

INDEPENDENT EXPERT CONSULTANTS

COMPENDIUM OF CURRICULUM VITAE FOR EXPERT WITNESS PANELS

Tab	IEC	Name	Subject	Dates
1.	Potomac Economics	a) Dr. Robert A. Sinclair b) Dr. David B. Patton	MISO Export Market	March 31, 2014 April 1, 2014
2.	Elenchus	a) Mr. John D. Todd b) Mr. Russ Houldin	Load Forecasting and DSM	April 2, 2014 April 2, 2014
3.	La Capra Associates	a) Mr. Daniel E. Peaco b) Mr. John G. Athas c) Ms. Mary Neal	Power Resource Planning & Economic Evaluation, Business Case & Risk Assessment, Transmission Economics, Export Contracts, Financial Modeling, and Wind	April 7, 2014 April 8, 2014 April 9, 2014 April 10, 2014 - CSI
4.	Power Engineers	a) Mr. Glenn Davidson b) Mr. Brian Furumasu c) Mr. Paul Arnold	Transmission Line Construction and Management	April 11, 2014
5.	Knight Piesold	a) Mr. Boris Fichot b) Mr. Mike J. Robertson	Capital Costs & Construction Management	April 14, 2014 April 15, 2014 (am)
6.	TyPlan	a) Mr. Russell Bernard Tyson	Socio-Economic Issues	April 15, 2014 (pm) April 16, 2014
7.	Morrison Park Associates	a) Mr. Pelino Colaiacovo b) Mr. Benjamin Kinder	Public Sector Finance	April 16, 2014 (pm) April 17, 2014 (am) April 17, 2014 (pm) - CSI
8.	MNP	a) Mr. Craig Sabine b) Ms. Sarah Keyes	Macro Environmental Issues	April 22, 2014

TAB 1A

ROBERT A. SINCLAIR
(January 2014)

Business Address

Potomac Economics
9990 Fairfax Blvd Suite 560
Fairfax VA 22030

Education

Ph.D., Economics, University of Pittsburgh (1993)
B.A., Economics, Indiana University of Pennsylvania (1986)

Fields of Concentration

Applied Microeconomics, Law and Economics, Empirical Industrial Organization

Professional Experience

2001 - Vice President, Potomac Economics, Fairfax, VA
2000 - 2001, Economic Consultant, Micronomics, Washington, DC
1993 - 2000, Economic Consultant, J.W. Wilson and Associates, Washington, DC

Expert Testimony

Before the Louisiana Public Service Commission, Application Entergy Gulf States, Inc. for Authorization to Participate in an MSS-4 Contracts, etc. (2011), Docket No. U-32031; and Joint Application of Entergy Louisiana, LLC for approval to Construct Unit 6 at Ninemile Station and of Entergy Gulf States, etc. (2011), Docket No. U-31971; prepared and filed expert testimony at the request of the Louisiana Public Service Commission Staff on the independent monitoring of Entergy's evaluation of power supply proposals.

Before the Federal Energy Regulatory Commission, Northeast Utilities Service Company and NSTAR Electric (2009), Docket No. EL09-20-000; prepared affidavit on behalf of Nalcor Energy addressing vertical market power issues associated with a participant-funded transmission line.

Before the Régie de l'Énergie, Quebec, Complaint by Transmission Customer Newfoundland and Labrador Hydro concerning Transmission provider Hydro Quebec's Administration of its Tariff, etc. (2008), Case No: P-110-1692; prepared and filed expert testimony on behalf of Newfoundland and Labrador Hydro on issues relating to the technical requirements for receiving certain-transmission service.

Before the Régie de l'Énergie, Quebec, Complaint by Transmission Customer Newfoundland and Labrador Hydro concerning Transmission provider Hydro Quebec's Administration of its Tariff, etc. (2008), Case No: P-110-1565 and No: P-110-1597; prepared and filed expert testimony on behalf of Newfoundland and Labrador Hydro on issues relating to calculation of available transmission capacity and open access policies.

Before the Louisiana Public Service Commission, Joint Application of Entergy Louisiana, LLC. And Entergy Gulf States, Inc. for Authorization to Participate in Contracts for the Purchase of Electric Power (2007), Docket No.U-29955; prepared and filed expert testimony at the request of the Louisiana Public Service Commission Staff on the independent monitoring of Entergy's evaluation of power supply proposals.

*Before the Federal Energy Regulatory Commission, Progress Energy, Inc. (2003), Docket No. ER03-1389-000, *et al*; prepared affidavit on behalf of Florida Municipal Power Agency and Seminole Electric Power Cooperative addressing market power issues associated with Progress Energy's application to sell wholesale power at market-based rates.*

Before the United States District Court for the Northern District of California—San Jose Division, ABB Power T&D Company v. Alstom ESCA Corporation (2001), Case No. C-99-21242 SW PVT ENE; prepared expert report on behalf of plaintiff on economic and structural issues in the electric power industry.

Before the Connecticut Department of Environmental Protection, In the Matter of the Determination to Issue the Draft Air and Water Permits to Towantic Energy (2001); prepared expert report on behalf of citizens group opposing new plant construction; report addressed economic benefits of new plant construction.

Before the Federal Communications Commission, In the Matter of Inquiry Concerning High-Speed Access to the Internet Over Cable and Other Facilities (2000), GN Docket No. 00-185; prepared affidavit to support comments on behalf of various consumer groups and Internet Service Providers relating to policies on open access cable broadband.

Before the Superior Court of the State of Arizona in and for the County of Santa Cruz, Sam and Sherri Chilcote, et al., v. Citizens Utilities Company, et al. (2000), Case No. CV 98-471; prepared expert report on behalf of a class of electricity customers relating to damages resulting from inadequate electric service.

Before the United States District Court for the Southern District of Ohio -- Western Division, PepsiCo, Inc. v. Central Investment Corporation (2000), Case No. C-1-98-389; prepared expert report on behalf of PepsiCo on economic issues relating to soft drink production and distribution (co-authored with Roy Weinstein).

Before the Federal Energy Regulatory Commission, Western Resources, Inc. (1998), Docket No. ER98-2157-000; prepared affidavit on behalf of the Kansas City Board of Public Utilities addressing market power issues associated with Western Resources' application to sell wholesale power at market-based rates.

Before the Corporation Commission of the State of Oklahoma, Joint Application of American Electric Power Company, Inc. Public Service Company of Oklahoma and Central and South West Corporation Regarding Proposed Merger (1999), Cause No. PUD 980000444; prepared testimony on behalf of public power entities on merger-related market power issues.

Before the Public Service Commission of the State of Wisconsin, In the matter of Proposed Revision of Chapter PSC 100, Wis. Admin. Code – Rules for Wholesale Merchant Plants (1999), Docket No. 1-AC-174; prepared testimony on behalf of various intervenors concerning market power issues relating to merchant plant development.

Before the Federal Energy Regulatory Commission, New England Electric Power Company, et al. (1998), Docket Nos. ER98-6-000 and EC98-1-000; prepared affidavit on behalf of the Town of Norwood addressing market power issues associated with the New England Power's sale of generating assets to U.S. Generating Company.

Before the Mississippi Public Service Commission, Report on Retail Market Power Issues (1998), Docket No. 96-UA-389; prepared expert report on market power issues associated with electric utility restructuring in Mississippi on behalf of the Municipal Energy Agency of Mississippi.

Before the Connecticut Department of Public Utility Control, Review of the Connecticut Light & Power Company Rates and Charges (1998), Docket No. 98-01-02; prepared testimony and exhibits on cost allocation and rate design issues on behalf of the Connecticut Office of Consumer Counsel.

In United States District Court for the District of Massachusetts, Town of Norwood, Massachusetts v. New England Power Company, et al. (1998), Case No. 97-CV10818-PBS; prepared affidavit on behalf of the Town of Norwood addressing antitrust issues associated with New England Power Company's sale of generating assets.

In United States District Court for the District of Massachusetts, Town of Norwood, Massachusetts v. New England Power Company, et al. (1998), Case No. 97-CV10818-PBS; prepared affidavit on behalf of the Town of Norwood addressing recent changes in the corporate organization of Pacific Gas & Electric Company pertinent to New England Power's sale of its generating assets to an affiliate of Pacific Gas & Electric Company.

Before the Federal Energy Regulatory Commission, San Diego Gas & Electric Company, Enova Energy, Inc. (1997), Docket No. EC97-12-000; prepared affidavit on behalf of Southern California Public Power Authority addressing market power issues associated with the San Diego Gas & Electric/Southern California Gas merger.

Before the Federal Energy Regulatory Commission, The Cleveland Electric Illuminating Company and Market Responsive Energy, Inc. (1997), Docket Nos. ER96-372-000 and ER95-1295-000, respectively; prepared affidavit on behalf of Cleveland Public Power in opposition to CEI's and MREI's settlement offer to resolve market power issues in their filing under §206 of the Energy Policy Act to sell power at market-based rates.

Before the California Public Service Commission, Joint Application of Pacific Enterprises, Enova, et al. (merger of San Diego Gas & Electric Company and Southern California Gas Company, (1997)), Application No. A96-10-038; prepared testimony on behalf of Southern California Public Power Authority addressing market power issues associated with the merger.

Before the Public Utilities Commission of Ohio, Application of the Toledo Edison Company and the Cleveland Electric Illuminating Company for authority to increase rates (1996), Case No. 95-299-EL-AIR and 95-300-EL-AIR; prepared testimony on cost allocation and rate design issues on behalf of the Ohio Office of Consumers' Counsel.

Before the South Carolina Public Service Commission, South Carolina Electric & Gas Company Application for Increases in Electric Rates and Charges (1995), Docket No. 95-1000-E; prepared testimony on behalf of the South Carolina Department of Consumer Affairs analyzing the Company's proposal to shift depreciation reserves and shorten amortization schedules in order to reduce the unrecovered costs of generation assets in preparation for retail competition.

Before the Public Service Commission of the District of Columbia, Application of the Potomac Electric Power Company for an Increase in its Retail Rates (1995), Formal Case No. 939; prepared testimony on cost allocation and rate design issues on behalf of the District of Columbia Office of People's Counsel.

Other Expert Reports

To the Federal Energy Regulatory Commission, Quarterly Independent Monitoring Report on Entergy's Weekly Procurement Process, (2012-2013) Docket No. ER09-555, principal author of report to FERC on the Energy weekly activities to procuring network resources from third-party suppliers.

Energy Community Regulatory Board – Electricity Working Group, Market Monitoring Guidelines for the 8th Congestion Management Region of Europe, (2010); Developed draft Market Monitoring Guidelines to South East Europe Regulators for screens and indices to monitor cross-border transmission capacity market.

To the Federal Energy Regulatory Commission, Seasonal Independent Monitoring Report on Duke Energy Corporation and Progress Energy, (2011-2013) Docket No. EC11-60, principal author of independent monitoring report to FERC addressing interim market power mitigation issues relating to seasonal power sale agreements.

International Upper Great Lakes Study Hydropower Technical Working Group, IUGLS Hydropower Technical Working Group (TWG) Contextual Narrative, (2009); Provided technical economic analysis of Hydro production at Sault Ste. Marie to inform the final TWG narrative.

To the South East Europe Energy Regulation Forum, Report on Market Monitoring in South East Europe (2007-2008), principal author of market monitoring report for the United States Agency for International Development Market Monitoring Pilot Project addressing electricity market activities among the countries of South East Europe.

To the Federal Energy Regulatory Commission, Quarterly Market Monitoring Report on the Public Service Co. of New Mexico, (2005-2010) Docket No. EC05-29-000, principal author of market monitoring report to FERC addressing the potential for market power related to the company's operation of its transmission and generation facilities.

To the Federal Energy Regulatory Commission, Quarterly Market Monitoring Report on the Arizona Public Service Co., (2005-2010) Docket No. EC03-131-000, principal author of market monitoring report to FERC addressing the potential for market power related to the company's operation of its transmission and generation facilities.

To the Federal Energy Regulatory Commission, Quarterly Market Monitoring Report on the Oklahoma Gas & Electric Company, (2004-2006) Docket No. EC03-131-000, principal author of market monitoring report to FERC addressing the potential for market power related to the company's operation of its transmission and generation facilities.

Publications and Papers

ARTICLES

1. "Electric Power: Generating Controversy," with D.B. Patton Industry Studies, 3rd edition, Larry Duetsch, editor, New York: M.E. Sharpe (2002).
2. "An Empirical Model of Entry and Exit in Airline Markets," (October 1995) 10 *Review of Industrial Organization*
3. "Incremental Transmission Pricing, the Comparability Standard, and an Alternative to the FERC's 'Higher of' Policy," with D. F. Greer and J.W. Wilson (December 1994) *The Electricity Journal*
4. "Airport Dominance and State Action Antitrust Immunity for Airport Operators," (Fall 1991), 96 *Dickinson Law Review*

BOOK REVIEWS

1. "Designing Competitive Electricity Markets," by Hung-po Chao and Hillard G. Huntington (eds.), for the *Review of Industrial Organization* 2000.
2. "Power Structure - Ownership, Integration, and Competition in the U.S. Electric Utility Industry," by John Kwoka for the *Review of Industrial Organization*, 1998
3. "Electric Utility Mergers - Principles of Antitrust Analysis", by M. Frankena and B. Owens for the *Review of Industrial Organization*, 1994

Teaching Experience

The George Washington University (2005)

Law and Economics

The University of Pittsburgh (1989-1993)

Microeconomics (intro and advanced), Industrial Organization and Antitrust, Macroeconomics (intro),

Department of Economics Outstanding Teaching Award (1992)

Speeches

1. "Market Monitoring Process in South East Europe," presented at Regional Workshop on Emerging Issues in Cross-Border Trade, Market Monitoring and Regulatory Role in Energy Efficiency in the Black Sea Region, sponsored by USAID and NARUC, Kiev, Ukraine, October 2013.
2. "Who Should be the Market Monitor?" presented at Southeast Europe Electricity Market Monitoring Workshop, sponsored by USAID and NARUC, Athens, Greece, October 2005.
3. "Market Monitoring and Standard Market Design," presented at Standard Market Design – Dealing with the New Giga-NOPR sponsored by Infocast, Washington, D.C., December 5, 2002.
4. "The Role of Market Monitoring in Competitive Electricity Markets," presented at How's It Going – Snapshots of the Status of Electric Restructuring sponsored by the Energy Bar Association, Midwest Energy Conference, Kansas City Missouri, February 7, 2002.
5. "Measuring Market Shares in the 'Energy Services' Market," presented at Communicating Competitive Concerns, sponsored by the American Gas Association, Arlington, VA, February 25, 1998.
6. "Hostile Takeovers in the Electric Utility Merger Wave," presented at Antitrust, Merger Guidelines, and Regulation of Utility Consolidation, sponsored by the Institute of Public Utilities at Michigan State University, Washington D.C., November 7, 1996.
7. "Telecommunications: Developing the Future at Home and Abroad," presented at The Future of Competition, sponsored by National Association of Regulatory Utility Commissioners, Columbus, OH, September 13, 1996.
8. "Economic Aspects of FERC's Policy on Electric Utility Mergers," presented at Mergers: A Threat to Competition? sponsored by the McGraw-Hill Company, Washington, D.C., March 15, 1996.

TAB 1B

**PROFESSIONAL BACKGROUND OF
DAVID B. PATTON, PH.D.**

EDUCATION

Ph.D., Economics, George Mason University
Areas of specialization: Industrial Organization, International Finance

M.A., Economics, George Mason University

B.A., Economics, New Mexico State University
Minor in Mathematics

EMPLOYMENT

President, Potomac Economics, 2001 – present

Serve as Market Advisor for the New York ISO and ISO New England, responsible for assisting in monitoring the markets to identify and remedy market design flaws and market power concerns.

Lead and direct Potomac Economics' activities in its role as Independent Market Monitor for the Midwest ISO. Responsible for developing and performing the market monitoring function in the Midwest ISO region.

Provide expert testimony, analysis, and advice for clients on competitive issues in the electricity and natural gas industries, including mergers, market power and antitrust issues, competitive market design, and transmission pricing.

Director of Energy Practice, Capital Economics, 1997 – 2001

Provided expert advice and testimony to clients in cases involving transmission pricing, wholesale electric market design, mergers, market power, and antitrust matters.

Assisted electric utilities in developing regional transmission organizations by providing expert advice regarding transmission pricing, congestion management, market development, and market monitoring.

Retained by the New York ISO to service as the Independent Market Advisor regarding the development and monitoring of the wholesale electricity market.

Senior Economist, Office of Economic Policy, Federal Energy Regulatory Commission, 1995 – 1997

Developed transmission open access policies, including power pool, ISO, and comparability requirements in FERC's Open Access Rule (Order 888).

Developed the analytical framework in FERC's Merger Policy Statement for assessing the competitive effects of electric and natural gas utility mergers.

Responsible for analysis of transmission and ancillary service pricing issues associated with restructuring of the electric utility industry.

Director of Buildings Policy, Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy, 1992 – 1995

Responsible for development of U.S. policy related to the energy efficiency of housing and commercial buildings. Managed data and analysis programs to estimate the effects of energy efficiency policies and programs.

Staff Economist, Office of Policy, Planning and Analysis, U.S. Department of Energy, 1989 – 1992

Responsible for development and assessment of energy policies in President Bush's National Energy Strategy and federal legislation, including the Energy Policy Act of 1992.

REPORTS AND ANALYSES

Midwest ISO. Prepared Annual State of the Market Reports for 2004 through 2011 that review the performance of the New York electricity markets, including recommending improvements to the operation and design of the markets.

ISO New England. Prepared Annual Reports for 2003 to 2011 that analyze the performance of the nodal electricity markets implemented in New England in March 2003.

New York ISO. Prepared Annual Reports for 2001 through 2011 that review the performance of the New York electricity markets, including recommending improvements to the operation and design of the markets.

New York ISO. Prepared expert testimony and affidavits in 2007 to 2011 regarding market power in the New York City capacity market, including the design and execution of both supply-side and buyer-side mitigation measures to address the market power.

Midwest ISO. Prepared filed comments and answer in 2012 regarding capacity trading between MISO and PJM.

New York ISO. Filed multiple affidavits and supplemental affidavits regarding proposed installed capacity demand curves in 2007 to 2011.

- Midwest ISO. Prepared and filed multiple comments in 2011 with FERC regarding the need for a sloped capacity demand curve and market power mitigation in the MISO capacity market.
- New York ISO. Prepared affidavit in 2010 regarding market power and proposed mitigation associated with local reliability requirements.
- Midwest ISO. Prepared a report and multiple affidavits addressing cost-causation and the allocation of Revenue Sufficiency Guarantee Payments, 2008-2011.
- Midwest ISO. Prepared Market Power Study in 2007 evaluating market power issues in the proposed Ancillary Services Markets in the Midwest and proposing mitigation to address the market power concerns.
- Public Utility Commission of Texas. Provided expert testimony and rebuttal testimony in 2005 regarding the proposed design of the nodal energy markets to be implemented in 2009.
- Public Utility Commission of Texas. Prepared an assessment of the operation of the current ERCOT market in 2004, which provides detailed recommendations to address a number of issues identified in the report.
- Midwest ISO. Prepared quarterly reports regarding the effectiveness of market power mitigation from 2004 to 2011. Also prepared expert testimony supporting filings to renew the mitigation measures.
- Public Utility Commission of Texas. Prepared Annual Reports for 2003 to 2006 that evaluate the ERCOT electricity markets. The reports provide recommendations for improvements to the existing zonal markets.
- ISO New England. Prepared a report evaluating the market operations during the first six months of the new multi-settlement wholesale electricity markets in New England.
- Midwest ISO. Prepared annual reports for 2002 through 2004 evaluating the sale and utilization of electricity transmission capacity in the Midwest, the results of the wholesale market, and the potential for market power problems in the future.
- ISO New England. Prepared annual reports for 2001 and 2002 analyzing withholding and market power in the New England electricity markets.
- Midwest ISO. Assessed the economic efficiency and potential risks associated with the configuration of the RTO's in the Midwest.
- ISO New England. Prepared a report analyzing the pricing in New England's energy and ancillary services markets, and recommending changes in the market rules.
-

- New England Power Pool.** Developed and negotiated a market power monitoring and mitigation plan with the NEPOOL, the State Commissions, and the New England Independent System Operator.
- TransConnect LLC.** Provided expert advice and analysis to transmission owners seeking to form an independent transmission company regarding an incentive pricing proposal to promote efficient operation of and investment in the transmission network.
- Northern States Power.** Advised client on alternative transmission pricing and service proposals associated with the development of an independent transmission Co.
- FirstEnergy Merger (Ohio Edison Company / Centerior).** Advised client on competitive issues related to the merger and on market power mitigation alternatives.
- Exxon and British Petroleum.** Prepared economic analyses of wholesale gasoline prices in the California market.
- Northern States Power/Wisconsin Electric Power merger (Primergy).** Advised FERC regarding competitive issues associated with the merger.
- Electricity and Transmission Pricing in Electric Utility Industry.** Analyzed alternative auction and bilateral contracting regimes for FERC.
- Ameren Merger (Union Electric/ Central Illinois Public Service).** Advised FERC regarding competitive issues associated with the merger.
- American Electric Power / Central & Southwest Merger.** Negotiated market power mitigation commitments with FERC staff on behalf of client.
- PJM Power Pool.** Analyzed the generation and transmission pricing aspects of restructuring proposal for FERC.
- Fannie Mae/U.S. Department of Energy.** Developed partnership to use loan and mortgage products to improve the energy efficiency of U.S. housing.
- Freddie Mac.** Analyzed the issues related to liquidity and risk in the mortgage finance and asset-backed securities markets.
- Gas Pipeline Analysis.** Submitted a competitive analysis of a potential natural gas pipeline acquisition to the Federal Trade Commission.
- Midwest Natural Gas Market.** Submitted a competitive analysis of Midwest pipeline and storage capacity to the U.S. Department of Justice regarding a civil antitrust investigation of a natural gas marketing joint venture.
-

SELECTED PUBLICATIONS AND PRESENTATIONS

- “RTO Energy Markets: Theory, Design and Challenges”, presented at the Energy Bar Association 2012 Annual Meeting, April 2012.
- “How Markets Improve Reliability in Wholesale Electricity Markets”, workshop presented to the Western Electricity Coordinating Council, December 2011.
- “Independent Market Monitoring: In RTO and Non-RTO Areas”, presented to the Entergy Regional State Committee and its stakeholders, August 2011.
- “Independent Market Monitoring: Current Issues”, presented to the Harvard Electricity Policy Group, June 2011.
- ” Emerging Issues in Forward Capacity Markets”, presented at an EUCI industry conference, October 2010.
- “The Role of Financial Entities in Wholesale Electricity Markets”, presented at the Energy Bar Association 2009 Annual Meeting, April 2009.
- “Comments of the Midwest ISO Independent Market Monitor”, presented at a Technical Conference hosted by the Federal Energy Regulatory Commission regarding market monitoring policies, April 2007.
- “Potential Market Power in the Midwest ISO Ancillary Services Markets”, presented to Midwest ISO Markets Committee and the Federal Energy Commission in Fall 2007.
- “Load Pockets and Local Market Power”, presented at a Technical Conference hosted by the Federal Energy Regulatory Commission, February 2004.
- “Electric Power: Generating Controversy”, with R.A. Sinclair, Industry Studies, 3rd edition, Larry Duetsch, editor, New York: M.E. Sharpe (2003).
- “Market Configuration and Coordination in the Midwest”, presented to the Energy Bar Association, October 2003.
- “Market Monitoring Roles and Responsibilities”, presented at the National Association of Regulatory Utility Commissioners’ 2003 Winter Meeting, Committee on Electricity, February 2003.
- “Lessons Learned from Market Monitoring in North American Electricity Markets”, presented at the World Bank Electricity Forum, February 2003.
- “Setting Efficient Wholesale Electricity Prices During Periods of Shortage”, presented to the Electric Power Supply Association, October 2002.
-

- “Development of Competitive Wholesale Markets in the Northeast”, presented to the NARUC Winter Meeting, February 2002.
- “Detecting and Mitigating Market Power in Deregulated Electric Markets”, presented at the Market Monitoring Conference hosted by the American Antitrust Institute, December 2001.
- “Monitoring Wholesale Electric Markets”, presented to the MIT Energy and Environmental Policy Workshop, December 2001.
- “The Role of Market Monitoring in Competitive Electric Markets”, presented to the Energy Bar Association, November 2001.
- “Assessing the Competitive Performance of Electricity Markets”, presented at the Market Monitoring and Mitigation Workshop by the Edison Electric Institute, June 2001.
- “Transmission Pricing Issues”, presented to the EEI Transmission Pricing Workshop, May 2001.
- “Developing Efficient Incentives for A Transco”, presented to the Electric Power 2001 Conference, March 2001.
- “Managing and Pricing Congestion in Competitive Electric Markets”, presented to the Energy Bar Association, February 2001.
- “Defining an Appropriate Role for Market Monitoring in a Deregulated Electric Industry”, Association of Power Exchanges and International Electric Industry Conference, October 2000.
- “Defending Innovative Pricing Proposals for Regional Transmission Organizations”, Edison Electric Institute Members’ Workshop -- Developing Incentive Rates: Applications and Problems, July 2000.
- “Cost Shifting and Other RTO Pricing Issues”, EEI – Energy Daily Incentive Transmission Ratemaking Conference, July 2000.
- “Innovative Pricing Workshop: Developing and Defending Proposals for RTOs”, Infocast Transmission Pricing Conference, May 2000.
- “Addressing Market Power in Deregulated Electric Markets”, presented at the Spring Meeting, Antitrust Law Section of the American Bar Association, April 2000.
- “Evaluating Investment Opportunities in Emerging Competitive Power Markets”, presented at Lehman Brothers’ Competitive Generation Conference, March 2000.
- “RTO Monitoring of Competitive Electric Markets”, presented at the Annual Energy & Project Finance Conference, February 2000.
-

- "Monitoring Competitive Electric Markets", presented at 1999 Mid-Year Meeting of the Federal Energy Bar Association, November 1999.
- "Merger Review and Analysis", presented at Antitrust Issues in Competitive Electric and Natural Gas Markets sponsored by Howrey and Simon, September 1999.
- "The Role of Regional Transmission Organizations in Emerging Competitive Electric Markets", *CCH Power and Telecom Law*, July 1999.
- "Transmission Congestion in Competitive Electric Markets", presented at the Transmission Business Forum, July 1999
- "Designing Efficient Performance Based Rates", Incentive Ratemaking Workshop conducted at Independent Transmission Company conference hosted by Infocast, April 1999.
- "Designing an Independent Transmission Company to Promote Competition and Efficiency", presented at Independent Transmission Company conference hosted by Infocast, April 1999.
- "Mitigating Market Power in a Deregulated Electric Utility Industry", *CCH Power and Telecom Law*, May 1998.
- "ISOs as a Safeguard Against Market Power Abuse", presented at Independent System Operator conference sponsored by Howrey & Simon, May 1998.
- "Competitive Analysis of Electric Utility Mergers: An Evolving Standard", *CCH Power and Telecom Law*, March 1998.
- "Key Transmission Issues for an Independent System Operator", presented to Desert Star Independent System Operator participants, August 1997.
- "FERC Perspective on Electricity Trading and Derivatives", presented at Electricity Trading and Derivatives Strategies Conference hosted by Infocast, March 1997.
- "Market Power in Electricity: Analysis and Mitigation", presented to National Association of Regulatory Utility Commissioners' Winter Meeting, February 1997.

PROFESSIONAL ACTIVITIES AND AWARDS

American Economic Association
International Association of Energy Economists
National Association of Business Economists
U.S. Department of Energy, Commendation from Secretary of Energy, 1992
Phi Kappa Phi honorary society
Omicron Delta Epsilon, economics honorary society

TAB 2A

JOHN D. TODD



34 King Street East, Suite 600 | Toronto, ON M5C 2X8 | 416 348 9910 | jtodd@elenchus.ca

PRESIDENT

John Todd has specialized in government regulation for over 35 years, addressing issues related to price regulation and deregulation, market restructuring to facilitate effective competition, and regulatory methodology. Sectors of primary interest in recent years have included electricity, natural gas and the telecommunications industry. John has assisted counsel in over 200 regulatory proceedings and provided expert evidence in over 100 hearings. His clients include regulated companies, producers and generators, competitors, customers groups, regulators and government.

PROFESSIONAL OVERVIEW

Founder of Elenchus Research Associates Inc. (ERAI) 2003

- ERAI was spun off from ECS (see below) as an independent consulting firm in 2003. There are presently twenty-five ERAI Consultants and Associates. Web address: www.elenchus.ca

Founded the Canadian Energy Regulation Information Service (CERISE) 2002

- CERISE is a web-based service providing a decision database, regulatory monitoring and analysis of current issues on a subscription basis. Staff are Rachel Chua and rotating co-op students. Web address: www.cerise.info

Founded Econalysis Consulting Services, Inc., (ECS) 1980

- ECS was divested as a separate company in 2003.
- There are presently four ECS consultants: Bill Harper, Mark Garner, Shelley Grice and James Wightman. Web address: www.econalysis.ca

Education

1975 Masters in Business Administration in Economics and Management Science, University of Toronto

1972 Bachelors of Science in Electrical Engineering, University of Toronto

PRIOR EMPLOYMENT

Ontario Economic Council, Research Officer (Government Regulation)	1978 - 1980
Research Assistant	1973 - 1978
Univ. of Toronto, Faculty of Management Studies	
Bell Canada	1972 - 1973
Western Area Engineering	

REGULATORY/LEGAL PROCEEDINGS

Provided expert evidence and/or assistance to the applicant or another participant for:

Before the Ontario Energy Board

- | | |
|-------------|--|
| 2013 | <ul style="list-style-type: none">• Enbridge Gas Distribution (EB-2012-0459)
(Evidence: Cost Allocation Methodology, with Michael Roger)• IESO Fees Case
(Evidence: Review of IESO Fees Billing Determinant) |
| 2012 | <ul style="list-style-type: none">• Hydro One Transmission 2013-2014 Revenue Requirement (EB-2012-0031)
(Evidence: Ontario Cost Allocation and Export Tariff Service, with Michael Roger) |
| 2011 | <ul style="list-style-type: none">• Cost Allocation evidence for several Ontario electricity distributors (2012 Cost of Service) |
| 2010 | <ul style="list-style-type: none">• Natural Resource Gas Rate Case
(Evidence: Proposed Incentive Regulation Mechanism)• Cost Allocation evidence for several Ontario electricity distributors (2011 Cost of Service) |
| 2009 | <ul style="list-style-type: none">• Hydro One Distribution Rate Case
(Evidence: Principles for Density Based Rates)• Cost Allocation evidence for several Ontario electricity distributors (2010 Cost of Service) |
| 2008 | <ul style="list-style-type: none">• Provided technical and strategic assistance to eight second tranche electricity distribution companies in preparing their rebasing applications for rates for 2009.
(Evidence: Cost allocation model updates (for two LDCs)) |
| 2007 | <ul style="list-style-type: none">• Third generation Incentive Regulation
(Evidence: Inclusion of a capital expenditure factor)• Provided technical and strategic assistance to six first tranche electricity distribution companies in preparing their rebasing applications for rates for 2008. |
| 2006 | <ul style="list-style-type: none">• Cost Allocation Review (EB-2005-0252)• Transmission Revenue Requirement Adjustment Mechanism (EB-2005-0501)• Second Generation Incentive Regulation Mechanism (EB-2006-0088-0089)
(Evidence: Capital Investment Factor) |
| 2005 | <ul style="list-style-type: none">• Sub-metering Review (EB-2005-0317)
(Evidence: Comments on Staff Discussion Paper on Sub-metering) |

- 2004
 - Union Gas Rate Hearing
(Evidence: Evaluation of Avoided Cost Methodology)
 - Enbridge Gas Distribution 2005 Rates (RP-2003-0203)
(Evidence: Determining the Fair Rate of Return for a 15-Month Period)
- 2003
 - Generic Proceeding on Electricity Distributor Boundary Changes (RP-2003-0044)
(Evidence: The Benefits of Competition in the Electrical Distribution Sector)
 - Union Gas Limited, 2004 Rates (RP-2003-0063)
(Evidence: Monthly Demand Charge for Brighton Beach Power Station (with Paula Zarnett))
- 2002
 - Union Gas Limited, 2003 Rates (RP-2002-0130/EB-2002-0363)
(Evidence: Review of Union's Delivery Commitment Credit (with Joyce Poon))
- 2001
 - Union Gas, Further Unbundling of Rates (RP-2000-0078)
(Evidence: Regulatory Framework and Cost Responsibility)
 - Hydro One Networks, Cost Allocation and Rate Design for RP-2000-0023
(Evidence: Cost Allocation Model (with Bruce Bacon))
- 1999
 - Propose Electric Distribution Rate Handbook
(Evidence: Comments on Staff Proposals)
 - Standard Supply Service Code, (RP-1999-0040)
(Evidence: Comments and Alternate Proposal)
 - Enbridge, Year 2000 Rate Application (RP 1999-0001)
 - Enbridge, Performance Based Regulation Application (EBRO 497-01)
 - Enbridge, Ancillary Service Separation & Rental Wind Down (EBO 179-14/15)
- 1998
 - Consumers Gas, 1999 Test Year Rates Application (EBRO 497)
 - Union Gas, Separation of Ancillary Services (EBO 177-17)
- 1997
 - Town of Aurora, Franchise Renewal (EBA 795)
 - Union Gas, Customer Information System (EBO 177-15)
 - Legislative Change (EBO 202)
 - System Expansion Generic Hearing (EBO 188)
 - Consumers Gas, 1998 Test Year Rates Application (EBRO 495)
- 1997
 - Ten Year Market Review Working Group
 - Union Gas/Centra Gas Amalgamation Application
- 1996
 - Union Gas/Centra Gas, 1997 Rates Application (EBRO 493/494)
 - Consumers Gas, 1997 Test Year Rates Application (EBRO 492)
 - Ontario Hydro, Review of 1997 Rates (HR-24)
- 1995
 - Ontario Hydro, Review of 1996 Rates (HR-23)
 - Consumers Gas, 1996 Test Year Rates Application (EBRO 490)
 - Union Gas, 1996 Test Year Rates Application (EBRO 486)
 - Union Gas/Centra Gas, Shared Services Hearing (EBRO 486/489)
- 1994
 - Centra Gas, 1995 Test Year Rates Application (EBRO 489)
 - Ontario Hydro International Hearing (EBRLG - 36)
 - Ontario Hydro Corporate Restructuring and 1995 Rates (HR-22)
 - Consumers' Gas, 1995 Test Year Rate Case (EBRO 487)
- 1993
 - Joint Hearing on Direct Purchase Issues (EBRO 474-B/476/483/484/485)
(Evidence: Return-to-System Policies for Ontario LDCs)

- 1993
 - Centra Gas, 1994 Test Year Rates Application (EBRO 483/484)
 - Consumers' Gas, 1994 Test Year Rate Case (EBRO 485)
 - Union Gas, 1994 Test Year Rate Case (EBRO 476-03)
(Evidence: Equity Effects of Union's Depreciation Study)
- 1992
 - Consumers' Gas, 1993 Test Year Rate Case (EBRO 479)
 - Union Gas, 1993 Test Year Interim Rate Increase (EBRO 476)
- 1991
 - Consumers' Gas, 1992 Test Year Rate Case (EBRO 473)
(Evidence: Direct Purchase Issues)
 - Union Gas, Application for Rates and Cost of Gas (EBRO 462)
 - Centra Gas, 1992 Test Year Rates Application (EBRO 474)
(Evidence: Direct Purchase Issues)

