

Ian Goodman

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Professional Profile

Ian Goodman is President and founder of The Goodman Group, Ltd. For over 40 years, he has conducted research and consulted in energy regulation and economics (related to conventional, unconventional and renewable energy, and energy efficiency). His practice has addresses a broad range of issues, including economic development and environmental impacts of large energy supply, infrastructure and transportation projects (including pipelines), North American and global oil, gas, coal and electricity markets, as well as regulation of natural gas and electricity. He also has expertise in the planning and operations of energy systems, as well as interjurisdictional energy trade in North America.

Since 2011, his practice has focused on fossil fuel supply (notably shale oil and gas, Canadian tar sands and coal) and transportation logistics (including pipelines, rail and transloading facilities). Mr. Goodman has co-authored reports and expert testimony on the most controversial oil, gas and coal projects in North America, including crude oil pipelines (Keystone XL, Enbridge Line 9B, Trans Mountain), natural gas pipelines (PennEast and NESE) and energy logistics facilities (Millennium Bulk Terminal (coal), Kalama Manufacturing & Marine Export Facility (shale gas/methanol) and Vancouver Energy Distribution Terminal (crude)).

He has provided expert evidence in over 50 regulatory, environmental assessment, and legal proceedings in various North American jurisdictions including California, Washington, Colorado, North Dakota, South Dakota, New York, New Jersey, three New England states, Florida, British Columbia, Manitoba, Ontario, Quebec and before Federal Energy Regulatory Commission (FERC) in the US and the National Energy Board (NEB) in Canada, and United States District Courts. He has also assisted counsel in those and other proceedings. His clients include governments, regulators, environmental and customer groups, Indigenous organizations and energy sector companies. Mr. Goodman is the author or co-author of over 60 publications and major reports relating to the energy industry.

Professional Experience

**1989 – present President, The Goodman Group, Ltd.,
Berkeley, California (formerly Boston, Massachusetts)**

Collaborating with a team of associates to provide expert consulting services such as expert testimony, reports, research, policy assessment and litigation support related to energy regulation and economics (conventional, unconventional and renewable energy, and energy efficiency).

Specializing in pipeline economics and regulation, evolving North American oil, gas and electric markets, economic development and environmental impacts of various energy supply options and transportation logistics, and energy system planning and operations.

Major Projects:

- Since 1991, has conducted or co-authored over 50 national, regional, and state/provincial studies on the economic and environmental impacts of various energy options, infrastructure and systems throughout the US and Canada.

Economic Development and Environmental Impacts of Large Energy Projects with a Focus on Fossil Fuels

- Since 2011, has authored or co-authored 15 expert reports on the economic and environmental impacts of fossil fuel production and transportation (particularly shale and tar sands crude production, interjurisdictional pipelines, transloading facilities and crude-by-rail projects). These reports include analysis of related markets for energy supply produced and/or transported.
- Prepared the [“Expert Report on Millennium Bulk Terminals-Longview/Lighthouse”](#) and the [“Expert Rebuttal Report on Millennium Bulk Terminals-Longview/Lighthouse”](#) with in-depth participation of Brigid Rowan, on behalf of the **Washington State Office of the Attorney General (AGO)** in the matter of *Lighthouse Resources, Inc., et al. v. Jay Inslee, et al.* before the US District Court (West). At maximum throughput of 44 million metric tons of coal per year, the Millennium Bulk Terminals-Longview (proposed by Lighthouse), would be the largest coal export terminal in North America. TGG was retained by the AGO to conduct research and analysis on the burden to the US coal industry if the Millennium Bulk Terminals-Longview were not built.

In light of TGG’s analysis of the Asian demand for the US coal to be

exported via the terminal, as well as the employment impact of the terminal, the November 2018 Expert Report concluded that the terminal would not significantly affect the US coal industry, nor US coal exports to Asian markets. After careful review of the other expert reports, TGG concluded in the December 2018 Expert Rebuttal Report that the findings and conclusions of the November 2018 Expert Report remained unchanged. New developments occurring since the filing of the Expert Report, as well as TGG's review of the reports of the other experts, have further strengthened the opinions and findings in the TGG Expert Report.

- Co-authored the "[Expert Report on the Northeast Supply Enhancement \(NESE\) Project Economic Impact Analysis for New Jersey, New York and Pennsylvania](#)" with Brigid Rowan, commissioned by the **Eastern Environmental Law Center (EELC)**. This May 2018 report evaluates the economic impact study (Economic Impacts of the Proposed Northeast Supply Enhancement in New Jersey, Pennsylvania and New York) prepared for the Transcontinental Gas Pipe Line Company, LLC (Transco) by Michael Lahr and Will Irving of Rutgers University.

TGG's evaluation demonstrates that the Rutgers Analysis substantially overstates the jobs from building the Project. The Rutgers Analysis overstates construction jobs in the tri-state area by 70-80%. Moreover, pipeline operations result in very small expenditures (and employment impacts) and have very little positive effect on the economy. The expert report was submitted at FERC in May 2018 by the Eastern Environmental Law Center (EELC) on behalf of NY/NJ Baykeeper, Food & Water Watch et al, as part of [Intervenors' Additional Comments On FERC's March 2018 Draft Environmental Impact Statement For The Northeast Supply Enhancement Project](#).

- Authored a Declaration regarding a review of the environmental and economic impacts of a proposed methanol production plant at Port of Kalama (the Project) in Washington. The Declaration discusses the failure of the Final Environmental Impact Statement for the Project to adequately consider GHG emissions associated with the Project, as well as a number of other potential environmental and economic impacts. The Declaration of Ian Goodman was filed in August 2017 with a legal brief by **Earthjustice** before the Shorelines Hearings Board for the State of Washington **on behalf of Columbia Riverkeeper, Sierra Club and Center for Biological Diversity**.
- Authored a Declaration **on behalf of the Standing Rock Sioux Tribe** concluding that a shutdown of the Dakota Access Pipeline, pending the completion of a new environmental review, (a) would not have the severe disruptive consequences claimed by the pipeline company; (b) would not unduly harm crude producers, refiners, consumers and the US economy; (c) would (at most) result in a relatively limited increase in crude by rail; and

- (d) would not have significant adverse impacts in regard to risk of accidents/spills. The Declaration of Ian Goodman was filed on August 7, 2017 to support an extensive [legal brief by Earthjustice before the United States District Court for The District Of Columbia](#). This brief is part of [Earthjustice's litigation on behalf of Standing Rock Sioux Tribe on the Dakota Access Pipeline](#).
- Co-authored written [Expert Testimony on the Need for the Vancouver Energy Distribution Terminal \(VEDT\)](#) and a [Technical Appendix on the Market Analysis Underlying the Need for the VEDT](#) with Brigid Rowan. The expert report was filed in May 2016 before the State of Washington Energy Facility Site Evaluation Council on behalf of **Earthjustice**. The testimony concludes that the VEDT will do little if anything to supply Washington with energy. Consequently, there is no economic need for this Project to supply the state.

The testimony also shows that the VEDT is likely not in Washington's public interest. TGG's cross-jurisdictional study of the costs and benefits of energy logistics facilities for host jurisdictions consistently concludes the following: the benefits are relatively small; the cost/risks are relatively large; and the economic benefits and costs/risks tend to be unevenly distributed (across stakeholders and regions), with the project proponents getting the majority of the benefits and the hosting jurisdiction bearing the majority of the costs/risks.

 - [Video of oral direct testimony of Ian Goodman](#); Morning Day 13 (7/19/16) of the VEDT hearings
 - [Video of oral cross-examination of Ian Goodman](#); Afternoon Day 13 (7/19/16) of the VEDT hearings.
 - Co-authored the "[Expert Report on the PennEast Pipeline Project Economic Impact Analysis for New Jersey and Pennsylvania](#)" with Brigid Rowan, commissioned by the **New Jersey Conservation Foundation**. This November 2015 report evaluates the economic impact study (PennEast Pipeline Project Economic Impact Analysis) prepared for the PennEast Pipeline Company. The PennEast Analysis claims that the pipeline project to transport Marcellus shale natural gas from Pennsylvania to New Jersey would have considerable economic benefits in both states. Goodman and Rowan demonstrate that the PennEast Analysis significantly overstates the total jobs from designing and building the pipeline by approximately two thirds or more. This expert report was submitted at FERC in November 2015 and in September 2016 by the New Jersey Conservation Foundation (NJCF).
 - Co-authored written expert testimony, entitled "[Changes to the Economic Costs and Benefits of the Keystone XL Pipeline for South Dakota](#)" with Brigid Rowan. The testimony filed in April and June 2015 at the South

Dakota Public Utilities Commission on behalf of the **Rosebud Sioux Tribe** and withdrawn in July 2015. Based on the conclusions of pipeline safety expert, Richard Kuprewicz, Rowan and Goodman estimate a range of Worst-Case Scenario Costs starting at US\$1 billion and escalating to \$2 billion or more for a very high consequence event. Given the Keystone XL's very small employment and property tax benefits, TGG concludes that, under a range of worst-case scenarios, the costs of the Project will greatly exceed the benefits for South Dakota.

