, led a team to assess the reasonableness of the evaluation procedures and criteria used by an electric utility in the southern United States in its RFP to acquire new generation assets and power purchase agreements. Reviewed the RFP requirements and the papers supporting the RFP results in a brief period of time to identify the questionable assumptions and criteria used by the electric utility, and quantified the impacts of these on the relative costs of bids.
- For EPRI, analyzed and reviewed the major drivers of generation technology choice in various countries and regions around the world. Although the availability and degree of access to fuels was a common driver, other factors such as capital cost, attitude towards nuclear technology and renewables, constraints on carbon-intensive technologies, and degree of economic development played a varying degrees of roles in the choice of generation fuels and technologies in each country.

ENVIRONMENTAL AND CLIMATE POLICIES – DESIGN AND IMPLICATIONS

- For various environmental protection organizations, evaluated economics of coal-fired electric generating units in the U.S. and the potential impacts of EPA’s proposed and final rules for emissions of GHG and NOx and ELGs.
- For a merchant generation owner in New England, managed a team to conduct an economic study on the potential cost and emission impacts of making the existing clean energy generators eligible under an expanded Clean Energy Standard (CES) program in Massachusetts. Under the existing CES program, commercial operating date requirements limited eligibility to clean energy generators commencing operation after 2010. The study concluded that retaining existing clean generation that came online prior to 2010 under the CES program would reduce GHG emissions in Massachusetts and New England, and would reduce system production and customer costs.
- For a power industry association, co-authored a study to assess the carbon emission impacts of premature nuclear retirements. The study concluded that the vulnerability of some nuclear power plants to premature retirement could create a major threat to the attainment of desired CO₂ reduction. The analysis found that the retirement of a 1,000 megawatt nuclear plant could increase CO₂ emissions in the range of 4.1 to 6.7 million tons per year, or 0.52-0.84 tons per MWh of nuclear generation lost, depending on the region in which the nuclear retirement occurs. In addition, the increased level of CO₂ emissions arising from a premature nuclear retirement would not be confined to the state in which the unit resides. In fact, in most cases the majority of this increase would occur outside the state, and a significant amount of the emissions increase would occur in states beyond those adjacent to the state experiencing the retirement.
- For an industry association, co-authored a study to analyze the potential implications for competitive wholesale electricity markets if new gas-fired combined cycle (CC) plants were not covered under the Clean Power Plan’s (CPP) mass-based state implementation plans (SIPs). The authors found that if state implementation plans excluded new gas CC plants, the electric sector could fall short of the carbon dioxide (CO₂) reduction goals set by the CPP, while incurring higher system costs per ton of CO₂ avoided. In addition, Brattle simulations illustrated that excluding new gas CCs from the emissions cap would introduce a discrepancy in the economics facing new and existing gas CCs that were identical in all respects other than their in-service dates. New CCs would earn greater profits in the energy market because they would be compensated as if they were entirely non-emitting plants.
- For a power industry association, conducted analysis of the EPA’s proposed rule for regulating CO₂ from existing sources under Section 111(d) of the Clean Air Act, focusing on

potential economic impact to hydropower. Summarized key aspects of the rule, and assessed how the compliance options for states could differ from the BSER options in setting target rates and how states could utilize hydropower (existing or new) as a compliance option under the rule.

- For a western electric utility, evaluated the EPA's development of CO₂ rate targets in Arizona and assessed the reasonableness of projected pace and level of emission reductions. Conducted a detailed assessment of the assumptions and modeling approach in EPA's IPM simulations and identified areas of improvements. Prepared a whitepaper to summarize the findings to be filed as part of the utility's comments to the EPA.
- For an electric utility in the western US, conducted a study to assess reliability and supply-chain implications of compliance with the EPA's Regional Haze Rule. The Regional Haze Rule aimed to reduce haze-forming pollution (primarily due to emissions of particulate matter and its precursors SO₂ and NO_x) that reduced visibility in parks and wilderness areas, especially in the western United States. Assessed the impact of outages at coal units to tie-in the environmental retrofit equipment on available resources to meet the utility's load obligations in the future. In addition, compared the historical retrofits on coal units in the region against projected retrofits to comply with Regional Haze Rule.
- Co-authored a study commissioned by the MISO to evaluate the feasibility of the large number of simultaneous environmental retrofits and new generation that might be needed for coal plants to comply with the Environmental Protection Agency's Mercury and Air Toxics Standards (MATS) rule. The study found that compliance with the MATS rule posed significant challenges. The study took into account the historical level of actual retrofits and new generation construction, typical timelines to complete various types of projects, potential bottlenecks in specialized types of labor, and the required planned outages in coal plants to install and test the environment control equipment.
- Co-authored studies that analyzed the economics of retirement decisions for each coal plant operating in the United States under proposed and emerging EPA air quality and water regulations, taking into account the predicted profitability and cost of replacement power for both regulated and unregulated plants. The regulations were expected to force coal plants to decide between retiring versus installing expensive control equipment to reduce emissions of SO₂, NO_x, particulates, and hazardous air pollutants such as mercury, as well as cooling towers to reduce the use of cooling water.
- For a natural gas producer, analyzed the potential for change in natural gas demand as a result of the Waxman-Markey climate policy proposal. Using scenarios for new renewable capacity and price of natural gas relative to coal, analyzed effects of CO₂ prices on dispatch

