

Curriculum Vitae

A.J. GOULDING

President, London Economics International LLC

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KEY QUALIFICATIONS:

In his role as president of London Economics International LLC, A.J. Goulding manages a growing international consulting firm focused on finance, economic, and strategic consulting to the energy and infrastructure industries. In addition to serving as a sector expert in electricity and gas markets, his responsibilities include project management, marketing, budget and financial control, and recruiting. A.J. also serves as an Adjunct Associate Professor at Columbia University, where he teaches a course on electricity market design and regulatory economics while also supervising graduate workshops.

With over twenty years of experience in evolving electricity and natural gas markets, A.J.'s diverse background enables him to work effectively in both emerging markets and OECD countries. In North America, A.J. has been articulate in describing market relationships between wholesale power marketers, merchant plants, aggregators, and the existing investor owned utilities. In emerging markets, A.J. has considerable experience dealing with the challenges of mixed private and public ownership, difficulties in creating credit-worthy distribution and retail entities, and the realities of line losses, unreliable fuel deliveries, and politicized labor relations.

A.J. began his career performing natural gas market analysis for the ICF Resources subsidiary of ICF Kaiser International. Later, he lived for two years in New Delhi, India, where he advised the United States Agency for International Development (USAID) on electric power sector restructuring in India. He continued his work on India while pursuing his MA at Columbia University, leading to the publication of an article on Indian privatization. Simultaneously, he researched the process of power sector reform in Pakistan, contrasting it with the Indian experience. Upon completion of his MA, A.J. served as business development associate for Citizens Power LLC, a top ten US wholesale power marketer. He then moved to London Economics, where he has held roles of progressively increasing responsibility.

EDUCATION:

Earlham College, Richmond, Indiana, B.A. in Economics, 1991. College honors, scholar-athlete, public service graduate fellowship.

Columbia University, New York, New York, M.A. in International Business, 1997. Foreign Language and Area Studies fellowship, Cordier prize.

EMPLOYMENT RECORD:

- From:** 1996
Employer: *London Economics International LLC, United States*
President (July 1999 to present), Senior Consultant (January 1998 to July 1999), Summer Associate (June 1996 to August 1996)
- From:** September 2003
Employer: *Columbia University*
Adjunct Associate Professor (2014 to present), Adjunct Assistant Professor (2003-2014)
- From:** 1997
Employer: *Citizens Power LLC; Boston, MA*
Associate
- From:** 1994
Employer: *USAID; New Delhi, India*
Energy Consultant
- From:** 1991
Employer: *ICF Resources, Inc.; Fairfax, VA*
Analyst

SAMPLE PROJECT EXPERIENCE:

The projects briefly described below are typical of the work A.J. has performed throughout his career at London Economics, Citizens Power, USAID/India, and ICF Resources. A.J. also serves as an adjunct professor at Columbia University, where he teaches a course in electricity market design.

Canada

- ***led Ontario gas LDC performance-based ratemaking project:*** LEI was engaged by Union Gas to review Union's proposed 2014 to 2018 incentive ratemaking ("IR") plan as presented to stakeholders on April 29th, 2013 and to examine case studies of approaches to IR applied to other North American gas distribution utilities. In the case study analysis, Union particularly requested LEI to examine approaches to a set list of ratemaking parameters: productivity and X-factor trends, alternative approaches to designing an I-X framework, approaches to establishing inflation factors, approaches in other jurisdictions to applying an Earnings Sharing Mechanism ("ESM"), use of capital trackers for unknown costs, appropriateness of deferral accounts for unaccounted-for gas ("UFG"), and service quality indicators ("SQIs") and how they are measured. LEI was subsequently requested by Union to provide comments on Union's draft Settlement Agreement
- ***submission to Ontario LTEP consultations regarding value of capacity imports:*** On behalf of a large Canadian hydropower generator, LEI analyzed the potential economic benefits of

the export of capacity and energy from Quebec to Ontario. The engagement included a review of the treatment of imports in capacity markets in the Northeast, an examination of the impact on capacity prices of imports, and a discussion of the reliability benefits that long term contracts for capacity imports provide. In addition, LEI discussed how Ontario can create a level playing field for clean energy imports relative to other potential future sources of supply in Ontario

- ***due diligence support associated with the evaluation of the possible acquisition of a minority stake in a major Ontario transmission and distribution company:*** LEI prepared reports and analysis which contributed to the analytic framework for this proposed transaction, including analysis of the regulatory framework, review of impact of PBR on revenues, strategic issues, and the potential for revenue growth
- ***valuation of integrated investor owned utilities (“IOUs”):*** AJ coordinated evaluation effort for acquisition of Southeastern US utility and of Ontario municipal electric utility; tasks included assessment of impact of PBR, calculation of difference in profits from generation portfolio under ratebase versus in open market, and analysis of ratebase settlement
- ***valuation of Ontario generating plants, including assessment of regional electricity markets:*** AJ organized and implemented a major modeling effort to determine the potential value of generation stations in Ontario. Assessed impact of transmission constraints and restructuring efforts in neighboring markets on future the wholesale market prices
- ***price forecasts in key Canadian markets and associated export zones:*** LEI provided long term electricity price forecasts in multiple engagements for key Canadian markets, including Alberta, British Columbia, and Ontario, as well as related export markets such as New York, Midwest ISO, and PJM. Results used by clients for obtaining financing and assessing contract pricing
- ***revenues to hydro portfolio in Ontario:*** For a large North American industrial company, A.J. led the creation of a market study and report underlying the issuance of income trust securities. Tasks included multiple scenario analysis of merchant revenues, review of ancillary services revenues, and an examination of the Ontario hybrid market structure
- ***assessment of the role of a peaking plant in Ontario power sector:*** For an Ontario government body, LEI performed extensive scenario analysis to determine extent to which peaking plant should be a part of future procurement plans in the province; this analysis included assessment of revenues from ancillary services and of optionality
- ***transmission review in Canada:*** LEI was hired by a French consulting firm to provide commentary and insights on the state of the transmission and distribution market in a number of Canadian provinces including Alberta, Ontario, British Columbia, Manitoba, Saskatchewan and Quebec
- ***impact of Ontario market changes on industrial consumers:*** For the Association of Major Power Consumers in Ontario (“AMPCO”), LEI assessed market trends and future entry and exit scenarios to determine long term price dynamics in the face of changes in government deregulation policies
- ***Ontario electricity market paper:*** On behalf of a respected Canadian think tank, LEI provided an assessment of the ways in which the Ontario electricity sector could be improved to increase economic efficiency and reduce costs for consumers over the long run