- Co-authored the "[Economic Costs and Benefits of the Trans Mountain Expansion Project \(TMX\) for BC and Metro Vancouver](#)" with Brigid Rowan **in collaboration with Simon Fraser University's Centre for Public Policy Research**. The report, released in November 2014 and re-released in February 2015, refutes Kinder Morgan's claims regarding the positive economic development benefits of its controversial pipeline project. Goodman and Rowan show that the benefits of the pipeline are very small and have been significantly overstated by Kinder Morgan, whereas the worst-case costs of a catastrophic spill are very large and have been vastly understated. This expert report was filed with the Canadian National Energy Board on July 2015 by North Shore No Pipeline Expansion (NSNOPE).
- Co-authored the "[Economics of Transporting and Processing Tar Sands Crudes in Quebec](#)" with Brigid Rowan **in collaboration with Équiterre and Greenpeace Canada**. The January 2014 report demonstrates that the economic development benefits for Quebec of moving and refining tar sands crudes would be insignificant while the costs and risks are very high.
- Co-authored an "[Analysis of the Potential Costs of Accidents/Spills Related to Crude by Rail](#)" with Brigid Rowan on behalf of **Oil Change International (OCI)**. The November 2013 report demonstrates that the economic costs of crude by rail accidents can be very large and concludes that a major crude by rail (CBR) unit train accident/spill could cost \$1 billion or more for a single event. The report was incorporated into [Comments filed by NRDC, Sierra Club and OCI before PHMSA as part of the Advance Notice of Proposed Rulemaking Hazardous Materials: Rail Petitions and Recommendations To Improve the Safety of Railroad Tank Car Transportation, December 5, 2013](#).
- Co-authored expert testimony, entitled "[The Relative Economic Costs and Benefits of Enbridge's Line 9B Reversal and Line 9 Capacity Expansion Project](#)" with Brigid Rowan. The expert report was filed in August 2013 at Canada's National Energy Board on behalf of the **Équiterre Coalition**, a coalition of Quebec- and Ontario-based environmental groups. In light of pipeline safety expert, Richard Kuprewicz's high-risk assessment for

- rupture on the Project, Goodman and Rowan demonstrate that due to Line 9B's extraordinary proximity to people, water and economic activity, the rupture costs of the Project (under a wide variety of pipeline accident/spill possibilities) range from significant to catastrophic. They conclude that the potential economic costs could exceed (and, under a wide range of accident/spill conditions, greatly exceed) the potential economic benefits.
- Co-authored "[Comments on Initial Study/Mitigated Negative Declaration \(IS/MND\) Valero Crude by Rail Project Benicia, California](#)" with Brigid Rowan on behalf of **NRDC**. The July 2013 report provides a Market Analysis of a proposed crude by rail project for the Valero Benicia Refinery. Goodman and Rowan conclude that the proposed project could significantly affect crude supply (and thus quality) for the refinery, and recommend that a full Environmental Impact Report be undertaken. The report was included as an attachment to [NRDC's Comments on Notice of Intent to Adopt a Mitigated Negative Declaration for the Valero Crude by Rail Project, filed with the City of Benicia on July 1, 2013](#).
 - Co-authored a "[Report evaluating the adequacy of the Keystone XL \(KXL\) Draft Supplemental Environmental Impact Statement \(DSEIS\) Market Analysis](#)" with Brigid Rowan, and filed as an attachment to the Comments on KXL DSEIS jointly submitted by the **Sierra Club, NRDC, and 14 other environmental and public interest organizations** in April 2013. Based on their evaluation of the early 2013 market conditions (including emerging crude markets, factors driving tar sands expansion, availability and cost of crude oil transportation, and tar sands breakeven costs), Rowan and Goodman concluded that (i) the US State Department's DSEIS Market Analysis was deeply flawed and not a sound basis for decision-making; and (ii) KXL, and specifically its impact on tar sands logistics costs and crude prices, would have a significant impact on tar sands expansion under a very broad range of conditions and assumptions.
 - Co-authored an [influential and widely publicized](#) study of the Keystone XL pipeline employment impacts ("[Pipe Dreams? Jobs Gained, Jobs Lost by the Construction of Keystone XL](#)") with Brigid Rowan and the **Cornell Global Labor Institute**. The report was released in September 2011 and updated in January 2012. Goodman and Rowan provided the economic analysis to demonstrate that TransCanada Pipelines Ltd had greatly exaggerated the employment impacts of the Keystone XL (KXL) Project. TGG estimated the Project would create no more than 2,500-4,650 temporary direct construction jobs for two years and at the most a handful of permanent jobs (ranging from a low of 20 to a high of 127). TGG's conclusions in Pipe Dreams were used to demonstrate to the US media and to the Obama Administration that KXL would not be a major job creator for the US, nor would it have any substantial impact on US

unemployment.

- Co-authored “Employment Impacts of Air-Pollution Controls at North Dakota Coal Plants” with Brigid Rowan. This November 2011 study for **Sierra Club National** estimated the employment impacts of Air-Pollution Controls at North Dakota Coal Plants.
- Provided expert testimony on behalf of **The Greenlining Institute** on economic development impacts (focusing on job creation and stimulus) of capital expenditures and rate increases proposed by the Pacific Gas & Electric Company in its 2011 General Rate Case.
- Co-authored the Avoided Energy Supply Costs in New England: 2009 Report, prepared for **Avoided-Energy-Supply-Component (AESC) Study Group**, which represents all major electric and gas utilities in New England, as well as efficiency program administrators, state energy offices and regulators. TGG’s contribution to this report was an analysis of the economic development impact of Massachusetts electricity and gas energy efficiency programs.
- Co-authored several national and regional analyses with Ian Goodman in 2007 and 2008 to brief management of **SunPower Corporation** (an international solar electric manufacturer based in California). The focus was on the economic development and environmental benefits of solar manufacturing and reduction of coal use.
- Co-developed E³AS (Energy, Economic, and Environmental Analysis System) software on behalf of the **US EPA** in 1996 and made it available to assist government agencies in evaluating the economic and environmental impacts of energy supply and efficiency programs, and in considering both the benefits and costs of energy alternatives. Has incorporated E³AS model analysis in studies of economic and environmental impacts since 1996.

Muskrat Falls Hydroelectric Project Impacts and Canadian Federal Environmental and Regulatory Reviews

- Provided expert support to **NunatuKavut Community Council (NCC)**, an Inuit community in Labrador from 2016-2018.
- Supported TGG colleague, Brigid Rowan, who was appointed external advisor for the Independent Expert Advisory Committee (IEAC) on Muskrat Falls (2017-2018). Muskrat Falls is a large and highly controversial hydroelectric project that has been widely opposed by many Indigenous residents. The mission of the IEAC was to use science and Indigenous Knowledge to recommend measures to protect the health of the Indigenous and local population from the effects of methylmercury related to hydro development at Muskrat Falls.

- In-depth participation with Brigid Rowan, NCC's external advisor on the Canadian federal environmental and regulatory reviews (2016-2017) in:
 - Preparation of a December 15, 2016 presentation for NCC President, Todd Russell to the Canadian Federal Environmental Assessment Review Expert Panel. Authored [“Written Submission to Federal Environmental Assessment Review Panel”](#) on behalf of NCC (based on the presentation), filed on December 23, 2016. The purpose of the presentation and the written submission was to present NCC's recommendations to the Federal Environmental Assessment Review Panel in the context of the Trudeau government's commitment to improve the federal environmental assessment process and Indigenous consultations.
 - Preparation and editing of NCC's [“Submissions to the Government of Canada Regarding Environmental and Regulatory Reviews – Discussion Paper,”](#) filed on September 15, 2017. This document presented NCC's comments on the update of the federal review of environmental and regulatory processes (pertaining to the Fisheries Act, the Navigation Protection Act, Environmental Assessment Processes and the Modernization of the National Energy Board).

Manitoba Hydroelectric System Planning, Operations, Project Assessment, and US Exports

Wuskatim Generating Station and Transmission Project (1999-2005)

On behalf of the **Pimicikamak Cree Nation (PCN)**:

- Evaluated Manitoba Hydro system planning, environmental review, and disclosure relating to the Churchill-Nelson hydro project
- Assessed the environmental and other impacts from existing hydro and the proposed 200 MW Wuskwatim hydro project
- Analyzed the need for comprehensive assessment of the entire Churchill-Nelson project (existing, proposed, and future)
- Reviewed precedents regarding comprehensive assessment of existing major hydro projects
- Submitted comments to the Minnesota Public Utilities Commission on Northern States Power's supply requirements in relation to Manitoba energy exports from Wuskwatim.

Conawapa Generating Station (1990, 1992)

On behalf of a **coalition of citizens', conservation and environmental groups**: expert evidence in the 1992 Conawapa Project Environmental Assessment concerning:

- the need for environmental reviews to evaluate the justification of design alternatives to the 1290 MW Conawapa hydro project

- a description of the changes in the utility industry and new supply source options affecting the design alternatives included in an environmental review
- a review of the treatment of the project justification in North American environmental assessments.
- Filed expert evidence before the Manitoba Public Utilities Board in the context of the 1990 Manitoba Hydro Submission for the Conawapa generating station, which included:
 - a review of the Manitoba Hydro submission; a review of Manitoba Hydro load forecasting; an estimation of economic and attainable conservation potential; development of principles of conservation program design and delivery; a critique of the utility's proposed demand-side management program, an evaluation of supply-side alternatives and analysis of avoided costs; an assessment of employment and economic development effects of hydroelectric development and conservation; and an analysis of profitability and risks of the proposed power sales contracts.