switching from coal-fired to gas-fired generation plants in various ISO regions, as well as on demand for gas in non-electric sectors.

- Assisted an electric utility in understanding the implications of the Waxman-Markey climate policy proposal on its renewable generation portfolio and its electricity sales to other regions. Identified opportunities and risks for specific renewable technologies due to provisions in the bill imposing renewable portfolio standards for electric utilities.
- For electric utility companies in the eastern United States, analyzed the potential effects of existing and developing environmental legislation and regulation on the existing generation fleet. The assignment included reviewing and summarizing the regulations by pollutant, identifying the specific generation plants that these regulations could affect, and estimating economics of retirement for each plant under a regulatory scenario.
- Conducted screening analyses for electric utilities to assess their exposure to allowance costs in the near- and long-term due to recent cap and trade climate policy proposals. Under alternative assumptions to comply with the regulations (from complete reliance on allowance purchases to reducing emissions to meet the economy-wide targets), estimated the potential cost of the policy net of free allowances under the proposal using various CO₂ price scenarios.
- For an electric utility, assisted in evaluating expected natural gas prices under potential CO₂ prices due to proposed federal climate policies in the United States. The analysis included modeling of changes in demand for natural gas in electric and non-electric sectors as a result of potential CO₂ prices, as well as feedback effects due to dispatch switching from coal-fired generation plants to gas-fired generation plants in electric sector.
- Helped a large energy company evaluate the implications of several climate policy options on United States CO₂ emissions from electric and transportation sectors, and consumption and prices of electricity, natural gas, and coal. The analysis focused primarily on long-term implications for future generation capacity mix and provided insights about the feedback effects between fuel prices, electricity prices, and electricity consumption.

WHOLESALE MARKET ANALYSIS AND ASSET VALUATION

- For Con Edison, examined the potential impacts on electric customers as New York works to add large amounts of renewable resources in the next decade to achieve the state's energy and climate goals. Compared the pros and cons of supplementing the state's current private ownership model for renewable energy with utility ownership of resources. Found that utility ownership of renewables could accelerate the build-out of renewable resources in

New York by allowing the state to access capital for renewables from utility investors; this could create benefits for customers under certain circumstances. However, utility ownership would likely shift most risks currently borne by private owners (or by developers) to electricity customers with respect to asset performance and cost overruns. In addition, depending on the implementation rules, utility ownership may raise concerns about cross-subsidization of costs between the delivery services and the renewable project and assuring equal access to information on the transmission and distribution systems to all developers of renewable generation in the state. Finally, utility ownership may raise customer costs over the lifetime of the renewable asset under certain conditions, such as depending on the approach used to reflect the federal investment tax credits in customer rates.

- For MISO, evaluated design options for the resource adequacy market to provide efficient signals to resource owners for making their resources available during hours when the system was at or near scarcity conditions. As a result of the increasing penetration of renewables in the MISO region, as well as the increasing prevalence of common mode failures at fossil-fuel generation plants, MISO evaluated design options with the understanding that critical resource adequacy periods would increasingly include periods outside the summer peak load hours. Evaluated alternative mechanisms for accreditation of resources under a sub-annual resource adequacy construct and for MISO's modeling of planned and forced outages in determining planning reserve requirements, and compared these mechanisms against practices of other system operators.
- For an asset management firm considering investing in a virtual trading company with operations in Regional Transmission Organizations (RTOs), performed due diligence analysis on the trading algorithm, profitability, achievable market size, and compliance with market monitoring rules.
- For a large electric utility in Canada, researched industry practices on the wind integration service rates charged by balancing authorities in the United States outside the organized wholesale power markets.
- For a group of market participants in Texas, managed a team to estimate the impacts of implementing marginal losses in the ERCOT market on system production costs, transmission losses, LMPs, load payments, and generator revenues. Simulated the ERCOT power system using PSO software, and calibrated the model to recent generation and load patterns. The study results were made public in a proceeding before the Texas Public Utility Commission.
- For a large group of generation owners and trade groups, conducted a study to estimate the above-market payments to certain merchant generation plants with 90-day fuel supply

