

**BEFORE THE  
PUBLIC UTILITIES COMMISSION  
OF THE  
STATE OF RHODE ISLAND**

**IN RE:** )  
 )  
**THE NARRAGANSETT ELECTRIC** )  
**COMPANY d/b/a RHODE ISLAND ENERGY** ) **Docket No. 23-49-NG**  
**FY 2025 INFRASTRUCTURE, SAFETY,** )  
**AND RELIABILITY PLAN** )

**TESTIMONY OF**

**JEFF D. MAKHOLM, Ph.D.**

**On behalf of**

**THE DIVISION OF PUBLIC UTILITIES AND CARRIERS**

**February 9, 2024**

1 **Q. Please state your name, business address and current position.**

2 A. My name is Jeff D. Makhholm. I am a Senior Managing Director at National Economic Research  
3 Associates, Inc. (“NERA”). NERA is a firm of consulting economists with its principal offices in  
4 several cities in the United States and around the world. My business address is 99 High Street,  
5 Boston, Massachusetts, 02110. I have been with the firm since 1984.

6 **Q. Please describe NERA.**

7 A. NERA was founded in 1961 by consulting economists working in conjunction with Professor  
8 Alfred E. Kahn of Cornell University (a founder and longtime Special Consultant at NERA). NERA  
9 is the oldest and largest firm of independent consulting economists, worldwide. Among other areas  
10 of economics applied to industrial organization, regulation, and economic trade questions, NERA  
11 has been heavily involved in the regulation of US electricity and natural gas utilities.

12 **Q. On whose behalf do you provide testimony in this docket?**

13 A. I appear for the Division of Public Utilities and Carriers.

14 **Q. What is the purpose of your testimony?**

15 A. I appear on a subject associated with Rhode Island Energy’s (RIE’s) Infrastructure, Safety and  
16 Reliability (“ISR”) filing. I comment on an issue raised by the Commission related to the rate  
17 treatment of street re-paving costs associated with RIE’s gas distribution pipe replacement  
18 activities. Specifically, I deal with whether such re-paving costs accompanying RIE’s pipe  
19 replacement program should be either (a) capitalized (as part of the investment cost of maintaining  
20 a safe and adequate pipeline infrastructure network serving Rhode Island customers); or (b)  
21 expensed in the year they are spent.

22 **Q. Please provide a brief summary of your conclusions.**

23 A. The question of whether to change normal depreciation practices, to expense re-paving costs, was  
24 prompted by concerns voiced by the Commission on two issues, one being the risk of stranded  
25 costs for RIE given the actions that may accompany Rhode Island’s 2022 Act on Climate (the

1 “Act”).<sup>1</sup> Indeed, much of the analysis informing the questions of *stranded cost risk* emanates from  
2 the current analysis of the Act, including the report recently submitted by the Commission’s  
3 consultant.<sup>2</sup>

4 In this respect, for the Commission to pursue the expense treatment of re-paving costs (which  
5 normal practice would treat as simply another of the sundry components of a pipeline capital  
6 replacement exercise) would exhibit aspects of circularity. Against unknown and unmeasurable  
7 consequences of pursuing the Act in years to come, the Commission, if it directed such a change  
8 (not that it has said it *would* do so), would change the normal rules on depreciation and ratemaking.  
9 Given the foundation for how investor-owned firms like RIE and the Commission work together  
10 to pursue the public interest, such an action would not be a *remedy* for a known or measurable  
11 risk—but rather a *source of new risk* by altering, without an objective foundation, a regulatory  
12 model built on a purposeful framework (which strives for objectivity and reliable evidence).

13 To be sure, there are many uncertainties about how the Act will affect public gas service in Rhode  
14 Island. Such uncertainties include the extent to which potential useful actions under the Act fall  
15 within, or beyond, the Commission’s jurisdiction or whether they signal a kind of risk that would  
16 affect the creditworthiness of RIE and its cost of capital (to ensure that RIE maintains the kind of  
17 continuous access to capital needed for it to provide safe and reliable service). Containing such risk  
18 is key to ensuring economical service in Rhode Island—for as long as gas distribution service  
19 remains.

20 Thus, I recommend that the Commission not move to change the normal methods of booking and  
21 depreciating capital upgrade project costs at this time.

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<sup>1</sup> The other reason given is the increase “curb to curb” extent of such costs newly required by the local authority.

<sup>2</sup> See, for example: RI Investigation into the Future of the Regulated Gas Distribution Business: Technical Analysis Draft Results, February 13, 2024, (Draft, Preliminary) Energy + Environmental Economics: “Risk of stranded costs exists for scenarios with high levels of customer departures; potentially unrecovered rate base in 2050 between \$2,6M (unmanaged) and \$1,5M (managed)” p. 23.

1 **Q. Please describe your academic background and experience.**

2 A. I have M.A. and Ph.D. degrees in economics from the University of Wisconsin—Madison, with a  
3 major field of Industrial Organization and a minor field of Econometrics/Public Economics. I also  
4 have B.A. and M.A. degrees in economics from the University of Wisconsin—Milwaukee. I joined  
5 NERA in 1986. From 1987 to 1989, I was an Adjunct Professor in the Graduate School of Business  
6 at Northeastern University in Boston, Massachusetts, teaching courses in microeconomic theory  
7 and managerial economics.

8 **Q. Please describe your professional experience pertinent to this proceeding.**

9 A. My work as a consulting economist principally involves the area of regulated industries—both  
10 those that operate networks (such as oil and gas pipelines, electricity transmission and  
11 gas/electricity distribution systems, telecommunications networks, and water utility systems) and  
12 those operating infrastructure businesses at specific sites, such as airports, electricity generation  
13 plants, oil refineries, and sewage treatment plants. I have researched and provided evidence  
14 regarding regulated pricing, the presence or absence of market power, competition, the fair rate of  
15 return, regulatory rulemaking, incentive ratemaking, load forecasting, least-cost planning, cost  
16 measurement, contract obligations, and bankruptcy, among other issues, concerning these  
17 industries. I have prepared expert testimony and affidavits, and I have appeared as an expert  
18 witness, in many state and federal agencies, and United States District Court proceedings, as well  
19 as in regulatory and court proceedings abroad.

20 I have also directed studies on behalf of utility companies, governments, and the World Bank in  
21 many countries: drafting regulations, establishing tariffs, recommending financing options for  
22 major capital projects, and advising on industry restructurings. I have assisted in the privatization  
23 of state-owned utilities. I provide my current curriculum vitae, which more fully details my  
24 educational and consulting experience and my publications as Appendix A.

1 **Q. In your work, do you have experience pertaining to the regulation of natural gas distribution**  
2 **companies?**

3 A. Yes. I have extensive experience in dealing with the regulatory issues involving natural gas  
4 distribution utilities in the United States and in many other countries around the world. I list over  
5 50 such gas distribution companies on my CV from around the world, including three Rhode Island  
6 natural gas distributors (Providence Gas, Bristol and Warren Gas, and Valley Gas) that are now  
7 part of RIE. I also testified before the Commission for Valley Gas in 1995, regarding the cost of  
8 equity capital.

9 **Q. Have you published papers or books on issues related to the economic development and**  
10 **regulation of US and international public utilities?**

11 A. Yes. Listed on my curriculum vitae are two books and many published papers and working papers  
12 pertaining to the regulation of utilities such as RIE.