Hydro-Québec System Planning, Operations, Project Assessment, and US Exports

Great Whale Project (1989-1994)

Submitted evidence and testified before various regulatory and legal bodies in the US and Canada on behalf of the **Grand Council of the Crees (of Québec) and/or a coalition of environmental groups** to assess the economic and environmental impacts of the proposed 3160 MW Great Whale Project, as well as the long-term US export contracts based on the project.

Mr. Goodman's wide-ranging efforts were instrumental in Hydro-Québec's eventual cancellation of the Great Whale Project. Key interventions included:

- Submitting evidence between 1989 and 1991, before the Vermont Public Service Board, including a review of a proposed thirty year, 450 MW purchase by twenty-four Vermont utilities of Hydro-Québec power derived from the development of the Great Whale Project; and an analysis of planning and operation of Hydro-Québec power supply and modeling of hydro reservoir levels.
- Testifying in 1991 before the State of Vermont Supreme Court regarding the same 450 MW purchase and providing a summary of changes concerning load forecasts and supply-side alternatives and an analysis of the cost effectiveness of the contract.

- Submitting an analysis of the nexus between New York Power Authority purchases and the construction of specific Hydro-Québec facilities (notably Great Whale), as well as the operation of fossil fuel electric generation before the State of New York Supreme Court in 1990.
- Presenting a review of Hydro-Québec's proposed export contracts to Vermont (450 MW) and New York State (1000 MW) before Canada's National Energy Board in 1990.
- Analyzing confidential risk-sharing electric supply contracts between Hydro-Québec and large industrial customers, including an assessment of the resulting implications for Hydro-Québec and its ratepayers in 1991.
- Submitting evidence in 1992 for the Canadian and Québec governments' Environmental Review of the Great Whale Project including a discussion of changes in the utility industry and new supply resource options affecting design alternatives included in an environmental review.
- Assessing an 800 MW seasonal diversity contract in the context of the 1994 energy market before the State of New York Assembly Standing Committees on Energy and Conservation.

1986 – 1989 Consulting Associate, PLC, Inc., Boston, Massachusetts

Research and consulting in various aspects of utility regulation and economics. Advised utilities and regulatory commissions on electric and gas least-cost planning. Assessed potential for conservation, non-utility generation, and other supply alternatives. Reviewed prudence of power supply investment decisions. Analyzed rate design and allocation issues. Developed end-use demand estimates. Evaluated district heating system management. Analyzed markets and rates of regulated transportation services.

1981 – 1986 Consulting Associate, Analysis and Inference, Inc., Boston, Massachusetts

Research and consulting in various aspects of utility regulation and statistical applications. Reviewed prudence of utility power plant construction programs with emphasis on cost and schedule of nuclear plants. Researched utility rate design and allocation issues. Reviewed demand forecasts. Analyzed taconite industry economics and electricity supply. Analyzed causal factors for statistical theft estimation of fuel oil overbilling and diversion of parking meter and transit revenue.

1978 – 1987 Consultant, Salgo & Lee, Boston, Massachusetts

Research and consulting in electric utility regulation and civil damage litigation. Reviewed nuclear construction programs and alternatives, demand forecasts, transmission line proposals, and state rate-making policies. Analyzed effects of regional power pool rules on independent power producers. Evaluated damage claims arising from power plant equipment outages.

Education

1977 S.B., Civil Engineering, Massachusetts Institute of Technology

Advisory Assignments to Regulatory and Investigatory Commissions and Staff

1996 Commission of Inquiry on Hydro-Québec's Purchase Policy for Electricity from Independent Power Producers (*Commission d'enquête sur la politique d'achat par Hydro-Québec d'électricité auprès de producteurs privés*), Commission Staff.

1993 – 2000 Maine Public Utilities Commission Staff, Docket Nos. 92-331, 95-598, 98-791, 2000-441, and 2000-47; Special Industrial Rate Contracts

1993 Maine Public Utilities Commission Staff, Docket No. 93-147; Certificate of Public Convenience to Erect a Transmission Line

1987 – 1988 District of Columbia Public Service Commission, Docket No. 834 Phase II; Least-cost Planning Procedures and Goals.

Appointments

1991 – 1995 Committee to Review the Glen Canyon Environmental Studies, National Research Council Water Science and Technology Board

1978 New England Energy Congress, Regulatory and Institutional Process Committee.

Publications and Major Reports

Submissions to the Government of Canada Regarding Environmental and Regulatory Reviews – Discussion Paper on behalf of NunatuKavut Community Council, *September 15, 2017* (co-authors B. Rowan, S. Kath and D. Simon and in-depth participation of I. Goodman).

Written Submission to Federal Environmental Assessment Review Panel on behalf of NunatuKavut Community Council to the Canadian Federal Environmental Assessment Review Expert Panel, *December 23, 2016* (with in-depth participation of G. Russell Jr., T. Russell and I. Goodman).

Expert Report on the PennEast Pipeline Project Economic Impact Analysis for New Jersey and Pennsylvania, commissioned by the New Jersey Conservation Foundation, *November 4, 2015* (co-author with Brigid Rowan). This expert report was submitted at FERC in November 2015 and in September 2016 by the New Jersey Conservation Foundation (NJCF).

Comments on Scoping Supplemental Environmental Impact Statement (SEIS) Rulemaking for Colorado Roadless Coal Exception #46470 to the U.S. Department of Agriculture Forest Service on behalf of the Sierra Club, *May 22, 2015* (co-author with Brigid Rowan).

Comments on Draft Environmental Impact Report (DEIR) Analysis of Oil and Gas Well Stimulation Treatments in California on behalf of NRDC, *March 16, 2015* (co-author with B. Rowan), incorporated as an attachment to Comments filed by Natural Resources Defense Council (NRDC), Center for Biological Diversity (CBD), Sierra Club, Los Angeles Waterkeeper on the Department of Conservation's, through its Division of Oil, Gas and Geothermal Resources (DOGGR), Draft Environmental Impact Report (DEIR) for Well Stimulation in California (the Project) prepared pursuant to the California Environmental Quality Act (CEQA).

Economic Costs and Benefits of the Trans Mountain Expansion Project (TMX) for BC and Metro Vancouver in collaboration with The Centre for Public Policy Research, Simon Fraser University, *November 10, 2014* (co-author with B. Rowan, re-released *February 4, 2015*). This expert report was filed with the Canadian National Energy Board on July 2015 by North Shore No Pipeline Expansion (NSNOPE).

Report on the Economics of Transporting and Processing Tar Sands Crudes in Quebec in collaboration with Équiterre and Greenpeace Canada, *January 2014* (co-author with B. Rowan).

Analysis of the Potential Costs of Accidents/Spills Related to Crude by Rail, *November 8, 2013* (co-author with B. Rowan) on behalf of Oil Change International

(OCI), incorporated as Attachment 3 to Comments filed by NRDC, Sierra Club and OCI before The Pipeline and Hazardous Materials Safety Administration, U.S. Department Of Transportation as part of the Advance Notice of Proposed Rulemaking Hazardous Materials: Rail Petitions and Recommendations To Improve the Safety of Railroad Tank Car Transportation, *December 5, 2013*.

Comments on Initial Study/Mitigated Negative Declaration (IS/MND) Valero Crude by Rail Project, Use Permit Application 12PLN-00063, Benicia, California, *July 1, 2013* (co-author with B. Rowan) on behalf of NRDC, included as an attachment to NRDC's Comments on Notice of Intent to Adopt a Mitigated Negative Declaration for the Valero Crude by Rail Project, filed with the City of Benicia Community Development Department on *July 1, 2013*.

Report evaluating the adequacy of the Keystone XL (KXL) Draft Supplemental Environmental Impact Statement (DSEIS) Market Analysis, *April 22, 2013* (co-author with B. Rowan), filed as an attachment to the Comments on KXL DSEIS jointly submitted by the Sierra Club, NRDC, and 14 other environmental and public interest organizations.

Pipe Dreams? Jobs Gained, Jobs Lost by the Construction of Keystone XL, *September 28, 2011* (co-author with B. Rowan, TGG, and L. Skinner and S. Sweeney, Cornell Global Labor Institute; *revised January 18, 2012*).

Employment Impacts of Air-Pollution Controls at North Dakota Coal Plants, prepared for Sierra Club, *November 21, 2011* (co-author with B. Rowan).

The Economics of Supplier Diversity Examining Areas of Potential Interest for GLI with respect to GRC 2011 and Potential Amendments to GO 156, prepared for The Greenlining Institute, *August 6, 2010* (co-author with B. Rowan).

Avoided Energy Supply Costs in New England: 2009 Report, prepared for Avoided-Energy-Supply-Component (AESC) Study Group, *August 21, 2009* (co-author with R. Hornby, P. Chernick, et al and in-depth participation of B. Rowan; *revised October 23, 2009*).

Reallocation of Funds from National Grid's Current Energy Efficiency Programs to Other Uses, prepared for National Grid USA, *October 24, 2006*

National Grid's Energy Efficiency Programs: Benefits for Rhode Island's Economic Development and Environment, prepared for National Grid USA, *July 28, 2006*.

