UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Exelon Corporation	**)**	
Public Service Enterprise Group Incorporated	**)**	**Docket No. EC05-43-000**

Joint Affidavit of Bruce Edward Biewald and David Alan Schlissel on behalf of the New Jersey Division of the Ratepayer Advocate

Introduction and Summary

1. This affidavit addresses the potential for the utility businesses of the proposed merger applicants to exercise market power in electricity markets, and the failure of the virtual and actual divestiture of capacity proposed by the applicants to mitigate that market power.

2. Our analyses show that the market power analyses presented by the Applicants significantly understate the pre-merger levels of market concentration in the PJM energy and capacity markets as revealed in historical PJM data.

3. This historical PJM data indicates that there are already significant market power concerns in PJM. The proposed merger will exacerbate these market power concerns.

4. We conclude that the Applicants' proposed mitigation plan is not adequate to offset the market power problems that would be created by the merger.

Qualifications

Mr. Biewald

5. My name is Bruce Edward Biewald. My address is Synapse Energy Economics, Inc., 22 Pearl Street, Cambridge, Massachusetts, 02139.

6. I am submitting this affidavit on behalf of the New Jersey Division of the Ratepayer Advocate.

7. I am President of Synapse Energy Economics, Inc., a consulting company specializing in economic and policy analysis of electricity restructuring, particularly issues of consumer protection, market power, stranded costs, renewables, efficiency, environmental quality, and nuclear power.

8. I graduated from the Massachusetts Institute of Technology in 1981, where I studied energy use in buildings. I was employed for 15 years at the Tellus Institute, where I was Manager of the Electricity Program, responsible for studies on a broad range of electric system regulatory and policy studies. I have testified on energy issues in more than eighty regulatory proceedings in twenty-five states and two Canadian provinces and in state and Federal courts. I have co-authored more than one hundred reports, including studies for the Electric Power Research Institute, the U.S. Department of Energy, the U.S. Environmental Protection Agency, the Office of Technology Assessment, the New England Governors' Conference, the New England Conference of Public Utility Commissioners, and the National Association of Regulatory Utility Commissioners. My papers have been published in the *Electricity Journal*, *Energy Journal*, *Energy Policy*, *Public Utilities Fortnightly* and numerous conference proceedings, and I have made presentations on the economic and environmental dimensions of energy throughout the U.S. and internationally. I also have consulted for federal agencies, including the U.S. Department of Energy, the U.S. Department of Justice, the U.S. Environmental Protection Agency, the Federal Trade Commission and National Renewable Energy Laboratory. My resume is provided here as Exhibit DRA-1.

9. I have analyzed electricity market power issues in numerous markets throughout the Eastern, Central and Southern United States, including, but not limited to, PJM, New York, and New England. I have presented the results of these analyses as testimony on market power issues before the Connecticut Department of Public Utility Control, the New Jersey Board of Public Utilities, the Arkansas Public Service Commission, the West Virginia Public Service Commission, the Maryland Public Service Commission, the Mississippi Public Service Commission, the New York Public Service Commission, and the New Hampshire Public Utilities Commission. I also have submitted affidavits and testimony to FERC in Dockets Nos. EC98-40-00, et al., EC97-46-000, OA97-237-000, and ER97-1079-000.

10. I have co-authored a number of studies on market power issues. These studies included *The New England Experiment: An Evaluation of the Wholesale Electricity Markets*, June 2003*; Best Practices in Market*

Monitoring: A Survey of Current ISO Activities and Recommendations for Effective Market Monitoring and Mitigation in Wholesale Electricity Markets, November 2001*; Competition and Market Power in Northern Maine Electricity Market,* November 1998*; Analysis of Market Power in the APS and Duquesne Service Territories,* February 1998*;* and, *Horizontal Market Power in New England Electricity Markets: Simulation Results and a Review of NEPOOL's Analysis,* March 1997.

11. I have been invited to speak on market power issues by the National Association of Regulatory Utility Commissioners, the New England Conference of Public Utility Commissioners, the National Consumer Law Center, and the National Association of State Utility Consumer Advocates.

Mr. Schlissel

12. My name is David Alan Schlissel. My address is Synapse Energy Economics, Inc., 22 Pearl Street, Cambridge, Massachusetts, 02139.

13. I am submitting this affidavit on behalf of the New Jersey Division of the Ratepayer Advocate.

14. I am a Senior Consultant at Synapse Energy Economics, Inc.

15. I graduated from the Massachusetts Institute of Technology in 1968 with a Bachelor of Science Degree in Engineering. In 1969, I received a Master of Science Degree in Engineering from Stanford University. In 1973, I received a Law Degree from Stanford University. In addition, I studied nuclear engineering at the Massachusetts Institute of Technology during the years 1983-1986.

16. Since 1983, I have been retained by governmental bodies, publicly-owned utilities, and private organizations in 24 states to prepare expert testimony and analyses on engineering and economic issues related to electric utilities. My clients have included the Staff of the California Public Utilities Commission, the Staff of the Arizona Corporation Commission, the Staff of the Kansas State Corporation Commission, the Arkansas Public Service Commission, municipal utility systems in Massachusetts, New York, Texas, and North Carolina, and the Attorney General of the Commonwealth of Massachusetts. I have testified before state regulatory commissions in Connecticut, Arizona, New Jersey, Kansas, Texas, New Mexico, New York, Vermont, North Carolina, South Carolina, Maine, Illinois, Indiana, Ohio, Massachusetts, Missouri, and Wisconsin and before an Atomic Safety & Licensing Board of the U.S. Nuclear Regulatory Commission. A copy of my current resume is attached as Exhibit DRA-2.

17. I have analyzed market power issues in PJM and New York State. I have presented the results of market power analyses in testimony before the New Jersey Board of Public Utilities.

The Applicants do not provide any analyses that show that the combined company created by the proposed merger will not be able to profitably exercise market power through strategic bidding

18. Horizontal market power in electricity arises from horizontal concentration in generation. A key mechanism for exploiting horizontal market power is for a large firm to raise market prices by withholding capacity from the market, raising the market price and thereby increasing profits over competitive-market levels. The withholding can be "physical," such as declaring a unit to be out of service, or "economic," such as bidding some capacity at high prices that effectively remove it from the dispatch. Sophisticated strategies can be developed, in which bidding generation into the market is done in order to maximize profits -- with bids differing by hour and tailored to create and exploit transmission constraints.

19. The analyses presented by the Applicants through the testimony of Dr. Hieronymus and Mr. Frame merely attempt to show that the proposed merger will meet FERC's Appendix A guidelines in terms of post merger concentration. They did so by examining pre-merger and post-merger Herfindahl-Hirschman Indices. ("HHI") The HHI is the sum of the squares of individual firms' market shares. The higher the index number, the greater the level of concentration and the more likely that market power will be a problem.

20. In their merger guidelines, FERC and the U.S. Department of Justice use the HHI as a screening tool to identify whether market power might be a problem.[1] FERC has specifically noted that the HHI screening tool is "not infallible" and "in some cases may not detect certain market power problems."[2]

21. Although HHIs are a useful measure that can serve as a starting point in analyses of market power, they are only rough illustrations of relative market concentration. HHI calculations are based on a limited set of snapshots of the markets examined in terms of loads, resources, and transmission capacities. There may be situations during a typical year

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1 *U.S. Department of Justice and Federal Trade Commission Horizontal Merger Guidelines*, April 2, 1992, and *FERC Policy Statement Establishing Factors the Commission will Consider in Evaluating Whether a Proposed Merger is Consistent with the Public Interest*, December 18, 1996.

2 *FERC Policy Statement Establishing the Factors the Commission will Consider in Evaluating Whether a Proposed Merger is Consistent with the Public Interest, December 18, 1996, at page 25.*

when loads and transmission capacities differ from those studied and actual post-merger market shares may be higher. The most significant failure of HHI calculations is their inability to recognize strategic bidding or the withholding of otherwise available capacity in order to increase market clearing prices.

22. A proper analysis of the market power implications of a proposed merger requires an electric system simulation model to look at the hourly behavior of the market under a wide variety of physical conditions, contractual situations and bidding behaviors. Such a realistic model would provide better insights into potential market power concerns than the idealized HHI calculations presented by Dr. Hieronymus and Mr. Frame.

23. Simulation models can be useful in directly analyzing market power, given the specific characteristics of a market such as the number of suppliers and their production facilities and cost structure. Such models help us to understand likely market behavior in particular cases, and to examine the ability of firms in the market to profitably raise prices. If a simulation model shows that it is not profitable for any individual firm to raise its prices significantly above its marginal costs, that offers some comfort that the market will be adequately competitive. If, on the other hand, simulations show that it is profitable for individual large firms to increase prices significantly above marginal costs, then there is cause for concern. In this case, models can be helpful for understanding the extent of the market power problem and exploring the effectiveness of various remedies.

24. The Applicants have not presented evidence that directly shows that the combined company created by the proposed merger would not be able to profitably raise prices for power in PJM through strategic bidding.

25. The analyses that need to be performed prior to any approvals of this proposed merger include the following:

- Simulation with an hourly model that would represent generating unit outages probabilistically rather than as simple deratings of capacity.
- Analysis of a full range of input assumptions for system conditions such as generating unit and transmission line outages, loads, and markets prices.
- Consideration of possible strategies for the dominant firms to exercise market power by the physical and/or economic withholding of capacity of different types in different time periods.
- Analysis that includes the specific details of current (and possible future) market mitigation procedures and bid capping.

- Examination of a longer time frame than calendar year 2006 in order to reflect such changed circumstances as planned power plant additions and retirements, load growth, transmission system enhancements, and the addition of increased transmission links to New York State such as the proposed 600 MW HVDC Neptune Project from New Jersey to Long Island.
- Examination of divestiture scenarios in which the implications of divesting different sets of generating units are explored.
- Detailed analysis of specific constrained areas, including Northern New Jersey.
- Detailed analysis of the capacity markets including analysis of specific mitigation plans for addressing the market power of the merged companies in the capacity markets.
- A rigorous analysis of the effectiveness of the Applicants' proposed "virtual divestiture" that would consider the distinctions between ownership and control, and the likely effects of power sales of different durations.

26. These analyses would enable FERC to understand the likely and potential market power impacts of the merger. Approval of the merger without having the benefit of such analyses would not be prudent, as the merger could jeopardize the competitiveness of electricity markets that are crucial to the economic and overall well-being of customers and businesses in New Jersey.

Historical data published by PJM indicates that the PJM East energy market is substantially more concentrated than Dr. Hieronymus and Mr. Frame's modeling analyses suggest

27. Dr. Hieronymus and Mr. Frame both acknowledge that the new combined company created by the proposed merger would fail the FERC-mandated concentration screening analyses unless the combined company implements a significant mitigation plan.[3] However, their analyses understate the levels of market concentration in the PJM East energy market. Therefore, Dr. Hieronymus and Mr. Frame also understate the magnitude of the capacity that must be divested by the combined company in order to satisfy the FERC-mandated screens.

28. Table 1 below compares the pre-merger HHIs for the PJM East energy market developed for the year 2006 by Dr. Hieronymus and Mr. Frame to

[3] For example, see Dr. Hieronymus's Exhibit No. J-1, at pages 3 and 6 and Mr. Frame's BPU Testimony, at page 6, lines 5-11.

the historical market concentration data published by the PJM Market Monitoring Unit for 2003 and 2004. ("PJM MMU").

Table 1: PJM East Energy Market - Hieronymus and Frame HHI Projections vs. Historical PJM Data

	Hieronymus-Projected for the Year 2006[4]	Frame-Projected for the Year 2006[5]	PJM MMU Data for the Year 2003[6]	PJM MMU Data for the Year 2004[7]
High	1477	1564	2500	1980
Low	1187	993	1300	1156
Average			1935	1568

29. Thus, the PJM MMU data in Table 1 indicate a substantially more concentrated market than Dr. Hieronymus or Mr. Frame imply. In fact, the high ends of the PJM MMU data suggest that the PJM East energy market was very highly concentrated for some hours during the years 2003 and 2004.

30. As shown in Table 1, the average historical HHIs for the PJM East Energy market for 2003 were higher than the high ends of the pre-merger HHIs calculated by Dr. Hieronymus and Mr. Frame. The average historical HHI for the PJM East Energy market for 2004 was higher than the high end of Dr. Hieronymus's calculated pre-merger HHIs and approximately the same as the high end of Mr. Frame's calculated pre-merger HHIs.

31. The increases in transmission system import capability and new generation facilities that are planned to be in service prior to 2006 do not explain or justify the differences between the actual PJM East 2003 and 2004 energy market HHIs and the substantially lower level of market concentration suggested by Dr. Hieronymus and Mr. Frame's analyses.

32. These significant differences with historical PJM data on pre-merger market concentrations call into question the validity of all of Dr. Hieronymus and Mr. Frame's modeling of the PJM system post-merger and post-mitigation market concentrations.

[4] Dr. Hieronymus's Exhibit No. J-7.
[5] Mr. Frame's Exhibit No. RF-6, page 1 of 3.
[6] PJM Market Monitoring Unit 2003 State of the Market, at page 42.
[7] PJM Market Monitoring Unit 2004 State of the Market, at page 58.

Historical data published by PJM indicates that the PJM capacity markets are substantially more concentrated than Dr. Hieronymus and Mr. Frame's modeling analyses suggest

33. Dr. Hieronymus and Mr. Frame also analyze the pre-merger and post-merger market concentrations in the Expanded PJM and PJM East capacity markets. Comparison with historical PJM data indicates that their analyses understate the existing pre-merger levels of concentration in the PJM capacity markets.

34. The PJM capacity markets have expanded over the past two years as new areas have joined PJM. During the last three months of 2004, PJM had two capacity markets. One was for Commonwealth Edison Company. The other was for the remainder of Expanded PJM. Tables 2 and 3 below compare the Daily and Monthly and MultiMonthly HHIs experienced in these two markets with the HHIs produced by Dr. Hieronymus and Mr. Frame.

Table 2: Expanded PJM Capacity Market – Daily Market HHIs - Hieronymus and Frame HHI Projections vs. Historical 2004 PJM Data

	Hieronymus-Projected for the Year 2006[8]	Frame-Projected for the Year 2006[9]	Expanded PJM Capacity Market without Commonwealth Edison[10]	Commonwealth Edison Market[11]
High			2561	NA
Low			1292	NA
Average	799	687	1631	NA

8 Dr. Hieronymus's Exhibit No. J-9.
9 Mr. Frame's BPU Testimony, at RF-8, page 2 of 2.
10 2004 State of the Market Report, Table 4-1, at page 147.
11 2004 State of the Market Report, Table 4-10, at page 170.

