

Hamish Fraser

Energy Sector Economist

Overview

Hamish Fraser is an Associate Consultant with Wight Economics Limited (WEL) and specializes in detailed electricity market design, implementation of electricity markets, electricity market analysis, and software and modelling development in the electricity industry.

He has provided advice to regulators, Ministries of Energy, system operators, market operators, market monitoring units, power companies, and other electricity industry organizations regarding restructured electricity markets in more than thirty countries and in approximately twenty states of the US. He has led or participated in the design and implementation of detailed market rules and electricity market policy in a number of countries/ markets including PJM, New York & New England in the US, Singapore, New Zealand, Russia, Greece, Spain, Ireland, Mexico, Slovakia and throughout the Persian Gulf. He has worked in the development of Market Monitoring Units, and in the development of IT solutions in the electricity industry.

Hamish has also led many electricity market due diligence, regulatory strategy and valuation assignments, and has provided market and regulatory strategy advice to numerous utilities in the electricity industry.

Hamish was the principle contributor to a leading book on the subject of implementing electricity markets, written over a period of two years.

He has provided advice to the electricity industry for nineteen years.¹

Qualifications

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| 1994 | Harvard University (USA)
Graduate Coursework in Managerial Finance |
| 1990 | University of Canterbury (New Zealand)
BSc. with First Class Honours in Operations Research (Master of Commerce equivalent) |

¹ *Making Competition Work in Electricity*, Sally Hunt, John Wiley & Sons (New York) May 2002.

Career Details

- 2006-2010** **Independent Consultant**
New York USA, and London, United Kingdom
- 1997-2006** **National Economic Research Associates, Inc.**
Senior Consultant, New York USA
- 1990-1997** **Putnam, Hayes & Bartlett, Inc. (and predecessor companies)**
Senior Associate & Project Manager, Boston USA & Auckland New Zealand

Project Experience

- § Market Council, Russia, 2010 - current. Advised the Market Council (the market operator in Russia) on detailed arrangements relating to the design and implementation of the rules of the Day-Ahead Market in Russia (and in particular arrangements for nodal pricing and treatment of the Nodal Prices Differential Fund).
- § Ministry of Trade and Industry, Singapore, 2010. Participated in a project to advise the Ministry on issues relating to market power in the Singapore electricity market, arising from a dispute between market participants and the Energy Market Authority.
- § Commission for Energy Regulatory of Ireland; Northern Ireland Authority for Energy Regulation 2007-2010: Implementation of the market power mitigation plan for the Irish electricity market, and provision of IT advice for the establishment of its Market Monitoring Unit (refer to earlier project re establishment of the Market Monitoring Unit);
- § Association of Hellenic IPPs, Greece, 2009-2010. Performed detailed quantitative and regulatory analysis of the Greek electricity market on behalf of the Independent Power Producers, and submitted findings to the Regulatory Authority for Energy.
- § Gulf Cooperation Council Interconnection Authority (GCCIA), Saudi Arabia, Kuwait, Bahrain, Qatar, UAE, Oman, 2006-2010. Advised the GCCIA on the development of arrangements for energy trading, and transmission pricing & access arrangements for the new cross-border transmission system linking the six member states as well as the establishment of a capacity obligation and capacity trading methodology (a capacity market). The assignment entailed extensive consultation in all member states and drafting of the legal documents constituting the trading arrangements and bilateral agreements.
- § Market Council, Russia, 2009. Advised the Market Council on design of the Capacity Payment Mechanism in Russia, and on load forecasting.
- § Electricity Commission Panel, New Zealand, 2009. Participated in a project to advise the panel of market participants on recommended changes to the transmission pricing regime in New Zealand.
- § Commonwealth Edison, Chicago USA, 2009. Developed the solver software for optimising bid evaluation in the Illinois default service (retail electricity) auctions.

