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November 14, 2008

Ms. Erica Hamilton, Secretary
British Columbia Utilities Commission
Sixth Floor, 900 Howe Street, Box 250
Vancouver, BC, V6Z 2N3
BY EMAIL: Commission.Secretary@bcuc.com
AND BY WEB FILING
AND HARDCOPY BY COURIER

Dear Madam:

Re: British Columbia Hydro and Power Authority, 2008 Long Term Acquisition Plan,
BCUC Order No. G-96-08, BCUC Project #3698514

Enclosed please find the Direct Evidence of John Plunkett, Green Energy Economics Group, Inc. for filing in the 2008 LTAP proceeding. For reference, the contents of the pdf file are as follows:

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Yours truly,

William J. Andrews



Barrister & Solicitor

cc. Distribution List by email

BEFORE THE BRITISH COLUMBIA UTILITIES COMMISSION

British Columbia Hydro and Power Authority)
2008 Long Term Acquisition Plan)
BCUC Order No. G-96-08 and G-126-08)
BCUC Project #3698514)

DIRECT TESTIMONY OF

JOHN PLUNKETT

ON BEHALF OF

THE BRITISH COLUMBIA SUSTAINABLE ENERGY ASSOCIATION

AND

SIERRA CLUB OF BRITISH COLUMBIA

Green Energy Economics Group, Inc.

NOVEMBER 14, 2008

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Exhibit____JJP-2	<i>Comparison of Efficiency Portfolio Expenditures and Savings for Leading Electric Efficiency Portfolio Administrators</i>

1 **I. Identification and Qualifications**

2 **Q: State your name, occupation, and business address.**

3 A: I am John J. Plunkett. I am a partner in and president of Green Energy
4 Economics Group, Inc., a small energy consultancy I co-founded in 2005. My
5 office address is 1002 Jerusalem Road, Bristol Vermont 05443.

6 **Q: Summarize your qualifications.**

7 A: Trained as an economist, I have worked for thirty years in energy utility
8 planning, concentrating on energy efficiency as a resource and business strategy
9 for energy service providers.

10 Throughout my career I have played key advisory and negotiating roles on
11 all aspects of electric and gas utility demand-side management, including
12 residential, industrial and commercial program design; implementation
13 management and oversight; performance incentive design; and monitoring,
14 verification and evaluation. I have led, prepared or contributed to numerous
15 analyses and reports on the economically achievable potential for efficiency and
16 renewable resources.

17 I have worked on these issues throughout North America as well as in three
18 Chinese provinces on behalf of energy service providers, citizen and
19 environmental groups, state consumer advocates, utility regulators, government
20 agencies at the local, state, provincial, and national level.

21 I earned my B.A. in Economics with Distinction from Swarthmore
22 College, where I graduated *Phi Beta Kappa* and was awarded the Adams Prize
23 in Quantitative Economics. Exhibit ___JJP-1 contains my full resume.

24 **Q: Have you testified previously in utility regulatory proceedings?**

1 A: Yes. I have testified over two dozen times before utility regulators in a dozen
2 states and three Canadian provinces.

3 **Q: Have you testified previously before the British Columbia Utilities**
4 **Commission (the Commission)?**

5 A: Yes. Last year I testified in Project No. 3698419 regarding BC Hydro's 2006
6 Integrated Electricity Plan and Long Term Acquisition Plan. Last month I
7 submitted written evidence concerning the conservation program portfolio
8 proposed by the Terasen Companies (Terasen).

9 **Q: Have you been involved in other activities relevant to this proceeding?**

10 A: Yes. I have been involved in the review of many electricity and gas demand-side
11 management investment plans over the past two decades. Most recently, I
12 testified in October 2008 before the Connecticut Department of Public Utility
13 Control regarding the demand-side component of the proposed integrated
14 resource plans of the Connecticut Light and Power and the United Illuminating
15 Companies. On behalf of the Office of Consumer Counsel, I testified against
16 approval of a more aggressive long-range energy-efficiency investment portfolio
17 because I found it lacked credible analytical support.

18 Since its inception in 2000, I have been engaged as a senior advisor for
19 Efficiency Vermont, the nation's first statewide "energy-efficiency utility."
20 Currently I am helping to establish performance goals for the 2009-2011
21 contract with the Public Service Board, in which the portfolio investment budget
22 will climb from \$30 million to \$40 million annually. I am also leading a project
23 to forecast economically achievable peak demand and energy savings over the
24 next twenty years throughout the state and in 16 load zones. In 2006-7, I helped
25 Efficiency Vermont determine achievable performance targets for a major
26 budget expansion.

1 I have also been active in gas efficiency program planning. I am in the
2 midst of developing a five-year gas DSM program plan for Philadelphia Gas
3 Works. I am also working with People's Gas of Illinois to develop and apply a
4 cost-effectiveness calculator in the preparation of a three-year gas DSM
5 program portfolio.

6 Since 2007 I have been working for New York City's Economic
7 Development Corporation in the Public Service Commission's Energy
8 Efficiency Portfolio proceeding to establish programs for Consolidated Edison's
9 customers to reduce forecasted electricity and gas requirements for 2015 by
10 15%. I have also assisted the city in collaborative negotiations concerning Con
11 Edison's gas DSM programs for 2009-2010, and in the design and evaluation of
12 its geographically targeted electric DSM program to defer transmission and
13 distribution (T&D) investment.

14 In 2006-2007, I led a team of Chinese and American experts in a pre-
15 feasibility study For the Asian Development Bank of a 24-year, \$120 million
16 loan to Guangdong province to establish a positive-cashflow financing facility
17 for industrial and commercial/institutional efficiency investments. This analysis
18 included technical, economic, and financial analysis of the "efficiency power
19 plant" portfolio, and of case studies of ten "subprojects." ADB's board of
20 directors unanimously approved the loan in June 2008.

21 **II. Introduction and Summary**

22 **Q: On whose behalf are you testifying?**

23 A: My testimony is sponsored by the British Columbia Sustainable Energy
24 Association and Sierra Club of British Columbia (BCSEA, et al).

25 **Q: What is the purpose of your direct testimony?**

1 A: BCSEA asked me to assess the proposed energy-efficiency program plan
2 submitted by BC Hydro for Commission review in this proceeding.

3 **Q: What documents did you review?**

4 A: I reviewed a large number of documents, including

- 5 • Exhibit B-1, BC Hydro LTAP, Application and Appendices,
- 6 • Exhibit B-3, BC Hydro responses to Commission IR 1 and intervenors
7 IR1, and
- 8 • Exhibit B-4, BC Hydro responses to Commission IR 2 and intervenors IR2.

9 **Q: Summarize your findings, conclusions, and recommendations.**

10 A: BC Hydro developed and examined two competing long-term energy-efficiency
11 procurement plans for possible inclusion in its Long Term Acquisition Plan
12 (LTAP). It proposes to pursue Option A, which would reduce forecast electric
13 energy requirements by 10,820 GWh/year by F2020, rather than Option B,
14 which would save an additional 2,210 GWh/yr by F2020. Hydro recommends
15 against Option B because it concludes that it would be riskier, despite analysis
16 indicating that total resource portfolio costs would be \$709 million lower in
17 present value (PV).

18 I conclude that Hydro's proposal to pursue Option A is more than adequate
19 to meet the statutory requirement that cost-effective demand-side management
20 (DSM) meet at least half the forecast growth in energy requirements by 2020.

21 Hydro's overall approach to and methodology for assessing the risk of
22 more aggressive DSM investment is sound. I did find, however, that Hydro's
23 risk assessment of energy-efficiency investment failed to account for its strategic
24 risk-mitigating advantages – consisting of its high diversity compared with
25 supply resources, the uniquely strong correlation between the magnitude of
26 achievable energy-efficiency savings and variations in energy requirements, and

1 the modularity and scalability of discretionary investments in energy-efficiency
2 retrofits. This shortcoming in BC Hydro's DSM risk analysis leads it to
3 mistakenly conclude that Option B is inferior to Option A.

4 I also found considerable room for improvement in the design and delivery
5 of the programs BC Hydro proposes that would increase electricity savings and
6 net economic benefits. In particular, better integration of program design and
7 delivery with Terasen's natural gas DSM programs targeting the same markets
8 as BC Hydro's would improve program cost-effectiveness and market
9 penetration, especially in new construction and building retrofits.

10 The relative cost-effectiveness of electric vs. gas heating is highly
11 situation-specific. Nevertheless, it is clear that Hydro's Option A omits a
12 significant amount of cost-effective fuel-switching of electric space and water
13 heating to gas.

14 I conclude that BC Hydro's Option A does not meet the call by the Provincial
15 Government's Policy Action 3 for utilities "to pursue all cost-effective
16 investments in demand side management". Correcting errors in BC Hydro's
17 risk analysis reveals that the more aggressive Option B is more cost-effective
18 than Option A. The incremental savings from Option B over Option A would
19 cost half as much as the supply resources they would avoid. Further cost-
20 effective electricity savings could be acquired with better program integration
21 with Terasen on initiatives serving common markets such as new construction
22 and retrofit markets. Pursuing some portion of the cost-effective potential for
23 fuel substitution that BC Hydro found in the CPR would further increase cost-
24 effective savings.

25 On the basis of these conclusions, I recommend that the Commission direct
26 BC Hydro to

- 27 • pursue Option B in the LTAP, and reduce supply procurement accordingly;

- 1 • redesign programs to increase electric savings and net resource benefits, by
- 2 streamlining programs and better integrating some of them with Terasen's
- 3 gas efficiency programs;
- 4 • include cost-effective fuel-switching opportunities identified in the
- 5 Conservation Potential Review (CPR); and
- 6 • correct the errors I have identified here in the next iteration of what is
- 7 otherwise a sound approach to DSM risk assessment.

8 I further recommend that the Commission direct BC Hydro and Terasen to

9 invite other stakeholders (including BCSEA, et al) to participate in a cooperative

10 effort to develop an unbiased protocol for determining the cost-effectiveness of

11 electric-to-gas (and even potentially gas-to-electric) fuel-switching investment,

12 and a fair method for assigning and allocating the costs of programs that

13 promote it.