Before the Public Utilities Board of Manitoba

- 2013
 - Need for and Alternatives to Manitoba Hydro's Preferred Development Plan
(Evidence: Review of Manitoba Hydro's Load Forecast)
(Evidence: Review of Demand Side Management and Energy Efficiency issues)
- 2005
 - Manitoba Public Insurance, 2006 General Rates Application
(Evidence: Rate Stabilization Reserve and Related Issues)
- 2003
 - Centra Gas Manitoba, 2003/04 General Rate Application,
(Evidence: Comments on the Future Regulatory Methodology)
- 2002
 - Manitoba Hydro, Rate Status Update
(Evidence: Manitoba Hydro's Financial Requirements and Proposed Curtailable Rate Program, with William Harper)
 - Manitoba Hydro, Integration Proceeding
(Evidence: Assessment of Manitoba Hydro/Centra Manitoba Integration, with William Harper)
- 2001
 - Manitoba Public Insurance, 2002 General Rate Application
(Evidence: Rate Stabilization Issues)
 - Centra Gas Manitoba, Primary Gas Rates
(Evidence: Centra Gas Manitoba's Rate Setting Methodology)
- 2000
 - Centra Gas Manitoba, Rate Management
 - Manitoba Public Insurance, 2001 General Rate Application
(Evidence: MPI's Rate Stabilization Reserve Surplus)
 - Manitoba Hydro, Surplus Energy Program
- 1999
 - Centra Gas Manitoba, Western T-Service and Agency Billing and Collection Service
(Evidence: Assessment of the Proposals of the Company)
 - Manitoba Public Insurance, 2000 General Rate Application
(Evidence: Rate Stabilization Reserve Risk Analysis)
- 1999
 - Manitoba Hydro Purchase of Centra Manitoba
(Evidence: Implications for Rates and the Regulatory Regime)
- 1998
 - Centra Gas Manitoba, Rates Flowing from Board Order 79/98
 - Manitoba Public Insurance, 1999 General Rate Application
(Evidence: Rate Stabilization Reserve, Allocation of Costs and IT Expenditures)

- Centra Gas Manitoba, Feasibility Cost Assumptions Application
(Evidence: Comments on Centra's Proposed Changes to the Feasibility Test)
- Centra Gas Manitoba, 1998 Test Year General Rate Application
(Evidence: Comments on Centra's Proposed Customer Information System)
- 1997
 - Centra Gas Manitoba, Ste. Agathe Franchise Application
 - Manitoba Hydro, Review of ISE/DFH/SESS Programs
 - Manitoba Public Insurance, 1998 General Rate Application
- 1996
 - Centra Gas Manitoba, Continuation of Shared Services Application
 - Centra Gas Manitoba, 1997 General Rate Application
 - Centra Gas Manitoba, Cost of Service and Rate Design Review
 - Generic Hearing on the Role of the LDC in Manitoba
(Evidence: The Future Role of Centra Manitoba in the Supply of Natural Gas)
- 1995
 - Manitoba Hydro, General Rate Application, 1996 and 1997
 - Centra Gas Manitoba, Price Management and Direct Purchase Issues
 - Application of the Gladstone, Austin Natural Gas Co-op Ltd.
 - Manitoba Hydro, Review of Prospective Cost of Service Study (GRA)
(Evidence: Comments on the Prospective COSS Methodology)
- 1995
 - Manitoba Hydro, Dual Fuel Heating and Industrial Surplus Energy Rates
 - Centra Gas Manitoba, Rural Expansion/Brandon Facilities Upgrade Hearings
 - Centra Gas Manitoba, 1995 General Rate Application
(Evidence: Review of Centra's Weather Normalization Methodology)
- 1994
 - Centra Gas Manitoba, Rural Expansion Hearing
(Evidence: Rural Mains Expansion Feasibility Test)
 - Centra Gas Manitoba, Future Test Year Application
(Evidence: Comparison of the Future and Historic Test Year methods of RB-ROR regulation)
- 1993
 - Manitoba Hydro, General Rate Application, 1994 and 1995
 - Centra Gas Manitoba, Inc. 1994 General Rate Application
 - Manitoba Telephone System, Interconnect Hearing
- 1992
 - Manitoba Telephone System, 1993 General Rate Application
 - Manitoba Telephone System, 1992 General Rate Application
(Evidence: The appropriate debt ratio for a crown corporation)
 - Manitoba Hydro, General Rate Application, 1992
 - Centra Gas Manitoba, Inc. General Rate Application
- 1991
 - Manitoba Telephone System, General Rate Application, 1991
 - Centra Gas Manitoba, Inc. Application for Interim Refundable Rate Increase
- 1990
 - Manitoba Hydro, Major Capital Projects
(Evidence: Hydro's 1000MW Ontario Sale and system planning risks)
 - ICG Utilities (Manitoba) Ltd., Generic Hearing on Rate Setting
(Evidence: Implications of using a future versus historic test year)

Before the British Columbia Utilities Commission

- 2006
 - British Columbia Transmission Corporation, 2006 Transmission Revenue Requirement
- 2005
 - Insurance Corporation of British Columbia, Financial Allocation Workshop

- FortisBC, General Rates Application
(Evidence: Review of FortisBC Performance under PBR, 1996 to 2004) w. S. Motluk
- 2004 • Insurance Corporation of British Columbia, Financial Allocation Methodology
(Evidence: Review of ICBC's Financial Allocation Methodology, with ICBC)
- 2002 • Pacific Northern Gas West and Northeast, General Rate Application
- 2001 • Utilicorp Networks Canada (formerly West Kootenay Power), Annual Review, 2001
- 2000 • Pacific Northern Gas, 2000-01 General Rate Application (negotiated)
- West Kootenay Power, Annual Review, 2000
- 1999 • Centra Gas BC, 2000-02 Rates Application (negotiated)
- BC Gas, Market Unbundling Group (Report to the BCUC)
- West Kootenay Power, 2000-02 Rate Application (negotiated)
- Pacific Northern Gas, 1999-00 General Rate Application (negotiated)
- Annual Reviews of WKP and BC Gas
- West Kootenay Power, Transmission Access Application
- 1998 • BC Gas, Southern Crossing Pipeline Application (Revised)
- Pacific Northern Gas, 1998-99 Revenue Requirement/Rate Design
(Evidence on PNG's Cost of Service Methodology)
- 1997 • BC Gas, Southern Crossing Pipeline Application
(Evidence on the impact of ratepayer risks related to the SCP due to developments in the competitive environment in the natural gas sector)
- Annual Reviews of WKP and BC Gas.
- West Kootenay Power, Cost of Service and Rate Design (negotiated settlement)
- 1997 • Pacific Northern Gas Shared Services
- Retail Access and Unbundling Tariff Hearing (suspended)
(Evidence on the impact of market restructuring on costs and rates)
- 1996 • BC Gas - 1996 Rate Design (negotiated settlement)
(Evidence: Alternative Methods for Allocating Distribution Mains Costs to Customer Classes)
- BC Gas - 1996-1997, Revenue Requirement & IRP (negotiated settlement)
- West Kootenay Power - Brilliant Generating Station Transactions
- West Kootenay Power - General Rate Application/IRP (negotiated settlement)
- 1995 • Generic System Expansion Hearing
- BC Gas - General Rate Application (negotiated settlement)
- 1994 • BC Hydro, 1994 Rate Increase Application
- West Kootenay Power, 1994/95 Rates and Integrated Resource Plan
(Evidence: Review of WKP's Integrated Resource Plan)
- 1993 • BC Hydro, 1993 Rate Increase Application
- BC Gas, Rate Design Hearing
(Evidence: Analysis of BC Gas' cost studies and their use in setting rates)
- BC Gas - General Rate Application (settled and withdrawn prior to hearing)
- Generic Hearing into the New Provincial Domestic Natural Gas Supply Policy

Before the Régie de l'énergie

- 2001
 - Hydro Québec, Transmission Rates (R-3401-98)
(Evidence: HQT's Transmission Tariff Rate Design Methodology, with B. Bacon)
 - Inclusion of Operating Costs in the Gasoline Price Floor Set By the Régie
(Evidence: Review of Principles) (Régie File R-3457-2000)
- 2000
 - SCGM Unbundling of Tariffs (R-3443-2000)
(Evidence: SCGM's Unbundling Tariff Proposal, with R. Higgin)
 - Gazifère, Rates (R-3446-2000)
(Evidence: Cash Working Capital and Other Issues, with G. Morrison)
- 1999
 - Operating Costs Borne by Gasoline or Diesel Fuel Retailers (R-3399-98)
(Evidence: Methodology for Determining Operating Costs)
 - Small Hydro Within Hydro Quebec's Resource Plan (R-3410-98)
(Evidence: Determining the Purchase Price for Small Hydro)
- 1999
 - Gazifère, Year 2000 Rate Case
(Evidence: Assessment of Cost Allocation and Revenue Sharing Proposals)
- 1998
 - Hydro Québec, Rate-Setting Methodology Under s. 167 of the Régie de l'énergie Act.
(Evidence: Recommendations on Regulatory Framework)
 - Hydro Québec, The Role of Wind Power in the Quebec Energy Portfolio
(Evidence: Issues Related to Establishing a Set-Aside)

Before the Alberta Energy and Utilities Board

- 2001
 - Generic, Gas Rate Unbundling (2001-093)
(Evidence: Canadian Experience and Approaches)
 - Generic, Gas Cost Recovery Rate Methodology (2001-040)

Before the Newfoundland & Labrador Board of Commissioners of Public Utilities

- 2013
 - Newfoundland Hydro General Rate Application
- 2009
 - Newfoundland Power, General Rate Application (2013-2014)
- 2007
 - Newfoundland Power, 2010 General Rate Application
(Evidence: Assessment of five hearing issues)
- 2006
 - Newfoundland Power, 2008 General Rate Application
(Evidence: Regulatory instruments and other issues)
- 2006
 - Newfoundland Power, 2007 Amortization and Cost Deferrals Application
- 2005
 - Newfoundland Power, 2006 Accounting Policy Application
(Evidence: Assessment of Newfoundland Power's Proposals)

Before the New Brunswick Energy and Utilities Board

- 2013
 - New Brunswick Power, PLGS Deferral Account (Matter No. 171)
(Evidence: Options for the Recovery of the Point Lepreau Nuclear Generating Station Deferral Account Balance)
- 2010
 - New Brunswick Power Distribution Corp, 2010 Rate Review

- 2009
 - EGNB, Development Period hearing
 - New Brunswick Power Distribution Corp, 2009 Rate Review
- 2008
 - New Brunswick Power Distribution Corporation, PDVSA Deferral Account
- 2007
 - New Brunswick Power Distribution Corporation, PDVSA Deferral Account (Evidence: Treatment of the Petroleos De Venezuela, S.A. (PDVSA) Settlement in Setting Rates)

Before the Nova Scotia Utility and Review Board

- 2013
 - NSPI Capital Expenditures for the South Canoe Wind Project (CI# 42127) (Evidence: Treatment of costs associated with competitive wind power project)
 - Town of Antigonish Electric Utility Large User Rate (Evidence: Cost Allocation)
- 2011
 - Nova Scotia Power, 2011 Annual Capital Expenditure Plan
 - Nova Scotia Power, Load Retention Tariff (Evidence: Load Retention Tariff Methodology)
 - Heritage Gas, 2012 General Tariff Application
 - Efficiency Nova Scotia, Compliance Filing (Cost Allocation Methodology Report)
- 2008
 - Town of Antigonish Electric Utility rate process (Evidence: Comments on the Town of Antigonish Electric Utility Revised Cost of Service Study)

Before the National Energy Board

- 1999
 - BC Gas, Southern Crossing Project

Before the Canadian Radio television and Telecommunications Commission

- 2010
 - Obligation to Serve and Other Matters (NC 2010-43) (Evidence: Analysis of Issues Related to Local Service Subsidy)
- 2006
 - Review of Price Cap Framework (PN 06-5)
- 2001
 - Implementation of Price Cap Regulation for Québec-Téléphone & Télébec (PN 01-36) (Evidence: Designing a Consistent Price Cap Regime)
 - Price Cap Review (PN 01-37) (Evidence: The Second Generation Price Cap Regime)
 - Recovery of 2000 and 2001 Income Tax Expense (PN 00-108) (Evidence: Appropriate Recovery of MTS Income Tax Expense)
- 2000
 - Scope of Price Cap Review (PN 00-99)
 - Sunset Rule for Near-Essential Facilities (PN 00-96)
 - Access to Municipal Property in the City of Vancouver (PN 99-25)
 - Review of Contribution Collection Mechanism (PN 99-6) (Evidence: Review of Contribution Collection Mechanism)
 - Review of Direct Connection Charges

- 1999
 - Review of Frozen Contribution Rate Policy (PN 99-5)
(Evidence: Comments on the Frozen Contribution Rates Policy)
 - High Cost of Serving Areas (PN 97-42)
- 1998
 - Local Number Portability Start-up Costs (PN 98-10)
 - Competition in the Provision of International Telecommunications Services (PN 97-34)
- 1997
 - Implementation of Price Caps (PN 97-11)
 - Review of Joint Marketing Restrictions (PN 97-14/97-21)
 - Forbearance from Regulation of Toll Services Provided by Dominant Carriers (96-26)
 - -Regulation of Telecom Services Offered by Broadcast Carriers (PN 96-36)
- 1996
 - Scope of Contribution (PN 96-19)
 - Bell Canada, Business Rate Restructuring (PN 96-13)
 - Price Cap Regulation and Related Issues (PN 96-8)
(Evidence: Evidence addressing the design of the price cap system)
- 1996
 - Local Interconnection and Network Component Unbundling (PN 95-36)
(Evidence: Mechanisms for Collecting Contribution)
 - AGT, General Rate Application
 - Local Services Pricing Options (PN 95-49/95-56)
(Evidence: Mechanisms for Pursuing the Goal of Universally Available Basic Telephone Service in Low-Penetration Exchanges)
- 1995
 - Review of Phase II (PN 95-19)
 - Regulatory Framework for Ontario Independent Telephone Cos. (PN 95-15)
 - Split Rate Base Hearing (PN 94-52, 94-56 and 94-58)
(Evidence: Applicability of the Decision 94-19 Regulatory Framework to MTS)
- 1995
 - Review of the Regulatory Framework of Teleglobe Canada Inc. (PN 95-11)
 - Review of the Quality of Service Indicators (PN 94-50)
 - Bell SYGMA Hearing (PN 94-53)
- 1994
 - Regulatory Framework
(Evidence: A Proposed Regulatory/Structural Alternative)
 - Maritime Tel, General Rate Increase
 - Island Tel, General Rate Increase
 - BC Tel, General Rate Increase
 - AGT, General Rate Increase
 - Northwestel, General Rate Increase (paper hearing)
 - Bell Canada, General Rate Increase
 - Teleglobe, Annual Construction Program Review (paper hearing)
 - New Brunswick Tel, Annual Construction Program Review (paper hearing)
- 1992
 - Bell Canada - 1992 Annual Construction Program Review
 - AGT - 1992 Annual Construction Program Review
- 1991
 - Bell Canada - 1991 Construction Program Review
- 1990
 - Maritime Telegraph & Telephone, Review of Revenue Requirement 1990-91
(Evidence on the impact of modernization)
 - Island Telephone Company, Review of Revenue Requirement 1990-91
(Evidence on the impact of modernization)

- Review of Cable Television Regulations
(Evidence on alternative forms of regulation)

Before the Ontario Telephone Services Commission

- 1992 • Review of Rate-of-Return Regulation for Public Utility Telephone Companies.
(Evidence: The need for OTSC regulation of municipal public utility telcos)

Before the Ontario Securities Commission

- 1985 • Securities Industry Review
(Evidence: Industry structure and the form of regulation)
- 1983 • Role of Financial Institutions in the Securities Industry
(Evidence: Discount Brokerage and the Role of Financial Institutions)
- 1982 • Institutional Ownership of, and Diversification by, Securities Dealers
(Evidence: The impact of foreign and institutional entry)
- 1981 • The Unfixing of Brokerage Commission Rates
(Evidence: The impact of price competition on the securities industry)

Before the Ontario Municipal Board

- 1995 • Appeal of Boundary Expansion by Lincoln Hydro Electric Commission
(Affidavit prepared on the tests for boundary expansions)
- 1992 • Evidence dealing with the *Rental Housing Protection Act, 1989*

Before the Supreme Court of Ontario

- 1990 • Challenge of the Residential Rent Regulation Act (1986) under the *Canadian Charter of Rights and Freedoms*
(Evidence: The impact of rent regulation on Ontario's rental housing market)

Before the Saskatchewan Court of Queen's Bench

- 1993 • Evidence regarding market dynamics and competition policy.

Non-Hearing Processes (Task Forces, Lawsuits and Arbitrations)

- 2012 • Review of SaskPower's Cost Allocation Methodology (with Michael Roger)
- 2011 • Developing a regulatory training course for Ontario electricity distributors
- 2010 • Expert Advisor to the Ontario Energy Board for the Cost Allocation Review
- 2009 • Expert Advisor to New Brunswick Department of Energy on regulatory

- matters related to the proposed purchase of NB Power assets by Hydro Quebec
- 2008 • Expert Advisor to Ontario Energy Board for the Rate Design Review
- 2007 • Workshop on Electricity Market Design for the Electricity Regulatory Authority of Vietnam
- 2006 • Workshop on Regulatory Methodology for the Government of Vietnam (electricity regulator, Ministry of Energy and state-owned enterprises) with Marie Rounding
- 2004 • Vitamin Price Fixing
- Allocation of debt related to separation of electric utilities
- 2001 • BC Gas, Second Generation Performance Based Regulation Negotiation
- Telecommunications Industry, Price Cap Review Negotiation
- 1999 • PBR Task Force (Electricity), Ontario Energy Board
- Market Unbundling Group (BC Gas), British Columbia Utilities Commission
 - Western Supply Transportation Service (Centra Gas Manitoba), Manitoba PUB
- 1998 • Market Design Task Force, Ontario Energy Board
- 1997 • Ten Year Market Review, Ontario Energy Board

Commercial Arbitrations

Current: Two arbitrations in Alberta

- 2013 • Analysis of options for pricing of live chickens under Regulation 402
- 2006 • Disputed Power Purchase Agreement (PPA)
- 2004 • Evidence on the interpretation of a Gas Purchase Agreement (GPA)

Facilitation Activities

- 2010 • Strategic Planning Process for the Boards of Directors of an Ontario electricity distributor
- 2008 • Strategic Planning Processes for the Boards of Directors of electricity distributors
- 2007 • Stakeholder facilitation for Ontario Power Generation in relation to its Regulated Payment Amounts
- 2004 • Ontario Energy Board, Review of Further Efficiencies in the Electricity Distribution Sector (RP-2004-0020) (with IBM Consulting)
- Visioning Session: Structural Review of an association of Ontario electric LDCs
 - Business Plan Visioning Session with the Board of Directors of an Ontario electric LDC
- 2000 • Ontario Energy Board, Distribution Access Rule Task Force

Other Regulatory Issues Researched for Clients

- Analysis of strategic options for an Ontario electricity distributor
- Review of productivity enhancements for an Ontario electricity distributor
- Review of Conditions of Service for several Ontario electricity distributors
- Review of Economic Evaluation models and methodologies for several Ontario electricity distributors
- “Benchmarking for Regulatory Purposes” (with First Quartile Consulting) for the Canadian Association of members of Regulatory Tribunals (CAMPUT)
- “Review of Potential Regulatory Cost Measures” (a Report for the OEB)
- “Survey of Regulatory Cost Measures” (a Report for the Ontario Energy Board)
- OEA Working Dialogue on OEB Regulating Efficiency and Effectiveness (2007)
- Regulatory Cost Measures for the Ontario Energy Industry (2007)
- “Designing an Appropriate Lost Revenue Adjustment Mechanism (LRAM) for Electricity CDM Programs In Ontario”
- Small Hydro PPA Terms and Conditions
- Ontario Electricity Supply Mix
- Mitigation of Regulatory Risk for Utilities
- Regulatory Benchmarking
- Cross-jurisdictional Survey of Regulatory Efficiency
- Renegotiation of Municipal Franchise Agreement

Regulated Industries:

Papers and Research Projects

- *Report on the Effects of Separating Hydro One’s Transmission and Distribution Functions.*
- *Report on Hydro One Privatization Options.*
- *The Impact of Complete Deregulation on Market Efficiency of the Gas and Electric Industry in Alberta Post-2005 Assuming Current Market Dominance.*
- *Analysis of a Possible Equity Infusion for Ontario Hydro: Potential Implications for Financing Costs.*
- *Volatility in the Ontario Electricity Market, by ECS with Snelson International Energy.*
- *An Assessment of Price Volatility in the Ontario Electricity Market.*
- *Analysis of MTS Privatization Plan.*
- *Comments on the Issues Identified in the December 1995 Working Paper of the Advisory Committee on Competition in Ontario’s Electricity System, A submission on behalf of The Power Workers’ Union.*
- *Telecommunications Municipal/Franchise Tax Design Options (with Dr. E. Slack).*
- *The Implications of Phase III Costing for the Rates and Toll Settlements of Independent Telephone Companies (with Andrew Roman).*

- Submission to the Department of Communications (Canada) (August 1990): *Towards Competition in Telecommunication and Cable TV Services: A Single Switched Broadband Distribution Facility* (Comments of the Public Interest Advocacy Centre, with Robert E. Horwood and Gaylord Watkins).
- Submission to the Department of Communications (Canada) (May 1990): *Fibre Optic Networks: Facilitating Competition in Telecommunication and Television Services for the Benefit of All Users* (Comments of the Public Interest Advocacy Centre, with Robert E. Horwood and Gaylord Watkins).
- Submission to the CRTC concerning cable television regulation on behalf of the Public Interest Advocacy Centre (with Carmen Baggaley).
- Analysis of financing alternatives for Toronto Hydro's 13.8 kV conversion program for the City of Toronto Parks and Recreation Department.
- Analysis of the MacEachen White Paper on "Inflation and the Taxation of Personal Investment Income" for the Ontario Economic Council.
- Submission to the Parliamentary Committee commenting on the April 1985 Finance Green Paper, "The Regulation of Financial Institutions: Proposals for Discussion" prepared on behalf of the Public Interest Research Centre.

Financial Markets:

Papers and Research Projects

- Analysis of the potential consumer benefits from insurance retailing by financial institutions in Canada for the Public Interest Research Centre.
- Development of a financial model for projecting the financial implications of alternative corporate structures.
- Developed model for projecting cash flows for a major land development project.
- Analysis of the impact on the capital markets of changes to the investment rules for public sector pension funds for the Task Force on the Investment of Public Sector Pension Funds (with Prof. John Bossons).
- Review of the OSC proposals and alternatives for relaxing ownership restrictions in the securities industry prepared for the Ontario Securities Commission for submission to the Premier's Office (with Prof. Tom Courchene).
- Analysis of the Impact of Opening the Ontario Securities Market on the Economy of Toronto for a major Canadian securities dealer.
- Response to the December 1984 "Interim Report of the Ontario Task Force on Financial Institutions" for Consumer and Corporate Affairs (Canada).
- Report on functional integration in the Canadian financial services sector for the Australian Merchant Bankers' Association.
- Analysis of the Canadian and American Experience with Partially Negotiable Brokerage Commission Rates for the Australian Merchant Bankers Assoc.

- Served as a North American contact for the Office of Fair Trading (United Kingdom) providing information on developments in the debate over unfixing of brokerage fees, entry of banks into securities dealing and related matters.
- Development of a computerized package for analyzing the effects of alternative tax systems on business investment. Prepared for the Ontario Government reference to the Ontario Economic Council to study a separate personal income tax for Ontario.
- "An Analysis of the Use of Component Internal Rates of Return for Fund Performance Measurement" for Canadian National Investments.
- Analysis of Canadian Stock Market Data (development of a computer package for evaluating investment portfolio efficiency).
- Redesign and periodic updating of the financial, analysis methodology for Alfred Bunting and Co.
- Developed an APL computer package for teaching Business Finance concepts.

Housing:

Papers and Research Projects

- Potential Impact of Rent De-Control on Selected Markets in Ontario
- Review of the Ontario Auditors analysis of the cost of social housing.
- *Future Social Housing Delivery Opportunities in Metro Toronto.*
- Development of a model for projecting core need households to 2011.
- Analysis of the City of Toronto's approach to the valuation of certain properties developed under the *Rental Housing Protection Act, 1989.*
- *Security of Tenure Issues Pertaining to Co-operative Housing.*
- *Rent Regulation in Ontario*, a report prepared as expert Evidence for a Charter of Rights challenge of Ontario's system of rent regulation (with W.T. Stanbury).
- Feasibility study of enhancements to long term housing forecasting models (demographic factors) with David Foot.
- Feasibility study of enhancements to long term housing forecasting models (economic factors).
- Review of the housing situation in the Greater (Toronto) Metropolitan Region in 1988 and the next decade for the Ontario Ministry of Housing.
- Treatment of the Assisted Rental Program under rent regulation for the Ontario Ministry of Housing.
- Alternatives for implementing of the chronically depressed rent provision of the Residential Rent Regulation Act, 1986.
- Projected rental housing requirements to 1996, by unit rent level for Ontario Ministry of Housing.
- Analysis of the effects of the Canadian Home Ownership Stimulation Program on housing starts for Canada Mortgage and Housing Corporation.
- Energy Efficiency of New Housing (with Peat, Marwick and Partners and Scanada Consultants Limited) for Canada Mortgage and Housing Corporation.
- A Model of Supply and Demand in the Market for Housing for the Ontario Ministry of Housing.

- Several publications and presentations shown in the Academic Profile (see below).

Other Areas:

Papers and Research Projects

- Economic analysis of the market impact of the merger of two Canadian trucking companies in the context of the Competition Act.
- Assisted a Joint Task Force of the Ontario Ministries of Social Services and Health to develop a cost project model of alternative long term health care delivery systems.
- Study of Tax Incentives for Film and Television (joint project with Dr. E. Slack) for the Canadian Film and Television Association.
- Economic Analysis of Tax Incentives for the Film Industry (joint project with Dr. E. Slack) for the Department of Communications.
- Economic Impact of Cultural Institutions for Ontario Association of Art Galleries with the Ontario Federation of Symphony Orchestras and the Toronto Theatre Alliance.
- Economic Impact of Art Galleries' Expenditures on their Local Communities for the Ontario Association of Art Galleries.
- Developed a case study of the potash pro-rationing scheme invoked by the Saskatchewan government for the Faculty of Management Studies, Univ. of Toronto.
- Analysis of Regional Municipality of Niagara financial information for the Niagara Region Review Commission.
- Analysis of Ottawa/Carleton regional government's financial information, and comparison with other regional governments, using the MARS database (with Dr. E. Slack).
- A Dynamic Simulation Model of the North York Secondary School System for Planning for Declining Enrolment for the Ontario Institute for Studies in Education, Department of Educational Planning (with Dr. S. Padro).
- Development of an extension to the Limits to Growth World III Model incorporating commodity prices, technology, disaggregated regions and energy resources into the model.
- Development of a computer program for solving the Dynamic Transportation Problem (with Professors Sethi and Bookbinder at the Faculty of Management Studies, University of Toronto).

PRESENTATIONS

- MEARIE Training Program, Regulatory Specialist Certificate Course, (2011 – 2014)
- "Innovations in Rate Design", CAMPUT Training Session, Annually 2010-2013
- "Cost of Service Filing Requirements" (2010) 2nd Annual Applications Training for Electricity Distributors, Society of Ontario Adjudicators and Regulators in cooperation with the Ontario Energy Board

- “Green Energy Act” (2010) 2nd Annual Applications Training for Electricity Distributors, Society of Ontario Adjudicators and Regulators in cooperation with Ontario Energy Board
- “Rate Design”, CAMPUT Training Session, Annually 2009- 2013
- “How To Build Transmission and Distribution to Enable FiT: The Role of Distributors”, EUCI Conference on Feed in Tariffs, Toronto, Sept. 2009
- “Distributor Mergers and Acquisitions: Potential Savings”, 2007 Electricity Distributors Ass
- “Beyond Borders” Regulating the Transition to Competition in Energy Markets (with Fred Hassan), EnerCom Conference March 2006.
- “Low-Income Energy Plan for Peterborough City & County”, 2006 LIEN-AHAC Conference
- “The “Deregulated Retail Energy Sector in Ontario”, Toronto Association of Business Economists, Oct. 2003.
- “Other Approaches to Rate Regulation”, CAMPUT Annual Meeting, Sept. 2003.
- “Price Projection: Will the Rate Freeze be Revenue Neutral?” at Canadian Institute Conf., The Impact of Ontario’s New Electricity Market on Large Power Consumers Jan. 2003.
- “Managing Energy Price Risk: Impact of Market & Regulatory Developments on Price Risk Management”, Canadian institute Conference, Toronto, October 21, 2002.
- “Location Based Marginal Pricing: Will it Happen?” Ontario Energy Contracts, Insight Conference, Toronto, October 1, 2002.
- “The Evolution of the North American Energy Market” Canadian Gas Association Executive Conference, Vancouver, June 2002.
- “Alternate Dispute Resolution: Can Everyone Win?” Canadian Gas Association Breakfast, Whistler, British Columbia, May 7, 2002.
- “Incentive Regulation and Commodity Competition Impacts on Quality of Service & Rates”, CAMPUT Regulatory Educational Conference, Whistler, BC, May 7, 2002.
- “Energy Deregulation Developments and Impacts on the HVACR Industry”, HRAI’s 33rd Annual Meeting, August 23-25, 2001 Huntsville, Ontario.
- “Natural Gas Delivery Regulation in Canada”, HRAC Conference on Natural Gas in Nova Scotia, Halifax, Nova Scotia, August 25, 1999.
- “Licensing as a Regulatory Approach” Thirteenth Annual CAMPUT Regulatory Educational Conference, Saint John, New Brunswick, May 4, 1999.
- “The Impact of Restructuring Electricity Markets on Customers”, West Kootenay Power 1998 Annual Conference, The Dawn of Customer Choice, Kelowna, B.C., Dec. 2, 1998.
- “Gaining Access to the Retail Customer”, *Electricity Competition in Ontario, New Rule, New Opportunities, New Players* (Canadian Institute Conference), Toronto, Oct. 1998.
- “The Future: Mega-BTU Inc.?” (Plenary session) Twelfth Annual CAMPUT Regulatory Educational Conference, Banff, Alberta, April 27, 1998.
- “Protecting Low Income Consumers’ Access: Lessons Learned From Other Countries,” Twelfth Annual Energy Affordability Conference, National Consumers Law Center, Washington, D.C, February 26-27, 1998.
- “Competition: What happens downstream of the meter?” (Plenary) Eleventh Annual CAMPUT Regulatory Educ. Conference, Whistler, B.C., May 6, 1997.

- "Brokers, Marketers and the Public Interest" Eleventh Annual CAMPUT Regulatory Educational Conference, Whistler, B.C., May 6, 1997.
- "Separation of Gas Supply, Merchant Functions & Other Alternatives," Tenth Annual CAMPUT Regulatory Educ. Conf., Niagara-on-the Lake, May 1, 1996.
- "The Impact of Deregulation on the Public Interest," Tenth Annual CAMPUT Regulatory Educational Conference, Niagara-on-the Lake, April 30, 1996.
- "Marketing to Low and Moderate Income Consumers in the New Competitive Market: Lessons Learned From Other Industries," Tenth Annual Energy Affordability Conference, National Consumers Law Center, Washington, D.C, February 22, 1996.
- "Where Should We be Going?" OEB Ten Year Market Review Workshop, Jan. 31, 1996.
- "Restructuring the Electrical Power Industry in Ontario" for the Board of Directors of Ontario Hydro on behalf of the Power Workers' Union, August, 1995.
- "A New Vision for Ontario's Electric Demand/Supply Future" panel presentation, Opening Plenary Session of the Canadian Independent Power Conference, Toronto, Dec. 1993.
- "Trends in Rental Housing Affordability by Income Level in Ontario" presented at the 1992 meetings of the Canadian Economics Assoc., Charlottetown, PEI.
- "An Evaluation of Rent Regulation as an Instrument for Meeting the Housing Needs of Renters in Ontario," presented to the Ontario Standing Committee on General Government, August, 1991.
- with S.W. Hamilton (Sept 1990) "Housing and the Regulatory Environment", a paper presented at the Housing Young Families Affordability Symposium, (Vancouver: Canadian Housing and Renewal Association/Canada Mortgage and Housing Corp.)
- "New Telecommunications Technologies: Who Pays? Who Benefits?" presented at the 1990 (June) meetings of the Canadian Economics Assoc., Victoria, B.C.
- with W.T. Stanbury, (1989) "Rent Controls as a Prisoner of War Game", Canadian Real Estate Research Bureau, Faculty of Commerce and Business Administration, University of British Columbia, #89-ULE-019.
- "The Implications of Rent Regulation for Housing Market Models" presented at 1989 (June) meetings of the Canadian Economics Association, Quebec City.
- "Price Caps - An Alternative to Rate of Return Regulation?" at the Canadian Association of Members of Public Utility Tribunals/Centre for the Study of Regulated Industries, Annual Regulatory Studies Training Programme, McGill University, May 14-18, 1989.
- "Living with Rent Regulation in Ontario" at the 35th North American meetings of the Regional Sciences Association, Toronto, November 1988.
- "A Survey of the Research of the Thom Commission," at *Rent Control: The International Experience*, John Deutsch Institute Roundtable, Queen's University, September, 1987.
- Invited address on "Forecasting the Regulatory Environment of Financial Institutions" sponsored by the University of Michigan - Flint as the 1985 paper for their annual *Lectures on the American Economy and the Business Community* series.
- "Collapsing Barriers Between Banking and Other Financial Institutions" at the 1984 Canadian MBA Conference, McMaster University.

- The economic impact of cultural activities for conferences of National Museums of Canada, Canadian Conference on Heritage Resources, Canadian Museums Association, Ontario Association of Art Galleries, and Ontario Federation of Symphony Orchestras.

PUBLICATIONS

Refereed Books and Monographs:

- with W.T. Stanbury (February 1990) *Rent Regulation: The Ontario Experience*, (Vancouver: The Canadian Real Estate Research Bureau).
- with W.T. Stanbury (January 1990) *The Housing Crisis: The Effects of Local Government Regulation*, (Vancouver: The Laurier Institute).
- with T. Courchene and L. Schwartz (October 1986) *Ontario's Proposals for the Canadian Securities Industry*, Observation No. 29, (Toronto: C.D. Howe Inst.).
- (1983) *Price Competition in the Canadian Securities Industry: A Test Case of Deregulation*, (Toronto: Ontario Economic Council).
- with G.F. Mathewson (1982) *Information Entry and Regulation in Markets for Life Insurance - Part II Overview and Policy Implications*, (Toronto: Ontario Economic Council).

Refereed Articles:

- with W.T. Stanbury (1990) "Landlords as Economic Prisoners of War", *Canadian Public Policy*, XVI no.4.
- with G.D. Quirin and S.P. Sethi (1977) "Market Feedbacks and the Limits to Growth", *INFOR*, Vol. 15, No. 1.

Other Publications:

- (1992) *Technology, Competition and Cross-subsidization in the Canadian Telecommunications Industry*, (Ottawa: Public Interest Advocacy Centre).
- (April 1990) *Paying for What You Need: Technological Advances and Competition in Telecommunications*, (Ottawa: Public Interest Advocacy Centre).
- with Andrew Roman and Robert Horwood, (1989) *Insurance Retailing by Financial Institutions in Canada*, (Ottawa: Public Interest Research Centre).
- with Douglas G. Hartle (1983) "The TAX-2 Model and Results" in *A Separate Personal Income Tax for Ontario: An Economic Analysis*, Special Research Report, (Toronto: Ontario Economic Council).
- (1982) "Commentary" in *Inflation and the Taxation of Personal Investment Income: An Analysis and Evaluation of the Canadian 1982 Reform Proposals* (edit. D.W. Conklin), Special Research Report (Toronto: Ontario Economic Council).

TEACHING

1989	Economics of Housing, Scarborough College, University of Toronto
1979 – 1985	Engineering Economy, Faculty of Engineering, University of Toronto
1982 – 1985	Computerized Business Systems (B.A. Program), and Management Information Systems (M.B.A.), Canadian School of Management
1979	Introductory Economics at St. George Campus, University of Toronto
1977 – 1979	Economic Principles at Erindale College, University of Toronto
1980 – 1985	Scuba diving instruction for Basic Diver, Sport Diver, Assistant Instructor and Instructor courses (National Association of Underwater Instructors).

RESEARCH MANAGEMENT

1983 – 1987	<ul style="list-style-type: none">• Research Director: Commission of Inquiry Into Residential Tenancies.• Directing a staff of four in house researchers on various background studies on Ontario's housing market and the literature related to rent regulation. Managed thirty external projects on topics related to the housing market and rent regulation.
1978 – 1980	<ul style="list-style-type: none">• Research Officer: Ontario Economic Council.• Research was conducted in the areas of regulation of the securities industry, mineral resource taxation policy, and Federal Provincial energy policy.• Other duties included managing ten external research contracts on topics in regulation and directing the work of research assistants.