- § EDF, GdF, Enel and the World Bank, Russia, 2007-2008. For three of the largest utilities in Europe and for the International Finance Corporation (World Bank) in four separate assignments, performed due diligence on the Russian power market. This involved developing a detailed computer model of the Russian market and leading the teams providing power market price forecasts (energy and capacity) and dispatch forecasts of all individual generators in Russia. The transactions involved totalled 20,000+ MW. These assignments also involved full market analysis reports and development of detailed alternative future scenarios.
- § Ministry of Trade and Industry, Singapore, 2008. Advised the Ministry on issues related to generation capacity adequacy in Singapore and the suitability of capacity payment mechanisms.
- § Saudi Electricity Company, Saudi Arabia, 2008. Advised SEC on the development of energy and capacity tariffs for cogeneration developments in Saudi Arabia.
- § SembCorp Utilities, Singapore, 2007-2008. Provided power market price forecasts, dispatch forecasts and market due diligence report for client utility and its lenders, covering three Genco transactions in Singapore.
- § Commission for Energy Regulatory of Ireland; Northern Ireland Authority for Energy Regulation; Department of Communications, Marine and Natural Resources (Ireland); and Department of Enterprise Trade & Investment (Northern Ireland), 2005-2008. 2005: Member of the high level market design team for the all-island electricity market. Member of the team designing the capacity payment mechanism, and performing the governmental and regulatory cost-benefit analysis for the market. 2006-2007: Member of the team which developed and implemented the market power mitigation plan for the Single Electricity Market in Ireland. This plan includes elements of directed contracts, required bidding principles from generators, enhanced ring-fencing, and the design and implementation of a Market Monitoring Unit (MMU).
- § Agency for Forecasting Energy Balances (AFEB), Russia, 2006. Organised a study tour for the AFEB and visited major electricity market institutions in the United States, such as PJM and FERC's Market Monitoring Units, to discuss applicability of their market monitoring experience for Russia.
- § TGK-8, Russia, 2006-2007. Strategy development for TGK-8 (Southern Russia Regional Generating Company) involving electricity, capacity and heat price forecasting and production volume forecasting for all power plants in southern Russia.
- § Agency for Forecasting Energy Balances (AFEB), Russia, 2005. Lead technical advisor to the AFEB, whose responsibilities include ensuring capacity adequacy in Russia, projecting supply/ demand balances in Russia, forecasting market outcomes and required transmission investments, advising on the construction of new nuclear facilities and other generators required to maintain reliability levels, and advising regulatory agencies and the government of Russia accordingly. The assignment involved specification, selection and procurement of software systems, and the establishment of databases and forecasting methodologies.
- § RAO UESR of Russia, Market Reform Centre, 2003-2005. Lead technical advisor to the project team forecasting electric energy and capacity prices in Russia for RAO UESR.

These forecasts were used for a market valuation of all generating plant in Russia as part of the privatisation process. This project involves a detailed simulation of the Russian electricity industry and the new energy trading arrangements recently approved for Russia, and the development of an in-depth knowledge of the Russian electricity system and the key factors affecting energy and capacity prices in Russia.