14 **Q. How have you organized the rest of this testimony?**

15 A. The next section addresses the extent to which the DSM program component of

16 BC Hydro's 2008 LTAP satisfies specific Commission and Government policy

17 objectives. Section IV outlines BC Hydro's analysis of DSM program Options

18 A and B. Section V compares BC Hydro's planned energy-efficiency

19 acquisitions with those of leading North American portfolio administrators. My

20 critical review of BC Hydro's DSM program planning is the subject of Section

21 VI. The final Section VII states my conclusions and recommendations.

22 **III. Goals and objectives for BC Hydro's Energy Efficiency Acquisition**

23 **Plans**

24 **Q: Subsection 44.1 (2) of the *Utilities Commission Act* requires BC Hydro to file**

25 **a long-term resource plan, and paragraph 44.1(2)(b) requires the long-term**

1 **resource plan to include a plan of how the utility intends to reduce the**
2 **demand for energy by taking cost-effective demand-side measures. Does BC**
3 **Hydro’s 2008 LTAP include a plan for reducing energy demand by**
4 **pursuing cost-effective demand-side savings?**

5 A: Yes, BC Hydro’s proposed Option A DSM is cost-effective, although I have
6 concluded that BC Hydro could improve its DSM plan by adding additional
7 cost-effective demand-side measures, as explained below.

8 **Q: With reference to paragraph 44.1(2)(f), does the 2008 LTAP include an**
9 **explanation of why the demand for energy to be served by incremental**
10 **utility generation facilities and energy purchases is not planned to be**
11 **replaced by demand-side measures?**

12 A: I found that BC Hydro’s explanation for rejecting DSM Option B is not
13 supported by the evidence, as I explain below.

14 **Q: With reference to paragraph 44.1(4)(c), does the 2008 LTAP include a**
15 **statement of the demand-side measures BC Hydro would need to take so**
16 **that, in combination with demand-side measures taken by the government**
17 **of British Columbia or of Canada or a local authority, the electricity**
18 **demand increase would be reduced by 50% by 2020 over 2008 levels?**

19 A: Yes, the DSM plan includes demand-side measures that even on their own, not
20 counting DSM programs by other administrators, would reduce incremental
21 electricity demand by more than 50% between 2008 and 2020.

22 **Q: With reference to paragraph 44.2(5)(a) and the 2007 Energy Plan, does BC**
23 **Hydro’s DSM Option A include pursuing all cost-effective demand-side**
24 **measures?**

25 A: No. As explained in Section VII of my testimony, DSM Option A leaves cost-
26 effective demand-side savings unrealized. The incremental savings generated

1 by DSM Option B would net an additional \$709 million in economic benefits
2 over Hydro's proposal to pursue Option A. There are probably additional cost-
3 effective savings available beyond Option B for BC Hydro to acquire through
4 better coordination with Terasen.

5 **Q: With reference to paragraph 44.2(5)(a) and the 2007 Energy Plan, does BC**
6 **Hydro's DSM plan ensure a coordinated approach to conservation and**
7 **efficiency is actively pursued in B.C.?**

8 A: Only partially. BC Hydro's DSM plan leaves room for improvement particularly
9 regarding better coordination with natural gas DSM programs by the Terasen
10 companies. In addition, there appears to be a gap in the policy framework
11 governing fuel switching.

12 **IV. BC Hydro's Long-Term Acquisition Plan for Energy Efficiency**
13 **Resources**

14 *A. Alternative scenarios for investment expenditures and performance*

15 **Q: What are the differences between Options A and B?**

16

17 A: According to BC Hydro, both options contain the same components and
18 programs. Focusing on energy efficiency programs, Option B is a more
19 aggressive assessment of energy efficiency potential including higher incentives
20 and marketing expenditures (LTAP 3-5). The following table provides a
21 breakdown of savings between efficiency programs, codes and standards, and
22 rate structures.

23

1
2

Planned Energy Savings for Options A and B by F2020 (GWh/yr)

	Codes and Standards			Rate Structures			Programs			Total		
	Option A	Option B	Diff	Option A	Option B	Diff	Option A	Option B	Diff	Option A	Option B	Diff
Residential	2,640	2,700	60	800	1,060	260	1,230	1,430	200	4,680	5,190	510
Commercial	540	700	160	370	470	100	1,490	1,770	280	2,400	2,930	530
Industrial	110	110	-	800	840	40	2,840	3,960	1,120	3,740	4,900	1,160
Total	3,290	3,500	210	1,970	2,370	400	5,560	7,160	1,600	10,820	13,030	2,210

3
4

Seventy-five per cent of the Option B increase over Option A is attributable to energy efficiency programs, and 70% of the incremental program savings originate from industrial EE programs.

B. Comparison of scenario costs and benefits

Q: How do BC Hydro’s DSM Options A and B compare?

A: The following table (Table 3-3 from the LTAP) provides total electricity savings and levelized costs per kWh of savings for the two options.

12
13

DSM Electric Savings and Costs

Option	Planned Energy Savings in F2020 (GWh/year)	Planned Capacity Savings in F2020 (MW)	All Ratepayers (Total Resource) Levelized Cost (\$/MWh)
Option A	10,820	1,730	41
Option B	13,030	2,100	42

14
15
16
17

BC Hydro states that “DSM Option A would deliver electricity savings at an average unit cost of \$41/MWh, compared to new electricity supply costing an average of \$125/MWh (Table 5-15). The costs of the DSM Plan could double or

1 more (or the benefits could fall by half or more) and it would remain low cost.”
2 (LTAP 6-5, pg 269)

3 **Q. What other evidence did you find in the LTAP regarding the relative**
4 **benefits and costs of Options A and B?**

5 A. BC Hydro estimates the incremental present-value costs of Option B over
6 Option A as \$687 million. The incremental benefits of this additional
7 investment are reported as \$1,396 million. Hydro’s analysis therefore indicates
8 a net gain in economic benefits to the Province from Option B of \$709 million
9 present value beyond Option A, for an incremental benefit/cost ratio of 2.03.

10 **Q. How significant are the additional net benefits achievable from Option B?**

11 A. The additional \$709 million in present worth net benefits from pursuing the
12 more aggressive DSM Option B represents a 6% reduction in the \$11,857
13 million PV cost of Hydro’s entire resource portfolio costs with Option A. This
14 is equivalent to an annual injection of \$62 million into British Columbia’s
15 economy over the 20-year planning horizon (assuming 6% real discount rate).

16 **C. Risk assessment of competing plans**

17 **Q. Summarize BC Hydro’s approach to DSM risk analysis.**

18 A. BC Hydro details its risk assessment framework and its application in Appendix
19 F14. At p. 19 it states:

20
21 While BC Hydro has extensive experience working with its customer groups to encourage
22 energy conservation and efficiency, the size and scope of these new DSM programs and
23 their interdependence on rate changes and codes and standards suggested that forecasts
24 around energy savings were subject to significant uncertainty. As a result, the delivery risk
25 of these energy savings was made a key part of the LTAP Risk Framework’s quantitative
26 analysis.

27
28 While each individual DSM program was planned to achieve a certain level of energy
29 savings by 2020, this level of energy savings per program was subject to two key drivers of
30 uncertainty;

- 31 • The participation rate of customers in that program; and

- 1 • The energy savings per participant.
2

3 Total savings from DSM programs was estimated as simply the sum of the twenty-one
4 individual DSM programs. However, calculating the spread of uncertainty was more
5 involved as DSM program managers identified some significant interdependencies amongst
6 some of the key drivers of uncertainty; failing to capture these interrelationships would
7 significantly understate the spread of uncertainty around DSM Program savings.
8

9 Total DSM program savings were taken as a sum of the savings from the twenty-one
10 individual programs. The savings from each program was a random variable, depending on the
11 product of the participation and the savings per participant. Taking into account
12 interrelationships amongst these random variables, a Monte Carlo simulation analysis was
13 carried out using 10,000 random draws to calculate the total savings across all customer
14 classes.
15

16 **Q. What is your opinion of BC Hydro's risk analysis framework?**

17 A. It appears to be a well-structured attempt to apply Bayesian decision analysis to
18 DSM resource planning.
19

20 **Q. What were the results of BC Hydro's risk analysis of DSM Program
21 Options A and B?**

22 A. The LTAP states at p. 5-58 that

23
24 The DSM resource options avoid a number of supply-side risks such as First
25 Nations and siting risk, GHG cost risk, commodity fuel risks such as higher natural gas
26 prices, and transmission costs. This adds to its value as a key resource to in BC Hydro's
27 acquisition plans.

28 Based upon DSM's low cost, the uncertainties and costs of supply side options,
29 and in consideration of the degree of reliance on DSM programs, BC Hydro concludes
30 that it should set a plan in line with DSM Option A, and that this significant challenge
31 should be the extent of the reliance on DSM savings at this point in time.
32

33 **D. BC Hydro's conclusions and recommendations**

34 **Q: Does BC Hydro conclude that Option A satisfies the Government's call in
35 Policy Action 3 for utilities to pursue all cost-effective DSM?**

36 A: Yes. As BC Hydro stated in response to BCUC Information Request 1.46.1:

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BC Hydro has pursued all cost-effective DSM in its DSM Plan ... The definition of cost-effectiveness is broad and includes low cost, deliverability risk and diversity, meaning the degree to which BC Hydro is relying on a particular resource for its energy and/or capacity needs.

BC Hydro's best overall estimate of the maximum energy savings that are low cost relative to supply is provided by the economic potential from the 2007 CPR. The economic potential was estimated to be 19,017 GWh/yr in F2021. ...

BC Hydro's best estimate of the maximum energy savings that are cost-effective is represented by the volume of electricity savings delivered by DSM Option A. BC Hydro believes that the pursuit of DSM beyond this volume, while the savings are low cost, is not cost-effective due to the significant deliverability risk associated with the incremental electricity savings coupled with the lack of diversity within the overall resource portfolio containing DSM Option B. For this reason, BC Hydro is pursuing all cost-effective DSM by pursuing the volume of DSM electricity savings delivered by DSM Option A. DSM Option B would meet 92 per cent of the energy gap and over 100 per cent of the capacity gap by F2020.