- *conservation and demand management (CDM) in Ontario:* AJ wrote testimony related to the alternative ratemaking approaches available regarding CDM; addressed innovative alternatives and compared and contrasted various schemes in the Ontario context
- *cost of capital for regulated generating assets:* AJ provided expert testimony on behalf of the Ontario Energy Board regarding risk factors associated with Ontario Power Generation's prescribed assets, as well as creating a risk-return continuum on which power sector assets could be placed
- *incentive-based contract design:* For the OPA, LEI advised on provisions of power purchase agreement associated with incentives for optimization of production in peak periods for hydro facility owned by a major generator
- *upstream capability to deliver conservation and demand management:* For the OPA, LEI performed examination of capabilities of Ontario to provide necessary inputs to assure that Ontario meets its conservation and demand management targets; report incorporated into Integrated Power System Plan submission to OEB
- *regulation of generation in Ontario:* For the OEB, A.J. authored paper described the ways in which legacy assets of Ontario Power Generation could be regulated, including incentive regulation and a set of regulatory contracts. Deliverables included providing technical advisory during public workshop
- *potential for regulation of retail market auctions:* For the OEB, A.J. led engagement to review practice of regulatory oversight of load auctions to serve default supply across North America
- *examination of contracting processes in Ontario:* On behalf of the OPA, LEI met with over 50 stakeholder groups to determine potential ways in which contracting process for new supply could be improved. The engagement included assessing practices in other jurisdictions and review of standard offer processes
- *2nd generation PBR in Ontario:* AJ led Cdn. \$1.5 million engagement focusing on design of second generation PBR in Ontario. Key components include estimating TFP, determining appropriateness of yardstick competition, analyzing demand-side management programs in the context of PBR, and examining service quality indicators
- *market power concerns in Ontario:* LEI determined concentration ratios for existing configuration of generation plant, developed set of recommended portfolios to minimize market power across all timeslots in hourly market in preparation for divestiture or other market power mitigation mechanisms

Written and oral expert testimony

Note: expert testimony was also a component of some projects listed above, particularly regulatory projects for Ontario Power Authority, Ontario Energy Board, and involving incentive rates in Alberta.

- *reviewed Manitoba cost of service methodology:* London Economics International LLC ("LEI") was retained by Hill Sokalski Walsh Olson, at the request of Manitoba Public Utilities Board, to represent the interests of small commercial customers in its review of Manitoba Hydro's cost of service methodology proceeding. The engagement involved an assessment of the treatment of generation, transmission, distribution, export and DSM-related costs under cost of service

- *review of valuation metrics used in conjunction with tax payment challenge for an Alberta generator:* assessed the appropriateness of valuations utilized to determine depreciation deductions related to the acquisition of a coal-fired generating station. Engagement also required creating forecasts that would have been appropriate at the time the acquisition was made several years previously, as well as calculating asset values using multiple valuation approaches. Multiple forecasting tools were used. Engagement included developing critiques of work by opposing expert witnesses
- *examination of Swiss electricity market:* for a US financial institution, A.J. reviewed the development of the Swiss electricity market and specifically the position of hydro stations within that market. Analysis included a discussion of the factors that influence the value of hydro stations, presence of foreign owners in the Swiss electricity market, and use of post-tax cash flow to evaluate potential investments
- *analysis of potential customer impacts due to holding company acquisition of merchant generator:* discussed ways in which customer rates would be impacted by potential credit rating downgrades of regulated subsidiaries due to holding company parent's acquisition of merchant generator; engagement included examination of impact on default supply as well as reliability
- *assessment and valuation of quantum merit claims:* for advisor and developer of biomass facilities, provided expert opinion on value of services provided based on industry knowledge, review of correspondence, and experience providing or commissioning similar services
- *conservation and demand management (C&DM) in Ontario:* wrote testimony related to the alternative ratemaking approaches available regarding C&DM; addressed innovative alternatives and compared and contrasted various schemes in the Ontario context
- *review of Dutch electricity market regulatory dynamics:* in a case before the US Federal Court of Claims related to economic substance, provided understanding of how Dutch electricity market was structured in the mid-1990s, how it was expected to evolve, and how it did actually evolve. Issues addressed included market structure, regulation, role of non-utility investors, and role of private and international investors
- *valuation of PPAs associated with IPPs in Thailand:* as an expert witness in an arbitration case, A.J. quantified the change in value resulting from modifications to several PPAs associated with a power project in Thailand. Engagement included review of PPAs, evaluation of Thai power sector restructuring process, extensive modeling of financial aspects of PPAs, and assessment of financing alternatives; client won on all claims

Regulatory Economics

- *supported setting of Nova Scotia Performance Standards:* LEI was engaged by the Nova Scotia Regulatory Authority – the Nova Scotia Utility and Regulatory Board (NS UARB) to assist in setting performance standards for NSPI in respect of reliability, response to adverse weather conditions, and customer service for Nova Scotia
- *conducted NYC entities capacity portfolio analysis:* For a large Canadian hydropower generator, LEI performed a review and analysis of the capacity portfolio of several entities operating within New York City