- § Southeast Europe Regional Electricity Market, 2005. Co-authored the report Investment Incentives for the Southeast Europe Regional Electricity Market for the World Bank. This report recommended the SEE regional electricity market works towards a harmonised (though not necessary common) system of capacity obligations, and sets out steps by which it might achieve that goal.
- § Power Seraya, SembCorp Utilities, Senoko Power and Tuas Power, Singapore, 2005. Performed quantitative analysis of the vesting contract regime in Singapore using a game-theoretic (Supply Function Equilibrium) model to estimate the impact of the level of vesting contracts on market price.
- § Acquirente Unico, Italy, 2004. Advised the Single Buyer (the default service provider) in Italy regarding the appropriate contract structure and contract volumes necessary to optimise their hedging and tariff requirements for 2005-2007. Member of the team that subsequently organised and conducted an auction to purchase these electricity contracts. The Single Buyer is responsible for purchasing over 50% of Italian electricity and the auction face value was in excess of €20B.
- § Endesa Italy, 2003-2004. Developed several potential capacity payment schemes for Italy, and evaluated them against criteria applicable to Italy's electricity market situation. Recommended the appropriate capacity obligation/capacity market model for Italy, and analysed the likely impact on Endesa Italia.
- § Ministry of Energy, Ontario Canada, 2004. Evaluated and selected the winning competitive bids in a tender for the construction of approximately 2500 MW of new capacity in Ontario, valued at approximately \$2b.
- § Commission for Energy Regulatory of Ireland, 2004. Member of team that developed recommended transmission Use of System (TUoS) charges for the Republic of Ireland.
- § PJM, New York ISO, ISO-New England, 2003-2004. Advised a committee of PJM, NYISO and ISO-NE representatives regarding improvements to Northeast US capacity markets. Included determining whether candidate design refinements achieve specific market objectives, identifying potential for gaming, analysis of market power issues, and analysis of auction options. NERA's assignment was to review and refine the proposed capacity market model in order to identify a capacity market design and auction proposal that will be sufficient to meet the key objectives of the ISOs and to the extent there are several models that are sufficient, to identify the superior model.
- § Various U.S. Utilities – Industry Restructuring, 1994-2004. Worked with more than 30 electric utilities in Pennsylvania/ New Jersey/ Maryland (PJM), New York, California and elsewhere on numerous filings to State Commissions and to FERC (the Federal Energy Regulatory Commission). The wholesale market policy issues included all issues of wholesale market design, such as: congestion management; design of capacity markets; pricing of imbalances; design of ancillary services markets; the rules for settlement,

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scheduling and dispatch. Worked with the New York Power Pool in the design of capacity markets as early as 1995. Also worked with policy issues arising from restructuring at the retail level; these included issues of: tariff reform; load profiling; shopping credits; interval metering and pricing; transition regimes to retail competition; and stranded cost recovery. Quantitative analyses included market power analyses for mergers and acquisitions, requests for accelerated depreciation predicated on advances in generation technologies, and applications for performance based ratemaking. Recent representative projects include:²

- Edison Electric Institute and member transmission utilities, 2002: Assistance in developing economic arguments to support rules at the federal level limiting the liability of transmission providers (before FERC).
- Pennsylvania Power & Light, 2002: Economic support for PPL in defending their actions in the installed capacity market of PJM (before the federal antitrust authorities).
- Pacific Gas & Electric, 2002: Economic support for PGE in supporting the price level of their post-bankruptcy vesting contracts, by means of benchmarking (before FERC).

§ Contact Energy Ltd, 2003. Provided policy advice to Contact regarding Government proposals for new market arrangements designed to ensure dry-year security of supply in New Zealand. Involved the preparation of a report in response to the Government's request for comments regarding its capacity market/ dry-year generation reserve proposal. The report sets forth a description of criteria that can suitably be used to evaluate capacity market/ dry-year generation reserve schemes in New Zealand, describes the required elements of such a scheme, presents an analysis of the Government's proposal against those criteria, and examines how that proposal could be further developed and refined to better meet the criteria.

§ Kansas City Power & Light/ Rouse Hendricks German May, 2003. Led a team conducting a power plant valuation for use in litigation to support NERA economic witness. Involved energy and capacity price forecasting. Also performed detailed analysis and critique of defendant's alternative valuation (based on PROMOD and COUGAR models). The jury awarded damages in excess of \$450m based on the NERA valuation and disregarded the defendant's estimate of approximately \$100m.

§ Commission for Energy Regulatory of Ireland, 2003. Member of the team that managed a procurement process for 400 MW of new generating capacity in Ireland, a country that has recently restructured its electricity industry, but has yet to receive substantial outside investment. The assignment involved the development of a capacity contract structure that would provide the financial certainty necessary for an independent generator to finance a new power plant, do so at minimum cost, and do so in a way that would

² Representative clients: Public Service Electric & Gas (New Jersey); Pacific Gas & Electric (California); Cinergy (Ohio); Pennsylvania Power & Light (Pennsylvania); Consolidated Edison (New York); Wisconsin Electric Power Company (Wisconsin); Southern Company (Georgia); American Electric Power (Ohio); Southern California Edison (California); Sempra (California); FirstEnergy (Ohio); Consumers Power (Michigan); Baltimore Gas & Electric (Maryland); Niagara Mohawk (New York); Arizona Public Service (Arizona).

encourage a smooth transition to a competitive market rather than impede the development of a competitive market. The assignment involved analysis of regulatory, market, and credit risks and returns, and consequent design of bidding parameters, evaluation criteria, and the detailed development of the terms of a financial hedge contract to be offered to investors. It included a detailed bankability analysis to predict the change in required financing conditions/ expected contract purchase cost as a function of changes in major contract terms. It also included the development of the detailed evaluation rules to adjust the evaluation score of competing bids as a function of location, construction timing and other factors, so as to ensure that the best overall bid (or bids) for Ireland are selected.