Comment of Pimicikamak Cree Nation (PCN) on Minnesota Draft State Energy Planning Report, sponsored by Minnesotans for an Energy-Efficient Economy (ME3), *November 21, 2001*.

Proposal for PV and Energy Efficiency at State Facilities: Benefits for California's Economic Development and Environment, prepared for PowerLight Corporation, *November 15, 2001*.

Narragansett Electric's Energy Efficiency Programs: Benefits for Rhode Island's Economic Development and Environment, prepared for Narragansett Electric Company, *August 14, 2001*.

Comment Submitted By Pimicikamak Cree Nation on An Investigation Into Environmental And Socio-Economic Costs Under Minnesota Statute §216B.2422, Subd. 3, submitted in Minnesota Public Utilities Commission Docket No. E999/CI-00-1636, *January 16, 2001* (co-author with P. Chernick and A. Orkin).

Comment Submitted By Pimicikamak Cree Nation on Northern States Power's 1999 Request for Proposals for Supply Resources Needed Starting 2001-2005, submitted in Minnesota Public Utilities Commission Docket No. E002/M-99-888, *March 1, 2000*, Supplemental Comment *August 18, 2000* (co-author with R. McCullough, A. Orkin, A. Stewart, et al.).

Analysis of Special Industrial Rate Contracts: Maine Public Service Company with McCain Foods (Docket 2000-441) and J.M. Huber (Docket 2000-47), prepared for Maine Public Utilities Commission Staff, *July 2000*.

Energy, Economic, and Environmental Analysis System (E3AS) User's Guide: Version 2, prepared for the US Environmental Protection Agency, *July 1998* (co-author with R. Carlson and B. Krier).

Employment, Earnings, and Environmental Impacts of Regional Improvements in Energy Efficiency, the Southern States Energy Board, *December 23, 1996* (co-author with B. Krier and P. Kelly-Detwiler).

North Carolina State Energy Supply Plan for Use with E3AS, prepared for North Carolina Department of Commerce Energy Division, *November 27, 1996* (co-author with R. Carlson).

Energy, Economic, and Environmental Analysis System (E3AS) User's Guide, prepared for the Southern States Energy Board, *May 1996* (co-author with R. Carlson and B. Krier).

Preliminary Results of Mohave Competitiveness Analysis, prepared for the Hopi Tribe, *March 11, 1996*.

River Resource Management in the Grand Canyon, Committee to Review the Glen Canyon Environmental Studies, National Research Council Water Science and Technology Board (Washington: National Academy Press, 1996) (co-author with W. Lewis, et al.).

Submission of the Grand Council of the Crees (of Québec) and the Cree Regional Authority, Addressed to the Consultation of the Public Debate on Energy: Complement, prepared for Grand Council of the Crees (of Québec), *August 1995* (co-author with P. Raphals, et al.).

"Energy Efficiency and Employment: Recent Findings and Directions for Future Research," Third International Energy Efficiency & DSM Conference: Charting the Future, (Bala Cynwyd: SRC International, *1994*) (co-author with B. Krier).

"A Win/Win Approach to Commercial/Industrial DSM: Making DSM Work for All Utility Customers," *The Electricity Journal*, Vol. 7, No. 9, *November 1994* (co-author with H. Lachman, P. Cillo, and P. Kelly-Detwiler).

Conformity Analysis of Hydro-Quebec's Great Whale Project Feasibility Study, prepared by the Great Whale Environmental Assessment Office of the Grand Council of the Crees (of Québec)/Cree Regional Authority in consultation with Environmental Economics Intl., et al., *July 1994* (co-author with R. Torrie, et al.).

"DSM as Economic Development Strategy," *The Electricity Journal*, Vol. 7, No. 4, *May 1994* (co-author with S. Laitner and B. Krier).

Review of the Draft Environmental Impact Statement on Operation of Glen Canyon Dam, Committee to Review the Glen Canyon Environmental Studies, National Research Council Water Science and Technology Board (Washington: National Academy Press, *April 1994*) (co-author with W. Lewis, et al.).

Review of the Draft Federal Long-Term Monitoring Plan for the Colorado River Below Grand Canyon Dam, Committee to Review the Glen Canyon Environmental Studies, National Research Council Water Science and Technology Board (Washington: National Academy Press, *1994*) (co-author with W. Lewis, et al.).

A Comparison of New York State Employment Impacts from Expanded Demand-Side Management and Hydro-Québec Imports, prepared for Greenpeace USA, *February 16, 1994* (co-author with B. Krier and P. Kelly-Detwiler; *revised March 1, 1994*).

Employment Impacts of Electricity Efficiency in Florida, prepared for the Florida Energy Office, *November 18, 1993* (co-author with B. Krier and P. Kelly-Detwiler).

Economic Analysis of Mohave Generating Station Gas Conversion, prepared for the Alternative Coal Transport Study, Economic Analysis for the Hopi Tribe, *September 13, 1993*.

The Impact of Increased Coal Transportation Costs Upon Mohave Generating Station Customers, prepared for the Alternative Coal Transport Study, Economic Analysis for the Hopi Tribe, *July 27, 1993*.

Track II Position Paper on Behalf of the Grand Council of the Crees (of Québec) and PROTECT, submitted in New York Public Service Commission Case 92-E-1187 (Concerning Incorporation of Environmental Costs into Long-run Avoided Costs), *June 25, 1993* (co-author with J. Dumont and P. Kelly-Detwiler).

Review of the 1993 Hydro-Québec Development Plan, submitted to Québec Parliamentary Commission on the Economy and Employment, prepared for Grand Council of the Crees (of Québec), *March 11, 1993* (co-author with P. Kelly-Detwiler and E. Titus; also available in French as *Analyse Critique du Plan de Développement 1993 d'Hydro-Québec*).

Assessment of the Requirement and Rationale for Transmission Facilities Associated with the 1000 MW Electricity Purchase from Manitoba Hydro, submitted in Ontario Environmental Assessment Board Ontario Hydro Demand/Supply Plan Hearing, on behalf of Nishnawbe-Aski Nation/Grand Council Treaty #3/Teme-Augama Anishnabai, *December 1992*.

Economic Evaluation of Ontario Hydro's Proposed Moose River Basin Hydroelectric Projects, submitted in Ontario Environmental Assessment Board Ontario Hydro Demand/Supply Plan Hearing, on behalf of the Moose River/James Bay Coalition, *December 1992* (co-author with R. Carlson, R. McCullough, and W. Huddleston).

Energy Efficiency: Opportunities for Employment, prepared for Greenpeace U.K./International, *November 11, 1992* (co-author with B. Krier).

"Electricity Generation and Greenhouse Gases," Planning Our Electric Future Now, Conference Proceedings of Canadian Electric Association, *November 1992*.

Comments of Pace Energy Project; Natural Resources Defense Council, National Audubon Society; Vladeck, Waldman, Elias and Englehard; Environmental Defense Fund; Environmental Planning Lobby on the 1993-1994 Annual and Long Range Demand-Side Management and Integrated Resource Plans of the New York Utilities, submitted in New York Public Service Commission Case No. 28223, *September 14, 1992* (co-author with A. Gupta, J. Tripp, J. Vladeck, D. Wooley, et al.).

Employment Effects of Electricity Provision in Québec: The Great Whale Hydroelectric Project and Electricity Efficiency Alternative, prepared for Grand Council of the Crees (of Québec), *June 16, 1992* (co-author with B. Krier and M. Clark; *revised November 5, 1992*; abbreviated James Bay Publication Series version November 1994; full version and abbreviated versions also available in

French as Effets de la fourniture d'électricité sur l'emploi au Québec: le projet d'aménagement hydroélectrique Grande Baleine et la solution de rechange axée sur l'efficacité énergétique).

A Comparison of the Employment Creation Effects of the AES-Harriman Cove Coal-Fired Generating Station and Maine Demand-Side Management, prepared for Conservation Law Foundation and National Resources Council of Maine, *May 15, 1992* (co-author with M. Clark, P. Kelly-Detwiler, and M. Anthony).

A Review of the Report on Gas Integrated Resource Planning for Submission to the Ontario Energy Board, on behalf of Ontario Metis and Aboriginal Association, *February 28, 1992* (co-author with B. Morse, M. Watkins, J. Stevenson, P. Kelly-Detwiler, and M. Clark).

"Electricity Imports from Quebec: The Current and Historical Context," *Northeast Indian Quarterly, Winter 1991*.

The Role of Non-utility Generation in Vermont, *December 12, 1991* (co-author with P. Messerschmidt).

Economic and Employment Impacts of Vermont State Energy Options, prepared for Northeast Alliance to Protect James Bay, *November 7, 1991* (co-author with P. Kelly-Detwiler and M. Anthony).

Comments on the Draft New York State Energy Plan 1991 Biennial Update, on behalf of PROTECT, Hudson Sloop Clearwater, and Grand Council of the Crees (of Québec), *October 7, 1991*.

"Energy Conservation vs. the James Bay Hydroelectric Project," *Canadian Water Watch, Vol. 4, No. 5, June 1991*.

Employment Impacts of New York State Energy Options, prepared for Grand Council of the Crees (of Québec), *June 2, 1991* (co-author with M. Tennis and M. Clark).