- ***served as Ukraine Electricity Tariff Expert:*** As part of a team hired by the Anti-Crisis Energy Group of the Cabinet of Ministers of Ukraine, LEI was tasked with identifying opportunities to streamline and enhance procedures used to set tariffs and prices for electricity produced. LEI performed an extensive literature review of the Ukrainian electricity market, assessed the current tariff-setting regulations and procedures and carried out in-person interviews with stakeholders. LEI wrote a briefing memo on the Ukrainian market and a recommendations paper in line with its scope of work. The recommendations were incorporated into an Energy Resiliency Plan that would aid decision-making to the Cabinet of Ministers and the Verkhovna Rada
- ***Conducted 2015 Review of Non-Energy Margin:*** London Economics International LLC (“LEI”) was asked by ENMAX Energy Corporation (“EEC”) to review EEC’s proposed non-energy return/risk margin associated with expenses incurred as a result of operation of the Regulated Rate Option (“RRO”). For the client, LEI reviewed the settled practice in Alberta, recent proposed changes providing for an all-inclusive return margin, and calculated an indicative range of margin for EEC.
- ***overview of Colombia market and revenue forecasts for target assets:*** LEI was hired by an electric operator for the purposes of valuing a portfolio of generating assets in Colombia. LEI’s scope of work consists of a comprehensive review of the Colombia energy market (including fuel and power market drivers), describe in details the functioning of both wholesale power market and firm energy market (capacity market), develop forecasts of spot prices in order to derive expected revenues for the portfolio. Colombia being a hydro dominated system, as part of its modeling exercise, LEI ran a Monte Carlo simulation to develop a series of probabilities associated with generation profiles of Colombia’s hydro resources to reflect the impact of weather conditions and water inflows on hydropower plants’ output. LEI summarized its research and modeling results in a final report that was presented to lenders and other interested parties
- ***conducted analysis of Nova Scotia electricity systems:*** LEI was retained by Nova Scotia Department of Energy (“NS DOE”) to perform analysis of the organization and governance of electricity systems both cross-jurisdictionally and within the province of Nova Scotia. The scope of work was divided into two main phases: (i) Review of international best practices and lessons learned; and (ii) Translation of best practices and lessons learned into best fit for NS
- ***assessed consistency of proposed Clean Energy Standard with existing Alberta electricity market design characteristics:*** Paper included discussion of potential additional program attributes, indicative cost assessment, impact on investment and reliability, and assessment of further required research
- ***assisted generator in hydro development strategy:*** assisted Alberta generator on strategy related to new large scale hydro development, including justification as inflation hedge for potential pension fund investors, integration into competitive market while maintaining ability to finance, and other strategic and regulatory support
- ***conducted IBR workshop in Malaysia:*** LEI was retained by the largest electric utility company in Malaysia to conduct a workshop on incentive-based ratemaking (“IBR”). The topics for the workshop include theoretical conceptual overview of IBR regulatory framework, key elements of comprehensive IBR regimes, best practices of IBR in various

jurisdictions, timing and framework in other jurisdictions, how to convince regulators and stakeholders, identifying barriers to successful implementation of the IBR, and moving from first to second generation IBR, to name a few.

- ***developed a transmission cost causation study for the Alberta Electric System Operator ("AESO"):*** the study will be used for the determination of the AESO's Demand Transmission Service Rate DTS, and is expected to be filed with AESO's 2014 tariff application to the Alberta Utilities Commission ("AUC"). The study is intended to cover four main topics: (i) Functionalization of Capital Costs; (ii) Functionalization of Operating & Maintenance ("O&M") costs; (iii) Classification of Bulk and Regional System Costs; and (iv) Implementation Considerations
- ***conducted review of gas transmission sector in the US:*** for a European economic advisory firm, LEI reviewed the US gas transmission sector focusing on its regulatory structure. Tasks included researching the regulatory approach, legal framework, allowed capital costs and incentive mechanisms of the US gas industry
- ***review of rate of permitted return in Hong Kong:*** for the Hong Kong Government, LEI reviewed the rate base and the rate of permitted return for the power companies in Hong Kong under the Scheme of Control Agreements. This required reviewing the alternatives to using Average Net Fixed Assets as the rate base, examining the assumptions used and methodology to calculate the WACC of power companies, updating the indicative range for the permitted rate of return, and recommending changes to existing rates of return by identifying new international best practices
- ***supported client's transmission FBR reopen application:*** in particular, the client wanted LEI to provide an independent opinion on their argument (i) to amend the G factor calculation to eliminate the G-factor lag effective January 1, 2011 and (ii) to reduce EPC's current X factor of 1.2% to 0.0%. LEI provided support throughout the whole litigation proceeding by responding to information requests which involved additional research and analysis, including synthesis of publications on recent technological advances in electricity transmission sector, and updating the Ontario LDCs TFP model to ten years
- ***reviewed the US gas transmission sector focusing on its regulatory structure:*** on behalf of a European economic advisory firm, an LEI team, led by AJ, reviewed the US gas transmission sector. Tasks included researching the regulatory approach, legal framework, allowed capital costs, and incentive mechanisms of the US gas transmission industry. Analysis focused on US Federal Energy Regulatory Commission ("FERC") regulatory proceedings, as well as state commission findings, related to allowed returns, capital investment requirements, and treatment of capacity
- ***developed financial, commercial, and regulatory framework, in addition to drafting an investment strategy and model for Saudi clean energy institution:*** deliverables included: (i) A master plan on how to develop renewable and atomic energies based on local value chains in Saudi Arabia; (ii) An economic framework to create a favorable environment in order to follow this master plan; (iii) An investment strategy to make use of KSA resources and available funds in an efficient way; (iv) A multitude of international case studies to avoid costly mistakes in the future and to know when to adopt; (v) A final report on 'National Policy for Investment in Alternative Energy Sources'; and (vi) Two 'sales pitch' documents for submittal to the King's Supreme Council and for the financial community