Table 3: Expanded PJM Capacity Market – Monthly and MultiMonthly HHIs -Hieronymus and Frame HHI Projections vs. Historical 2004 PJM Data

	Hieronymus-Projected for the Year 2006[12]	Frame-Projected for the Year 2006[13]	Expanded PJM Capacity Market without Commonwealth Edison[14]	Commonwealth Edison Market[15]
High			4151	10000
Low			1316	2804
Average	799	687	2608	6419

35. The historical PJM HHIs presented in Tables 2 and 3 indicate that the Expanded PJM capacity market has been significantly more concentrated than the results of Dr. Hieronymus and Mr. Frame's analyses would suggest. In fact, the historical HHIs for the existing Expanded PJM short-term and monthly and multimonthly capacity markets have been significantly above the 799 pre-merger HHI produced by Dr. Hieronymus and the 687 pre-merger HHI produced by Mr. Frame.

36. The PJM MMU State of the Market Reports for 2003 and 2004 do not provide any analyses of the market concentration in the PJM East capacity market. However, they do provide data for the broader PJM capacity markets. Given the substantial amounts of capacity owned by Exelon Corporation and PSEG in the PJM East geographic region, it is reasonable to assume that the capacity market for that area would be more concentrated than the broader PJM capacity markets. Therefore, the historical HHIs for the broader PJM capacity markets can provide some insights into how concentrated the PJM East capacity market may be.

37. The PJM MMU 2003 State of the Market Report found that the Daily Market HHIs for the PJM capacity market averaged 2003 in 2003, ranging from a minimum of 1078 to a maximum of 3071.[16] These results imply a substantially more concentrated pre-merger market for PJM East than would be suggested by the 1282 pre-merger HHI produced by Dr. Hieronymus or the 1127 pre-merger HHI produced by Mr. Frame.[17]

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12 Dr. Hieronymus's Exhibit No. J-9.

13 Mr. Frame's BPU Testimony, at RF-8, page 2 of 2.

14 2004 State of the Market Report, Table 4-1, at page 147.

15 2004 State of the Market Report, Table 4-10, at page 170.

16 2003 State of the Market Report, Table 4-1, at page 112.

17 See Dr. Hieronymus's Exhibit No. J-9 and Mr. Frame's Exhibit RF-8, page 1 of 2.

38. The PJM MMU 2003 State of the Market Report similarly found Monthly and Multimonthly Market HHIs for the PJM capacity market averaged 2711, ranging from a minimum of 1288 to a maximum of 6180.[18] Again, these HHIs indicate substantially greater pre-merger concentration in the PJM East capacity market than would be indicated by the 1282 HHI produced by Dr. Hieronymus or the 1127 pre-merger HHI produced by Mr. Frame.[19]

39. The treatment of imports by Dr. Hieronymus and Mr. Frame in their capacity market analyses leads them to understate the pre-merger and post-merger HHIs for the PJM East and Expanded PJM markets. Dr. Hieronymus assumes that imports into each of these areas are supplied by four equal-sized firms.[20] However, in calculating pre-merger HHIs he assumes that none of these firms is either Exelon Corporation or PSEG. When calculating post-merger HHIs, he similarly assumes that none of the post-merger imports into PJM East or Expanded PJM are controlled by the combined company created by the merger.

40. Mr. Frame similarly assigns the 7,300 MW of power that can be imported into PJM East to four suppliers that do not currently own generating units in PJM East.[21] Of course, this excludes both PSEG and Exelon, and the combined company created by the proposed merger.

41. These are not reasonable assumptions and they lead Dr. Hieronymus and Mr. Frame to understate the degree of concentration in these markets, both pre- and post-merger. As a result, both witnesses' capacity market analyses understate the amount of capacity that must be divested in order to mitigate the levels of market concentration that would result from the proposed merger.

Dr. Hieronymus and Mr. Frame's analyses reflect a number of idealized and unrealistic modeling assumptions that cause their HHIs to understate the levels of pre-merger and post-merger market concentration

42. As noted earlier in this Affidavit, Dr. Hieronymus and Mr. Frame's modeling produces HHIs that imply substantially lower levels of market concentration in the PJM East energy market and the PJM capacity markets than are reflected in historical PJM data for 2003 and 2004.

43. Dr. Hieronymus uses the CASm model to produce pre-merger and post-merger HHIs. However, CASm represents an idealized and over-simplified

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18 2003 State of the Market Report, Table 4-1, at page 112.

19 See Dr. Hieronymus's Exhibit No. J-9 and Mr. Frame's Exhibit RF-8, page 1 of 2.

20 Dr. Hieronymus's Exhibit No. J-9.

21 Mr. Frame's Exhibit RF-8, page 1 of 2.

model that doesn't accurately represent conditions and market behavior of participants in the system being modeled.

44. For example, CASm assumes that scheduled maintenance outages occur only during the non-peak (shoulder) seasons. Forced outages are assumed to occur uniformly throughout the year.[22]

45. In the real world, however, planned outages sometimes occur, at least in part, during the summer and winter peak months. At the same time, forced outages do not occur in a smooth manner throughout the year. In other words, capacity availability on the actual PJM system is far more "lumpy" than CASm reflects. In the real world, generating units are often completely out of service for planned or forced outages – although in some circumstances units may be partially derated for maintenance. In CASM, all generating units are represented as running at a slightly lower than maximum capacity in all hours to reflect planned and forced outages, and are never assumed to be off line completely.

46. The overall effect of CASm's "smooth" and unrealistic representation of outages is that the model tends to overstate system reliability and not consider at all situations that are "worse than average." System operators would be ecstatic to have a system in which generating unit outages were so predictable and well-behaved. Unfortunately, the actual system does not operate like that. Generating units do fail and go off-line entirely; outages do sometimes bunch in terms of timing and location. This lumpiness has very important implications for market power and for analysis of market power.

47. Market power tends to be asymmetrical. In other words, during "tight" conditions market power will tend to be much worse than it is during average conditions. Stated specifically for outage rates we might say that compared to average conditions, the degree of market power during those hours when there is fifty percent more generating capacity out of service than average will tend to be much worse than average, while the degree of market power during those hours when there is fifty percent fewer outages than average will tend to be only slightly better than average outage rates. Of course, this also depends on the specific generating units that are out of service and which companies own them. By treating all of the outages as simple deratings in all hours, CASM entirely overlooks conditions in which the amount and distribution of outages will be worse than average, and so understates the overall degree to which market power will be a problem.

48. The discussion about the treatment of outages in CASM and the model's resulting tendency to understate market power applies to PJM conditions

[22] Dr. Hieronymus's Exhibit No. J-4, at page 5.

pre-merger and post-merger. It also has implications for the magnitude of the increase in market power caused by the merger. Because the ability to exercise market power is not symmetrical around the average conditions, a merger that worsens market conditions will tend to have proportionally greater effects during the "worse than average" conditions that are ignored in Dr. Hieronymus' CASm analysis.

49. CASm also uses generic, not unit-specific, planned and forced outage rates for generating facilities. Thus, his modeling may misestimate the amounts of capacity from individual facilities that will be in or out of service.

50. In addition, CASm does not reflect transmission system outages or deratings. He merely assumes that the calculated amounts of transmission import capability, subject to the determined simultaneous import limits, will be available during each hour he examines.

51. Moreover, CASm assumes that all of the capacity from the generating units being modeled is available for use in the geographic areas being studied, subject to the transmission import capability limits. In the real world, much of this capacity might not be available because of planned or forced outages, because it might already be committed to serving other load, or it might be diverted to other areas for economic reasons.

52. For all of these reasons, CASm does not accurately and realistically reflect conditions in the system being modeled and, therefore, the HHIs that it produces should not be the sole or even the primary evidence relied upon to show that a merger will not create significant market power concerns.

Dr. Hieronymus does not provide any evidence supporting the set of destination market prices he assumes in his modeling analyses

53. Dr. Hieronymus evaluated conditions assuming destination market prices ranging from $20/MWh in the Shoulder Off-Peak periods to $250/MWh in the Summer Super Peak period.[23]

54. The information that Dr. Hieronymus provides in his public workpapers in support of this set of destination market prices are the actual PJM East hourly energy market prices for 2003 and for the period January 1 through August 17, 2004.[24]

55. According to this information, the peak hourly energy market price in PJM East during 2003 was $156.69/MWh. This peak price was experienced on March 10, 2003 at 8 pm in the evening. This peak price was significantly

[23] Exhibit No. J-1, at page 36, lines 17-19.

[24] This information is provided on www.ferc.gov website in a file named MarketPrices.xls, accession number 20050204-4018. This same hourly price data is also publicly available at the PJM website.

below the $250/MWh peak price assumed by Dr. Hieronymus. It also was not experienced during the summer super peak period, contrary to Dr. Hieronymus's modeling assumption.

56. In addition, the peak price in PJM East during the period January 1 through August 17, 2004 was $133.42. This peak price was experienced on January 15, 2004 at 6 pm in the evening. Again, this peak price was significantly below the $250/MWh peak price assumed by Dr. Hieronymus and it was not experienced during the summer super peak period, contrary to Dr. Hieronymus's modeling assumption.

57. Moreover, the price at the time of the annual peak load in 2003 was only $94.16. The price at the time of the peak load in the period January 1 through August 17, 2004 was $106.74. Both of these prices were significantly below the $250/MWh peak price assumed by Dr. Hieronymus in his modeling.

58. Consequently, the historical PJM East hourly market prices for 2003 and much of 2004 do not support the range of destination market prices he uses in his modeling analyses.

The Applicants proposed mitigation plan is inadequate to offset the market power problems that would be created by the merger

59. Applicants have proposed a mitigation plan to address the competitive screening analysis failures identified by Dr. Hieronymus and Mr. Frame. This plan includes the virtual divestiture of 2,600 MW of baseload nuclear capacity (2,400 MW of which would be in PJM East) and the actual divestiture of another 2,900 MW of coal, mid-merit and peaking capacity in PJM East.[25]

60. If the merger is approved and closed, the combined company will own and have operational control over more than 6,200 MW of baseload nuclear capacity in PJM East.

Table 4: Combined company nuclear capacity

Nuclear Unit	Summer Capacity (MW)[26]
Oyster Creek	619
Limerick	2,268
Salem	2,221
Hope Creek	1,049

[25] Dr. Hieronymus's Exhibit No. J-1, at page 10.

[26] Source data from Dr. Hieronymus's Exhibit No. J-12.

61. The combined company also will own and have operational control over another 1,898 MW of baseload nuclear capacity in the remainder of PJM Mid-Atlantic and 10,439 MW of baseload nuclear capacity in the remainder of PJM Expanded.[27]

62. In order to mitigate the market power effects of the proposed merger, the Applicants have proposed the virtual divestiture of 2,400 MW of baseload nuclear capacity in PJM East and another 200 MW of baseload nuclear capacity that can be delivered anywhere in PJM Mid-Atlantic, including PJM East. According to the Applicants, the virtual divestiture of this nuclear baseload capacity would be accomplished through a combination of an auction of rolling three-year firm contracts and long-term energy sales contracts or swaps with parties that do not have significant generating assets in PJM.

63. The Applicants do not propose to sell the energy from any specific nuclear asset(s) through the proposed auction of rolling three-year firm contracts or one of the alternative products available under the long-term contract option. Instead, the capacity will be available at an aggregate of the Applicants' PJM East nuclear generation buses. Only in the second alternative product available under the long-term contract option would the Applicants be guaranteeing delivery of firm energy based on the performance of a designated PJM East nuclear facility.

64. In none of the virtual divestiture alternatives, that is, virtual divestiture through the auction of rolling three-year firm contracts or through long-term energy sales contracts or swaps, would operational control over any of the combined companies' nuclear units be transferred to any buyer. Instead, in all instances, the combined companies would retain all operational control over the scheduling of the output of the nuclear units and the scheduling of plant outages. The combined company created by the merger would retain control and decision-making authority over all aspects of plant operations, such as decisions to require a plant to run or shut-down, to declare an unscheduled outage, or to establish output levels when operating.

65. The Commission has emphasized that the capacity associated with firm energy sales must be attributed to the party that has the authority to decide when generating resources are available for operation[28] and that an applicant may only add or subtract long-term firm purchases or sales, respectively, that assign operational control of such capacity to the buyer.

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[27] Source is Dr. Hieronymus's Exhibit No. J-3.

[28] Revised Filing Requirements Section 33.3(c)(4)(i)(A).

> In short, if an applicant has control over certain capacity such that the applicant can affect the ability of that capacity to reach the relevant market, then that capacity should be attributed to the applicant when performing the screens.[29]

66. The buyer of the firm energy that the Applicants propose to sell as part of their virtual divestiture will not have any control over capacity such that it can affect the ability of that energy to reach the market. The buyer's firm energy will be produced if the combined company (which has full control over plant operations) decides to operate any of its nuclear plants in PJM East and, once produced, it will be sold into the markets.

67. Consequently, contrary to the claim of Dr. Hieronymus, the proposed virtual divestiture of nuclear baseload capacity does not have all of the key elements necessary to make it an adequate alternative to physical divestiture.[30] The proposed virtual divestiture, therefore, fails to satisfy FERC's requirement that operational control be transferred to the buyer, or else the capacity should continue to be attributed to the seller for the purpose of evaluating market power issues. Therefore, any divestiture that the Applicants should be required to undertake to mitigate the market power effects of the proposed merger should be actual, not virtual, divestiture of generating capacity.

68. The virtual divestiture proposed as part of the Applicant's mitigation plan is asymmetric. The Applicants propose that the virtual divestment requirement will be reduced, megawatt for megawatt, to the extent that Applicants' PJM East nuclear capacity is decommissioned, derated or sold, and to the extent that new transmission capacity is constructed into PJM that is not reflected in PJM's transmission expansion plan in the PJM Regional Transmission Report in effect as of June 2005.[31] Any virtual divestiture plan that FERC decides to approve should be symmetric, that is, it should increase the virtual divestiture requirement, megawatt for megawatt, to the extent that the Applicants' PJM East nuclear capacity is increased as the result of power uprates or the construction of new facilities.

69. Dr. Hieronymus acknowledges that there is no FERC precedent that virtual divestiture is an acceptable form of mitigation.[32] Before FERC approves the merger, it needs to evaluate what remedies will be available to regulators and customers if the virtual divestiture does not occur at all, or to the extent that the Applicants propose, because there is no interest among potential buyers or for any other technical, economic, or legal reason(s). If

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29 110 FERC 61,097, at page 29.