13 **Q. When did the Commission indicate its interest in alternative rate treatment of paving costs?**

14 A. On October 18, 2023, at the hearing in Docket 23-23-NG, the Commission provided a document  
15 entitled “New Budgeting Parameters and Principles for the Gas ISR.”<sup>3</sup> This document included a  
16 section on paving costs that stated “Costs incurred for street paving removed from capital and  
17 treated as an O&M expense annually covered by ISR.”

18 On November 9, 2023, the Commission established Docket 23-39-NG, seeking “to explore various  
19 options for new budget parameters and principles relating to the Company’s GAS ISR Plan for  
20 future application in ISR filings and proceedings.”<sup>4</sup> During the Technical Conference in Docket  
21 23-39-NG on November 29, 2023, the Commission asked that the Company’s ISR filing show rate  
22 impacts under two alternative treatments of paving costs: (a) traditional recording of such re-paving  
23 charges as capital-related costs subject to depreciation; and (b) expensing such re-paving costs.

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<sup>3</sup> Docket No. 23-23-NG, Transcript of Hearing dated October 18, 2023 at 86-87.

<sup>4</sup> Notice of Technical Record Session.

1 **Q. What appears to be the motivation for the Commission’s desire to consider alternative rate**  
2 **treatment of paving costs?**

3 A. The Commission’s interest in alternative rate treatment of paving costs appears based on two  
4 factors. First, paving costs have increased steadily over the last several years in response to the  
5 passage of the Rhode Island Utility Fair Share Roadway Repair Act, under which local  
6 municipalities have increasingly required curb-to-curb restoration for gas projects.<sup>5</sup> Beyond the  
7 increasing paving costs, however, a second motivating factor concerns risks of potential stranded  
8 costs connected to the Act on Climate. The Commission’s discussion of paving costs in the  
9 November 29, 2023 Technical Conference indicates that the rate treatment of paving costs parallels  
10 broader concerns about the risks of stranded costs given the Act on Climate’s potential implications  
11 for gas infrastructure investments.<sup>6</sup>

12 **Q. Has RIE calculated the rate result of expensing, rather than capitalizing the depreciating,**  
13 **such costs?**

14 A. Yes. As stated by Tyler G. Shields, the company estimates paving costs to be \$12 million. If paving  
15 costs were to be categorized as usual, the company estimates a total revenue requirement of \$77.4  
16 million and an annual bill increase for a representative customer of \$48.28 or 2.9 percent for a  
17 representative customer. However, if the increase in paving costs were considered an O&M  
18 expense, this would increase the total revenue requirement to \$88.4 million and increase the bill  
19 impacts for a representative customer to \$80.49 or 4.8 percent.<sup>7</sup> The difference in annual rate  
20 impacts is about \$32.

21 **Q. Is that \$32 the only consequence of expensing such re-paving costs?**

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<sup>5</sup> Dkt. 23-39-NG, Transcript of Technical Conference dated November 29, 2023 at 90.

<sup>6</sup> Dkt. 23-39-NG, Transcript of Technical Conference dated November 29, 2023 at 92-93 and 96.

<sup>7</sup> RIE Proposed FY20215 Gas Infrastructure, Safety, and Reliability Plan, Direct Testimony of Tyler G. Shields, p. 5.

1 A. No. There are more consequences involved in moving to expense what would normally be booked  
2 as one of the various charges (labor included) accompanying a capital upgrade project—  
3 particularly if such changes are spurred in part by the Act. Let me explain.

4 **Q. Please proceed.**

5 A. RIE is a privately-owned gas distributor—similar in that respect to the dominant form of state-  
6 regulated gas companies in other states. Those gas distributors also have longstanding methods to  
7 gain regulatory approval for major investments and have straightforward methods to compute the  
8 value of their regulated property and their operating expenses (including depreciation and taxes) to  
9 form a reliable cost basis for the prices they charge.

10 A highly purposeful structure—an invented structure—exists for the orderly regulation of investor-  
11 owned companies like RIE by the Commission. Depreciation is a part of that structure—critical to  
12 the tracking of the capital devoted by such companies to providing public services. The structure  
13 did not appear right away with the advent of state-based public utility regulation—it evolved as  
14 legislatures and the US Supreme Court worked, in the words of Oliver Williamson (the 2009 Nobel  
15 laureate in economics), to deal with “harmonizing relations between parties who are otherwise in  
16 actual or potential conflict.... [with] the purpose of promoting the continuity of relationships by  
17 devising specialized governance structures.”<sup>8</sup>

18 The comparatively straightforward means by which companies like RIE and regulators like the  
19 PUC work through revisions of rate and earnings issues with little real controversy (compared to  
20 what takes place in other countries) reflects the settled and objective nature of most of what  
21 constitutes US utility regulation. Indeed, the application of US regulatory principles is reasonably  
22 called “regulatory common law.”<sup>9</sup> But none of that regulatory common law appeared by itself. It

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<sup>8</sup> Williamson, O.E., *The Economic Institutions of Capitalism*, Free Press, New York (1985), p. 3.

<sup>9</sup> See: National Association of Regulatory Utility Commissioners, *Utility Regulatory Policy in the United States and Canada: Compilation 1993-94*, p. 52. Also see: Goodman, L.S., *The Process of Ratemaking*, Public Utility Reports Inc, Vienna VA (1998), pp. 857-58.

1 all represents specific US legislative or judicial decisions—often-enough reflecting solutions to  
2 great public interest problems, the facts of which relate to historical matters that have faded from  
3 memory (except for economic and legal historians).

4 Dealing with the issues arising in the context of depreciation for street re-paving in Rhode Island  
5 in no way requires a deep study of the origins of US regulation, the nature of the institutions that  
6 frame it, or the way in which those that regulate—and supporting institutions—are uniquely  
7 effective in promoting competitive US energy markets in the public interest. Nevertheless, it is  
8 useful to put even as seemingly minor an issue as the rate treatment of \$12 million in yearly re-  
9 paving costs in context.

10 **Q. What are the elements of what you describe as *regulatory common law*?**

11 A. There are two that frame the issue of depreciation that the Commission has raised: (1) the “prudence  
12 standard” for permissible costs and (2) property values and the importance of the *Hope* decision.

13  
14 1. The “Prudence Standard” for Permissible Costs

15 The first of the modern regulatory statutes appeared in Wisconsin and New York in 1906. Written  
16 independently, both were the result of a major 1905-1906 study of the efficacy of investor  
17 ownership in US utilities.<sup>10</sup> While those statutes created a reliable governing structure for  
18 regulation, they left several major items outstanding to be determined later.

19 One major outstanding item concerned the “fair value” of the rate base from which to derive rates.  
20 But such a focus on value, rather than cost, came close to dooming the investor-owned regulatory  
21 model. Economists of the era (including James C. Bonbright) saw that in the context of regulated  
22 ratemaking, value was circular (and thus unworkable).<sup>11</sup> US Supreme Court Justice Louis Brandeis

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<sup>10</sup> National Civic Federation, *Municipal and Private Operation of Public Utilities* (three volumes), National Civic Federation, New York (1907).