OTHER ACTIVITIES

- Organizing Committee for the Concert for Inclusion in support of ParaSport Ontario
- Chairman of the Board of Directors of the Ontario Energy Marketers Association (formerly the Direct Purchase Industry Committee) and Executive Director of the Association.
- Invited participant in the Ontario Energy Board's External Advisory Committee.
- Panelist for "Administrative Tribunals and ADR", Osgoode Hall Law School, Professional Development Program, Continuing Legal Education, April 1997.
- Participation on behalf of OCAP in consultative processes related to direct purchase and integrated resource planning in the Ontario natural gas industry.
- Former Member of the Board of Directors of East Toronto Community Legal Services.
- Former Chairman of the Board of Directors of the Festival of Canadian Theatre.
- Articles in the editorial section of the Financial Times of Canada on policies for reforming Ontario's system of rent regulation (June 1990) and federal proposals regarding bank directorships (February 1991).
- Numerous appearances on CBC radio and television commenting on energy industry issues, competition, regulation and mergers in the Canadian economy.

- Refereed articles and research studies for *Canadian Public Policy*, *Queen's Quarterly* and *Consumer and Corporate Affairs*, Canada.
- Several organizations have been assisted in developing their research agendas, writing submissions to government on economic issue, or in other advisory capacities. Clients include the Public Interest Research Centre (topics include airline deregulation, Via Rail, telephone solicitation, Bell Canada's rate structure, frequent flyer programs, price cap regulation, and home equity conversion), Ontario Association of Art Galleries (arts funding and economic impact), Public Affairs Management, Inc., City of Toronto, Parks and Recreation Department, and Goldfarb Consultants.

CLIENTS

Private Sector Companies

Alfred Bunting & Co.	Auto Haulaway Inc.
BC Gas Utilities Limited	BC Rail
Buttcon Ltd.	Canavest House Ltd.
Canadian National Investments	Entergrus (Chatham-Kent Energy)
Comdisco Canada Inc.	Coral Energy
Devon Canada	Direct Energy
EnCana	ENERconnect
Enbridge Gas Distribution	EnCana Corporation
Enron Trade and Capital Canada	Financial Times of Canada
Fine Line Communications Ltd.	FortisBC
Fuji Electric (Tokyo)	Goldfarb Consultants
Great West Life Assurance Co.	Highmark Properties
Hydro One Networks Inc.	Hydro Québec
Insurance Corp. of British Columbia	McLeod Young Weir
New Brunswick Power (Disco)	Ontario Hydro Services
Ontario Power Generation	Shulman Communications Inc.
Sithe Canada	Star Produce
Terasen Gas	The Morassutti Group
Union Gas Limited	Wirebury Connections Inc.
Over 30 Ontario electricity distributors	

Industry and Other Associations

Association for Furthering Ontario's Rental Development
 Australian Merchant Bankers' Association
 Canadian Association of Members of Public Utilities Tribunals (CAMPUT)
 Canadian Business Telecommunications Alliance
 Canadian Film and Television Association
 Canadian Independent Telephone Association
 Canadian Museums Association
 Cornerstone Hydro Electric Concepts
 Electricity Distributors Association

Manitoba Keewatinowi Okimakanak
Ontario Association of Art Galleries
Ontario Energy Association
Ontario Federation of Symphony Orchestras
Power Workers' Union (CUPE 1000)
Toronto Theatre Alliance

Consumers' Associations

Alberta Council on Aging
Alert on Welfare
British Columbia Old Age Pensioners' Association
Canadian Pensioners Concerned
(Nova Scotia Division)
Consumers Association Of Canada
(National)
(Manitoba Branch)
(Alberta Branch)
(Northwest Territories Branch)
Consumers Fight Back Association
Council of Senior Citizens' Organizations
Co-operative Housing Association of Ontario
Federated Anti-Poverty Groups of British Columbia
Action réseau consommateurs (formerly La Fédération
Nationale des Associations de Consommateurs du Québec)
Manitoba Society for Seniors
The National Anti-Poverty Organization
Nova Scotia League for Equal Opportunities
Ontario Coalition Against Poverty
Option Consommateurs
PEI Council for the Disabled
PEI Senior Citizens Federation
People on Welfare for Equal Rights
Public Interest Research Centre
Rural Dignity of Canada
Rural Dignity, PEI Chapter
Senior Citizen' Association
Social Action Commission

Counsel for Consumers' Associations

British Columbia Public Interest Advocacy Centre
Legal Aid Manitoba, Public Interest Law Centre

Newfoundland Consumer Advocate
Public Interest Advocacy Centre (Ottawa)

Government

Federal

Canada Mortgage and Housing Corporation
Canadian Conference on Heritage Resources
Consumer and Corporate Affairs (Canada)
Department of Communications (Canada)
Director of Investigation and Research, Combines Investigation Act
St. Lawrence Seaway Authority

Provincial

Alberta Department of Energy
Commission of Inquiry into Residential Tenancies
New Brunswick, Department of Energy
Niagara Region Review Commission
Ontario Economic Council
Ontario Energy Board
Ontario Institute for Studies in Education, Department of Educational Planning
Ontario Ministry of Community and Social Services
Ontario Ministry of Health
Ontario Ministry of Housing (Corporate Policy and Planning; Rent Review Policy, Housing Field Operations)
Ontario Securities Commission
Ontario Task Force on the Investment of Public Sector Pension Funds
Ottawa/Carleton Region Review Commission
University of Toronto

Other

City of Calgary Electrical System
City of Peterborough
City of Toronto, (Telecom; Housing; Parks and Recreation)
Halifax Regional Municipality
Manitoba NDP Caucus
Office of Fair Trading (United Kingdom)
St. Francis Xavier University
Toronto Harbour Commissioners
Four municipally operated public utility telephone system

TAB 2B

RUSS HOULDIN



34 King Street East, Suite 600 | Toronto, ON M5C 2X8 | 416 348 9917 x 36 | rouldin@elenchus.ca

ASSOCIATE

Russ is an Associate with 34-year experience in the Ontario government including 13 years at the Ontario Energy Board during which period he was involved with every area of electricity regulation. He was the Board's subject matter expert on smart grid and assists clients on smart grid.

Prior to joining the Board, Russ was the Ministry of Finance's manager of environmental economics and was a senior adviser on environmental policy at Cabinet Office to both the Rae and Harris administrations. Russ has an undergraduate degree in chemistry and graduate (masters) degrees in economics and environmental studies.

PROFESSIONAL OVERVIEW

Ontario Energy Board

**October 2004 –
December 31, 2013**

Senior Advisor, Compliance/Regulatory Policy

- Providing advice and administrative support to Board members on electricity and natural gas issues
- Support for Board Decision on the Gas Distribution Access Rule and consultations on natural gas Service Quality Requirements (SQR)
- Staff review of the Ontario Power Authority Integrated power System Plan
- Support to Board on the first Ontario Power Generation Prescribed Facilities application
- Staff Discussion Paper on Smart Grid

Ontario Energy Board

October 1999 - October 2004

Advisor, Energy Licensing

- Providing advice and administrative support to the Director of Licensing and Board members on electricity licensing issues
- A report to the Board on Market Readiness
- Analysis and advice leading to the issuing of a Generating Licence to Bruce Power Inc
- Coordination of the Board's authorization of Electronic Business Transactions (EBT) standards

**Ministry of Finance
Senior Economist, Fiscal Planning Branch**

October 1998 - October 1999

- Providing expert advice on the Ontario Government's Fiscal Plan on capital spending, energy, science and technology, environment and natural resources
- Assisted in the preparation of the 1999 Ontario Budget
- Designed and implemented a new database for capital project management

**Ministry of Finance
Senior Economist, Structural Economics Branch**

July 1996–October 1998

- Providing economic advice on utilities, regulated industries and environment and energy issues, in particular, the financial and economic aspects of electric power system restructuring
- Major achievements with the Tax Policy Branch
- Designed, developed, tested and applied a large financial and economic spreadsheet for the analysis of options for restructuring Ontario Hydro
- Provided advice and technical support for the preparation of the 1997 White Paper on electricity system restructuring and the subsequent introduction and passage of Bill 35, the Energy Competition Act
- Provided advice as MOF observer of the Market Design Committee.

**Cabinet Office (Secondment)
Senior Advisor**

September 1993–July 1996

- Providing advice on environmental, energy and local services policy to the Premier and to members of the Policy and Priorities Board (P&P) of Cabinet
- Co-authored the final report of the secretariat of the Cabinet Committee on Environment Policy
- Prepared major Briefing Paper for Premier Rae on electric power restructuring
- Assisted in the government transition following the June 1995 election
- Assisted in setting up the Restructuring and Local Services Subcommittee of P&P (Jan-Feb 1996)

**University of Toronto, Innis College
Adjunct Professor (Part-Time)**

August 1994 - Present

- Teaching fourth-year undergraduates courses on Environmental Thought and Public Policy and Environment

**York University, Faculty of Environmental Studies
Adjunct Professor (Part-Time)**

January 1993–June 1993

- Taught graduate students a course in the Economics of Pollution and Resource Depletion (1993) and undergraduates on Energy and Environment (2005)

Ministry of Treasury and Economics (Now Ministry of Finance)

September 1990–September 1993

Assistant Manager, Economy and Environment, Sectoral and Regional Policy Branch

- Providing advice on the economic aspects of environmental policies and programs; liaison with government Ministries and agencies and external groups
- Research on economics and environment
- Supervision of junior economists
- Wrote papers on the Economics of Solid Waste Management in Ontario and the Greater Toronto Area (which evaluated the Kirkland Lake proposal) and a Framework for Evaluating the Economic Benefits of Environmental Measures

**Office of Greater Toronto Area
Special Assignment**

May 1991–June 1991

- Assisted in the preparation of a Cabinet Submission setting up the Interim Waste Authority

Ministry of Environment and Energy

September 1991–December 1991

Financial and Economic Advisor (short term, part-time secondment), to the Assistant Deputy Minister (ADM), Waste Reduction Office

- Advice to the ADM during negotiations with the Chief Administrative Officers of the GTA municipalities and analysis of GTA waste management options
- Development and documentation of a spreadsheet model for the economic and financial analysis of waste management options in the Greater Toronto Area; and, a report, "The Economics of Solid Waste Management in the Greater Toronto Area"

Ontario Ministry of Industry, Trade and Technology (now Economic Development, Trade and Tourism).

March 1987–September 1990

Senior Policy Analyst, Technology Policy Branch

- Analysis and coordination of science and technology policy
- Administration of the Technology Centres program
- Wind-down and privatization of Ontario's Technology Centres program, including; preparing the Cabinet submission on the sunset review of the Technology Centres, the hiring and supervision of agents for the privatization of three centres
- Assistance in setting up the Centres of Excellence and the conduct of the first peer review of the Centres

Ontario Ministry of Energy (MEny)

November 1984–March 1987

Economist, Energy Economics and Forecasts Section

- Analysis of economic costs, benefits and impacts of a variety of energy issues and the preparation of energy price and demand forecasts

- Complete programming, data analysis and documentation for a new MEny residential energy demand model in LOTUS
- Supervision and documentation of the transfer of all of MEny's energy demand models from an IBM mainframe to an NCR (UNIX) minicomputer
- Supervision of the recalibration of MEny's commercial sector energy demand model
- A major study on the natural gas consumption of Toronto houses
- Supporting analysis for Ontario's new Energy Efficiency Act

Ministry of Energy

January 1984–November 1984

Policy Analyst, Alternative and Renewable Energy Group

- Analysis of social and economic impacts of policies and programs and the formulation of strategies to promote alternative and renewable energy technologies
- Wrote report on "The Analysis of Policy Instruments for the Commercialization of Alternative and Renewable Technologies"

Ministry of Energy

March 1981–January 1984

Project Leader, Biomass, Alternative and Renewable Energy Group

- Evaluation of the feasibility of biomass energy projects and the management of same, including the supervision of consultants, from feasibility to monitoring of the operational system
- Supervision of Arthur D. Little study "An Economic Assessment of Biomass Energy Systems"
- Management of the Grenville Christian College woodburning demonstration project to the end and the Chapleau woodwaste cogeneration project to the commercial venture stage

Ontario Ministry of the Environment (MOE).

March 1978–March 1981

Environmental Analyst, Environmental Approvals Branch

- Administration of the Environmental Assessment Act (EAA) and policy advice related to the Royal Commission on Electric Power Planning (RCEPP)
- Government review coordinator, under the EAA, for major transportation projects and for Ontario Hydro's "class" EA on minor (less than 500kV) transmission facilities, the latter including "Construction and Site Restoration Guidelines"
- Development of the first Manual of Administration for the EAA
- Organizer of a Workshop to develop a General Regulation applying the EAA to the private sector
- Liaison with the Federal-Provincial task force on energy and environment for the Canadian Council of Resource and Environment Ministers; and, completion of MOE's submissions to RCEPP

New Conserver Society Notes

November 1977–March 1978

Co-editor

- Resigned when made a public servant

**Ontario Ministry of the Environment (Environmental Approvals Branch).
Consultant on Energy Policy**

October 1976–March 1978

- Assistance in the preparation of submissions to RCEPP and policy analysis and advice on the environmental implications of energy issues
- MOE submissions to RCEPP (see Publications, below)

**York University, Faculty of Environmental Studies
Graduate Assistant to Professor W. Leiss**

May 1976–September 1976

- Preparation of a bibliography on politics and ecology

**University of Toronto, Lash Miller Laboratories
Demonstrator of First and Second-year Chemistry**

September 1974–October 1976

- Supervision and assistance of students and marking of tests and examinations

**University of Toronto, Lash Miller Laboratories
Laboratory Technician**

July 1974–October 1976

- Maintenance of laboratory, running of infra-red, ultra-violet and Nuclear Magnetic Resonance (NMR) spectrometric analysis
- Preparation of chemical precursors and analytical and general assistance to Professor B. Bosnich

PUBLICATIONS

- October 2013 “Hidden Predictability: mining price signals in Ontario’s electricity market” with Bunli Yang **Public Utilities Fortnightly**, 22-26
- October 2005 “Lost economies of integration and the costs of creating markets in electricity restructuring: evidence from Ontario” **The Electricity Journal (TEJ)**, 18(8), 45-54.
- April 2005 “Find the public good: shedding light on a bulk electricity card trick” **The Electricity Journal (TEJ)**, 17(9) November 2004, 61-67 and “Excuse me but your false analogy is showing” **TEJ** 18(3), 3-5.
- 2000 “Nature’s Wages: A Factor-based Alternative Approach to Environment-Economy Integration” **New Zealand Economic Papers**, 34(1), 111-128.
- Present **Stepping Out of the Clockwork Garden: Environmental Thought in the New Millennium, (in progress).**

May 1978	"The Conserver Society and Energy Policy: a theoretical framework for analysis", Major Paper for MES degree, York University
April 1977 – January 1979	"Submission to the Royal Commission on Electric Power Planning, Debate Stage Hearings, Parts I-VI", Ontario Ministry of the Environment, co-author.
Spring 1978	"Nuclear Power: The Year in Review", The New Conserver Society Notes, Vol 1, No. 1, p. 34; and, "What Happened at the Harbour Castle Hilton?", op. cit., p.7.
March 1979	"Review of the Proposed Airport at Deer Lake", Ontario Government Review
April 1980	"Review of the Proposed Sudbury Northwest Bypass", Ontario Government Review
April 1980	"Review of the Proposed Long-Term Improvements to the Highway 144 Corridor between Sudbury and Levack", Ontario Government Review
April 1980	"Review of Kasabonika Airport", Ontario Government Review
May 1980	"Review of the Remote Northern Airport Program (Class Environmental Assessment)", Ontario Government Review
September 1980	"Review of Ontario Hydro's Class Environmental Assessment for Minor Transmission Facilities", Ontario Government Review

COMPUTER SKILLS

- High degree of "computer literacy", in mainframe, minicomputer, microcomputer and network environments
- Used mainframe languages, FORTRAN, IFPS (Interactive Financial Planning System) and APL
- As a member of the Canada Remote Systems electronic Bulletin Board, became familiar with dozens of "shareware" software packages
- Expert programmer in spreadsheet software
- Also experienced Apple software user
- Knowledge of UNIX, expertise with PC-DOS and a wide variety of DOS-compatible software, especially WordPerfect and Presentation Graphics, MS Word and Powerpoint
- Knowledge of XML.

PROFESSIONAL MEMBERSHIPS

The Association of the Chemical Profession of Ontario

AWARDS

1980 – 1981	Social Sciences and Humanities Research Council of Canada Special M.A. Scholarship Award
1970 – 1973	Bolton Education Department University Award (Scholarship)
1969 – 1969	B.Sc. (Honours) in Chemistry, University of Bristol
1963 – 1970	Bolton Education Department Grammar School Award (Scholarship)

ACADEMIC ACHIEVEMENTS

1980- 1991	M.A in Economics, York University
1975-1978	Master of Environmental Studies (MES, Area of Concentration-Energy/Conserver Society/Environmental Philosophy
1974-1975	Special Student, University of Toronto
1970-1973	B.Sc (Honours) in Chemistry, University of Bristol
1963 - 1970	Canon Slade Grammar School, Bolton, Lancashire, U.K. <ul style="list-style-type: none">• 10 "Ordinary" Level General Certificates of Education (GCEs); in, English Language, English Literature, History, Geography, Religious Studies, Physics, Chemistry, Mathematics, French and Russian.• 4 "Advanced" level GCEs, in Physics, Chemistry, Mathematics and General Studies.

APPENDIX- UNIVERSITY COURSES TAUGHT

Years	Term(s)	Title	University	Department	Student type
1993	Winter	Environmental Economics ENV55	York	Environmental Studies	Graduate
1994- 95	Fall and Winter	Environmental Thought INI421Y	Toronto	Innis College	Undergraduate
1995- 96	Fall and Winter	Environmental Thought INI421Y	Toronto	Innis College	Undergraduate
1996	Fall	Environmental Thought INI331F	Toronto	Innis College	Undergraduate
1997	Winter	Public Policy & Environment INI421	Toronto	Innis College	Undergraduate
1997	Fall	Environmental Thought INI331F	Toronto	Innis College	Undergraduate
1998	Winter	Public Policy & Environment INI421S/ Environmental Regulation & Policy Development EDM370	Toronto	Innis College/ Faculty of Applied Science & Engineering	Undergraduate
1998	Fall	Environmental Thought INI331F	Toronto	Innis College	Undergraduate
1999	Winter	Public Policy & Environment INI421S/ Environmental Regulation & Policy Development EDM370	Toronto	Innis College/ Fac. Applied Science & Engineering	Undergraduate
1999	Fall	Environmental Thought INI331F	Toronto	Innis College	Undergraduate
2000	Winter	Public Policy & Environment INI421S	Toronto	Innis College	Undergraduate
2000	Fall	Environmental Thought INI331F	Toronto	Innis College	Undergraduate
2001	Winter	Public Policy & Environment INI421S			
2001	Fall	Environmental Thought INI331F	Toronto	Innis College	Undergraduate
2002	Winter	Public Policy & Environment INI421S			
2002	Fall	Environmental Thought INI331F	Toronto	Innis College	Undergraduate
2003	Winter	Inside the World of Ontario Environmental Policy INI421S	Toronto	Innis College	Undergraduate
2003	Fall	The Influence of Economic Ideas INI447F	Toronto	Innis College	Undergraduate
2004	Winter	Inside the World of Ontario	Toronto	Innis College	Undergraduate

2004	Fall	Environmental Policy INI421S The Influence of Economic Ideas INI447F	Toronto	Innis College	Undergraduate
2005	Winter	Energy and Environment ENVS3130	York	Environmental Studies	Undergraduate
2005	Winter	Inside the World of Ontario Environmental Policy INI421S	Toronto	Innis College	Undergraduate
2005	Fall	The Influence of Economic Ideas INI447F	Toronto	Innis College	Undergraduate
2006	Winter	Inside the World of Ontario Environmental Policy INI421S	Toronto	Innis College	Undergraduate
2006	Fall	The Influence of Economic Ideas INI347F	Toronto	Innis College	Undergraduate
2006	Fall	Energy and Environment Policy and Politics ENV350	Toronto	Center for Environment	Undergraduate
2007	Winter	Public Policy and Environment ENV323	Toronto	Center for Environment	Undergraduate
2007	Fall	The Influence of Economic Ideas ENV 347	Toronto	Center for Environment	Undergraduate
2007	Fall	Energy and Environment Policy and Politics ENV350	Toronto	Center for Environment	Undergraduate
2008	Winter	Public Policy and Environment ENV323	Toronto	Center for Environment	Undergraduate
2008	Fall	The Influence of Economic Ideas ENV 347	Toronto	Center for Environment	Undergraduate
2008	Fall	Energy and Environment Policy and Politics ENV350	Toronto	Center for Environment	Undergraduate
2009	Winter	Public Policy and Environment ENV323	Toronto	Center for Environment	Undergraduate
2009	Fall	The Influence of Economic Ideas ENV 347	Toronto	Center for Environment	Undergraduate
2009	Fall	Energy and Environment Policy and Politics ENV350	Toronto	Center for Environment	Undergraduate
2010	Winter	Ontario Environmental Policy ENV323	Toronto	Center for Environment	Undergraduate
2010	Fall	The Influence of Economic Ideas ENV 347	Toronto	Center for Environment	Undergraduate
2010	Fall	Energy and Environment Policy and Politics ENV350	Toronto	Center for Environment	Undergraduate
2011	Winter	Ontario Environmental Policy ENV323	Toronto	Center for Environment	Undergraduate
2011	Fall	The Influence of Economic Ideas ENV 347	Toronto	Center for Environment	Undergraduate
2012	Winter	Ontario Environmental Policy ENV 323	Toronto	Center for Environment	Undergraduate
2012	Fall	The Influence of Economic Ideas ENV 347	Toronto	School of Environment	Undergraduate

TAB 3A

La Capra Associates

DANIEL E. PEACO
La Capra Associates
President

Daniel Peaco is an electric industry planning specialist with more than 30 years of experience in power markets and marketing, strategic planning, pricing and price forecasting, power procurement and contracts, and power systems planning. Mr. Peaco has significant experience as an expert witness and as an advisor to senior utility managers and public policy officials. His consulting practice has included a range of engagements relating to integrated resource planning, competitive electric markets and industry restructuring, including generation asset valuation, strategic planning, competitive market formation and pricing, stranded cost assessment and mitigation, power market analysis of prices and supply requirements, power contract analysis, and power procurement practices. In addition to his tenure at La Capra Associates, he has held management and planning positions in power supply planning at Central Maine Power, CMP International Consultants, Pacific Gas & Electric, and the Massachusetts Energy Facilities Siting Council.

EMPLOYMENT HISTORY

La Capra Associates	Boston, MA
<i>President</i>	2002-current
<i>Managing Director</i>	1996-2002
Central Maine Power Company	Augusta, ME
<i>Manager, Industrial Marketing and Economic Development</i>	1995-96
<i>Principal, CMP International Consultants</i>	1993-95
<i>Director, Power Supply Planning</i>	1987-93
<i>Power Supply Planning Analyst</i>	1986-87
Pacific Gas & Electric Company	San Francisco, CA
<i>Power Supply Planning Analyst</i>	1985-86
<i>Hydropower Planning Analyst</i>	1983-84
<i>Cogeneration Contracts Analyst</i>	1981-82
Massachusetts Energy Facilities Siting Council	Boston, MA
<i>Planning Engineer</i>	1978-79

EDUCATION

Thayer School of Engineering, Dartmouth College	Hanover, NH
<i>M.S. in Engineering Sciences, Resource Systems and Policy Design</i>	1981
Massachusetts Institute of Technology	Cambridge, MA
<i>B.S. in Civil Engineering, Water Resource Systems</i>	1977

REPORTS AND PRESENTATIONS

Need for and Alternative To (NFAT) Review of Manitoba Hydro's Proposal for the Keeyask and Conawapa Generating Stations, Initial Expert Analysis Report prepared for the Manitoba Public Utilities Board. January 24, 2014. Lead Consultant and Principal Author.

Evaluation of the Transaction to Transfer the Entergy Corp. Transmission Business to ITC Holdings, Inc., Initial Report prepared for the General Staff of the Arkansas Public Service Commission. April 19, 2013. Lead Consultant and Principal Author.

Regarding Tri-State G&T's Cost to Serve Its Nebraska Loads and the Nebraska Power Supply Issues Group Loads, prepared for the Nebraska Power Supply Issues Group, two public power districts and two member-owned electric utilities in Western Nebraska. December 2012. Lead Consultant and Principal Author.

Independent Valuation Opinion for the Vernon Station in the Town of Hinsdale, NH, prepared for the Transcanada Hydro regarding the value of a 32 MW hydropower asset. November 2012. Lead Consultant and Principal Author.

Independent Valuation Opinion for the Comerford and McIndoes Stations in the Town of Monroe, NH, prepared for the Transcanada Hydro regarding the value of 179 MW hydropower assets. November 2012. Lead Consultant and Principal Author.

Independent Opinion Regarding the Market Value of Brassua Hydro LP Assets, prepared for the Owners of Brassua Dam regarding the value of a 4 MW hydropower asset. November 2012. Lead Consultant and Principal Author.

Independent Opinion Regarding Amortization Reserve of Brassua Hydro LP, prepared for the Owners of Brassua Dam regarding the amortization reserve value of a 4 MW hydropower asset. November 2012. Lead Consultant and Principal Author.

Regional Framework for Non-Transmission Alternatives, Report prepared for the New England States Committee on Electricity. October 2012. Lead Consultant and Principal Author.

Renewable Energy and Energy Efficiency Portfolio Standards(REPS) And Sustainable Energy in North Carolina, Lessons from the 2011 Energy Policy Committee Study, presentation to the 9th Annual Sustainable Energy Conference, Raleigh, North Carolina April 20, 2012.

Transmission Planning for the Next Generation, Some Implications for Generators in the New England Region of FERC Order 1000, presentation to the Connecticut Power and Energy Society's Energy, Environment, and Economic Development Conference, Cromwell, Connecticut March 14, 2012.

Entergy Arkansas, Inc.'s Withdrawal from the Entergy System Agreement, Response to EAI's Analysis of All Strategic Options, Supplemental Initial Report prepared for the General Staff of the Arkansas Public Service Commission. July 12, 2011. Lead Consultant and Principal Author.

North Carolina's Renewable Energy Policy, A Look at REPS Compliance To Date, Resource Options for Future Compliance, and Strategies to Advance Core Objectives, prepared for the North Carolina Energy Policy Council. June 2011. Lead Consultant and Co-Author.

Energy Policy Implementation, Framework Overview: Paying for the Policies, presentation to the NECA/CPES 18th Annual New England Energy Conference, Groton, Connecticut, May 18, 2011.

Entergy Arkansas, Inc.'s Withdrawal from the Entergy System Agreement, Initial Report prepared for the General Staff of the Arkansas Public Service Commission. February 11, 2011. Lead Consultant and Principal Author.

Non-Transmission Alternatives Assessment for the Lewiston-Auburn Area, Report for Central Maine Power. August 27, 2010. Co-Author.

Emerging Regional Energy Issues, How RPS Requirements will Affect Vermont's Energy Future, presentation to the Vermont's Renewable Energy Future Conference, Burlington, Vermont October 1, 2010.

2010 Comprehensive Plan for the Procurement of Energy Resources, Report prepared for the Connecticut Energy Advisory Board. April 27, 2010. Lead Consultant and Principal Author.

Phase I Report: Assessment of Energy Supply Options for the Town of Millinocket, report to the Town of Millinocket, Maine. December 18, 2009. Lead Consultant and Principal Author.

2009 Comprehensive Plan for the Procurement of Energy Resources, Report prepared for the Connecticut Energy Advisory Board. May 1, 2009. Lead Consultant and Principal Author.

Evaluation of the Grid Solar Proposal, Review of the Economics of the Proposal as an Alternative to the Maine Power Reliability Program, Report prepared for Central Maine Power. April 3, 2009. Lead Consultant and Principal Author.

An Analysis of the Connecticut Light and Power Company's Proposed Greater Springfield Reliability Project and Manchester to Meekville Project and the Non-Transmission Project Proposed as Alternatives, Report prepared for the Connecticut Energy Advisory Board. February 17, 2009. Lead Consultant and Principal Author.

Preparing A State-Centric IRP in a Multi-State Power Market, presentation to the EUCI Conference on Resource and Supply Planning, Scottsdale, Arizona, February 11, 2009.

Resource Considerations of Transmission Planning, half-day workshop presented to the EUCI Conference on Resource and Supply Planning, Scottsdale, Arizona, February 11, 2009.

2008 Comprehensive Plan for the Procurement of Energy Resources, Report prepared for the Connecticut Energy Advisory Board. August 1, 2008. Lead Consultant and Principal Author.

Maine Power Reliability Project: Non-Transmission Alternatives Assessment and Economic Evaluation, Report for Central Maine Power. June 30, 2008. Lead Consultant and Principal Author.

Maine Power Connection: Locational Marginal Price and Production Cost Implications in Maine and New England, Report for Central Maine Power and Maine Public Service Company. June 30, 2008. Lead Consultant and Principal Author.

Impact of Aroostook Wind Energy on New England Renewable Energy Certificate Market, Report for Horizon Wind Energy. June 25, 2008. Lead Consultant.

Initial Review of Integrated Resource Plan for Connecticut, Report for the Connecticut Energy Advisory Board. January 28, 2008. Lead Consultant and Principal Author.

Connecticut's Long-Term Electric Capacity Requirements, Report of the Connecticut Energy Advisory Board. April 7, 2006. Lead Consultant and Principal Author.

Technical Audit – Phase III: Review of Increase in Fuel Component of Power Budget FY 2007 relative to FY 2006, prepared for the New Brunswick Power Distribution and Customer Service Corp., October 5, 2005. Lead Consultant and Principal Author.

Preliminary Assessment of Connecticut's Electric Supply and Demand: Near Term Requirements for Reliability and Mitigation of Federally Mandated Congestion Charges, The Connecticut Energy Advisory Board. September 2, 2005. Lead Consultant and Principal Author.

Technical Audit – Phase II: Review of Increase in Fuel Component of Power Budget FY 2006 relative to FY 2005, prepared for the New Brunswick Power Distribution and Customer Service Corp., July 7, 2005. Lead Consultant and Principal Author.

Technical Audit: Purchased Power Budget April 2005 – March 2006, prepared for the New Brunswick Power Distribution and Customer Service Corp., May 18, 2005. Lead Consultant and Principal Author.

Retail Choice Study: Issues and Options for Electric Generation Service, The Belmont Electricity Supply Study Committee, Belmont, Massachusetts. June 2, 2004. Lead Consultant and Principal Author.

California Energy Markets: The State's Position Has Improved, Due to Efforts by the Department of Water Resources and Other Factors, but Cost Issues and Legal Challenges Continue, California Bureau of State Audits, April 2, 2003. Lead Consultant and a Principal Author.

California Energy Markets: Pressures Have Eased, but Cost Risks Remain, California Bureau of State Audits, December 21, 2001. Lead Consultant and a Principal Author.

Development of Competition in Electric Markets and the Impact on Retail Consumers in Arkansas, Arkansas General Staff's Report, In The Matter of a Progress Report to the Arkansas General Assembly on the Development of Competition in Electric Markets and the Impact, if any, on Retail Consumers, Docket No. 00-190-U, September 4, 2001. Principal Author.

Preliminary Market Value Assessment of PP&L Maine Hydroelectric Plants, August 2001. Proprietary report prepared for American Rivers, the Atlantic Salmon Federation, the Natural Resources Council of Maine, the Penobscot Indian Nation, and Trout Unlimited. Principal Author.

Development of Competition in Electric Markets and the Impact on Retail Consumers in Arkansas, Arkansas General Staff's Report, In The Matter of a Progress Report to the Arkansas General Assembly on the Development of Competition in Electric Markets and the Impact, if any, on Retail Consumers, Docket No. 00-190-U, September 29, 2000. Principal Author.

Wholesale Market Development: Timing and Issues Survey of Activity in Other Regions, FERC Initiatives, In The Matter of a Progress Report to the Arkansas General Assembly on the Development of Competition in Electric Markets and the Impact, if any, on Retail Consumers, Docket No. 00-190-U, September 29, 2000. Principal Author.

Retail Market Development: Timing and Issues Survey of Other States, In The Matter of a Progress Report to the Arkansas General Assembly on the Development of Competition in Electric Markets and the Impact, if any, on Retail Consumers, Docket No. 00-190-U, September 29, 2000. Principal Author.

The Progression toward Retail Competition in Arkansas' Neighboring States, In The Matter of a Progress Report to the Arkansas General Assembly on the Development of Competition in Electric Markets and the Impact, if any, on Retail Consumers, Docket No. 00-190-U, September 29, 2000. Principal Author.

Arkansas General Staff Proposal and Initial Comments, In The Matter of a Generic Proceeding to Establish Uniform Policies and Guidelines for a Standard Service Package, Docket No. 00-148-R, June 13, 2000. Principal Author.

Arkansas General Staff Initial Comments, In The Matter of a Generic Proceeding to Determine if Metering, Billing, and Other Services Are Competitive Services, Docket No. 00-054-U, March 31, 2000. Principal Author.

Arkansas General Staff Initial Comment and Proposed Market Power Analysis Minimum Filing Requirements, In The Matter of a Generic Proceeding to Establish Filing Requirements and Guidelines Applicable to Market Power Analyses, Docket No. 00-048-R, March 28, 2000. Contributing Author.

Vermont Electricity Prices: Regional Competitiveness Outlook; Implications of Restructuring in New England and New York, February 2000 Edition, prepared for Central Vermont Public Service. Principal Author.

Projected Retail Price of Electricity for Massachusetts Electric Company, Boston Edison Company, and Western Massachusetts Electric Company, September 1999, prepared for Massachusetts Municipal Wholesale Electric Company. Principal Author.

Comments of the Commonwealth of Massachusetts Division of Energy Resources, in the Investigation by the Department of Telecommunication and Energy into Pricing and Procurement of Default Service, July 1999 (Initial and Reply Comments). Contributing Author.

Need for Power Supply: The New England Power Pool and the State of Rhode Island, March 1999, prepared for Indeck – North Smithfield Energy Center.

Vermont Electricity Prices: Regional Competitiveness Outlook; Implications of Restructuring in Northeast States, a Report to the Working Group on Vermont's Electricity Future, November 1998, prepared for Central Vermont Public Service. Principal Author.