19 **V. Comparison of Hydro's Energy Efficiency Plans with Leading Program**
20 **Administrators**

21 **Q: Did Hydro compare Option A and B with DSM portfolios of other utilities?**

22 A: Yes. On page 31 of Appendix K, BC Hydro computes the average annual DSM
23 savings as a percentage of sales and compares this figure with other utilities'
24 efforts. Option A falls short of many leading utility administrators in program
25 savings as well as "programs + codes and standards" savings as a percentage of
26 sales.

27 As for Option B, BC Hydro finds that "(w)hen measured as the annual
28 incremental energy efficiency savings as a percentage of sales, only New York
29 and New Jersey are more aggressive than BC Hydro's Option B." (LTAP 6-8),

30 **Q: Have you done your own comparison of BC Hydro's planned spending and**
31 **savings with leading portfolio administrators?**

1 A. Yes. Exhibit JJP-2 compares BC Hydro's Option A with past and planned
2 spending and savings by leading program administrators. BC Hydro's program
3 savings from Option A as a percentage of sales fall short of almost all the
4 leading DSM providers – especially going forward.

5 **Q. What findings do you reach from these comparisons?**

6 A. Option A would place BC Hydro at the back of the pack of leading energy-
7 efficiency portfolio administrators in North America, when compared both with
8 past and planned investments elsewhere. Pursuing Option B would advance BC
9 Hydro to the forefront of efficiency portfolio administrators, but not all the way
10 to the front of the pack.

11 **VI. Critical assessment of BC Hydro's DSM planning**

12 A. *Missing cost-effective potential*

13 1. *Fuel-switching*

14 **Q: On what basis does BC Hydro exclude fuel-switching from the DSM**
15 **program LTAP?**

16 A: BC Hydro excludes fuel switching from both Options A and B. The reason it
17 gives for excluding fuel switching is as follows: "Fuel switching from electricity
18 to natural gas was screened out for purposes of this DSM Plan because while the
19 B.C. Government has legislated GHG targets for the Province pursuant to the
20 Greenhouse Gas Reduction Targets Act - the Act sets into law B.C.'s GHG
21 emissions target of at least 33 per cent below 2007 levels by 2020, and at least
22 80 per cent below 2007 levels by 2050, with interim targets for 2012 and 2016

1 to be set by the end of 2008 - there is uncertainty as to how those targets will be
2 met. BC Hydro will continue to monitor GHG legislative and policy
3 developments, and will revisit whether fuel switching should be targeted as part
4 of its next DSM Plan.” (Appendix K, p. 15).

5 **Q: Do cost-effective fuel-switching opportunities exist**

6 A: Yes. BC Hydro’s Comprehensive Potential Review 2007 found an economically
7 cost-effective potential of 6,102 GWh by 2021. (BC Hydro Comprehensive
8 Potential Review 2007, p. 45). Despite this it was rejected from the achievable
9 potential for the following reasons: “Study team members, including those from
10 the consultant team, BC Hydro and the External Review Panel, reviewed the
11 results of the fuel-switching Economic Potential forecasts. Based on the results
12 of that review, there was consensus that none of the fuel-switching measures
13 included in either of the two Economic Potential forecasts provided a practical
14 opportunity for BC Hydro to pursue as part of its DSM initiatives. Hence, there
15 was no Achievable Potential for fuel switching under either of the supply cost
16 forecasts.” (BC Hydro Comprehensive Potential Review 2007, p. 45).

17
18 2. *Large C&I customers*

19 **Q: Which aspects of BC Hydro’s Power Smart program designs inhibit deeper
20 efficiency investments by eligible participants?**

21 A: BC Hydro does not offer incentives for large customers with the TSR Tier 2
22 rate. (Appendix K, p. 178 “Transmission customers will have the choice of
23 receiving capital incentives for the implemented energy efficient measures or
24 applying the DSM project to their CBL under the TSR in order to receive the
25 benefit of the Tier 2 price.”)

1 This practice of BC Hydro’s non-residential Power Smart program design
2 discourages comprehensiveness and/or customer participation: the denial of
3 financial incentives to the largest customers billed at stepped rates.

4 **Q: How could lifting the restriction on financial incentives to customers billed**
5 **at the Tier 2 rate increase cost-effective savings acquisition?**

6 A: Hydro withholds financial incentives in its transmission-level Power Smart
7 Partners program to those customers paying stepped (i.e., increasing-block)
8 rates. This second tier of rates charges transmission-level customers rates that
9 better reflect Hydro’s long-run marginal costs (i.e., avoided costs). Hydro’s
10 theory appears to be that higher electricity prices will be just as effective as
11 financial incentives currently offered in overcoming market barriers preventing
12 industrial customers from undertaking custom efficiency upgrades on their own
13 (2006 EEP at 5).

14 **Q: Why do you disagree with Hydro’s proposition that stepped rates will be**
15 **just as effective as financial incentives offered other customers on lower**
16 **rates?**

17 A: Withholding financial incentives from the array of program strategies Hydro
18 uses to overcome industrial efficiency market barriers will likely severely deter
19 participation as well as the depth of savings participants accomplish. Over the
20 past generation, utilities with industrial rates far above 6¢/kWh (for example, in
21 California, New York, New Jersey, Connecticut, Massachusetts, and Vermont)
22 have found financial incentives to be necessary to achieve the significant and
23 highly cost-effective savings they realize from their industrial programs.
24 Hydro’s policy is likely to leave untapped much of the Power Smart portfolio’s
25 most cost-effective efficiency savings. Conversely, restoring financial incentives
26 to the program in conjunction with stepped rates would probably increase

1 savings compared to previous experience, as the stepped rates increase
2 customers' interest in efficiency investment.

3 **Q. Does your testimony on this subject relate to BC Hydro's alternative**
4 **program Option B?**

5 A. Yes, it does. Hydro projects that most of incremental savings in Option B over
6 Option B are from industrial customers. It appears that relaxing BC Hydro's
7 restrictions on large customer participation would go along way toward
8 achieving the additional savings from Option B.

9

10 **B. *Biased risk assessment of DSM Program Option B***

11 **Q. Why do you find that BC Hydro's risk analysis of Option B is biased?**

12 A. BC Hydro has misconstrued the risks of pursuing its more aggressive energy-
13 efficiency acquisition option in the following ways:

- 14 • It understates the diversity of the additional energy efficiency savings
15 compared to supply resources.
- 16 • It fails to consider the uniquely high correlation between energy savings
17 and energy requirements.
- 18 • It does not reflect the modularity and scalability of discretionary retrofit
19 programs compared to supply.

20 **Q. How does BC Hydro understate the diversity of additional DSM?**

21 A. BC Hydro treats the additional DSM as if it were a single point source of supply,
22 observing that the total DSM savings with Option B would be equivalent to the
23 capacity of the Burrard station. In fact, additional savings will originate from a
24 large number of small sources from a diverse set of efficiency technologies

1 applied across a wide range of end-uses, efficiency markets, and customers over
2 a long time.

3 Hydro acknowledges that the main uncertainties in eventual program
4 savings deliverability come down to savings per participant and total
5 participation. The likelihood of “losing” a large amount of the incremental
6 savings associated with Option B is far lower than losing a single supply
7 resource of the same size.

8 **Q. What is so significant about the high correlation between DSM program
9 energy savings and BC Hydro’s total energy requirements?**

10 A. Imagine a supply resource that automatically increased output as energy
11 requirements increased, both in the short term (e.g., diurnally and seasonally)
12 and over the long term (e.g., following changes in actual and forecast annual
13 requirements). Such a resource would be considered far less risky than a
14 resource without this risk-mitigating advantage.

15 In the aggregate, energy efficiency resources are the only resources
16 available to BC Hydro that display high correlation with load. In the parlance of
17 BC Hydro’s risk analysis, there is a uniquely strong covariance between energy
18 efficiency savings and system energy requirements.

19 On an hourly basis, for example, the hotter and more humid it gets in the
20 summer, the higher the load on Hydro’s system; likewise, greater the savings
21 from high-efficiency air-conditioners as temperature and humidity increase. The
22 reverse is also true. The same dynamic applies to space heating efficiency
23 improvements.

24 This covariance between efficiency savings and energy requirements also
25 applies over the long term. Swings in annual growth in electricity requirements
26 are highly correlated with economic cycles. Ups and downs in economic

1 activity are extremely highly correlated with the underlying pace of new
2 construction, renovation, and expansion. The current recession will lead to a
3 downturn in underlying investments in these markets. The economically
4 achievable potential for efficiency upgrades in these markets will thus naturally
5 decline during an economic slowdown.

6 Conversely, the eventual economic recovery will inevitably lead to an
7 increase in new construction, renovation, and expansion investment. The result
8 will be not only higher electric energy requirements due to the faster pace of
9 economic activity, but also increased efficiency program savings as the size of
10 new construction, renovation, and expansion markets expands.

11 Failing to address directly the strongly positive correlation between
12 electricity requirements and efficiency program savings is an error of omission
13 in BC Hydro's otherwise rigorous approach to DSM risk assessment. It
14 introduces bias into the risk assessment by skewing the distribution of potential
15 outcomes and thus over-estimating the riskiness of more ambitious efficiency
16 investment.

17 **Q. How do you know BC Hydro ignored the covariance between load growth,**
18 **both diurnal and annual, in its risk assessment of DSM program Option B?**

19 A. BC Hydro explains that it treated program savings and load growth as
20 independent processes (i.e., without significant covariance):

21 DSM energy savings, when paired with expected load growth, determines the size of the
22 load/resource gap that needs to be filled over time with additional resources. Treating
23 DSM savings and load growth as different processes was a simplification that allowed
24 the separate impacts of load growth (driven by economic growth, population change,
25 etc) and DSM savings (driven by elasticities of demand, government initiatives,
26 participation rates, etc) to be varied.
27
28

29 The problem is that load growth and efficiency savings are not independent
30 processes as BC Hydro assumes. In fact, DSM savings is not alone in being a

1 function of elasticities of demand; so, of course, is load growth. Clearly load
2 growth and DSM programs are anything but independent.

3 **Q. What is modular and scalable about DSM retrofit programs, and why does**
4 **this matter?**

5 A. BC Hydro can modulate the pace and scale of its efficiency retrofit programs
6 according to resource needs dictated by changing system energy requirements,
7 once fully operational. This feature is complementary to and reinforces the
8 long-term covariance of economically achievable electricity savings in new
9 construction markets with BC Hydro's long-term energy requirements. It means
10 that compared to conventional utility supply resources, efficiency retrofit
11 resource acquisition is uniquely flexible.