Comments on the Determination of the Supply Resources and Environmental Effects Affiliated with Ontario Hydro Proposed Export Sales, submitted in Canadian National Energy Board Order No. EW-3-90, on behalf of Moose River James Bay Coalition / Nishnawbe-Aski Nation / Grand Council Treaty No. 3, *January 28, 1991* (co-author with P. Kelly-Detwiler).

Comments of Sierra Club, Inc.; Atlantic States Legal Foundation, Inc.; PROTECT; and Grand Council of the Crees (of Québec) on Issues to be Addressed in the New York State Energy Planning Report 1991, *January 2, 1991* (co-author with P. Messerschmidt).

"Analysis of Residential Fuel-Switching as an Electric Conservation Option," *Gas Energy Review*, Vol. 18, No. 12, *December 1990* (co-author with P. Chernick and E. Espenhorst).

Comments of Center for Environmental Legal Studies; Natural Resources Defense Council, National Audubon Society; Vladeck, Waldman, Elias and Englehard; Environmental Defense Fund on the 1991-1992 Annual and Long Range Demand-Side Management Plans of the Major Electric Utilities, submitted in New York Public Service Commission Case No. 28223, *September 28, 1990* (co-author with J. Plunkett, et al.).

"Hydro-Québec's Long-Term Export Policy," *Canadian Water Watch*, Vol. 3, No. 7-8, *July-August 1990*.

Conservation and Capacity Optimization Alternatives to the PGT/PG&E Gas Pipeline Project, Tellus Institute Study No. 90-03, prepared for California Public Utilities Commission, *May 1990* (co-author with R. Hornby, S. Bernow, D. Marron, D. Nichols, D. Singh, and M. Tennis).

Complément Technique au Mémoire du Grand Conseil des Cris (du Québec) à la Commission de l'Économie et du Travail de l'Assemblée Nationale du Québec, prepared for Grand Council of the Crees (of Québec), *April 1990* (co-author with R. Mainville, et al.).

Analysis of Fuel Substitution as an Electric Conservation Option, PLC, Incorporated, prepared for Boston Gas Company, *December 22, 1989* (co-author with P. Chernick and E. Espenhorst).

Conservation Potential in the State of Minnesota, Volumes I and II, PLC, Incorporated, prepared for Minnesota Department of Public Service, *June 27, 1988* (co-author with P. Chernick).

The Excess Capacity Situation of Minnesota Power: Magnitude, Duration, and Origin, PLC, Incorporated, prepared for Minnesota Department of Public Service, *July 20, 1987* (co-author with P. Chernick; *revised August 12, 1987*).

Final Report, Phase I, Module IV, Rate Design/Analysis, Pacific Northwest Electric Power and Conservation Planning Council, *December 1981* (co-author with P. Chernick, S. Finger, and M. Meyer).

Regional and Commodity Price-Indices for the Trucking Industry, M.I.T. Center for Transportation Studies, CTS Report 77-13, *July 1977* (co-author with A. Friedlander).

Expert Testimony and Formal Submissions

Information is presented in the following order: jurisdiction and docket number; title of case; client; date testimony filed; and subject matter covered.

- 1. United States District Court Western District of Washington at Tacoma (Case No. 3:18-cv-05005-RJB); Lighthouse Resources, Inc., et al. v. Jay Inslee, et al.; Washington State Office of the Attorney General (Defendant); November 14, 2018 (with in-depth participation of B. Rowan); December 14, 2018 (with in-depth participation of B. Rowan).**

Conducted research and analysis on the burden to the US coal industry if the Millennium Bulk Terminals-Longview (the largest proposed coal export terminal in North America) were not built. In light of TGG's analysis of the Asian demand for the US coal to be exported via the terminal, as well as the employment impact of the terminal, concluded in the TGG Expert Report that the terminal would not significantly affect the US coal industry, nor US coal exports to Asian markets. Concluded in the TGG Expert Rebuttal Report that the findings and conclusions of the TGG Expert Report remained unchanged. New developments occurring since the filing of the Expert Report, as well as TGG's review of the reports of the other experts, have further strengthened the opinions and findings in the TGG Expert Report.
- 2. United States Federal Environmental Regulatory Commission (Docket CP17-101-000); on behalf of NY/NJ Baykeeper, Food & Water Watch, Central Jersey Safe Energy Coalition, and Princeton Manors Homeowners Association; May 14, 2018 (co-author with B. Rowan); submitted by the Eastern Environmental Law Center (EELC) as part of Intervenors' Additional Comments On FERC's March 2018 Draft Environmental Impact Statement For The Northeast Supply Enhancement Project.**

Evaluated the economic impact study (Economic Impacts of the Proposed Northeast Supply Enhancement in New Jersey, Pennsylvania and New York) prepared for the Transcontinental Gas Pipe Line Company, LLC (Transco) by Michael Lahr and Will Irving of Rutgers University. Concluded that the Rutgers Analysis substantially overstates the jobs from building the Project. The Rutgers Analysis overstates construction jobs in the tri-state area by 70-80%. Moreover, pipeline operations result in very small expenditures (and employment impacts) and have very little positive effect on the economy.
- 3. Shorelines Hearings Board for the State of Washington (SHB No. 17-010c); Columbia Riverkeeper, Sierra Club and Center for Biological Diversity (Petitioners); August 21, 2017 (with in-depth participation of B. Rowan); in support of Brief filed by Earthjustice on behalf of Petitioners.**

Reviewed the environmental and economic impacts of a proposed methanol production and marine export facility in an industrial park owned by the Port of Kalama (the Project). Discussed the failure of the Final Environmental Impact

Statement for the Project to adequately consider GHG emissions associated with the Project, as well as a number of other potential environmental and economic impacts.

4. United States District Court for The District Of Columbia (Case No. 1:16-cv-1534-JEB); Standing Rock Sioux Tribe, joined by Cheyenne River Sioux Tribe (Plaintiffs); August 7, 2017 (with in-depth participation of B. Rowan); Technical Appendix; August 7, 2017 (with in-depth participation of B. Rowan); in support of Brief filed by Earthjustice on behalf of Plaintiffs.

Reviewed the Brief and Declarations filed by Dakota Access, LLC, regarding remedy in this litigation. Concluded that a shutdown of the Dakota Access Pipeline (DAPL), pending the completion of a new environmental review, (a) would not have the severe disruptive consequences claimed by the pipeline company; (b) would not unduly harm crude producers, refiners, consumers and the US economy; (c) would (at most) result in a relatively limited increase in crude by rail; and (d) would not have significant adverse impacts in regard to risk of accidents/spills. In fact, for the Plaintiffs' reservations, DAPL would have a much higher proximity and much greater risk than does crude by rail. In terms of the risk of worst-case accidents and spills, the Declaration concluded that there is no clear reason to assume that DAPL is less risky than crude by rail.

5. State of Washington Energy Facility Site Evaluation Council (Case No. 15-001); Application No. 2013-01 of Tesoro Savage LLC Vancouver Energy Distribution Terminal; Earthjustice; May 13, 2016 (with in-depth participation of B. Rowan); Technical Appendix: Market Analysis; May 13, 2016; (co-author with B. Rowan).

Evaluation of the economic need for Washington State of the Vancouver Energy Distribution Terminal (VEDT). Demonstrated that the VEDT will do little if anything to supply Washington with energy. Consequently, concluded that there is no economic need for this Project to supply Washington. Analysis of whether the Project is in the public interest of Washington State. TGG's cross-jurisdictional study of the costs and benefits of energy logistics facilities for host jurisdictions consistently concludes the following: the benefits are relatively small; the cost/risks are relatively large; and the economic benefits and costs/risks tend to be unevenly distributed (across stakeholders and regions), with the project proponents getting the majority of the benefits and the hosting jurisdiction bearing the majority of the costs/risks. Recommendation that the Project be rejected based on the conclusion that it is highly likely that the VEDT is not in the public interest of Washington.

6. **United States Federal Environmental Regulatory Commission (Docket No. CP15-558-000); on behalf of New Jersey Conservation Foundation; November 6, 2015 (co-author with B. Rowan); submitted by New Jersey Conservation Foundation as part of its comments October 29, 2015 regarding the PennEast Pipeline Application and resubmitted by the same party on September 8, 2016.**

Evaluation of the economic impact study (PennEast Pipeline Project Economic Impact Analysis) prepared for the PennEast Pipeline Company. Refuted the PennEast Analysis claims that the pipeline project to transport Marcellus shale natural gas from Pennsylvania to New Jersey would have considerable economic benefits in both states. Demonstrated that the PennEast Analysis significantly overstated the total jobs from designing and building the pipeline by approximately two thirds or more.

7. **Canadian National Energy Board Hearing Order OH-001-2014; Application for Trans Mountain Expansion Project; North Shore No Pipeline Expansion (NSNOPE); July 21, 2015 (joint testimony with B. Rowan).**

Estimated the economic benefits of the proposed Trans Mountain Expansion Project (TMX) for BC and Metro Vancouver and compares these benefits to a range of potential costs of bad to worst-case scenarios. Provided guidance as to whether TMX is in the public and economic interest of BC and Metro Vancouver. Refuted Kinder Morgan's claims regarding the positive economic development benefits of its controversial pipeline project. Demonstrated that the benefits of the pipeline are very small and have been significantly overstated by Kinder Morgan (the proponent), whereas the worst-case costs of a catastrophic spill are very large and have been vastly understated.