<sup>11</sup> “[H]ad the [Supreme] Court deliberately set out to defeat the whole purpose of regulation and to make public ownership inevitable, it would hardly have pursued this objective more effectively than by its rulings and dicta

1 agreed. Against the majority on the Supreme Court, he worked to substitute cost for value in  
2 regulated ratemaking. But in doing so, he knew that the next question coming was *which costs?*

3 In response to that question, Brandeis proposed a purposeful regulatory filter through which all  
4 costs would have to pass to be part of the ratemaking formula. That filter would prohibit judging  
5 the efficiency of costs via hindsight. It also would embrace a presumption that utility management  
6 has acted “prudently” in their investment decisions.<sup>12</sup> His objective was the reasonable continuation  
7 of a utility enterprise that could maintain uninterrupted access to low-cost investor capital on  
8 reasonable terms. A “prudent investment” was one made with reasonable judgement and “under  
9 ordinary circumstances, would be deemed reasonable” absent “dishonest or obviously wasteful or  
10 imprudent expenditures.”<sup>13</sup>

11 Brandeis’ purpose was promoting *orderly action* where the *private interests* of utility investors  
12 intersected with the *public interest* at large.

13 The force of Brandeis’ reasoning led to the prudence standard becoming part of US regulatory  
14 common law. US regulators apply innumerable minor instances of “imprudence” as regulatory  
15 commission staffs assess normal rate cases. But major imprudence disallowances that threaten the  
16 credit of utilities are uncommon.

## 17 2. Property Values and the Importance of the *Hope* Decision

18 Confirming the role of investor capital in 1905-1906 was not enough to make reliable the kind of  
19 regulation defining the relationship between RIE and the PUC. Employing private capital for

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on valuation.” Bonbright, J.C., *The Valuation of Property*, Volume II, McGraw-Hill Book Company, New York (1937), p. 1154.

<sup>12</sup> “Every investment may be assumed to have been made in the exercise of reasonable judgment, unless the contrary is shown.” *Missouri ex rel. Southwestern Bell Tel. Co. v. PSC*, 262 U.S. 276 (1923).

<sup>13</sup> *Missouri ex rel. Southwestern Bell Tel. Co. v. Public Svc. Comm'n*, 262 U.S. 276, 289 (1923) (“*Missouri*”), note 1. As Brandeis wrote (p. 276): “The adoption of the amount prudently invested as the rate base and the amount of the capital charge as the measure of the rate of return would give definiteness to these two factors involved in rate controversies which are now shifting and treacherous, and which render the proceedings peculiarly burdensome and largely futile. Such measures offer a basis for decision which is certain and stable. The rate base would be ascertained as a fact, not determined as matter of opinion.”

1 regulated public service purposes essentially over-stressed the traditional English common law  
2 tools of the US Supreme Court in the nineteenth and early twentieth centuries. Up until the 1930s,  
3 the Supreme Court had failed to find a workable method of regulating prices that respected the  
4 reasonable value of investor-owned private property—ostensibly protected under the due process  
5 requirements of the 5<sup>th</sup> and 14<sup>th</sup> Amendments of the US Constitution.<sup>14</sup>

6 The Supreme Court remedied the problem in 1944, in its first full rate case for an interstate gas  
7 pipeline under its new 1938 Natural Gas Act. The Federal Power Commission (the predecessor of  
8 the Federal Energy Regulatory Commission) pressed for the booked dollar investment cost of the  
9 pipeline’s owners to be the standard by which to value regulated utility property. The Supreme  
10 Court agreed in *Federal Power Commission et al. v. Hope Natural Gas Co.*<sup>15</sup> The *Hope* decision  
11 permanently settled the “cost-of-service model” and the “prudence standard” in the United States.  
12 It has thus become commonly accepted that credit sustaining revenues—meaning the ability of a  
13 well-managed utility to attract needed capital in all circumstances—is essentially first among the  
14 criteria of a fair return that commissions like the PUC provide to the investor-owners of US  
15 utilities.<sup>16</sup>

16 The *Hope* decision used invested capital to compute a utility’s permissible regulated revenues. The  
17 fair return on such capital, as reflected in accurate and objective accounting, would be measured  
18 by potential earnings for investors based on other enterprises of similar risk. Both in the use of  
19 invested capital of the owners (as reflected in the books) and in requiring measures of profitability  
20 in similarly risky ventures (as reflected in the capital markets), the *Hope* decision sharply limited  
21 regulatory discretion and secured utility companies’ investments from seizure (a “taking” of private

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<sup>14</sup> Reflecting the problem, Franklin D. Roosevelt, while campaigning for President in 1932, articulated his preference for government ownership of utilities, as least in some forms Roosevelt, Franklin D., *The Public Papers and Addresses of Franklin D. Roosevelt* (New York, 1938), vol. 1, pp. 737-40.

<sup>15</sup> *Federal Power Commission v. Hope Natural Gas*, 320 US 591 (1944).

<sup>16</sup> Bonbright, J.C., *Principles of Public Utility Rates*, Columbia University Press, New York (1961), p. 152.

1 property without due process). It made the “rate base” a verifiable fact embedded in utilities’ books  
2 and records, not a matter of expert opinion.

3 As such, the *Hope* decision was a landmark event in the history of the economics of US utility  
4 regulation—still referred-to in cost of capital evidence in every state and federal rate case.

5 **Q. What are the implications of these elements of regulatory common law for the meaning and**  
6 **computation of depreciation in ratemaking?**

7 A. Depreciation accounting for ratemaking purposes drew on these pillars of regulatory common law  
8 to define a set of rules laid down in the 1940s by the National Association of Regulatory Utility  
9 Commissioners (NARUC)—the trade group of American regulators.<sup>17</sup> For the purpose of  
10 computing reasonable rates of return on equity for US utilities, depreciation never rises above the  
11 straight-line booking of objective engineering-based asset lives. Depreciation in the US is not about  
12 funding replacements, as such, but serves to maintain the integrity of utility investments by  
13 recording the cost of property consumed in providing service (where the value of that property was  
14 defined by *Hope*). In that way, depreciation is a method of safeguarding the capital devoted to  
15 providing service until it can be returned to investors as a component of consumer charges.

16 **Q. How does the context you describe bear on a choice to treat street re-paving, as a part of**  
17 **RIE’s ISR program capital cost, as an operating expense as for rate purposes?**

18 A. It is no hyperbole to say that the twin aspects of regulatory common law—*prudence* and the 1944  
19 *Hope Natural Gas* decision—resurrected the investor-owned US utility model from problems that  
20 had widely been held by economists to be verging on public scandal.<sup>18</sup> After the 1940s, US utility

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<sup>17</sup> *Report of the Committee on Depreciation*, 1943, NARUC. The NARUC Staff Subcommittee on Depreciation describes the history of American regulatory depreciation practices in its Manual on Public Utility Depreciation Practices, which is publicly available.

<sup>18</sup> “It is not too much to say that in terms of cost, delay, uncertainty, and the arousing of animosity and contention, the performance of the ... method falls little short of a public scandal; by far the greater part of the grotesque and costly ponderosity which characterizes modern rate regulation is to be attributed directly and solely to [that] approach.” See: Lyon, L.S., and Abramson, V., *Government and Economic Life: Development and Current Issues of American Public Policy, Volume II*, Brookings, Washington, D.C. (1940), p. 691.

1 regulation became a highly reliable and predictable matter. With a model grounded on the  
2 objectivity of original cost ratemaking associated with *Hope*, depreciation accounting became a  
3 highly objective engineering and statistical analysis informing a straightforward accounting  
4 treatment for ratemaking.