12 **Q. Have regulators elsewhere recognized these risk mitigating advantages of**
13 **energy-efficiency resources relative to supply?**

14 A. Yes. In 1990, the Vermont Public Service Board directed program
15 administrators to apply a 10% cost discount to energy-efficiency measures and
16 programs in the conduct of cost-effectiveness analysis for making investment
17 decisions. This policy remains in force almost two decades later. It stands in
18 stark contrast to the negative risks BC Hydro attributes to energy efficiency
19 resource acquisition.

20

21 **C. *Improving integration of electric and gas efficiency programs***

22 **Q: What do you mean by improving integration?**

23 A: I mean integrating the design and delivery of programs procuring electricity and
24 gas savings from the same customers in the same markets.

1 *1. Design and delivery of programs serving common markets*

2 **Q: How would you characterize the degree of coordination between BC**
3 **Hydro's DSM programs and Terasen's proposed programs serving the**
4 **same markets?**

5 A: I find that the residential and commercial gas efficiency programs are not
6 designed to integrate electricity and gas efficiency investments that arise in new
7 construction and in retrofit opportunities among BC Hydro's customers.

8 **Q: Substantiate your finding that BC Hydro's new construction and retrofit**
9 **strategies inadequately treat electricity and gas savings opportunities in**
10 **combination.**

11 A: BC Hydro's residential new construction strategies only address electric end
12 uses. However, there are additional residential efficiency measures, such as
13 building shell improvements, that save both gas and electricity. Typically such
14 measures are cost-effective under the TRC when both (gas and electricity)
15 savings are counted but not so on the basis of one or the other. This applies in
16 both residential new construction and residential retrofit. Failure to integrate
17 electricity and gas savings into program design and delivery could easily lead to
18 the false conclusion that efficiency investments are not cost-effective.

19 As for new construction, the existence of two separate efficiency programs
20 run by BC Hydro and by Terasen would result in lower market penetration and
21 less comprehensive savings among participants.

22 *2. Policy guidelines for fuel-substitution investment*

23 **Q: What is your view of BC Hydro's treatment of fuel-substitution?**

1 A: Hydro is mistaken in dismissing the potential for energy savings from fuel
2 substitution because of unfavorable customer economics at current prices, since
3 it could jointly design and deliver a program with Terasen that overcomes a
4 regulated pricing barrier. I recommend clear regulatory guidance by the
5 Commission on the economic “rules of the game” in determining which fuel-
6 substitution opportunities are economically worthwhile, and how much money
7 is reasonable for each set of ratepayers to contribute toward program incentives
8 and administration costs.

9 **VII. Conclusions and recommendations**

10 **Q: What are your conclusions and recommendations?**

11 A. BC Hydro’s analysis is biased against DSM by overstating the dispersion of
12 potential outcomes. BC Hydro’s choice of DSM Option A would sacrifice \$700
13 million in present worth benefits to the system. My primary conclusion is that
14 the Commission should therefore direct BC Hydro to pursue DSM program
15 Option B.

16 In addition, I recommend that the Commission require BC Hydro to
17 integrate more closely its electricity DSM programs with the Terasen
18 Companies’ natural gas DSM programs.

19 Lastly, I recommend that the Commission address the current absence of
20 guidelines for fuel-substitution investment.

21 **Q: Does this complete your direct testimony?**

22 A. Yes, it does.

RESUME

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Trained as an economist, John Plunkett has worked for 30 years in energy utility planning, concentrating on energy efficiency as a resource and business strategy by energy service providers. He has played key advisory and negotiating roles on all aspects of electric and gas utility demand-side management, including residential, industrial and commercial program design, implementation, oversight, performance incentives, and monitoring and evaluation, and their respective roles in business, regulatory, ratemaking, resource planning and policy decisions. He has led, prepared or contributed to numerous analyses and reports on the economically achievable potential for efficiency and renewable resources.

Plunkett has worked throughout North America and in three Chinese provinces. He has provided expert testimony before regulators in Connecticut, Delaware, the District of Columbia, Florida, Illinois, Indiana, Louisiana, Maine, Maryland, Massachusetts, New Jersey, New York, North Carolina, Pennsylvania, and Vermont, as well as in the Canadian provinces of British Columbia, Ontario, and Quebec.

EMPLOYMENT HISTORY

2005-present

*Partner and co-founder, **Green Energy Economics Group, Inc.**, Bristol, VT*

Three-person consultancy specializing in energy-efficiency and renewable resource portfolios investing in electricity and gas savings. Technical and strategic assistance with development, design, economic and financial analysis, planning, administration, implementation management support, oversight, performance verification and evaluation, design of performance incentive and pricing mechanisms, and regulatory and ratemaking treatment of utility-funded electricity and gas energy-efficiency portfolios.

1996 – 2005

*Partner and co-founder, **Optimal Energy, Inc.**, Bristol, VT.*

Strategic planning, implementation management and regulatory support on energy-efficiency investment by regulated and unregulated businesses. Lead consultant for Natural Resources Defense Council on demand-side management portfolio design and economic analysis in two Chinese provinces. Lead author and expert witness on report recommending revamped performance incentive for Connecticut efficiency program administrators, on behalf of Office of Consumer Counsel. Led statewide efficiency and renewable potential study for New York and efficiency potential study for Vermont. Lead author and expert witness on assessment of economically achievable transmission capacity from efficiency resources for Vermont's transmission utility. Advisor on economic analysis of clean energy initiative for the Long Island Power Authority, program cost-effectiveness in Massachusetts and New Jersey collaboratives, and regional market transformation initiatives for Northeast Energy Efficiency Partnerships.

1990 – 1996

Senior Vice President, Resource Insight, Inc., Middlebury, VT.

Provided analysis of DSM resource planning/acquisition and integrated resource planning in numerous states. Investigated regulatory and planning reforms needed to integrate demand-side resources with least-cost planning requirements by public utility commissions. Prepared, delivered and/or supported testimony on wide variety of IRP, DSM, economic, cost recovery and other issues before regulatory agencies throughout North America. Consulted and provided technical assistance regarding utility filings. Responsible for presentations and seminars on DSM planning and evaluation.

1984 – 1990

Senior Economist, Komanoff Energy Associates, New York, NY.

Directed consulting services on integrated utility resource planning. Testified on utility resource alternatives, including energy-efficiency investments and independent power. Examined costs and benefits of resource options in over twenty-five proceedings. Supported major investigation into utility DSM investment and integrated resource planning. Designed and co-wrote microcomputer software for evaluating the financial prospects of customer-owned power generation. Wrote and spoke widely on integrated planning issues. Contributed to least-cost planning handbooks prepared by the National Association of Regulatory Utility Commissioners and by the National Association of State Utility Consumer Advocates.

1978 – 1984

Staff Economist, Institute for Local Self-Reliance, Washington, D.C.

Project development and management for a non-profit consulting firm specializing in energy and urban economic development. Project manager and economist for an investigation into the economic impact on small generators from electric utilities' grid-interconnection requirements. Coordinated research by three electrical engineers, and analyzed the impact of interconnection costs on wind, hydroelectric and cogeneration projects in seven utility service areas in New York. Provided technical coordination in cases before the District of Columbia Public Service Commission involving gas and electric utility demand management investment, non-utility generation pricing, both for the D.C. Office of People's Counsel.

1977-78

Energy Project Director, D.C. Public Interest Research Group, Washington, D.C. 1977. Led energy research and advocacy on campuses of Georgetown and George Washington Universities.

EDUCATION

B.A., Economics, with Distinction, *Phi Beta Kappa*, Swarthmore College, Swarthmore, PA, 1983. Awarded annual Adams Prize in Quantitative Economics.

(Georgetown University School of Foreign Service, Washington, DC, 1975-1977.)

PROJECT EXPERIENCE

ONGOING AND RECENT ASSIGNMENTS

DOMESTIC

Vermont

- Senior Policy Advisor to Efficiency Vermont, the world's first Energy Efficiency Utility, operating under contract with the Vermont Public Service Board to deliver statewide energy-efficiency programs for the customers of Vermont's electric utilities. Senior management team member from inception in 2000 through 2007; led program development and planning, 2000-2002. Responsibilities include economic analysis, advice, and policy, evaluation research planning, and most recently, technical direction of a 20-year forecast of electricity savings from continued investment. Contract negotiation team member advising on performance goals and incentive mechanism for four successive contracts over twelve years, including major budget increases ordered by the PSB in 2006, and for the \$107 million 2009-11 portfolio budget ordered in August 2008. Strategic advice and analysis on demand-side capacity bidding into New England ISO's forward capacity market.
- Technical support to Vermont's largest electric distribution utility in its participation in the Vermont System Planning Committee to pursue accelerated, geographically-targeted demand-side investment as non-transmission alternatives, on behalf of Central Vermont Public Service (in progress).
- Program design and regulatory support for 5-year investment of \$9 million Energy Efficiency Fund, supplementing Efficiency Vermont investment, on behalf of Green Mountain Power. February 2007 – present. Rebuttal testimony on achievable value from additional energy-efficiency investment in utility service area, on behalf of Green Mountain Power in its merger approval application in Docket No. 7213. December 2006-January 2007. The PSB approved the plan in April 2007.

Pennsylvania

- Conservation program design, implementation planning, and regulatory support, for Philadelphia Gas Works. In progress.
- Analysis and report on costs and benefits of meeting all statewide load growth with energy-efficiency investment, on behalf of Citizens for Pennsylvania's Future (Pennfuture). September 2007.
- Direct and surrebuttal testimony for Citizens for Pennsylvania's Future (Pennfuture) on appropriate levels of efficiency portfolio investment in two rate cases before the Pennsylvania Public Utility Commission: Docket Nos. 00061366 and 00061367 re Metropolitan Edison Company and Pennsylvania Electric Company; and Docket No. R-00061346 re Duquesne Light Company. May - August 2006.

New York

- Advisor on energy-efficiency portfolio design and implementation, for the Economic Development Corporation of the City of New York, in three proceedings before the New York Public Service Commission. One is the PSC's investigation into an energy-efficiency portfolio standard for meeting statewide energy savings goals of 15% by 2015. The second is a collaborative effort with Consolidated Edison's gas division to design a portfolio of gas efficiency programs. The third is evaluation and future redesign of Con Ed Electric's \$1250 million network-targeted demand-side program. 2007-present.