8. **South Dakota Public Utilities Commission (Docket HP14-001); Petition of TransCanada Keystone Pipeline, LP (Keystone) for Order Accepting Certification of Permit Issued in Docket HP09-001 to Construct the Keystone XL Pipeline; The Rosebud Sioux Tribe; April 24, 2015; Rebuttal Testimony June 26, 2015 (joint testimony with B. Rowan). Testimony withdrawn July 17, 2015.**

Analysis of the changes to the economic costs and benefits of the Keystone XL Pipeline for South Dakota. Based on the conclusions of pipeline safety expert, Richard Kuprewicz, evaluation of a range of Worst-Case Scenario Costs starting at US\$1 billion and escalating to \$2 billion or more for a very high consequence event. Given the Keystone XL's very small employment and property tax benefits, concluded that, under a range of worst-case scenarios, the costs of the Project will greatly exceed the benefits for South Dakota.

9. Canadian National Energy Board Hearing Order OH-002-2013; Enbridge Pipelines Inc. Line 9B Reversal and Line 9 Capacity Expansion Project Application; Équiterre (Coalition); August 8, 2013 (joint testimony with B. Rowan).

Analysis of relative economic costs and benefits of Enbridge's Line 9B Reversal and Line 9 Capacity Expansion Project. Evaluation of the Project, which would transport a mix of tar sands dilbit, Bakken, and conventional WCSB crudes through Ontario and Quebec, crossing major waterways and Canada's most populous urban areas, (including Toronto and Montreal). Recommendation that the Enbridge Project be rejected, based on (i) the results of this relative economic cost-benefit analysis, demonstrating that the potential economic costs could exceed (and, under a range of malfunction/accident conditions, greatly exceed) the potential economic benefits; (ii) the highly uneven allocation of costs and benefits among the stakeholders, and across regions; and (iii) the conclusion of international pipeline safety expert, Richard Kuprewicz, that there is a high risk of pipeline rupture in the early years following Project implementation due to a combination of cracking and corrosion.

10. California Public Utilities Commission Application No. 09-12-020; Pacific Gas & Electric Company General Rate Case 2011; The Greenlining Institute; May 19, 2010; Rebuttal Testimony June 4, 2010.

Analysis of economic development impacts (focusing on job creation and stimulus) of PG&E's proposed capital expenditures and associated rate increases. Consideration of the impacts of these expenditures and rate increases on customers and communities. Recommendation that PG&E increase its supplier diversity activities in order to offset adverse impacts on customers and communities while addressing equity concerns. Analysis of PG&E's Customer Retention and Economic Development (Load Attraction and Retention) activities. Analysis of the direct testimony of other intervenors with respect to economic development impacts of the proposed capital expenditures and quantification of these impacts in the Rebuttal Testimony.

11. Manitoba Clean Environment Commission Public Registry Files 4724/4725; Wuskwatim Generating Station and Transmission Project; Pimicikamak Cree Nation (PCN); August 8, 2003 (joint affidavit with R. McCullough).

Evaluation of Manitoba Hydro system planning, environmental review, and disclosure relating to the Churchill-Nelson hydro project. Consideration of environmental harm and other impacts from existing hydro and proposed 200 MW Wuskwatim project. Analysis of need for comprehensive assessment of the entire Churchill-Nelson project (existing, proposed, and other future). Discussion of precedents regarding comprehensive assessment of existing major hydro projects.

- 12. United States District Court, Northern District of New York Case 01-CV-0951; Pogliani, et al. v. Army Corps of Engineers; Stand Together Oppose Power Plant (STOPP); June 29, 2001.**
Analysis of need for proposed 1080 MW gas combined cycle power plant in Athens, New York. Consideration of locational requirements for supply. Evaluation of potential for other in-state sources and imports.
- 13. Vermont Public Service Board Docket 6300; Proposed Sale of Vermont Yankee Nuclear Power Station; New England Coalition on Nuclear Pollution and Vermont Public Interest Research Group; April 14, 2000.**
Consideration of power supply planning in the context of risk and uncertainty. Evaluation of whether the proposed plant sale is consistent with sound utility planning, regulatory oversight, and electricity restructuring.
- 14. Maine Public Utilities Commission Docket 98-791; Bangor Hydro-Electric Company; Maine Public Utilities Commission Staff; May 4 1999 (Bench Analysis joint with A. Monroe and M. Force).**
Assessment of request for extension and amendment of special industrial rate. Analysis of the economic and physical viability of paper mill self-generation options. Evaluation of whether the contract extension would be beneficial for other utility ratepayers. Development of recommendations for amended contract termination provisions.
- 15. California Public Utilities Commission A. 96-03-031; Southern California Gas Company; The Utility Reform Network (TURN); December 30, 1998; Rebuttal Testimony February 26, 1999.**
Review of claims by gas utility and other parties that economic development would be promoted by allocating transition costs away from large industrial and other noncore gas customers. Evaluation of how economic development will be impacted by the period selected for amortization of these transition costs. Provision of recommendations regarding consideration of economic development issues by the Commission.
- 16. California Public Utilities Commission A. 97-12-048; Southern California Gas Company; The Utility Reform Network (TURN); April 17, 1998; Rebuttal Testimony May 4, 1998.**
Review of claims by gas utility and other parties that economic development would be promoted by allocating transition costs away from large industrial and other noncore gas customers. Provision of recommendations regarding consideration of economic development issues by the Commission.
- 17. Ontario Energy Board E.B.O. 177-17; Union Gas Ltd./Centra Gas Ontario, Inc. Application to Transfer Appliance Businesses to Union Energy; Pollution Probe; January 19, 1998.**
Review of gas utilities' proposal to transfer their appliance sales, financing, renting and servicing businesses to an unregulated subsidiary. Evaluation of

costs and benefits for gas consumers. Assessment of impacts upon competition, DSM, and the environment. Discussion of precedents regarding large-scale divestiture of utility assets, tender processes, and market-based valuation. Provision of recommendations regarding the future of the appliance businesses and development of competitive markets.

18. United States Federal Energy Regulatory Commission Dockets ER97-1079-000 and OA97-237-000; New England Power Pool; Grand Council of the Crees (of Québec) and New England Coalition for Energy Efficiency and the Environment; July 1, 1997 (joint affidavit with R. Carlson).

Review of the market power analysis and market power mitigation principles submitted by New England Power Pool. Development of applicable standard for market power analysis. Evaluation of the potential for exercise of horizontal and vertical market power by Hydro-Québec. Assessment of possible market power mitigation measures.

19. State of Vermont House Commerce Committee and House Judiciary Committee; April 30, 1997.

Review of a contract for purchases of Hydro-Québec power by Vermont utilities. Analysis of how changes in load forecasts, supply-side alternatives, and the wholesale power markets affect contract cost-effectiveness. Evaluation of decisions by Vermont utilities and state agencies to approve the contract. Discussion of implications for utility restructuring.

20. United States Federal Energy Regulatory Commission Docket ER97-851-000; Petition of H.Q. Energy Services (U.S.) Inc. for Order Accepting Initial Rate Schedule, Authorizing Market-Based Rates, and Granting Certain Waivers and Blanket Approvals; Grand Council of the Crees (of Québec) and New England Coalition for Energy Efficiency and the Environment; March 27, 1997; Affidavit August 19, 1997 (joint affidavit with R. Carlson); Supplemental Affidavit September 25, 1997 (joint affidavit with R. Carlson).

Review of Hydro-Québec subsidiary's request for power marketer status. Assessment of Hydro-Québec transmission tariff and conformity with FERC Transmission Pricing Principles and Order 888. Development of applicable standard for market power analysis and critique of applicant's analysis under traditional Hub-and-Spoke and Merger Policy Statement frameworks. Identification of potential affiliate abuse, anti-competitive behavior, and environmental impacts. Assessment of possible market power mitigation measures. Discussion of reciprocal access to Québec markets.

21. Massachusetts Department of Public Utilities 96-25; Massachusetts Electric Restructuring Proposal; Wheeled Electric Power Company; November 21, 1996.

Review of Massachusetts Electric's proposed Restructuring Settlement. Analysis of effects upon the utility's financial position and retail competition.

Evaluation of the financial and rate reduction implications of an alternative proposal for Standard Offer retail prices to be market-based, rather than pre-specified.

22. Commission d'enquête sur la politique d'achat par Hydro-Québec d'électricité auprès de producteurs privés; Commission Staff; September 16, 1996.

Analysis of Hydro-Québec's cycle of electricity surpluses and sales promotion in domestic and export markets. Evaluation of the relationship between sales promotion and the utility's independent power program. Review of mechanisms used elsewhere to acquire independent power. Discussion of transfer of utility small hydro projects to independent producers.

23. Ontario Energy Board E.B.R.O. 493/494; Union Gas Ltd./Centra Gas Ontario, Inc. 1997 Rates Hearing; Pollution Probe; September 6, 1996 (joint testimony with R. Carlson).

Evaluation of the utilities' gas avoided cost methodology, and avoided cost estimates used in their 1997 DSM Plan. Review and verification of the utilities avoided cost analysis. Development of recommendations for future avoided cost submissions.