under the United States Department of Energy's (DOE) proposed payments. While the DOE's rationale for the proposed payments was to improve the resilient operations of the power system, the study concluded that 1) there was no evidence supporting the premise that 90 days of on-site fuel at individual power generating plants would improve the resilience of the grid in the regions where the rule would apply, and that 2) implementing the proposed rule would undermine core market principles and diminish some of the most important advantages of competitive wholesale power markets.

- For a developer of a biogas power plant, submitted expert testimony on the outlook of projected long-term wholesale power prices in Arizona. Reviewed forward market prices for near term deliveries as of the execution date of a contract with the supplier of waste feedstock, and summarized the industry expectations for the timing of the need and cost to build new generation in the region.
- For a developer of solar PV generation plants, conducted research and analyses to identify potential opportunities for renewables to be offered to electric utilities as qualifying facilities (QFs) under the Public Utilities Regulatory Policies Act (PURPA). Summarized the states with the largest penetration of renewable QFs and most favorable contract/pricing terms, and presented the likely outlook on avoided cost rates by region.
- For an investment firm, evaluated the projected net margins from energy and capacity markets in the Northeast for a new gas-fired generation plant. Assessed the key market drivers and risk factors associated with the plant's future performance and conducted analyses to assess the implications for the asset's market value.
- For an independent power producer, analyzed the market trends in California power markets and explored potential value drivers of the client's existing gas-fired combined-cycle plant in California. Simulated the long-term wholesale energy prices in the Southern California region and developed a modeling tool to analyze the projected capacity payments for existing resources under the California's local resource adequacy construct.
- Assisted an electric utility in performing a valuation of a coal-fired unit. Managed the analysis to model the projected revenues from energy and capacity markets, as well as to project variable and fixed operating costs and environmental compliance costs in the future. Various market and regulatory scenarios were considered and presented to the client.
- For an investor, performed a valuation analysis of a potential new gas combustion turbine (CT) in Texas. Developed scenarios for future energy-only and capacity markets, estimated regional reserve margins under a few load-growth scenarios. In addition to estimating

annual energy margins using a virtual commitment and dispatch model, estimated the projected run-hours for the new CT.

- For an investor, co-authored a valuation analysis of a large gas-fired cogeneration facility in the Midwest. In addition to projecting energy and capacity prices in the region under the key uncertainties on gas prices, coal plant retirements, and renewable generation additions, the study analyzed the projected revenues under the existing long-term sale contracts to provide energy and steam.
- Co-lead team to assist a municipal electric utility in the Midwest United States to sell a portion of its share of energy and capacity from a new coal plant. Acted as sale advisor to design the sale process, solicit bids, prepare informational documents, and evaluate the bids.
- For an RTO in the Midwest United States, estimated the future costs and benefits from an electric utility joining that RTO as a member, compared to stand-alone and an alternative RTO membership. The analysis included impact on production cost savings, existing transmission constraints and interconnection capacities, wholesale trading activity, load diversity benefits, generation investment savings, and allocation of transmission costs and revenues.
- For a power plant developer, estimated the market potential for new wind, solar and gas peaking plants in the Eastern Interconnection. Developed and refined assumptions and scenarios on future fuel prices, capital costs of new plants, federal tax credits as well as federal climate policy. Economic potential for new generation alternatives were estimated by using Brattle's in-house simulation model Xpand, which optimized plant dispatch as well as generation entry and retirements in order to meet future electric demand and reserve margin requirements.
- For an electric cooperative in the Midwest, conducted studies to evaluate the impact of planned new wind and gas combined-cycle units at alternative locations on nodal energy prices and net revenues for generation fleet owned by the cooperative. Provided analytical support to assess likely allocations of auction revenue rights for hedging congestion.
- For a large merchant generation company in PJM, assessed the likely causes of high energy prices during polar vortex events. Analyzed the impact of each driver on market prices, and conducted simulations to evaluate the likely market prices in the future under similar weather conditions and sensitivities for coal plant retirements, increased penetration of demand-resources, and expected gas prices.