30 Dr. Hieronymus's Exhibit No. J-1, at page 8, lines 17-20.

31 Dr. Hieronymus's Exhibit No. J-1, at page 8, lines 7-12.

32 Dr. Hieronymus's Exhibit No. J-1, at page 8, lines 17-20.

FERC approves the merger and the 2,600 MW of baseload nuclear capacity is not virtually divested, the result will be a new company with significant market power.

70. The Applicants' proposed set of mitigation eligible units, listed in Exhibit J-12, does not distinguish between those units that are offer-capped and those units that are exempt from offer capping. Similarly, because Dr. Hieronymus's analyses do not address potential strategic bidding by the combined company created by the proposed merger, the issue of divesting offer-capped versus non-offer-capped units is not addressed in his testimony. Maintaining ownership of non-capped units while divesting capped units will enhance the combined company's ability to profit from strategic bidding. Therefore, if FERC does approve the proposed merger, the Applicants should be required to divest non-capped units as part of their mitigation plan.

71. Dr. Hieronymus and Mr. Frame have both testified that the Applicants' proposed mitigation plans would resolve any competitive screening analysis failures that they have identified.[33] However, both witnesses also have testified that the precise HHI changes that would result from the implementation of the mitigation plan depend on which specific plants are sold and who the specific buyers are.[34] Therefore, the changes between their estimated pre-merger and post-mitigation HHIs may actually not satisfy FERC's Appendix A Guidelines.

72. Mr. Frame, in particular, merely assumes, without any supporting evidence, that the mitigation amounts of capacity will be sold to two parties, neither of whom owns generation capacity in PJM.[35] This arbitrary assumption impacts and calls into question the validity of Mr. Frame's post-mitigation HHIs.

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33 For example, see Dr. Hieronymus's Exhibit No. J-1, at page 65, lines 14-20, and Mr. Frame's BPU Testimony, at page 6, lines 10-11.

34 For example, see Dr. Hieronymus's Exhibit No. J-1, at page 68, lines 7-9, and Mr. Frame's BPU Testimony, at footnote no. 19 on page 38.

35 Mr. Frame's BPU Testimony, at page 38, lines 6-8.

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Exelon Corporation	)	
Public Service Enterprise Group Incorporated	)	**Docket No. EC05-43-000**

AFFIDAVIT OF BRUCE EDWARD BIEWALD

State of Massachusetts

County of Middlesex

I declare under penalty of perjury that the foregoing affidavits and the matters stated therein are true and correct to the best of my knowledge, information and belief.

Bruce Edward Biewald

Subscribed and sworn before me this 8th this day of April, 2005

Notary Public

Torry Khakali Carter
NOTARY PUBLIC
My commission expires Oct. 16, 2009

My Commission Expires:

Bruce Edward Biewald

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Exelon Corporation	)	
Public Service Enterprise Group Incorporated	)	**Docket No. EC05-43-000**

AFFIDAVIT OF DAVID ALAN SCHLISSEL

State of Massachusetts

County of Middlesex

I declare under penalty of perjury that the foregoing affidavits and the matters stated therein are true and correct to the best of my knowledge, information and belief.

David Alan Schlissel

Subscribed and sworn before me this 8th this day of April, 2005

Notary Public

My Commission Expires:

Torry Khakali Carter
NOTARY PUBLIC
My commission expires Oct. 16, 2009

EXHIBIT DRA-1

Bruce Edward Biewald

President
Synapse Energy Economics, Inc.
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PROFESSIONAL EXPERIENCE

Synapse Energy Economics, Inc., Cambridge, MA. President, 1996 to present.
Consulting on issues of energy economics, environmental impacts, and utility regulatory policy, including electric industry restructuring, electric power system planning, performance-based regulation, stranded costs, system benefits, market power, mergers and acquisitions, generation asset valuation and divestiture, nuclear and fossil power plant costs and performance, renewable resources, power supply contracts and performance standards, green marketing of electricity, environmental disclosure, nuclear plant decommissioning and radioactive waste issues, climate change policy, environmental externalities valuation, energy conservation and demand-side management, electric power system reliability, avoided costs, fuel prices, purchased power availability and cost, dispatch modeling, economic analysis of power plants and resource plans, portfolio management, risk analysis and risk management.

Tellus Institute, Boston, MA. Senior Scientist and Manager of the Electricity Program, 1989 to 1996. Responsible for research and consulting on all aspects of electric system planning, regulation, and restructuring.
Research Associate, later Associate Scientist, 1980 to 1988.

EDUCATION

Massachusetts Institute of Technology,
BS 1981, Architecture, Building Technology, Energy Use in Buildings.
Harvard University Extension School,
1989/90, Graduate courses in micro and macroeconomics.

SUMMARY OF TESTIMONY, PUBLICATIONS, AND PRESENTATIONS

Expert testimony on energy, economic, and environmental issues in more than eighty proceedings in two Canadian provinces, twenty six states, before the Federal Energy Regulatory Commission, and in State and Federal Courts.

Co-author of more than one hundred reports, including studies for the Electric Power Research Institute, the U.S. Department of Energy, the U.S. Environmental Protection Agency, the Office of Technology Assessment, the New England Governors' Conference, and the National Association of Regulatory Utility Commissioners.

Papers published in the Electricity Journal, the Energy Journal, Energy Policy, Public Utilities Fortnightly, and numerous conference proceedings.

Invited to speak by American Society of Mechanical Engineers, International Atomic Energy Agency, National Association of Regulatory Utility Commissioners, National Association of State Utility Consumer Advocates, National Consumer Law Center, the Latin American Energy Association (OLADE), the Swedish Environmental Protection Agency (SNV), the U.S. Environmental Protection Agency, and others.

TESTIMONY

Nuclear Regulatory Commission Atomic Safety and Licensing Board (Docket No. 52-007-ESP and ASLBP No. 04-821-01-ESP) – April 2005
Affidavit on the environmental impacts and economic costs of a proposed new nuclear power project and alternatives.

Indiana Utility Regulatory Commission (Cause Nos. 42622 and 42718) – March 2005
Public Service Company of Indiana environmental compliance planning, including cost estimates for emission control technologies, climate change policy and carbon price forecasting, energy efficiency and renewables as compliance options, power plan retirement economics, and cost recovery issues.

National Research Council, Division on Engineering and Physical Sciences, Board on Energy and Environmental Systems (Project No. BEES-J-03-03-A) – March 2005
Alternatives for replacing the generation of the Indian Point Energy Center nuclear facility.

Georgia Public Service Commission (Docket No. 18300-U) – October 2004
Georgia Power Company's cost of service study, treatment of electrical distribution equipment, and proposed rates for the Metropolitan Atlanta Rapid Transit Authority.

Texas Public Utility Commission (Docket No. 29526) – June 2004
Issues in CenterPoint Energy Houston Electric LLC's true up filing, including environmental cleanup costs, excess mitigation credits, and construction work in progress. Also rebuttal testimony on June 14.

Texas Public Utility Commission (Docket No. 28818) – April 2004
The Independent Transmission Operator proposal of Energy Gulf States Utilities, Inc. (prefiled testimony adopted by Paul Peterson).

Indiana Utility Regulatory Commission (Cause No. 42359) – August 2003
Public Service Company of Indiana rate making issues including the impact of trackers on risks to shareholders and customers, costs of environmental compliance, treatment of merchant plant investment and risk, and joint dispatch issues.

Nevada Public Utilities Commission (Docket No. 03-1014) – April 2003
Review of Sierra Pacific Power Company's risk management and procurement of electric power in the wholesale markets.

Nevada Public Utilities Commission (Docket No. 02-11021) – March 2003
Review of Nevada Power Company's risk management and procurement of electric power in the wholesale markets.

United States District Court for the Southern District of Illinois (Civil Action No. 99-833-MJR, United States v. Illinois Power Company and Dynegy Midwest Generation, Inc.) – August 2003
Testimony at trial on analysis and opinions in rebuttal report dated October 2002 on use of computer models for system planning, projections of generating unit operations, and the relationship between generator availability and output.

State of Vermont, Windham Superior Court (Appeal of USGen New England, Inc. from 2001 Property Valuation by the Town of Rockingham) – September 2002
Electricity market prices and economic valuation of hydroelectric generating plant.

United States District Court for the Middle District of North Carolina (Civil Action No. 1:00 CV 1262, United States v. Duke Energy Corporation) – August 2002
Expert report on use of computer models for system planning, projections of generating unit operations, and the relationship between generator availability and output. (Joint report with Phil Hayet.)

Indiana Utility Regulatory Commission (Cause No. 41746) – July 2002
Reply testimony on a rate case settlement agreement, dealing with issues including NiSource's finanical condition, service quality, environmental commitment, and electric rate impacts.

Connecticut Department of Public Utility Control (Docket No. 00-12-13RE01) – July 2002
The proposed sale of Seabrook Nuclear Station to FPL Energy Seabrook, LLC. Market power issues and market modeling.

United States District Court for the Southern District of Indiana (Civil Action No. IP99-1692-C-M/S, United States v. Southern Indiana Gas and Electric Company) – June 2002
Declaration on confidential business information and competitive harm.

Nevada Public Utilities Commission (Docket No. 02-2002) – April 2002
Review of Sierra Pacific Power Company's risk management and procurement of electric power in the wholesale markets.

Vermont Public Service Board (Docket No. 6596) – March 2002
Used and useful policy issues, electricity market prices, and above market costs of the purchase from Hydro Quebec.

Nevada Public Utilities Commission (Docket No. 01-11029) – February 2002
Review of Nevada Power Company's risk management and procurement of electric power in the wholesale markets.

Vermont Public Service Board (Docket No. 6545) – January 2002
Economic analysis of the proposed sale of Vermont Yankee nuclear plant and an associated Purchased Power Agreement.

New Jersey Board of Public Utilities (Docket No. EM01050308) – September 2001
Analysis of the proposed merger between Conectiv and PEPCo. Also, surrebuttal testimony in November. (Joint testimony with David Schlissel.)

Indiana Utility Regulatory Commission (Cause No. 41954) – June 2001
System planning and joint operation in a partially deregulated context.

State of Vermont, Windham Superior Court (Dockets S 362-9-99 and S372-9-99) – May 2001
Deposition on electricity market prices and economic valuation of hydroelectric generating plant.

Federal Energy Regulatory Commission (Docket No. ER01-200-001) – April 2001
Termination of the Cinergy Operating Agreement, treatment of merger savings, and affilliate relationships. Also cross-answering testimony in April.

New Jersey Board of Public Utilities (Docket No. EM00110870) – April 2001
Analysis of the proposed merger between FirstEnergy and GPU. Also, supplemental testimony in April. (Joint testimony with David Schlissel.)

Vermont Public Service Board (Dockets Nos. 6120 and 6460 – March 2001
Used and useful policy issues, electricity market prices, and above market costs of the purchase from Hydro Quebec. Also, surrebuttal testimony in April.

United States District Court for the Northern District of New York (Civil Action No. 00-CV-1738) – January 2001
Affidavit on the issuance and trading of SO2 emission allowances under the Title IV of the Clean Air Act. in Clean Air Markets Group v. George E. Pataki et al.

Department of Energy (Docket No. EE-RM-500) – December 2000
Oral testimony on proposed rules for central air conditioner and heat pump energy conservation standards.

Illinois Commerce Commission (Docket No. 00-0361) – July 2000
Review of ComEd's funding for nuclear power plant decommissioning.

California Public Utilities Commission (Rulemaking 99-10-025) – July 2000
Distributed generation and related rate design issues. Also, rebuttal testimony in August.

Massachusetts Department of Environmental Protection – July 2000
Comments on reliability implications of proposed emission standards for power plants.

Arkansas Public Service Commission (Docket No. 00-048-R) – June 2000
Requirements for electricity market power analyses.

United States District Court for the Middle District of North Carolina (1:99CV00033) – March 2000
Expert report on replacement power costs in Carolina Power & Light Company vs. Yuasa Exide, Inc.

Illinois Commerce Commission (Docket No. 99-0115) – September 1999
Review of ComEd's nuclear power plant decommissioning cost estimates.

West Virginia Public Service Commission (Case No. 98-0452-E-GI) – August 1999
AEP and Allegheny Power restructuring, market power, divestiture of generation, electric system market price modeling, statistical analysis of comparable sales, and responsibility for stranded costs and gains.

Mississippi Public Service Commission (Docket No. 96-UA-389) – August 1999
Review of Entergy Mississippi, Inc. and Mississippi Power Company stranded cost filings, divestiture of generation, statistical analysis of comparable sales, responsibility for stranded costs and gains.

Connecticut Department of Public Utility Control (Docket No. 99-03-36) – July 1999
Connecticut Light and Power Company standard offer service, market prices for electricity and the influence of market power, simulation analysis of the New England electricity market.

Connecticut Department of Public Utility Control (Docket No. 99-03-35) – July 1999
United Illuminating Company standard offer service, market prices for electricity and the influence of market power, simulation analysis of the New England electricity market.

Utah Public Service Commission (Docket No. 98-2035-04) – June 1999
Cost savings expectations for the proposed merger of PacifiCorp and Scottish Power.

Washington Utilities and Transportation Commission (Docket No. UE-981627) – June 1999
Cost savings expectations for the proposed merger of PacifiCorp and Scottish Power and assessment of whether the merger is in the public interest.

Federal Energy Regulatory Commission (Docket Nos. EC98-40-00, et al.) – April 1999
Horizontal market power and barriers to entry in consideration of the proposed merger of American Electric Power Company and Central and South West Corporation.

Connecticut Department of Public Utility Control (Docket No. 99-03-04) – April 1999
Market power, market prices, and simulation modeling as related to the application of United Illuminating Company for recovery of stranded costs.

Connecticut Department of Public Utility Control (Docket No. 99-02-05) – April 1999
Market power, market prices, and simulation modeling as related to the application of Connecticut Light & Power Company for recovery of stranded costs.

Maryland Public Service Commission (Case No. 8797) – January 1999
Simulation analysis of the ECAR market and projected market prices for electricity for estimation of Potomac Electric Company's stranded generation costs and unbundled rates.

Maryland Public Service Commission (Case No. 8795) – December 1998
Simulation analysis of the PJM market and projected market prices for electricity for estimation of Delmarva Power and Light Company's stranded generation costs and unbundled rates.

Maryland Public Service Commission (Cases Nos. 8794 and 8804) – December 1998
Simulation analysis of the PJM market and projected market prices for electricity for estimation of Baltimore Gas and Electric Company's stranded generation costs and unbundled rates.

Vermont Public Service Board (Docket No. 6107) – September 1998
Excess capacity, used & useful, and the economics of Green Mountain Power's purchase from Hydro Quebec.