APPE A

5 **Q. Are you saying that there is a cost to departing from such an objective standard for**  
6 **depreciation?**

7 A. Yes, without a specific justification also grounded in reliable evidence. The evident care with which  
8 the evidentiary foundation for depreciation is maintained by US regulators generally shows the  
9 value of retaining an objective standard grounded in reliable evidence—all devoted to reducing risk  
10 and minimizing the investment cost of public services.<sup>19</sup>

11 **Q. Is the same true for considerations relating to RIE’s \$12 million re-paving costs?**

12 A. Yes. While the amount may seem relatively minor, the \$32 per customer annual effect on rates is  
13 not minor. And the justification for such a move is based on the highly uncertain risk consequences  
14 related to the Act.

15 **Q. What is the ultimate message that you wish to convey with your evidence?**

16 A. The methods created to regulate US utilities (including in Rhode Island) were purpose-built to  
17 encourage the ready flow of investor capital for public services at reasonable prices. From an  
18 international perspective, the success of that US model is manifest—as energy prices for US  
19 consumers have long been a fraction of those, for example, in the UK or the rest of Europe. Those  
20 US methods are deeply rooted in decades-old state and federal legislation, Supreme Court action  
21 (to confirm the constitutionality of such legislation), and collective action by the nation’s state and  
22 federal regulators comprising NARUC. The deliberateness of those methods makes them highly

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<sup>19</sup> See: Goodman, L.S., *The Process of Ratemaking*, Public Utility Reports Inc, Vienna VA (1998), pp. 485-530  
(Chapter on Depreciation).

1 resistant to change—a strength of the system in controlling risk to encourage economical  
2 investment in such public services.

3 How and why the methods work, again and again in state after state, are public matters—but still  
4 really only visible to those who have sat through a typical rate case where the evidence rolls out,  
5 day after day, from myriad experts in accounting, engineering, working capital, depreciation, tariff  
6 design, and cost of capital. The method also provides (via another critical regulatory institution—  
7 the Administrative Procedures Act of 1946<sup>20</sup>) for the testing of such evidence by other experts and  
8 the ability of commissions (like the PUC) to judge a reasonable result. Capital markets have long  
9 understood the method and the way in which it minimizes investment risk. It works.

10 The Act on Climate presents inchoate risks for those who provide for the uninterrupted capital  
11 access that RIE needs—which the Commission’s consultant’s February draft report usefully  
12 describe. Avoiding unnecessary risks will require that any ratemaking actions proposed in response  
13 to efforts to deal with the goals of the Act on Climate are respectful of the depth of evidentiary  
14 analysis that has gone into the development of the longstanding treatment of depreciation, among  
15 other ratemaking elements. To me, a proposal to expense capital-related re-paving costs, separate  
16 from the various other costs of pipeline upgrades and repairs, has not met that standard of analysis.

17 **Q. Does this conclude your prepared direct testimony?**

18 A. Yes.

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<sup>20</sup> 5 USC §551 et seq. (1946).

# Appendix A

**JEFF D. MAKHOLM, Ph.D.**  
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Dr. Makhholm concentrates on the issues surrounding the market and regulation for energy (electricity and gas), transportation (road and rail), and mining—those that operate networks (pipelines, electricity transmission networks, rail and road networks, telecommunications and water utility systems) and those operating infrastructure business at specific sites, such as mines, hydrocarbon rigs, oil refineries, electricity generation plants, oil and gas storage facilities, gas treatment plants, sewage treatment plants and airports. These issues include the broad categories of project valuation, efficient pricing, market definition, traded commodity valuation, and the components of reasonable regulatory practices. Specific valuation issues in the extractive industries include the value of permits for include the right to explore and develop natural resources and the exchange-traded spot, hedged and transported value of commodities. Specific pricing issues include tariff design, incentive ratemaking, and the unbundling of prices and services, and analysis of energy commodities markets (including derivative markets comprising forwards, futures and swaps for commodities and liquefied natural gas—LNG). Issues of market definition include assessments of mergers, including the identification and measurement of market power. Issues of reasonable regulatory practices include the creation of credible and sustainable accounting rules for ratemaking as well as the establishment of administrative procedures for regulatory rulemaking and adjudication. On such issues among others, Dr. Makhholm has prepared expert testimony, reports and statements, and has appeared as an expert witness in many states, federal and U.S. district court proceedings as well as before courts, international arbitrations and regulatory bodies and Parliamentary panels abroad.

Dr. Makhholm's clients in the United States include privately held oil, gas and utility corporations, rail companies, public corporations, government agencies and consumer groups. He has represented dozens of gas and electric distribution utilities, as well as both intrastate and interstate oil and gas pipeline companies and oil, gas and electricity producers. Dr. Makhholm has also worked with many leading law firms engaged in issues pertaining to the local and interstate regulation of energy utilities.

Internationally, Dr. Makhholm has directed an extensive number of projects in the mining, utility and energy transportation businesses in 20 countries on six continents. These projects have involved work for investor-owned and regulated business as well as for governments and the World Bank. These projects have included advance pricing and regulatory work prior to major gas, railroad and toll highway privatizations (Poland, Argentina, Bolivia, Mexico, Chile and Australia), gas industry restructuring and/or pricing studies (Canada, China, Spain, Morocco, Mexico and the United Kingdom), utility mergers and market power analyses (New Zealand), gas development and and/or contract and financing studies (Tanzania, Egypt, Israel and Peru), regulatory studies (Chile, Argentina), and oil pipeline transport financing and regulation (Russia). As part of this work, Dr. Makhholm has prepared reports, drafted regulations and conducted training sessions for many government, industry and regulatory personnel.

Dr. Makhholm has published many papers in various peer-reviewed and editor-reviewed publications (*Review of Environmental Economics and Policy*, *Economics of Energy & Environmental Policy*, *Public Utilities Fortnightly*, *Natural Gas and Electricity*, *The Electricity Journal*, *The Energy Law Journal*, and *Competition and Regulation in Network Industries*)—involving a wide range of subjects pertaining to his research work. He is a frequent speaker in the U.S., Europe and elsewhere at conferences and seminars addressing market, pricing and regulatory issues for the energy, commodity and transportation sectors. His latest book, *The Political Economy of Pipelines: A Century of Comparative Institutional Development*, was published by the University of Chicago Press in 2012 and re-issued in Chinese in 2016 by Beijing's Petroleum Institute Press.

**EDUCATION**

UNIVERSITY OF WISCONSIN-MADISON,  
MADISON, WISCONSIN  
Ph.D., Economics, 1986  
Dissertation: Sources of Total Factor Productivity in the Electric Utility Industry  
M.A., Economics, 1985

BROWN UNIVERSITY  
PROVIDENCE, RHODE ISLAND  
Graduate Study, 1980-1981

UNIVERSITY OF WISCONSIN-MILWAUKEE  
MILWAUKEE, WISCONSIN  
M.A., Economics, 1980  
B.A., Economics, 1978

**EMPLOYMENT**

1996-present      Senior Managing Director/Senior Vice President. National Economic Research Associates, Inc., (NERA) Boston, Massachusetts.

1986-1996      Vice President/Senior Consultant. National Economic Research Associates, Inc., (NERA) Boston, Massachusetts.