- For a large coal company, assisted in designing and evaluating innovative coal supply contracts with power plants. Developed a customized tool to simulate the regional energy and capacity prices in the eastern power markets and evaluated the profitability of various types of supply contracts from the perspective of the coal company and the power plant. In addition, identified coal-fired power plants that could be potential candidates to benefit from signing innovative coal supply contracts.
- For a group of electric utilities in the Midwest, led a team to assess the energy-related costs and benefits of joining an RTO. Using a nodal pricing simulation software, estimated the net costs to customers of the utilities with respect to energy, congestion, marginal losses, and allocation of financial transmission rights and loss refunds under each configuration (stand-alone and RTO membership).
- For clients in PJM, examined the variability of historical congestion patterns to help assess the reasonableness of the utilities' strategies to acquire financial transmission rights (FTRs) and Auction Revenue Rights (ARRs).
- Provided consulting services on the impact of moving into a locational marginal price (LMP) market design for a client in the Western Electricity Coordinating Council. In addition to quantifying the expected congestion cost exposure under LMP market design, examined the impacts of potential mitigating solutions on the cost exposure and on the client's ability to hedge these costs through acquisition of financial instruments.
- Estimated the economic benefits of a proposed power plant in California. The project included an analysis of benefits from reduced market-clearing prices, avoided/deferred transmission upgrades, and reliability improvements.
- For an independent power producer, assessed the competitive offer price for its planned gas-fired generation unit in the PJM capacity market. Under key scenarios reflecting uncertainty in market fundamentals and in reasonable modeling assumptions, estimated the net cost of new entry (Net CONE) for the generation plant using plant-specific cost and performance information supplemented by publicly available estimates for generic plants. The key modeling assumptions driving the range of results were the appropriate methodology to levelize overnight capital costs and the appropriate time period over which the costs of the generation plant would be recovered in the PJM markets.
- Assisted an energy company to understand the fundamentals of the PJM capacity markets to inform the company's bidding strategy in the capacity auctions. Conducted a training session to review the auction clearing mechanism, simulation of the market-clearing prices and quantities and alternative methodologies to project future market supply curves.

- For an energy trading company in the western United States, assessed the California Independent System Operator's (CAISO's) historical calculations of nodal energy prices at specific locations. The focus of the assessment was to understand the impact of modeling differences between day-ahead energy markets and annual Congestion Revenue Rights (CRRs) auctions on the nodal energy prices at those locations. The findings of this assessment were used to support a complaint at the FERC.
- For a transmission owner in Canada, assessed whether the proposed procedures to coordinate the Available Transmission Capacity (ATC) on its interfaces with neighboring systems were consistent with the FERC requirements and the practices of various United States counterparts. ATC coordination was required under FERC Order 890 in order to ensure that ATCs were calculated in a consistent manner by transmission providers and that transmission service was provided in a non-discriminatory manner.
- For an RTO in the eastern United States, assisted in the preparation two expert reports regarding an alleged manipulation of market credit rules through its trading activity in the FTR markets. The analysis involved a review of trading activity and an assessment of risks assumed by the trader through a review of historical congestion prices.
- Submitted rebuttal and surrebuttal testimony jointly before the Pennsylvania Public Utilities Commission on the causes of an episode of high locational marginal prices (LMPs) experienced by a small electric utility in PJM wholesale energy markets. Using data on potential causes of high congestion and detailed market simulation modeling, identified several causes including increased virtual bidding activity, reduced transmission capability, and changes to physical characteristics of certain transmission assets.
- For an electric utility considering joining an RTO, managed transmission flow analyses of generation and load deliverability, as well as LMP market simulations to assess the effects of the company's move on prices in its service territory.
- Co-authored a report reviewing the results and the performance of the ISO-NE Forward Capacity Market (FCM) auctions conducted for the 2010/2011 and 2011/2012 commitment periods.
- Submitted an affidavit at the Public Utilities Commission of Texas (PUCT) regarding a proposed rule to allocate costs of procuring replacement reserves to market participants in ERCOT.
- Analyzed the economic and network impacts of a utility signing renewable energy contracts with several potential renewable generation projects. Using market simulation tools such as MarketSym™ and Powerworld™, simulated an entire reliability council to assess whether

each of the potential renewable generation projects would cause additional transmission constraints, and estimated the impacts of these projects on LMPs across the region.