EXPERT TESTIMONY AND APPEARANCES

<u>Forum</u>	<u>Client</u>	<u>Topic</u>
Arkansas Public Service Commission Docket No. 12-069-U	General Staff of the AK Public Service Comm.	Testimony regarding the evaluation of Entergy Arkansas's proposed divestiture of its transmission business to ITC Holdings. Direct Testimony April 19, 2013 Surrebuttal Testimony June 7, 2013 Supplemental Testimony - Rate Mitigation Aug 15, 2013
Superior Court Windham Unit State of Vermont Docket No. 547-11-12 Wmev	TransCanada Hydro Northeast, Inc.	Expert testimony regarding the valuation of a four hydropower facilities totaling 260 MW in appeal of appraised values in the towns of Vernon, Rockingham, and Barnet VT. Valuation Report July 15, 2013
Arbitration AAA Case No. 11 198 Y 002014 12	City of Burlington, VT Burlington Electric Dept.	Expert testimony regarding the valuation of a 7 MW hydropower facility and the determination of fair value for transfer of ownership of the asset. Valuation Report June 21, 2013 Rebuttal Report July 26, 2013 Deposition Testimony September 12, 2013 Oral Testimony October 4, 2013
US District Court Colorado Civil Action No. 10-CV-02349-WJM-KMT	Nebraska Power Supply Issues Group	Expert testimony regarding Tri-State G&T cost to serve five Nebraska members. Expert Report December 31, 2012 Deposition Testimony February 27, 2013
Arbitration AAA Case No. 11 153 Y 02133 11	Owners of Brassua Dam FPL Hydro Maine LLP Madison Paper Industries Merimil Ltd Partnership	Expert testimony regarding the valuation of a 4 MW hydropower facility and the determination of amortization reserve obligations under FERC license provisions. Valuation Report November 1, 2012 Amortization Reserve Report November 1, 2012 Amortization Reserve Rebuttal November 15, 2012 Oral Testimony December 5, 2012
Burrillville Board of Review	Transcanada; Ocean States Power Holdings, Ltd..	Expert testimony regarding the valuation of a 540 MW combined cycle power plant in appeal of an appraisal conducted for the Town of Burrillville, RI. Valuation Report January 4, 2012 Oral Testimony March 1, 2012
Arkansas Public Service Commission Docket No. 10-011-U	General Staff of the AK Public Service Comm.	Testimony regarding the evaluation of Entergy Arkansas's strategic reorganization options and request for authorization to transfer control of its transmission asset to the Midwest ISO. Oral Testimony May 31, 2012 Surrebuttal Testimony April 27, 2012 Direct Testimony March 16, 2012

Burrillville Board of Review	Transcanada; Ocean States Power Holdings, Ltd..	Expert testimony regarding the valuation of a 540 MW combined cycle power plant in appeal of an appraisal conducted for the Town of Burrillville, RI.
		Valuation Report January 4, 2012 Oral Testimony March 1, 2012
Oklahoma Corporation Commission Cause No. PUD 201100186	OK Corporation Commission OK Attorney General	Testimony regarding a 60 MW Wind Energy Purchase Agreement and Cogeneration deferral Agreement proposed by Oklahoma Gas & Electric Company, addressing cost pre-approval, and a requested waiver from competitive procurement. requirements.
		Prefiled Testimony February 8, 2012
Arkansas Public Service Commission Docket No. 10-011-U	General Staff of the AK Public Service Comm.	Testimony regarding the evaluation of Entergy Arkansas's strategic reorganization options upon its exit from the Entergy System Agreement.
		Oral Testimony September 9, 2011 Surrebuttal Testimony August 18, 2011 Supplemental Initial Testimony July 12, 2011 Initial Testimony February 11, 2011
State Corporation Commission of the State of Kansas	The Landowner Group	Testimony regarding the application of ITC Great Plains for a siting permit for a 345-kV Transmission Line addressing project need and route selection methodology.
		Initial Testimony April 18, 2011
Federal Energy Regulatory Commission (FERC) RM10-23-000	Maine Public Utilities Commission, et. al.	Expert Affidavit regarding economic analysis methodology for transmission project evaluation. Provided in reply comments on the FERC Transmission Planning and Cost Allocation NOPR.
		Affidavit November 12, 2010
Maine Public Utilities Commission Docket No. 2008-255	Central Maine Power	Testimony regarding CMP's application for approval the Lewiston Loop 115kV Transmission Project. Testimony addressed non-transmission alternatives.
		Oral Testimony November 16, 2008 December 14, 2010 Rebuttal Testimony November 8, 2010 August 27, 2010
Oklahoma Corporation Commission Cause No. PUD 201000092	OK Corporation Commission OK Attorney General	Testimony regarding a 99.2 MW wind farm power purchase agreement and green energy choice tariff proposed by Public Service Company of Oklahoma, addressing cost pre-approval, resource need, and competitive procurement. requirements..
		Prefiled Testimony October 5, 2010 Oral Testimony November 3, 2010

Oklahoma Corporation Commission Cause No. PUD 201000037	Oklahoma Attorney General	Testimony regarding a 198 MW wind farm proposed by Oklahoma Gas & Electric, addressing cost pre-approval, resource need, and competitive procurement. requirements.
		Prefiled Testimony June 11, 2010
Connecticut Dept. of Public Utilities Control (DPUC) Docket No, 10-02-07	Connecticut Energy Advisory Board (CEAB)	Lead witness sponsoring the CEAB's 2010 <i>Comprehensive Plan for the Procurement of Energy Resources.</i>
		Oral Testimony June 2 & 3, 2010
Georgia Public Service Commission Docket No, 31081	Georgia Public Service Commission Public Interest Advocacy Staff	Witness sponsoring testimony regarding integrated resource planning methods, renewable energy, solar PV demonstration projects, and uncertainty analysis.
		Written Testimony May 7, 2010 Oral Testimony May 18, 2010
Maine Public Utilities Commission Docket No. 2008-255	Central Maine Power	Testimony regarding CMP's application for approval \$1.5 B Maine Power Reliability Transmission Project. Testimony addressed non-transmission alternatives and economic benefits, economics of proposed solar alternative, wind energy development benefits.
		Oral Testimony October 10, 2008 November 19, 2008 December 21, 2009 February 4, 2010 Rebuttal Testimony December 4, 2009 April 3, 2009
Oklahoma Corporation Commission Cause No. PUD 200900167	Oklahoma Attorney General	Testimony regarding a 102 MW wind farm proposed by Oklahoma Gas & Electric, addressing cost pre-approval, resource need, and competitive procurement. requirements.
		Prefiled Testimony Sept 29, 2009
Oklahoma Corporation Commission Cause No. PUD 200900099	Oklahoma Industrial Energy Consumers (OIEC)	Testimony regarding a power contract pre-approval and recovery of Independent Evaluator costs of Public Service Company of Oklahoma.
		Prefiled Testimony July 14, 2009
Connecticut Dept. of Public Utilities Control (DPUC) Docket No, 09-05-02	Connecticut Energy Advisory Board (CEAB)	Lead witness sponsoring the CEAB's 2009 <i>Comprehensive Plan for the Procurement of Energy Resources.</i>
		Oral Testimony June 30, 2009

Connecticut Dept. of Public Utilities Control (DPUC) Docket No. 08-07-01	Connecticut Energy Advisory Board (CEAB)	Lead witness sponsoring the CEAB's 2008 <i>Comprehensive Plan for the Procurement of Energy Resources</i> . This Plan is the first prepared under the State's new integrated resource planning statute.
		Oral Testimony August 28, 2008 September 22, 2008 October 3, 2008
Maine Superior Court Civil Action Docket No. cv-06-705	Worcester Energy Co., Inc.	Expert opinion regarding renewable energy and power procurement services.
		Prefiled Report January 30, 2008 Oral Testimony March 18, 2009
Massachusetts Dept. Of Telecommunications And Energy Docket No. DTE/DPU-06-60	Russell Biomass	Testimony regarding economic, reliability and environmental need for renewable power in the Massachusetts and New England in support of Russell Biomass petition for a zoning exemption.
		Prefiled Testimony June 2007 Oral Testimony October 30, 2007
Hawaii Public Utilities Commission Docket No. 04-0046	Hawaii Division of Consumer Advocacy	Testimony regarding Hawaii Electric Light Company's integrated resource plan.
		Prefiled Testimony September 28, 2007 Oral Testimony November 26, 2007
Nevada Public Utilities Commission Docket No. 06-12002	Nevada Attorney General Bureau of Consumer Protection	Testimony regarding the prudence of Sierra Pacific Power Company in its purchased power expenses for the period December 2001 through November 2002.
		Prefiled Testimony September 14, 2007
Oklahoma Corporation Commission Cause No. PUD 2005516 Cause No. PUD 2006030 Cause No. PUD 2007012	Oklahoma Attorney General	Testimony regarding a 950 MW coal-fired generation facility proposed by Public Service of Oklahoma and Oklahoma Gas & Electric, including IRP, competitive procurement, and construction financing issues.
		Prefiled Testimony May 21, 2007 Rebuttal Testimony June 18, 2007 Oral Testimony July 26, 2007
Oklahoma Corporation Commission Cause No. PUD 2002-038 REMAND	Oklahoma Industrial Energy Consumers (OIEC)	Testimony regarding a power contract proposal of Lawton Cogeneration and the pricing analysis of Public Service Company of Oklahoma.
		Prefiled Testimony October 28, 2005 Rebuttal Testimony March 17, 2006 Oral Testimony May 9, 2006

New Brunswick Board of Commissioners of Public Utilities (PUB)
Ref: 2005-002

New Brunswick Power Distribution Company

Testimony regarding La Capra Associates' three technical audits of the NBP-Disco purchased power budget and variance analyses for FY 2004 – 2006.

Oral Testimony February 14-22, 2006

Connecticut Department of Public Utility Control
Docket No. 05-07-14
Phases I and II

Connecticut Energy Advisory Board

Testimony regarding Connecticut's need for electric capacity to meet reliability requirements and to mitigate congestion charges in the wholesale markets.

Oral Testimony February 14-22, 2006
May 1, 2006
June 15, 2006
September 26, 2005

Hawaii Public Utilities Commission
Docket No. 03-0372

Hawaii Division of Consumer Advocacy

Testimony regarding competitive bidding rules and integrated resource planning.

Oral Testimony December 12-16, 2005

Oklahoma Corporation Commission
Cause No. PUD 2005-151

Oklahoma Industrial Energy Consumers (OIEC)

Testimony regarding resource planning, prudence of generation investment of Oklahoma Gas & Electric Company.

Prefiled Testimony September 12, 2005
Rebuttal Testimony September 29, 2005
Oral Testimony October 18, 2005

Oklahoma Corporation Commission
Cause No. PUD 2003-076

Oklahoma Industrial Energy Consumers (OIEC)

Testimony regarding resource planning, prudence of generation investment and fuel and purchased power expenses of Public Service Company of Oklahoma.

Prefiled Testimony January 4, 2005

Oklahoma Corporation Commission
Cause No. PUD 2003-633/4

Oklahoma Industrial Energy Consumers (OIEC)

Testimony regarding power contract proposal for Blue Canyon wind development and avoided costs of Public Service Company of Oklahoma.

Prefiled Testimony August 16, 2004

Civil Litigation
Maine Superior Court
Docket No. CV-01-24

Central Maine Power Co.

Factual and expert witness in litigation regarding pricing provisions of a purchased power agreement between Central Maine Power and Benton Falls Associates.

Deposition Testimony April 28, 2004

Oklahoma Corporation Commission

Oklahoma Attorney General

Testimony regarding power contract proposal for PowerSmith Cogeneration and avoided cost analysis of Oklahoma Gas & Electric Company.

Prefiled Testimony February 18, 2004
Rebuttal Testimony March 16, 2004
Oral Testimony August 4, 2004

Nevada Public Utilities Commission

Nevada Attorney General Bureau of Consumer Protection

Testimony regarding the Nevada Power Company's Integrated Resource Plan and associated financial plan.

Prefiled Testimony September 19, 2003
Oral Testimony October 15, 2003

Massachusetts Energy Facilities Siting Council Docket No. EFSB-02-2	Cape Wind	<p>Testimony regarding economic, reliability and environmental need for power in the Massachusetts and New England power markets regarding the need for new wind power facility.</p> <p>Prefiled Testimony February 14, 2003 Oral Testimony August 6&7, 2003</p>
Maine State Board of Property Tax Review	United American Hydro	<p>Testimony regarding the Maine and New England power market prices pertaining to the valuation of a hydro-electric power facility in Winslow, Maine.</p> <p>Oral Testimony June 18, 2003</p>
Nevada Public Utilities Commission Docket No. 03-1014	Nevada Attorney General Bureau of Consumer Protection	<p>Testimony regarding the prudence of Sierra Pacific Power Company in its purchased power expenses for the period December 2001 through November 2002.</p> <p>Prefiled Testimony April 25, 2003</p>
Oklahoma Corporation Commission Cause No. PUD 2002-038	Oklahoma Attorney General	<p>Testimony regarding a power contract proposal of Lawton Cogeneration and the pricing analysis of Public Service Company of Oklahoma.</p> <p>Prefiled Testimony December 16, 2002 Oral Testimony May 22, 2003</p>
Arkansas Public Service Commission	General Staff of the AK Public Service Comm.	<p>Testimony regarding the Development of Competition in Electric Markets and the Impact on Retail Consumers in Arkansas.</p> <p>Prefiled Testimony September 4, 2001</p>
Arkansas Public Service Commission	General Staff of the AK Public Service Comm.	<p>Testimony regarding the Development of Competition in Electric Markets and the Impact on Retail Consumers in Arkansas.</p> <p>Prefiled Testimony September 29, 2000</p>
Arkansas Public Service Commission	General Staff of the AK Public Service Comm.	<p>Testimony regarding the establishment of uniform Policies and guidelines for a Standard Service Package.</p> <p>Staff Proposal and Comments June 13, 2000 Reply Comments July 21, 2000 Sur reply Comments August 2, 2000 Oral Testimony August 8, 2000 Petition for Rehearing Rebuttal Testimony November 15, 2000 Oral Testimony November 29, 2000</p>
Arkansas Public Service Commission	General Staff of the AK Public Service Comm.	<p>Testimony regarding the determination of the merits of declaring retail billing services competitive effective At the start of retail open access.</p> <p>Oral Testimony June 27, 2000 Prefiled Rebuttal Testimony June 23, 2000 Prefiled Testimony June 16, 2000 Oral Testimony May 10, 2000</p>

Arkansas Public Service Commission	General Staff of the AK Public Service Comm.	Testimony regarding the minimum filing requirements for market power studies to be filed by the Arkansas Electric utilities and affiliated retail companies. Oral Testimony June 1, 2000
Amer. Arb. Assoc. No. 50T 198 00197-98	Vermont Joint Owners	Testimony regarding economic damages resulting from alleged breach of a long-term purchase power agreement between Hydro-Quebec and Vermont utilities (VJO). Oral Testimony May 25, 2000 Prefiled Rebuttal Testimony February 10, 2000 Prefiled Testimony August 13, 1999
Rhode Island Energy Facilities Siting Board	Indeck-North Smithfield, L.L.C.	Testimony regarding economic, reliability and environmental need for power in the Rhode Island and New England power markets regarding the need for new, merchant power facility. Prefiled Testimony August 16, 1999 Oral Testimony August 17, 2000 Prefiled Testimony January 26, 2001 Oral Testimony March 23, 2001
Civil Litigation Maine Superior Court Docket No. CV-98-212	Central Maine Power Co.	Factual and expert witness in litigation regarding pricing provisions of a purchased power agreement between Central Maine Power and Regional Waste Systems. Deposition Testimony May 5, 1999
Connecticut Energy Facilities Siting Council Docket No. 190	PDC – El Paso Meriden LLC	Testimony regarding economic, reliability and environmental need for power in the Connecticut and New England power markets regarding the need for new, merchant power facility. Prefiled Testimony January 25, 1999
Rhode Island Energy Facilities Siting Council Docket No. SB-98-1	R. I. Hope Energy, L. P.	Testimony regarding economic, reliability and environmental need for power in the Massachusetts and New England power markets regarding the need for new, merchant power facility. Oral Testimony November 4, 1998 Prefiled Testimony October 30, 1998
Massachusetts Energy Facilities Siting Council Docket No. EFSB-91-101A	Cabot Power Corp.	Testimony regarding economic, reliability and environmental need for power in the Massachusetts and New England power markets regarding the need for new, merchant power facility. Oral Testimony May 27, 1998 Prefiled Testimony August 15, 1997
Massachusetts Energy Facilities Siting Council Docket No. EFSB-97-2	ANP Blackstone Energy	Testimony regarding economic, reliability and environmental need for power in the Massachusetts and New England power markets regarding the need for new, merchant power facility. Oral Testimony April 6, 1998 Prefiled Testimony January 23, 1998
Massachusetts Energy Facilities Siting Council Docket No. EFSB-97-1	ANP Bellingham	Testimony regarding economic, reliability and environmental need for power in the Massachusetts and New England power markets regarding the need for new, merchant power facility. Oral Testimony February 3, 1998 January 28, 1998

Rhode Island Energy Facilities Siting Board Docket No. SB-97-1	Tiverton Power Associates LP	Testimony regarding economic, reliability and environmental need for power in the Rhode Island and New England power markets regarding the need for new, merchant power facility. Oral Testimony October 15, 1997 Prefiled Testimony October 1, 1997
Maine Public Utilities Commission Docket No. 92-102	Central Maine Power	Testimony regarding CMP's avoided cost methods and practices pertaining to the prudence of power purchase contract decisions with regard to contract awards and contract management. Oral Testimony July 1993 Deposition Testimony February 25, 1993 March 1, 1993 Prefiled Rebuttal Testimony June 7, 1993 Prefiled Testimony June 15, 1992
Maine Public Utilities Commission Docket No. 92-315	Central Maine Power	Testimony regarding CMP's avoided cost methods and practices pertaining to the setting of long-term avoided costs, CMP's Energy Resource Plan, and the relationship of marginal costs of generation to embedded costs. Supplemental Prefiled Testimony April 20, 1993 Prefiled Testimony February 17, 1993
Maine Public Utilities Commission Docket No. 87-261 Docket No. 88-111	Central Maine Power	Testimony regarding CMP's avoided cost methods and practices pertaining to the setting of long-term avoided costs, CMP's Energy Resource Plan, and the proposal for a 900 MW power Contract with Hydro Quebec. Oral Testimony Summer 1988 Pefiled Testimony October 31, 1987

TAB 3B

John G. Athas

Principal Consultant and Treasurer

John Athas joined La Capra Associates in 2006, bringing nearly 30 years of diverse electric industry experience. He has substantial, hands-on skills having worked for an electric utility, a competitive retail electric services provider, a power technology manufacturer, and an energy industry consulting firm. Through extensive practical application, he has assumed leadership roles in market pricing and policy, resource planning, analysis of competitive wholesale and retail markets, financial and risk analysis, strategic planning, and contracts and transactions. With expertise in utility regulation, energy marketing and product development, energy policy, asset valuation, mergers and acquisitions, and corporate strategy, Mr. Athas has provided clients valuable insight from his unique blend of experience in strategy consulting, technical evaluations and energy market participation.

Mr. Athas holds an M.B.A. from the University of Connecticut, an M.S. in Mechanical Engineering from Rensselaer Polytechnic Institute, and a B.E. from Cooper Union.

PROFESSIONAL EXPERIENCE

Economic Development

- Developed special incentive packages of utility rate discounts and comprehensive energy efficiency investments for large customers in Business Retention and Economic Development circumstances. These packages were coordinated with and integrated into broad incentive packages developed by state and local economic development agencies.
- Provided expert testimony before the Nova Scotia Public Service Board regarding the appropriateness of special load retention tariffs for Nova Scotia Power Incorporated
- Managed NU's economic development and special contracting flexible rate tariffs in Connecticut and Massachusetts.
- Negotiated special contracts with NU's large customers in Massachusetts, Connecticut and New Hampshire.

Rates and Regulation

- Provided expert review and critique for Public Service Organization of Oklahoma's request for proposal for baseload generation in support of the Office of the Attorney General.
- Provided review and comment on the Philadelphia Electric Smart Metering Implementation Plan for the Pennsylvania Office of Consumer Advocate
- Drafted changes to proposed demand-side rules in Oklahoma for the Oklahoma Industrial Energy Consumers.
- Managed rates and cost-of-service functions for Northeast Utilities (NU).

Integrated Resource Planning

- Collaborating to review and critique the Connecticut utilities' 2010 IRP on behalf of the Connecticut Energy Advisory Board (CEAB), including extending analysis and modeling to 2030.

- Managing consultant leading IRP planning and related regulatory filings for various New England electric utilities and cooperatives, including Green Mountain Power, Washington Electric Cooperative (VT), Vermont Electric Cooperative, and Vermont Marble Power.
- Provided a critique of Public Service of Oklahoma's IRP and Oklahoma Gas & Electric Company's IRP, in response to their joint application to build a base load coal fired generating capacity, on behalf of the Oklahoma Attorney General's Office.
- Managed NU's resource planning function from the inception of Integrated Demand/Supply Planning (now IRP) through 1991.

Market Analysis

- Project manager and principal lead on analysis for Vermont Combined Heat and Power and Distributed Generation Potential Study in 2010 on behalf of Vermont's System Planning Committee.
- Provide principal leadership to the team responsible for the La Capra Associates' Electric Market Model, which is used to support the analysis for numerous client projects.
- Conducted scenario planning studies for all North America regional power markets (U.S. and Canada). Provided capacity requirements, resource adequacy assessment, and energy price outlooks.
- Conducted scenario planning studies for all North America regional power markets (U.S. and Canada). Provided capacity requirements, resource adequacy assessment, and energy price outlooks.
- Charged with the role of principal for power research and consulting for the Eastern Energy Service, providing insight into the interactions of electric and gas markets within the Eastern Interconnect.
- Led marketing, structuring and product development for Select Energy's retail energy commodity and energy services business.
- Directed market research regarding customer choice and customer satisfaction.
- Supervised market modeling activities for North America (U.S. and Canada) for Cambridge Energy Research Associates (CERA).
- Analyzed power prices and their impacts on clients in the evolving market structures for ISO New England (ISO-NE), New York Independent System Operator (NYISO) and the PJM Interconnection (PJM).
- Supported the development and marketing, while negotiating a power and energy services package to, major retail aggregations and affinity for Select Energy. This includes the largest Municipal Aggregation the Cape Light Compact for communities on Cape Cod and Martha's Vineyard.

Stakeholder Facilitation and Process

- Facilitated information exchange and consensus building between the utilities and stakeholders—for Connecticut's *first IRP since the 1980s*—including multiple generation owners, operators and developers; energy efficiency planners, regulatory oversight groups and public advocate organizations; environmental agency and environmental advocacy organizations, transmission owners and the regional transmission ISO; and consumers.
- In 2010, facilitated a greatly-expanded process during the subsequent Connecticut IRP to include nuclear power operators, developers, advocates and opposition groups, natural gas utilities and pipeline operators; energy security experts; and CHP developers, policymakers and commercial/industrial business.

Utility Planning

- Project Principal and Witness in the review of acquisition of generation resources in Arkansas (EAI –KGEN Hot Springs, AECC – Suez Hot Spring Plant).
- Managed strategic planning analyses for NU including the areas of competition, integrated resource planning (IRP), and utility strategic and organizational goal development.
- Led the team responsible for analysis and presentation materials for executive planning conferences, including utility diversification into energy services and merchant generation.
- Supervised generation planning for a large utility provided economic and financial analysis of power plant construction and capital additions and determined avoided costs.
- Developed a New England market entry business plan for Direct Energy's retail business.
- Advised the management team at Cape Light Compact on the merits of forming an Electric Cooperative.

Expert Witness

- Provided expert testimony on behalf of the Appalachian Voices, the Chesapeake Climate Action Network and the Virginia Sierra Club (collectively, "Environmental Respondants" in *Commonwealth of Virginia ex reL State Corporation Commission, In re: Virginia Electric and Power Company's Integrated Resource Plan filing pursuant to § 56-59 7 et s e_q0 . 4 the Code of Virginia*
- Provided expert testimony on behalf of the Small Business Advocate of Nova Scotia *NSPI-128-13 In the Matter of an Application by Nova Scotia Power Incorporated for Approval of its 2014 Annual Capital Expenditure Plan*
- Presented expert testimony on behalf of the Arkansas Public Service Commission (ASPC) General Staff in *Docket NO.13-033-U IN THE MATTER OF THE PETITION OF SOUTHWESTERN ELECTRIC POWER COMPANY FOR A DECLARATORY ORDER FINDING THAT CERTAIN RENEWABLE WIND ENERGY PURCHASE AGREEMENTS ARE PRUDENT, AND WIND ENERGY PURCHASE AGREEMENTS ARE ENERGY ONLY CONTRACTS ELIGIBLE FOR COST RECOVERY THROUGH THE ENERGY COST RECOVERY RIDER*
- Provided expert testimony on behalf of the Small Business Advocate of Nova Scotia in *NSPI-128-13 In the Matter of an Application by Nova Scotia Power Incorporated for Approval of Capital Expenditure for 2013 for South Canoe Wind Project - CI#42127 for \$93,091,536*
- Provided expert testimony on behalf of the Small Business Advocate of Nova Scotia *NSPI-128-13 In the Matter of an Application by Nova Scotia Power Incorporated for Approval of its 2013 Annual Capital Expenditure Plan*
- Presented expert testimony on behalf of the Arkansas Public Service Commission (ASPC) General Staff in *Docket NO.12-067-U In the Matter of the Application of Oklahoma Gas and Electric Company for an Oder Approving a Temporary Surcharge to Recover the Costs of a Renewable Wind Generation Facility*
- Presented expert testimony on behalf of the Arkansas Public Service Commission (ASPC) General Staff in *Docket NO.12-038-U In the Matter of Entergy Arkansas, Inc.'s Request for approval of certain wholesale base load capacity to serve EAI customers and a proposed rider recvoery mechanism for these and other capacity costs.*
- Presented expert testimony on behalf of the Citizen's Action Coalition of Indiana before the State of Indiana Utility Regulatory Commission. *In the Matter of the application of Indiana Michigan Power Company requesting from the Commission, 1) A Finding that the Life Cycle*

Management program for the Donald C. Cooke Nuclear Plant is Reasonable and Necessary, 2) Approving of Cost and Schedule, 3) Authorizing Recovery through a periodic Rate Adjustment Mechanism, 4) Granting I&M Authority to Defer Costs and 5) Grant I&M future Rate Relief as may be Necessary and Appropriate.

- Presented expert Public Service Commission regarding IRP and Existing Nuclear Capital Projects. *In the Matter of the application of Indiana Michigan Power Company for a certificate of necessity pursuant to MCL 460.6s and related accounting authorizations*
- Presented expert testimony on behalf of the Arkansas Public Service Commission (ASPC) General Staff in *Docket NO.12-012-U In the Matter of Arkansas Electric Cooperative Corporation for Approval of the Acquisition of the Hot Spring*
- Provided expert testimony on behalf of the Small Business Advocate of Nova Scotia in *Matter M04862 Application by Pacific West Commercial Corporation and NSPI for a Load Retention Rate*
- Provided expert testimony on behalf of the Small Business Advocate of Nova Scotia in *Matter M04175 Proposed Amendments to Nova Scotia Power Inc.'s Load Retention Tariff*
- Provided expert testimony on behalf of the Small Business Advocate of Nova Scotia in *Matter M04892 Main Computer Centre Upgrade*
- Presented expert testimony on behalf of the Arkansas Public Service Commission (ASPC) General Staff in *Docket NO.11-069-U In the Matter of Entergy Arkansas, Inc.'s Request for Approval of the Acquisition of the Hot Spring Plant to Serve its Retail Customers*
- Presented expert testimony on behalf of the Oklahoma Attorney General before the Oklahoma Corporation Commission regarding IRP and baseload coal RFPs. *(Causes Nos. PUD 200500516, 200600030, 200700012, 2006 through 2007.)*
- Presented expert testimony before the Connecticut Department of Public Utility Control (DPUC) for Select Energy in Connecticut regarding its retail licensing application in 2000.
- Testified on customer impacts, pricing levels and utility planning during various electric industry restructuring proceedings in Connecticut and Massachusetts.
- Presented expert testimony on numerous occasions before the Connecticut DPUC regarding special contract approvals.

EMPLOYMENT HISTORY

La Capra Associates, Inc. Boston, MA
Principal Consultant 2009 - Present
Managing Consultant 2006 - 2009

Direct Energy North America Stamford, CT
Independent Consultant 2005

Assignment – New England Market Entry Business Plan, Channel Management Plan Development

Northeastern US Markets

Developed a business plan outlining the potential market entry for the client into the New England power market.

Cambridge Energy Research Associates Cambridge, MA
Associate Director, North American Electric Power 2001 – February 2005
Eastern North American Energy Service Principal

Developed independent primary research on various aspects of power markets around the Eastern U.S. and Canada, primarily responsible for the Northeast and Midwest markets, including price outlooks for energy and “full requirements” electric power. Analyzed market structure, supply/demand balances, price caps, market clearing prices, capacity markets, and generation technologies.

Northeast Utilities Berlin, CT
Director, Retail Business Strategy - Select Energy 1997 – 2000
Managing Director, Marketing - Select Energy

Directed market strategy, market research, product development, product management, strategic alliance development, retail electric energy supply management and pricing strategy for Northeast Utilities’ unregulated retail energy service company, Select Energy, formed in 1997. Managed the activities of 31 professionals, including six managers. Negotiated a major retail supply agreement with the Massachusetts Municipal Association, which resulted in participation by 120 cities and towns.

Director, Market Pricing & Policy 1995 – 1997

Directed the work in all areas of pricing for Northeast Utilities and its operating companies: CL&P, WMECo, PSNH and HWPCo, with revenues totaling over \$3 billion. Three managerial units comprised the pricing organization, Cost of Service, Rates and Special Contracts. Led the development of proposals in unbundled rates prior to the restructuring of electric utility markets in Connecticut and Massachusetts. Responsible for developing utility discount rate and energy efficiency offerings for large customers in Business Retention and Economic Development circumstances, which were coordinated and packaged into state and local economic development agencies incentive packages.

Manager, Market Analysis 1990 – 1995

Led market planning and market research functions in developing strategies to prepare NU for the competitive business environment, including sales force program training and development.

Manager, Strategic Analysis & Long Term Resource Planning 1987 – 1990

Held various positions within the Capacity Planning Department 1981 – 1987

United Technologies Corporation Hartford, CT
Analytical Engineer – International Fuel Cells/Pratt & Whitney Aircraft 1977 – 1981

EDUCATION

University of Connecticut <i>Masters of Business Administration</i>	Storrs, CT 1987
Rensselaer Polytechnic Institute – HGC <i>M.S., Mechanical Engineering</i>	Troy, NY 1982
Cooper Union <i>B.E., Mechanical Engineering</i> <i>Elected to Pi Tau Sigma – Mechanical Engineering Honorary Fraternity</i>	New York, NY 1977

PROFESSIONAL ACHIEVEMENTS

- Recipient, **1998 Northeast Utilities Chairman's Award** for innovation in developing offerings and negotiating with large aggregation groups
- Recipient, **1996 Northeast Utilities Chairman's Award** and **1996 Retail Business Group's President's Award** for the role in leading efforts in the Retail Competition Pilot in New Hampshire
- Recipient, **Northeast Utilities 1994 Retail Business Group's President's Award** for developing and successfully implementing special utility contracting efforts
- **Licensed Professional Engineer** - State of Connecticut
- Past appointee to the **Electric Power Research Institute (EPRI)** Industrial Business Unit Council
- Participation in the Energy Committee of the Manufacturer's Alliance of Connecticut, Inc.
- Participation in various **NEPOOL** Committees
- Member of the **Association of Energy Engineers**
- Author of the paper '**Fulfilling on the Promises of Deregulation**'
- Speaking experience includes:
 - 2012, Speaker at EUCI *Resource Planning: A Practitioner's Toolkit for Current Issues*
 - U.S. Chamber Of Commerce Satellite Seminar Series on Deregulation
 - Massachusetts HEFA sponsored conference on *Organizing Energy Buying Groups*
 - INFOCAST Seminars on *Negotiating Power Contracts*
 - Interview on a nationally syndicated news show, *First Business*, on energy deregulation

TAB 3C

Mary Neal

Consultant

Mary Neal, one of our Consultants, joined La Capra Associates in the summer of 2009, bringing energy modeling and energy policy research experience. Her work at La Capra Associates includes analysis of electric utility plans for the acquisition and building of new resources, as well as capital upgrades to existing units. Ms. Neal has also provided extensive analysis of electric utility cost allocation models. Other important tasks include electric and gas utility rate design and electric utility integrated resource planning. Currently, Ms. Neal is the lead modeler for La Capra Associates' market analytics team responsible for maintaining its AURORA_{xmp} Northeast electric market model. Prior to joining the firm, she designed gas turbine combustion systems for a gas turbine manufacturer. Ms. Neal holds a B.S. degree in Mechanical Engineering from the University of California, Davis and graduated with an M.A. in Energy and Environmental Analysis from Boston University in early 2010.

PROFESSIONAL EXPERIENCE

Electric Utility Planning

- Testified on behalf of the Nova Scotia Small Business Advocate as part of a proceeding to review Nova Scotia Power Inc.'s 2012 Annual Capital Expenditure Plan and on behalf of the Citizens Utility Board of Wisconsin as part of a 2012 Madison Gas and Electric rate case proceeding.
- Performs and reviews utility economic evaluations of investment decisions regarding new capacity, capacity acquisitions, and retrofits to existing units.
- Assistant project manager for a review of Entergy Arkansas's strategic planning for post-System Agreement operation on behalf of the General Staff of the Arkansas Public Service Commission.
- Key contributor to the research and writing efforts in creation of the 2010 Comprehensive Plan for the Procurement of Energy Resources for the state of Connecticut, including authoring technical papers on combined heat and power (CHP), nuclear power, and emerging technologies.
- Evaluates projections of fuel consumption and costs using market simulation tools.
- Provides research for utility load and sales projections, including load reductions from demand response and energy efficiency as well as load from electric vehicles.

Market Modeling

- Lead modeler for the team that maintains La Capra Associates' AURORA_{xmp} electricity market model.
- Developed CHP technology and size optimization model.
- Analyzes and develops utility simulations of energy market operations, including economic dispatch using both deterministic and stochastic methods.
- Understands details of energy markets in ISO-NE, NYISO, PJM, SPP and MISO.
- Possesses a working knowledge of other energy market models, including PROMOD and EGEAS.

Rates

- Provided analysis of electric and gas utility allocated COS models and/or rate design in regulatory proceedings in five states.

- Assisted in development of an electronic COS model for Vermont electric municipals and cooperatives.
- Performs econometric and other analyses of utility capital investment to calculate marginal cost.

EMPLOYMENT HISTORY

La Capra Associates, Inc. Boston, MA
Consultant June 2010 – Present
Analyst June 2009 – May 2010

Cambridge Housing Authority Cambridge, MA
Energy Analyst (Internship) September 2008 – May 2009

- Performed time series econometric and engineering analyses of energy use in public housing projects to reduce consumption and cost

Solar Turbines Inc. San Diego, CA
Engineer August 2008
Staff Engineer April 2006 – August 2008
Associate Engineer November 2005 – April 2006

- Designed dry low-emission gas turbine combustion systems for Mars SoLoNOx engines.
- Led the SoLoNOx combustion liner implementation team.
- Designed fuel injectors for landfill gas fuel and aftermarket retrofit applications.

EDUCATION

Boston University Boston, MA
M.A., Energy and Environmental Analysis 2010

University of California Davis Davis, CA
B.S., Mechanical Engineering 2005

University of Canterbury Christchurch, New Zealand
Energy and Environmental Engineering Study Abroad Program Summer 2004

PROFESSIONAL TRAINING & SKILLS

Time Series Econometrics, Environmental System Modeling, Six Sigma Green Belt, Microsoft Excel VBA, SQL, MATLAB, MathCAD, ProE, Minitab, ArcGIS, RATS

HONORS AND AWARDS

University of California Davis

- College of Engineering, *M.S. Ghausi Medal*
- Mechanical Engineering, *Departmental Citation of Excellence*

TAB 4A

GLENN DAVIDSON, P.E.
SENIOR PROJECT MANAGER

YEARS OF EXPERIENCE

49

EDUCATION

- > M.S., Electrical Engineering, Newark College of Engineering, 1969
- > B.S., Electrical Engineering, Newark College of Engineering, 1964
- > Public Utility Executive Program, University of Michigan

AREAS OF EXPERTISE

- > Project management
- > Transmission line design
- > Transmission line and substation routing and siting
- > Preparation of transmission line design criteria
- > Testimony before local and state boards and commissions

LICENSING

- > P.E., Electrical: Colorado
- > P.E., Electrical: New Jersey

SPECIAL TRAINING

- > Workshop for the Electric Utility Industry, Northeastern University

AFFILIATIONS

- > Institute of Electrical and Electronics Engineers, Senior Member
- > Rocky Mountain Electrical League, Transmission Committee

PUBLICATIONS

- > "Reasons for Limits on Bare Overhead Conductors," Symposium on Thermal Ratings of Overhead Transmission Conductors, July 1996.
- > "Transmission Enhancements, the Key to Open Access Success," Restructuring Electric Transmission Conference, Sept. 1995.
- > "New Transmission Lines - Do We Really Need Them?" Strategic Utility Planning Conference, June 1992 (with J. Baylor).

EXPERIENCE SUMMARY

Mr. Davidson's career in the power industry spans more than four decades. He brings senior-level expertise to the design of overhead and underground transmission and distribution systems, with experience including routing, design, and project management of substations and lines at voltages up through 500 kV. Prior to becoming a consultant, he worked for 17 years for Jersey Central Power and Light Company in various capacities. He has been responsible for plans to replace and upgrade aging systems and for feasibility studies to determine economic advantages and life extension options for a number of electric utilities. He has testified before state and local boards and commissions in support of transmission line routing studies and has participated in public information workshops for transmission line projects.