- ***advised Jordan regulator:*** advised the regulator on the weighted average cost of capital and optimal capital structure for Jordan's three distribution companies: EDCO, IDECO and JEPSCO. The recommended optimal capital structure was consistent with targeted debt service and interest coverage ratios in line with the rating methodology for distribution companies from the global credit rating agencies. Work also included identifying salient risk factors for the distribution companies, identifying appropriate local and international metrics and benchmarks, developing a usable cost of capital model, and providing training workshops for local staff
- ***drafting National Renewable Energy Plan for Saudi Arabia:*** on behalf of the regulator, developed proposal for renewable energy plan for Saudi Arabia, including assessment of procurement methods, new institutions required, and determination of resource eligibility
- ***rate design for water and wastewater services in Saudi Arabia:*** on behalf of utility serving industrial areas in the Kingdom, examined appropriate regulatory structure and recommended approach to establishing new regulatory body, including composition of regulator, incentive structure, and tariff modeling
- ***design of wheeling tariff and pilot program for Saudi Arabia:*** for Saudi regulator, developed proposed plan for wheeling of power in Saudi Arabia, including proposed pilot program, assessment of impact on incumbent, relative economics of wheeling versus the industrial tariff, and review of associated commercial and regulatory issues
- ***tariff design for Kingdom of Saudi Arabia:*** led engagement with international team assessing tariff design, modeling, and electricity market evolution in Saudi Arabia; engagement resulted in a revised tariff system, including performance based rates, tolling agreements for generation, and an open access tariff. Included holding workshops for regulator in explaining cost of capital, tariff design, and other regulatory issues
- ***Electricity Industry Restructuring Plan for Saudi Arabia:*** A.J. developed the blueprint for industry restructuring in Saudi Arabia, including unbundling of the current monopoly vertically integrated utility, introduction of wholesale competition, and creation of a Single Buyer
- ***developed regulatory incentives in Jordan:*** examined regulatory framework in Jordan, with particular focus on creating specific regulatory incentives for distribution companies to optimize their operational expenses. Proposals envision move away from cost of service regime to incentive based structure benefiting customers and shareholders
- ***global regulatory review:*** assisted private equity player in assessing electricity markets in Eastern Europe, Turkey, Asia, and Latin America to determine potential regulatory and market issues associated with proposed purchase of diverse portfolio of generation, distribution, natural gas pipeline, and retail fuels businesses
- ***assessed retail margin review for generator in India:*** reviewed retail margins on electricity sales worldwide, in order to provide Indian generator insight with regards to appropriate retail margins that could be charged to selected customers in one Indian jurisdiction. Engagement involved review of case studies of electricity retail margins around the world, including the US, UK, and Australia. In addition, retail margins in other industries were reviewed, along with the progression of margins as an industry progresses from infancy to maturity

- ***institutional development for IPP promotion:*** contributed to Indian private power promotion efforts through technical assistance program to state electricity boards, central government agencies, and private firms, with particular emphasis on role of PURPA in creating US IPP industry
- ***bagasse cogeneration:*** worked extensively with Indian sugar mills, equipment suppliers, government investment promotion agencies, and state electricity boards to develop cost-effective targeted loan and technical assistance program to promote bagasse cogeneration
- ***barriers to introduction of new coal combustion technologies in emerging markets:*** served as liaison between India's National Thermal Power Corporation (NTPC) and US research institutions to assess ways to adapt US coal combustion technologies to Indian conditions
- ***recommendations for next Scheme of Control in Hong Kong:*** worked with the Hong Kong government to develop a series of recommendations regarding appropriate allowed returns, calculation of asset base, prevention of over-investment, and rate stability
- ***lessons from North American experience for Chinese regulators and grid companies:*** for a set of Chinese state-owned companies, including grid operators, the nuclear operating company, and provincial power companies, London Economics International LLC prepared a series of detailed briefings on developments in electricity market design worldwide, with a particular emphasis on lessons from the North American experience. This experience was then used to highlight the various alternatives for market design in China, and the potential outcomes
- ***implications of restructuring the Japanese power sector:*** for a major Japanese development bank, we analyzed the impact of proposed reforms on a Japanese transmission and generation company, including the potential for stranded costs, opportunities for expansion of transmission, and future tariff setting regimes. The engagement included extensive training of the development bank's staff, as well as the creation of a working model of the Japanese power sector
- ***preparing appropriate framework for private investment in Romanian distribution sector:*** on behalf of a private client, worked with Romanian regulators to develop a consensus on approaches to capital recovery, PBR application, performance standards, supply cost-pass through, and cost of capital. These elements served as preconditions for the private investor's participation in the privatization process
- ***arguments for retaining vertical integration:*** for large French utility, reviewed cases worldwide in which during liberalization incumbents were allowed to remain active across the value chain, including retail. Our work included an assessment of the minimum competition enhancing measures regulators may require in order for the utility to continue operating in all or most of its traditional supply chain activities
- ***implications of performance based ratemaking (PBR) in the Caribbean:*** for a privately owned integrated electric company based on a well developed Caribbean island, directed strategic analysis of implications of PBR, suggested approach to regulators, and provided indicative benchmarking analysis
- ***review of stranded cost settlement and default supply pricing:*** prepared support for regulatory filing in Pennsylvania assessing benefits to customers from a proposal to extend recovery period for competitive transition charge while extending fixing price for default supply