- Assisted an electric utility before the energy regulator in Quebec, Regie De l'Energie, involving third-party access to an electric transmission system owned and operated by another company.
- Assisted numerous clients in examining the potential for the exercise of horizontal and vertical market power under the FERC's market power tests as a result of asset acquisitions, mergers, and as part of periodical market-based rate (MBR) filings.
- Helped a client assess the potential liability and market impacts associated with offering the output of an out-of-service generation unit to the ISO-NE markets.
- Led efforts to prepare a report assessing the implications of the Open Access Transmission Tariff (OATT) filed by MISO on market efficiency and gaming opportunities.
- Contributed to Brattle's investigation of the California power crisis on issues involving physical or economic withholding and manipulative gaming strategies such as double-selling, circular scheduling, wheel-out, simulation of real-time energy, and ancillary services markets.
- Estimated the potential for the exercise of market power in a load pocket in the Northeast United States power markets. The study simulated strategic behavior in order to assess the price risk for a distribution company due to congested transmission facilities.

RETAIL ELECTRIC RATES – COST ESTIMATION AND RECOVERY

- For an electric utility in the western United States, managed a team to support expert testimony before Oregon and Wyoming regulators with respect to the appropriate recovery mechanisms for fuel and purchased power costs. Demonstrated the historical persistency of under-recovery of such costs due to the inherent asymmetric nature of the difference between actual net purchased power costs and year-ahead deterministic forecasts. Compared the existing true-up methodology for that utility against common industry practices across the United States with respect to the use of variance deadbands, earnings tests and sharing arrangements between ratepayers and shareholders.
- For multiple clients including a university, several hospitals and a hotel and shopping complex in Pennsylvania, conducted economic due diligence studies on the potential cost savings from installing an on-site combined heat and power (CHP) facility that would offset power and heating needs. Reviewed key drivers of potential cost savings, including net

metering revenues from excess generation output from the CHP plant, reduction in cost of purchasing grid power, and future market prices for power and fuels. Presented findings to the executive teams and provided analytical support in contract negotiations.

- For an investor in distributed gas-fired generation assets in Texas, conducted a study on future savings in transmission and distribution service costs and potential market penetration of distributed energy resources. Reviewed key aspects of the wholesale market structure that directly impact the long-term stability of the transmission tariff rate, and identified potential risks and mitigating factors associated with possible changes to the design of the market.
- In a merger involving two electric companies in the eastern United States, analyzed the impacts of the merger on competition in retail electricity markets. Both companies owned electric distribution companies, transmission assets, generation resources, and retail electricity providers in several states. The analysis involved assessment of whether the increased market share in wholesale energy markets would affect retail competition, number of suppliers in retail electricity markets, ease of entry and exit to provide electricity to retail customers directly or through Default Service (DS) procurements, and potential for abusing affiliate relationships with the electric distribution company to favor the retail electricity provider affiliate.
- For an association of suite meter providers in Canada, analyzed whether the incumbent electric utility had been cross-subsidizing the provision of suite meters to its residential customers at the expense of its other customers. The analysis involved a comparison of the estimated fully-allocated costs of providing suite meters to the net revenues from these customers under the regulated retail rates under alternative assumptions on the costs of meters and types of suite meter installations.
- Prepared a marginal cost study for an integrated electric utility in the PJM region. The study estimated the incremental costs to the utility of serving additional demand and customers by time period, sub-region, and customer class.
- For a large electric customer of a utility in the western United States, assisted in evaluating the utility's proposed rate design. Specifically, provided an assessment of alternative methods to classify generation costs (as demand, energy, or customer related) and to allocate the fixed costs among customer classes. The analysis included an assessment of the treatment of the costs and revenues associated with off system sales in determining the revenues to be recovered from various customer classes.

- For an electric customer in United States, analyzed whether a proposed change in rates by the electric utility would result in just and reasonable rates for transmission level and station service customers. The resulting testimony assessed whether the proposed rates were consistent with fundamental principles of ratemaking such as cost causation and rate stability, and compared the proposed rate design to the rate options provided by utilities in other jurisdictions for transmission level and station service customers. The parties settled the case with reduced rates for the client based on the lower cost of serving transmission level customers relative to distribution level customers.
- For an electric utility planning to install smart meters and in-home displays in the eastern United States, assisted in estimating the likely benefits to retail customers and to the utility. The quantified benefits to the utility company mostly came from reduced costs of meter reading and outage managements, whereas the customer benefits came from reduced costs of energy, capacity, and carbon emissions as a result of reduced peak load and annual energy consumption.
- Co-managed a case regarding a Texas electric utility company auctioning off its generation assets in order to determine its stranded costs. Assessed whether the market value of the utility's jointly-owned generation assets was depressed due to the rights of first refusal (ROFR) provisions attached to these assets, and whether the utility company failed to take commercially reasonable steps to mitigate its stranded costs.
- Helped a client analyze the cost of providing ancillary services (reserves, regulation, voltage support, etc.) from its hydroelectric generation facilities. The analysis dealt with the implications of separating cost of energy and ancillary services on the electricity rates of different customer types.