Mr. Davidson has a specialty in conductor rating. In 1968, he was appointed to the Pennsylvania-New Jersey-Maryland Interconnection (PJM) Conductor Rating Task Force, which was charged with developing a method for rating bare overhead transmission conductors for Interconnection-wide use. In 1969, the Task Force developed a procedure for calculating Short Time Ratings (covering periods of time from 15 minutes to 30 minutes). This procedure was adopted by PJM and was presented to the industry in a 1969 IEEE paper. Following this, Mr. Davidson was made chairman of the Task Force, which developed a steady state rating procedure for PJM. This was also adopted by the Interconnection and was the subject of a 1974 IEEE paper. The Task Force went on to publish ratings for tubular bus for substations, and a unique ambient adjusted rating system that allowed the system operators to enter key daily weather parameters to customize ratings for a particular day's daylight or night period. All the PJM rating methods included a loss-of-strength calculation to ensure that there was no excessive loss of strength due to annealing at the higher ratings calculated by the programs.

Mr. Davidson was a member and chairman of the IEEE Working Group on Thermal Aspects of Bare Overhead Conductors, which published and is responsible for maintaining IEEE Standard 738, "IEEE Standard for Calculating the Current-Temperature Relationships of Bare Overhead Conductors." This standard is consistent with the PJM Task Force model.

Mr. Davidson was the Chairman of the IEEE Towers, Poles, and Conductors Subcommittee (now renamed the overhead Lines Subcommittee).

KeySpan Corporation, LIPA Wind Study and Line Rating Analysis, New York

Project Manager responsible for the management of an extensive wind study for KeySpan Energy/LIPA on Long Island. The project involved placing 10 new high precision meteorological monitoring stations at selected locations on Long Island, gathering historical weather data from available records at

- > "Transmission Limits, Real and Imagined," Transmission and Wheeling Conference, Dec. 1990.
- > "Economics of Underground Distribution (R&D Project UG-2)," TVPPA, April 1987.
- > "Considerations in the Application of Advanced Conductor Rating Concepts," Proceedings of Georgia Power/EPRl Real-Time Rating Seminars, June 1986.
- > "Electric Utility Mapping and Data Management: the State of the Art," Presented to IEEE Rural Electric Power Conference, April 1985.
- > "Distribution Systems Efficiency Guidebook," Prepared for Bonneville Power Administration, 1982.
- > "500 kV Steel Pole H-Frames - Economic Choice for Jersey Central Power and Light Co." Presented at Meyer Steel Pole Seminar, 1981.
- > "PJM Conductor Ratings. Presented to PEA Systems Operation Committee," February 1976.
- > "Weather Variables Can Stretch Conductor Capabilities," EL&P, June 1976, p. 37, 38.
- > "Thermal Ratings for Bare Overhead Conductors," IEEE Winter Power Meeting, February 1974, Paper C 74 003-0.
- > "Short Time Thermal Ratings for Bare Overhead Conductors," Trans. IEEE, March 1969, Vol. PAS-88, No. 3, p. 194.

airports (JFK, LaGuardia, Islip, Newark, White Plains) and correlating the historic records with the new high precision records. Records were gathered for a one year period (and are ongoing as an add-on study). The wind study was used to determine and quantify the frequency of low velocity wind speeds. Data was obtained in open, moderately sheltered, and heavily sheltered locations, and above and below tree top levels for lies in wooded areas with wire elevations lower than tree top elevation. A Computational Fluid Dynamics (CFD) model was used to determine weather conditions at locations remote from our monitoring sites. We worked with KeySpan to develop a seasonal breakdown and a diurnal breakdown to provide 5 rating tables for use by their system operators. The weather data and line loading data were combined into a Monte Carlo simulation to calculate ratings on a Percent Assurance level. KeySpan selected a 95% confidence level rating algorithm. Our report provided ratings for a variety of confidence levels, for KeySpan's review and selection. The project was a teaming effort with EDM International and CPP Wind.

Morenci Water and Electric Company, Morenci 345 kV Interconnection, Arizona

Project Engineer and Transmission Line Project Engineer responsible for routing, design and development of electrical design criteria. POWER provided engineering design and support services to assist Morenci Water and Electric in a major project to increase reliability and transmission capacity to the Phelps Dodge Morenci Copper Mine. The project consisted of 11 miles of 345 kV steel H-frame line, five miles of 230 kV steel pole line, the new Frisco 230/46 kV ring bus substation, the new 345/230 kV 400 MVA Copper Verde Substation, and upgrades to the existing 230/46 kV Phelps Dodge Morenci Substation and 345 kV TEP Phil Young Switchstation.

Prysmian Cables & Systems, Snowmass 115 kV Underground Project, Colorado

Principal for a project to design 3.1 miles of double circuit XLPE 115 kV underground cable system for Holy Cross Energy. Responsible for client interface and design oversight. POWER was responsible for conducting an underground facility investigation, route selection, permitting support, duct bank and manhole design, jack and bore design, termination structure design and procurement, development of erosion control/stormwater management plan, specifications and drawings, interface with GIS substation, construction support, as well as the design and material procurement of two overhead river crossing spans to connect into an existing 115 kV transmission line.

Southern California Edison, Distribution Circuit Cost Estimates, California

Project Engineer responsible for engineering review. POWER provided construction cost estimates for upgrades to distribution circuits (both overhead and underground) in and around the Los Angeles and Riverside areas. POWER provided the estimates to allow SCE to conduct an internal comparison to assess engineering and construction costs. SCE developed internal costs and asked POWER to estimate prices for the same work.

American Transmission Company, Rockdale to Middleton 345 kV

Overhead & Underground Line Study, Wisconsin

Provided routing assistance in selecting potential routes for a 345 kV transmission line. Participated in field evaluations of routes, prepared cost estimates, coordinated with environmental, lands, construction, and public relations staff. Participated in two series of open houses to provide overhead line engineering and routing answers to the public's questions. Addressed EMF and health effects questions from the public. POWER supported ATC during the regulatory approval process for a proposed new 345 kV transmission line. Scope included analyzing alternative potential route segments and overall routes, preparing preliminary designs, and developing cost estimates for overhead and underground alternatives. POWER developed the engineering sections of the CPCN document and prepared studies and reports addressing structure reliability, induced voltages in distribution lines, construction along major highways, and electromagnetic field and interference calculations.

City of Tallahassee, Eastern 115 kV Underground Project, Florida

Project Manager responsible for overall project coordination, budget, scheduling and client contact. POWER performed design and permitting for two miles of single and double circuit 115 kV XLPE underground transmission line. POWER was responsible for all facets of the design including: survey, permitting, geotechnical and geothermal investigations, underground facility investigation, route selection, duct bank and manhole design, jack and bore design, substation termination structure and riser pole design, development of erosion control/storm water management plan, construction specifications and drawings, contractor selection and construction support.

Greenlight Energy, Cedar Creek Wind Farm, Colorado

Project Manager responsible for owner's engineer services for the transmission and substation facilities of the 300 MW wind farm located in northeast Colorado. Prepared design-build specifications for the line and interconnection switchyard, assisted in bid evaluation, provided design review and periodic site visits to observe construction and budget. The 230 kV transmission line is 70 miles long and uses concrete/steel hybrid structures.

Kauai Island Utility Cooperative, Lydgate 69 kV GIS Substation, Hawaii

Project Manager for design of a new 69 kV 4-position ring bus GIS substation on the island of Kauai. The indoor substation has two 69 kV cable connected lines, two transformers, and two 12 kV switched capacitor banks. The station also includes indoor 12 kV metal clad switchgear. POWER designed the building, assisted in the extensive permitting process, developed the GIS specification and bid documents, evaluated bids and designed the balance of plant, which included outdoor physical design, protection and control schematics and wiring diagrams. POWER designed a new 69 kV 4-position ring bus GIS substation on the island of Kauai. The substation has two 69 kV cable connected lines, two transformers, and two 12 kV switched capacitor banks.

Western Area Power Administration, General Services Agreement, Multiple Locations

Project Manager responsible for multiple projects over a five-year timeframe. POWER provided planning, design, construction and maintenance services for high voltage power transmission and distribution systems and facilities. Services included engineering studies, archeological, general, geological and geotechnical, site investigations, surveying, civil and electrical design and analysis, as-built drawings, design and specifications preparation for construction, materials testing and inspection and construction management.

PacifiCorp, 90th South to Camp Williams 345 kV Transmission Line, Utah

Lead Engineer responsible for review of EPC contractor submittals and RFIs. As Owner's Engineer, POWER supported the design of a new 10.7 mile double circuit 345 kV transmission line from 90th South Substation to Camp Williams Substation, and modifications to the substations to terminate the new lines. Responsibilities included preliminary engineering to support line permitting and expansion of 90th South Substation, aerial and ground survey, and geotechnical investigations. POWER prepared a preliminary PLS-CADD model for the line, preliminary substation drawings (30% design level), and EPC technical specifications.

Xcel Energy Services, Xcel Buffalo Ridge Incremental Generation Outlet (BRIGO) Projects, Multiple Locations

Project Manager responsible for general supervision of the design effort, organizing and staffing the projects, and overseeing budget and schedule performance of our project team. The BRIGO projects included engineering, design and construction support for upgrades of approximately 28 miles upgrades of transmission lines located between five different transmission substations. These projects included work at 115 kV and 345 kV.

Xcel Energy Services, Chisago - Apple River Reliability Improvement Projects, Multiple Locations

Project Manager responsible for general supervision of the design effort, organizing and staffing the projects, and overseeing budget and schedule performance of our project team. The Chisago-Apple River Reliability Improvement projects consisted of several transmission line upgrades designed to strengthen the client's transmission system. This included approximately 12 miles of new 115 kV overhead transmission line, one mile of 69 kV rebuild, and a combined 1.5 miles of 161 kV overhead and 2.5 miles of 161 kV underground line.

Tri-State Generation and Transmission Association, Inspection and Engineering Services, Colorado

Project Manager for a general services agreement for work throughout the Tri-State service area. Under a long-term services contract, POWER provided inspection and engineering services for projects in Colorado, Wyoming and New Mexico. POWER supplied inspectors for numerous transmission line and substation construction projects. Engineering projects included structural design for the upgrade of a 69 kV substation to 115 kV

and design of a new substation take-off structure.

PacifiCorp, Transmission Line Standards, Phase I and II, Oregon

Senior Project Engineer responsible for performing a review of PacifiCorp transmission standards with the goal of improving the clarity and functionality of the documents. PacifiCorp embarked on a review of its transmission line standards with a two-fold goal: 1) verify standards accurately reflect current industry standards and references and 2) remove language ambiguity to prevent misinterpretations of PacifiCorp standards by external entities (i.e., contractors). POWER was engaged to assist PacifiCorp's engineering staff to review, update and/or develop all transmission standards, 438 standards in total.

Xcel Energy Services, Smoky Hill 230/345 kV Yard Expansion, Colorado

Project Manager responsible for preliminary proposals and scope of work development, schedule creation and maintenance, and general day-to-day management of the design process to ensure timely submittals were made within the definition of the project. The project consisted of the design of a 345/230 kV ring bus substation arranged for an ultimate breaker-and-a-half configuration on land adjacent to Xcel's existing Smoky Hill 230 kV Substation. It also covered modifications to the existing substation to accommodate two transformer feeds from the new 345 kV yard. For the new 345 kV yard and the new 230 kV equipment, POWER provided complete civil and electrical design, with the exception of grading and drainage.

San Diego Gas and Electric, Transmission Engineering - Specification Review & Structural Standards Development, California

Senior Project Engineer responsible for performing a review of SDG&E specifications and standards and supervising engineers providing work product for the project. POWER is currently working with the SDG&E transmission engineering staff to review approximately 46 Engineering Specifications for conformance with best industry practice based on POWER's wide-spread experience, as well as checking for inclusion of up-to-date standards and references. Additionally, POWER is creating approximately 75 Standard Structural Models for PLS Cadd and PLS Pole application software that implements material management capabilities via the PLS Cadd parts file (.prt file) within the structure files.

Austin Energy, General Services Agreement 2003-2007, Texas

Project Manager for a contract to provide engineering services for transmission and substation projects. During the four years that the GSA was in place, POWER completed 57 separate tasks including substations, surveys, studies, architecture, and relaying. POWER had extensive involvement by a team of MBE/WBE subconsultants and far exceeded the MBE/WBE goals of the City. Tasks included: on-site project management, relay system design, architecture, surveying, SPCC plan preparation, structural analysis, insulator inspection and assessment; on-site relay technicians, soil resistivity measurements, substation reliability assessments, CAD drafting, overhead/underground comparisons and estimates, EMF modeling and

analysis using SES CDEGS software, equipment failure analysis, and easement and right of way determination.

Western Area Power Administration, Yuma Area Parker-Davis System Study, Arizona

Project Manager for the study of the transmission system power quality for the Yuma, Arizona, area. A large portion of the project consisted of installation of 21 power quality monitors at various substations in the Yuma area for data collection over a six-week period. This data was analyzed to determine the actual performance of the system. A computer model of the various utility transmission systems was developed and added to the Western Systems Coordinating Council database for simulation of load flow and short circuit analyses to predict response of the system to various system configurations and disturbances. The findings and recommendations were presented to the numerous electric utilities and irrigation districts in the area.

Calthness Energy, Buck Boulevard 230 kV Switchyard, California

Project Manager for oversight of the design of a new breaker-and-a-half switchyard to support a new merchant generation plant. Also responsible for management of the design team and budget, and coordinated procurement services for long-lead equipment. The new switchyard connects the generation plant to the Mead-Phoenix 500 kV transmission line. POWER was responsible for design review and schedule and budget coordination with the owner and Western Area Power Administration. POWER also provided procurement services for long-lead equipment.

PPL Global, Griffith Energy Project, Arizona

Project Manager responsible for overall coordination of the budget, schedule, design, and material procurement activities to meet the required energization date for the transmission lines and substations and allow plant start-up and commissioning and commercial operation. POWER provided program management for this project that involved the design of interconnection structures associated with a gas-fired combined cycle power plant. In addition, POWER provided a host of engineering services including detailed design for the new 230 kV Griffith Switchyard, design of a new 230 kV/69 kV transmission line, procurement services and construction services. POWER delivered this large and complex project under budget and ahead of schedule.

Xcel Energy Services, Capitol Hill-Harrison 230 kV XLPE, Colorado

Principal responsible for client interface and oversight for engineering services for an underground line to connect the Capitol Hill and Harrison substations in downtown Denver. The line is two miles of 230 kV XLPE in a concrete-encased duct bank under city streets. The design included three manholes for splicing and a pull-through manhole to allow the circuit to be extended in the future. POWER provided design criteria and parameters, underground facilities location investigation, survey and thermal evaluations. We provided the cable system design, construction drawings and specifications.

Caithness Energy, Big Sandy 500 kV Switchyard, Arizona

Project Manager for oversight of the design of a new 500 kV breaker-and-a-half substation to support a new merchant generation plant. The plant is intended to supply power to the Mead-Phoenix 500 kV transmission line through the new substation. POWER was responsible for design review and schedule and budget coordination with the owner and Western Area Power Administration. POWER also provided procurement services for long-lead equipment.

Caithness Energy, Blythe Energy 230 kV Switchyard, California

Project Manager providing owner's engineering services for a project to add a new 230 kV switchyard to support a new merchant generation plant. The plant is connected to the Western Area Power Administration, Southern California Edison and Imperial Irrigation District 161/230 kV systems through the new breaker and a half switchyard. The project also involved significant transmission line rearrangements. POWER was responsible for design review, schedule, budget coordination and procurement of long lead equipment.

PPL Global, Sundance 230 kV Switchyard, Arizona

Project Manager responsible for design review and material procurement for a new 230 kV switchyard to support a new merchant peaking plant. Responsible for schedule and budget oversight and procurement of material. As owner's engineer, POWER was responsible for design of a 230 kV collector bus system and design review and long-lead material procurement for a new 230 kV switchyard to support a new merchant peaking plant. The plant is connected to the Western Area Power Administration transmission system through a ring bus (expandable to a breaker and a half) switchyard. New 230 kV lines were extended to the switchyard and a new fiber optic communication system was installed on the new lines and retrofitted to several existing lines. POWER was also responsible for schedule and budget oversight.

NV Energy, 500 kV Harry Allen-Mead EA, Nevada

As an in-house transmission line consultant, assisted Nevada Power in the route selection and conceptual design of the Harry Allen to Mead 500 kV line. Coordinated with NPC's engineering, right of way, construction, and project management departments. Coordinated an interconnection in the Mead substation with Western Area Power Administration. A siting study to identify alternative routes was completed initially and the EA was completed with BLM as the lead federal agency and Western Area Power Administration as a cooperating agency. POWER also prepared a plan of development for construction, operations, mitigation and monitoring procedures.

Xcel Energy Services, General Services Agreement, Multiple States

Project Manager on a general services agreement to provide transmission line design and related services. POWER provided transmission line design and related services for Xcel Energy Services to refurbish and expand its

Midwest properties under a three-year general services contract. Services included program management, project management, project development, engineering, design, and owner's engineer assistance on line facilities ranging from 34.5 kV to 500 kV. POWER developed complete project plans that include scope development, cost estimating, outage plans, scheduling, and development of deliverables. Projects completed under the contracts include new line design, upgrades, re-ratings, restorations, structure replacements, structural analysis (wood, tubular and lattice) and underground transmission design.

EPRI, Corona and Thermal Models of Overhead Conductors Operating at High Temperatures

Technical expert selected by EPRI to participate in a research and development project to determine if the heat transfer equations used to rate conductors operating at temperatures around 100°C are applicable for rating HTLS conductors operating at temperatures in excess of 200°C. This high conductor temperature will affect the properties of the air film that is responsible for convected heat transfer.

Griffith Energy Project, Western Davis-Prescott 230 kV Line Upgrade, Arizona

Program Manager for a major transmission system upgrade to support a new merchant plant 600 MW generating station near Kingman, Arizona. As part of this project, the Western Davis-Prescott 230 kV line was upgraded with a special Trap-wire ACSS conductor to provide increased capacity through higher temperature ratings while minimizing the need for replacing or extending the existing structures.

Idaho National Engineering Laboratory ADSS System, Idaho

Project Manager/Project Engineer for the addition of an ADSS to a 66 mile long transmission line and a 4 mile long distribution line. The ADSS was added to existing structures which were checked for Grade B strength requirements and NESC Heavy loading. Placement of the ADSS on the long span transmission line had to be carefully selected to coordinate the bare sag and ice loaded sag with the bare and ice loaded 115 kV conductors. Worked closely with OFS, the ADSS manufacturer to select a suitable tension to allow the proper sag coordination.

City of Mesa, University Drive 69 kV Line, Arizona

Designed a replacement 69 kV line for higher strength and reliability. Mesa, Arizona, is subject to downburst winds that have damaged the line several times in recent years. Developed a downburst model to determine a wind force for design, designed a line to withstand the expected winds for NESC Grade B strength requirements, and specified containment structures periodically along the line to contain damage, if it occurs.

New Century Energies, 69/13.8 kV Mosca Substation, Colorado

Project Manager for the design of the new 69/13.8 kV Mosca Substation. The project included design for three 69kV feeders, disconnect switches, breakers, two transformers and reclosers.

New Century Energies, Dillon Substation Structural Evaluation, Colorado

Project Manager for an evaluation of a distribution structure that was settling in poor soils at NCE's Dillon Substation. The structure was experiencing differential settlement, with one side settling at a higher rate than the other. POWER was responsible for developing options for remedying the problem.

Turlock Irrigation District, Tuolumne-Hilmar 115 kV Transmission Loop Project, California

Project Manager responsible for the design of a 115 kV transmission loop to allow TID to extend its 115kV loop to reinforce the southern part of its system. The work included an economic comparison resulting in the selection of light duty steel poles of weathering steel for the line. The project included construction of approximately 22 miles of single steel pole, overhead, 115 kV, transmission line, underbuilt with 69 kV and 12 kV distribution circuits. The design included the selection and rating of conductors for the 115 kV and 69 kV systems to carry the normal and emergency load for the system. The line was designed for several 12 kV crossings and three 115 kV crossings. The project required coordination of structure locations to suit landowner requirements. Built in two phases, the line connects two existing and one new substations. This phased project is being built principally on private easements adjacent to public roads, including highway and canal crossings. The 115 kV transmission loop is the backbone of TID's electrical system.

Turlock Irrigation Dist., Walnut-Hilmar 115 kV Transmission Project, California

Project Manager responsible for the design of an eight-mile 115 kV transmission line with 12 kV underbuild. This new transmission line completes an expansion of Turlock Irrigation District's system. The line uses single wood tangent poles and single steel angle poles set on drilled pier foundations. The line follows the Cal-Trans right of way, which necessitated special construction stipulations. It also required railroad crossing permits.

MidAmerican Energy, 345 & 161 kV Loop Project Substations, Iowa

As Project Manager, Mr. Davidson was responsible for the design of two 345 kV switching stations, one 161 kV switching station, and a 345/161 kV substation. These stations are part of a 345 kV loop around Des Moines. Responsibilities included physical and electrical design. Conducted siting studies to recommend a location. Testified before the IUB in support of the sites.

Western Area Power Administration, Open-End Substation Engineering Services, Western U.S.

Project Manager responsible for design services for Western Area Power Administration substations in the western United States. Projects included relay, control, outdoor electrical, civil/structural, and other related services. Projects included new substations and additions or modifications to existing

substations. A total of sixteen major projects and six minor projects were completed. Included in the projects was the replacement of 26-230 kV circuit breakers, and their control systems at Mead Substation.

PacifiCorp, Rawlins 230 kV Switchrack, Wyoming

Project Manager responsible for siting and design of a new 230 kV switching station. The switching station was designed to be converted to a 230 kV ring bus design with three 230kV line positions and two 230/34.5 kV transformers. The station was located under an existing 230 kV line. The project had a tight schedule to provide service to a new industrial customer.

Kauai Electric Company, Standard 69 kV Substation, Hawaii

Project Manager responsible for developing a standard 69/12.5 kV substation for use at various sites on the island. Developed standard structures, design and construction details, relay and control schemes, and site layouts. The drawings and specifications are intended to be used for up to six future substations. The design is for up to two 69 kV lines and up to six 12.5 kV circuits.

Western Area Power Administration, Replacement Lives Analysis, Western U.S.

As Transmission Specialist, developed recommendations for transmission line and substation major property unit life expectancies. Interviewed operations and construction personnel to incorporate recent trends in the analysis.

MidAmerican Energy, Des Moines 345 kV Loop, Iowa

Project Manager responsible for routing and design of a 35-mile 345 kV line to complete a loop around Des Moines, and three 345/161 kV substations. Selected a 400-square-mile study area, identified potential corridors, established environmental constraints and weightings. Analyzed multiple structure concepts for environmental and economic impact. Testified before the Iowa Utility Board on EMF issues and to support design and routing. The IUB commended MidAmerican Energy on the design and routing process.

PREVIOUS WORK HISTORY

Pennsylvania New Jersey Maryland Interconnection (PJM) Conductor Rating Task Force

Chairman of the PJM Conductor Rating Task Force that developed steady state, short-time, and ambient adjusted conductor and bus ratings for the PJM Interconnection. This was a multi-company task force. The project was initiated by the PJM System Operations Committee, and the study was closely coordinated with the requirements of the System Operators. The study included consideration of sags and clearances and loss of strength. Using simulations of conductor lifetime operation, the loss of strength was found to be lower than 10% over a conductor's life. Conductor temperatures for ACSR up to 180 degrees C were included in the reports. Several IEEE papers were produced out of the results of the study.

City of Walsenburg, Distribution System Design, Colorado

Project Manager responsible for the design of a 22 kV line and two distribution circuits to integrate a new substation into the City's system. Circuits were reconfigured to divide the City into two substation zones to improve reliability, voltage regulation, and reduce losses.

Maui Electric Company, Kealahou 69 kV Substation, Hawaii

Project Manager responsible for the permitting, conceptual design, detailed design, and preparation of bills of material. Extensive grading and storm water runoff planning was necessary.

Dayton Power & Light Company, Salem - West Milton 69 kV Rebuild, Ohio

Project Manager responsible for the design of a new steel pole line to replace an existing lattice tower line located in a rapidly growing residential area. Structures consisted of light duty steel poles with self-supporting steel poles used at angles.

Dayton Power & Light Company, 69 kV and 345 kV Priority Wash-Out Remediation, Ohio

Project Manager responsible for survey, design and material specification for the replacement of five structures located on river banks that were in danger of erosion. Two projects were 345 kV and three were 69 kV. Wood poles and steel poles were used. Provisions were made for future river bank scour on a 345 kV single steel pole.

Provincial Electricity Authority, Long Range Planning Study, Thailand

As Senior Transmission Line Specialist, reviewed the design and construction practices of the Authority. Spent five weeks observing construction, interviewing engineers, and evaluating design practices. Prepared a report recommending changes and revisions in the design and construction practices. Assisted in preparation of system planning report for new lines and substations.

Dayton Power & Light Company, Lewisburg 69 kV Tap Line, Ohio

Project Manager responsible for the design of a new 69kV line to provide a second feed to the Lewisburg Substation. Wood and steel poles were used.

ING Bank, Independent Engineer's Services, Argentina

As Senior Utility Specialist, inspected the substation and distribution facilities of ESEBA in the Buenos Aires Province to provide a condition assessment for a privatization financing. Evaluated substation condition, distribution system condition, staffing plans, loss reduction plans, and fleet requirements for the privatized enterprises (EDEN & EDES).

Dayton Power & Light, Trebein - Yellow Springs 69 kV Rebuild,

Ohio

Project Manager responsible for the design of a new nine-mile 69 kV line to replace an existing 70-year-old line. The line used DP&L's transmission line standard construction.

Dayton Power & Light Company, Kings Creek - Marysville 69 kV Line Evaluation and Assessment Study, Ohio

Project Manager responsible for the inspection and assessment of options for the replacement of this 21-mile line that had a very poor lightning and galloping conductor history. Prepared budgets and capital cost expenditure schedules.

Houston Lighting and Power Company, Dow Velasco - P.H. Robinson and W.A. Parish - Dow Velasco 345 kV Lines, Texas

Project Manager responsible for the project to inspect 511 structures on 112 miles of line to recommend maintenance work. Provided input on fence and gate locations, property restrictions, and right of way drainage culverts into HL&P's maintenance program.

American Samoa Power Authority, Pago Pago - Tafuna 34.5 kV Line, Samoa

As Project Manager/Project Engineer, designed a 34.5 kV wood pole line with steel self-supporting angle poles. Located along a coastal road, the line was designed to withstand hurricanes wind and wave forces.

Basin Electric Power Cooperative, FAA Compliance Study, North Dakota

As Project Manager, reviewed FAA permits for five transmission line river or reservoir crossings and recommended upgrades to conform to new FAA regulations.

Hawaiian Electric Company, Waiau - CIP and CIP - Ewa Nui 138 kV Lines, Hawaii

Project Manager responsible for design and construction management of two double circuit, high capacity 138 kV lines with 46 kV and 12 kV underbuilds. The line was designed with limited diameter steel poles and special low drag coefficient conductor. The conductor was a 1590 kcmil ACSR/AW/TW/LWD. It featured 1942 kcmil of aluminum strands compacted into the diameter of 1590 kcmil ACSR. The emergency loading of the circuit required the large thermal rating. In addition to a high thermal rating the wire has a low drag coefficient surface to reduce structural loading in the coastal environment of Oahu.

Grant County PUD, Priest Rapids - Wanapum ADSS Cable, Washington

Project Manager/Project Engineer responsible for design and specifications for a LSTK installation of a 21-mile ADSS fiber optic cable.

Chugach Electric Association, University - Quartz Creek 115kV Line, Alaska

Project Manager responsible for the design and construction of a 72-mile-long 115 kV line to replace an aging and unreliable transmission line. The line crosses varied terrain and is subject to variable weather conditions and frequent avalanches.

Hawaiian Electric Company, Conductor/Structure Study, Hawaii

Project Manager responsible for a study to recommend a suitable structure conductor combination for a new 69/138 kV line to be constructed on the island of Hawaii. A preliminary design, cost estimate, and present worth analysis were used to compare capital costs and future loss and replacement costs. Conductor ratings and conductor design temperatures were included in the analysis.

Kauai Electric, Port Allen - Wainiha 69 kV Transmission Line, Hawaii

As Project Manager, responsibilities included planning for construction outages; recommendations for voltage and conductor size of new line considering load growth; and design, material procurement, and construction inspection.

Iowa Power Corporation, Council Bluffs - Clarinda 161 kV Line, Iowa

As Project Manager, responsible for a study to evaluate the technical and economic feasibility of rebuilding the existing wood pole H-frame line or modifying it into a 345 kV line. Prepared conceptual designs and cost estimates.

Black Hills Power & Light Company, Spearfish - Kirk 230 kV Transmission Line, South Dakota

As Project Manager, responsibilities included route selection and conceptual design for a 20 mile 230 kV line to be built in the northern Black Hills of South Dakota. A crossing of Spearfish Canyon was included.

Puget Sound Power & Light Company, Novelty Hill Substation Transmission Lines, Washington

As Project Manager, responsibilities included evaluation of structure types, structure configurations, and maintenance clearances to develop three right of way cross sections to enable Puget Sound Power to justify and purchase additional required right of way to serve a new substation.

City of Grand Island, South Loop 115 kV Transmission Line, Nebraska

As Project Manager/Project Engineer, selected a route for a new transmission line to convert an existing radial feed to a loop feed from the Platte Station.

Developed design for the new line and reconductoring scheme for an existing line to provide a 1200 amp circuit. Rating/temperature calculations were made for the line design to provide an overall economic solution balancing structural loading of large conductors with increased heights for high temperature conductor operation.

Centel Corporation, Transmission Conductor Assessment, Colorado

As Project Manager/Project Engineer, provided an analytical study and field inspection for an existing 115 kV conductor to determine its suitability for reuse on a rebuilt 115 kV line.

Arkansas River Power Authority, Burro Canyon - Raton 115 kV Transmission Line, Colorado and New Mexico

As Project Manager, provided route selection, permitting, conceptual, and final design as well as construction management for a wood pole, H frame 115 kV line in the historic Raton Pass area of the Santa Fe Trail. Testified before Las Animas County Planning Commission for a Special Use Permit. This was Arkansas River Power Authority's first 115 kV line and the project involved developing standard designs and design criteria for future projects.

City and County of Denver, City and County Building Main Switchgear Replacement, Colorado

As Project Manager, directed the design and installation of new 208 V main switchgear capable of withstanding 200,000 Amps short circuit duty. The new switchgear was a complete replacement of the existing gear. In order to avoid interruption to the essential city services, the entire installation, including connection of 80 branch feeders, was constructed over a three-day holiday weekend.

City and County of Denver, HVAC Feasibility Study, Colorado

As Project Manager, directed the study of the feasibility of air conditioning the City and County Building. The study was concerned with preservation of the historic architecture of the building and the economics of installation and operation.

Public Service Company of Colorado, Construction Department Effectiveness Audit, Colorado

As Transmission Specialist, provided analysis of the cost effectiveness of the client's Construction Department as compared to outside contractors.

Iowa Power Company, Transmission Issues Study, Iowa

As Transmission Specialist, evaluated the physical condition of the utility's 161 kV transmission lines in the Des Moines area to determine remaining life and suitability of upgrading or reconductoring. Recommended additions to the 345 kV and 161kV systems to increase reliability.

EWR, Medina Area Reinforcement, Saudi Arabia

As Transmission Specialist, prepared specifications for a lump sum turnkey project for a 380kV line, two 110 kV overhead lines, and four 110 kV underground lines to supply a new 380/110 kV GIS substation near Medina.

Saudi Consolidated Electric Company East, 115 kV Lines, Saudi Arabia

As Project Manager/Project Engineer, provided base design and detailed design for 163 km (101.5 mi.) of lattice tower 115 kV lines in the Arabian desert. Base design included structure loadings, sag and tension, clearances, guy and anchor details, substation entrance and relocation drawings, grounding details, and typical plan and profile sheets. Detailed design included insulator and hardware assembly drawings and complete plan and profile drawings. Saudi Consolidated Electric Co. specifications were used for material and installation.

Southeastern Pennsylvania Transit Authority, Wayne Junction 230 kV Lines, Pennsylvania

As Transmission Design Specialist, responsibilities included sag and tension calculations, insulator and hardware details, structure loading calculations, insulator swing calculations, and assistance in the preparation of structure procurement and installation specifications.

Alaska Power Authority, Bradley Lake Hydroelectric Project, Alaska

As Transmission Line Design Consultant, reviewed and commented on structure designs and details, and material and construction specifications for two 115 kV lines to interconnect the power plant with the Homer electric transmission system.

Gainesville Regional Utilities, Sugarfoot - Serenola 138 kV Line, Florida

As Senior Consultant, responsibilities included establishment of structure configuration, design loadings, and assistance in route selection. Assisted in the preparation and review of construction and material specifications. The line is double circuit 138kV on steel poles.

Western Area Power Administration, Open-End Contract, Transmission Lines Engineering, Western U.S.

Conducted strength tests on 345kV strut insulators to assist in analysis of failures. The contract also included survey work for the Casper Dave Johnston Transmission Line, Casper Waltman Transmission Line, and the Redding Tracey portion of the Central Valley Project (COTP) in California.

Los Alamos County Dept. of Utilities, Utilities Master Plan, New Mexico

As Project Manager, managed an electric, gas, water, and sewer master plan; a management audit; and a revenue bond refunding.

Northern Arizona University, 12 kV Distribution System, Arizona

Project Manager responsible for the preparation of an electric system master plan, PCB transformer replacement plan, cogeneration feasibility study, and the design of facilities to serve several academic buildings. The campus consisted of 81 buildings on 630 acres. Buildings were transferred from the old 2.4 kV system to the new system in stages as funds were budgeted.

Tennessee Valley Public Power Association, R&D Testing, Tennessee

As Project Manager and Principal Researcher, conducted a one year R&D accelerated aging test on long samples of eight different commercially available 15 kV cables. Impulse and AC breakdown tests, and microscopic examinations of the cables were made as received, and at four, eight, and 12 months of aging. The research predicted the lifetime, in wet environments, of EPR, XLPE, and filled XLPE cables with and without jackets or shields. The life time data was included in an economic analysis comparing total life cycle costs of direct buried and duct systems for underground residential development.

Colorado School of Mines, 13.8 kV Distribution System, Colorado

Project Manager responsible for the design of a loop 13.8 kV system to replace an existing 4160 V system. The new distribution system was constructed in a utility tunnel system. The new system incorporated an existing switchgear lineup that had been operating at a lower voltage. The construction and cutover activities were staged to minimize disruption of the academic schedule.

Arizona Public Service Company, Cordes Junction - New Substation 69 kV Line, Arizona

Project Manager responsible for the complete design using Arizona Public Service (APS) standards. The line was designed on client supplied plan and profile sheets. A complete construction cost estimate and detailed material list, incorporating APS's stock numbers, were prepared. The line consisted of a single circuit 69 kV line supported by line post insulators on single wood poles.

Colorado Springs, DPU, North Plant - Patty Jewett 34.5 kV Line, Colorado

Project Manager responsible for the design of a new 34.5 kV line with 12 kV underbuild to replace an existing line in poor physical condition. The line was designed to Colorado Springs' standards.

Seattle City Light, Electromagnetic Field Strength Survey, Washington

Project Engineer responsible for conducting a field measurement program to record electric and magnetic field strengths in the vicinity of the City's 230 kV and 115 kV lines. The field measurements were correlated with computer models to verify the projected field strength along the route of a proposed 230 kV line.

Tillamook Public Utility District, Wood Pole Line Design Seminar, Oregon

As Project Manager, prepared and presented a three day line design seminar to the Engineering Department of Tillamook Public Utility District, and several invited engineers from other utilities. A complete design note book was prepared for the instructional seminar.

City of Lakeland, 230 kV Line, Florida

As Senior Consultant, responsibilities included the determination of line loading conditions, review and approval of design calculations and specifications.