- ***assessment of changes in market power for a FERC Section 203 filing:*** in connection with a proposed combination of generation portfolios, developed testimony concerning the change in market concentration as a result of the transaction, including an assessment of changes in HHIs under various market definitions
- ***review of durability of gas franchises in the face of competition:*** reviewed state regulator decisions and FERC rulings regarding sanctity of natural gas distribution franchises, assessed relevance in the face of deregulation of gas markets
- ***market response to tax credit:*** performed in-depth analysis of impact of Section 29 tax credit for non-conventional fuels production on supply and price response in US southwestern gas markets
- ***economic efficiency effects of retail market design:*** for major US electricity retailer, analyzed various forms of retail electricity competition and default service parameters and compared them to retail/wholesale structure in other industries to determine welfare effects
- ***assessed potential cost of Ontario Green Energy Act:*** explored costs of Green Energy Act, including feed in tariff provisions, grid connection funding, institutional development, loss of local control, and stakeholder mandates
- ***design of incentive rate structure for Alberta utility:*** for a large metropolitan Alberta utility, A.J. advised on design of a proposed incentive based rate structure, including a multi-year term, operating cost incentive structure, and earnings sharing mechanism. Deliverables aided in development of regulatory filings and included testimony before the Alberta Utilities Board
- ***critiquing and improving electricity market structure in Alberta:*** for market institutions and regulators in the Canadian province of Alberta, performed extensive analysis of current industry market structure, including role of Power Pool, Transmission Administrator, Market Surveillance Administrator, the Scheduling Coordinator, and the Balancing Pool. Directed detailed analysis of market power issues associated with divestiture of specific assets and advised on particular market rules to ameliorate strategic behavior
- ***recommendations regarding market power mitigation and retail market design:*** in two separate engagements, advised the Government of Alberta on alternatives for rate designs for small customers and on measures to monitor, measure, and ameliorate market power; both engagements included extensive modeling of Alberta wholesale market and of retail supply tariffs
- ***evaluation of rates across Canada:*** reviewed rates charged to final consumers across Canada and identified distortions in rate design across provinces; performed modeling to adjust for distortions; developed appropriate calculations to appropriately compare rates across jurisdictions
- ***resource adequacy mechanisms for Alberta:*** worked with generators association to assess alternative approaches to assuring resource adequacy. Reviewed mechanisms for capacity and default supply procurement worldwide, developed alternatives for Alberta, and engaged in intensive stakeholder consultation
- ***strategic implications of US deregulation:*** performed in-depth study of the impact of unbundling in the US on the fundamental economics of the electric power industry at all

points on the value chain; identified regional investment opportunities congruent with these dynamics

- **Regulatory review of power markets for Chilean client:** at the request of a major Chilean generating company, LEI performed a detailed review of the regulatory regimes of four restructured power markets (California, Colombia, Nord Pool, and Spain), as well as an analysis of the current Chilean regulatory regime and the changes to that regime that the regulator has proposed. The review addressed the positions of all stakeholders, with a particular focus on the implications of various types of market design on generators

Electricity and Natural Gas Asset Valuation and Transaction Advisory Work

- **led Alberta performance review:** LEI was engaged to perform an assessment of the Alberta Energy Framework, which encompasses the wholesale generation market, retail market, agencies, transmission planning, access and distribution, as well as the operations of the Alberta Interconnected Electricity System. The analysis included both qualitative and quantitative components
- **conducted overview of hydro-dominated market:** LEI was hired to provide an understanding of the dynamics underpinning hydro-dominated power markets as opposed to thermal systems. As part of this project, LEI reviewed in details the dynamics and key drivers of energy markets in a sample of Latin America countries including Colombia, Panama, Brazil and Chile. Colombia was the point of focus of the report, in this respect LEI compared and contrast several aspects of the Colombian markets to other jurisdictions and created a scoring card to evaluate Colombia against similar jurisdictions.
- **evaluated peaker units in New England:** London Economics International LLC (“LEI”) was retained to evaluate the economics of constructing peaking units in two possible existing New England hydro facilities. Specifically, LEI conducted an analysis on existing peaker technologies, the permits required, and determined how much investment would be justified to make the project economic.
- **evaluated cost economics of installing energy storage technologies at existing hydro power plants in Massachusetts and New York:** The analysis was conducted in three phases – phase 1 consisted of literature reviews and primary information collection (from manufacturers and service providers) on the available types of energy storage technologies and associated fixed and variable costs. Phase 2 consisted of an economic cost-benefit analysis of the least cost storage technologies to understand the viability of the investment. Phase 3 consisted of developing comprehensive criteria for selecting the energy storage manufacturer/service provider and presenting implementation recommendations.
- **conducted PJM price forecasting:** London Economics International LLC (“LEI”) was retained to provide forecasted energy and capacity prices as well as supply curves for a plant located in PJM’s SWMAAC region
- **led Ontario gas LDC performance-based ratemaking project:** LEI was engaged by Union Gas to review Union’s proposed 2014 to 2018 incentive ratemaking (“IR”) plan as presented to stakeholders on April 29th, 2013 and to examine case studies of approaches to IR applied to other North American gas distribution utilities. In the case study analysis, Union particularly

requested LEI to examine approaches to a set list of ratemaking parameters: productivity and X-factor trends, alternative approaches to designing an I-X framework, approaches to establishing inflation factors, approaches in other jurisdictions to applying an Earnings Sharing Mechanism (“ESM”), use of capital trackers for unknown costs, appropriateness of deferral accounts for unaccounted-for gas (“UFG”), and service quality indicators (“SQIs”) and how they are measured. LEI was subsequently requested by Union to provide comments on Union’s draft Settlement Agreement

- **market briefing on renewables in El Salvador:** LEI was engaged by a private equity firm focused on small-scale renewable energy projects considering expanding into South America to develop a market briefing on El Salvador, focused on the challenges and opportunities in developing small hydro projects in the country
- **cost benefits analysis of US transmission line:** for a utility in the northeastern US, LEI prepared a cost-benefit analysis of a proposed transmission line with the potential to change existing market arrangements. In the analysis, LEI developed a base case and multiple project cases based on different configurations of the transmission project. Using its proprietary modeling tool, POOLMod, LEI simulated energy and capacity prices in each configuration over a 15-year timeframe, and compared the price differences against various cost allocation scenarios for the transmission line's construction. LEI also tested the statistical significance of the project case results against the base case results, and conducted further analysis on the economic effects of additional renewable generation projects that construction of the transmission line would make possible
- **review of RRO in Alberta:** London Economics International LLC (“LEI”) was asked by ENMAX Energy Corporation (“EEC”) to review EEC’s request for continuation of the practice of earning a fixed margin associated with expenses incurred as a result of operation of the Regulated Rate Option (“RRO”). For the client, LEI reviewed the settled practice in Alberta, investigated the risk of operating the RRO, and calculated an indicative range of margin for EEC
- **review of risk management practices:** LEI was engaged by the client to review its risk management practices and provide meaningful insights with regards to the risk management related issues. Analysis included quantification of the magnitude and probability of risks being faced, as well as research into the best practices of other similar organizations
- **conducted Independent Evaluation review:** LEI provided advisory services to assist the OPA in evaluations of applications made to the Aboriginal Renewable Energy Fund (“AREF”) and the Aboriginal Transmission Fund (“ATF”). LEI provided advice and analysis related to the technical, financial and regulatory viability of each proposed project
- **conducted a report on net metering programs in New Hampshire and New York:** for a private equity power sector investor, LEI conducted a report on net metering programs to determine if the client's facilities would qualify. Project work included determining load at the sites, examination of net metering in the applicable regions, assessment of potential solar installation, exploration of installation options to determine which would be most suitable, and analyzing potential returns
- **assessment of small hydro properties:** as part of a retainer agreement with a growing private equity firm focused on the roll-up of small hydro properties, LEI performed a variety of