- § Public Power Corporation of Greece, 2000-2003. Led the team designing the detailed rules of the first Power Exchange Code for Greece in 2000. The Power Exchange Code specifies the rules for trading electricity in the country, in accordance with Greece's requirements under the EU electricity directive and in accordance with the conditions placed on Greece as a prerequisite for it to enter the European Monetary Union. Since 2000, provided technical advice regarding ongoing enhancements to the Power Exchange Code, and advice regarding procurement of capacity in Greece under the new market arrangements so as to ensure security of supply.
- § Various North American Electric Utilities 1994 – 2003. Completed electric energy and capacity price forecasting analyses and production cost simulations for several utilities in PJM, New York, California and ERCOT within numerous filings to state regulatory commissions and to FERC. The issues related to stranded cost recovery, economic depreciation (predicated on advances in generation technologies), performance based rate-making, retail access and must-run generation, in addition to issues of wholesale market design.
- § Various U.S. and International Utilities – Strategy and Regulatory Strategy, 1994-2003. Developed economic strategies for a number of utilities regarding various aspects of trading in restructured electricity markets. This has included, for example, strategies for the acquisition of transmission rights, and demonstration of methodologies that generation utilities might use for fixed and minimum load cost recovery. It has also included analysis of transitional issues in retail competition, such as strategies for the recovery of stranded costs, strategies for retail access implementation, strategies for tariff reform incorporating the interrelationship between dispatchable demand and system reliability. Representative projects include:
 - Niagara Mohawk Power Corporation: developed and reviewed the implementation of a market price forecasting methodology for Niagara Mohawk that considered transmission constraints, unit economic viability and retirement, new brownfield and greenfield market entrants and the impact of trades with adjacent utilities and RTOs. The scope of the assignment included developing and advising on a methodology to examine capacity prices, developing a methodology for examining retirement impacts, reviewing all input assumptions and advising on production simulation issues.
 - Cinergy: Assistance to Cinergy in developing their strategy for response and compliance with FERC's Standard Market Design initiative, with special emphasis on

the Reliability Adequacy Requirement, transmission rights and transmission hedging arrangements, and FERC's market mitigation proposals.

- Public Service Electric & Gas: Assistance to PSE&G in developing their strategy and regulatory filings for retail market access and stranded cost recovery in compliance with New Jersey's retail restructuring.
 - Baltimore Gas & Electric: Assistance to BGE in developing their strategy and regulatory filings for retail market access and stranded cost recovery in compliance with Maryland's retail restructuring.
- § Ministry of Economy of Slovakia, 2002. Member of a team that recommended and designed wholesale electricity market rules in Slovakia, including the Power Exchange Code, the rules for regulation of transmission and generation, the arrangements for ensuring provision of adequate capacity, and the arrangements for price unbundling and retail competition.
- § Edison Electric Institute, 2000-2002. Principal collaborator on a leading book in the power industry, published in 2002, on the subject of electricity restructuring in the U.S. and around the world: what has gone wrong and what needs to be done to make it right.³ Included writing the chapters on transmission pricing, transmission business models, transmission expansion and location price signals for transmission congestion and losses.
- § Various International Agencies, 1994-2002. Participated in reviews of Grid Code or design process reviews, regarding specific issues, in countries such as Nigeria, Northern Ireland and the United Arab Emirates.
- § Alliance Regional Transmission Organization, 1999-2000. Provided technical and economic advice regarding transmission agreements to the Alliance RTO, a new ISO intending to be established in the upper Mid-West of the U.S. The proposal envisaged the largest ISO in the world and the first combined transmission-owner/ISO in the U.S. This project addressed governance, fixed-cost allocation and other market rule design issues in order for the Alliance to make its FERC application to begin operations.
- § Ministry of Energy and Commission for Energy Regulation, Mexico 1998-2000. Led the market design team advising on all aspects of market design for the restructuring of the electricity market in Mexico. This included the development and writing of detailed electric energy trading arrangements (Grid Code and Power Code), transmission pricing and expansion policy, and the trading rules for ancillary services markets. Included the development of the capacity market proposal for Mexico.
- § Various U.S. and International Utilities, 1994-2000. Conducted wholesale energy price forecasting studies, utilising GE MAPS, PROMOD and proprietary models.
- § Various Utilities, Brazil, 1999. Participated in providing advice to a consortium of distribution utilities in Brazil on the implementation of a wholesale market; involving