Connecticut

- Testimony regarding long-range energy-efficiency procurement plan of the Energy Conservation Management Board, on behalf of the Connecticut Office of Consumer Counsel. August –October 2008.

Illinois

- Cost-effectiveness calculator development, oversight of cost/benefit analysis, and regulatory support for 3-year energy-efficiency portfolio for People's Gas. In progress.

Florida

- Direct testimony on the effect of economically achievable energy efficiency on the need for new coal-fired generation, on behalf of the Sierra Club and other environmental intervenors, Florida Public Service Commission Docket No. 070098-EI. March-April 2007. The PSC denied the requested certificate of public good in June 2007.

INTERNATIONAL

British Columbia, Canada

- Direct testimony and technical support on assessment of BC Hydro's long-term DSM plan, before the BCUC, on behalf of the BC Sustainable Energy Association and Sierra Club Canada. In progress.
- Direct testimony and technical support on assessment of Terasen Gas conservation plans before the BCUC, on behalf of the BC Sustainable Energy Association and Sierra Club Canada. In progress.
- Direct testimony on energy-efficiency investment spending and savings, British Columbia Hydro and Power Authority, 2006 Integrated Electricity Plan and Long Term Acquisition Plan, Project No. 3698419; and F2007/F2008 Revenue Requirements Application, Project No. 3698416, on behalf of the Sierra Club of Canada (British Columbia Chapter), British Columbia Sustainable Energy Association, and Peace Valley Environment Association. September 2006 – January 2007.

People's Republic of China

Central Government

- Consulting team member on a project developing a national DSM implementation manual for China, sponsored by the National Development and Reform Commission, led by the Natural Resources Defense Council, in cooperation with California's investor-owned utilities, and funded by the international Renewable Energy and Energy Efficiency Programme (REEEP). Wrote chapters concerning performance indicators and cost-effectiveness analysis. 2007-Spring 2008.

Guangdong Province

- Consultant for the Institute for Sustainable Communities to assist Chinese experts with technical, economic, and financial assessments of industrial retrofit projects in Guangdong Province (in progress). Economic and financial assessment of efficiency retrofits to a ceramics manufacturing plant. Training on and development of efficiency investment economic and financial analysis tools. 2007-present.
- Team leader for Chinese and international consultants on a pre-feasibility analysis for the Asian Development Bank of a 24-year loan to support a \$120 million demonstration Efficiency Power Plant (EPP) project in Guangdong province, focusing on industrial, commercial and institutional retrofits. June 2006 – 2007. ADB Board of Directors unanimously approved the loan and its first tranche of projects in June 2008.

Jiangsu Province

- Consulting team leader on development, assessment, and implementation of demand-side management investment portfolios for China, for the Natural Resources Defense Council. (July 2003 – 2007) Responsible for program implementation planning and support (2005-2007). Led modification and application of US-based program and portfolio economic analysis tool for DSM planning. Assisted Jiangsu Province with design and planning for first-stage implementation of Efficiency Power Plant (EPP) programs investing \$12 million annually on high-efficiency retrofits to industrial motors and drives and commercial lighting and cooling. Directed economic and financial analysis of industrial retrofits for several manufacturers to determine financial incentives offered by the program. October 2005 – 2007. Training and technical support on economic and financial analysis of industrial retrofit projects for structuring and negotiating financial incentive offers to customers (ongoing).

PRIOR ASSIGNMENTS (OPTIMAL ENERGY)

- Policy and economic advisor for Massachusetts energy efficiency collaboratives, focusing on regulatory, cost-effectiveness, shareholder incentives and other policy issues and strategies, on behalf of Massachusetts Collaborative Non-Utility Parties. (January 1999 – 2005)
- Co-author (with Optimal Energy and Vermont Energy Investment Corporation), Comments on Efficiency Maine's 2006-2008 Program Plan, on behalf of Maine's Office of Public Advocate. September 2005.
- Team leader providing technical assistance supporting rulemaking to implement energy-efficiency provision of renewable portfolio standard for Pennsylvania, on behalf of Citizens for Pennsylvania's Future (PennFuture). Lead consultant on development of protocols for measuring savings from energy-efficiency investments as tradable credits toward the electricity resource portfolio standard. Protocols adopted by the Pennsylvania Public Utilities Commission. 2005. (February – September 2005)
- Leader of analysis of economically achievable potential for energy-efficiency resources to offset loss of output in the event of early retirement of the Indian Point nuclear generation station, on behalf of the National Academy of Sciences. May-October 2005.
- Co-author (with Paul Chernick) of testimony assessing planned energy-efficiency investments by British Columbia Hydro, on behalf of the British Columbia Sustainable Energy Association and British Columbia Sierra Club, August 2005.
- Written testimony recommending energy-efficiency portfolio investment levels and savings goals in utility merger application before the Pennsylvania Public Utility Commission, Joint Application of PECO Energy Company and Public Service Electric and Gas Company for Approval of the Merger of Public Service Enterprise Group with and into Exelon Corporation, on behalf of the Pennfuture Parties, June 28, 2005.
- Co-author of and expert witness supporting "Getting Results: Review of Hydro Quebec's Proposed 2005-2010 Energy Efficiency Plan," before the Quebec Energy Board, on behalf of a coalition of business, municipal, and environmental groups (January-March 2005)
- Testimony (with Ashok Gupta) before the New York Public Service Commission supporting joint settlement proposal for 300 MW of additional efficiency investment in Con Edison territory, on behalf of the Natural Resources Defense Council, Pace Energy Project, and the Association for Energy Affordability (December 2004 – January 2005).
- Report and testimony on performance incentives for administrators of conservation and load management programs in Connecticut, on behalf of Connecticut Office of Consumer Counsel. (February 2003 – August 2004). DPUC adopted recommended performance incentive mechanism for 2006 program year.
- Project leader, including report and testimony, for consulting team projecting potential for demand-side resources to defer the need for the Northwest Reliability Project, a major

transmission upgrade, on behalf of Vermont Electric Power Company. (November 2001 – December 2004)

- Report and testimony on Opportunities for Accelerated Electrical Energy Efficiency in Québec 2005 – 2012, on behalf of Regroupement National des Conseils Régionaux de L'environnement du Québec, Regroupement des Organismes Environnementaux en Energie and Regroupement pour la Responsabilité Sociale des Entreprises. (March – June 2004)
- Project leader for consulting team assessing technical, achievable and economic potential for energy-efficiency and renewable resources in New York State and five sub regions over 5, 10 and 20 years, on behalf of New York State Research and Development Authority. (January 2002 – August 2003)
- Project leader for consulting team updating statewide projection of economically achievable efficiency potential for state of Vermont, on behalf of the Vermont Department of Public Service. (October 2001 – 2003)
- "A Conservation Contingency Plan for Indian Point: Using California's Success Beating Blackouts to Replace Nuclear Generation Serving Greater New York," prepared for the Natural Resources Defense Council, October 2003.
- "The Achievable Potential for Electric Efficiency Savings in Maine." Projected and compared 10-year C&I costs, savings and benefits (based on technical potential analysis prepared by Exeter Associates). Expert testimony on behalf of the Office of Public Advocate, before the Maine PUC. (October 2002)
- Project leader for consulting team supporting utilities in targeting demand-side resources to optimize distribution investment planning in statewide distributed utility planning collaborative, on behalf of the Vermont Department of Public Service. (September 2001 – December 2002) Led development of DSM scoping tool, an MS Excel spreadsheet for preliminary analysis of the economically achievable potential for energy-efficiency to defer or displace planned distribution investments.
- Advisor on economic analysis for program planning and implementation of multi-year statewide energy-efficiency programs in the New Jersey Clean Energy Collaborative involving all the state's electric and gas utilities and the Natural Resources Defense Council. (April 2000 – June 2003, on behalf of NRDC). Co-directed collaborative work on program development, planning, and implementation for Conectiv. (November 1996 – 2000)
- Analysis and testimony before the Connecticut Siting Council on integrating potential demand reductions from targeted demand-side resources into need assessment for transmission upgrades, on behalf of the Connecticut Office of Consumer Counsel. Docket No. 217. (February 2002 – February 2003)
- Advice and negotiation on policy and scope of utility activities regarding targeted DSM to optimize distribution investment planning, involving Consolidated Edison, PECO Energy, and Orange and Rockland Utilities, on behalf of the Natural Resources Defense Council (Con Ed and PECO) and Pace Energy Project (O&R). (1999 – 2000)

- Consultant to Vermont Senate Natural Resources and Finance Committees on efficiency and renewable policies in restructuring legislation passed by the Senate but not adopted by the House. Provided technical assistance to support drafting and passage of utility restructuring legislation (S.62). (1997)
- Provided direct testimony and cross-examination relating to the future of DSM under the proposed BG&E/PEPCo utility merger. Case No. 8725 In the matter of Application of BGE, PEPCo & Constellation Energy Corporation for Merger. (1996)
- "Examining the Potential for Energy Efficiency in Michigan: Help for the Economy and the Environment," for American Council for an Energy-Efficient Economy (ACEEE). Analysis and report projecting costs and benefits of aggressive energy-efficiency investment. (January 2003)
- Led consulting team in the preparation of detailed recommendations for implementing strategic plan for acquiring clean power resources for the Jacksonville Electric Authority. (May – September 2001)
- Consultant to Citizens Utilities Corporation, supporting planning and management of investments pursuing maximum achievable levels of optimally cost-effective energy-efficiency in its Vermont Electric Division. (1997 – 2001)
- Consultant to PEPCo Energy Services on building energy-efficiency into retail service offerings. (2000 – 2001)
- Consultant to California Board for Energy-Efficiency, the agency responsible for administering wires-charge funded statewide energy-efficiency programs. Technical service consultant on nonresidential program design. (1997 – 1999)
- Lead consultant on energy product development for consumer energy cooperative, on behalf of Vermont Energy Futures, a non-profit organization spearheading development of a consumer-owned energy cooperative that will bundle electricity with energy-efficiency, renewables, and fossil fuels for residential, low-income, and small non-residential customers. One of key team members who prepared grant application to federal Health and Human Services Department for \$800,000 grant supporting development of the co-op. (1997 – 2000)
- Led feasibility analysis and prepared preliminary business plan for bundling electricity, fuel, efficiency services, and green power initially targeting low-income and environmentally-conscious consumers, on behalf of the Energy Coordinating Agency and Conservation Consultants, Inc. (July – December 1997). Consultant on energy and business strategy and planning for Energy Cooperative Association of Pennsylvania, a buyers' cooperative offering electricity, fuel oil, energy-efficiency, and renewable energy to residential and non-profit consumers in eastern and western Pennsylvania. (1998 – July 1999)
- Lead consultant on energy efficiency program design and planning for Maryland Office of People's Counsel and Maryland Energy Administration. Led research, analysis, and program descriptions and budgets for use in restructuring workshops and legislative development on efficiency and renewable programs supported by system benefits charge. (1998)

