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October 14, 2008

British Columbia Utilities Commission
Sixth Floor, 900 Howe Street, Box 250
Vancouver, BC, V6Z 2N3
Attn: Erica Hamilton, Secretary
By Web Posting and courier

Dear Madam:

Re: Terasen Gas Inc. and Terasen Gas (Vancouver Island) Inc.
Energy Efficiency and Conservation Programs Application
BCUC Project No. 3698512; Order G-102-08 and G-130-08

Attached please find the Evidence of the intervenors B.C. Sustainable Energy Association and Sierra Club of British Columbia. For reference, the following is a table of contents:

Cover letter	pdf. p.1
Direct Testimony of John Plunkett	pdf p.2
Exhibit JPP-1, Resume	pdf p.27
Exhibit JPP-2, Supply Curves for Gas Energy-Efficiency Savings Under Total Resource and Utility Cost-Effectiveness Tests	pdf p.45
Exhibit JPP-3, Actual and Planned Expenditures and Savings For Leading Gas Efficiency Program Administrators	pdf p.46

Hard copies will be provided to the Commission by courier.

Yours truly,

William J. Andrews



Barrister & Solicitor

cc. Distribution List by email

BEFORE THE BRITISH COLUMBIA UTILITIES COMMISSION

)
RE: Terasen Gas Inc.-Terasen Gas) **BCUC Project No. 3698512**
Vancouver Island Energy Efficiency)
and Conservation Programs)

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.

OCTOBER 14, 2008

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Exhibit___JJP-1	<i>Professional Qualifications of John Plunkett</i>
Exhibit___JJP-2	<i>Supply Curves for Natural Gas Energy Efficiency Savings</i>
Exhibit___JJP-3	<i>Comparison of Efficiency Portfolio Expenditures and Savings for Leading Natural Gas Utilities</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.

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

8 A: Yes. I have been involved in the review of many electricity and gas
9 demand-side management investment plans over the past two decades. Last
10 month, for example, I testified before the Connecticut Department of Public
11 Utility Control regarding the demand-side component of the proposed integrated
12 resource plans of Connecticut Light and Power and of United Illuminating, on
13 behalf of the Office of Consumer Counsel.

14 In Vermont, I have been engaged as a senior advisor for Efficiency
15 Vermont, the nation's first statewide "energy-efficiency utility," since its
16 inception in 2000. In 2006-7, I worked with Efficiency Vermont to determine
17 achievable savings goals for a major budget expansion. Currently I am helping
18 to establish performance goals for the 2009-2011 contract with the Public
19 Service Board, in which the portfolio investment budget will climb to \$40
20 million annually. At Efficiency Vermont I am also leading a project to forecast
21 economically achievable peak demand and energy savings over the next twenty
22 years throughout the state and in 16 load zones, assuming recently-ordered
23 funding levels remain fixed in real terms throughout the planning period.

24 I have also been active in gas efficiency program planning. I am in the
25 midst of developing a 5-year gas DSM program plan for Philadelphia Gas
26 Works. I am also just beginning an assignment with People's Gas of Illinois to

1 develop and apply a cost-effectiveness calculator in the development of a gas
2 DSM program portfolio.

3 Since 2007 I have been working for New York City's Economic
4 Development Corporation in the Public Service Commission's Energy
5 Efficiency Portfolio proceeding to establish programs for Consolidated Edison's
6 customers to reduce forecasted electricity and gas requirements for 2015 by
7 15%. I have also assisted the city in collaborative negotiations concerning Con
8 Edison's gas DSM programs for 2009-2010.

9 For the Asian Development Bank in 2006-2007, I led a team of Chinese
10 and American experts that prepared a pre-feasibility study of a 24-year, \$120
11 million loan to Guangdong province to establish a revolving loan fund offering
12 positive-cashflow financing for industrial and commercial/institutional
13 efficiency investments. This analysis included technical, economic, and
14 financial analysis of the "efficiency power plant" portfolio, and of case studies
15 of ten case-study "subprojects." The bank's board of directors unanimously
16 approved the loan in June of this year.

17 **II. Introduction and Summary**

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

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

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

22 A: BCSEA asked me to assess the proposed energy-efficiency program plan
23 submitted for Commission review by the Terasen Companies (Terasen).

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

- 1 A: I reviewed a large number of documents, including
- 2 • Exhibit B-1, Terasen Application and Appendices,
 - 3 • Exhibit B-2, Terasen's responses to BCUC staff Information Request # 1,
 - 4 • Exhibit B-3, Terasen's responses to BCUC staff Information Request #2,
 - 5 • Exhibit B-5, Terasen's responses to BC Hydro Information Request #1,
 - 6 • Exhibit B-6, Terasen's responses to BCOAPO Information Request #1,
 - 7 • Exhibit B-7, Terasen's responses to BCSEA-SCBC Information Request
 - 8 #1,
 - 9 • Exhibit B-8, Terasen's responses to CEC Information Request #1,
 - 10 • Exhibit B-9, Terasen's responses to MEMPR Information Request #1,
 - 11 • Exhibit B-10, Terasen's responses to ROMS BC Information Request #1,
 - 12 • Exhibit B-12, Terasen's responses to BCUC staff Information Request #3,
 - 13 • Exhibit B-13, Terasen's responses to BCOAPO Information Request #2,
 - 14 and
 - 15 • Exhibit B-14, Terasen's responses to BCSEA-SCBC Information Request
 - 16 #2.