Mississippi Public Service Commission (Docket No. 96-UA-389) – September 1998
Analyses of market concentration and market power, behavior of affiliated companies, need for an independent system operator.

California Public Utilities Commission (Application No. 97-12-020) – July 1998
Nuclear power plant decommissioning and radioactive waste disposal. Also, rebuttal testimony in August.

Federal Energy Regulatory Commission (Docket No. EC97-46-000) – June 1998
Affidavit on market power implications of the proposed merger between Allegheny Power System and Duquesne Light Company.

New Jersey Board of Public Utilities (Docket Nos. EX4120585Y, EO97070460, and EO97070463) – March 1998
Economic and environmental benefits of energy efficiency, including estimation of marginal air emissions from the PJM System. (Joint testimony with Nathanael Greene, Edward Smeloff, and Thomas Bourgeois.)

Vermont Public Service Board (Docket No. 6018) – February 1998
Excess capacity and the economics of Central Vermont Public Service Company's purchase from Hydro Quebec.

Public Service Commission of Maryland (Case No. 8774) – February 1998
Market power implications of the APS-DQE merger.

Federal Energy Regulatory Commission (Docket Nos. OA97-237-000 and ER97-1079-000) – January 1998
Market power in New England electricity markets.

British Columbia Utilities Commission – November 1997
British Columbia Hydro and Power Authority Wholesale Transmission Services Application.

Pennsylvania Public Utility Commission (Docket R-00973981) – November 1997
West Penn Power Company Restructuring Plan. Environmental disclosure, consumer education, and allocation of default customers.

Pennsylvania Public Utility Commission (Docket R-00974104) – November 1997
Duquesne Light Company Restructuring Plan. Environmental disclosure, consumer education, nuclear decommissioning, and allocation of default customers. Also surrebuttal testimony in December 1997.

Mississippi Public Service Commission (Docket No. 97-UA-496) – November 1997
Petition of Mississippi Power Company for a Certificate of Public Convenience and Necessity Authorizing Construction of a Generating Plant in Jackson County.

Pennsylvania Public Utility Commission (Docket Nos. R-00973953 and P-00971265) – November 1997
Application of PECO Energy Company for approval of its restructuring plan and petition on Enron Energy Services Power, Inc. for approval of an electric competition and customer choice plan. Allocation of default customers.

Vermont Public Service Board (Docket No. 5983) – October 1997
Excess capacity and the economics of Green Mountain Power Company's purchase from Hydro Quebec. Also rebuttal testimony in December 1997 and supplemental rebuttal testimony in January 1998.

Pennsylvania Public Utility Commission (Docket No. R-00973953) – September 1997
Joint petition for partial settlement of PECO Energy Company's proposed restructuring plan and application for a qualified rate order. Environmental disclosure, nuclear decommissioning and spent fuel.

Pennsylvania Public Utility Commission (Docket No. R-00974009) – September 1997
Pennsylvania Electric Company's Restructuring Plan. Environmental disclosure, customer education, and nuclear issues.

Pennsylvania Public Utility Commission (Docket No. R-00974008) – September 1997
Metropolitan Edison Company's Restructuring Plan. Environmental disclosure, customer education, and nuclear issues.

Indiana Legislature, Regulatory Flexibility Committee -- September 23, 1997.
Testimony on "Electric Industry Restructuring To Benefit Consumers and the Environment: Stranded Costs, Nuclear Issues, and Air Emissions."

Pennsylvania Public Utility Commission (Docket No. R-00973954) – June 1997
Pennsylvania Power & Light Company's Restructuring Plan. Environmental disclosure, customer education, PJM market structure, nuclear decommissioning and spent fuel, rate design for stranded cost recovery. Also, surrebuttal testimony in August.

Pennsylvania Public Utility Commission (Docket No. R-00973953) – June 1997
PECO Energy Company's Restructuring Plan. Environmental disclosure, PJM market structure, nuclear decommissioning and spent fuel.

New York Public Service Commission (Case 96-E-0897) -- April 1997
Consolidated Edison Company's Plans for Electric Rate Restructuring. Analysis of market power in the New York City load pocket.

Pennsylvania Public Utility Commission (Docket No. R-00973877) -- February 1997
Application of PECO Energy Company for Issuance of a Qualified Rate Order. Nuclear power plant decommissioning costs, stranded cost recovery, and securitization.

New Hampshire Public Utilities Commission (DR 96-150) -- November 1996
Electric industry restructuring, including stranded costs, industry structure, market power, and nuclear issues.

Massachusetts Department of Public Utilities (96-100) -- July 1996
Nuclear plant stranded costs and decommissioning.

Vermont Public Service Board (5854) – July 1996
Electric industry restructuring, including stranded costs, industry structure, and environmental protection.

Ontario Energy Board (H.R. 23) -- June 1995
Electricity rate options (joint evidence with John Stutz).

Pennsylvania Public Utility Commission (R-00943271) -- April 1995
Discount rates and system benefits charge.

Colorado Public Utilities Commission (94A-516A) – January 1995
Construction of new generating resources.

Public Service Commission of Nevada (94-9002) – November 1994
Environmental and health impacts of a proposed power plant.

Nuclear Decommissioning Finance Committee of New Hampshire (93-001) – September 1994
Seabrook decommissioning cost, spent fuel storage, and cost collection methodology (joint testimony with William Dougherty).

Public Service Commission of Wisconsin (6630-CE-197 and 6630-CE-209) – September 1994
Point Beach externalities, economics, spent fuel storage, and aging (joint testimony with William Dougherty).

British Columbia Utilities Commission – August 1994
Greenhouse gas emissions and environmental externalities policy

Public Service Commission of Wisconsin (05-EI-14) – February 1994
Cost of decommissioning Point Beach and Kewaunee nuclear power plants. Also, rebuttal and surrebuttal testimony in February.

Delaware Public Service Commission (91-39) – September 1992
Nuclear and fossil power plant performance targets.

Massachusetts Department of Public Utilities (91-131) – December 1991
Internalization of environmental externalities, greenhouse gas valuation and policy.

Massachusetts Department of Public Utilities (91-131) – October 1991
Environmental externalities valuation, emissions effects and global warming.

Massachusetts Department of Public Utilities ((89-141, 90-73, 90-141, 90-194 and 90-270) – December 1990
The incorporation of environmental externalities in specific utility RFPs.

Massachusetts Department of Public Utilities (90-55) – June 1990
Costs and benefits of high-efficiency gas heating equipment.

Massachusetts Department of Public Utilities (86-36-G and 89-239) – March 1990
Environmental externalities of electric resources.

Florida Public Service Commission (890973-E1) – January 1990
Integrated energy planning, power plant emissions, and nuclear plant performance.

Pennsylvania Public Utilities Commission (R-891364) – October 1989
Generating capacity requirements of the Philadelphia Electric Company and the Pennsylvania-New Jersey-Maryland Interconnection.

Maryland Public Service Commission (8199) – October 1989
Performance standards for coal, oil, and nuclear power plants.

Michigan Public Service Commission (U-9172) – April 1989
Economic analysis of the Palisades Power Purchase Agreement. Ratepayer impacts, incentives, and implications for plant operation and decommissioning.

Pennsylvania Public Utility Commission (P-870216, P-880283, P-880284, and P-880286) – March 1989
Allegheny Power System planning and avoided costs.

Michigan Public Service Commission (U-8880) – February 1988
Detroit Edison Company power supply costs, economics of Fermi "buy-back" purchase, nuclear fuel expense, oil costs, and power transactions.

Michigan Public Service Commission (U-8866) – December 1987
Consumers Power Company power supply costs, including projections of oil prices and purchased power costs.

Pennsylvania Public Utility Commission (R-850220) – September 1987
Economic analysis of West Penn Power Company's participation in the Bath County Pumped Storage Project, and Allegheny Power System capacity reserve requirements. Also, surrebuttal testimony in October.

Arizona Corporation Commission (U-1345-85-367) – February 1987
Palo Verde decommissioning cost.

Michigan Public Service Commission (U-8545) – December 1986
Consumers Power Company power costs, projected cost of oil and purchased power, economic evaluation of the Big Rock Point nuclear unit.

Public Service Commission of Indiana (38045) – November 1986
Northern Indiana Public Service Company system reliability and excess capacity.

California Public Utility Commission (84-06-014 and 85-08-025) – July 1986
Diablo Canyon decommissioning cost and collection issues.

Michigan Public Service Commission (U-8042R) – June 1986
Review of Consumers Power Company system operations during 1985 and economic evaluation of the Big Rock Point nuclear unit.

Michigan Public Service Commission (U-8291) – April 1986
Detroit Edison Company power supply costs, application of a multi-area dispatch model.

Michigan Public Service Commission (U-8286) – February 1986
Consumers Power Company power supply costs, application of a multi-area dispatch model.

Maine Public Service Commission (85-132) – January 1986
Standard and long term rates for cogeneration and small power production. Surrebuttal testimony in February.

Arkansas Public Service Commission (84-249-U) – June 1985
Impact of the Grand Gulf nuclear unit upon Arkansas Power and Light Company and Middle South Utilities electricity production costs.

Kentucky Public Service Commission (8666) – February 1984
Production costing modeling issues.

REPORTS

Preliminary Estimates of Economic Impacts and Avoided Air Emissions from Renewable Generation and Efficiency Programs in New England: Phase 1 Summary, a Synapse Energy Economics, Inc. report for the Regulatory Assistance Project by William Steinhurst, Robert McIntyre, Bruce Biewald, Cliff Chen, and Kenji Takahashi. June 24, 2004.

A Responsible Electricity Future: An Efficient, Cleaner and Balanced Scenario for the US Electricity System, a Synapse Energy Economics, Inc. report for the National Association of State PIRGs, by Bruce Biewald, David White, Geoff Keith, and Time Woolf. June 11, 2004.

Electricity Prices in PJM: Comparison of Wholesale Power Costs in the PJM Market to Indexed Generation Service Costs, a Synapse Energy Economics, Inc. report prepared for the PJM Interconnection, L.L.C., by Bruce Biewald, William Steinhurst, David White, and Amy Roschelle. June 3, 2004.

Reply Comments in Docket No. 2004-147: Strategies for Procuring Residential and Small Commercial Standard Offer Supply in Maine, a Synapse Energy Economics, Inc. report prepared for the Maine Office of Public Advocate by Amy Roschelle, Bruce Biewald, and Paul Peterson. April 21, 2004.

Portfolio Management: How to Procure Electricity Resources to Provide Reliable, Low-Cost, and Efficient Electricity Services to All Retail Customers, a Synapse Energy Economics, Inc. report prepared for the Regulatory Assistance Project and the Energy Foundation, by Bruce Biewald, Tim Woolf, Amy Roschelle and William Steinhurst. October 10, 2003.

A Clean Electricity Strategy for the Hudson River Valley, a Report for the Hudson River Foundation by Synapse Energy Economics and Pace Law School Energy Project. Geoff Keith, Bruce Biewald, David E. White, and Fred Zalcman. October 2003.

Estimating the Environmental Benefits of Renewable Energy and Energy Efficiency in North America: Experience and Methods, a report for the Commission for Environmental Cooperation, by Geoffrey Keith, Bruce Biewald, Anna Sommer, Patrick Henn, and Miguel Breceda, September 22, 2003.

Comments on the RPS Cost Analyses of the Joint Utilities and the DPS Staff, a Synapse Energy Economics, Inc. report prepared for the Renewable Energy Technology and Environment Coalition by Bruce Biewald, Cliff Chen, Anna Sommer, William Steinhurst, and David E. White. September 19, 2003.

Modeling Demand Response and Air Emissions in New England, a Synapse Energy Economics, Inc. report prepared for the U.S. Environmental Protection Agency, by Geoff Keith, Bruce Biewald, David White, and Mike Drunsic, August 2003.

Cleaner Air, Fuel Diversity and High-Quality Jobs: Reviewing Selected Potential Benefits of an RPS in New York State, a Synapse Energy Economics, Inc. report prepared for the Renewable Energy Technology and Environment Coalition by Geoff Keith, Bruce Biewald, David White, Anna Sommer and Cliff Chen. July 28, 2003.

The New England Experiment: An Evaluation of the Wholesale Electricity Markets, a Synapse Energy Economics, Inc. report provided to the Connecticut Office of Consumer Counsel, Maine Office of the Public Advocate, and New Hampshire Office of Consumer Advocate, by Paul Peterson, David White, Bruce Biewald, and Cliff Chen, June 2003.

Financial Insecurity: The Increasing Use of Limited Liability Companies and Multi-Tiered Holding Companies to Own Nuclear Power Plants," a Synapse Energy Economics, Inc. report prepared for the STAR Foundation and Riverkeeper, Inc., by David Schlissel, Paul Peterson, and Bruce Biewald, August 7, 2002.

Predicting Avoided Emissions from Policies that Encourage Energy Efficiency and Clean Power**,** a Synapse Energy Economics, Inc. report prepared for the Ozone Transport Commission, by Geoff Keith and Bruce Biewald, June 24, 2002.

Survey of Clean Power and Energy Efficiency Programs, a Synapse Energy Economics report prepared for the Ozone Transport Commission, by Lucy Johnston, Geoff Keith, Tim Woolf, Bruce Biewald, and Etienne Gonin, January 14, 2002.

Updated Avoided Energy-Supply Costs for Demand-Side Management Screening in Massachusetts, a Resource Insight report for the AESC Study Group, by Paul Chernick, Susan Geller, Bruce Biewald, and David White, December 5, 2001.

Best Practices in Market Monitoring: A Survey of Current ISO Activities and Recommendations for Effective Market Monitoring and Mitigation in Wholesale Electricity Markets, a Synapse Energy Economics report for the Maryland Office of People's Counsel, the Pennsylvania Office of Consumer Advocate, the Delaware Division of the Public Advocate, the New Jersey Division of the Ratepayer Advocate, and the Office of the People's Counsel of the District of Columbia, by Paul Peterson, Bruce Biewald, Lucy Johnston, Etienne Gonin, and Jonathan Wallach, November 9, 2001.

Electricity Market Analysis of Coal Waste Regulations: An Illustrative Midwest Case Study**,** a Synapse Energy Economics report prepared for US Environmental Protection Agency by Bruce Biewald, David White, and Montserrat Ramiro, October 31, 2001.

The Other Side of Competitive Markets: Developing Effective Load Response in New England's Electricity Market, a Synapse Energy Economics report prepared for the Maine Department of Attorney General and the Maine Office of the Public Advocate, June 13, 2001.

Valuation of the Bellows Falls Hydroelectric Generating Station as of April 2001, a Synapse Energy Economics report, June 4, 2001.