1987-1989      Adjunct Professor. College of Business Administration, Northeastern University, Boston, Massachusetts

1984-1986      Consulting Economist. National Economic Research Associates, Inc., (NERA) Madison, Wisconsin.

1983-1984      Consulting Economist. Madison Consulting Group, Madison, Wisconsin.

1981-1983      Staff Economist. Associated Utility Services, Inc., Moorestown, New Jersey.

**TESTIMONY SINCE 1981**

Before the Alberta Energy Regulator, Proceeding No. 432, in the matter of Reconsideration No. 1940992 concerning Amended Application No. 1932335, 24 January 2024. Report (with Laura T. W. Olive) on behalf of Plains Midstream Canada ULC, Pembina Pipeline Corporation, and SECURE Energy Services, Inc. Subject: Public interest considerations related to existing pipelines and prospective land development.

Before the Alberta Utilities Commission, Proceeding 27388, 2024-2028 Performance-Based Regulation Plan for Alberta Electric and Gas Distribution Utilities, January 17, 2023. Subject: Independent expert to update Total Factor Productivity (TFP) study used for PBR 1 plans in Alberta.

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Before the Federal Energy Regulatory Commission, Reply Declaration in support of Gulfport Energy

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Before the International Chamber of Commerce Expert Report on behalf of STP Energy Pte Ltd. Subject: Valuation of offshore oil and gas exploration permit, April 29, 2015.

Before the Régie de l'énergie, Written Evidence on behalf of Gaz Métro. Subject: Pricing of gas distribution system expansion, January 20, 2015

Before the Supreme Court of Western Australia, Filed Statement on behalf of North West Shelf Pty Ltd, Subject: Value and interpretation of gas swaps agreement, December 24, 2014.

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Before the 298<sup>th</sup> Judicial District Court of Dallas County, Texas, Rebuttal Expert Report on behalf of plaintiff in Energy Transfer Partners, L.P., and Energy Transfer Fuel, L.P. v. Enterprise Products Partners, L.P., Enbridge (US) Inc., and Enterprise Products Operating LLC, Cause No. 11-12667, March 2013. Subject: Causation and damages in abandoned joint oil-pipeline venture

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Before the United States Federal Energy Regulatory Commission, Prepared Direct Testimony in Public Utilities Commission of Nevada and Sierra Pacific Power Company v Tuscarora Gas Transmission Company, Docket No. RP11-1823-000. October 17, 2011. Subject: Reasonable interstate gas pipeline tariff levels.

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Before the Arkansas Public Service Commission, Rebuttal Testimony on behalf of Entergy Arkansas, Inc., Docket No. 09-084-U. March 24, 2010. Subject: Justification of the operation of a multi-year formula rate plan.

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**TESTIMONY SINCE 1981 CONTINUED**

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**TESTIMONY SINCE 1981 CONTINUED**

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**TESTIMONY SINCE 1981 CONTINUED**

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“Security of Supply in Europe,” Florence School of Regulation, State of the EU Conference at the European University Institute. Florence, Italy, May 10, 2012.

“Regulating Gas Pipelines: United States and Europe,” Florence School of Regulation, FSR Summer Course Advanced Training on Gas Markets. Florence, Italy, March 23, 2011.

“Foundation for Regulating Pipelines, United States and Europe: Two Different Regulatory Worlds,” Florence School of Regulation Summer Course on Regulation of Energy Utilities. Florence, Italy, June 30, 2010.

“Governance and the Electricity Sector,” Governance and Regulation in the Electricity Sector Conference. Toronto, Ontario, June 4, 2010.

“Public Utility Companies and Regulatory Risk,” Saul Ewing’s 4<sup>th</sup> Annual Public Utility Symposium. Philadelphia, PA, May 24, 2010.

“It’s All About Inland Transportation,” US Gas Pipelines Reflect What’s Happening in Europe,” Florence School of Regulation Specialized Training on Regulation of Gas Markets. Florence, Italy, March 24, 2010.

“Windmills and Wires: FERC Rate Cases, Transmission Cost Allocation, and Renewable Power Development,” Law Seminars International Sixth Annual National Conference on Today’s Utility, Las Vegas, Nevada, February 11, 2010.

“The East-West Energy Corridor and Europe’s Energy Security,” The Brookings Institution conference on Turkey, Russian and Regional Energy Strategies, Washington D.C., July 15, 2009.

“Understanding U.S. Gas Pipelines,” Florence School of Regulation, FSR Summer School on Regulation of Energy Utilities. Florence, Italy, June 24, 2009.

“Vertical Relations in Energy Markets: On the Role of Contracts and Other Legal Entitlements in the U.S. Gas Transport Market”, Vienna University of Economics and Business, Workshop 2009. Vienna, Austria, May 29, 2009.

“Institutional, Transactional and Political Barriers to Competitive Gas Market in Europe: Europe’s Pipelines and Economics,” Florence School of Regulation Workshop: Tariffs for European Gas Transmission Networks. Florence, Italy, March 6, 2009.

“Cost recovery mechanisms: Options and where each works best; what approach is most likely to get necessary projects built,” Law Seminars International, Utility Rate Case: Issues and Strategies 2009. Las Vegas, Nevada, February 5, 2009.

“Alaska as a Gas Supplier: Where is the North Slope Gas Going, and How?” Law Seminars International, Energy in Alaska conference. Anchorage, Alaska, December 8-9, 2008.

**RECENT SPEECHES (CONTINUED)**

“Maintaining Adequate Infrastructure in the Natural Gas and Electric Industries,” Increasing Longer-Term Stability in Energy Markets conference sponsored by the Institute for Regulatory Policy Studies. Springfield, Illinois, May 1, 2008.

“Rate Decoupling and Associated Rate and Cost Issues,” New Hampshire Public Utilities Commission, Concord, New Hampshire, November 6, 2007.

“Electricity Transmission Cost Allocation in New England: A Throwback to an Earlier Era in Gas Transmission,” Law Seminars International, Energy in the Northeast conference, Boston, Massachusetts, October 18-19, 2007.

“Rate Decoupling and Associated Rate and Cost Issues,” American Gas Association (AGA) Legal Forum. Vail, Colorado, July 15- 17, 2007.

“Seeking Competition and Supply Security in Natural Gas: The US Experience and European Challenge,” 1<sup>st</sup> CESSA Conference, Berlin, Germany, May 31-June 1, 2007.

“Toward a Regulatory Equilibrium in Gas Hedging,” Electric Utility Consultants’ Conference: Utility Hedging in an Era of Natural Gas Price Volatility, Arlington, Virginia, October 4, 2006.

“The Theory of Relationship Specific Investments: Long-Term Contracts and Gas Pipeline Development in the United States.” Dresden University of Technology Workshop on Energy Economics and Technology, April 21, 2006.

“A Gas Network to Meet the Needs of New Electricity Generators,” Ontario Energy Association, Ontario, Canada, June 23, 2005.

“Forks in the Road for Electricity Transmission,” Electricity Industry Regulation and Restructuring conference by The Salt River Project and The Arizona Republic, October 11, 2002.

“Role of Yardsticks in Cost & Service Quality Regulation,” London Regulated Industries Group, November 30, 2000.

“Natural Gas Issues: Retail Competition, LDC Gas Rate Unbundling, and Performance Based Rates,” Wisconsin Public Utility Institute, November 17, 2000.