supporting activities, including examination of forward markets, review of PPAs, assessment of renewable energy policies, and strategic analysis

- ***review of North American hydro assets:*** LEI was engaged by a large Canadian hydro generator to evaluate the potential renewable premium associated with its hydro assets in North America. LEI developed an economic model to project legacy Renewable Energy Certificate (“REC”) prices in New York and New England. LEI also provided alternative methodologies such as projecting the premium based on forecasted carbon allowance prices and analyzing potential sales to large corporations on a voluntary basis
- ***analyzed current and future dynamics in the British Columbia power markets for of British Columbia power producers:*** topics analyzed included costs of independent power producers (“IPPs”) relative to BC Hydro, uncertainty around future demand levels in BC, implications of moving away from use of Critical Water Year analysis in planning, risks and uncertainties regarding import availability, and the overall macroeconomic contributions of IPPs. LEI also analyzed the provincial government’s Review of BC Hydro and provided an assessment
- ***valuation of distribution company in Bolivia:*** LEI provided inputs into the valuation of a Bolivian distribution company, including developing the cost of capital; assessing demand, cost, and tariff forecasts; and reviewing the overall cash flow model. LEI also reviewed the company’s historical performance relative to efficiency and performance targets
- ***wrote paper on investments by electric and natural gas utilities:*** LEI authored a paper on the successes and failures associated with international investment by electric and natural gas utilities for a major Japanese utility. The paper focused on the activities of over forty companies, both within North America and internationally
- ***European power market analysis:*** LEI worked with one of North America’s largest independent operator of power generation facilities to develop a comprehensive analysis of central European power markets including price forecasts and renewable energy policies. As part of its client’s efforts to acquire a portfolio of hydroelectric power generating facilities, LEI’s team developed a medium-term price forecast, stress tested critical assumptions, and provided detailed insight into federal and state renewable energy policies
- ***developed several forecasts of the long-term Alberta electricity power pool prices (2010 to 2030) based on different market parameters and build decisions:*** the forecast also made special note of the effect on the market, if any, of the following conditions: (i) greenhouse gas legislation; (ii) increase in unconventional (shale) natural gas production; (iii) effect of the enactment of Bill 50; and (iv) effect on the market by external jurisdictions
- ***market analysis for a client interested in purchasing a portfolio of global generation assets:*** in this project, the LEI team, led by AJ, provided a market analysis of California, Mexico, and the Philippines. This market analysis included the following aspects: description of portfolio assets in the jurisdiction, supply/demand balance in the jurisdiction, regulatory framework, contract description and impact of competition on specific portfolio assets in the jurisdiction, indicative position of target asset on supply curve presently and in the future, impact of climate change and other environmental regulations, observations from material in dataroom, review of pool price projections, and remarks about the jurisdiction. In addition, LEI performed a 20-year price forecast for these markets, which was delivered in a spreadsheet form and incorporated into the management presentation

- ***review of business plans for hydrokinetics technology company:*** for start up hydrokinetics technology company, LEI reviewed business plans and applicability of technology worldwide. Tasks included commenting on strategic plan, advising board members on the evolution of renewable energy markets worldwide, and assessing US Federal Energy Regulatory Commission policies towards hydrokinetic projects
- ***due diligence and valuation of engineering consulting firm:*** for a Middle Eastern investment fund, A.J. led the evaluation of the acquisition of an engineering consulting firm with offices in the US, Europe, and the Middle East focused on the power sector; the project included creation of a pro forma for the business, evaluation of business prospects and strategy, and an examination of the relevant economic conditions and their impact on value
- ***assessment of plant pro formas and underlying market environment in six Asian countries:*** for leveraged buyout of major global IPP developer, assessed plant financial models, state of reform efforts, and potential for unbundling in Bangladesh, China, India, Philippines, Thailand, and Turkey
- ***valuation of Singapore generating asset:*** on behalf of a large Asian generating company, provided revenue forecasts from spot, retail, and vesting contracts for successful acquisition of Singapore generator. Analysis included review of repowering options, assessment of regulatory evolution, assessing the relevant cost of capital, and potential for strategic behavior; A.J. later performed a similar exercise for a second Asian generating company also seeking to purchase a similar set of assets in Singapore, as well as subsequently assisting in analysis associated with refinancing of the acquisition performed by initial client
- ***modeling future Japanese electricity market dynamics:*** for a leading Japanese financial institution, led workshop and directed the creation of an interactive model of the Japanese electric power sector. Issues addressed included quantification of plant asset values under various market scenarios, an assessment of the potential for stranded costs, review of debt coverage ratios, and exploration of the evolution of transmission assets
- ***advised Japanese company on potential US power sector acquisitions:*** reviewed project economics for multiple acquisition targets of Japanese investor. Tasks included providing long term revenue forecasts, reviewing motivations of sellers, providing insights on the associated market, and examining the role of hedge funds and private equity
- ***examination of markets and generation asset values in Mexico, Philippines, and California:*** assisted Asian IPP in assessing generating assets in Mexico and Philippines, as well as export potential from Mexican plants to the US; mandate included developing long run marginal cost forecasts for Philippines and Mexico, and providing detailed dispatch modeling of the California market
- ***valuation of generation and distribution assets in Philippines and the Caribbean:*** provided detailed analysis of regulatory trends in the Philippines and in selected Caribbean countries. Used regulatory filings, PPAs, and public information to develop a value for generation and distribution assets in these markets. Advised potential buyer on relative risk in each country examined, including country risk, regulatory risk, and fuel supply and load growth issues
- ***power price forecast for Balkans:*** to support potential bid to acquire nuclear station in Bulgaria, led team forecasting revenues from future spot power market sales. Issues included

treatment of carbon emission credits, extent of regional integration, and availability of existing transmission capacity