³ *Making Competition Work in Electricity*, Sally Hunt, John Wiley & Sons (New York) May 2002.

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issues such as capacity market design, transmission right design, and the design of appropriate energy and ancillary services pricing rules.

- § Spanish Electric Utility, 1997. For a major Spanish electric utility, assisted in the development of the utilities' recommendations on the development of Codes for the national wholesale electricity market. This included developing policies and rules for economically efficient and transparent pricing of energy, capacity and ancillary services, rules for efficient conduct of the financial settlements system and rules for the physical dispatch of the system.
- § Ministry of Energy, Argentina, 1997. Participated in and produced the final report of a year-long review of the restructured Argentine electricity market.
- § New York Power Pool, 1994-1997. Assisted the New York Power Pool in the development of pricing policy and detailed Codes for the deregulation of the New York electricity industry. This spanned a period of two years, with a six-month period of focused effort on specific electricity pricing issues in 1996. This involved developing policies and rules for ancillary services and capacity markets in New York State, developing policies and rules for locational marginal cost based pricing, transmission pricing, and filing these policies and rules for approval with FERC.
- § Wisconsin Electric Power Company, Arizona Public Service Company, Southern Companies and others, 1995-1996. Developed and implemented competitive electricity market simulation software for a group of US electric utilities, used in seminars for over 1000 senior executives. The simulation was used in presentations to executives and senior managers of the utilities to help them gain insight into the issues surrounding deregulation in US electricity markets. Participants "compete" by making decisions in a simulated environment in which utilities are gradually deregulated. The simulation focused on generation competition, functional unbundling, financial hedging, transition costs, market power, retail competition and generation investment issues.
- § Methanex Corporation/ Fletcher Challenge Industries, New Zealand, 1993. Integrated the various financial planning models of the world's largest, methanol producer into a single standardised and company wide corporate model. The model was initially used for valuing gas contracts and was ultimately used for valuing the company during its takeover.
- § Electricity Corporation of New Zealand, 1992. Worked with the state transmission monopoly's energy modeling group in New Zealand, implementing real-time locational spot price calculations in the nation's electricity market in 1992. This project involved development of location-specific marginal cost-based pricing policy (LMP) in that market and redeveloping prototype pricing software for real-time use.
- § Representative Non-Energy Sector IT and modelling Assignments, 1990-1995.
 - Confidential Bank Client, 1995. Developed a detailed financial model to predict the weekly cash flow of a large multi-sector company nearing bankruptcy. The analysis vigilantly considered revenue timing and production cost aspects, and was used successfully by a consortium of creditors to predict funding requirements to make the decision whether to support the company by up to a billion dollars of new equity, or to let it enter bankruptcy.