- Lead consultant for the Vermont Department of Public Service regarding energy-efficiency investment during and after the transition to electricity restructuring. Lead author of *The Power to Save: A Plan to Transform Vermont's Efficiency Markets*, the DPS filing which calls for development of centrally delivered statewide core programs by an efficiency utility. Prepared written testimony, on behalf of the Vermont Department of Public Service in Docket 5980. (1997 – 1999)
- Support to the Burlington (VT) Electric Department in developing energy efficiency programs and policies as part of their resource and business planning. (November 1996 – May 1997)
- Prepared written report to the Ontario Energy Board assessing the 1997 DSM Plan filed by Union and Centra Gas LTD in light of prior OEB decisions, as well as specific program plans for residential and non-residential customers. The report also addressed potential changes in gas DSM regulation, cost recovery, and incentives. [*Assessment of the Centra/Union Gas Fiscal 1997 DSM Plan*, Plunkett, Hamilton, and Mosenthal, August 30, 1996.] Also testified before the OEB concerning the report's findings and recommendations. Union/Centra Rate Case, EBRO 493/494. Also prepared a report and testified on Union Gas's DSM program design in EBRO 496/94/95. (July 1996 – November 1996)

PRIOR ASSIGNMENTS (RESOURCE INSIGHT)

- Consultant on energy-efficiency program, planning, and policy issues for Maryland utilities including Potomac Electric, Baltimore Gas and Electric, Potomac Edison, Delmarva Power and Light, Southern Maryland Electric Cooperative, Washington Gas, on behalf of Maryland Office of People's Counsel. Coordinator and lead negotiator on DSM collaboratives for Washington Gas, Potomac Electric, Baltimore Gas and Electric, Delmarva Power and Light and Potomac Electric. Projects have included resource planning and allocation, program design, policy, cost recovery, mechanism design, and monitoring and evaluation planning. (1989 – 1997)
- Support to the Vermont Department of Public Service in assessing the performance and expenditures of Green Mountain Power's commercial and industrial DSM programs. Also provided support to the DPS in the evaluation of GMP's actions surrounding the Vermont Joint Owners contract with Hydro Quebec including prudence. (1997)
- Prepared testimony and supported settlement negotiations concerning the DSM Plan of Jersey Central Power and Light on behalf of the Mid Atlantic Energy Project and New Jersey Public Interest Research Group. Analyzed DSM policy and commercial and industrial programs. Docket No. EE9580349 In the matter of Consideration and Determination of Jersey Central Power and Light Company's Demand Side Management Resource Plan filed pursuant to N.J.A.C. 14:12. (1995)
- Support to the Iowa Office of Consumer Advocate with the review and analysis of MidAmerican's, Interstate Power's and Iowa Electric Services' existing energy efficiency plans. Developed proposals for changes to and modifications of the utilities commercial and industrial energy efficiency programs. (1995 – 1996)
- Prepared testimony and supported the Iowa Office of Consumer Advocate in settlement negotiations re IES Utilities C/I DSM programs. Docket No. EEP-95-1. (February 1996)

- Supported Florida Power Corporation with development of alternative DSM programs for commercial and industrial customers. (1995 – 1997)
- Supported the development of testimony and discussions regarding DSM program alternatives for Carolina Power & Light, on behalf of the Southern Environmental Law Center. Docket No. 92-209-E. (1995 – 1996)
- Reviewed and commented on Consumer Gas' C/I DSM programs on behalf of the Green Energy Coalition. (1995)
- Support to the Vermont Department of Public Service in negotiation settlement with Green Mountain Power regarding DSM program design and planning, focusing on target retrofits in load centers under T&D capacity constraints, and increased participation and comprehensiveness of lost-opportunity programs. (1995)
- Consulting services and expert testimony concerning Ontario Hydro's DSM plans and acquisition of lost-opportunity resources on behalf of the Green Energy Coalition. Before Ontario Energy Board H.R. 22. re: Ontario Hydro 1995 Rates and Spending. (1994) and re: Ontario Hydro's Bulk Power Rates for 1993. Ontario Energy Board HR-21. (1992)
- Reviewed Tennessee Valley Authority programs and environmental planning for the Tennessee Valley Energy Reform Coalition. (November 1994 – July 1995)
- Prepared and defended direct testimony on gas and electric Demand-Side Management/Integrated Resource Planning guidelines before the North Carolina Public Utilities Commission. Evaluated DSM activities in light of market barriers, total-resource-cost-effectiveness, and rate impacts. Docket No. E-100, SUB 64A in the matter of Request by Duke Power Company for Approval of a Food Service Program, Docket E-100, SUB 71 In the matter of Investigation of the Effect of Electric IRP and DSM Programs on the Competition Between Electric Utilities and Natural Gas Utilities. (1994)
- Prepared and defended expert testimony and led analyses of demand-side management and fuel switching opportunities in Central Vermont Public Service territory, on behalf of the Vermont Department of Public Service. Project involved detailed analysis of measure costs, savings, and cost-effectiveness. Vermont Public Service Board, Docket 5270-CVPS-1&3. (1994)
- Prepared and defended expert testimony for the Vermont Department of Public Service on prudence of demand-side management in CVPS rate case. Vermont Public Service Board, Docket 5724. (May – August 1994)
- Directed and supported the preparation of joint testimony for Enersave, an efficiency service provider. Before the New York Public Service Commission, Case No. 94-E-0334. (September 1994)
- Joint testimony with Jonathan Wallach for the New York Public Utility intervenors reviewing 1994 LILCo DSM Plan. Before the New York Public Service Commission. P.S.C. Case No. 93-5-1123. (May 1994)
- Contributed to the critique of PECO Demand-Side Management Plan for the Nonprofits

Energy Savings Investment Program. (February 1994)

- Provided direct testimony in a proceeding to investigate restrictions on DSM that could give one utility (gas or electric) an unfair competitive advantage over another (electric or gas, respectively). Before the Louisiana Public Service Commission Docket No. U-20178 Re: Louisiana Power & Light Company Least Cost Resource Plan. (1994)
- Provided expert testimony in support of PEPCo's DSM implementation. Before the Public Service Commission of the District of Columbia. Case No. 929. (1993)
- Prepared written testimony for the Maryland Office of People's Counsel analyzing potential for demand-side resources offset need for power for proposed coal-fired plant. Delmarva Power & Light Company Dorchester Power Plant Certificate of Public Convenience and Necessity. Maryland PSC Case No. 8489. (January 1993)
- Coordinated testimony assessing the planning process, screening analyses, and cost-recovery proposals of the Detroit Edison Company for its demand-side management programs. Estimated potential levels of savings; identified improvements to the utility's proposed cost-recovery, lost-revenue, and incentive mechanisms; and recommended regulatory signals consistent with least-cost planning. Provided economic and regulatory advice, consulting services, and oversaw preparation of testimony. Michigan PSC Case No. U-10102. (1992)
- Economic and regulatory advice, consulting services, and oversaw preparation of testimony. Provided technical services encompassing demand-side management program monitoring and evaluation, cost recovery, and review of second efficiency plans. Before the Iowa Utilities Board, Iowa Power and Light Docket No. EEP-91-3 and Interstate Power Company Docket No. EEP-91-5. (1992)
- Consulting on policy and resource-allocation issues on behalf of the Vermont Department of Public Service as part of DSM-program-design collaboratives with Vermont Gas. (1990 – 1991), Citizens Utilities (1990 – 1991), Central Vermont Public Service Corporation (1990) and Green Mountain Power. (1990)
- Comprehensive assessment of Ontario Hydro's 25-year resource plan. Directed work by over a dozen consultants. The study encompassed load forecasting; assessing DM potential and costs; resolving DM-implementation, resource-integration, and institutional issues; assessing all resource costs, including externalities; assessing costs of all supply resources, including non-utility generators; and estimating avoided costs. (1990 – 1992)
- Support to the Pennsylvania Energy Office in its evaluation of Pennsylvania electric utility demand-management plans by preparing testimony and co-authoring a comprehensive, five-volume study of all aspects of demand management. This document surveys issues related to integration of demand-management resources into utility planning, and reconciling least-cost planning objectives with rate-impact constraints; discusses strategies for utility intervention to remove market barriers to energy conservation; evaluates cost-recovery mechanisms for demand-management expenditures by utilities; explores issues related to the screening demand-management measures and programs; and examines direct costs, risk, and externalities avoidable through demand management. (1991 – 1993)