ARTICLES & PUBLICATIONS

- "Utility Ownership of New Renewables in New York State -- Potential Benefits and Risks for Customers," with Joe DeLosa III, Josh Figueroa, Sanem Sergici, Ragini Sreenath, Ethan Snyder, prepared for Con Edison, September 20, 2024.
- "Bulk System Reliability for Tomorrow's Grid," with Andrew Levitt, Andrew Thompson, Ragini Sreenath, Xander Bartone, Sam Willett, and Hazel Ethier, prepared for the Center for Applied Environmental Law and Policy, December 20, 2023.
- "Role of Hydrogen in a Decarbonized Future," with Josh Figueroa and Andrew Thompson, presented at the Bank of America 2023 Hydrogen Conference, December 19, 2023.

- “A Review of Coal-Fired Electricity Generation in the US,” with Long Lam, Jadon Grove and Natalie Northrup, prepared for The Center for Applied Environmental Law and Policy, April 27, 2023.
- “Rail Delivery Disruptions in the US in 2022: An Overview of Scale and Extent,” with Nicholas Powers, prepared for Alliant Energy, March 30, 2023.
- “A Pathway to Decarbonization: Generation Cost & Emissions Impact of Proposed NC Energy Legislation,” with Michael Hagerty, Matt Witkin, Julia Olszewski, and Frederick Corpuz, prepared for Cypress Creek Renewables, August 31, 2021.
- “Western Energy Imbalance Service and SPP Western RTO Participation Benefits,” with John Tsoukalis, Johannes P. Pfeifenberger, Sophie Leamon, Carson Peacock, and Sharan Ganjam, prepared for Southwest Power Pool, December 2, 2020.
- “The Role of Economics in Evaluating Contractual Performance Defenses: Emerging Disputes on COVID-Related Force Majeure Claims,” with Shaun D. Ledgerwood, Peter S. Fox-Penner, and Jake Zahniser-Word, September 2020.
- “The Brattle Group’s Notes on the Affordable Clean Energy Rule,” with David Luke Oates, Michael Hagerty, Yingxia Yang, and Marc Chupka, August 23, 2018.
- “The Cost of Preventing Baseload Retirements: A Preliminary Examination of the DOE Memorandum,” with Richard Sweet, Kelly Oh, and Marc Chupka, prepared for the Advanced Energy Economy (AEE), American Petroleum Institute (API), American Wind Energy Association (AWEA), Electricity Consumers Resource Council (ELCON), Electric Power Supply Association (EPSA), and Natural Gas Supply Association (NGSA), July 19, 2018.
- “New Technologies and Old Issues under PURPA,” with Robert S. Mudge, Marc Chupka, and Peter Cahill, Norton Rose Fulbright’s *Project Finance NewsWire*, February 26, 2018.
- “The Future of Cap-and-Trade Program in California: Will Low GHG Prices Last Forever?” with Yingxia Yang, Michael Hagerty, Ashley Palmarozzo, Hannah Sheffield, Marc Chupka, and Frank C. Graves, December 5, 2017.
- “Comments on Expanding CES Eligibility to Existing Nuclear Units,” with Onur Aydin, David Luke Oates, Tony Lee, and Kelly Oh, prepared for NextEra Energy Resources and presented to the Massachusetts Department of Environmental Protection in response to the proposed Clean Energy Standard-Existing (CES-E), November 30, 2017.
- “The Future of the U.S. Coal Generation Fleet,” with Marc Chupka, Dean M. Murphy, Samuel A. Newell, and Ira H. Shavel, ABA Antitrust Section Transportation and Energy Industries Committee Fall 2017 newsletter, November 30, 2017.