Room to Breathe: Why the Massachusetts Department of Environmental Protection's Proposed Air Regulations Are Compatible With Electric System Reliability, a Synapse Energy Economics report prepared for MASSPIRG and Clean Water Fund, March 2001

Repowering the Midwest: A Plan for Cleaning Up the Electricity Industry in America's Heartland, prepared for the Environmental Law and Policy Center and a coalition of Midwest environmental organizations, February, 2001.

Generator Outage Increases: A Preliminary Analysis of Outage Trends in the New England Electricity Market, a Synapse Energy Economics report prepared for the Union of Concerned Scientists, by Daniel Allen, Bruce Biewald, and David Schlissel, January 7, 2001.

Marginal Price Assumptions for Estimating Customer Benefits of Air Conditioner Efficiency Standards: Comments on the Department of Energy's Proposed Rules for Central Air Conditioners and Heat Pump Energy Conservation Standards, a Synapse Energy Economics report prepared for the Appliance Standards Awareness Project, by Tim Woolf, Bruce Biewald, and Daniel Allen, December 4, 2000.

Transmitting Windpower from the Dakotas to Chicago: A Preliminary Analysis of a Hydrogen Transmission Scenario, a Synapse Energy Economics report prepared for the Environmental Law and Policy Center, with funding from the Leighty Foundation, by Barclay Gibbs and Bruce Biewald, September 8, 2000.

Valuation of Hydroelectric Generating Facilities on the Connecticut and Deerfield Rivers in Vermont, a Synapse Energy Economics report for the Vermont Department of Taxes, by Bruce Biewald, Daniel Allen, David White, Neil Talbot, Paul Kirshen, Lawrence Martin, Paul Chernick, and Rachel Brailove, April 1, 2000.

Use of Selective Caralytic Reduction For Control of NOx Emissions From Power Plants in the U.S., a Synapse Energy Economics report for the OntAIRio Campaign, February, 2000.

Electricity Market Distortions Associated With Inconsistent Air Quality Regulations, by Tim Woolf, Bruce Biewald, and David White for the Project for Sustainable FERC Energy Policy, November 18, 1999.

Avoided Energy-Supply Costs for Demand-Side Management Screening in Massachusetts, a Resource Insight report for the AESC Study Group, by Rachel Brailove, Paul Chernick, Susan Geller, Bruce Biewald, and David White, July 7, 1999.

Comments on the Scope of Issues for FERC Staff's Environmental Assessment of the Proposed Rule on RTOs by the Project for Sustainable FERC Energy Policy on behalf of Multiple Parties, prepared by Terry Black and Bruce Biewald, June 14, 1999.

Stranded Nuclear Waste: Implications of Electric Industry Deregulation for Nuclear Plant Retirements and Funding for Decommissioning and Spent Fuel, by Bruce Biewald and David White, January 15, 1999.

New England Tracking System, a report to the New England Governors' Conference, Inc., funded by a grant from the U.S. Environmental Protection Agency, prepared with Environmental Futures, Inc. and Tellus Institute, October 1998.

The Role of Ozone Transport In Reaching Attainment in the Northeast: Opportunities, Equity and Economics, a Synapse Energy Economics report for the Northeast States for Coordinated Air Use Management, by Tim Woolf, David White, Bruce Biewald, and William Moomaw, July 1998.

Competition and Market Power in Northern Maine Electricity Market, a Synapse Energy Economics report for the Maine Public Utilities Commission, by Tim Woolf, Bruce Biewald, and Duncan Glover, November 24, 1998.

Grandfathering and Environmental Comparability: An Economic Analysis of Air Emission Regulations and Electricity Market Distortions, a Synapse Energy Economics report for the National Association of Regulatory Utility Commissioners, by Bruce Biewald, David White, Tim Woolf, Frank Ackerman, and William Moomaw, June 11, 1998.

Analysis of Market Power in the APS and Duquesne Service Territories, prepared for the Maryland Office of People's Counsel, by Bruce Biewald and David White, February 9, 1998.

Performance-Based Regulation in a Restructured Electric Industry, a Synapse Energy Economics report for the National Association of Regulatory Utility Commissioners, by Bruce Biewald, Tim Woolf, Peter Bradford, Paul Chernick, Susan Geller, and Jerrold Oppenheim, November 8, 1997.

Massachusetts Electric Utility Stranded Costs, a Synapse Energy Economics report for MASSPIRG, Union of Concerned Scientists, Clean Water Action, Massachusetts Citizens for Safe Energy, and Public Citizen, by Bruce Biewald, Tim Woolf, and Marc Breslow, November 4, 1997.

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"Capacity for the Future: Kinky Curves and Other Reliability Options," Paul Peterson, David White, Amy Roschelle, and Bruce Biewald, December 20, 2004.

"Estimating Emission Reductions from Energy Efficiency in the Northeast," Bruce Biewald and Geoff Keith, ACEEE 2004 Summer Study, Pacific Grove, CA. August 22-27, 2004.

"Long-Term Power Contracts: The Art of the Deal," Amy Roschelle, William Steinhurst, Paul Peterson, and Bruce Biewald, *Public Utilities Fortnightly*, August 2004.

"Designing Demand Response Programs in New England to Achieve Air Quality Benefits," Geoffrey Keith, Bruce Biewald, and David White, *The Electricity Journal*, May 2004.

"The 2003 Blackout: Solutions that Won't Cost a Fortune," David White, Amy Roschelle, Paul Peterson, David Schlissel, Bruce Biewald, and William Steinhurst, *The Electricity Journal*, November 2003.

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"Efficiency, Renewables and Gas: Restructuring as if Climate Mattered," Tim Woolf and Bruce Biewald, *The Electricity Journal*, January/February 1998.

"**Green Electricity: Tracking Systems for Environmental Disclosure**," B. Biewald and J.A. Ramey, proceedings of WINDPOWER '97, the American Wind Energy Association's annual conference in Austin, Texas, forthcoming.

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"**Residential Real-Time Metering Technology for Electricity Restructuring**," Daljit Singh and Bruce Biewald, presented at the National Training and Information Center conference, Chicago, September 1996.

"**Competition and Environmental Impacts in the U.S. Electric Sector: Must Market Forces be Tamed?**," presented at the International Society of Ecological Economics conference, Boston, August 1996.

"Stranded Risk: Nuclear Power Issues in Electricity Restructuring," for Energy Advocates meeting in Austin, Texas, May 1996.

"Counting the Costs: Scientific Uncertainty and Valuation Perspective in EXMOD," Stephen Bernow, Bruce Biewald, William Dougherty, and David White, presented at technical meeting of the International Atomic Energy Agency, Vienna, Austria, December 4-8, 1995.

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"Environmental Externalities: Highways and Byways," NRRI Quarterly Bulletin, Vol. 15 No. 4, Bruce Biewald, Paul Chernick and Bill Steinhurst, December 1994. Also presented at NARUC's 5th National Conference on Integrated Resource Planning, Kallispell, Montana, May 15-18, 1994.

"From Social Costing to Sustainable Development: Beyond the Economic Paradigm," Stephen Bernow, Bruce Biewald, and Paul Raskin, in Social Costs of Energy: Present Status and Future Trends, Proceedings of an International Conference held at Racine, Wisconsin, September 8-11, 1992. Edited by Olav Hohmeyer and Richard Ottinger. Published by Springer-Verlag, September 1994.

"Modelling Renewable Electric Resources: A Case Study of Wind," Stephen Bernow, Bruce Biewald, Daljit Singh, and Jeff Hall, proceedings of the Ninth NARUC Biennial Regulatory Information Conference, Columbus, OH, September 7-9, 1994.

"Alternative Closed Cycle Cooling Systems for Power Plants: A Framework of Evaluation in Integrated Resource Planning," Daljit Singh and Bruce Biewald, in the proceedings of the Ninth NARUC Biennial Regulatory Information Conference, Columbus, OH. September 7-9, 1994.

"Misconceptions, Mistakes and Misnomers in DSM Cost-Effectiveness Analysis, Or What Do You Really Mean By T.R.C.?," Mark Fulmer and Bruce Biewald, ACEEE 1994 Summer Study, Pacific Grove, CA. August 28 - Sept. 2, 1994.

"Modelling Renewable Electric Resources: A Case Study of Wind Power," Stephen Bernow, Bruce Biewald, and Daljit Singh, presented at WINDPOWER 1994, Sponsored by American Wind Energy Association, Minneapolis, Minnesota, May 9-13, 1994.

"National Climate Change Policy and Clean Air Act Compliance: A Case Study of Combined CO2/SO2 Reduction," Stephen Bernow, Bruce Biewald, Mark Fulmer, Tim Woolf, Kristen Wulfsberg, and Barry Solomon, in the proceedings of NARUC's 5th National Conference on Integrated Resource Planning, Kallispell, Montana, May 15-18, 1994.

"Modelling Renewable Electric Resources: A Case Study of Wind Reliability," Stephen Bernow, Bruce Biewald, and Daljit Singh, presented at the NARUC-DOE National Regulatory Conference on Renewable Energy, Savannah, Georgia, October 3-6, 1993.

"Environmental Sustainability as a Goal in Resource Planning and Policy," Stephen Bernow and Bruce Biewald, Office of Technology Assessment workshop, Washington, DC. April 1993.

"Climate Change and the U.S. Electric Sector," Bruce Biewald and Stephen Bernow, presented at NARUC's 4th National Conference on Integrated Resource Planning, Burlington, Vermont, September 1992.

"Coordinating Clean Air Act Compliance with Integrated Resource Planning: The Role of Externalities," Stephen Bernow, Bruce Biewald, and Kristin Wulfsberg, the Eighth NARUC Biennial Regulatory Information Conference, Ohio State University, Columbus, Ohio. September 9-11, 1992.

"Direct Environmental Impacts of Demand-Side Management," Stephen Bernow, Frank Ackerman, Bruce Biewald, Mark Fulmer, Karen Shapiro, and Kristin Wulfsberg, American Council for an Energy Efficient Economy (ACEEE) 1992 Summer Study, September 1992.

"Modelling Fuel Cycle and Site-Dependent Environmental Impacts in Electric Resource Planning," Stephen Bernow and Bruce Biewald, invited paper at OECD-IEA Expert Workshop on Life-Cycle Analysis of Energy Systems, Paris, France, May 18 and 19, 1992. Proceedings published OECD/IEA Paris, 1993.

"Computer Model Use in Energy Conservation Planning," presented at the Latin American Energy Organization (OLADE) Seminar on Power Systems Computer Modelling in Quito, Ecuador, September 23-25, 1991.

"Environmental Externalities Measurement: Quantification, Valuation and Monetization," Bernow, Biewald and Marron, in External Environmental Costs of Electric Power, proceedings of a German-American workshop, Ladenburg, FRG, October 23-25, 1991. Edited by Olav Hohmeyer and Richard Ottinger, published by Springer-Verlag (Berlin, Heidelberg, New York).

"Some Microcomputer Tools for Least Cost Integrated Energy Planning: ECO, LEAP and EDB," Bruce Biewald and Harvey Salgo, presented at workshop on Energy Pricing and Planning, Bratislava, Czechoslovakia, May 21-22, 1991.

"**Confronting Uncertainty: Contingency Planning for Decommissioning,"** Bruce Biewald and Stephen Bernow, Chapter 18 of "Nuclear Decommissioning Economics," a special issue of *The Energy Journal* of the International Association for Energy Economics, Volume 12, March 1991.

"Avoided Emissions and Environmental Dispatch," Stephen Bernow and Bruce Biewald, presented at the Conference on "Demand-Side Management and the Global Environment," Arlington, Virginia, April 22-23, 1991.

"Environmental Benefits of DSM in New York: Long Island Case Study," Bruce Biewald and Stephen Bernow, presented at the Conference on "Demand-Side Management and the Global Environment," Arlington, Virginia, April 22-23, 1991.

"Full Cost Dispatch: Incorporating Environmental Externalities in Electric System Operation," Stephen Bernow, Bruce Biewald and Donald Marron, the *Electricity Journal*, March 1991.

"EDB: A Flexible Database System for Energy-Environmental Analysis," Bruce Biewald, Michael Lazarus, and David Von Hippel, presented at International Atomic Energy Agency (IAEA) Technical Committee Meeting on "Development of a Database for Comparative Health and Environmental Impacts of Various Energy Systems," in Vienna, Austria, October 15-19, 1990.

"Full Cost Economic Dispatch: Recognizing Environmental Externalities in Electric Utility System Operation," Stephen Bernow, Bruce Biewald, and Donald Marron, presented at NARUC Conference on Externalities, Jackson Hole, Wyoming, October 1990.

"An Assessment of Demand-Side Management Models and Their Use and Applicability in Canadian Utilities," Martin Adelaar and Bruce Biewald, in the proceedings of the Canadian Electrical Association Demand-Side Management Conference, Halifax, Nova Scotia, September 1990.

"**Avoided Cost Contracts Can Undermine Least Cost Planning,"** Stephen Bernow, Bruce Biewald, and Donald Marron, Energy Policy, September 1990.

"Environmental Externalities Measurement: Quantification, Valuation, and Monetization," Stephen Bernow, Bruce Biewald, and Donald Marron, in the proceedings of the Seventh NARUC Biennial Regulatory Information Conference, September 1990.

"**Do We Really Need Nuclear Generating Companies?,"** Public Utilities Fortnightly, June 7, 1990.

"Nuclear Power Economics: Construction, Operation and Disposal," Bruce Biewald and Donald Marron, March 1989.

"Electric Utility System Reliability Analysis: Determining the Need forGenerating Capacity," Stephen Bernow and Bruce Biewald, in the proceedings of the Sixth NARUC Biennial Regulatory Information Conference, September 1988.

"Nuclear Power Plant Decommissioning: Cost Estimation for Power Planning and Ratemaking," Stephen Bernow and Bruce Biewald, Public Utilities Fortnightly, October 29, 1987.

"Cost and Performance of Boiling Water Reactors," Stephen Bernow, Bruce Biewald and Tim Woolf, Public Utilities Fortnightly, August 1987.

PRESENTATIONS

(Note: Presentations that were accompanied by a written paper are listed in the section for "papers," above.)

"The Shape of Things to Come: Incorporating Unproven Reserves of Efficiency Savings into Energy Models," presentation to the East Coast Energy Group, Washington, DC, November 10, 2004.

"Displaced Emissions from Renewables and Efficiency in the Northeast United States," presentation at a workshop convened by the Commission for Environmental Cooperation, the US Environmental Protection Agency, and the World Resources Institute, Washington DC, Novermber 4, 2004.