- **revenue forecast and financing advisory for renewables acquisition:** for newly established private equity firm, managed acquisition process for small hydro and biomass site. Process included revenue forecasting, negotiating term sheets with banks, obtaining quotes for power purchase agreements, reviewing operating agreements, and overseeing all aspects of transaction process
- **prices for merchant generators and IPPs:** provided expert opinion on the extent to which value of a generating station could change over a 12 to 18 month period, based on historical analysis of price changes for individual generation assets as well as for generation asset portfolios
- **biomass investment evaluation:** on behalf of growing private equity investor, performed extensive analysis of economics of restart of several biomass plants in California and elsewhere. Tasks included PPA review, examination of permits, assisting in arranging financing, and examination of California market dynamics
- **advised on purchase of small hydro station:** for a newly established hydro-focused private equity investor, valued and performed regulatory review associated with successful purchase of a small hydro facility in Maine. Tasks including creating pro forma, reviewing material contracts, negotiating purchase and sale agreement, hiring operator, and monitoring ongoing performance
- **bid for New York City gas and oil fired stations:** for a major financial institution, A.J. led a team of analysts in examining potential future revenues for a portfolio of peaking plants in New York City. Assignment included using proprietary models to forecast future capacity and energy revenues, and the application of real option techniques to determine value of plant flexibility
- **bid for PJM coal-fired power station:** worked closely with private equity fund in creating deal team, preparing first round bid, and valuation of facility, including coal supply, environmental compliance, site options, and forecast of future revenues; helped to develop second round bid, including assisting in arranging financing and risk management
- **collateralized debt obligations (“CDOs”):** led projects associated with detailed statistical analysis of the underlying economics of CDOs associated with distressed debt in the power sector, and with examining whether such a CDO could have been launched in the wake of the Enron collapse
- **valuation of New England based generation portfolio:** worked with potential acquirer of New England’s largest generation portfolio to determine the costs of ongoing obligations associated with the portfolio, provide an understanding of long term market dynamics, and assess value of overall portfolio, including revenue forecasts and review of market rules
- **valuation of integrated IOUs:** coordinated evaluation effort for acquisition of Southeastern US utility and of Ontario municipal electric utility; tasks included assessment of impact of PBR, calculation of difference in profits from generation portfolio under ratebase versus in open market, and analysis of ratebase settlement
- **valuation and regulation of LNG facilities:** assessed potential for combination of strategically situated LNG facility with US wholesale power marketer; for separate client, advised on third

party access requirements for LNG facilities in the US and relevance to potential regulatory changes in Japan

- ***assessment of value of coal station contracts circa year 2000:*** developed analysis of value of contracts to bear costs and benefits associated with output from coal fired power stations in Alberta. Engagement involved considering only information known as of 2000, for inclusion in tax litigation case. Created pro forma valuation of the contracts as of 2000, including forecast costs and revenues, as well as opining on the appropriate cost of capital to be used
- ***revenues to wind generators in Alberta:*** A.J. led the examination of merchant revenues to a portfolio of existing and under construction wind generators in the province of Alberta. Tasks included review of market design issues, 20 year scenario analysis for merchant revenues, review of contract terms and conditions, and an examination of the potential for additional revenues from the sale of emissions reduction credits and renewable energy certificates. Deliverables included market study supporting issuance of income trust units
- ***assessment of role of peaking plant in Ontario power sector:*** for Ontario government body, performed extensive scenario analysis to determine extent to which peaking plant should be a part of future procurement plans in the province; this analysis included assessment of revenues from ancillary services and of optionality
- ***developed price trends, in conjunction with the valuation of several Colombian power plants:*** LEI also provided an evaluation of the Colombian market, an overview of modeling methodologies and assumptions, and modeling results. The modeling results included forecast spot market prices, plant dispatch and revenues (energy and capacity), under a variety of scenarios
- ***conducted tariff review for Ente Nacional Regulador de la Electricidad (“ENRE”):*** the Argentine regulatory authority for the electricity sector (ENRE) awarded a contract for a tariff review of Edenor, a large utility serving the northern portion of Buenos Aires to a consortium led by LEI. The engagement entailed evaluating the performance of Edenor in the 1992-2002 tariff period; advising ENRE on international best-practice design of distribution tariffs; proposing a tariff setting methodology for the 2002-2007 tariff period; providing technical assistance in the analysis of information presented to ENRE by Edenor; proposing tariffs for the 2002-2007 tariff period; and assisting ENRE during public hearings on the proposed tariffs. The consortium proposed that tariffs be set via an RPI-X approach employing Data Envelopment Analysis (DEA) for establishment of the X-factor
- ***revenue forecasting in Nicaragua:*** LEI developed revenue forecasts for two generating companies (GeCsa and GeOsa) being auctioned by the Nicaraguan government as part of the privatization of the country's electric power industry. The revenue forecasting was conducted in three stages: a production cost-based spot price and dispatch forecasting stage, a contracts valuation stage, and a Monte Carlo Simulation stage. Out Monte Carlo simulation quantified the impacts of hydrological and fuel price variation on the values GeCsa and GeOsa
- ***advised on bid strategy for Mexican IPP:*** LEI assisted a large foreign utility in its bid strategy for acquisition of generating assets in international jurisdictions (across North America, Europe, and Asia). The LEI team led the market analysis for assets located in Mexico; more specifically, LEI analyzed a series of macroeconomic risks (including political, economic, and regulatory risks) likely to impact operations of the assets in the long run, performed a full due

diligence review of the targeted assets, and developed forecast of the Mexican wholesale spot energy prices in order to determine future profitability of the assets.