- “Evaluation of the DOE’s Proposed Grid Resiliency Pricing Rule,” with Judy Chang, Marc Chupka, Samuel A. Newell, and Ira H. Shavel, prepared for NextEra Energy, Inc., October 26, 2017.
- “Impacts of Marginal Loss Implementation in ERCOT,” with Toshiki Bruce Tsuchida, Rebecca Carroll, Colin McIntyre, and Ariel Kaluzhny, prepared for Ad Hoc Group, including Vistra Energy, The Wind Coalition, and First Solar, October 11, 2017.
- “Nuclear Retirement Effects on CO₂ Emissions: Preserving a Critical Clean Resource,” with Marc Chupka, Frank C. Graves, Dean Murphy, and Ioanna Karkatsouli, December 2016.
- “Covering New Gas-Fired Combined Cycle Plants under the Clean Power Plan: Implications for Economic Efficiency and Wholesale Electricity Markets,” with Judy Chang, Kathleen Spees, and Tony Lee, November 2016.
- “The Clean Power Plan: Focus on Implementation and Compliance,” with Marc Chupka, Judy Chang, Ira H. Shavel, Kathleen Spees, Jürgen Weiss, Pearl Donohoo-Vallett, Michael Hagerty, Michael A. Kline, prepared as a Brattle Policy Brief, January 2016.
- “EPA’s Proposed Clean Power Plan: Implications for States and the Electricity Industry,” with Kathleen Spees, Michael Hagerty, Samuel A. Newell, Dean Murphy, Marc Chupka, Jürgen Weiss, Judy Chang, and Ira Shavel, prepared as a Brattle Policy Brief, June 2014.
- “Coal Plant Retirements: Feedback Effects on Wholesale Electricity Prices,” with Onur Aydin and Frank C. Graves, November 2013.
- “Potential Coal Plant Retirements: 2012 Update,” with Frank C. Graves and Charles Russell, published by The Brattle Group, Inc., October 2012.
- “Supply Chain and Outage Analysis of MISO Coal Retrofits for MATS,” with Kathleen Spees, Quincy Liao, and Steve Eisenhart, May 2012.
- “State Regulatory Hurdles to Utility Environmental Compliance,” with Philip Q. Hanser and Bin Zhou, *Electricity Journal*, April 2012.
- “Decision Complexities in Utility Resource Planning and Environmental Compliance Investment,” with Frank C. Graves, chapter in EPRI report “The Market Backdrop to US Power Generation Coal Technology Goal-Setting and Learning, September 2011.
- “Marginal Cost Analysis in Evolving Power Markets: The Foundation of Innovative Pricing, Energy Efficiency Programs, and Net Metering Rates,” with Philip Q. Hanser, The Brattle Group Energy Newsletter Issue 2, 2010.

- “Virtual Bidding: The Good, the Bad, and the Ugly – Experience of RTOs with Virtual Bidding and Implications for Market Participants’ Hedging Congestion Costs,” with Attila Hajos and Philip Q. Hanser, *Electricity Journal*, June 2010.
- “Can the US Congressional Ethanol Mandate be Met?” with Evan Cohen, Michael I. Cragg, David Hutchings, and Minal Shankar, The Brattle Group Discussion Paper, May 2010.
- “Prospects for Natural Gas Under Climate Policy Legislation: Will There be a Boom in Gas Demand?” with Steven H. Levine and Frank C. Graves, The Brattle Group Discussion Paper, March 2010.
- “Internal Market Monitoring Unit Review of the Forward capacity Market Auction Results and Design Elements,” with Dave Laplante, Hung-po Chao, Samuel A. Newell, and Attila Hajos, filed at FERC by ISO-NE, June 5, 2009.
- “CO₂ Price Volatility: Consequences and Cures,” with Frank C. Graves, The Brattle Group Discussion Paper, January 2009.
- A Lexicon Entry for “A Theory of Incentives in Procurement and Regulation – Laffont&Tirole,” with Richard Arnott, Lexikon der Okonomischen Werke, 2006.
- Contributing author for the Energy Bar Association Antitrust Committee’s report on 2005 Antitrust Development.
- “The CAISO’s Physical Validation Settlement Service: A Useful Tool for All LMP Based Markets,” with Philip Q. Hanser, Jared S. des Rosiers, and Joseph B. Wharton, *Electricity Journal*, October 2005.
- “The Design of Tests for Horizontal Market Power in Market-Based Rate Proceedings,” with James Bohn and Philip Q. Hanser, *Electricity Journal*, May 2002.
- “Financial Transmission Rights: Implementation Issues,” with Philip Q. Hanser, Working Paper, February 2002.
- “An Analysis of Incentives and Regulation in Providing Capacity and Reliability in Power Transmission Networks,” unpublished PhD thesis for Boston College, September 2000.

PRESENTATIONS & SPEAKING ENGAGEMENTS

- “Cashing In On CHP: Increasing Energy Reliability and Savings with Combined Heat and Power (CHP),” with Frank C. Graves, Alan Seltzer, and John Povilaitis, June 3, 2021.