City of Colorado Springs DPU, AM/FM Feasibility Study, Colorado

As Project Manager, conducted a study to review the need and feasibility of implementation of an AM/FM system for the electric, gas, water, and sewer utilities of the City of Colorado Springs. The study concluded that the most effective means to eliminate the city's concerns over their existing manual system, and provide the benefits desired, was an AM/FM system.

Nantahala Power & Light Company, Nantahala - Santeetlah 161 kV Line, Tennessee

As Project Manager, responsibilities included review of alternatives for increasing clearance over a reservoir to allow safe operation of sail boats. The method selected was to install new 35 foot vertical extensions into the existing 41 year old lattice towers. The construction was coordinated to fit into a one week time period when the reservoir could be lowered and the system load was low enough to be supported by internal generation.

Gainesville Regional Utilities, Fort Clarke - Deerhaven 138kV Line, Florida

As Project Manager, responsibilities included comparison of wood pole, steel pole, and concrete pole alternatives to select the most economical structure; line design; preparation of construction and material specifications; supervision of a structure test; and assistance during construction. This line was constructed on concrete poles, using hinge base horizontal line post insulators. Because the line was constructed over limestone caverns, extensive subsoil exploration was conducted at structure sites.

Rushmore Electric Power Cooperative, Power Supply Study, South Dakota

As Project Manager, responsibilities included conducting an inspection of condition, estimation of remaining economic life, and an economic analysis of Rushmore operating the Kirk and Osage power plants, currently leased to Black Hills Power & Light Company.

Lake Worth Utilities Authority, Main Plant - Hypaluxo 138 kV Line,

Florida

As Senior Consultant, responsibilities included the review of design drawings, calculations, specifications, and material selection. The first section of the line, which crossed an interstate highway in a congested area, was constructed on double circuit steel poles. The balance of the line was constructed on concrete poles designed to Florida Power and Light Company's standards.

Northwest Public Power Association, Distribution System Design School, Oregon

As Project Engineer, prepared and presented courses on distribution system efficiency, and practical methods for reducing system losses.

Western State College, Distribution System Design, Colorado

As Project Manager, responsibilities included the conceptual and detailed design of a two loop 13.2 kV underground distribution system to serve 21 campus buildings. The new system replaced an existing 4160 V system that was partially overhead and partially underground. The poles of the overhead portion supported area and roadway lighting. A new lighting system was designed for the entire campus. Most buildings required extensive modifications to their existing electrical vaults.

Mesa College, Distribution System Design, Colorado

Project Manager responsible for the design of a 13.8 kV underground loop distribution system to replace a 4160 V system. The system was designed to allow a sequential cutover from the old to the new circuit with minimum disruption to the academic schedule. Many of the buildings required modifications to their electrical vaults to conform to the National Electrical Code.

Bonneville Power Administration, Distribution System Efficiency Guidebook

As Project Manager, prepared a simplified guidebook for use by the distributors of Bonneville Power Administration energy, to assist them in determining the economic feasibility of replacing inefficient facilities with more efficient items, and having the savings in losses pay for the cost of the improvement. Consideration was given to reconductoring, transformer replacement, addition of capacitors, and changing voltage. Several promising alternatives were identified.

Jersey Central Power & Light, Larrabee - Cookstown 230 kV Line, New Jersey

As Project Engineer, responsibilities included the design of a double circuit lattice tower line on an existing right of way, using standard towers. Based on the level terrain, the horizontal span capabilities of the towers was extended, requiring fewer towers per mile.

Jersey Central Power & Light, Whippany - Roseland 230 kV Line,

New Jersey

As Project Engineer, added a second circuit to an existing tower line. The two circuits were paralleled at the quarter points to produce a superbundle 1200 MVA 230 kV line. Selected conductors, prepared material requisitions, evaluated bids, and assisted in providing construction inspection.

Jersey Central Power & Light, Red Bank - Atlantic 230 kV Line, New Jersey

Project Manager responsible for representing Jersey Central Power & Light Company on this project, which was designed by an outside consultant. The line was designed to support two circuits of 230 kV, 2 circuits of 34.5 kV, railroad signal power, and railroad electrification catenary circuits. Responsibilities included assisting in and approving the conceptual and detailed design, ordering all material, evaluating bids, and assisting the contractor resolving construction questions.

Jersey Central Power & Light, Cookstown - Ampton 230 kV Line, New Jersey

Project Manager responsible for the design of a lattice tower line on private right of way. In cooperation with the company forester, devised a selective clearing program to minimize the visual impact of the line clearing.

Jersey Central Power & Light, Forked River - Deans 500 kV Line and Forked River - New Freedom 500 kV Line, New Jersey

Project Manager responsible for route selection, design, estimates, material and construction specifications, vendor selection, and services during construction. Testified before municipal and county boards to obtain approvals for construction. Testified before the State Public Utilities Commission in condemnation cases. Was responsible for calculating electric field effects, and evaluating conductor and structure configurations to minimize field effects on the multi circuit right of way.

Jersey Central Power & Light, Werner - Raritan River 69 kV - 230 kV Upgrade, New Jersey

As Project Manager devised a design to add vertical cage extensions, and replace the arms on a 40 year old lattice tower line to allow operating the line from 69 kV to 230 kV, and increasing the conductor size from 336.4 KCMIL ACSR to 1590 KCMIL ACSR. Dead End Towers were replaced with new towers. Coordinated the use of the land under the tower line as public park.

Jersey Central Power & Light, Atlantic - Oceanview 230 kV Line, New Jersey

Project Manager responsible for the design of a double circuit 230 kV line on wood poles with curved laminated cross arms. The line was designed as an unbraced, pin connected two pole structure to improve its visual accept-ability. Special groundline treatment was designed to provide long life for the poles in the moist areas traversed by the line. A special finite element program was written to determine pole stresses and required pole classes.

Jersey Central Power & Light, Morristown 230 kV Loop, New Jersey

Project Manager responsible for the design of a double circuit 230 kV, double circuit 34.5 kV steel pole line along a narrow railroad right of way. The line was designed using a compact configuration to minimize pole height and right of way width. The line was visually sensitive as it passed near and in view of Washington's Headquarters National Historic Site.

Jersey Central Power & Light, Gilbert-Martins Creek 230 kV Line, New Jersey

Manager of Transmission Engineering responsible for the design of this 230 kV lattice tower line on a right of way occupied by an existing 115 kV line. The line was designed to carry both the new 230 kV line and the existing 115 kV line. A long river crossing span was designed using 500 kV construction for future conversion.

Jersey Central Power & Light Company, 34.5 kV Lines, New Jersey

Project Engineer and Manager of Transmission Line Design responsible for the design of several hundred miles of 34.5 kV lines along roads and private right of way. Construction included overhead, underground, and submarine cables. Developed design standards and approved material lists. Testified before many county and municipal boards to obtain approval for construction.

Jersey Central Power & Light Company, PJM UHV Task Force, New Jersey

Chaired a six company task force that developed a conceptual design for an 1100 kV line that was being considered for construction to deliver power from a proposed energy park in Pennsylvania to Western New Jersey. The design considered environmental effects, economics, and feasibility of construction.

TAB 4B

BRIAN FURUMASU, P.E.
SENIOR PROJECT MANAGER**YEARS OF EXPERIENCE**

37

EDUCATION

- > Executive MBA, University of Oregon, 1993
- > M.S., Electrical Engineering, Thesis: HVDC Insulator Contamination, Washington State University, 1976
- > B.S., Electrical Engineering, Washington State University, 1975

AREAS OF EXPERTISE

- > HVAC / HVDC systems
- > Reactive compensation
- > Shunt and series capacitors
- > Insulation coordination
- > System security
- > Information technology

LICENSING

- > P.E., Electrical: Oregon

AFFILIATIONS

- > Senior Member, IEEE

PUBLICATIONS

- > "The Upgrade of the Northern Terminal of the Pacific NW-SW HVdc Intertie Celilo Converter Station (USDOE-BPA)," B.C. Furumasu, M.A. Reynolds, D.J. Kell, K.A. Mitsch, CIGRE US National Committee, 2013 Grid of the Future Symposium, Boston MA. October 2013.
- > "Considerations for Investigation and Reliability Improvement of SVC Systems," M.A. Reynolds PE, B.C. Furumasu PE, and W.H. Litzemberger, IEEE T&D Conference, April 2014.
- > "Thyristor Controlled Series Compensation Prototype Installation at the Slatt 500 KV Substation," J. Urbanek, R. Piwko, E. Larson, B. Damsky, B. Furumasu, W. Mittelstadt, IEEE PES Summer Power Meeting, Seattle, WA, July 1992.
- > "Design and Installation of 500 KV

EXPERIENCE SUMMARY

Mr. Furumasu specializes in high voltage transmission engineering for HVAC and HVDC systems. During his career with the Bonneville Power Administration, he was involved in the development and design of reactive compensation, HV and EHV equipment engineering, and compliance with North American Electric Reliability Corporation (NERC) reliability standards. He has specialized experience in high-voltage equipment insulation coordination, reactive compensation, and HVDC substation technology. He is an expert on shunt and series capacitor equipment, including AC and DC filters. His experience also includes utility research and development, including collaboration with manufacturers on FACTS technology, development of metal oxide protective systems for series capacitors, and characterizing the electrical environment under HVDC transmission lines. Mr. Furumasu was a chief information officer and senior manager at BPA responsible for leading organizational and policy changes involving the realignment of IT, power market research groups, and establishing a corporate NERC Compliance Oversight Office.

Bonneville Power Administration, I-5 500 kV Technical Feasibility Comparison, Northwestern US

Project Manager for a study to compare overhead and underground options for a new 70-mile, 500 kV transmission line along the Interstate 5 Corridor between Washington and Oregon. Defined the scope of work and organized the implementation of the work plan for the comparison of underground and overhead project components. Also coordinated data gathering and technical discussions with client. The report, required for BPA's NEPA application and sole sourced to POWER based on expertise in transmission design and operating practices for EHV underground lines, outlined comparative technical requirements and cost estimates for the overhead and underground options. Due to prohibitive costs and technical requirements for the underground option, BPA chose an overhead route.

Clean Line Energy Partners, Plains & Eastern HVDC Line, Multiple Locations

Lead Studies Engineer responsible for oversight of all electrical studies performed on the project. Worked with the client to identify technical engineering needs including identifying required studies of insulation and electrical clearances, economic conductor selection, and EMF/EMI performance for the transmission line. Worked with the client to establish parameters for these studies to best serve the project objectives. The project is an 800-mile, 600 kV HVDC transmission line from the Oklahoma panhandle to Memphis, Tennessee. POWER developed conceptual design information including preliminary design criteria, conductor and OPGW selection, proposed and alternative structures, structure foundations, and structure spotting/line design. POWER also performed preliminary studies

Back-to-Back Shunt Capacitor Banks," B.C. Furumasu, R.M. Hasibar, IEEE PES Winter Power Meeting, New York, N.Y., February 1991.

- > "Comparison of RTV Silicone Rubber Coatings Under Artificial Contamination in Fog Chamber," R. Gorur, G. Karady, A. Jagota, M. Shah, B. Furumasu, IEEE PES Winter Power Meeting, New York, N.Y., February 1991.
- > "Measurements of Capacitor Switching Transients," B.C. Furumasu, T&D Conference Panel Session, September 1986.
- > "Bonneville Power Administration's Experience with Gas Insulated Substation Technology," B.C. Furumasu, BPA's Third Annual TCPPE Seminar, February 1986.
- > "Managing the Transition from AIS to GIS Technology," B.C. Furumasu, International GIS Symposium, Toronto, Ontario, Canada, September 1985.
- > "Corona Performance of the Bonneville Power Administration's HVDC Test Line to +600 KV," T.D. Bracken, R.D. Stearns, B.C. Furumasu, V.L. Chartier, Minnesota Power Systems Conference, Minneapolis, MN, October 1978.
- > "Field and Ion Current Measurements in Regions of High Charge Density Near Direct Current Transmission Lines," T.D. Bracken & B.C. Furumasu, Conference on Cloud Physics and Atmospheric Electricity of the American Meteorological Society, August 1978.
- > "Contamination Mechanisms for HVDC Insulators," R.G. Olsen, B.C. Furumasu, & D.P. Hartmann, IEEE PES Winter Power Meeting, New York, N.Y., February 1977.

for insulation and electrical clearances, economic conductor selection, and EMF/EMI performance.

Lansing Board of Water & Light, Substation Communications Study, Lansing, Michigan

Engineering Consultant responsible for NERC compliance and cybersecurity. POWER provided conceptual design, specification, and recommendations for communication systems to connect 13 existing and one new substation in a new wide-area network. POWER assessed existing locations to determine utility communications requirements for various applications including SCADA, system protection, billing and metering, and workforce mobility. POWER then studied both widely-accepted and emerging technologies, including communications processors, communications multiplexers, fiber optics, network interface equipment, and wireless solutions for applicability and compliance with IEEE, IEC, and NERC CIP standards, and recommended solutions for future implementation.

Terra-Gen Power LLC, Dixie Valley Transmission Line ATC Calculations, California

Senior Studies Engineer responsible for interpreting the NERC Standards and Open Access Transmission Tariff (OATT) as it applies to Terra Gen Power LLC's Dixie-Valley Transmission Line. The analysis resulted in a report that describes the methodology for calculating the Total Transfer Capability (TTC) and Available Transfer Capability (ATC) for the 230 kV Dixie Valley Transmission Line. POWER developed methodology for calculating Total Transfer Capability and Available Transfer Capability for Terra-Gen Power's Dixie Valley 230 kV Transmission Line. This line transfers power from the Dixie Valley geothermal plant near Fallon, Nevada, to Southern California Edison's Oxbow-Bishop Control 115 kV Substation. Based on the analysis, a Rated System Path Methodology was selected and a description of the necessary steps to calculate TTC and ATC were developed.

Jacobs Engineering, National Geospatial Intelligence Agency (NGA), Power Reliability Study, Fort Belvoir, Virginia

Project Manager The National Geospatial-Intelligence Agency (NGA) requested that POWER Engineers, Inc. (POWER) perform a cost and reliability study to evaluate several plans of electric service from Dominion Virginia Power and to propose alternative plans of service with the goal of increasing the reliability of the utility service from Dominion Virginia Power to the Central Utility Plant that feeds the NGA campus.

The reliability study objective was to develop and provide reliability and cost analysis for alternate electric service configurations that could replace the existing configuration and increase utility service reliability. POWER based its power system reliability analysis on IEEE Standard 493-1997 "IEEE Recommended Practice for the Design of Reliable Industrial and Commercial Power Systems." The study took into consideration multiple alternative electrical service configuration options detailed in the request for proposal (RFP) and created six configuration options which were analyzed for both reliability and total life cycle cost.

Southern California Edison, Eldorado-Ivanpah 220 kV

Transmission Line Project, California

Project Engineer responsible for providing conductor temperature back-check and coordinating electrical studies. POWER performed transmission line design for a 34-mile double circuit 220 kV transmission line. Where the new line crosses higher voltage lines, special tubular H structures were designed to route the circuits under the existing lines. For a secondary communications line, overhead ground wire on the Eldorado Lugo 500 kV Line will be replaced with optical ground wire. POWER is also providing owner's engineering and construction management services.

Bonneville Power Administration, Celilo 500 kV HVDC Converter Terminal Replacement, The Dalles, Oregon

Technical Lead responsible for studies and technical specifications for main circuit high voltage equipment. POWER is contracted as the Owner's Engineer to perform various system studies for the replacement of the Celilo HVDC converter terminal near The Dalles, Oregon. POWER is responsible for the studies development (including interconnection and complex modeling studies) to characterize the operating and contingency operations of the HVDC system operating at 3,250 MW with possible upgrade to approximately 3,800 MW operating at +/- 560 kV. POWER, working with other leading HVDC technology subcontractors, will provide detailed study analytical support including RTDS simulation and other calculations to assist BPA with design of the replacement arrangement at the terminal and will assist in the commissioning process.

Starwood Energy Group Global, LLC, Mead-Adelanto-Phoenix HVDC Upgrade Project, California

Great River Energy, Dickinson HVDC Ground Electrode Study, Minnesota

Project Manager for a ground electrode study at Great River Energy's Dickinson HVDC Converter Station. The Client experienced dc ground currents when the converter station was operated in ground return mode at higher power levels, affecting equipment in several substations. POWER reviewed the subsurface geology in the vicinity of the existing electrode using local well data, performed time domain electromagnetic (TDEM) field measurements to verify the soil resistivity, and developed a model to simulate existing and alternate electrode configurations. The study presented various electrode configurations, with a recommendation to build a second electrode at a site at least two miles away from the existing one, and to operate both sites in parallel such that they share the converter earth return current approximately equally.

Los Angeles Department of Water & Power, Power System Reliability Evaluation, California

Senior Engineer for a study to evaluate LADWP's Power System Reliability Plan. POWER performed a third-party assessment of the PSRP and provided recommendations to support the utility in seeking increased funding for reliability improvements. Mr. Furumasu was Lead Engineer for assessing the Substation and Transmission sectors program and reviewer for the Distribution sector. Assembled a team of POWER's top experts to review

equipment that was identified in the PSRP for replacement and develop recommendations on the quantity and timeframe for replacements of specific substation and transmission, including recommendations to accelerate replacements in some cases.

RES, Talbot Wind Farm 230 kV Transmission Line

Provided the engineering for selecting the phase conductors, OHGW and OPGW to meet specified loss requirements, conducted the insulation coordination studies, and directed tower grounding studies. The loss calculations were performed using the ATP application. Recommendations for the suspension insulators and electrical clearances for this H-frame structure resulted from the insulation coordination studies. Upon completion of the transmission line design, performed electric and magnetic field, audible noise, RI and TVI calculations to determine the electrical performance of the line.

Plains & Eastern Clean Line Energy Partners, +/- 600 kV HVDC Transmission Line Project – Preliminary Metallic Return Conductor Design, Multiple States

Project Engineer responsible for working with the client to develop a preliminary design for a metallic return conductor and insulation requirements for an 800 mile +/- 600 kV HVDC line with a 3100 Ampere rating that can be used for continuous monopole operation. This project included developing the operating considerations and the duty cycle parameters needed for the preliminary design. The recommendations included the number and range of conductor sizes that can accommodate the thermal and mechanical requirements needed for the application. This effort also included doing the analysis to specify the required insulation levels and clearances.

PREVIOUS WORK HISTORY

Quality Plus Engineering, NERC CIP Program, Oregon

NERC CIP Program Manager responsible for NERC CIP compliance evaluations for registered NERC utilities. Also responsible for compliance violation, settlement resolution and compliance documentation.

Bonneville Power Administration, Reliability Compliance Officer, Oregon

As Reliability Compliance Officer, established Agency policy, process and roles for a newly created governance organization. Integrated NERC compliance function into the Agency's existing governance structure. Performed internal audit of NERC standards for compliance. Managed alleged violation and settlements of non-compliance issues.

Bonneville Power Administration, Pacific Intertie Upgrade, Oregon

Member of an engineering team responsible for the design of the 1985 upgrade to the first commercial HVDC transmission system in the U.S. Responsible for the development of technical specifications for shunt

reactive and AC and DC filter equipment, vendors technical proposal evaluation, design review and manufacturing and installation testing requirements for the equipment. The upgrade added two 100 kV thyristor valve groups in series with the original mercury arc groups. This increased the system's voltage from ± 400 kV to ± 500 kV and raised the capacity from 1600 MW to 2000 MW. First completed in 1970, the system runs 846 miles from BPA's Celilo Converter Station on the Columbia River at The Dalles, Oregon, to Los Angeles Department of Water and Power's Sylmar Converting Station near Los Angeles.

Bonneville Power Administration, Pacific Intertie Expansion, Oregon

Member of an engineering team responsible for the design of the 1989 expansion of the first commercial HVDC transmission system in the U.S. Responsible for the development of technical specifications for thyristor valves, shunt reactive and AC and DC filter equipment, vendors technical proposal evaluation, design review, and manufacturing and installation testing requirements for the equipment. The expansion added two 12-pulse converters to operate in parallel with the original mercury arc valve groups and the 100-kilovolt thyristor valve groups added in the 1985 upgrade. This increased the system's capacity to 2000 MW to 3100 MW at ± 500 kV. First completed in 1970, the system runs 846 miles from BPA's Celilo Converter Station on the Columbia River at The Dalles, Oregon, to Los Angeles Department of Water and Power's Sylmar Converting Station near Los Angeles.

Bonneville Power Administration, Control Center Software Manager

As Manager for the design and maintenance of control center software, with responsibility for automated tools to support BPA's dispatch and scheduling function. This group developed the performance specifications for automation tools, lead procurement and award for applications, and integrated and maintained the applications on site. The applications include SCADA, AGC, data acquisition for control center and scheduling functions, and scheduling applications. Responsibilities included sponsoring a risk analysis study for the SCADA and AGC systems to identify vulnerabilities and put into place a corrective action plan to resolve vulnerabilities. The completed risk analysis and formulated action plans were subsequently used as the foundation for DOE required system certification and accreditation (C&A) under NIST guidelines. The C&A included a tested disaster recovery plan.

Bonneville Power Administration/PNNL & SCE Subcontractor, Transmission Business Line (TBL) Y2K Project Manager

Developed and implemented a plan to identify, evaluate, and tested over 700 operational and business applications that could be adversely affected by the Y2K problem, completing this effort by March 1999. Worked with the States of Idaho, Montana, Oregon and Washington to coordinate disaster recovery plans for the Y2K transition. Given the critical nature of many of TBL's computer systems and their impact on the transmission systems reliability, BPA mounted an aggressive public communications strategy. Addressed over 100 public meetings, and newspaper/radio/TV interviews to convey

factual information and confidence about BPA and the electric utility industry efforts to keep the lights on through this millennium transition. BPA consultant to Pacific NW National Laboratories for providing Y2K training in Vienna, Austria and Moscow, Russia for IT systems associated with Soviet designed nuclear reactors. Consulted two months for Southern California Edison supporting the State Department in evaluating the Y2K risk for power systems in the former Soviet Union countries of Ukraine, Armenia, and Georgia.

Bonneville Power Administration, Security Coordinator Project Manager

Coordinated complex negotiations for BPA's hosting of this newly conceived transmission system reliability function with 14 NW control area utilities, NERC, WSCC, and the NW Power Pool. The name of this function changed to Reliability Coordinators with the Energy Policy Act of 2005 and new NERC Reliability Standards. As project manager, put into place the real time modeling tools and communications to support the Security Coordinator function. This included the design and implementation of an advanced computer system to monitor and model the NW portion of the WSCC transmission grid. Completed project within schedule and budget.

Bonneville Power Administration, Manager, Market Research

Led a newly formed organization to determine the kinds of information that BPA needed to support decision making for the sales organization in the competitive deregulated environment. Initiated and directed an employee task force to define the Market Research organization structure needed to support its account executives and market segment managers. This effort clarified the organization's mission and work priorities. Clarity in the organization's purpose and client information needs to be successful in a competitive market created by deregulation. Developed the organization structure to carry out the findings of the task force, defined the positions descriptions and filled the positions. This group contributed to BPA's success in transitioning a new deregulated environments, which had elements of competition and regulatory oversight structure.

Bonneville Power Administration, FACTS Thyristor-Controlled Series Capacitor Project

BPA's Project Manager for developing a new type of series capacitor to enhance the operation of electrical systems using Flexible AC Transmission Systems (FACTS) technology. The EPRI-sponsored project with GE, PGE and BPA made a technological first by installing GE-developed thyristor valves with series capacitors on BPA's 500 kV transmission system at the Slatt Substation. The new thyristor-controlled series capacitor (TCSC) technology uses sophisticated valve controls that allow the capacitor bank to be switched very quickly, thus optimizing real power flows, enhancing system stability, and damping sub-synchronous resonance. The TCSC technology has significant implications for how utilities upgrade or expand their systems. With improved power flow, utilities can better use their existing transmission lines, thereby eliminating or postponing the expense of new transmission lines. Mr. Furumasu's team was responsible for recommending a site for the TCSC device to demonstrate control features, device protection features and sub-synchronous resonance damping in

turbine generators. He was also responsible for design review, component testing, installation and rigorous field testing of the installed TCSC device.

Bonneville Power Administration, Supervisor High Voltage Practices Group

Lead the development and interpretation of BPA's high voltage policies, practices, standards, electrical characteristics and electrical performance requirements for design of BPA's transmission system including high voltage equipment research and development. This group provided the technical specifications for all substation equipment and the insulation requirements for substation and transmission lines. A strategic focus of this position was to evaluate and establish long term goals for BPA in the areas of EHV AC and DC substation and transmission systems.

Bonneville Power Administration, High Voltage Engineer

Planning and high voltage technical experience gained in this position. The High Voltage Practices group was located in the System Planning organization and provided consulting and engineering solutions during the planning stages of projects. Examples included investigation and recommendations for the Malin Dynamic Voltage Support Project, providing technical support for the HVDC Voltage Upgrade and HVDC Expansion projects at Celilo for the Pacific NW-SW HVDC Intertie projects, providing technical solutions leading to the Taft gas insulated substation (GIS) for the Colstrip project.

Developed broad expertise in both series and shunt reactive compensation. Represented BPA on IEEE standards activities as an active member on the Capacitor Subcommittee and the Shunt and Series Capacitor working groups (WG). Chaired the WG to rewrite the Series Capacitor Std that update the standard by including metal oxide varistors as a protective device for series capacitor banks. Reactive compensation experience included developing the AC and DC filter requirements for the HVDC Voltage Upgrade and Expansion projects and developed BPA's first static var compensator (SVC) specification.

General experience in preparing technical requirements and recommendations on insulation levels and electrical characteristics for high voltage equipment such as shunt and series capacitors, transformers, surge arrestors, transmission lines and other substation equipment. Performed engineering studies of transmission line and substation equipment as needed to provide engineering specifications, investigated equipment failure investigations to determine root cause, and managed R&D projects to develop new HVAC and HVDC equipment. Specific R&D projects managed included evaluation of metal oxide series capacitor protection using GE and Westinghouse products; also, developed a new design configuration for 115 kV back-to-back switched shunt capacitor banks, procured by BPA in 1986.

Bonneville Power Administration, Studies Engineer

Performed EMTP studies of power system transients and other electrical phenomena. Developed a practical knowledge of electric power equipment which help in subsequent design, failure investigations, HV equipment maintenance support and in developing technical requirements for EHV

equipment and systems.

Bonneville Power Administration, Electrical Environment Characterization, Oregon

Lead Engineer for a research and development project to determine the environmental characteristics of electric and ion fields of transmission lines. Working with Dr. T. Dan Bracken, a Lead BPA physicist specializing in electrical effects, the project was designed to characterize the electric environment beneath a test line capable of ± 600 kV. Engineering responsibilities included designing the measurement package, which included designing and fabricating a solid state pico-ampere meter for measuring ion currents, installing an instrumentation trailer under the DC test line, verifying instrumentation measurement accuracy and conducting experiments to acquire data for analyzing electric and ion fields and their interaction.

Bonneville Power Administration, IT Security Analysis and Compliance, Oregon

Chief Information Officer responsible for developing and implementing mandatory system-wide federal security measures. Responsible for redefining BPA's policy and IT architecture to conform to the requirements of the Federal Information Security Management Act and National Institute of Standards and Technology Special Publication 800-53, which establish mandatory IT security measures for federal agencies. The agency's IT consolidation involved redesigning the enterprise-wide network and infrastructure, establishing hardware and software standards across the enterprise and implementing change management practices for 500 federal and contractor employees. In August 2004, he was recognized by Secretary of Energy Spencer Abraham for outstanding contributions to Expanded Electronic Government initiatives under President Bush's Management Agenda e-Gov objectives.

Bonneville Power Administration, Transmission System Planning, Oregon

Held multiple positions in the Transmission System Planning and High Voltage Equipment Engineering for AC and DC applications including the following:

- Branch Chief Quality Assurance
- Project Manager for Thyristor Controlled Series Capacitor Section
- Chief for the High Voltage Practices Section
- Senior Technical Engineer – Capacitor equipment specialist and High Voltage Equipment Engineer
- Chaired the IEEE Series Capacitor Working Group – BPA technical expert, led the industry in the development of series capacitor equipment International technical expert in EHV capacitor equipment and its application
- Lead engineer for thyristor valves, AC/DC filters and capacitive reactive requirements for the Pacific Intertie Voltage Upgrade and Expansion Projects

Bonneville Power Administration, Corporate IT Consolidation and Restructuring, Oregon

CIO for Pacific Northwest's largest wholesale power and transmission utility. Responsible for consolidation of four business line IT groups into one central organization. The consolidation impacted over five hundred federal and contract employees. The consolidated IT organization reduced the annual capital and expense budget of \$97M by 25 percent. The following major steps were planned and implemented over a two year period.

- Established an Agency Prioritization Steering Committee as a decision making body for all IT investments
- Created a Project Management Office into the IT organization to provide disciplined management oversight and controls for the IT project portfolio
- Established a BPA Software License Position to review all software licenses, to negotiate technology contracts and manage compliance. This action sunset high-risk contracts and was a key factor in mitigation overall risk in technology acquisition and implementation.
- Established a Chief Technical Officer position to define and implement new IT architecture and hardware/software standards
- Implemented NIST 800-53, a risk framework for managing federal IT systems

Secretary of Energy recognized BPA's IT program for outstanding contributions to Expanded Electronic Government initiatives under the President's Management Agenda.

TAB 4C



PAUL ARNOLD

SENIOR PROJECT ENGINEER

YEARS OF EXPERIENCE

45

EDUCATION

- > B.S., Electrical Engineering, University of Portland, 1971

AREAS OF EXPERTISE

- > Strategic management of interconnected transmission systems
- > Optimization of grid use
- > Planning for efficient grid expansion
- > Transmission system security and protection
- > Reliability compliance auditing
- > Utility transmission system operation and planning
- > System control and protection engineering
- > Transmission system scheduling
- > WECC/NWPP system planning and operations
- > EHV AC and DC transmission interconnections
- > Technical and strategic measures for incorporation of VERS

AFFILIATIONS

- > NERC, WECC, and NWPP Regional Reliability Operating Committees
- > Advisory Member, Board of Directors of the California Independent System Operator during CALISO's startup and first year of operations
- > NERC Operating Committee and Compliance and Certification Committee
- > NERC Market Interface Committee, chairing the Variable Generation Subcommittee/Marketing Work Group
- > WECC's Transmission Expansion Planning Policy Committee (TEPPC)

PUBLICATIONS

- > *Summary, System Restoration Plan for the Pacific Northwest Power System*, P.F. Arnold (IEEE/PES January 1982 Winter Power Meeting, and in *Power System Restoration: Methodologies and*

EXPERIENCE SUMMARY

Paul Arnold is one of the U.S.'s leading experts on the strategic management of regional and sub-regional operations of utility companies, and is a specialist in transmission systems serving the Pacific Northwest. At POWER, he provides high-level consultation on transmission system reliability and interconnections. An electrical engineer, he has invested a generous span of career time as a consultant, utility executive and utility technical manager directly working on the security, reliability, stability and optimization of large interconnected transmission networks. He has been particularly involved in system enhancements to comply with evolving federal and regional regulations and to productively accommodate changes in electrical supply resources, including contributions from gas-fired stations and the incorporation of variable renewable supplies from wind and solar sources. He is a prominent authority in reliability compliance auditing for utility and grid operations.

Mr. Arnold's pre-POWER background includes service as an executive and manager with the multi-utility agency and WECC planning group Columbia Grid Planning, as a technical and operations consultant to the Western Electricity Coordinating Council, and as a senior electrical engineer for the Bonneville Power Administration. His career service has involved, at all levels, the coordination and oversight of regional and sub-regional utility operations in the Northwest.

Mr. Arnold has worked extensively within WECC (Western Electricity Coordinating Council) at a variety of levels in planning, operations and marketing. In 2007-2008, Mr. Arnold led the WECC Project Coordination Review Process for the integration of the BPA McNary-John Day 500 kV project and the I-5 Corridor 500 kV project. As Manager of ColumbiaGrid Planning, a WECC sub-regional planning group, he formed regional project coordination review groups to review studies provided by BPA, review project alternatives, and identify adverse impacts to existing transmission facilities. This work culminated in a Project Coordination Review Report addressing the objectives and guidelines in the WECC Overview of Policies and Procedures for Project Coordination Review, Project Rating Review, and Progress Reports.

Before his work with Columbia Grid Planning, Mr. Arnold worked for 36 years as an electrical engineer for the Bonneville Power Administration holding various management and technical positions, and completing his BPA service as VP Operations.

Paul Arnold was an advisory board member during the start-up and first operational year for the California Independent System Operator.

Mr. Arnold has a reputation for excellence in technical expertise and cooperation throughout the Western Interconnection system. His broad experience and leadership skills have proven to be invaluable in gathering

Implementation Strategies, Wiley-IEEE, 2000.

- > *Production Coordination Review Report, WECC Overview of Policies and Procedures for Project Coordination Review, Project Rating Review, and Progress Reports*, ColumbiaGrid Planning, 2010.
- > Principal Developer, *NERC Version 0 Standards* in support of mandatory compliance legislation.

information, coordinating and resolving issues related to planning and operations of new and existing transmission facilities in the region.

Enbridge, Inc., MATL Transmission Line Project, Canada and U.S.

Senior Transmission Engineer responsible for providing POWER's advisory services to Enbridge for technical consultation and development of operating procedures and reliability/protection design for the MATL 230 kV international transmission line connecting Lethbridge, Alberta, to Great Falls, Montana. The project involves design of the Marias Switchyard and the 120S Substation facilities as part of the Montana Alberta Tie Ltd. (MATL) transmission line project, a 215-mile, 230 kV AC transmission line. Marias (near Cut Bank, Montana) will serve as the mid-point substation, providing voltage control with two series capacitor banks --156 Mvar and 93 Mvar -- and four 40 Mvar shunt capacitor banks. 120S, in Lethbridge, Alberta, will serve as the northern terminus, providing power flow and voltage control with a 300 MVA phase shifting transformer and two 40 Mvar shunt capacitor banks. Both stations are designed to be expandable to accept future transmission lines.

TransAlta, Big Hanaford Repower Project Grid Support Study, Washington

Senior Transmission Engineer responsible for advising TransAlta on transmission interconnection to support the Centralia generation facilities. The Big Hanaford plant at Centralia now consists of four GE LM 6000 gas turbines in a 4 x 1 combined cycle configuration plant. TransAlta is considering making it into a more efficient gas-fired combined cycle installation as the two coal boilers at Centralia are scheduled for shutdown by 2020 and 2025.

Oncor Electric Delivery, Regional Grid Consultation, Texas

Senior Transmission Engineer responsible for managing and providing POWER's consultant services to Oncor for study and strategic transmission system management for development of its transmission assets in Texas.

PREVIOUS WORK HISTORY

Pacific AC Intertie and Pacific DC Intertie, Northwest States and California

Mr. Arnold was involved in the planning and design of the Pacific AC Intertie and Pacific DC Intertie between the Northwest and California. This included participation in path rating studies, and working with WECC committees to determine safe simultaneous transfer capability limits between the Northwest-to-California and Arizona-to-California transmission paths. This involved working with Southwest and California utilities on the development of operating nomograms and operating agreements for real time operation of facilities, including the use of remedial action schemes to maintain system reliability in the event of unplanned outages, and manage parallel operation of the DC and AC transmission system.

ColumbiaGrid, Vice President, Oregon

Mr. Arnold's duties included start-up manager for regional planning. ColumbiaGrid is a recognized Sub-Regional Planning Group and is part of WECC's TEPPC (Transmission Expansion Planning Policy Committee). Other duties included Common OASIS development among its eight member utilities, and manager of reliability initiatives including coordinated outage management, reliability re-dispatch, energy imbalance markets, and Balancing Authority consolidation alternatives. The major context of these initiatives focused on reliable integration of renewable resources. Mr. Arnold also represented ColumbiaGrid on the WECC Variable Generation Subcommittee and chaired its Marketing Work Group.