"Electric Transmission Technical and Policy Issues," presentation at National Association of State Utility Consumer Advocates conference in Austin, Texas, June 14, 2004.

"Incorporating Renewable Generation into a Risk Management Strategy," presentation at the New England Conference of Public Utility Commissioners Symposium, Brewster, Massachusetts, May 25, 2004.

"Electricity Portfolio Management," presentation at Illinois State University Institute for Regulatory Policy Studies Conference on "Beyond 2006," Springfield, Illinois, May 20, 2004.

"Electricity Risk Management: Diversified Resource Portfolios," presentation at Electric Power Supply Association Meeting, Washington, D.C., May 6, 2004.

"Quantifying Emission Reductions from Local Government Actions," presentation to Metropolitan Washington Council of Governments Energy and Air Quality Conference, Washington DC, April 5, 2004.

"Electricity Portfolio Management," presentation to National Association of Regulatory Utility Commissioners' conference in Washington, D.C., March 9, 2004.

"Portfolio Management for Electricity," presentation at the Regulatory Assistance Project's workshop on portfolio management, Chicago, September 18, 2003.

"Issues in Estimating Electric System Displaced Emissions," presentation at the Commission for Environmental Cooperation Technical Meeting on on Approaches to Estimating Environmental Benefits of Renewable Energy and Energy Efficiency, Washington, DC, July 27, 2003.

"Best Practices in Market Monitoring and Mitigation," presented at the National Association of State Utility Consumer Advocates Mid-Year Meeting in Austin, Texas, June 16, 2002.

"Regulation of Waste Management at Large Electric Utilities: Modeling Industry Impacts," US Environmental Protection Agency, August 7, 2001.

"Quality of Service in Performance-Based Regulation: US Experiences," presented at the Seminar on Regulation of Electricity Supply Quality, Milan, Italy, June 8, 2001.

"Demand Response in Electricity Markets," presented at the National Association of State Utility Consumer Advocates Mid-Year Meeting in Santa Fe, New Mexico, June 18, 2001.

Presentation on "Repowering the Midwest: The Clean Energy Development Plan for the Heartland," at the National Wind Coordinating Committee Upper Midwest Transmission Workshop, Minneapolis, Minnesota, May 1, 2001.

"Observations on New England's Electricity Markets," National Regulatory Research Institute Market Power Conference, Columbus, Ohio, April 10, 2001.

Presentation on "Derailing Coal: The Economics of Coal-Fired Electricity Generation in the U.S.," Tax Shift Strategy Meeting, Washington, D.C., December 2, 2000.

Presentation on "Repowering the Midwest: A Clean Energy Development Plan for the Heartland," presentation with Howard Learner at the National Association of Regulatory Utility Commissioners Annual Meeting, San Diego, California, November 14, 2000.

Presentation on "Electricity in New England: Market Imperfections of Failure?" at National Association of State Utility Consumer Advocates Annual Meeting, San Diego, California, November 13, 2000.

Presentation on "How Green is Green? Verifying Energy Advertising Claims," at the New England Conference of Public Utility Commissioners Symposium, Bretton Woods, New Hampshire, May 25, 1999.

Presentation on "Consumer Perspectives on Market Power – Case Studies from New England, New York, PJM, and Mississippi," IBC Conference on Market Power, Washington DC, May 24, 1999.

Presentation on "Grandfathering and Environmental Comparability," at the National Association of Regulatory Utility Commissioners 1998 Summer Committee Meetings, Seattle, July 26, 1998.

Presentation on "Tracking Electricity in the New England Market," at the National Association of Regulatory Utility Commissioners 1998 Summer Committee Meetings, Seattle, July 26, 1998.

Presentation on "Tracking Electricity in the New England Electricity Market," at the National Council on Competition and the Electricity Industry National Executive Dialogue on Customers' Right to Know, Chicago, May 13, 1998.

Presentation on "Comparable Environmental Regulations in a Restructured Electricity Industry: The Grandfathering Effect," National Association of Regulatory Utility Commissioners meeting in Washington, D.C., March 1, 1998.

Presentation on "Market Power in Electricity Generation," National Consumer Law Center Conference, Washington, D.C., February 9, 1998.

Presentation on "Electricity Market Power in New England," Massachusetts Electric Industry Restructuring Roundtable, Boston, December 15, 1997.

Presentation on wind power development and air quality, National Wind Coordinating Committee New England Wind Issues Forum, Boston, November 7, 1997.

Invited speaker on market power, National Association of State Utility Consumer Advocates meeting in Boston, November 12, 1997.

Presentation on "Distortions to Future and Current Competitive Electric Energy Markets Due to Grandfathering Environmental Regulations of Electric Power Plants," National Association of Regulatory Utility Commissioners meeting in Boston, November 9, 1997.

Presentation on "Electric Industry Restructuring as if the Environment Mattered," Boston Area Solar Energy Association, October 9, 1997.

Invited speaker on "Modeling Market Power in Electricity Generation," National Association of Regulatory Utility Commissioners meeting in San Francisco, July 22, 1997.

Presentation on "Performance-Based Regulation in a Restructured Electric Industry," National Association of Regulatory Utility Commissioners meeting in San Francisco, July 20, 1997.

Presentation on "State Initiatives and Regional Issues," New England Governors' Conference Workshop on Restructuring and Environmentally Sustainable Technologies, Warwick, Rhode Island, March 25, 1997.

Invited speaker on stranded costs, National Association of State Utility Consumer Advocates meeting in San Francisco, November 1996.

Presentation on "Nuclear Power Plant Decommissioning Costs and Electricity Restructuring," Nuclear Decommissioning Trusts conference, New York City, November 18, 1996.

Invited speaker on stranded costs, Indiana Utilities Regulatory Commission Forum, Indianapolis, November 1, 1996.

Presentation on “Electric Industry Restructuring and the Environment,” at the Indiana Energy Conference, Indianapolis, Indiana, October 10, 1996.

Presentation on "Small Customers in a Restructured Electricity Industry: Transaction Costs, Advanced Metering Technologies and Aggregation Options" to the Consumers' Energy Conference, South Portland, Maine, July 1996.

Presentation on "Electric Generation Market Power in New England" to New England Conference of Public Utility Commissioners, Manchester Village, Vermont, May 1996.

Presentation on "Advanced Metering for Residential Customers on Electricity Restructuring" to National Consumer Law Center's 10th Annual Conference in Washington, DC, February 1996.

Presentations on "Market Power," "Environmental Aspects of Restructuring" and "Market Access for Small Customers" to Vermont Public Service Board workshops on electricity restructuring, January and February 1996.

Presentation on "Environmental Impacts of Energy: Sustainability and Social Costing" to British Columbia Utilities Commission Workshop, Vancouver, BC, March 1995.

Presentation on "Competition and Economic Efficiency" to the National Council on Competition and the Electric Industry, December 1995.

Presentation on "Compliance Planning Under Regulatory Uncertainty," to EPA "Opportunities Conference: Energy Efficiency and Renewable Energy," Washington, DC, June 1993.

Presentation on "Energy and Sustainability" to Hydro-Quebec Conference, Hampshire College, Amherst, Massachusetts, April 1993.

Invited Speaker on environmental externalities, ASME "ECO World" conference in Washington, DC, June 1992.

Invited Speaker, Association of Energy Engineers, Boston, Massachusetts, February 1992.

Presentation of Acid Rain Abatement Optimization Model to the Swedish Environmental Protection Agency, Solna, Sweden, November 1991.

Presentation on Integrated Resource Planning to Boston Gas Company, July 1990.

Training on Methods for Calculating Electric System Avoided Costs, provided to energy planners and policy makers from five Southeast Asian countries sponsored by U.S. Agency for International Development and administered by the Institute of International Education, May 1990.

Invited Speaker, National Association of State Utility Consumer Advocates (NASUCA) Mid-Year Meeting, Annapolis, Maryland, and June 1988.

Invited Speaker, Conference on New Developments in Nuclear Decommissioning Costs and Funding Methods, sponsored by the Northeast Center for Professional Education, Washington, DC, April 1988.

EXHIBIT DRA-2

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SUMMARY

I have worked for thirty years as a consultant and attorney on complex management, engineering, and economic issues, primarily in the field of energy. This work has involved conducting technical investigations, preparing economic analyses, presenting expert testimony, providing support during all phases of regulatory proceedings and litigation, and advising clients during settlement negotiations. I received undergraduate and advanced engineering degrees from the Massachusetts Institute of Technology and Stanford University, respectively, and a law degree from Stanford Law School

PROFESSIONAL EXPERIENCE

Electric System Reliability - Evaluated whether new transmission lines and generation facilities were needed to ensure adequate levels of system reliability. Investigated the causes of distribution system outages and inadequate service reliability. Examined the reasonableness of utility system reliability expenditures.

Transmission Line Siting – Examined the need for proposed transmission lines. Analyzed whether proposed transmission lines could be installed underground. Worked with clients to develop alternate routings for proposed lines that would have reduced impacts on the environment and communities.

Power Plant Operations and Economics - Investigated the causes of more than one hundred power plant and system outages, equipment failures, and component degradation, determined whether these problems could have been anticipated and avoided, and assessed liability for repair and replacement costs. Examined power plant operating, maintenance, and capital costs. Analyzed power plant operating data from the NERC Generating Availability Data System (GADS). Evaluated utility plans for and management of the replacement of major power plant components. Assessed the adequacy of power plant quality assurance and maintenance programs. Examined the selection and supervision of contractors and subcontractors.

Power Plant Repowering - Evaluated the environmental, economic and reliability impacts of rebuilding older, inefficient generating facilities with new combined cycle technology.

Power Plant Air Emissions – Investigated whether proposed generating facilities would provide environmental benefits in terms of reduced emissions of NO_x, SO_2 and CO_2. Examined whether new state emission standards would lead to the retirement of existing power plants or otherwise have an adverse impact on electric system reliability.

Power Plant Water Use – Examined power plant repowering as a strategy for reducing water consumption at existing electric generating facilities. Analyzed the impact of converting power plants from once-through to closed-loop systems with cooling towers on plant revenues and electric system reliability. Evaluated the potential impact of the EPA's Proosed Clean Water Act Section 316(b) Rule for Cooling Water Intake Structures at existing power plants.

Nuclear Power - Examined the impact of the nuclear power plant life extensions and power uprates on decommissioning costs and collections policies. Evaluated utility decommissioning cost estimates and cost collection plans. Investigated the significance of the increasing ownership of nuclear power plants by multiple tiered holding companies with limited liability company subsidiaries. Investigated the potential safety consequences of nuclear power plant structure, system, and component failures.

Electric Industry Regulation and Markets - Investigated whether new generating facilities that were built for a deregulated subsidiary should be included in the rate base of a regulated utility. Evaluated the reasonableness of proposed utility power purchase agreements with deregulated affiliates. Investigated the prudence of utility power purchases in deregulated markets. Examined whether generating facilities experienced more outages following the transition to a deregulated wholesale market in New England. Evaluated the reasonableness of nuclear and fossil plant sales and the auctions of power purchase agreements. Analyzed the impact of proposed utility mergers on market power. Assessed the reasonableness of contract provisions and terms in proposed power supply agreements.

Economic Analysis - Analyzed the costs and benefits of energy supply options. Examined the economic and system reliability consequences of the early retirement of major electric generating facilities. Evaluated whether new electric generating facilities are used and useful. Quantified replacement power costs and the increased capital and operating costs due to identified instances of mismanagement.

Expert Testimony - Presented the results of management, technical and economic analyses as testimony in more than ninety proceedings before regulatory boards and commissions in twenty three states, before two federal regulatory agencies, and in state and federal court proceedings.

Litigation and Regulatory Support - Participated in all aspects of the development and preparation of case presentations on complex management, technical, and economic issues. Assisted in the preparation and conduct of pre-trial discovery and depositions. Helped identify and prepare expert witnesses. Aided the preparation of pre-hearing petitions and motions and post-hearing briefs and appeals. Assisted counsel in preparing for hearings and oral arguments. Advised counsel during settlement negotiations.

TESTIMONY, AFFIDAVITS AND COMMENTS

Maine Public Utilities Commission (Docket No. 2004-771) – March 2005
Analysis of Bangor Hydro-Electric's Petition for a Certificate of Public Convenience and Necessity to construct a 345 kV transmission line

United States District Court for the Southern District of Ohio, Eastern Division (Consolidated Civil Actions Nos. C2-99-1182 and C2-99-1250)
Whether the public release of company documents more than three years old would cause competitive harm to the American Electric Power Company.

New Jersey Board of Public Utilities (Docket No. EO03121014) – February 2005
Whether the Board of Public Utilities can halt further collections from Jersey Central Power & Light Company's ratepayers because there already are adequate funds in the company's decommissioning trusts for the Three Mile Island Unit No. 2 Nuclear Plant to allow for the decommissioning of that unit without endangered the public health and safety.

Maine Public Utilities Commission (Docket No. 2004-538) – January 2005
Analysis of Maine Public Service Company's request to construct a 138 kV transmission line from Limestone, Maine to the Canadian Border.

California Public Utilities Commission (Application No. AO4-02-026) – December 2004 and January 2005
Southern California Edison's proposed replacement of the steam generators at the San Onofre Unit 2 and Unit 3 nuclear power plants and whether the utility was imprudent for failing to initiate litigation against Combustion Engineering due to defects in the design of and materials used in those steam generators.

United States District Court for the Southern District of Indiana, Indianapolis Division (Civil Action No. IP99-1693) – December 2004
Whether the public release of company documents more than three years old would cause competitive harm to the Cinergy Corporation.

California Public Utilities Commission (Application No. AO4-01-009) – August 2004
Pacific Gas & Electric's proposed replacement of the steam generators at the Diablo Canyon nuclear power plant and whether the utility was imprudent for failing to initiate litigation against Westinghouse due to defects in the design of and materials used in those steam generators.

Public Service Commission of Wisconsin (Docket No. 6690-CE-187) – June, July and August 2004
Whether Wisconsin Public Service Corporation's request for approval to build a proposed 515 MW coal-burning generating facility should be granted.

Public Service Commission of Wisconsin (Docket No. 05-EI-136) – May and June 2004
Whether the proposed sale of the Kewaunee Nuclear Power Plant to a subsidiary of an out-of-state holding company is in the public interest.

Connecticut Siting Council (Docket No. 272) – May 2004
Whether there are technically viable alternatives to the proposed 345-kV transmission line between Middletown and Norwalk Connecticut and the length of the line that can be installed underground.

Arizona Corporation Commission (Docket No. E-01345A-03-0437 – February 2004

Whether Arizona Public Service Company should be allowed to acquire and include in rate base five generating units that were built by a deregulated affiliate.