- “FERC's Recent Ruling on PURPA: Variable Energy Rate Option,” EUCI Online Conference, December 15, 2020.
- “PURPA Notice of Proposed Rulemaking 2019,” NRRI PURPA Perspectives Webinar, January 29, 2020.
- “PURPA Resurgence and Avoided Costs,” EUCI Symposium, September 9, 2019.
- “Future of Coal: Clean Power Plan, Market Drivers, and Other Regulations,” American Coal Ash Association’s (ACAA) 2017 Winter Membership Meeting, January 25, 2017.
- “CO₂ Regulations and Coal,” Energy Bar Association’s (EBA) Energizer: Ongoing Climate Imperative, November 10, 2016.
- “Update on Clean Imperative and Sectoral Responses in the US Power Industry,” with Robert S. Mudge, Susan Nickey, Allyson Umberger Browne, and Elias B. Hinckley, American Bar Association (ABA) Business Law Section’s Annual Meeting, September 8, 2016.
- “The Clean Power Plan: Retirements and Reliability,” Wisconsin Energy Institute 2015 Energy Summit, October 2015.
- “The Clean Power Plan: Retirements and Reliability,” with Michael Hagerty, Yingxia Yang, and Nicole Irwin, EUCI Conference, April 1, 2015.
- “Hydropower and the EPA Section 111(d) Proposal,” with Marc Chupka and Kathleen Spees, National Hydropower Association, August 12, 2014.
- “Coal Plant Retirements and Market Impacts,” Wärtsilä Flexible Power Symposium, February 5, 2014.
- “U.S. Coal Plant Retirements: Outlook and Implications,” Coaltrans West Coast Conference, June 14, 2013.
- “U.S. Coal Plant Retirements: Outlook and Implications,” West LegalEd Center CLE Webcast, January 24, 2013.
- “Environmental Retrofits: Costs and Supply Chain Constraints,” MISO Annual Stakeholders’ Meeting, June 2012.
- “Potential Coal Plant Retirements in U.S. and Impact on Gas Demand,” CERl Conference, February 27, 2012.
- “Potential Coal Plant Retirements and Retrofits Under Emerging Environmental Regulations,” Minnesota Rural Electric Association (MREA) Annual Meeting, August 10, 2011.

- “Potential Coal Plant Retirements in ERCOT Under Emerging Environmental Regulations,” with Frank C. Graves, Public Utility Commission of Texas workshop on Potential Environmental Regulations and Resource Adequacy, June 22, 2011.
- “The Regulatory Landscape for Coal-Fired Power: EPA Rules and Implications,” with Frank C. Graves and Marc Chupka, EUCI Conference, January 24, 2011.
- “Potential Coal Plant Retirements under Emerging Environmental Regulations,” with Frank C. Graves, Gunjan Bathla, and Lucas Bressan, EUCI Webinar, December 8, 2010.
- “Financial Instruments in Power Markets: Virtual Bids and FTRs,” with Attila Hajos and Philip Q. Hanser, EUCI Conference, July 19, 2010.
- “Marginal Cost Studies in Ratemaking and Implications of Federal Climate Policy,” Southeastern Electric Exchange Rates and Regulation Section Meeting, October 28, 2009.
- “CO₂ Price Volatility Delays Clean Generation Investment,” Law Seminars International’s Renewable Energy in New England Conference, June 25, 2009.
- “What to Expect from Electric Power and Transport Sectors in Response to U.S. Climate Policy,” Rutgers University Center for Research in Regulated Industries, January 18, 2008.
- “Financial Transmission Rights: Necessary or Burdensome?” with Philip Q. Hanser, IAEE Conference, June 7, 2006.
- “Regulation of Transmission Investment and Reliability in Power Networks,” METU International Conference in Economics V, September 2001.

SELECTED HONORS & AWARDS

1999	Summer Dissertation Award, Boston College Graduate School of Arts and Sciences
1998	Summer Dissertation Award, Boston College H. Michael Mann Fund
1991–1993	Scholarship, Yasar Holding Company
1988–1993	Tuition Scholarship and Stipend towards the completion of BSc in Industrial Engineering, Turkish Ministry of Education

PROFESSIONAL ASSOCIATIONS & MEMBERSHIPS

2021–2024 **American Bar Association (ABA)**

Sections: Litigation; Environment, Energy, and Resources; Infrastructure and Related Industries

2022–Present **Energy Bar Association (EBA)**

LANGUAGES

- Turkish (native)