ColumbiaGrid, Regional Planning Group, BPA McNary-John Day Transmission and I-5 Corridor Transmission Projects, Oregon

While at ColumbiaGrid, Mr. Arnold was responsible for the start-up of its regional planning group and was ColumbiaGrid's TEPPC representative. One major accomplishment was leading the regional project coordination review for the BPA McNary-John Day and I-5 Corridor transmission projects. This effort included notification of WECC and interested parties, as well as conducting meetings among interested parties to determine project synergies or adverse impacts. It involved coordination with planning engineers, developing agendas, holding meetings and submitting a coordination report to WECC and interested parties. Potential coordination issues were resolved with the proposed PGE Southern Crossing project through a cooperative analysis of study results and acknowledgement that the projects supported different needs and objectives.

Independent Consultant, Northwest and California

Mr. Arnold worked as an independent consultant, primarily for WECC. Services included leading readiness audits of WECC utilities in the areas of planning, operations, maintenance, and critical infrastructure protection and representing WECC on the NERC Certification and Compliance Committee.

Bonneville Power Administration, Management & Technical Roles including VP Operations

Mr. Arnold worked for 36 years as an electrical engineer for the Bonneville Power Administration holding various management and technical positions. Areas of responsibility included reliability compliance, transmission scheduling, system protection maintenance, system operations and technical studies, control system design, and representation on WECC, NERC, and NWPPA operating committees.

WECC Membership and Special Projects, (Broad Perspective including Planning, Operations and Marketing)

Mr. Arnold's experience with WECC committees spans broad areas of expertise paralleling his work experience. He was ColumbiaGrid's representative during the formation of TEPPC, representing one of WECC's Sub regional Planning Groups.

Having served for many years on WECC's Operating Committee and key subcommittees, Mr. Arnold is primarily known at WECC for his operating

expertise. He has been responsible for developing minimum operating reliability criteria and analyzing system disturbances. Mr. Arnold also served on the NERC Operating Committee and the Compliance and Certification Committee, and was instrumental in developing the Version 0 Standards in support of mandatory compliance legislation.

Mr. Arnold also served on the Market Interface Committee, and chaired the Variable Generation Subcommittee--Marketing Work Group. This activity focused on the development of market based energy imbalance supply schemes to support the integration of Wind, Solar, and other forms of renewable energy.

Bonneville Power Administration, AC and DC Transmission Intertie Systems, Northwest and California

While at BPA, Mr. Arnold provided technical and managerial support for the operations, planning, and contractual agreements for the Pacific AC Intertie and Pacific DC Intertie between the Northwest and California, establishing project ratings, operating limits and the use of special protection schemes. HVDC Power Modulation was used to dampen oscillations of the AC system. Fast ramping of the DC Intertie was used to effectively off-load interconnected AC systems following unplanned outages. Generation and load dropping schemes were used to protect the AC system for single or double pole contingencies of the DC Intertie. Calculation of concurrent converter and line losses to a point at the Nevada-Oregon border were factored into balancing area controller totals for the LADWP and BPA balancing authority areas.

As manager of technical operational studies at BPA, he developed technical and contractual requirements for an unprecedented coal fired generation dropping scheme among engineering, legal and policy interests of six Northwest utilities.

California Independent System Operator, California

Mr. Arnold served as an advisory member of the Board of Directors of the California Independent System Operator during its start up phase and first year of operation. A major accomplishment during his tenure was resolution of scheduling procedure conflicts. He initiated efforts within the WECC region to call meetings and propose solutions that ultimately lead to a successful compromise.

TAB 5A

BORIS FICHOT, P.ENG., P.E.

SENIOR ENGINEER

SUMMARY

Mr. Boris Fichot holds a bachelor's and a master's degree in Civil Engineering with a specialization in water resources planning and management. He has been involved in the successful identification, staking, permitting, bidding, and detailed design and construction of a number of run-of-river hydroelectric projects. He is involved in wind resource screening assessments, hydropower due diligence studies, and mine water management. Before moving to Canada, he worked as a water resources planner for the Lower Colorado River Authority in Texas, where he was involved in water resources modelling, risk analysis, systems operations, system optimization, water management policy and public process.



EDUCATION

- Graduate Studies in Civil Engineering, University of British Columbia, Canada, 2000
- M.Sc. Water Resources Planning and Management - Civil Engineering, Colorado State University, USA, 1999
- B.Eng. Civil Engineering and Applied Mechanics, McGill University, Canada, 1998

REGISTRATION/CERTIFICATIONS

- Professional Engineer, British Columbia, Canada (APEGBC#30575)
- Professional Civil Engineer, Alaska, USA (Inactive, CE#12405)
- Professional Engineer, Texas, USA (Inactive, TBPE#93528)

AFFILIATIONS

- Clean Energy BC, Member through Dragonfly Hydropower Corporation
- Kitimat Chamber of Commerce, Member through Dragonfly Hydropower Corporation
- Canadian Wind Energy Association (CANWEA), Corporate Member through Knight Piésold Ltd.
- American Society of Civil Engineers (ASCE), Member
- Environmental & Water Resources Institute of ASCE (EWRI), Member

TRAINING

- Run-of-River Hydropower, BCIT, Instructor, 2010 through 2013
- Knight Piésold Renewable Energy Seminar, Presenter, 2008, 2011
- Optimization of Hydropower Operations Workshop Waterpower XVI, July 2009
- Microsoft Project 2003 by On-Track Computer Training), March 2008
- WindPRO Training Course by EAPC), June 2007
- Cold Regions Engineering Course by the University of Washington, November 2006
- Emergency First Aid – Industry (#1-15PMVQ) by St. John Ambulance, August 2009
- Leadership Training Course by LCRA, June 2004
- Riverware Training Course by Cadswes, April 2004

PROFESSIONAL EXPERIENCE

- **824 MW Muskrat Falls and Labrador Island Link, NL, Canada** – As Expert Reviewer for the Consumer Advocate of Newfoundland and Labrador, reviewed documents prepared by Nalcor and the Public Utilities Board on Muskrat Falls being the least cost option for the supply of power to Newfoundland and provided independent input to the Consumer Advocate.
- **132 MW John Hart Generating Station Replacement Project, BC, Canada** – RFP technical submission preparation with Knight Piésold Ltd. for the Elk Falls Energy Partners.
- **30 MW Sabanilla Hydroelectric Project, Ecuador** – Conducted a Due Diligence study on energy production and project economics.
- **22 MW Jaime Creek Project, BC, Canada** – Conducted a Due Diligence study, elevated construction progress, energy, hydrology, performed optimization of plant capacity, reviewed detailed design and tender.
- **15 MW Box Canyon, BC, Canada** – As Design Coordinator, coordinated and participated in engineering design, optimization, cost estimating, and conducted project management and project design scheduling.
- **20 MW Zeballos Lake Hydroelectric Project, BC, Canada** – Conducted a Due Diligence study on energy production.
- **15 MW Iqaluit Hydro, Nunavut, Canada** – Completed a high-level regional study of potential hydroelectric resources to supply the Iqaluit and potential mining developments. Prepared reservoir energy models.
- **1 MW Hartley Bay Hydroelectric Project, BC, Canada** – Conducted a Due Diligence Study on Project Feasibility for INAC. Conducted review of Tender Documents and Bids for the Hartley Bay Band.
- **24 MW Betmai Hydroelectric Facility, Sierra Leone** – Prepared Feasibility Study including facility design layouts, cost estimates, energy estimates, and project overall financial valuation.
- **Sechelt FN Territory Study, BC, Canada** – Completed a detailed study of the run-of-river potential in the Sechelt FN traditional territory.
- **150 MW Kwalsa and Upper Stave Project, BC, Canada** – As Design Coordinator, coordinated and participated in engineering design, prepared earned value reports, and conducted project management and project design scheduling.
- **10 MW Homestake Project, BC, Canada** – prepared alternatives assessment for mine power supply alternatives including transmission line alignments, a regional look at all hydropower facility option, and estimated development cost.
- **4 MW Brucejack Creek, BC, Canada** – Prepared Mine PA section pertaining to a hydroelectric supply to the mine, including facility layouts, energy estimates and capital cost.
- **120 MW Upper Toba Valley Hydroelectric Project, BC, Canada** – As Project Coordinator, conducted project management and scheduling, reviewed and coordinated facility layout and design, evaluated project feasibility, prepared Clean Power Call bid material, and participated in project permitting.

Boris Fichot, P.Eng., P.E.
Senior Engineer

- **La Joie Project, BC, Canada** – identified and analyzed alternatives to remediate Dam Safety deficiencies in a manner that will not preclude future potential plant modernization and power generation expansion opportunities at the La Joie facility.
- **Kitsault Project, BC, Canada** – Evaluated the mine water management options and integrated a 9 MW hydroelectric project option in the feasibility study.
- **Roadhouse Wind Power Project, ON, Canada** – Wind Power Due Diligence Study, prepared energy estimates and project layout for a private developer.
- **60 MW Cascade Creek Hydroelectric Project, Alaska, USA** – Conducted a Due Diligence Study on Project Feasibility for investors.
- **Pebble, Alaska, USA** – Prepared a Wind Power Screening Assessment for the proposed Pebble Mine. Identified run-of-river hydropower options.
- **1,100 MW Bute Inlet Project, BC, Canada** – Conducted project identification, project optimization, land and water license application submissions, hydrology and energy studies, cost estimations, preliminary project design, and project permitting.
- **Dhalaks Creek and Seven Other Projects in the Kitimat Area, BC, Canada** – Responsible for project identification, land and water license application submissions, hydrology and energy studies, cost estimations, preliminary project design, and project permitting.
- **60 MW Meager, Salal, and South Creek in the Lillooet, BC, Canada** – Responsible for project identification, land and water license application submissions, hydrology and energy studies, preliminary project design, and project permitting.
- **Kensington Gold Project, Alaska, USA** – Provided onsite construction supervision and sediment control design and consulting services during the construction of this gold mine north of Juneau, AK.
- Prepared BCHydro tender submissions for the **East Toba River and Montrose Creek Project, Canada** (a 235 MW run-of-river project), the **Rainy River Project, Canada** (a 15 MW run-of-river project), the **Emory Creek Project, Canada** (a 6.5 MW run-of-river project), and the **Log and Kookipi Creeks, Canada** (a 20 MW run-of-river project).
- **Lower Colorado River Authority (LCRA) Water Management Plan, Austin, Texas, USA** – Evaluated and modelled impacts of water resources management plans, conducted analysis of water resources management policy options, and drafted technical reports. Developed water resources planning models, such as water allocation, water rights, hydraulic, stochastic and environmental models, and optimization tools. Presented the results of analyses in briefings, meetings, and documentation to a variety of internal and external parties.
- **Texas Senate Bill 1 Long Range Water Management Plan, Texas, USA** – Modeled and presented water resources management options.
- **Canadian International Development Agency (CIDA), Beijing, China** – Conducted research in China for the Beijing-Tianjin 3x4 Water Resources Management Project. Topics of research included: institutional analysis of Chinese environmental governance, assessment of Beijing's hydrological and environmental situation, and policy analysis of Chinese environmental policies related to water quality management.

Boris Fichot, P.Eng., P.E.
Senior Engineer

- **Dept. of Civil Engineering, University of British Columbia, BC, Canada** – Researched topics in relation to the development of indicators of environmental health particularly for water resources.
- **Canadian Journal of Civil Engineering, BC, Canada** – Performed technical translations of journal articles.
- **Dept. of Civil Engineering, McGill University, QC, Canada** – Conducted research in environmental fluid mechanics through image analysis for correlative purposes.
- **SNC-Lavalin, Kuala Lumpur, Malaysia** – Planned and managed daily tasks for foremen. Established a system of inventory control for shipping and installation of linear induction modules (a primary rail component).

WORK HISTORY

- Knight Piésold Ltd., Vancouver, BC, Canada, Specialist Consultant, 2012 - Present
- Dragonfly Hydropower Corporation, Owner/Director, 2012 - Present
- Dragonfly Hydropower Consulting Ltd., Principal, 2012 - Present
- Knight Piésold Ltd., Vancouver, BC, Canada, Senior Engineer, 2009 - 2012
- Knight Piésold Ltd. Vancouver, BC, Canada, Project Engineer, 2006 – 2008
- Lower Colorado River Authority, Austin, Texas, USA, Engineering Associate, 2001 – 2004
- Canadian International Development Agency, Beijing, China, Researcher, 2000 – 2001
- SNC-Lavalin, Kuala Lumpur, Malaysia, Engineering Assistant, 1997

PUBLICATIONS AND PRESENTATIONS

Brown R., Fichot B., and Kabir N., "Accounting on the Lower Colorado", RiverWare User Group Meeting 2004, February 2004

Brown R., Fichot B., Kabir N., "Innovations in LCRA's Water Supply Modeling", Texas Section - ASCE Spring 2005, April 2005, Austin, Texas.

Fichot, B., "Finding Indicators to Evaluate Beijing-Tianjin Wastewater Discharge Policies", CIDA and Center for Human Settlement, 2000. <http://www.chs.ubc.ca/china/index.html>

Fichot B. and Hou E., "Beijing-Tianjin Watershed Report Card", CIDA and Center for Human Settlement, 2000. <http://www.chs.ubc.ca/china/index.html>

Fichot B., "Deriving an Inflow and Outflow Fuzzy Rule Base System", M.Sc. Technical Paper, August 1999.

TAB 5B

MIKE J. ROBERTSON, P. ENG.

SPECIALIST ENGINEER & PROJECT MANAGER

SUMMARY

Mr. Mike Robertson is a Civil Engineer with over 40 years of professional experience, primarily in the water resources, hydroelectric power and mining sectors. He has been extensively involved in all aspects of dams and bulk water supply schemes for urban and irrigation use. He also has extensive experience in dam safety inspections and evaluations, water resources planning and feasibility studies, run-of-river and pumped storage hydroelectric schemes, mining developments and projects for upgrading urban infrastructure. His career has included time spent with consultants in London, UK; with the Ministry of Water Development in Zimbabwe (including a year with the US Bureau of Reclamation Dams Branch in Denver, Colorado, USA); with consultants in South Africa; and with consultants in Vancouver, Canada. He has worked on projects in the United Kingdom, United States of America, Canada, Mexico, Chile, Suriname, Zimbabwe, South Africa, Tanzania, Madagascar, Ethiopia, Kenya, the Democratic Republic of the Congo, Liberia, Egypt and Iraq.



EDUCATION

- B.Sc., Civil Engineering (Honours), University of Bristol, UK, 1970

PROFESSIONAL REGISTRATIONS/CERTIFICATIONS

- Professional Engineer, British Columbia, Canada, #23784
- Former professional registration in UK, South Africa and Zimbabwe
- Approved Professional Engineer for Dam Safety Inspections, South Africa
- Approved Engineer for Dams and Large Dams, Zimbabwe

AFFILIATIONS

- Canadian Dam Association, Member
- Institution of Civil Engineers, UK; South African Institution of Civil Engineers and Zimbabwe/Rhodesian Institution of Engineers – Past Member

TRAINING (SHORT COURSES, WORKSHOPS, SEMINARS AND SYMPOSIA)

- Run-of-River Hydro, Independent Power Producers of BC Short Course (Presenter), 2009
- Conferences and Seminars – Waterpower/Hydrovision (including Paper Presenter, Session Moderator and Technical Papers Committee/Session Chair), Clean Energy BC (Independent Power Producers of BC), Association of Power Producers Ontario, Canadian Dam Association
- Cold Regions Engineering Short Course, 2006
- Swiftwater, Avalanche and Confined Space Training
- Construction Management Programme, University of Stellenbosch, South Africa, 1993
- Certificate in Management Practice, Rhodes University, South Africa, 1989
- One year Work/Study Programme on Design of Dams with the United States Bureau of Reclamation, Denver, Colorado, USA, 1980

Mike J. Robertson, P.Eng
Specialist Engineer / Project Manager

PROFESSIONAL EXPERIENCE

- Arrow Lakes Generating Station Dam Safety Review, BC, Canada** - Designated Dam Safety Review Engineer for periodic dam safety review of CFRD embankment 185 MW hydropower dam and associated structures. For Columbia Power Corporation.
- Keeyask and Conawapa Hydroelectric Projects, Manitoba, Canada** – Project Manager for review of Manitoba Hydro proposals for the design and construction of the 695 MW Keeyask and 1,485 MW Conawapa Dams. For Manitoba Public Utilities Board.
- Pocaterra and Interlakes Dam Safety Review, Alberta, Canada** - Designated Dam Safety Review Engineer for periodic dam safety review of two earth/rock embankment hydropower dams – Pocaterra and Interlakes Dams. For TransAlta Generation Partnership.
- Kootenay River Dam Safety Reviews, BC, Canada** – Designated Dam Safety Review Engineer for periodic dam safety review of four concrete hydropower dams in cascade on Kootenay River - Corra Linn, Upper and Lower Bonnington and South Slokan Dams. For FortisBC Inc.
- Corra Linn Dam Breach Inundation Study, BC, Canada** – Project Manager for study into consequences of cascade failure of five dams on the Kootenay River, BC should Corra Linn Dam fail. For FortisBC Inc.
- John Hart Hydroelectric Project, BC, Canada** - Project Manager for design elements of bid proposal for 130 MW replacement of power generating facility at existing BC Hydro Dam. For Graham Construction (part of P3 format bid).
- Lower Mamquam and Moresby Lake Hydroelectric Projects, BC, Canada** - Designated Dam Safety Review Engineer for periodic Dam Safety Reviews of intake structures. For Atlantic Power Preferred Equity Ltd.
- Rosebel Hydropower Study, Suriname** - Project Manager for desk top assessment of feasibility of using hydroelectric power for development of proposed Rosebel Mine (~25-60 MW). For IAMGOLD Corporation.
- New Liberty Hydropower Study, Liberia** - Project Manager for study into feasibility of using hydroelectric power of various rivers for development of proposed New Liberty Mine (~6 MW). For Aureus Mining Inc.
- Kokish River Hydroelectric Project, BC, Canada** - Responsible for monitoring overall Quality Assurance for design, and construction supervision under EPC Contract. For Peter Kiewit Sons Co.
- Culliton Hydroelectric Project, BC, Canada** – Project Manager for detail design, contract procurement and construction of 16 MW run-of-river hydroelectric project. For Culliton Creek Power LP (division of Veresen Inc.).
- Tretheway Creek Hydroelectric Project, BC, Canada** - Project Manager for preliminary design of 15 MW run-of-river hydroelectric project. For Innergex Renewable Energy.
- Dasque and Middle Cluster Hydroelectric Projects, BC, Canada** – Owners Review Engineer for detail design and construction of 12 MW Dasque and 8 MW Middle run-of-river hydroelectric projects. For Swift Power LP (now Veresen Inc.)

Mike J. Robertson, P.Eng
Specialist Engineer / Project Manager

Newfoundland Two Generation Alternatives Project, NL, Canada – Part of team reviewing plans to provide future power to Newfoundland from either the proposed Muskrat Falls Hydroelectric Project in Labrador or from a combination of On-Island alternatives. For the Consumer Advocate for Newfoundland and Labrador, Canada.

Fitzsimmons Hydroelectric Project, BC, Canada – Project Manager for investigation of cause of poor performance of Coanda effect intake screens. For contractor Ledcor CMI.

Upper Lillooet Hydroelectric Project, BC, Canada – Project Manager for cluster of three run-of-river hydroelectric facilities bid into BC Hydro 2008 Call for Power – Upper Lillooet, Boulder and North, combined 120 MW capacity. For Creek Power Inc (Innergex Renewable Energy). Subsequently joined Walsh Group team for EPC bid.

Pocaterra Penstock Replacement Project, AB, Canada – Project Manager for the replacement of the 55 year old 11 ft diameter woodstave penstock at the Pocaterra Generating Station, including assessment of alternative material types, alignments and buried vs. surface condition, and contract procurement and construction supervision. For TransAlta Generation Partnership.

Budana and Soleniama Hydroelectric Projects, DRC – Project Manager for condition assessment and studies into the feasibility of using hydroelectric power from the old existing and largely non-functional Budana and Soleniama Hydroelectric Projects on the Shari River for the reopening of the old Mongbwalu Mine (~12 MW). For AngloGold Ashanti, South Africa.

Upper Pelly Hydroelectric Project, YT, Canada – Project Manager for studies into the feasibility of using hydroelectric power from the Pelly River for the development of the proposed Selwyn Zinc Mine (~20 MW). For Selwyn Resources.

Various Potential Run-of-River Hydroelectric Projects, BC, Canada – Project Manager for studies of various proposed run-of-river hydroelectric projects, including Log, Kookipi, Rainy, Bear, Kwoiek, American, Emory, Ruby, Gamet. Technical assistance with others, including Kinskuch, Beaver. For various clients.

Cairns Hydroelectric Projects, BC, Canada – Project Manager responsible for (pre)feasibility studies into seven run-of-river hydroelectric projects submitted in response to BC Hydro Call for Clean Power 2008 (range 10 to 35 MW). For Cloudworks Energy / Peter Kiewit Sons Co.

Bute Inlet Hydroelectric Projects, BC, Canada – Responsible for concept design reviews of components of 17 run-of-river hydroelectric projects submitted in response to BC Hydro Call for Clean Power 2008 (range 20 to 115 MW). For Plutonic Power Corporation / Peter Kiewit Sons Co.

East Toba Montrose & Kwalsa Upper Stave Hydroelectric Projects, BC, Canada – Responsible for monitoring overall Quality Assurance for design, procurement and construction aspects of eight hydroelectric run-of-river projects presently under construction or recently completed under EPC Contracts. For Peter Kiewit Sons Co.

Campo Morado G9 Development, Mexico – Overall Project Manager for ongoing development of 1,500 to 2,000 tpd poly-metallic mine (mainly Zn, Cu, Pb), including design engineering and construction supervision by various Canadian and US consultants. For Farallon Resources Ltd., Canada.

Twangiza-Namoya Mine, DRC – Project Manager for studies into the feasibility of using hydroelectric power for the proposed development of several adjacent gold mines (26.5 MW for 5 Mt/a process plant). For Banro Corporation, Canada.

Mike J. Robertson, P.Eng
Specialist Engineer / Project Manager

- Nzoro Hydroelectric Project, DRC** – Project Manager for studies into the feasibility of using hydroelectric power from the Nzoro River for the development of the proposed Moto Gold Mine (20 MW for 4.5 Mt/a process plant). For Lycopodium / Moto Gold Mines, Australia.
- Box Canyon and Marty Creek Hydroelectric Project, BC, Canada** – Project Manager for feasibility studies of proposed run-of-river hydroelectric project, including assistance with preparation of submissions in response to BC Hydro Call for Clean Power 2008. For Sound / Elemental Energy.
- Aberfeldie Redevelopment Project, BC, Canada** – Project Manager for the optimization, detailed design and construction supervision of the redevelopment to 24 MW of the 1922 existing 5 MW facility, including alteration to the intakes from the Aberfeldie Dam and replacement of all other run-of-river components. For BC Hydro.
- Alto Cachapoal Hydroelectric Projects, Chile** – Optimization of the development potential of the whole catchment, involving three or four separate projects with a combined capacity in the order of 600 MW. For Pacific Hydro Chile S.A.
- Rutherford Creek Hydroelectric Project, BC, Canada** – Project Manager for all stages of 50 MW run-of-river hydropower development from feasibility and environmental studies, through preliminary design and tendering and EPC contract negotiations to final design and construction supervision. For Rutherford Creek Power Ltd. / Peter Kiewit Sons Co.
- Rosia Montana Gold Project, Romania** – Project Manager for geotechnical aspects of feasibility study including tailings disposal facility, open pit slopes, waste dumps and plant site for 20 Mt/a mine. For Gabriel Resources.
- Geita Gold Project, Tanzania** – Resident Engineer for geotechnical aspects of construction, including tailings disposal facility, water storage / diversion dam and river diversion channel for 6 Mt/a mine. For Ashanti Goldfields / Anglo-American Corporation.
- Dam Safety Program, BC, Canada** – Manager of a 4-year Dam Safety Strategic Alliance for various Deficiency Investigations (principally 80 m high, 675 Mva Seven Mile Hydroelectric Dam), Comprehensive Inspections and Reviews (Dam Safety Reviews), OMS Manuals and assistance with investigation of sinkholes at 183 m high Bennett Dam. For and with BC Hydro.
- Ambatovy Nickel Mine, Madagascar** – Responsible for initial appreciation on site of power and water requirements and availability, for feasibility study. For Phelps Dodge / H. A. Simons.
- Seven Sisters Dam and Generating Station, MB, Canada** – Overall reviewer for Dam Safety Review of 20 m high concrete gravity dam and 150 MW powerstation. For Manitoba Hydro.
- St. Lawrence and Madawaska River Dams, ON, Canada** – Lead Senior Engineer for risk assessment component of Dam Safety Reviews of 9 dams (FMEA). For Ontario Hydro.
- Hogsback Pumped Storage Scheme, South Africa** – Project Manager for a reconnaissance study for 1000 MW scheme including 45 m high embankment and rollcrete dams. For South African Government (Ciskei).
- Lower Fish River Irrigation Scheme, South Africa** – Project Manager for a bulk water supply to 1,500 ha scheme. For South African Government (Ciskei).

Mike J. Robertson, P.Eng
Specialist Engineer / Project Manager

Ciskei Dam Safety Programme, South Africa – Project Manager for an establishment and execution of programme including identification, classification, inspection, evaluation and reporting of all dams in Ciskei with identified safety risk. 12 large dams, 20 medium and 21 small. Production and supervision of number of remedial works contracts. For South African Government (Ciskei).

Inanda Dam, Natal, South Africa – Produced a Dam Safety Inspection Report on 65 m high composite gravity concrete / earth fill dam with an 11,700 m³/s Safety Evaluation Flood. For and with Department of Water Affairs Dam Safety Inspectorate, South Africa.

Dimbaza Upgrade Project and Urban Management Programme, South Africa – Project Manager for a number of projects to upgrade urban infrastructure and develop new residential areas, and project leader and technical member of consortium to train and empower local government. For South African Government (Ciskei) and Development Bank of Southern Africa.

Luvuvhu River Dam Feasibility Study, Queenstown Regional Water Supply Feasibility Study and Amatole Water Resource System Analysis, South Africa – Project Manager on behalf of own company in separate consortia of consultants. For South African Government.

Gibb Africa Water Division, Africa – After incorporation of local consultancy HKS into international Law Gibb Group, responsible for technical leadership, including technical audits of offices in Kenya, Ethiopia and Uganda and close liaison with Gibb UK. Involved in preparation of submissions for components of Lesotho Highlands Project, for Maguga Dam, Swaziland and projects elsewhere in Africa. (For HKS LAW GIBB).

Sandile Pipeline and Other Works, South Africa – Resident Engineer for various pipelines and reservoir construction contracts, including 7 km, 0.5 to 1.0 m diameter Sandile Pipeline. For South African Government (Ciskei).

Independent Consultant, Zimbabwe – Planning, design and construction supervision of dams and irrigation bulk water supplies. For various private clients.

Major Dams And Bulk Water Supply Works, Ministry Of Water Development, Zimbabwe – Chief Design Engineer Designs Branch, Head Office responsible for the design and construction supervision of various projects including **Raising of Chiredzi Canal** (to 7.6 m³/s capacity), **Kamativi Dam** (30 m high doubled curved arch, including ADSAS design at USBR), **Raising of Sebakwe Dam** (concrete buttress, from 39 m to 45 m high), **Smallbridge Dam** (32 m high embankment). Period included one-year work/study programme with USBR Engineering and Research Centre Dams Branch, Denver, Colorado, USA, learning hands-on and performing productive work on secondment from Ministry. Included detail embankment design for 30 m high earthfill **Lone Tree Dam, USA**; spillway aeration for 216 m high concrete gravity arch **Glen Canyon Dam, USA**; outlet works for 48 m high earthfill **McGee Creek Dam, USA**; stress analysis of 61 m high concrete arch **Gibson Dam, USA**; and uplift and seepage studies for concrete **Esna Barrage, Egypt**. Period also included separate two week USBR International Seminar on Management of Large Water Systems for Irrigation at Denver, Colorado and Fresno, California, USA. For Zimbabwe Government / USBR.

Major Dams And Bulk Water Supply Works, Ministry Of Water Development, Zimbabwe – Design Engineer to Deputy Chief Design Engineer Designs Branch, Head Office feasibility studies, preliminary and detail designs and construction supervision of various major dams and bulk irrigation water supply works throughout Zimbabwe. Included 45,000 ha **Chisumbanje Irrigation Scheme**, 27 m high **Amapongokwe Dam**, 1,500 ha **Middle Sabi Irrigation Scheme**, 90 m high **Condo Dam**, and various dams for City of Mutare. Detailed design for and two years as Assistant

Mike J. Robertson, P.Eng
Specialist Engineer / Project Manager

Resident Engineer on **Siya Dam** (56 m high embankment), primarily responsible for concrete works (300 m³/s tunneled drop inlet spillway and outlet works). Resident Engineer for final six months. For Zimbabwe Government.

Sir M. Macdonald And Partners, London, UK – Detail design for **East Gharraf, Badra and Mandall Irrigation Schemes, Iraq** and **Clachnaharry Sewage Scheme, Inverness**. Assistance with feasibility report **Paphos Irrigation Scheme, Cyprus**. For various clients.

WORK HISTORY

- Knight Piésold Ltd., (Vancouver, BC) Canada, Resident Engineer then Specialist Engineer / Senior Project Manager, 1999 - present
- Kohn-Crippen Consultants Ltd., (Vancouver, BC) Canada, Senior Project Manager, 1996 - 1999
- Hill Kaplan Scott Law Gibb (Pty) Ltd., South Africa, Senior Engineer to Director, 1986 - 1996
- Hill Kaplan Scott, Inc., South Africa, Resident Engineer, 1985 - 1986
- Independent Consultant, Zimbabwe, 1984
- Ministry of Water Development, Zimbabwe, Chief Design Engineer, 1980 - 1983
- Ministry of Water Development, Zimbabwe, Design and Assistant Resident Engineer, 1973 - 1979
- Sir M. MacDonald and Partners, London, Design Engineer, 1971 - 1972

PUBLICATIONS AND PRESENTATIONS

M. Robertson, "Eight River Crossings on 6.8 km long Sandile Dam Pipeline", 1988, SA Construction World, South Africa.

M. Robertson and R. Witthuhn, "Community Involvement in Housing Development: Lessons from Dimbaza", 1993, 21st IAHS World Housing Congress, Cape Town, South Africa.

M. Robertson, "The Ciskei Dam Safety Programme: A Pragmatic Approach to Dam Safety Assessments and Improvements", 1994, International Commission on Large Dams, 18th Congress, Durban, South Africa.

M. McCann and M. Robertson, "Estimating Loss of Life Due to Dam Failure: Pitfalls, Fallacies and Recommendations", 1999, Annual Conference of (US) Association of Dam Safety Officials, St. Louis, Missouri, USA.

N. Reid, C. Marti, B. Hughes and M. Robertson, "Rutherford Creek Hydroelectric Project: Sediment Exclusion at Main Intake", 2003, 16th Canadian Society of Civil Engineers Hydrotechnical Conference, Burlington, Ontario, Canada.

M. Robertson, "The Use of Weholite Large Diameter HDPE Pipe for the Low Pressure Conduit of the Rutherford Creek Hydroelectric Project", 2004, Large Diameter Polyethylene (KWH) Pipe Symposium, 2004, Toronto, Ontario, Canada.

M. Robertson, P. Wearmouth and R. Blanchet, "Rutherford Creek Hydroelectric Project – An Example of the Synergy That Can Be Obtained When Owner, Engineer And Contractor Work Together Using An EPC Contract Format", 2005, Waterpower XIV Conference, Austin, Texas, USA.

M. Robertson, "The Use of Weholite Plastic Pipe for Low Pressure Conduits in Hydroelectric Schemes", 2005, Plastic Pipe Institute Seminar, 2005, Vancouver, BC, Canada.

M. Robertson, "Aberfeldie Redevelopment Project", International Water Power and Dam Construction Small Hydro Conference, April 2009, Vancouver, Canada.

M. Robertson, "Redeveloping Aberfeldie", International Water Power and Dam Construction, July 2009.

Mike J. Robertson, P.Eng
Specialist Engineer / Project Manager

M. Robertson and G. McDonnell, "Run-of-River Hydro", Independent Power Producers of British Columbia Short Course, November 2009, Vancouver, Canada.

M. Robertson and N. Atkins, "Design of Intakes, Waterways and Powerhouses", Contributing Lecturer to British Columbia Institute of Technology Course on Run-of-River Hydro Power, May 2010, Vancouver, Canada.

M. Robertson, "Design of Waterways and Powerhouses", Contributing Lecturer to British Columbia Institute of Technology Course on Run-of-River Hydro Power, April 2011, Vancouver, Canada.

M. Robertson, R. Drury and E. Scherman, "The Pocaterra Penstock Replacement Project: Replacement of an Aging Surface Woodstave Penstock with a new Buried Steel Penstock", HydroVision Conference, 2013, Denver, Colorado, USA

TAB 6A

Russell Bernard Tyson

M.Pl., M.C.I.P., R.P.P., P.L.E

TyPlan
Planning and Management
(President)
2001 – Current

President of a "boutique" planning and management advisory firm.
The TyPlan team focuses on the delivery of:

- Economic development/economic impact studies
- Land use/development planning
- Business case development
- Socio-economic assessment, and land development
- First Nations Consultation/ Facilitation

Socio-economic assessments represent a key area of focus, having prepared a number of studies evaluating potential benefits of hydroelectric facilities on local communities and First Nations, and developing local employment strategies associated with such construction projects.

Arthur Andersen LLP.
Director: Real Estate Services Group
1997 to 2001

Director, Real Estate Services Vancouver office.
Responsible for the provision of advisory services at a corporate level to both the private and public sector. Services included:

- Economic development/Tourism strategies
- Sustainability/Conflict management
- Corporate real estate and planning
- Strategic planning
- Land development (e.g. municipal liaison and approvals)

UMA Engineering Ltd.
Senior Planner
1994-1997

Senior planner responsible for project management of large multidisciplinary studies.

Services included:

- Strategic planning and organizational management plans
- Tourism/Community economic strategies
- Environmental impact assessment/Land use planning
- Communications planning/Public facilitation
- First Nations
- Land development (e.g. Municipal liaison)

Dillon Consulting
Planner
1991-1994

Planner responsible for coordinating multidisciplinary studies:

- Environmental impact assessment
- Land use planning and policy

Delcan Corporation/D.R. Barker
& Associates
Land Development Planner
1986-1991

Land Development Planner responsible for:

- Community and land use planning
- Approval processing/Site planning
- Market analysis
- Land development

Education

Masters Certificate in Project Management, University of Victoria, 2012
Certificate Conflict Management and Analysis; Royal Roads University 2000
Professional Development Program; Corporate Real Estate, Massachusetts Institute of Technology, 1999
Certificate, Executive Management Development Program ("EMDP"); Simon Fraser University 1997
Master's in Urban and Regional Planning (M.Pl.); Queens University In Kingston, 1990
Honours Bachelor of Arts, Geography (H.B.A.); University of Western Ontario, London, 1986

Professional Associations

Member, Project Management Institute
Member Canadian Institute of Planners (M.C.I.P., R.P.P)
Member, British Columbia Institute of Planners (PIBC)
Member Ontario Professional Planners Institute (OPPI)
Member, Association of Professional Land Economists (P.L.E.)

TAB 7A

Pelino Colaiacovo

Pelino is a Managing Director at Morrison Park Advisors. In this role he is responsible for origination and transaction execution, financial advisory and capital raising services. Since joining MPA Pelino has focused on advising clients in the energy, utilities, infrastructure and public sectors.

Utility clients have included Hydro One, BC Hydro, Enwin Utilities, Milton Hydro, Woodstock Hydro, the Nova Scotia Utilities Review Board and the Alberta Market Surveillance Administrator, among many others. More broadly in the energy sector Pelino has worked on a number of M&A and capital raising assignments for renewable energy companies.

Prior to joining MPA, Pelino was Chief of Staff to the Ontario Minister of Energy from 2003 to 2005. During that time, he assisted in significant restructuring of the Ontario electricity sector, including the drafting and implementation of new legislation, the creation of the Ontario Power Authority, and significant procurements of new electricity generation capacity for the province.

Previously, Pelino spent more than 10 years in management, policy and communications consulting in Canada and the United States, advising clients across a wide range of sectors, including energy, transportation, telecommunications, and healthcare.