24. Ontario Energy Board HR 24; Ontario Hydro 1997 Rate Proceeding; Green Energy Coalition; June 11, 1996 (joint testimony with R. Carlson).

Examination of social and economic consequences affiliated with Ontario Hydro's existing and proposed industrial, residential, and commercial optional rates. Specific analysis of load retention/expansion, surplus power, real time, and aggregation rates, with reference to the Board's stated concerns regarding transparency, consideration of environmental impacts, and due diligence to prevent free ridership.

25. Vermont Public Service Board Docket 5870; Tariff filing of Green Mountain Power requesting authority to implement its Customer Pilot Pricing Program; Grand Council of the Crees (of Québec), New England Coalition for Energy Efficiency and the Environment, and Vermont Public Interest Research Group; March 19, 1996.

Review of a proposed rate discount for incremental sales to residential and small commercial customers. Analysis of impacts upon sales, energy efficiency, and net revenues. Evaluation of program design, evaluation plan, equity considerations, environmental impacts, and potential for free ridership.

26. Maine Public Utilities Commission Docket 95-598; Central Maine Power Company's Annual Demand-Side Management Targets; Maine Public Utilities Commission Staff; June 26, 1995 (joint testimony with J. Raab).

Discussion of the rationale for Central Maine Power Company's continued acquisition of demand-side management resources and the need for utility

efficiency programs. Review of Central Maine Power Company's 1996 DSM targets and presentation of alternative efficiency targets and associated budgets. Evaluation of CMP's DSM proposal in the context of basic program design principles.

27. Ontario Energy Board HR 23; Ontario Hydro 1996 Rate Proceeding; Green Energy Coalition; June 16, 1995 (joint testimony with R. Carlson).

Examination of social and economic consequences affiliated with Ontario Hydro's existing and proposed industrial discount rates. Specific analysis of load retention and risk-sharing rates, with reference to the Board's stated concerns regarding transparency, consideration of environmental impacts, and due diligence to prevent free ridership.

28. Ontario Energy Board E.B.L.O. 251; 1995/96 Trafalgar Facilities Expansion Program of Union Gas Limited; Pollution Probe; May 5, 1995; Supplemental Testimony February 8, 1996 (joint testimony with R. Carlson).

Evaluation of Union Gas Ltd.'s application for Dawn-Parkway/Trafalgar natural gas pipeline system facilities expansion. Verification of its discounted cash flow analysis. Critique of Union's expected energy cost savings to participants from displacement of alternative fuels, and development of alternative energy cost savings estimates. Verification and validation of its long-term transmission facilities expansion model and its total resource cost savings analysis.

29. Ontario Energy Board E.B.R.O. 486; Union Gas Ltd. 1995 Rate Hearing; Pollution Probe; December 5, 1994 (joint testimony with R. Carlson).

Evaluation of Union Gas Ltd.'s gas avoided cost methodology and avoided cost estimates used in its 1995 DSM Plan. Review of Union's avoided cost analysis. Verification of Union's results. Discussion of the limitations inherent in the utility's avoided cost modeling approach, and provision of an alternative perspective to that approach. Development of recommendations for future avoided cost submissions.

30. New York Public Service Commission Case 94-E-0334; Consolidated Edison Company of New York Rate Proceeding; Enersave, Inc., Natural Resources Defense Council, Pace Energy Project, and New York Energy Efficiency Council; September 23, 1994; Revised Testimony October 11, 1994 (joint testimony with J. Peters).)

Assessment of proposed changes to Consolidated Edison's demand-side management programs, focusing on the Commercial & Industrial Lighting Program. Analysis of the impacts on rates, revenue requirements, and societal costs associated with demand- and supply-side resources. Discussion of the interaction between electricity rates and economic competitiveness. Provision of recommendations concerning changes to the utility's proposed DSM program.

- 31. Maine Public Utilities Commission Docket 92-345, Phase II; Central Maine Power Company's Proposed Increase in Rates; Office of the Maine Public Advocate; June 15, 1994 (joint testimony with R. Carlson).**
Discussion of Central Maine Power Company's load-building programs, including fuel-switching, within the context of Maine's economic and regulatory environment. Assessment of short-run and long-run risks associated with Central Maine Power Company's flexible pricing proposal. Review of pricing flexibility impacts from surplus energy auctions. Provision of recommendations concerning appropriate cost-effectiveness tests for load-building activities, limitations to auction of surplus electricity, and the insulation of residential rates from the impact of commercial/industrial sector promotional activities.
- 32. Ontario Energy Board HR 22; Ontario Hydro 1995 Rate Proceeding; Grand Council Treaty #3; June 2, 1994.**
Summary of First Nation concerns relating to the proposed corporate restructuring of Ontario Hydro and potential impacts on price of electricity and quality of service. Discussion of the potential impact of restructuring on the settlement of outstanding grievances.
- 33. Ontario Energy Board HR 22; Ontario Hydro 1995 Rate Proceeding; Nishnawbe Aski Nation and Grand Council Treaty #3; June 2, 1994 (joint testimony with R. Carlson).**
Review of First Nation concerns related to Ontario Hydro's ratesetting policies and orientations, including proposed discount rates and market-based pricing. Assessment of the potential impacts of rate restructuring on rural rates and equity. Critique of Ontario Hydro's cost allocation process and its potential impacts on rural customers.
- 34. Ontario Energy Board HR 22; Ontario Hydro 1995 Rate Proceeding; Green Energy Coalition; June 2, 1994 (joint testimony with R. Carlson).**
Summary of general considerations relating to discounted industrial rates. Outline of the problems inherent in Ontario Hydro's proposed strategy of offering discount rates to industrial customers. Description of the applicable standard for granting special discount rates. Recapitulation of Hydro-Québec's experiences and financial difficulties associated with a strategy promoting discount rates.
- 35. Florida Public Service Commission Case Nos. 930548-EG to 930551-EG; Adoption of Numeric Conservation Goals and Consideration of National Energy Policy Act Standards by Florida's Investor-Owned Utilities; Florida Department of Community Affairs; April 29, 1994 (joint testimony with B. Krier).**
Discussion of precedents for utility commission consideration of employment and economic development issues. Summary of the role of energy efficiency programs in Florida's economic development. Interpretation of the qualitative

findings contained in a companion Goodman Group report entitled The Employment Impacts of Electricity Efficiency in Florida. Comparison of this analysis with standards and practices utilized in similar studies in other jurisdictions.

36. Ontario Energy Board E.B.L.O. 246 Amended; 1994/95 Trafalgar Facilities Expansion Program of Union Gas Limited; Pollution Probe; April 4, 1994; Supplemental Oral Direct Testimony April 22, 1994 (joint testimony with R. Carlson).

Assessment of utility's demand-supply framework. Review of natural gas use projections and potential impacts of DSM and greenhouse gas restrictions. Critique of utility's application of cost-benefit test. Evaluation of fuel-switching analysis. Critique of fuel price forecasts utilized. Analysis of economic risk associated with proposed Dawn-Parkway/Trafalgar natural gas pipeline system facilities expansion.

37. State of New York Assembly Standing Committee on Energy and Assembly Standing Committee on Environmental Conservation; March 2, 1994.

Assessment of 800 MW Hydro-Quebec/New York Power Authority seasonal diversity contract in the context of reduced load forecasts, increased projections for independent power production and demand-side management, and the changing wholesale power markets. Analysis of the contract's cost-effectiveness. Analysis of risk, reliability, and economic development considerations.

38. Maine Public Utilities Commission Docket No. 93-147; Central Maine Power Company Petition for a Certificate of Public Convenience and Necessity to Erect a Transmission Line Carrying 100 Kilovolts or More in York County; Maine Public Utilities Commission Staff; September 21, 1993 (joint testimony with R. Carlson and W. Scott).

Assessment of peak load forecasts through 2008 for York County. Economic analysis of the need for a transmission line. Cost-effectiveness analysis of alternative line routes.

39. Maine Public Utilities Commission Docket No. 92-331; Airco Industrial Gases Request for Interruptible Load Retention Service Rate with Central Maine Power Company; Maine Public Utilities Commission Staff; July 9, 1993; Supplemental Testimony August 10, 1993 (joint testimony with R. Carlson and R. McCullough).

Assessment of request for a special industrial rate. Review of supply and demand trends in the industrial gases industry. Analysis of production scheduling and transportation cost models. Calculation of internal rates of return based on alternative assumptions. Development of recommendations for the framework, evidentiary standards, and evaluation criteria to be used in consideration of special industrial tariffs.

40. Ontario Energy Board 169-III; Integrated Resource Planning for Ontario's Local Gas Distribution Companies; Ontario Metis and Aboriginal Association; November 20, 1992.

Identification of importance of considering environmental and social externalities in energy planning generally and in Ontario natural gas industry specifically. Formulation of recommendations for incorporating externalities into the planning process. Consideration of externalities from the standpoint of the Aboriginal population.

41. Government of Canada and Government of Manitoba; Conawapa Project Environmental Assessment; Concerned Citizens of Manitoba, Sierra Club of Western Canada (Manitoba Branch), Manitoba Naturalists Society, Inc., Manitoba Branch of the Canadian Parks and Wilderness Society, and Time to Respect Earth's Ecosystems (TREE) Inc.; June 4, 1992 (joint testimony with C. Goodwin and W. Marcus).