- Procter and Gamble, 1991-1994. Designed, developed and implemented a real-time software system to optimise the picking and packing operations of the largest US manufacturer of consumer items. Following implementation of the software, Procter and Gamble has reported cost reductions measured in the tens of millions of dollars from significantly improved productivity and from significantly reduced damage claims, as well as an increased level of customer satisfaction.
- Health Sector of New Zealand, 1990-1994. Part of a team that designed and built an integrated budgeting, operational planning and strategic modeling system for New Zealand government health department enterprises. The software product has approximately 1,500 end users and was integral to the process of corporatisation of health services in New Zealand.
- BellSouth (now Vodafone) New Zealand, 1991-1993. For a start-up cellular telecommunications company, developed a model to determine profit-maximising location and choice of plant. This involved developing load forecasts and cost functions for given plant and system configurations. The analysis was used to negotiate point-of-interconnect agreements and to determine the optimal location and quantity of network facilities. For the same company, developed a capital expenditure model for development of optimal network expansion plan.
- Fletcher Challenge Cement, 1991. Modeled and analysed the competitive position of a cement manufacturer by developing industry supply curves using a combination of linear programming and economic theory. This work resulted in a major strategic redirection for the company.
- Tasman Pulp and Paper, 1991. Led a team that developed and implemented container-packing software to maximise container utilisation of exported paper for the leading New Zealand pulp and paper company.

Publications

Al-Asaad, Hassan K.; and Fraser, Hamish: *Engaging in Cross Border Power Exchange & Trade via the Arab Gulf States Power Grid*, Electricity Journal, December 2008.

Fraser, Hamish; and Lanza, Salvatore: *It Matters Which Way You Slice it: Risk Management for the Acquirent Unico's 2005 Procurement Auction*, Electricity Journal, January 2006.

Fraser, Hamish: *Capacity Payment Mechanisms: How to Pick the One that's Right for You*, Chapter of NERA book: *The Line in the Sand: The Shifting Boundary Between Markets and Regulation in Network Industries*.

Nieto-Hernandez Amparo; and Fraser, Hamish: *Locational Capacity Payment Mechanisms*, Chapter of NERA book: *The Line in the Sand: The Shifting Boundary Between Markets and Regulation in Network Industries*.

Fraser, Hamish; and Lo Passo, Francesco: *Developing a Capacity Payment Mechanism in Italy*, Electricity Journal and Staffetta Quotidiana, November 2003

- Rosenzweig, Michael; Fraser, Hamish; and Voll, Sarah: *Let Customers Fix Electricity Markets*, Mercer Management Journal, November 2003
- Fraser, Hamish: *US Blackout Illuminates Problems*, Energy International, September 2003
- Fraser, Hamish: *Capacity Adequacy in New Zealand's Electricity Market*, Asia Power and Energy International, September 2003
- Fraser, Hamish; and Meehan, Gene: *Evaluation of Compulsory Dry-Year Generation Reserve Proposals for New Zealand*, Submission to the Ministry of Economic Development, June 2003
- Rosenzweig, Michael; Fraser, Hamish; Falk, Jonathan; and Voll, Sarah: *Market Power and Demand Responsiveness: Letting Customers Protect Themselves*, Electricity Journal, May 2003.
- Fraser, Hamish: *A Critique of the Resource Adequacy Requirement Proposed in FERC's SMD NOPR*, Electricity Journal, April 2003
- Rosenzweig, Michael; Fraser, Hamish; Falk, Jonathan; and Voll, Sarah: *Remedying Undue Discrimination through Open Access Transmission Service and Standard Electricity Market Design*, Submission to FERC, February 2003
- Irastorza, Veronica; and Fraser, Hamish: *Are ITP-Run Day-Ahead Markets Needed?*, Electricity Journal, November 2002.
- Fraser, Hamish: *Can FERC's Standard Market Design Work in Large RTOs?*, Electricity Journal, July 2002.
- Hunt, Sally; and Fraser, Hamish: *Trading Arrangements in the United States*, Edison Electric Institute Electric Perspectives, May/June 2002.
- Principal contributor to the book by Sally Hunt: *Making Competition Work in Electricity*, John Wiley & Sons (New York), May 2002.
- Fraser, Hamish: *The Importance of an Active Demand Side in the Electricity Industry*, Electricity Journal, November 2001.
- Parmesano, Hethie; Fraser, Hamish; and Lyons, Karen: *An Introduction to Financial Transmission Rights*, Electricity Journal, December 2000.
- Fraser, Hamish; and George, John: *Integrated Container Loading Software for the Pulp and Paper Industry*, European Journal of Operations Research, 1994.