Power, Gas, and Infrastructure Sector Business Development and Strategy

- ***conducted workshop on generation reliability standard review in Malaysia:*** LEI held a two-day workshop on Generation Reliability Standard Review Seminar for TNB in Kuala Lumpur, Malaysia. The topics included: Malaysia reliability standard policy overview, jurisdiction review on reliability indices and benchmarking Malaysia's reliability standard against other countries, inter-play between government agencies in formulating the reliability standard, lessons learned from other countries, incorporating renewable energy, interconnection and distributed generation in calculating reliability indices, input parameter to derive the value of reliability indices, and lesson learned from LOLE studies from other jurisdictions.
- ***performed a peer-group analysis of Independent Power Producers ("IPPs") in the US market:*** LEI presented research to Osaka Gas with insights on the key economic, financial and strategic factors contributing to growth of mid-sized companies in the US merchant generation market. LEI identified nine categories of IPPs in the US merchant market and defined a subset of companies to be considered as the peer-group of Osaka Gas. For the peer-group, LEI reviewed key success criteria of each company including business focus, leadership, growth strategy and financial performance. LEI presented three peer-group companies as case studies to highlight examples of successful players in the US IPP market. Overall, LEI highlighted the implications that current market trends and key success factors of Osaka's peer-group would have on the company's future growth strategy in the US market.
- ***conducted water pricing in California:*** London Economics International LLC ("LEI") was retained to conduct a 30-year price curve for Metropolitan Water District of Southern California ("MET Water") in relation to a potential acquisition of a proposed desalination plant in California. The desalination plant's water rate specified in the draft Term Sheet of the Water Purchase Agreement is based on MET Water's prices plus avoidable charge, subsidy, and a premium. LEI reviewed the regulatory arrangements of MET Water, supply-demand dynamics in Southern California, and water pricing mechanisms used by MET Water. LEI also assessed the different key drivers for each component of the MET Water price. Lastly, LEI created a cost of service model and projected the MET Water prices for the next 30 years.
- ***study on transmission and distribution:*** LEI collaborated with StratOrg, a French consultancy on the development of strategic recommendations for market penetration in the US transmission and distribution markets. As part of this work, LEI and StratOrg performed a detailed analysis of the US market structure, identifying key market players and recent development, as well as barriers of entry and market opportunities for a prospective European investor. LEI travelled to Paris for an internal workshop session with StratOrg and actively participated in the final presentation of the team findings before the client's top managers.
- ***analyzed cost implications of Ontario's Green Energy Act:*** on behalf of the Official Opposition in Ontario, analyzed the cost implications of the government proposed 2009 Green Energy Act. This included costing of the feed in tariff program, interconnection costs, conservation and demand management initiatives and the implementation of the smart grid. The company presented key results in a press conference

- ***advisory services on the development of a 75 MW hydroelectric power plant in Cameroon:*** under a USTDA contract, AJ Goulding acted as a Senior Energy Market Specialist in the LEI portion of the work for a consortium to provide financial and technical advisory assistance to the Ministry of Energy and Water Resources of the Government of Cameroon with respect to the development of a 75 MW hydroelectric power plant at Bini à Warak. Specific tasks included review of Cameroon's existing regulatory system, regional market demand analysis and assessment of developmental impact of the project
- ***provided a briefing for Alberta's Minister of Energy:*** Briefings consisted of two 90 minute presentations – the first was a review of the Alberta Retail Market, and the second was a wholesale market review of ERCOT, Australia, Singapore, UK and Ontario
- ***business development opportunities in India:*** for UK electricity and mining conglomerate, provided detailed assessment of opportunities in construction of integrated mining and mine-mouth power stations and in distribution of electricity
- ***assessment of US natural gas storage business:*** for a large Japanese gas utility, examined trends in regulation and investment in the US natural gas storage business. Engagement included comparison of natural gas storage business risks to that of IPP investment
- ***European renewables investment strategy:*** on behalf of a global power and real estate investment company, reviewed policies towards renewable energy in Europe and individual European companies, as well as available assets, sites, and investment climate
- ***distressed asset acquisition strategy:*** advised a major Japanese utility on entry strategies to the US market, including performing a workshop on due diligence, US regional market analysis, and asset valuation; arranging for introductions to major asset sellers, potential investment partners, and advisors; and creating a screening methodology and database of potential acquisition targets
- ***unbundling of French state-owned vertically integrated monopoly:*** worked with leading French electricity generator and supplier to examine how to create independent profit and loss statement for its generation assets, benchmark performance against expectations, and separate revenues from plant operations from those gained through trading
- ***renewables value chain investment analysis:*** for Dutch foundation based in Switzerland, examined macro trends associated with renewable energy in several major global economies, including the global supply chain from component manufacturers to installation to operation. Objective was to determine where on the renewables value chain the most profitable opportunities could be found
- ***workshop on performance-based ratemaking strategy:*** for first stand-alone transmission company in North America, conducted day long workshop on issues associated with PBR, including the types of PBR and which one is most appropriate for what type of company, the sources of efficiency gains observed in other transmission companies worldwide, and the impact of performance standards on profitability and flexibility
- ***global generation investment strategy:*** for a major Canadian generation company, used modern portfolio theory to identify combination of asset classes and geographic locations which would result in optimal risk-reward combination for generator given its core competencies. Deliverables included interactive model to be used by generator staff on an ongoing basis

- *development of regulatory and financing strategy for transco*: for first stand-alone transmission company in North America, evaluated key transaction parameters, assessed allowed ROE, proposed strategy for attaining favorable incentive rates, and helped to identify potential cost savings
- *impact of Ontario market changes on industrial consumers*: for association of large power consumers in Ontario, assessed market trends and future entry and exit scenarios to determine long term price dynamics in the face of changes in government deregulation policies