Discussion of the need for environmental reviews to evaluate justification of design alternatives to the proposed 1290 MW Conawapa Project. Description of changes in the utility industry and new supply resource options that will affect the design alternatives included in an environmental review. Review of the treatment of project justification in North American environmental assessments.

42. Government of Canada and Government of Québec; Great Whale River Project Environmental Review; Grand Council of the Crees (of Québec); March 18, 1992 (joint testimony with R. McCullough).

Discussion of the need for environmental reviews to evaluate justification of design alternatives to the 3160 MW Great Whale River Project. Description of changes in the utility industry and new supply resource options that will affect the design alternatives included in an environmental review. Review of the treatment of project justification in North American environmental assessments.

43. New York Public Service Commission Case 90-E-0775; Petition to Reopen Proceeding and Determine the Prudence of the Contracts for Delivery of Hydro-Quebec Power; Environmental Defense Fund, Center for Environmental Legal Studies of the Pace University School of Law, Natural Resources Defense Council, National Audubon Society, Sierra Club, (Atlantic Chapter), Greenpeace U.S.A., Environmental Planning Lobby, and Hudson River Sloop Clearwater; November 25, 1991.

Review of the need for a contract for purchases of Hydro-Québec power by New York utilities. Summary of declining load forecasts and changes in the supply outlook. Analysis of the cost-effectiveness of the proposed purchase. Discussion of risk, reliability, and other considerations.

- 44. State of Vermont Supreme Court and Public Service Board; In re: Application of Twenty-Four Electric Utilities for a Certificate of Public Good Authorizing Execution and Performance of a Firm Power and Energy Contract with Hydro-Québec and a Hydro-Québec Participation Agreement, and Specifically Concerning Motions for a Remand to the Board for a New Trial; October 15, 1991; Reply Affidavit October 28, 1991.**
Review of a contract for purchases of Hydro-Québec power by Vermont utilities. Summary of changes concerning load forecasts and supply-side alternatives. Analysis of how these changes affect the cost-effectiveness of the contract.
- 45. State of New York Assembly Energy Committee Senate Environmental Conservation Committee; September 30, 1991 (updated October 7, 1991).**
Assessment of Hydro-Quebec contract in the context of reduced load forecasts, increased projections for independent power production, and the changing wholesale power markets. Analysis of the contract's cost-effectiveness. Estimation of risk, reliability, and economic development considerations.
- 46. New York Public Service Commission Case 91-E-0462; Consolidated Edison Company of New York Rate Proceeding; City of New York; September 6, 1991.**
Review of Consolidated Edison's demand-side management programs. Analysis of program delivery mechanisms and incentive levels. Identification of additional cost-effective efficiency measures. Discussion of opportunities for increased cooperation between Consolidated Edison and the City of New York to achieve greater efficiency.
- 47. New York Public Service Commission Case 91-E-0462; Consolidated Edison Company of New York Rate Proceeding; Environmental Defense Fund, National Audubon Society, Greenpeace, and Center for Environmental Legal Studies; September 6, 1991.**
Analysis of Consolidated Edison's resource planning process with respect to demand-side management programs and the 482 MW Hydro-Québec purchase. Evaluation of demand-side management and the Hydro-Québec purchase in context of long run avoided cost estimates. Determination of cost-effectiveness of Hydro-Québec contract. Discussion of risk, reliability, environmental and economic development considerations relating to the Hydro-Québec purchase.
- 48. New York Public Service Commission Case 90-E-1185; Long Island Lighting Company Rate Proceeding; Vladeck, Waldman, Elias and Englehard, Natural Resources Defense Council, and Center for Environmental Legal Studies; June 3, 1991 (joint testimony with C. Komanoff).**

Evaluation of Long Island Lighting Company's proposed 20 year, 218 MW purchase of electricity from Hydro-Québec. Comparison of Long-Run Avoided Cost and the Hydro-Québec purchase. Review of supply and demand options as alternatives to the purchase. evaluation of risk, reliability, environmental, and economic development considerations.

49. Québec Access to Information Commission No. 90-04-07; Risk-Sharing Contracts; Grand Council of the Crees (of Québec); May 3, 1991.

Analysis of confidential risk-sharing electricity supply contracts between Hydro-Québec and thirteen large industrial customers. Description of participants by company ownership, location, principal activities, and business relationships. Estimation of energy and capacity required to service contracts. Assessment of resulting implications for Hydro-Québec and its ratepayers. Review of treatment of electricity contracts for aluminum smelters and other large industrial customers in North American jurisdictions.

50. Massachusetts Department of Public Utilities 90-261-A; Massachusetts Electric Fuel Switching; Massachusetts Division of Energy Resources; April 17, 1991.

Evaluation of fuel switching as a demand-side management option. Review of current status of fuel-switching technologies. Formulation of cost and benefit allocation algorithms to optimize program participation and maximize societal benefits by incorporating fuel choice options, including renewables and active and passive solar, as part of utility least-cost planning.

51. State of Vermont, Chittenden County Superior Court, Docket S518-91 CnC; March 5, 1991 Burlington Municipal Election Question 8; Grand Council of the Crees (of Québec); March 28, 1991.

Analysis of Burlington Electric Department Assessment provided as "voter information" in referendum concerning power purchase contract with Hydro-Québec. Evaluation of accuracy and impartiality of information concerning cost estimates, alternative sources of supply, environmental effects, and economic benefits.

52. Manitoba Public Utilities Board; Manitoba Hydro Submission in Respect to Major Capital Projects; Concerned Citizens of Manitoba, Sierra Club of Western Canada (Manitoba Branch), and Conservation Strategy Association of Manitoba; July 23, 1990; Surrebuttal Testimony August 30, 1990 (joint testimony with W. Marcus).

Review of Manitoba Hydro's submission and the proposed: construction of 1290 MW Conawapa generating station and other northern hydro projects; 100 MW demand-side management program; twenty-two year, 1000 MW power sale to Ontario Hydro; and two 150 MW seasonal diversity exchanges. Review of Manitoba Hydro load forecasting. Estimation of economic and attainable conservation potential. Development of principles of conservation program design and delivery. Critique of utility's proposed demand-side management

program. Evaluation of alternative supply-side resources. Analysis of avoided costs. Assessment of employment and economic development effects of hydroelectric development and conservation. Analysis of profitability and risks of proposed power sales contracts.

53. State of New York Supreme Court; Application of Sierra Club, Inc. et al. For Judgment Under Article 78 Against the Power Authority of the State of New York, et al.; April 18, 1990; Reply Affidavit August 6, 1990; Supplemental Reply Affidavit September 13, 1990.

Analysis of nexus between New York Power Authority purchases and construction of specific Québec hydro facilities and operation of fossil fuel electric generation. Evaluation of power imports in New York State Energy Plan. Assessment of energy conservation as a potential substitute for hydro and fossil generation. Comparison of employment and economic development impacts of power purchase and conservation options.

54. Canadian National Energy Board Hearing Orders No. EH-3-89 and AO-1-EH-3-89; Application of Hydro-Québec for Export License for Firm Power and Energy Contracts with Vermont Joint Owners and New York Power Authority; Grand Council of the Crees (of Québec); February 14, 1990 (joint testimony with W. Marcus).

Review of a proposed thirty year, 450 MW sale of Hydro-Québec power to twenty-four Vermont utilities and review of a proposed twenty year, 1000 MW sale of Hydro-Québec power to the New York Power Authority. Analysis of planning and operation of Hydro-Québec power supply. Modeling of hydro reservoir levels. Determination of marginal supply resources associated with sales to Vermont and New York. Estimation of acid rain and greenhouse gases emissions from fossil and hydro generation. Analysis of reliability including adequacy of energy, capacity, and transmission supply. Estimation of achievable conservation potential in Québec. Analysis of the profitability of the proposed power sales on both a private cost and social cost basis.

55. Vermont Public Service Board Docket 5330; Application of Vermont Utilities for Approval of a Firm Power and Energy Contract with Hydro-Québec; Grand Council of the Crees (of Québec) and New England Coalition for Energy Efficiency and the Environment; December 19, 1989; Supplemental Testimony January 18, 1990 (joint testimony with W. Marcus). Docket 5330-A; Testimony April 30, 1991.

Review of a proposed thirty year, 450 MW purchase of Hydro-Québec power by twenty-four Vermont utilities. Analysis of planning and operation of Hydro-Québec power supply. Modeling of hydro reservoir levels. Determination of marginal supply resources associated with sales to Vermont. Estimation of acid rain and greenhouse gases emissions from fossil and hydro generation. Analysis of risk and reliability including supply diversity, and adequacy and security of energy and transmission supply. Estimation of achievable conservation potential in Québec. Development of proposal for exports to

Vermont based on conservation and alternative supply resources in Québec. Evaluation of costs and benefits of Vermont Joint Owners' proposed Waiver and Release to extend the date for cancellation of export contracts without penalty.

56. Massachusetts Department of Public Utilities 89-72; Statewide Towing Association, Police-Ordered Towing Rates; Massachusetts Automobile Rating and Accident Prevention Bureau; September 13, 1989 (joint testimony with P. Chernick).

Review of study supporting proposed increase in towing rates. Critique of study sample and methodology. Comparison with competitive rates. Supply of towing services. Effects of joint products and joint sales on profitability of police-ordered towing.