- Provided analysis of 1991 - 1992 New York electric utility DSM plans, and support for the analysis of 1993 - 1994 DSM Plans on behalf of Pace University Center for Environmental and Legal Studies, and Vladeck, Waldman, Elias & Engelhard, P.C., Counsel for the Class of LILCo Ratepayers in County of Suffolk *et al. v. LILCo et al.* Proceeding to Inquire into the Benefits to Ratepayers and Utilities from Implementation of Conservation Programs that will reduce Electric Use, New York Public Service Commission Case No. 28223. (1990, 1992, 1994)
- Reviewed Demand Side Management regulations and DSM compliance filings of four New Jersey utilities on behalf of the New Jersey Division of Rate Counsel. Demand Side Management Resource Plan of Jersey Central Power & Light Company. Docket No. EE-92020103. (1992 Identified energy-efficiency resources missing from FPL's resource plan that could provide economical substitutes for proposed power supply option. Expert testimony also addressed environmental costs avoided by DSM. Florida PSC Docket No. 920520-EG, In Re: Joint Petition of Florida Power and Light and Cypress Energy Partners, Limited Partnership for Determination of Need. (1992)
- Provided technical consulting services for the Indiana Office of Utility Consumer Counselor, including expert testimony. In the matter of the Petition of Indianapolis Power & Light Company for a Certificate of Public Convenience and Necessity for the Construction by it of Facilities for the Generation of Electricity and Submission and Request for Approval of Plan to meet future needs for Electricity. Cause No. 39236. (August 1991 – May 1992)
- Provided technical consulting services for the Indiana Office of Utility Consumer Counselor, including expert testimony. In the matter of the Petition of PSI Energy, Inc. Filed Pursuant to the Public Service Commission Act, as Amended, and I.C. 8-1-8.52 for the Issuance of Certificates of Public Convenience and Necessity to Construct Generating Facilities for the Furnishing of Electric Utility Service to the Public and for the Approval of Expenditures for such Facilities. Cause No. 39175. (June 1991 – February 1992)
- Testimony and surrebuttal for the Delaware PSC Staff. Before the Delaware Public Service Commission Staff, In the Matter of the Application of Delmarva Power & Light Company for Approval of 48 MW Power Purchase Agreement with Star Enterprise, PSC Docket No. 90-16. (January 1991)
- Prepared comments on IRP principles and objectives for the Southern Environmental Law Center. Commonwealth of Virginia State Corporation Commission Order Establishing Commission Investigation to Consider Rules and Policy Regarding Conservation and Load Management Programs, Case No. PUE900070. (1991)

PRIOR ASSIGNMENTS (KOMANOFF ENERGY ASSOCIATES)

- Advisor to the Vermont Public Service Board. Supported formulating issues, conducting hearings, deciding policy, and drafting opinions and orders on DSM planning programs, and ratemaking. Advised the Board's hearing officer on numerous decisions concerning policy and process, including cost-benefit analysis, design and coverage of utility energy-efficiency programs and integrated planning requirements. Investigation into Least-Cost Investments, Energy Efficiency, Conservation, and Management of Demand for Energy, Docket No. 5270. (1988 – 1990)
- Technical advisor to the Public Utility Law Project of New York. Recommended economic principles for planning utility DSM investment for low-income customers in New York. Proceeding on Motion of the Commission to Determine Whether the Major Gas and Combination Gas and Electric Utilities Subject to the Commission's Jurisdiction Should Establish and Implement a Low-Income Energy Efficiency Program, Case 89-M-124. (1990).
- Provided technical assistance and advice on behalf of the South Carolina Department of Consumer Affairs on all aspects of Integrated Resource Planning and DSM planning including cost-effectiveness tests for South Carolina PSC investigation into Electric Utility Least-Cost Planning, Docket No. 87-223-E. (1987 – 1992)
- Prepared and defended expert testimony for the Indiana Office of Utility Consumer Counselor on potential for DSM to defer need for new generating capacity. Petition of Southern Indiana Gas and Electric Co. for Approval of Construction and Cost of Additional Electric Generation and for Issuance of a Certificate of Need Therefore, Indiana Utility Regulatory Commission, Cause No. 38738. (September 1989)
- Prepared and defended expert testimony for the Illinois Citizens Utility Board on adequacy of Commonwealth Edison's DSM efforts. Rulemaking Implementing Section 8-402 of the Public Utilities Act, Least-Cost Planning, Illinois ICC Docket No. 89-0034. (July 1989)
- Supported the Vermont Public Service Board with analysis, findings, and conclusions regarding the need for power based on potential DSM resources. Application of Twenty-Four Electric Utilities for a Certificate of Public Good Authorizing Execution and Performance of a Firm Power and Energy Contract with Hydro-Quebec and a Hydro-Quebec Participation Agreement, Docket No. 5330. (1989 – 1990)
- Cost-benefit analysis for the City of Chicago examining alternatives to the renewal of Commonwealth Edison's franchise. (1989)
- Co-author (with J. Wallach) of *The Power Analyst*, integrated spreadsheet-based software for projecting the economic and financial performance of renewable and cogeneration projects, for the New York State Energy Research and Development Authority. Project manager, economic analysis. (1989)
- Advisor for the South Carolina Department of Consumer Affairs. Assessed costs and benefits of long-term power contract. In the Matter of Duke Power Company, Federal Energy Commission, Docket No. ER89-106-000. (January 1989 – March 1990)

- Analyzed and provided expert testimony on the economic potential for cost-effective DSM to substitute for capacity and energy from a combined cycle generating plant. Testimony. Application of Potomac Electric Power Company for Certificate of Public Convenience and Necessity for Station H, Maryland PSC Docket No. 8063 Phase II. (1988)
- Examined, compared, and recommended appropriate cost-effectiveness tests for the DSM portion of the Massachusetts Department of Public Utilities investigation into the Pricing and Ratemaking Treatment to Be Afforded New Electric Generating Facilities Which Are Not Qualifying Facilities. Docket No. 86-36. (1988)
- Testimony for the District of Columbia on electric and gas utility least-cost planning. Application of the Potomac Electric Power Company for Changes to Electric Rate Schedules, D.C. PSC Formal Case 834 Phase II. (April and June 1987)
- Stood cross-examination for the Connecticut Division of Consumer Counsel to defend KEA's financial assessment of CL&P's ability to withstand Millstone 3 disallowance. Investigation into Excess Generating Capacity of Connecticut Light & Power Company, Connecticut DPUC Docket No. 85-09-12. (April 1986)
- Cross examination for the Connecticut Division of Consumer Counsel to defend financial and statistical model supporting KEA's findings of CL&P construction imprudence. Retrospective Audit of the Prudence of the Construction of Millstone 3, Connecticut DPUC Docket 83-07-03. (March 1986)
- Cross-examination for the Pennsylvania Office of Consumer Advocate, defended quantification of imprudence findings by O'Brien/Kreitzberg & Associates regarding PECO's construction management of the Limerick 1 project. Pennsylvania PUC v. Philadelphia Electric Company Docket R-850152. (February 1986)
- Prepared and defended direct and surrebuttal testimony for the Pennsylvania Office of Consumer Advocate critiquing utility conservation and cogeneration assumptions and presented alternative 20-year electricity sales projection. Pennsylvania PUC Limerick 2 Investigation Docket I-840381. (April 1985)

PRIOR ASSIGNMENTS (INSTITUTE FOR LOCAL SELF-RELIANCE)

- Technical and economic analysis of small-generator grid interconnection of seven New York electric utilities for the New York Energy Research and Development Authority. Project manager, economic analysis. (1983)
- Written testimony on behalf of the Alaska Public Interest Research Group implementing PURPA 210. Before the Alaska PUC. (1981)
- Written and oral testimony in oversight hearings on state implementation of the Public Utility Regulatory Policy Act of 1978 (PURPA). U.S House of Representatives Subcommittee on Energy Conservation and Power. (1981)
- Written and oral testimony in rulemaking for the Public Utility Regulatory Policy Act of 1978 (PURPA) on behalf of ILSR, before the Federal Energy Regulatory Commission. (1979)

PUBLICATIONS/PRESENTATIONS

"'Walking the Walk' of Distributed Utility Planning: Deploying Demand-Side Transmission and Distribution Resources in Vermont, Part Dieux" with Bruce Bentley 2008 *Summer Study on Energy Efficiency in Buildings*, American Council for an Energy Efficient Economy, Pacific Grove, California, August 2008.

"Demand-Side Management Strategic Plan for Jiangsu Province, China: Economic, Electric and Environmental Returns from an End-Use Efficiency Investment Portfolio in the Jiangsu Power Sector," with Barbara Finamore and Francis Wyatt, 2006 *Summer Study on Energy Efficiency in Buildings*, American Council for an Energy Efficient Economy, Pacific Grove, California, August 2006.

"'Walking the Walk' of Distributed Utility Planning: Deploying Demand-Side Transmission and Distribution Resources in Vermont's 'Southern Loop,'" with Bruce Bentley and Francis Wyatt, , 2006 *Summer Study on Energy Efficiency in Buildings*, American Council for an Energy Efficient Economy, Pacific Grove, California, August 2006.

"Comparative Performance of Electrical Energy Efficiency Portfolios in Seven Northeast States," with Glenn Reed and Francis Wyatt, 2006 *Summer Study on Energy Efficiency in Buildings*, American Council for an Energy Efficient Economy, Pacific Grove, California, August 2006.

"Charting New Frontiers with Vermont's Deployment of Demand-Side Transmission and Distribution Resources," ACEEE National Conference on Energy Efficiency as a Resource, Berkeley, CA, September 27, 2005.

"Energy Efficiency and Renewable Energy Resource Potential In New York State: Summary of Potential Analysis Prepared For the New York State Energy Research and Development Authority", invited presentation to the National Academy of Sciences Committee On Alternatives to Indian Point, Washington, DC, January 2005.

"Estimating and Valuing Energy-Efficiency Resource Contributions: Toward a Common Regional Protocol," presented at the Northeast Energy Efficiency Partnerships conference on regional efficiency policy, November 2004.

"The Economically Achievable Energy Efficiency Potential in New England," presented at the Northeast Energy Efficiency Partnerships conference on regional efficiency policy, November 2004.

"Rewarding Successful Efficiency Investment In Three Neighboring States: The Sequel, the Re-Make and the Next Generation (In Vermont, Massachusetts and Connecticut)," (with P. Horowitz and S. Slote), 2004 *Summer Study on Energy Efficiency in Buildings*, American Council for an Energy Efficient Economy, Pacific Grove, California, August 2004.

"Measuring Success at the Nation's First Efficiency Utility" (With B. Hamilton), 2002 *Summer Study on Energy Efficiency in Buildings*, American Council for an Energy Efficient Economy, Pacific Grove, California, August 2002.

"New Jersey's Clean Energy Collaborative: Model or Mess?" (with D. Bryk and S. Coakley), 2002

Summer Study on Energy Efficiency in Buildings, American Council for an Energy Efficient Economy, Pacific Grove, California, August 2002.