“Performance Based Ratemaking (PBR) in Restructured Markets,” Edison Electric Institute Seminar in San Antonio Texas, April 27, 2000.

“Benchmarking versus Rate Cases and the Half Live of Regulatory Commitment,” Australian Competition & Consumer Commission’s Incentive Regulation and Overseas Development Conference, Sydney, Australia, November 19, 1999.

“Benchmarking, Rate Cases and Regulatory Commitment,” Australian Competition & Consumer Commission’s Incentive Regulation and Overseas Developments Conference, Sydney, Australia, November 14, 1999.

“Gas and Electricity Sector Convergence: Economic Policy Implications,” Energy Week ’99, “The Global Shakeout,” The World Bank, Washington D.C., April 6-8, 1999.

“Gas and Electricity Sector Convergence: Economic Policy Implications,” Economic Development Institute, The World Bank, Washington D.C., December 8-9, 1998.

“Sustainable Regulation for Russian Oil Pipelines,” Presentation at Pipeline Transportation: A Linkage Between Petroleum Production and Consumers, Moscow, June 25, 1997.

**RECENT SPEECHES (CONTINUED)**

“Rocks on the Road to Effective Regulation,” Brazil/US Aspen Global Forum, Aspen, Colorado, December 5-8, 1996.

“Stranded Cost Case Studies in the Gas Industry: Promoting Competition Quickly,” MCLE Seminar: Retail Utility Deregulation, Boston, MA, June 17, 1996.

“Why Regulate Anyway? The Tough Search for Business-As-Usual Regulation,”—Panelist at St. Louis 1996, The Fifth Annual DOE-NARUC Natural Gas Conference, St. Louis, Missouri, April 30, 1996.

“Antitrust for Utilities: Treating Them Just Like Everyone Else”—Panelist at St. Louis 1996, The Fifth Annual DOE-NARUC Natural Gas Conference, St. Louis, Missouri, April 29, 1996.

“Natural Gas Pricing: The First Step in Transforming Natural Gas Industries”—One-Day Interactive Workshop on Pricing Strategy at The Future of Natural Gas in the Mediterranean Conference, Milan, Italy, March 27, 1996.

“Open Access in Gas Transmission,” New England Chapter of the International Association for Energy Economics, Boston, Massachusetts, December 13, 1995.

“Light-Handed Regulation for Interstate Gas Pipelines,” Twenty-Seventh Annual Institute of Public Utilities Conference, Williamsburg, Virginia, December 12, 1995.

“Ending Cost of Service Ratemaking,” Electric Industry Restructuring Roundtable, Boston, Massachusetts, October 2, 1995.

“Promoting Markets for Transmission: Economic Engineering or Genuine Competition?” The Forty-Ninth Annual Meeting of the Federal Energy Bar Association, Inc., May 17, 1995.

“End-Use Competition Between Gas and Electricity: Problems of Considering Gas and Electric Regulatory Reform Separately,” ORLANDO ‘95, The Fourth Annual DOE-NARUC Natural Gas Conference, Orlando, Florida, February 14, 1995.

“Incremental Pricing: Not a Quantum Leap,” Natural Gas Ratemaking Strategies Conference, Houston, Texas, February 3, 1995.

“The Feasibility of Competition in the Interstate Pipeline Market,” Institute of Public Utilities Twenty-Sixth Annual Conference, Williamsburg, Virginia, December 13, 1994.

“A Mirror on the Evolution of the Gas Industry: The Views from Within the Business and from Abroad,” 1994 LDC Meeting-ANR Pipeline Company, October 4, 1994.

“Creating New Markets Out of Old Utility Services,” Fifteenth Annual NERA Santa Fe Antitrust and Trade Regulation Seminar, Santa Fe, New Mexico, July 9, 1994.

“Sources of and Prospects for Privatization in Developed and Underdeveloped Economies,” Spring Conference of the International Political Economy Concentration and the National Center for International Studies at Columbia University, New York, March 30, 1994.

“Experiencias en el Desarrollo del Mercado de Gas Natural (Experiences in gas market development),” “Perspectivas y Desarrollo de Mercado de Gas Natural,” Centro de Extensión de la Pontificia Universidad Católica de Chile, November 16, 1993.

“The Role of Rate of Return Analysis in a More Progressive Regulatory Environment,” Twenty-Fifth Financial Forum held by the National Society of Rate of Return Analysts, Philadelphia, Pennsylvania, April 27, 1993.

**RECENT SPEECHES (CONTINUED)**

“Privatization of Energy and Natural Resources,” International Privatization Conference “Practical Issues and Solutions in the New World Order,” New York, New York, November 20, 1992.

**RECENT INTERNATIONAL REPORTS**

“Serious Problems with CREG Document 070 Facing Colombia’s Energy Market.”, report generated for the Asociación Nacional de Empresas Generadoras (ANDEG). White paper (with Graham Shuttleworth) assessing the economic and policy implications of a proposal by the Colombian Energy and Gas Regulatory Commission (CREG) to reform the country’s Reliability Charge mechanism for the wholesale power market. September 2015.

“Principles and Methodology of a Domgas Commercial Price Threshold” Report generated for North West Shelf Joint Venture (NWSJV) to define a methodology for computing a schedule of minimum *reasonable* prices (the Commercial Price Threshold) for prospective gas production for domestic gas (Domgas) based on the NWSJV’s supply costs. August 13, 2014.

Gas Pipeline Transport in China: An Economic, Financial and Institutional Analysis,” report prepared for Gazprom Export and BP Russian Investments Limited on gas transmission networks and gas pipeline tariffs in China. August 6, 2008.

“Consultation Paper: Development of Approaches Towards Regulating Tariffs for Petroleum Pipelines, Storage and Loading Facilities in South Africa,” Report prepared for the National Energy Regulator of South on the determination of economically feasible approaches towards establishing revenue requirements, regulating the setting/approval of tariffs, and developing rules, guidelines and framework regarding regulatory accounts for the petroleum pipelines, storage, and loading facilities in South Africa. December 14, 2006.

“Regulatory Assessment of the Turkish Electricity Sector.” Report prepared for Prisma Energy on the examination of the economic and regulatory risks facing investors in the privatization of the energy infrastructure of Turkey. December 6, 2006.

“Calculation of the X-Factor in the 2nd Reference Report of the Bundesnetzagentur.” Report prepared for E. ON Ruhrgas, Germany: Design of a regulatory method based on comparison of average tariffs, consistent with new German legislation on the regulation of gas transmission networks. April 21, 2006. (with Graham Shuttleworth and Michael Kraus).

“Cargo Access Charges for the Jorge Chavez International Airport in Lima, Peru.” A report prepared for OSITRAN (Public Transport Infrastructure Regulator) on behalf of Lima Airport Partners S.R.L. February 19, 2004.

A Critique of CEPA’s Report on “Productivity Improvements in Distribution Network Operators:” A report for EDF Energy (with Graham Shuttleworth). December 16, 2003.

Advised on Fare Regulation Issues related to the Impending Merger of the MTRC and KCRC Railroad Companies in Hong Kong, Mercer Consulting on behalf of MTRC, 2003-2004.

“Natural Gas Pipeline Access Regulation”. Report prepared for BHP Petroleum Pty Ltd., May 31, 2001.