State of Rhode Island Energy Facilities Siting Board (Docket No. SB-2003-1) – February 2004
Whether the cost of undergrounding a relocated 115kV transmission line would be eligible for regional cost socialization.

State of Maine Department of Environmental Protection (Docket No. A-82-75-0-X) – December 2003
The storage of irradiated nuclear fuel in an Independent Spent Fuel Storage Installation (ISFSI) and whether such an installation represents an air pollution control facility.

Rhode Island Public Utility Commission (Docket No. 3564) – December 2003 and January 2004
Whether Narragansett Electric Company should be required to install a relocated 115kV transmission line underground.

New York State Board on Electric Generation Siting and the Environment (Case No. 01-F-1276) – September, October and November 2003
The environmental, economic and system reliability benefits that can reasonably be expected from the proposed 1,100 MW TransGas Energy generating facility in Brooklyn, New York.

Wisconsin Public Service Commission (Case 6690-UR-115209) - September and October 2003
The reasonableness of Wisconsin Public Service Corporation's decommissioning cost collections for the Kewaunee Nuclear Plant.

Oklahoma Corporation Commission (Cause No. 2003-121) – July 2003
Whether Empire District Electric Company properly reduced its capital costs to reflect the write-off of a portion of the cost of building a new electric generating facility.

Arkansas Public Service Commission (Docket 02-248-U) – May 2003
Entergy's proposed replacement of the steam generators and the reactor vessel head at the ANO Unit 1 Steam Generating Station.

Appellate Tax Board, State of Massachusetts (Docket No C258405-406) – May 2003
The physical nature of electricity and whether electricity is a tangible product or a service.

Maine Public Utilities Commission (Docket 2002-665-U) – April 2003
Analysis of Central Maine Power Company's proposed transmission line for Southern York County and recommendation of alternatives.

Massachusetts Legislature, Joint Committees on Government Regulations and Energy – March 2003
Whether PG&E can decide to permanently retire one or more of the generating units at its Salem Harbor Station if it is not granted an extension beyond October 2004 to reduce the emissions from the Station's three coal-fired units and one oil-fired unit.

New Jersey Board of Public Utilities (Docket No. ER02080614) – January 2003

The prudence of Rockland Electric Company's power purchases during the period August 1, 1999 through July 31, 2002.

New York State Board on Electric Generation Siting and the Environment (Case No. 00-F-1356) – September and October 2002 and January 2003
The need for and the environmental benefits from the proposed 300 MW Kings Park Energy generating facility.

Arizona Corporation Commission (Docket No. E-01345A-01-0822) – March 2002
The reasonableness of Arizona Public Service Company's proposed long-term power purchase agreement with an affiliated company.

New York State Board on Electric Generation Siting and the Environment (Case No. 99-F-1627) – March 2002
Repowering NYPA's existing Poletti Station in Queens, New York.

Connecticut Siting Council (Docket No. 217) – March 2002, November 2002, and January 2003
Whether the proposed 345-kV transmission line between Plumtree and Norwalk substations in Southwestern Connecticut is needed and will produce public benefits.

Vermont Public Service Board (Case No. 6545) – January 2002
Whether the proposed sale of the Vermont Yankee Nuclear Plant to Entergy is in the public interest of the State of Vermont and Vermont ratepayers.

Connecticut Department of Public Utility Control (Docket 99-09-12RE02) – December 2001
The reasonableness of adjustments that Connecticut Light and Power Company seeks to make to the proceeds that it received from the sale of Millstone Nuclear Power Station.

Connecticut Siting Council (Docket No. 208) – October 2001
Whether the proposed cross-sound cable between Connecticut and Long Island is needed and will produce public benefits for Connecticut consumers.

New Jersey Board of Public Utilities (Docket No. EM01050308) - September 2001
The market power implications of the proposed merger between Conectiv and Pepco.

Illinois Commerce Commission Docket No. 01-0423 – August, September, and October 2001
Commonwealth Edison Company's management of its distribution and transmission systems.

New York State Board on Electric Generation Siting and the Environment (Case No. 99-F-1627) - August and September 2001
The environmental benefits from the proposed 500 MW NYPA Astoria generating facility.

New York State Board on Electric Generation Siting and the Environment (Case No. 99-F-1191) - June 2001
The environmental benefits from the proposed 1,000 MW Astoria Energy generating facility.

New Jersey Board of Public Utilities (Docket No. EM00110870) - May 2001
The market power implications of the proposed merger between FirstEnergy and GPU Energy.

Connecticut Department of Public Utility Control (Docket 99-09-12RE01) - November 2000
The proposed sale of Millstone Nuclear Station to Dominion Nuclear, Inc.

Illinois Commerce Commission (Docket 00-0361) - August 2000
The impact of nuclear power plant life extensions on Commonwealth Edison Company's decommissioning costs and collections from ratepayers.

Vermont Public Service Board (Docket 6300) - April 2000
Whether the proposed sale of the Vermont Yankee nuclear plant to AmerGen Vermont is in the public interest.

Massachusetts Department of Telecommunications and Energy (Docket 99-107, Phase II) - April and June 2000
The causes of the May 18, 1999, main transformer fire at the Pilgrim generating station.

Connecticut Department of Public Utility Control (Docket 00-01-11) - March and April 2000
The impact of the proposed merger between Northeast Utilities and Con Edison, Inc. on the reliability of the electric service being provided to Connecticut ratepayers.

Connecticut Department of Public Utility Control (Docket 99-09-12) - January 2000
The reasonableness of Northeast Utilities plan for auctioning the Millstone Nuclear Station.

Connecticut Department of Public Utility Control (Docket 99-08-01) - November 1999
Generation, Transmission, and Distribution system reliability.

Illinois Commerce Commission (Docket 99-0115) - September 1999
Commonwealth Edison Company's decommissioning cost estimate for the Zion Nuclear Station.

Connecticut Department of Public Utility Control (Docket 99-03-36) - July 1999
Standard offer rates for Connecticut Light & Power Company.

Connecticut Department of Public Utility Control (Docket 99-03-35) - July 1999
Standard offer rates for United Illuminating Company.

Connecticut Department of Public Utility Control (Docket 99-02-05) - April 1999
Connecticut Light & Power Company stranded costs.

Connecticut Department of Public Utility Control (Docket 99-03-04) - April 1999
United Illuminating Company stranded costs.

Maryland Public Service Commission (Docket 8795) - December 1998
Future operating performance of Delmarva Power Company's nuclear units.

Maryland Public Service Commission (Dockets 8794/8804) - December 1998
Baltimore Gas and Electric Company's proposed replacement of the steam generators at the Calvert Cliffs Nuclear Power Plant. Future performance of nuclear units.

Indiana Utility Regulatory Commission (Docket 38702-FAC-40-S1) - November 1998
Whether the ongoing outages of the two units at the D.C. Cook Nuclear Plant were caused or extended by mismanagement.

Arkansas Public Service Commission (Docket 98-065-U) - October 1998
Entergy's proposed replacement of the steam generators at the ANO Unit 2 Steam Generating Station.

Massachusetts Department of Telecommunications and Energy (Docket 97-120) - October 1998
Western Massachusetts Electric Company's Transition Charge. Whether the extended 1996-1998 outages of the three units at the Millstone Nuclear Station were caused or extended by mismanagement.

Connecticut Department of Public Utility Control (Docket 98-01-02) - September 1998
Nuclear plant operations, operating and capital costs, and system reliability improvement costs.

Illinois Commerce Commission (Docket 97-0015) - May 1998
Whether any of the outages of Commonwealth Edison Company's twelve nuclear units during 1996 were caused or extended by mismanagement. Whether equipment problems, personnel performance weaknesses, and program deficiencies could have been avoided or addressed prior to plant outages. Outage-related fuel and replacement power costs.

Public Service Commission of West Virginia (Case 97-1329-E-CN) - March 1998
The need for a proposed 765 kV transmission line from Wyoming, West Virginia, to Cloverdate, Virginia.

Illinois Commerce Commission (Docket 97-0018) - March 1998
Whether any of the outages of the Clinton Power Station during 1996 were caused or extended by mismanagement.

Connecticut Department of Public Utility Control (Docket 97-05-12) - October 1997
The increased costs resulting from the ongoing outages of the three units at the Millstone Nuclear Station.

New Jersey Board of Public Utilities (Docket ER96030257) - August 1996
Replacement power costs during plant outages.

Illinois Commerce Commission (Docket 95-0119) - February 1996
Whether any of the outages of Commonwealth Edison Company's twelve nuclear units during 1994 were caused or extended by mismanagement. Whether equipment problems, personnel performance weaknesses, and program deficiencies could have been avoided or addressed prior to plant outages. Outage-related fuel and replacement power costs.

Public Utility Commission of Texas (Docket 13170) - December 1994
Whether any of the outages of the River Bend Nuclear Station during the period October 1, 1991, through December 31, 1993, were caused or extended by mismanagement.

Public Utility Commission of Texas (Docket 12820) - October 1994
Operations and maintenance expenses during outages of the South Texas Nuclear Generating Station.

Wisconsin Public Service Commission (Cases 6630-CE-197 and 6630-CE-209) - September and October 1994
The reasonableness of the projected cost and schedule for the replacement of the steam generators at the Point Beach Nuclear Power Plant. The potential impact of plant aging on future operating costs and performance.

Public Utility Commission of Texas (Docket 12700) - June 1994
Whether El Paso Electric Company's share of Palo Verde Unit 3 was needed to ensure adequate levels of system reliability. Whether the Company's investment in Unit 3 could be expected to generate cost savings for ratepayers within a reasonable number of years.

Arizona Corporation Commission (Docket U-1551-93-272) - May and June 1994
Southwest Gas Corporation's plastic and steel pipe repair and replacement programs.

Connecticut Department of Public Utility Control (Docket 92-04-15) - March 1994
Northeast Utilities management of the 1992/1993 replacement of the steam generators at Millstone Unit 2.

Connecticut Department of Public Utility Control (Docket 92-10-03) - August 1993
Whether the 1991 outage of Millstone Unit 3 as a result of the corrosion of safety-related plant piping systems was due to mismanagement.

Public Utility Commission of Texas (Docket 11735) - April and July 1993
Whether any of the outages of the Comanche Peak Unit 1 Nuclear Station during the period August 13, 1990, through June 30, 1992, were caused or extended by mismanagement.

Connecticut Department of Public Utility Control (Docket 91-12-07) - January 1993 and August 1995
Whether the November 6, 1991, pipe rupture at Millstone Unit 2 and the related outages of the Connecticut Yankee and Millstone units were caused or extended by mismanagement. The impact of environmental requirements on power plant design and operation.

Connecticut Department of Public Utility Control (Docket 92-06-05) - September 1992
United Illuminating Company off-system capacity sales.

Public Utility Commission of Texas (Docket 10894) - August 1992
Whether any of the outages of the River Bend Nuclear Station during the period October 1, 1988, through September 30, 1991, were caused or extended by mismanagement.

Connecticut Department of Public Utility Control (Docket 92-01-05) - August 1992
Whether the July 1991 outage of Millstone Unit 3 due tot he fouling of important plant systems by blue mussels was the result of mismanagement.

California Public Utilities Commission (Docket 90-12-018) - November 1991, March 1992, June and July 1993
Whether any of the outages of the three units at the Palo Verde Nuclear Generating Station during 1989 and 1990 were caused or extended by mismanagement. Whether equipment problems, personnel performance weaknesses and program deficiencies could have been avoided or addressed prior to outages. Whether specific plant operating cost and capital expenditures were necessary and prudent.

Public Utility Commission of Texas (Docket 9945) - July 1991
Whether El Paso Electric Company's share of Palo Verde Unit 3 was needed to ensure adequate levels of system reliability. Whether the Company's investment in the unit could be expected to generate cost savings for ratepayers within a reasonable number of years. El Paso Electric Company's management of the planning and licensing of the Arizona Interconnection Project transmission line.

Arizona Corporation Commission (Docket U-1345-90-007) - December 1990 and April 1991
Arizona Public Service Company's management of the planning, construction and operation of the Palo Verde Nuclear Generating Station. The costs resulting from identified instances of mismanagement.

New Jersey Board of Public Utilities (Docket ER89110912J) - July and October 1990
The economic costs and benefits of the early retirement of the Oyster Creek Nuclear Plant. The potential impact of the unit's early retirement on system reliability. The cost and schedule for siting and constructing a replacement natural gas-fired generating plant.

Public Utility Commission of Texas (Docket 9300) - June and July 1990
Texas Utilities management of the design and construction of the Comanche Peak Nuclear Plant. Whether the Company was prudent in repurchasing minority owners' shares of Comanche Peak without examining the costs and benefits of the repurchase for its ratepayers.

Federal Energy Regulatory Commission (Docket EL-88-5-000) - November 1989
Boston Edison's corporate management of the Pilgrim Nuclear Station.

Connecticut Department of Public Utility Control (Docket 89-08-11) - November 1989
United Illuminating Company's off-system capacity sales.

Kansas State Corporation Commission (Case 164,211-U) - April 1989
Whether any of the 127 days of outages of the Wolf Creek generating plant during 1987 and 1988 were the result of mismanagement.

Public Utility Commission of Texas (Docket 8425) - March 1989
Whether Houston Lighting & Power Company's new Limestone Unit 2 generating facility was needed to provide adequate levels of system reliability. Whether the Company's investment in Limestone Unit 2 would provide a net economic benefit for ratepayers.

Illinois Commerce Commission (Dockets 83-0537 and 84-0555) - July 1985 and January 1989
Commonwealth Edison Company's management of quality assurance and quality control activities and the actions of project contractors during construction of the Byron Nuclear Station.

New Mexico Public Service Commission (Case 2146, Part II) - October 1988
The rate consequences of Public Service Company of New Mexico's ownership of Palo Verde Units 1 and 2.

United States District Court for the Eastern District of New York (Case 87-646-JBW) - October 1988
Whether the Long Island Lighting Company withheld important information from the New York State Public Service Commission, the New York State Board on Electric Generating Siting and the Environment, and the U.S. Nuclear Regulatory Commission.

Public Utility Commission of Texas (Docket 6668) - August 1988 and June 1989
Houston Light & Power Company's management of the design and construction of the South Texas Nuclear Project. The impact of safety-related and environmental requirements on plant construction costs and schedule.

Federal Energy Regulatory Commission (Docket ER88-202-000) - June 1988
Whether the turbine generator vibration problems that extended the 1987 outage of the Maine Yankee nuclear plant were caused by mismanagement.