"Yes, Virginia, You Can Get There From Here: New Jersey's New Policy Framework For Guiding Ratepayer-Funded Efficiency Programs" (with S. Coakley and D. Bryk), *2000 Summer Study on Energy Efficiency in Buildings*, American Council for an Energy Efficient Economy, Pacific Grove, California, August 2000.

"Integrated Market-Based Efficiency and Supply for Small Energy Consumers: The Consumer Energy Cooperative" (with B. Sachs and E. Belliveau) *2000 Summer Study on Energy Efficiency in Buildings*, American Council for an Energy Efficient Economy, Pacific Grove, California, August 2000.

"Comprehensive Energy Services At Competitive Prices: Integrating Least-Cost Energy Services to Small Consumers through a Retail Buyer's Cooperative" (with B. Sachs), *1998 Summer Study on Energy Efficiency in Buildings*, American Council for an Energy Efficient Economy, Pacific Grove, California, August 1998.

"Capturing Comprehensive Benefits from Commercial Customers: A Comparative Analysis of HVAC Retirement Alternatives" (with P. Mosenthal and M. Kumm), *1996 Summer Study on Energy Efficiency in Buildings*, American Council for an Energy Efficient Economy, Pacific Grove, California, August 1996. 5.169.

"Joint Delivery of Core DSM Programs: The Next Generation, Made in Vermont" (with S. Parker), *1996 Summer Study on Energy Efficiency in Buildings*, American Council for an Energy Efficient Economy, Pacific Grove, California, August 1996. 7.127.

"Retrofit Economics 201: Correcting Common Errors in Demand-Side Management Cost-Benefit Analysis" (with R. Brailove and J. Wallach) *IGT's Eighth International Symposium on Energy Modeling*, Atlanta, Georgia, April 1995.

"DSM's Best Kept Secret: The Process, Outcome and Future of the PEPco-Maryland Collaborative" (with R. D. Obeiter and E. R. Mayberry), *Proceedings of the ACEEE Summer Study on Energy Efficiency in Buildings*, Monterey, California, August 1994. 10.199.

Louisville Gas and Electric Company. Invited to make presentation on commercial program design. March 10, 1994.

"DSM for Public Interest Groups," Seminar coordinator and presenter. DSM Training Institute, Boston, Massachusetts, October 1993.

DSM Training Institute - *Training for Ohio DSM Advocates: Effective DSM Collaborative Processes*. Seminar co-presenter. Cleveland, Ohio, August 1993.

"Demand-Management Programs: Targets and Strategies," Vol. 1 of "Building Ontario Hydro's Conservation Power Plant" (with J. Wallach, J. Peters, and B. Hamilton), Coalition of Environmental Groups, Toronto, ONT, November 1992.

"DSM Program Monitoring and Evaluation: Prospects and Pitfalls for Consumer Advocates," *Proceedings from the Mid-Year NASUCA Meeting*, Saint Louis, Missouri, June 8, 1993.

"Twelve Steps To Comprehensive Demand-Management Program Development: A Collaborative Perspective", *Proceedings from the IRP Workshop: The Basic Landscape, NARUC-DOE Fourth IRP Conference*, Burlington Vermont, September 1992. 45.

"Demand-Side Cost Recovery: Toward Solutions that Treat the Causes of Utility Under-Investment in Demand-Side Resources" (with P. Chernick), *Proceedings from the Third NARUC Conference on Integrated Utility Planning*, Santa Fe, New Mexico, April 1991.

"Demand-Side Bidding: A Viable Least-Cost Resource Strategy?" (with P. Chernick and J. Wallach), *Proceedings from the Seventh NARUC Biennial Regulatory Information Conference*, Columbus, Ohio, September 1990.

"Where Do We Go From Here? Eight Steps for Regulators to Jump-Start Least-Cost Planning" (with M. Dworkin), *Proceedings from the Seventh NARUC Biennial Regulatory Information Conference*, Columbus, Ohio, September 1990.

"A Utility Planner's Checklist for Least-Cost Efficiency Investment" (with P. Chernick) *Proceedings from the Seventh NARUC Biennial Regulatory Information Conference*, September 1990. Also published in *Proceedings from the Canadian Electric Association's Demand-Side Management Conference*, St. John, Nova Scotia, September 1990.

"Carrots and Sticks: Do Utilities Need Incentives to Do the Right Thing on Demand-Side Investment?", *Proceedings from the National Association of State Utility Consumer Advocates* Santa Fe, New Mexico, June 1990.

"New Tools On the Block: Evaluating Non-Utility Supply Opportunities with the Power Analyst" (with J. Wallach), *Proceedings from the Fourth National Conference on Microcomputer Applications in Energy*, Phoenix, AZ, April 1990.

"Breaking New Ground in Collaboration and Program Design," *The Rocky Mountain Institute Competitek Forum* (Moderator), Aspen, Colorado, September 1989.

"Lost Revenues and Other Issues in Demand-Side Resource Evaluation: An Economic Reappraisal" (with P. Chernick), *1988 Summer Study on Energy Efficiency in Buildings*, American Council for an Energy Efficient Economy, Pacific Grove, California, September 1988.

"Pursuing Least-Cost Strategies for Ratepayers While Promoting Competitive Success for Utilities", *Proceedings from the Least-Cost Planning Conference, National Association of Regulatory Utility Commissioners*, Aspen, Colorado, April 1988.

"Balancing Different Economic Perspectives in Demand-Side Resource Evaluation", Workshop on Demand-Side Bidding, Co-sponsored by New York State PSC, ERDA, and Energy Office, Albany, New York, March 1988.

"There They Go Again: A Critique of the AER/UDI Report on Future Electricity Adequacy through the Year 2000" (with C. Komanoff, H. Geller and C. Mitchell), Presentation NASUCA (also debated AER/UDI co-author before NARUC annual meeting), New Orleans, Louisiana, November 1987.

"Saying No to the No-Losers Test: Correctly Assessing Demand-Side Resources to Achieve Least-Cost Utility Strategies", *Proceedings from the Mid-year NASUCA meeting*, Washington, D.C., June 1987.

"The Economic Impact of Three Mile Island" (with C. Komanoff), *Proceedings from the American Association for the Advancement of Science symposium*, May 1986.

"Facing the Grid" (with D. Morris), *New Shelter*, May - June 1981.

Exhibit__ JJP-2
Actual and Planned Efficiency Expenditures and Savings
For Leading Efficiency Program Administrators
(Nominal \$)

	Year	Residential		Non-Residential		Total	
		Savings % of Sales	Spending per annual kWh Saved	Savings % of Sales	Spending per annual kWh Saved	Savings % of Sales	Spending per annual kWh Saved
BC Hydro (Option A)	2008	0.2%	\$0.33	0.7%	\$0.16	0.6%	\$0.18
	2009	0.3%	\$0.59	0.6%	\$0.25	0.5%	\$0.31
	2010	0.5%	\$0.53	0.6%	\$0.32	0.6%	\$0.39
	2011	0.8%	\$0.46	0.8%	\$0.31	0.8%	\$0.36
	2012	0.7%	\$0.52	0.9%	\$0.31	0.8%	\$0.37
	2013	0.5%	\$0.61	1.0%	\$0.32	0.8%	\$0.38
	2014	0.5%	\$0.64	1.4%	\$0.36	1.1%	\$0.40
	2015	0.5%	\$0.64	0.9%	\$0.39	0.7%	\$0.44
	2016	0.5%	\$0.59	0.9%	\$0.40	0.8%	\$0.44
SMUD	2006	0.8%	\$0.27	0.7%	\$0.24	0.7%	\$0.25
SDG&E	2005	2.1%	\$0.14	2.0%	\$0.20	2.0%	\$0.18
	2006	0.8%	\$0.25	0.7%	\$0.21	0.7%	\$0.25
	2007					1.6%	\$0.21
SCE	2004	1.6%	\$0.12	0.9%	\$0.16	1.2%	\$0.14
	2005	1.8%	\$0.13	1.6%	\$0.17	1.7%	\$0.16
	2006	1.3%	\$0.18	0.6%	\$0.25	0.9%	\$0.15
	2007					1.8%	\$0.16
PG&E	2004	0.9%	\$0.22	0.6%	\$0.17	0.7%	\$0.19
	2005	1.3%		1.5%		1.5%	\$0.15
	2006	1.1%		0.8%		0.8%	\$0.32
	2007	2.2%		0.6%		2.0%	\$0.23
CT	2001	0.8%	\$0.37	1.3%	\$0.24	1.1%	\$0.27
	2002	0.6%	\$0.39	1.0%	\$0.33	0.8%	\$0.35
	2003	0.3%	\$0.39	0.5%	\$0.30	0.4%	\$0.36
	2004	0.8%	\$0.22	1.1%	\$0.23	1.0%	\$0.23
	2005	0.8%	\$0.27	1.2%	\$0.23	1.0%	\$0.24
	2006	0.9%	\$0.26	1.3%	\$0.19	1.1%	\$0.21
EVT	2001	1.0%	\$0.25	0.6%	\$0.20	0.7%	\$0.23
	2002	1.0%	\$0.29	0.6%	\$0.24	0.8%	\$0.27
	2003	1.0%	\$0.32	0.9%	\$0.19	0.9%	\$0.30
	2004	1.0%	\$0.31	0.7%	\$0.32	0.8%	\$0.32
	2005	1.2%	\$0.25	0.7%	\$0.37	0.9%	\$0.31
	2006	1.3%	\$0.29	0.7%	\$0.33	0.9%	\$0.31
	2007	2.4%	\$0.18	1.2%	\$0.26	1.6%	\$0.22
	2008	2.1%	\$0.23	1.7%	\$0.31	1.8%	\$0.28
MA	2002	0.4%	\$0.57	0.5%	\$0.43	0.4%	\$0.47
	2003					0.6%	\$0.38
	2004					0.8%	\$0.29
	2005					0.8%	\$0.27
NYSERDA	2005	0.6%	\$0.20	0.5%	\$0.43	0.6%	\$0.15
	2006	0.6%	\$0.18	0.0%	\$0.00	0.6%	\$0.14
	2007	0.4%	\$0.33	0.0%	\$0.00	0.5%	\$0.17
	2008	0.5%	\$0.34	0.0%	\$0.00	0.4%	\$0.28
	2009	0.9%	\$0.28	0.0%	\$0.00	1.0%	\$0.23