“Manual de Procedimientos para el Sistema Uniforme de Cuentas Regulatorias Eléctricas (SUCRE) de México” (April 2000). The report includes an explanation of each of the accounts needed for regulation, recording procedures and the structure the information should take when reporting to the regulator.

“Investigation into Petronets’ Liquid Fuels Pipeline Tariffs: Final Report” (March 9<sup>th</sup>, 2000). This report presents NERA opinions in the quasi-arbitration of the tariffs disputes in the oil industry in South Africa for their liquids pipelines.

“Seeking Genuine Gas Competition in NSW”, prepared for BHP Petroleum Pty. Ltd., February 18, 2000.

“Análisis y Revisión del Recurso de Revocatoria Interpuesto por la Compañía Boliviana de Energía S.A. (COBEE) a la Resolución SSDE N° 92/99 de la Superintendencia de Electricidad” (September 6, 1999). This report represents NERA’s opinion on COBEE’s appeal in the electricity tariff review process in Bolivia (report in Spanish).

“Gas Sector Regulation Consultancy Services” report prepared for the Vietnam Oil and Gas Corporation, August 10, 1999.

“Natural Gas Demand Estimation for Guatemala, Honduras and El Salvador” (July 19th, 1999). This report done for an international consortium of companies presents calculations of prices and volumes of natural gas demand for three Central American countries if a pipeline is built from Mexico.

“Comments on East Australian Pipeline Limited Access Arrangements: (July 15, 1999). Report prepared on behalf of Incitec Ltd.

“Supplementary Submission to IPART on AGLGN’s Proposed Access Arrangements” on behalf of Incitec Limited (April 27th, 1999). This submission discusses reload practices, customer contributions, operating expenses and recalculates charges for a user of the distribution network in New South Wales, Australia.

“Supplementary Submission to IPART on AGLGN’s Proposed Costs and Tariffs” on behalf of BHP (April 15th, 1999). This submission explains how NERA recalculated charges for AGLGN in New South Wales, Australia.

“Initial Comments on AGLGN’s Revised Access Arrangement Information” on behalf of BHP (March 20th, 1999). This submission presents NERA’s comment to AGLGN submission to IPART in New South Wales, Australia.

“International Restructuring Experience” (February 12th, 1999). This paper surveys a number of countries whose experience of restructuring and competition in the electricity sector is directly relevant to the proposed changes in Mexico – Argentina, Australia, Chile, Guatemala, New Zealand, Norway, Spain, the US and the UK

“Report I: Review of the Regulatory Framework” (January 18th, 1999). This report presents the options for a natural gas framework in Peru.

“Conceptual Framework for the Reform of the Electricity Sector in Mexico: White Paper” (November 24th, 1998). This report represents the White Paper for restructuring of the electricity sector in Mexico which is being used in Congress for debate.

“Precios del Gas Natural para la Generación de Electricidad en el Perú” (November 16th, 1998). This report analyzes different alternatives for the treatment of natural gas prices in the electricity tariff model (report in Spanish).

“Tariffs and Subsidies: Report for the Tariffs Group” (November 10th, 1998). This report presents recommendation on the path for tariffs and subsidies for 1999 to the Electricity Tariffs Group of the Government of Mexico.

“Gasoducto México-Guatemala: Informe Final” (October 22nd, 1998). This report analyzes the legal and regulatory framework in both Mexico and Guatemala and costs and volumes for the building of a natural gas pipeline connecting both countries. A copy of the report was given by President Zedillo (Mexico) to President Arzú (Guatemala) (report in Spanish).

“Checks and Balances in Regulating Power Pools: Seven case Studies. A Report for the Electricity Pool of England and Wales” (September 10th, 1998). This report surveys the regulation of power pools in electricity industries around the world.

“Fuels Policy Group: Recommendations” (September 11th, 1998). This report presents recommendations to the Government of Mexico on their fuels policies for the electricity sector.

“Análisis de Costos e Inversiones. Revisión Tarifaria de Transener” (August 25, 1998). Report given to ENRE (the Argentinean electricity regulator) on behalf of a Consortium of Generators on the analysis of costs and investments to be considered for the revenue requirement of the electricity transmission company (report in Spanish).

“Central America Pipeline: Regulatory Analysis and Proposal” (July 28, 1998). This report presents the regulatory analysis and development of a fiscal, legal and commercial framework proposal for gas import, transportation, distribution and marketing in El Salvador, Honduras and Guatemala regarding the proposed Central American Pipeline.

“Energy Regulation in El Salvador” (July 28, 1998). This report presents a deep analysis of the electricity and natural gas regulatory, legal and tax frameworks in El Salvador.

“Energy Regulation in Guatemala” (July 28, 1998). This report presents a deep analysis of the electricity and natural gas regulatory, legal and tax frameworks in Guatemala.

“The Cost of Capital for Gas Transmission and Distribution Companies in Victoria” (June 22, 1998). Report prepared for BHP Petroleum Pty Ltd.

“Principios Económicos Básicos de Tarificación de Transmisión Eléctrica. Revisión Tarifaria de Transener” (May 26, 1998). The main purpose for this report was to provide an economic and regulatory analysis of laws, decrees, license and documents of the tender to provide advise in the tariff review of Transener (the electricity transmission company in Argentina), to present an economic analysis of transmission tariffs and to provide an opinion on specific topics to be discussed in the public hearing. This report was written for a consortium of generators in Argentina (reports in English and Spanish)

“Asesoría en la Fijación de Tarifas de Transener y Normativa del Transporte, Benchmarking Study” (May 26, 1998). This report compares the costs of Transener (the electricity transmission company in Argentina) with those of other companies elsewhere for a consortium of generators (the electricity transmission company in Argentina).

“International Regulation Tool Kit: Argentina” (March 20, 1998). This document describes the natural gas regulatory framework in Argentina for BG.

“Tarificación de los Servicios Que Prestan las Terminales de Gas LP” (January 9, 1998). The final report given to PEMEX Gas y Petroquímica Básica (México) for the determination of rates for LPG terminals.

“NERA-Pérez Compañía Distribution Tariff Model” (January 5, 1998). This report explains the methodology behind NERA’s calculations of distribution tariffs for Pérez Compañía in Monterrey.

“Monterrey Natural Gas Market Assessment,” (January 5, 1998). A series of reports were written to present the results of the market study of the demand for natural gas in the geographic zone of Monterrey to a company interested in bidding for the natural gas distributorship.

“Resolving the Question of Escalation of Phases (bb) and (cc) Under the Maui Gas Sale and Purchase Contract”, prepared for the New Zealand Treasury, December 16, 1997.

“Timetable and Regulatory Review for the Monterrey International Public Tender,” (December 5, 1997). A description of the necessary steps to bid for a distribution company as well as an explanation and analysis of natural regulations in Mexico for Pérez Compañía.

“Economic Issues in the PFR for 18.3.1(I)(bb) & (cc)”, prepared for the New Zealand Treasury, November 17, 1997.

“NERA’s Distribution Tariff Model” (October 29, 1997). This report explains the methodology behind NERA’s calculations of distribution tariffs for MetroGas.

“Evaluation Design Standards for MetroGas,” (October 24, 1997). This report dealt with the analytical support resulting from work with MetroGas to create a meticulously-documented security criterion analysis that supported its efforts to obtain due recognition—and appropriate tariff treatment—for its costs.