Illinois Commerce Commission (Docket 87-0695) - April 1988
Illinois Power Company's planning for the Clinton Nuclear Station.

North Carolina Utilities Commission (Docket E-2, Sub 537) - February 1988
Carolina Power & Light Company's management of the design and construction of the Harris Nuclear Project. The Company's management of quality assurance and quality control activities. The impact of safety-related and environmental requirements on construction costs and schedule. The cost and schedule consequences of identified instances of mismanagement.

Ohio Public Utilities Commission (Case 87-689-EL-AIR) - October 1987
Whether any of Ohio Edison's share of the Perry Unit 2 generating facility was needed to ensure adequate levels of system reliability. Whether the Company's investment in Perry Unit 1 would produce a net economic benefit for ratepayers.

North Carolina Utilities Commission (Docket E-2, Sub 526) - June 1987
Fuel factor calculations.

New York State Public Service Commission (Case 29484) - May 1987
The planned startup and power ascension testing program for the Nine Mile Point Unit 2 generating facility.

Illinois Commerce Commission (Dockets 86-0043 and 86-0096) - April 1987
The reasonableness of certain terms in a proposed Power Supply Agreement.

Illinois Commerce Commission (Docket 86-0405) - March 1987
The in-service criteria to be used to determine when a new generating facility was capable of providing safe, adequate, reliable and efficient service.

Indiana Public Service Commission (Case 38045) - December 1986
Northern Indiana Public Service Company's planning for the Schaefer Unit 18 generating facility. Whether the capacity from Unit 18 was needed to ensure adequate system reliability. The rate consequences of excess capacity on the Company's system.

Superior Court in Rockingham County, New Hampshire (Case 86E328) - July 1986
The radiation effects of low power testing on the structures, equipment and components in a new nuclear power plant.

New York State Public Service Commission (Case 28124) - April 1986 and May 1987
The terms and provisions in a utility's contract with an equipment supplier. The prudence of the utility's planning for a new generating facility. Expenditures on a canceled generating facility.

Arizona Corporation Commission (Docket U-1345-85) - February 1986
The construction schedule for Palo Verde Unit No. 1. Regulatory and technical factors that would likely affect future plant operating costs.

New York State Public Service Commission (Case 29124) - January 1986
Niagara Mohawk Power Corporation's management of construction of the Nine Mile Point Unit No. 2 nuclear power plant.

New York State Public Service Commission (Case 28252) - October 1985
A performance standard for the Shoreham nuclear power plant.

New York State Public Service Commission (Case 29069) - August 1985
A performance standard for the Nine Mile Point Unit No. 2 nuclear power plant.

Missouri Public Service Commission (Cases ER-85-128 and EO-85-185) - July 1985
The impact of safety-related regulatory requirements and plant aging on power plant operating costs and performance. Regulatory factors and plant-specific design features that will likely affect the future operating costs and performance of the Wolf Creek Nuclear Plant.

Massachusetts Department of Public Utilities (Case 84-152) - January 1985
The impact of safety-related regulatory requirements and plant aging on power plant operating costs and performance. Regulatory factors and plant-specific design features that will likely affect the future operating costs and performance of the Seabrook Nuclear Plant.

Maine Public Utilities Commission (Docket 84-113) - September 1984
The impact of safety-related regulatory requirements and plant aging on power plant operating costs and performance. Regulatory factors and plant-specific design features that will likely affect the future operating costs and performance of the Seabrook Nuclear Plant.

South Carolina Public Service Commission (Case 84-122-E) - August 1984
The repair and replacement strategy adopted by Carolina Power & Light Company in response to pipe cracking at the Brunswick Nuclear Station. Quantification of replacement power costs attributable to identified instances of mismanagement.

Vermont Public Service Board (Case 4865) - May 1984
The repair and replacement strategy adopted by management in response to pipe cracking at the Vermont Yankee nuclear plant.

New York State Public Service Commission (Case 28347) -January 1984
The information that was available to Niagara Mohawk Power Corporation prior to 1982 concerning the potential for cracking in safety-related piping systems at the Nine Mile Point Unit No. 1 nuclear plant.

New York State Public Service Commission (Case 28166) - February 1983 and February 1984
Whether the January 25, 1982, steam generator tube rupture at the Ginna Nuclear Plant was caused by mismanagement.

U.S. Nuclear Regulatory Commission (Case 50-247SP) - May 1983
The economic costs and benefits of the early retirement of the Indian Point nuclear plants.

REPORTS, ARTICLES, AND PRESENTATIONS

Conservation and Renewable Energy Should be the Cornerstone for Meeting Future Natural Gas Needs. Presentation to the Global LNG Summit, June 1, 2004. Presentation given by Cliff Chen.

Comments on natural gas utilities' Phase I Proposals for pre-approved full cost recovery of contracts with liquid natural gas (LNG) suppliers and the costs of interconnecting their systems with LNG facilities. Comments in California Public Utilities Commission Rulemaking 04-01-025. March 23, 2004.

The 2003 Blackout: Solutions that Won't Cost a Fortune, The Electricity Journal, November 2003, with David White, Amy Roschelle, Paul Peterson, Bruce Biewald, and William Steinhurst.

The Impact of Converting the Cooling Systems at Indian Point Units 2 and 3 on Electric System Reliability. An Analysis for Riverkeeper, Inc. November 3, 2003.

The Impact of Converting Indian Point Units 2 and 3 to Closed-Cycle Cooling Systems with Cooling Towers on Energy's Likely Future Earnings. An Analysis for Riverkeeper, Inc. November 3, 2003.

Entergy's Lost Revenues During Outages of Indian Point Units 2 and 3 to Convert to Closed-Cycle Cooling Systems. An Analysis for Riverkeeper, Inc. November 3, 2003.

Power Plant Repowering as a Strategy for Reducing Water Consumption at Existing Electric Generating Facilities. A presentation at the May 2003 Symposium on Cooling Water Intake Technologies to Protect Aquatic Organisms. May 6, 2003.

Financial Insecurity: The Increasing Use of Limited Liability Companies and Multi-tiered Holding Companies to Own Electric Generating Plants. A presentation at the 2002 NASUCA Annual Meeting. November 12, 2002.

Determining the Need for Proposed Overhead Transmission Facilities. A Presentation by David Schlissel and Paul Peterson to the Task Force and Working Group for Connecticut Public Act 02-95. October 17, 2002.

Future PG&E Net Revenues From The Sale of Electricity Generated at its Brayton Point Station. An Analysis for the Attorney General of the State of Rhode Island. October 2, 2002.

PG&E's Net Revenues From The Sale of Electricity Generated at its Brayton Point Station During the Years 1999-2002. An Analysis for the Attorney General of the State of Rhode Island. October 2, 2002.

Financial Insecurity: The Increasing Use of Limited Liability Companies and Multi-Tiered Holding Companies to Own Nuclear Power Plants. A Synapse report for the STAR Foundation and Riverkeeper, Inc., by David Schlissel, Paul Peterson, and Bruce Biewald, August 7, 2002.

Comments on EPA's Proposed Clean Water Act Section 316(b) for Cooling Water Intake Structures at Phase II Existing Facilities, on behalf of Riverkeeper, Inc., by David Schlissel and Geoffrey Keith, August 2002.

The Impact of Retiring the Indian Point Nuclear Power Station on Electric System Reliability. A Synapse Report for Riverkeeper, Inc. and Pace Law School Energy Project. May 7, 2002.

Preliminary Assessment of the Need for the Proposed Plumtree-Norwalk 345-kV Transmission Line. A Synapse Report for the Towns of Bethel, Redding, Weston, and Wilton Connecticut. October 15, 2001.

ISO New England's Generating Unit Availability Study: Where's the Beef? A Presentation at the June 29, 2001 Restructuring Roundtable.

Clean Air and Reliable Power: Connecticut Legislative House Bill HB6365 will not Jeopardize Electric System Reliability. A Synapse Report for the Clean Air Task Force. May 2001.

Room to Breathe: Why the Massachusetts Department of Environmental Protection's Proposed Air Regulations are Compatible with Reliability. A Synapse Report for MASSPIRG and the Clean Water Fund. March 2001.

Generator Outage Increases: A Preliminary Analysis of Outage Trends in the New England Electricity Market, a Synapse Report for the Union of Concerned Scientists, January 7, 2001.

Cost, Grid Reliability Concerns on the Rise Amid Restructuring, with Charlie Harak, Boston Business Journal, August 18-24, 2000.

Report on Indian Point 2 Steam Generator Issues, Schlissel Technical Consulting, Inc., March 10, 2000.

Preliminary Expert Report in Case 96-016613, Cities of Wharton, Pasadena, et al v. Houston Lighting & Power Company, October 28, 1999.

Comments of Schlissel Technical Consulting, Inc. on the Nuclear Regulatory Commission's Draft Policy Statement on Electric Industry Economic Deregulation, February 1997.

Report to the Municipal Electric Utility Association of New York State on the Cost of Decommissioning the Fitzpatrick Nuclear Plant, August 1996.

Report to the Staff of the Arizona Corporation Commission on U.S. West Corporation's telephone cable repair and replacement programs, May, 1996.

Nuclear Power in the Competitive Environment, NRRI Quarterly Bulletin, Vol. 16, No. 3, Fall 1995.

Nuclear Power in the Competitive Environment, presentation at the 18th National Conference of Regulatory Attorneys, Scottsdale, Arizona, May 17, 1995.

The Potential Safety Consequences of Steam Generator Tube Cracking at the Byron and Braidwood Nuclear Stations, a report for the Environmental Law and Policy Center of the Midwest, 1995.

Report to the Public Policy Group Concerning Future Trojan Nuclear Plant Operating Performance and Costs, July 15, 1992.

Report to the New York State Consumer Protection Board on the Costs of the 1991 Refueling Outage of Indian Point 2, December 1991.

Preliminary Report on Excess Capacity Issues to the Public Utility Regulation Board of the City of El Paso, Texas, April 1991.

Nuclear Power Plant Construction Costs, presentation at the November, 1987, Conference of the National Association of State Utility Consumer Advocates.

Comments on the Final Report of the National Electric Reliability Study, a report for the New York State Consumer Protection Board, February 27, 1981.

OTHER SIGNIFICANT INVESTIGATIONS AND LITIGATION SUPPORT WORK

Reviewed the salt deposition mitigation strategy proposed for Reliant Energy's repowering of its Astoria Generating Station. October 2002 through February 2003.

Assisted the Connecticut Office of Consumer Counsel in reviewing the auction of Connecticut Light & Power Company's power purchase agreements. August and September, 2000.

Assisted the New Jersey Division of the Ratepayer Advocate in evaluating the reasonableness of Atlantic City Electric Company's proposed sale of its fossil generating facilities. June and July, 2000.

Investigated whether the 1996-1998 outages of the three Millstone Nuclear Units were caused or extended by mismanagement. 1997 and 1998. Clients were the Connecticut Office of Consumer Counsel and the Office of the Attorney General of the Commonwealth of Massachusetts.

Investigated whether the 1995-1997 outages of the two units at the Salem Nuclear Station were caused or extended by mismanagement. 1996-1997. Client was the New Jersey Division of the Ratepayer Advocate.

Assisted the Associated Industries of Massachusetts in quantifying the stranded costs associated with utility generating plants in the New England states. May through July, 1996

Investigated whether the December 25, 1993, turbine generator failure and fire at the Fermi 2 generating plant was caused by Detroit Edison Company's mismanagement of fabrication, operation or maintenance. 1995. Client was the Attorney General of the State of Michigan.

Investigated whether the outages of the two units at the South Texas Nuclear Generating Station during the years 1990 through 1994 were caused or extended by mismanagement. Client was the Texas Office of Public Utility Counsel.

Assisted the City Public Service Board of San Antonio, Texas in litigation over Houston Lighting & Power Company's management of operations of the South Texas Nuclear Generating Station.

Investigated whether outages of the Millstone nuclear units during the years 1991 through 1994 were caused or extended by mismanagement. Client was the Office of the Attorney General of the Commonwealth of Massachusetts.

Evaluated the 1994 Decommissioning Cost Estimate for the Maine Yankee Nuclear Plant. Client was the Public Advocate of the State of Maine.

Evaluated the 1994 Decommissioning Cost Estimate for the Seabrook Nuclear Plant. Clients were investment firms that were evaluating whether to purchase the Great Bay Power Company, one of Seabrook's minority owners.

Investigated whether a proposed natural-gas fired generating facility was need to ensure adequate levels of system reliability. Examined the potential impacts of environmental regulations on the unit's expected construction cost and schedule. 1992. Client was the New Jersey Rate Counsel.

Investigated whether Public Service Company of New Mexico management had adequately disclosed to potential investors the risk that it would be unable to market its excess generating capacity. Clients were individual shareholders of Public Service Company of New Mexico.

Investigated whether the Seabrook Nuclear Plant was prudently designed and constructed. 1989. Clients were the Connecticut Office of Consumer Counsel and the Attorney General of the State of Connecticut.

Investigated whether Carolina Power & Light Company had prudently managed the design and construction of the Harris nuclear plant. 1988-1989. Clients were the North Carolina Electric Municipal Power Agency and the City of Fayetteville, North Carolina.

Investigated whether the Grand Gulf nuclear plant had been prudently designed and constructed. 1988. Client was the Arkansas Public Service Commission.

Reviewed the financial incentive program proposed by the New York State Public Service Commission to improve nuclear power plant safety. 1987. Client was the New York State Consumer Protection Board.

Reviewed the construction cost and schedule of the Hope Creek Nuclear Generating Station. 1986-1987. Client was the New Jersey Rate Counsel.

Reviewed the operating performance of the Fort St. Vrain Nuclear Plant. 1985. Client was the Colorado Office of Consumer Counsel.

WORK HISTORY

2000 - Present: Senior Consultant, Synapse Energy Economics, Inc.

1994 - 2000: President, Schlissel Technical Consulting, Inc.

1983 - 1994: Director, Schlissel Engineering Associates

1979 - 1983: Private Legal and Consulting Practice

1975 - 1979: Attorney, New York State Consumer Protection Board

1973 - 1975: Staff Attorney, Georgia Power Project

EDUCATION

1983-1985: Massachusetts Institute of Technology
Special Graduate Student in Nuclear Engineering and Project Management,

1973: Stanford Law School,
Juris Doctor

1969: Stanford University
Master of Science in Astronautical Engineering,

1968: Massachusetts Institute of Technology
Bachelor of Science in Astronautical Engineering,

PROFESSIONAL MEMBERSHIPS

- New York State Bar since 1981
- American Nuclear Society
- National Association of Corrosion Engineers
- National Academy of Forensic Engineers (Correspondent Affiliate)