Pelino holds a B.A. and an LL.B., both from the University of Toronto.

TAB 7B

Benjamin Kinder

Benjamin Kinder is a Vice President at Morrison Park Advisors. He is responsible for client engagement, transaction design and execution, client development and overall delivery of service.

Prior to joining MPA in 2009, Benjamin spent two years in Scotia Capital's investment banking and equity capital markets divisions. While there, he focused on the communications, media and technology sectors, advising clients on mergers and acquisitions, and capital markets transactions.

Benjamin has experience in a number of industry segments including power and infrastructure, regulated utilities, basic materials, technology, media, telecommunications, non-profits and quasi-government entities.

His work has included mergers and acquisitions advisory, restructuring, private capital raising for early and mid-stage companies, expert advisory work for regulators, and strategic advice to the clients in the face of substantial change.

Benjamin holds a Bachelor of Business Administration (B.B.A.) from York University's Schulich School of Business, and a Master of Arts (M.A. Cantab.) from the University of Cambridge.

TAB 8A

Craig Sabine, MBA
 Senior Manager, Energy & Utilities
 416-515-3866
 craig.sabine@mnp.ca

PROFILE

Craig Sabine joined MNP in 2012 and is a Senior Manger in the Energy & Utilities practice. Craig is an expert in the analysis of Canadian energy projects and in climate change policy and mitigation strategy, as well as in other environmental and sustainability-oriented issues. For over 12 years, Craig has assisted a variety of clients with regulatory efforts and supported the development of public policy at the federal and provincial levels.

Prior to MNP, Craig spent 10 years with ICF International, working with a broad set of public and private sector clients on issues related to emissions reduction strategies and emissions trading initiatives, carbon finance, climate change policy and GHG risk. Craig was a member of ICF's verification team who performed verification, assurance and auditing functions for corporate GHG compliance and offsets development, as well as voluntary GHG strategies and carbon footprinting. Craig has participated in developing or verifying over twelve commercial-grade inventories and has completed numerous site visits to industrial and power generation facilities, providing GHG quantification services. Craig's climate practice assignments ranged from large point source emitter quantifications with the TransCanada, Husky, Capital Power and the Canadian Gas Association to carbon footprinting for services-based organizations and public sector entities.

In his energy practice, Craig developed much of the Canadian portion of ICF's electricity markets projection model and policy analysis tool, the IPM® and often supported generators, utilities and regulators in strategic planning, economic development, asset and portfolio assessment, due diligence, policy analytics and generation procurement and sale. Craig has evaluated the impacts of emissions reduction policies on the electricity sector, including Environment Canada's Turning the Corner climate change policies and transboundary NO_x and SO_x trading policies.

Prior to working at ICF, Craig worked in the International Smog Program of the Transboundary Air Issues Branch, Environment Canada, in Hull Quebec. He conducted preliminary research for the evaluation of effective emissions trading allocation methodologies as well as providing support for other projects and issues pertaining to public policies.

SERVICE LINE	Management Consulting
INDUSTRY FOCUS	Energy & Utilities, Sustainability, Public Sector
OFFICE	Toronto, Ontario

SELECTED ASSIGNMENTS:

INDUSTRY	SERVICE LINE	PROJECT DESCRIPTION
Energy and Utilities	Testimony	Koskie Minsky Expert Witness Support – For a law firm representing plaintiffs in a class action case vs. Atlantic Power Corporation, Craig provided expert witness evidence regarding economic and market-based impacts on the financial position of the IPP. Craig's testimony includes evaluation of the Florida and Ontario electricity markets and the impacts of PPA negotiations on Atlantic's share value and ability to service dividends.
Energy and	Audit and	OPA Process Audit and Re-design - Craig recently supported the OPA in

Utilities	Compliance	efforts to reconstruct the review and assurance process of regulated price plan claims submitted by Ontario electricity distributors as part of their settlement activities. Craig provided technical expertise on two field audits of the settlement claims and has been managing the development of a compliance and risk-based oriented certification program to replace annual audit.
Energy and Utilities	Regulatory	ENMAX Affiliates Fair Market Value Review – Craig managed the third party review of ENMAX's 2011 and 2012 affiliate transactions in support of the firm's current cost of service rate filing. The goal of the assignment was to provide assurance of compliance with the AUC's Affiliates Code of Conduct and to provide opinion on the fair market value of affiliate transactions between ENMAX and for-profit entities. Direct testimony may be required during the AUC hearing.
Energy and Utilities	Internal Controls	OEB Internal Controls Review – Craig participated as subject matter expert and reviewer on an assignment to evaluate the design and compliance of internal controls within the OEB's procurement, finance and IT departments. Subsequently the MNP evaluated and recommended on the need for and design of an internal audit function within the organization.
Energy and Utilities	Regulatory	ENMAX Fibre Optics Business Valuation – In support of the potential for regulatory hearings associated with the sale of a non-regulated business, Craig managed the development of a valuation of fibre optics assets for a Canadian utility. The assignment developed a full model of equipment, construction, labour and operating costs associated with an urban fibre optic network.
Energy and Utilities	Regulatory	CustomerFirst Alternative Service Delivery Model – For a number of Ontario LDCs, Craig is currently leading the development of a shared services collaboration to enhance the cost efficiencies and customer service for ratepayers. The collaborative model is an alternative design toward efficiency from traditional consolidation and merger.
Energy and Utilities	Regulatory	Distribution Sector Panel – Craig recently led an MNP team to support a consortium of 4 Ontario LDCs (Greater Sudbury Hydro, North Bay Hydro, Northern Ontario Wires, Chapleau Public Utilities Corp) in the development and presentation of their position on LDC consolidation for the Ministry of Energy and the Panel. The position included analysis of the economic, operational, and community-based implications of various options to drive efficiencies in the sector. The focus of the position paper and presentation addressed the following principles: Efficiency and reliability of the systems being maintained; Safety of the systems being maintained; Price impacts to ratepayers; and Capacity of LDCs to carry out their mandate.
Energy and Utilities	Regulatory	Kinder Morgan General Rate Application – Currently, Craig is working closely with an internal team of operations, project management and finance experts at a major Canadian pipelines company to prepare the rate base for their 2013 rates application to the National Energy Board. Craig is managing all aspects of development and verification of the rate base and capital project accounts to develop one of three key sections of the GRA cost of service.
Energy and Utilities	Finance and Risk	Kinder Morgan Pipeline Abandonment Trust Development – Pursuant to the current land matters consultation policy process currently being carried out by the National Energy Board, Craig is currently working with a team to manage the development of a pipeline abandonment mechanism for a major Canadian pipeline in the form of a trust fund. This project includes project

		management, financial and process advisory and collaboration with other service groups including valuation, actuarial, regulatory, finance and asset management (ongoing).
Energy and Utilities	Regulatory	Enbridge Shared Services Cost Allocation Model - Recently at MNP, Craig participated on a team who assessed the shared services cost model of one of Ontario's largest natural gas distribution utilities, whose parent company provides shared services support in a number of operational functions. To approve the natural gas rates charged to Ontario consumers, Enbridge Gas Distribution must have its shared services cost allocation approved by the OEB after third party assessment. The analysis included benchmarking the shared costs of several functions to other cost of service and ratemaking submissions of gas and electric utilities.
GHG Assurance and Auditing	Quantification of Greenhouse Gas Attributes of Renewable Energy Credits (RECs)	EPCOR/Capital Power Renewable Energy Credits Quantification - Electricity generation from renewable sources is eligible for "Eco-Logo" certification where it is deemed to offset fossil fuel generation. In Alberta, electricity is predominantly generated from coal and natural gas. Craig managed a project to develop a methodology and analysis of the greenhouse gases deemed to be offset from two renewable generators in Alberta for the period of 2003 through 2008. This quantification was used to provide an expert opinion on the actual offsets attributable to the RECs associated with these generators.
GHG Assurance and Auditing	SGER Compliance Reports and Baseline Application Verifications	Multiple Clients GHG Reporting - Mr. Sabine supported ICF's verification team conducting over 36 Compliance Reports and Baseline Application Verifications under Alberta's Specified Gas Emitters Regulation ('SGER'). The verifications were undertaken for EnCana, TransCanada Pipelines and Husky Energy for a broad range of facilities including: gas-fired power plants, natural gas pipelines, cogeneration units, natural processing facilities, and SAG-D bitumen recovery operations.
GHG Assurance and Auditing	Verification of F23 Emission Reduction Activities	Dupont Emissions Reduction Project Verification - Mr. Sabine was lead of an audit team that performed a verification of the DuPont Louisville Freon plant; to verify HFC-23 emission reductions for 2008, 2009 and 2010. The facilities managers have implemented several programs leading to GHG equivalent reductions of over 1 million tonnes. More recently, a change to the quantification protocol was also reviewed that added a new portion to the amount of HFC-23 reduced through project level reductions. The data sources and data were QA/QC'ed and calculations verified. The focus of this assignment was the issuance of a letter of verification for the emission reductions achieved by way of Dupont's efficiency optimization program and F-23 destruction abater.
GHG Assurance and Auditing	Third Party Verification and Opinion of Greentags	EPCOR Environmental Attributes - For one of Alberta's premiere electricity generators and marketers, Craig completed a verification of the methodology and quantification of the environmental attributes associated with renewable generation from Ecologo certified facilities. Opinion letters were drafted for several large commercial customers who have entered into contract with Epcor, for "Greentag" energy to be used voluntarily for a percentage of their load.
GHG Assurance and Auditing	CDM Project Risk Assessment and Valuation	Natsource GHG Reduction Portfolio Risk - Craig was engaged by a large asset management and carbon investment firm in valuing a portfolio of CDM projects. Using ICF's proprietary CDM project evaluation tool, KPRISM, Craig is working on a team to adapt the tool to evaluate a portfolio of CDM and JI projects that are part of a carbon hedge fund developed by Natsource. The risk assessment will enable Natsource to analyse their

		carbon price risk and risk of delivery from a portfolio and project level perspective. The KPRISM tool and other techniques employed by ICF have been developed through many years of project experience in valuing emissions reduction projects and assessing their risks to investors.
GHG Assurance and Auditing	Voluntary Carbon Market Project Risk	JP Morgan Carbon Assets Risk Evaluation - In early 2008, Mr. Sabine was the technical lead on developing a risk evaluation tool for a large New York investment banking arm. JP Morgan required expert carbon reduction project risk evaluation, on the likelihood of its portfolio of projects completing approvals, keeping construction deadlines and producing registered emission reductions and becoming optimally transactable. The resulting tool was based on ICF's proprietary KPRISM CDM risk evaluation tool, but was tailored for JP Morgan's portfolio of voluntary market projects. The excel-based tool is also flexible in design to be transferable to other portfolio's adaptable to any number of current carbon registries. Craig helped design and implement the programming, while acting as liaison with the client to incorporate specific inputs. Mr. Sabine also presented the final tool and first short training seminar.
GHG Assurance and Auditing	Verification of N ₂ O Emissions Reduction Activities	Invista GHG Reduction Verification - Craig was a key team member for a verification of 2006 vintage (January through July) emissions reductions created as a result of activities at the Invista Maitland, Ontario Adipic Acid production facility (N ₂ O abatement). The verification audit involved an onsite visit to the facility to review source data and confirm calculations described in the Emission Reduction Protocol and ensure that no emission sources have been omitted in the reporting. Based on the findings ICF issued a letter of opinion on the validity of the credits claimed.
Climate Change	2004 GHG Inventory Report	Canada Gas Association GHG Quantification - For a partnership of natural gas companies, ICF was employed to quantify and report on GHG emissions. With the growing concerns of climate change and its causes in Canada, the partnership recognized the need for a detailed and comparable inventory of GHG emissions from Canada's natural gas delivery system. Craig was involved in the QA/QC of company level data and development of the inventory report.
GHG Assurance and Auditing	Verification of F23 Emission Reduction Activities	Dupont Emissions Reduction Project Verification - Mr. Sabine was part of an audit team that visited the DuPont Louisville plant to verify HFC-23 emission reductions for 2005, 2006 and 2007. A change to the Protocol was also reviewed that added a new portion to the amount of HFC-23 reduced through project level reductions. The data sources and data were QA/QC'ed and calculations verified. The focus of this assignment was the issuance of a letter of verification for the emission reductions achieved by way of Dupont's efficiency optimization program and F-23 destruction abater.
Climate Change	Modeling and Strategic Advice, National Round Table on the Environment and Economy	NRTEE Economic Analysis of Canadian Emissions Reduction Strategies - Mr. Sabine worked with a team on this year long modeling and analysis effort investigating scenarios that Canada might use to achieve reductions in its Green House Gas (GHG) emissions by 50-60% as part of an effort to attain sustainable levels of CO ₂ emissions worldwide. Craig has worked with project managers to help develop, model and assess the level of success that a variety of policy and structural scenarios might have on Canada's next generation of climate change responses. NRTEE's goal for this program is to identify the strategic directions for energy and climate policy the government must pursue to put the country on a course for a 60 percent reduction in greenhouse gas emissions by 2050 in a manner that will contribute to Canada's economic prosperity and competitiveness. The

		team employed a full-cycle energy, economic-demand and supply model to simulate GHG emissions simultaneously across all economic sectors. This model called Energy 20/20 was used to develop and analyze the reductions that could be achieved using the Soclow Wedge theory.
Climate Change	WECC Transmission Developments: Cost and Benefits Quantification	TransCanada Emissions Cost and Benefits of Transmission Development - Craig developed an emissions impacts calculator tool for TransCanada Energy, who was exploring the development of two long distance, high-voltage, direct current transmission lines in the western United States. Mr. Sabine managed a team of consultants who developed the tool and provided a detailed displacement analysis of the western US electricity markets. The Zephyr and Chinook Transmission projects would originate in the western interior (Montana and Wyoming) and take advantage of high quality wind resources to be transported down to the Las Vegas area where the lines would gain access to southern California electricity markets. ICF built up a number of data inputs and a methodological framework to allow users to test various supply scenarios utilizing the lines. These supply scenarios are overlaid in the tool with a number of user defined inputs for the load serving entities who would purchase the western interior supply and serve California customers. The tool estimated the impacts on GHG, NOx and SO2 emissions that the development of these transmission lines might have in California if allowed to contribute to the California RPS standards.
Climate Change	Renewable Energy Credit and GHG Offset Market Analysis	AltaGas Environmental Markets Potential - Mr. Sabine led an effort for AltaGas, which explored the market potential for RECs and offsets for a British Columbian-based renewable asset. The study provided a very detailed summarization of the different mechanisms around western Canada and the western United States that could provide a source of revenue for the project for environmental attributes. The work also included a 25 year forward looking forecast of REC prices for the western markets, assuming current and future RPS standards and the likelihood of an aggregate US RPS system. The REC analysis was supplemented with quantification from ICF's carbon markets work to provide AltaGas and their investors with a reasonable outlook for the price of carbon offsets.
Climate Change	Alberta and Saskatchewan Power Sector GHG Emissions Assessment and Offsets Potential	Bruce Power Carbon Offsetting and Electricity Markets Study - Bruce Power In November of 2008, Craig finalized an analysis of the Saskatchewan and Alberta power markets. The two phased study implemented IPM® to forecast the power sector response in Alberta and Saskatchewan to various nuclear development scenarios over a 30 year time period. The study quantified the volume of GHG reductions that could be realized given nuclear development, the changing fleet dynamics in Saskatchewan and Alberta, as well as, the impacts on electricity transmission and intertie movement. The study also quantified the compliance cost reductions that could be realized if new nuclear were recognized in a Canadian federal offsets system and the potential revenue creation of the offsets produces.
Climate Change	Quantifying the Greenhouse Gas Emission Reductions Associated with the use of Wind Energy	CANWEA Electricity Generation GHG Intensity Review - In early 2008, ICF was commissioned by the Canadian Wind Energy Association to provide third party calculations of the power sector related greenhouse gas emissions intensity in Canada. For each province, ICF estimated power grid related emissions intensities using three separate conceptual frameworks. These included Annual Average-Provincial Intensity, Recently Commissioned Intensity, and Operating Margin Intensity, the latter of which followed internationally recognized protocols from the CDM and World

		Resources Institute. The study relied on real, historical and empirical data to calculate existing and historical sector GHG intensity. Where datasets were unavailable, proxy information was developed to simulate the likely power generating operations. Data was accumulated over a two month period from a survey of all provincial utilities, system operators, energy utilities boards and national level statistical databases. The results provided CANWEA with reasonable estimations of the emissions intensity associated with operating provincial power grids and how wind can play a role in reducing those emissions intensities on a displacement basis.
Climate Change	Scenario Analysis: Air Emissions Under the Canadian Regulatory Framework	CEA Air Emissions Futures - Mr. Sabine led a team employed by the CEA and its members, including all major generating utilities across Canada, to aggregate and analyze electricity sector futures outlooks. While managing the project and facilitating sessions aimed at developing an analysis and approach to lobby the federal government, Craig was challenged to address a broad range of sensitivities affecting different power companies across the country. The project was taken on to develop a comprehensive database of current and forecasted electric generating fleet operations and inform the development of alternative approaches to regulating the sector in terms of GHGs and air pollutants. The analysis assessed the changes in compliance flexibility, fuel switching, new and emerging technology development and credit purchasing across a broad range of regulatory scenarios. The analysis investigated the opportunities and barriers for capital stock turnover, culminating in a lower emitting national power sector and the relevant and realistic timeframes in which this may be feasible.
Climate Change	National Clean Energy and Transmission Development, GHG and CAC Displacement	TransCanada Environmental Cost/Benefits of National Transmission - Craig led the development of a GHG and CAC emissions displacement analysis tool incorporating significant power project developments across Canada, with extensive east-west transmission upgrading. The excel-based tool provided the client with a flexible spreadsheet analysis, based on several user-defined inputs. The tool could be used to create scenarios with results providing ultimate GHG and CAC displacements, based on the power projects analyzed and the set of input assumptions applied to these projects. Craig also presented this tool to client and other industry stakeholders at a one day planning and strategy session of the national grid effort.
Climate Change	Assessing the Impact of Climate Change	CIBC Carbon Pricing Risk Analysis - For a major lending institution, this project focused on the financial exposure to climate change risk that may be seen by Canada's Large Final emitters. ICF was tasked to develop and apply a methodology that would translate companies' current business practices into emissions intensities to compare against possible government targets. Mr. Sabine was involved in research, data development and QA/QC. Craig was involved in developing a methodology to calculate and project emissions intensities and production values which was a key portion to accurately assess risk to policy developments. The team also worked to forecast carbon market pricing, calculating possible emission reduction potential, and built the framework for the model.
Energy Markets	Generating Plant and Emission Control Technology Cost Model	Environment Canada Generation Technology Costing Model - Mr. Sabine managed the development of a costing model for Environment Canada to support their policy modeling efforts in the electricity generation sector. The costing model relies on standard industry approaches to capital cost and operations and maintenance cost estimations, while building on financial, market and other parametric assumptions to analyse macroeconomic impacts on the current and future costs of power plants and

		emissions reduction equipment in Canada. The tool will be used to set the basis for capital and lifetime costs of power plant options, which can be fed into simulation and optimization models supporting policy and market analysis.
Energy Markets	California Market and Policy Assessment of CAISO	Capital Power California Market Assessment - Mr. Sabine led an analytic assignment completed for Capital Power identifying and reviewing the key drivers in the California power markets. The analysis aimed to evaluate the attractiveness of the California market for investment in acquisition opportunities or greenfield projects, based on the current market and price direction, market rules, air emissions, climate and water policies and overall robustness of the energy markets in the western United States. The project culminated in a market price forecast and policy risk evaluation report.
Energy Markets	PJM Renewables Queue Process Risk	SolarRay LLC PJM Connection Due Diligence - For an investment firm specializing in deploying capital for large-scale solar energy projects, Mr. Sabine completed due diligence on the interconnection process and project status within the PJM interconnection queue. Craig's ICF team reviewed five potential solar projects between 10 MW and 20 MW to determine the risks associated with PJM and distribution utility review procedures, as well as the technical connection risks associated with each project's physical connection requirements and location.
Energy Markets	2010 North American Natural Gas Markets Supply Review	OEB Natural Gas Markets Assessment - For the OEB, Craig and a team of gas markets experts developed a review and forecast of the changing natural gas market in North America and its impacts on the Ontario market. In light of recent advancements in unconventional supply and technology, several new supply regions are growing in importance, changing the nature of gas prices and gas transmission around the continent. Several important factors were found to be affecting Ontario market participants.
Energy Markets	Conservation Potential and Market Capability Assessment for System Constrained Area	OPA Conservation Market Assessment - For the OPA, Craig managed an extensive study of the West GTA market's capacity and capability to deliver conservation measures, including energy efficiency, demand response and fuel switching in the residential, commercial and industrial sectors. The analysis included an estimation of the technical, economic and achievable potential for conservation and energy efficiency over a 10 year timeframe, under a set of incentive scenarios. Market capability was also assessed with several barriers to uptake of conservation measures being identified. Mr. Sabine managed an ICF team made up of Ontario market experts and building-technology experts to produce a report and set of implementation recommendations that could be used by the OPA and relevant local distribution companies in their design and implementation of conservation programs and incentives.
Energy Markets	Canadian Wind Energy Target 2020	CANWEA Wind Energy Target Setting - Mr. Sabine headed up an effort to support CANWEA's new target setting process. The study involved surveying the best available provincial-level electricity demand data and planned power plant new-build information to assess what the future of Canada's electricity supply-demand balance might be. Assumptions on the amount of projected wind uptake were layered over each province's supply-demand outlook to determine a reasonable wind target for the industry. Niche markets and cost competitiveness of different generating technologies were also explored during the process. An accompanying phase investigated in detail, the impacts of different scenarios of economic and policy conditions on cost competitiveness of wind versus other generating technologies.

Energy Markets	Analysis of Intensity Based and Cap & Trade GHG Regulation in Canada	Canadian Hydropower Association GHG Policy Analysis - While with ICF Mr. Sabine directed a study for the CHA designed to assess the impacts of different GHG regulation frameworks on the Canadian power sector and the role that hydro developers and operators could play. Mr. Sabine managed the modelling effort using the IPM® to assess hydro's potential role in meeting GHG reduction targets or becoming part of a Canadian system of GHG offsets. The study forecasted carbon price, sector compliance costs and energy prices.
Energy Markets	Regional Market Assessments	Bruce Power Ontario Market Study - In early 2007, Craig collaborated with Bruce Power, a nuclear power developer and operator in Ontario. The work focused on using IPM® to develop power market analyses and assessments of potential, future environmental markets. Under prospective regulatory regimes it was valuable to perform scenario analysis and emissions profiling in the Ontario and New Brunswick generating sectors, to allow Bruce Power to develop solid business and environmental strategies. In a regional context, Quebec plays a vital role to both of these markets and was analyzed to incorporate the most accurate representation and interaction possible. The modeling was designed to support the emissions and costs benefits of new large-scale nuclear development in two key Canadian power markets. Changes to capacity mix, dispatch, emissions patterns and interregional transmission were analyzed. The work identified the potential return new nuclear projects might receive, assuming participation in greenhouse gas and air pollutant markets.
Energy Markets	Clean Energy Standard Offer	OPA Supply Standard Offer Development - For the Ontario electricity system long-term planning, supply and conservation authority, Craig used modeling and analysis tools to determine the expected operating environment for small (less than 10 MW) gas generators if provided entry into the market given a standard offer program. Craig developed a methodology to assess optimal operating schedules for peak shaving, given the generators would operate four hours or sixteen hours daily. This also included the development of an energy demand and peak demand forecast incorporating planned DSM initiatives over a 25 year period. Craig also helped in developing a detailed hourly power market assessment using two different modeling tools. The forecasts included marginal energy and capacity prices and expected generator electricity rates given a specified uptake of the program across the ten Ontario zonal markets. The team also forecasted natural gas rates for each of the Ontario zones and provided expected operating margins given the different optimal operating schedules analysed.
Energy Markets	Third Party Power Market Assessment	AMPCO Coal Phase Out Air Emissions Analysis - ICF performed an assessment of the impacts of the Ontario Government's impending coal phase out plan in a number of different scenarios for an association of major wholesale electricity consumers. Mr. Sabine led an effort drawing on ICF's modeling tools to provide a provocative analysis that looked at the impacts of coal plant retirements on energy prices, investment costs and emissions markets. Craig analyzed several capacity replacement and expansion plans in a sensitivity type analysis on Ontario market dynamics. Mr. Sabine also completed follow-up work for AMPCO. This employment assessed the degree to which imported energy in the analyzed scenarios changed regional emissions patterns and included a research effort on international GHG markets and mercury tracking. All results were presented a Toronto Board of Trade breakfast speech.
Energy	National	Environment Canada Electricity Sector Policy Modelling - ICF was

Markets	Implementation of IPM Electric Sector Modeling	employed to follow-up work on an original Canada modeling project from 2003 that was directed at building a national model of the electricity sector that could be seamlessly docked with the US EPA's federal power sector model. After its success ICF will now move forward to update and refine the Canada model implementing structural, and policy changes of the past year. Craig is involved with the upkeep of the generating unit database, and with implementing the changes to the 2006 model. Operating costs, environmental policies, new developments that have been built or approved and other power sector trends are some of the rigorous updates that will be performed to provide Environment Canada with a comprehensive tool to assess policy development.
Energy Markets	Canada-Wide Electricity Sector Modelling	CEA Electricity Sector Analysis - ICF is employing a nation-wide electricity sector model on behalf of the CEA to support their negotiations with the federal government. The model will be based on both publicly researched data as well as incorporate utility specific data, thus providing meaningful detailed outputs. Mr. Sabine provided support for both the research and modelling effort in a collaborative effort with Canadian and U.S. colleagues.
Energy Markets	Identifying Carbon Impact and Cost Effective Generation for Regional Hydrogen Production	NRCAN The Hydrogen Economy - Acquired and analyzed a wide variety of data on the Canadian Electric Power Sector to determine the capacity of the power generation sector to support a hydrogen economy in transportation. Craig was part of the IPM team that modelled nine Canadian provinces to aid in this three-phase project to determine the impacts of increased demand on power sector emissions output.
Energy Markets	Analysis of Electricity Dispatch in Canada	Environment Canada PERRL Program Development - The Pilot Emissions Removals, Reductions and Learnings (PERRL) Initiative, allows the Government of Canada to purchase GHG removals through specified projects. For renewables, ICF analysed the dispatch order of power generation in provinces to estimate the emissions that would be displaced through renewable generation. Mr. Sabine was on the team that modelled the Canadian provinces and subsequently formulated the results for the client. He assisted in preparing the model, running and de-bugging the model as well as analysing the results.
Other Energy and Environment	Water Regulatory Review and Barriers Analysis	Capital Power Water Regulatory and Policy Analysis - Mr. Sabine managed the development of a full U.S. regulatory review focusing on policies, regulations, standards and permitting processes that are considered in power plant siting, project development and investment decisions. For CPC, interest was placed on several southwest and northeast U.S. markets where investment and expansion opportunities exist. The ICF reviewed riparian and prior appropriation water use law, the Clean Water Act, Secure Water Act and new OTC cooling intake regulations to understand how project development and M&A may be impacted or significantly hindered by existing and new water policy requirements. Significant focus was placed on allocation and transfer rights.
Other Energy and Environment	Mercury Re-release Potential in Canada	Environment Canada Mercury Sources in the Electricity Sector - Craig managed the development of an analytic options paper describing the fate of mercury from the fuel source through combustion and control in coal-fired generating stations; to estimate its potential for re-release into the environment from power plant release points besides the stack emissions. The analysis developed a unique quantification methodology to estimate the potential for release in Canada under a baseline scenario and other policy

		scenarios assuming mandatory mercury capture rates. The study will be used by the federal government as they develop and expand mercury policy in the country.
Other Energy and Environment	Environmental	TransCanada Analysis of Mercury Control technologies for Alberta Coal Plants - In Spring 2009 Craig was engaged to perform a literature review of technical testing documents for mercury removal at coal-fired plants in the US and Canada with the intention of identifying likely causes for lower than expected mercury removal at tested Alberta coal power plants. Mr. Sabine studied testing documents for client's site and compared with the benchmarking analysis created through technical research of mercury control testing documents at other North American sites. The end-product was to help the client develop a mercury removal strategy in response to provincial emissions regulation.
Other Energy and Environment	Environmental	Environment Canada Liquefied Natural Gas Sector: Technology and Environmental Impacts - Craig and team of natural gas market experts authored a technology paper for Environment Canada to support their understanding of the LNG value chain, infrastructure and potential environmental impacts of growth in the LNG market in Canada. The paper outlined the technologies and operations at liquefaction, transport, gasification and other LNG facilities and each of their studied environmental impacts and emissions releases.
Other Public Sector and Environment	Environmental	Environment Canada and Niagara Escarpment Commission Forest Monitoring – Craig executed in situ biodiversity monitoring of protected forest lands along the Niagara Escarpment, including species identification, inventorying and health assessment.
Other Public Sector and Environment	Environmental	Environment Canada Emissions Policy Development - While working at Environment Canada, Craig developed the first frameworks for allocating baseline emissions to electricity generation facilities based on historic performance and grandfathering. The effort was to support development of cross-border air pollutants trading policy.
Other Public Sector and Environment	Environmental	Lower Trent Conservation Waterfront Restoration Project – Craig designed a restoration ecology plan to support development of restored natural habitat along sections of the Lower Trent River in Trenton Ontario. Working closely with the conservation authority, Craig and his team designed the methodology and implementation for the project.
EDUCATION & TRAINING		<ul style="list-style-type: none"> • 2011 M.B.A. Executive Program, Queens School of Business, Kingston Ontario. • 2004 B.E.S. Environment and Resource Studies. Minor, Biology University of Waterloo. Ontario • 2006 Environmental Auditing, Schulich School of Business and Jaques Whitford
PUBLICATIONS		<ul style="list-style-type: none"> • Sabine, Craig. "The 21st Century Electricity Grid: The Right Time to Catch Up". Whitepaper. September 2009. • Sabine, C., Gilmore, A., Gibbons, W. and V. Young. 2002. "Environmental Education & the Ontario Elementary School Curriculum". <u>Interactions: The Journal of the Ontario Society of Environmental Education</u>. Spring 2002, Vol 14: 3.

TAB 8B

Sarah Keyes, CPA, CA
 Consultant, Energy & Utilities
 416-263-6987
 sarah.keyes@mnp.ca

PROFILE	<p>Sarah Keyes has over 4 years of diverse work experience in a variety of industries, including mining, oil & gas and manufacturing. Prior to joining MNP, Sarah worked for over 2 years at PricewaterhouseCoopers in Toronto in the mining practice working toward her CPA designation.</p> <p>Sarah has been actively involved in the sustainability space for over 5 years. In 2009, Sarah created and authored a sustainable business column for the McGill Management newspaper, the Bull & Bear. In 2010, Sarah took an elective course in Strategies for Sustainability, which was a research-oriented course covering a variety of disciplines. Also in 2010, Sarah performed an independent study on Environmental Accounting & Sustainability Reporting, which was heavily research focused.</p> <p>Upon receiving her CPA designation in 2013, she joined as a Consultant in the Energy & Utilities team at MNP. Sarah has worked on a number of projects for various clients within the Energy & Utilities niche since joining, including Sudbury Hydro, ENMAX Power Corp. and Oakville Hydro. Sarah is actively working toward her Greenhouse Gas Verifier (GHG-V) designation. In 2013, she completed a 3-day training course on ISO 14064-3 (Greenhouse Gas Verifications), which included passing a comprehensive final exam.</p>
SERVICE LINE	Consulting
INDUSTRY FOCUS	Energy & Utilities
OFFICE	Toronto, Ontario

SELECTED ASSIGNMENTS:

COMPANY	SERVICE TYPE	DESCRIPTION
MNP LLP	Energy & Utilities Consulting	<p>Suncor Energy Sustainable Supply Chain Industry Scan MNP was engaged by Suncor Energy to perform a comprehensive industry scan across the mining & metals and oil & gas industries to identify sustainable supply chain best practices and provide recommendations for Suncor's supply chain management. Sarah's role was to perform in-depth research on over ten companies, assist in the development of the maturity model and write the final deliverable. The final report submitted to Suncor included the company research performed, best practices and trends identified, metrics for measuring success and outcomes of initiatives, a 5 year implementation plan and the maturity model, which provides a visual overview of the companies relative to one another in terms of supply chain sustainability.</p>
MNP LLP	Energy & Utilities Consulting	<p>Koskie Minsky LLP Due Diligence Review MNP was engaged by Koskie Minsky LLP (Toronto-based law firm) as an independent expert consultant for a large class action lawsuit against a publicly-traded independent power producer. Sarah's role on the team was to perform in-depth analytical research; benchmark disclosure practices and trends in financial results against comparative companies; perform a full review of the corporation's disclosure and reporting practices; and perform extensive research on analyst reports. Sarah contributed heavily in writing the final independent expert report, which was used by Koskie Minsky LLP as evidence in the class action lawsuit against the corporation.</p>

MNP LLP	Energy & Utilities Consulting	<p>Consensus Accord</p> <p>MNP was engaged by a consortium of 40 LDCs (led by Sudbury Hydro) to prepare a response to the Ontario Distribution Sector Panel Review Report: <i>Ontario's Distribution Sector – Putting the Customer First</i>. Sarah's role on the team was to perform in-depth analytical research of the sector; prepare multiple financial analyses using the LDC financial statements from the Ontario Energy Board (OEB) website; perform a full cost-benefit analysis of consolidating the Ontario distribution sector; develop a qualitative case for the value of the local utility; use of research and historical benchmarking to develop a case for voluntary consolidation rather than mandatory consolidation; and prepare ultimate recommendations for the 40 utilities and the overall sector. The final deliverable was the Consensus Accord Paper (written and released publicly) on behalf of 40 local distribution companies, which is a response and critique to the Ontario Distribution Sector Panel Review Report.</p>
MNP LLP	Energy & Utilities Consulting	<p>Oakville Hydro Energy Services Inc. (OHESI) Renewable Energy Projects Offer to Purchase</p> <p>MNP was engaged by Oakville Hydro Energy Services Inc. (OHESI) to assist in the acquisition of 2 renewable energy (hydro) projects from Horizon Utilities. Sarah's role on this project involved preparing financial models for both hydro projects (included forecasted cash flows, KPIs, capital plan, balance sheet, income statement for 40 years duration of the hydro projects); assist in the structure and wording of the indicative offer presented to the seller; and a full assessment of the seller's forecasts for 2 hydro projects. The financial models resulted in an M&A transaction for a combined value over \$37M.</p>
MNP LLP	Energy & Utilities Consulting	<p>ENMAX Power Corp. (EPC) Underground Residential Distribution (URD) Fair Market Value Assessment</p> <p>MNP was engaged by EPC to perform a FMV assessment study for single phase multis and single family detached homes (100 amp and 200 amp) URD services in Calgary. Sarah led this project from start to finish and performed all supporting analyses behind the final report. Sarah's analyses included significant regulatory research of the URD-related Alberta Utilities Commission (AUC) regulatory applications and decisions; peer utility cost research; developing a cost build-up for a typical URD lot; and assessing alignment of FMV rates and cost build-ups with AUC regulatory requirements for affiliate transactions. The final deliverable was a comprehensive report outlining the fair market value assessment ranges for single phase multis and single family detached homes URD services in Calgary, Alberta for inclusion in the regulatory rate application to the AUC.</p>
EDUCATION AND PROFESSIONAL DESIGNATIONS	<ul style="list-style-type: none"> • Bachelor of Commerce, Major in Accounting (Distinction), McGill University (2010) • Chartered Professional Accountant, Chartered Accountant (CPA,CA) with the Chartered Professional Accountants of Ontario (2013) 	
SUSTAINABILITY QUALIFICATIONS AND EXPERIENCE	<ul style="list-style-type: none"> • Certified Sustainability Professional (CSP) with the Canadian Professional Sustainability Institute (2011) • ISO 14064-3 <i>Greenhouse Gas Verifier</i> Training with CSA Group (2013) • Environmental Accounting Independent Study (McGill Coursework – 2010) • Strategies for Sustainability (McGill Coursework – 2010) • Author of Sustainable Business column in Bull & Bear Newspaper (McGill – 2009/10) 	