“Ghana Natural Gas Market Assessment,” prepared for the Ministry of Mines and Energy, Ghana (March-July, 1997). A series of four reports assessing prospective gas demand usage and netback prices for a number of proposed pipeline project alternatives.

“Final Report for Russian Oil Transportation & Export Study: Commercial, Contractual & Regulatory Component,” prepared for The World Bank, June 25, 1997.

Response to FIEL’s criticisms regarding NERA’s report “Cálculo del Factor de Eficiencia (X)” (June 2, 1997).

“Impacts on Pemex of Natural Gas Regulations” prepared for Pemex Gas y Petroquímica Básica México, May 21, 1997.

“Market Models for Victoria’s Gas Industry: A Review of Options,” April 1997, prepared for Broken Hill Proprietary (BHP) Petroleum, to propose an alternative model for gas industry restructuring in Victoria, Australia.

“New Market Arrangements for the Victorian Gas Industry,” prepared for Broken Hill Proprietary Petroleum; March 13, 1997.

“CEG Privatization: Comments to the Regulatory Framework,” prepared for Capitaltec Consultoria Economica SA describing our comments with respect to the regulatory framework and the license proposed in the privatization of Riogas and CEG in Rio de Janeiro, Brazil; March 7, 1997.

“Determination of the Efficiency Factor (X),” prepared for ENARGAS, Argentina, January 24, 1997.

“Determination of Costs and Prices for Natural Gas Transmission,” prepared for Pemex Gas y Petroquímica Básica, México, December 19, 1996.

“Regulating Argentina’s Gas Industry,” a report prepared for The Ministry of Economy and The World Bank, November 26, 1996.

“Open Access and Regulation,” prepared for Gascor, in the State of Victoria, Australia; (October 2, 1996).

“A Review and Critique of Russian Oil Transportation Tariffs (Russian Oil Transportation & Export Study; Commercial, Contractual & Regulatory Component),” prepared for The World Bank, June 13, 1996.

“Tariff Options for Transneft (Russian Oil Transportation & Export Study; Commercial, Contractual & Regulatory Component),” prepared for The World Bank, June 6, 1996.

“Comments on the Proposed Amendments to the Regulation of Airports in New Zealand,” prepared for the New Zealand Parliament Select Committee hearings on the regulation of monopolies, March 13, 1996.

“Evaluating the Shell Camisea Project,” prepared for Perupetro S.A., Government of Peru, December 8, 1995.

“Towards a Permanent Pricing and Services Regime,” prepared for British Gas, London, England, November, 1995.

“Final Report: Gas Competition in Victoria,” prepared for Gas Industry Reform Unit, Office of State Owned Enterprises, June 1995.

“Natural Gas Tariff Study,” prepared for the World Bank, May 1995, consisting of:

*Principles and Tariffs of Open-Access Gas Transportation and Distribution Tariffs*

*Handbook for Calculating Open-Access Gas Transportation and Distribution Tariffs*

“Economic Implications of the Proposed Enerco/Capital Merger,” prepared for Natural Gas Corporation of New Zealand, December 1994.

“Contract Terms and Prices for Transportation and Distribution of Gas in the United States,” prepared for British Gas TransCo, November 1994.

“Economic Issues in Transport Facing British Gas,” prepared for British Gas plc, December 1993.

“Overview of Natural Gas Corporation's Open-Access Gas Tariffs and Contract Proposals,” prepared for Natural Gas Corporation of New Zealand, October 1993.

**PARTIAL LIST OF ENERGY CLIENTS SERVED WORLDWIDE****ELECTRIC UTILITY**

AEP Energy Services, Inc  
 Alberta Power Limited  
 American Electric Power Company  
 Atlantic Electric Company  
 Boston Edison Company  
 Central Hudson Gas and Electric  
 Central Maine Power Company  
 Central Power & Light Company  
 Commonwealth Edison Company (Unicom/Exelon)  
 Commonwealth Energy System  
 Consolidated Edison Company of New York, Inc  
 Conowingo Power Company  
 Duquesne Light Company  
 Edison Electric Institute  
 Entergy Gulf States, Inc  
 Florida Power and Light Company  
 Green Mountain Power Company  
 Long Island Lighting Company  
 Massachusetts Municipal Wholesale Electric Company  
 Massachusetts Electric Company  
 Nantahala Power Company  
 New York State Electric & Gas Corporation  
 Niagara Mohawk Power  
 Ohio Power Company  
 Orange & Rockland Utilities  
 Pennsylvania Power and Light Company  
 Pennsylvania Power Company  
 Philadelphia Electric Company  
 PJM electricity transmission owners  
 Public Service Company of New Hampshire  
 Public Service Company of New Mexico  
 Public Service Electric and Gas Company  
 Portland General Electric Company  
 Reliant Energy HL&P  
 Rochester Gas and Electric Corp.  
 Sierra Pacific Power Corporation  
 Southwest Electric Power Company  
 Southwestern Public Service Company  
 Tampa Electric Company  
 Texas-New Mexico Power Company  
 TXU Electric Company  
 United Illuminating Company  
 UtiliCorp Networks Canada  
 Virginia Electric and Power Company  
 West Penn Power Company  
 West Texas Utilities Company  
 Western Massachusetts Electric Co.

**GAS UTILITY**

Alberta Northeast Gas Company  
 ANR Pipeline Company  
 ARKLA, Inc.  
 Atlanta Gas Light Company  
 Bay State Gas Company  
 Berkshire Gas Company  
 Blackstone Gas Company  
 Boston Gas Company  
 Bristol & Warren Gas Company  
 British Gas plc  
 Brooklyn Union Gas Company  
 Canadian Western Natural Gas  
 Chattanooga Gas Company  
 Citizens Gas Supply Corporation  
 Colonial Gas Company  
 Commonwealth Gas Company  
 Connecticut Natural Gas Corp.  
 Consolidated Gas Supply Corp.  
 Elizabethtown Gas Company  
 Empire State Pipeline Company  
 ENAGAS (Spain)  
 EnergyNorth, Inc.  
 Equitable Gas Company  
 Essex County Gas Company  
 Fall River Gas Company  
 Fitchburg Gas & Electric Light Company  
 Gas and Fuel Corporation of Victoria  
 Gateway Pipeline Company  
 Granite State Gas Transmission, Inc.  
 Great Falls Gas Company  
 Holyoke, Mass. Gas & Electric Dept.  
 ICG Utilities (Ontario) Ltd.  
 KN Energy, Inc.  
 Michigan Consolidated Gas Company  
 Middleborough Municipal Gas & Electric  
 National Fuel Gas Distribution Corp.  
 Natural Gas Corporation of New Zealand  
 Natural Gas Pipeline of America  
 Northern Indiana Public Service  
 Norwich Department of Public Utilities  
 Pacific Gas Transmission  
 Pemex Gas y Petroquímica Básica  
 Pennsylvania Gas and Water Company  
 Peoples Gas Light and Coke Company  
 Polish Oil and Gas Company  
 Providence Gas Company  
 Southern Connecticut Gas Company  
 Southwest Gas Corporation  
 Transwestern Pipeline Company  
 Valley Gas Company  
 Washington Gas Light Company  
 Westfield Gas & Electric Light Dept.  
 Wisconsin Gas Company  
 Yankee Gas Services Company