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

18 A: Terasen's plan to increase spending and savings on gas DSM is well-intentioned
19 and commendable. While not as ambitious as leading portfolios elsewhere in
20 North America, the scale of the Terasen portfolio's spending and savings is
21 reasonable.

22 I did find two flaws in Terasen's approach to program planning. The first
23 is the economic objectives the Companies adopt in program design and
24 implementation. Rather than maximizing net resource benefits from energy-
25 efficiency programs as dictated by least-cost- planning principles, Terasen's
26 more limited objective is to deliver savings whose benefits merely exceed costs

1 by a sufficient margin. The second flaw is Terasen's determination not to
2 account for savings that would occur in the absence of the programs, a major
3 departure from best practices in DSM program planning.

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

10 For these reasons, I recommend that the Commission direct Terasen to
11 modify its energy-efficiency plan to

- 12 • pursue maximum net resource benefits, rather than merely achieve
13 benefit/cost ratios of 1.0 or better,
- 14 • deduct the expected savings from naturally-occurring market penetration in
15 program savings projections, rather than ignoring them, and
- 16 • redesign programs to increase gas savings and net resource benefits, by
17 streamlining programs and better integrating some of them with BC Hydro's
18 electric efficiency programs.

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

20 A: The next section explains the economics of energy-efficiency resource
21 procurement in the context of least-cost integrated resource planning. Section
22 IV provides information on gas DSM program spending and savings by leading
23 gas energy-efficiency program portfolios in the U.S and Canada.

24 Section V contains my assessment of Terasen's energy-efficiency plan.
25 There I address Terasen's program planning approach, including its economic
26 objectives and its failure to account for in-program savings that would have

1 taken place anyway. I also address Terasen's proposed program design,
2 implementation, and budgets. I present my conclusions and recommendations
3 in Section VI.

4 **III. Integrating Energy-Efficiency into Gas Resource Planning**

5 **A. *Economics of energy-efficiency resource procurement***

6 **Q: What is the least-cost planning objective of energy-efficiency resource**
7 **procurement?**

8 A: The Commission is an economic regulator. From a purely microeconomic
9 perspective, the primary objective of an economic regulator is to ensure that
10 energy utilities provide safe, adequate and reliable service at the lowest total
11 costs to customers at fair and reasonable rates. To the extent energy-efficiency
12 programs can reduce gas energy requirements for less than the marginal cost of
13 supply, they represent cost-effective supply alternatives that will lower total
14 costs of gas energy service.

15 **Q: Does the amount of achievable gas efficiency potential vary with respect to**
16 **cost?**

17 A: Yes. As with anything else, gas efficiency savings come at an ever increasing
18 cost due to diminishing marginal returns. The next unit of gas savings
19 eventually will have to come from a more costly efficiency measure or a harder
20 to reach customer. Thus, gas efficiency savings potential can be viewed as an
21 increasingly upward-sloping supply curve, as depicted in Exhibit JJP-2.

22 **Q: What information does Exhibit JJP-3 portray?**

23 A: This stylized graph plots a hypothetical marginal cost function for gas efficiency
24 supply, with total resource costs represented by the red line. The vertical axis is

1 in \$/GJ, and the horizontal axis is in GJ savings per year. It represents the
2 aggregation of costs and savings from numerous efficiency measures across all
3 participants; each individual participant would display a step function of
4 efficiency savings opportunities in order of increasing cost. Exh. JJP-2 also
5 plots a horizontal dotted line representing a (fixed) value of avoided marginal
6 supply costs per GJ saved. Finally, the green line represents only the utility
7 costs of administering the programs.

8 **Q: How does this exhibit demonstrate the economic objective of gas efficiency**
9 **resource investment planning?**

10 A: Exh. JJP-3 illustrates three essential principles to efficiency program planning,
11 design, and implementation:

- 12 1. Energy efficiency savings can be achieved at low or even negative costs for
13 relatively little supply, but eventually should be expected to climb in specific
14 efficiency markets and for individual customers over time as efficiency
15 investment increases. Negative savings costs occur when non-gas “co-
16 benefits” are worth more than the total resource costs of the efficiency
17 measures. Typical examples include electric and/or water savings (such as
18 high-efficiency clothes washers).
- 19 2. Least-cost resource planning should seek to maximize net benefits. In Exhibit
20 JJP-3, the total benefits of efficiency investment are the rectangular area below
21 the avoided cost line. The area below the red line from the origin to any amount
22 of savings represents the total resource costs of procuring it. The area above the
23 cost line and below the avoided cost line represents the net resource benefits
24 from any amount of efficiency investment. This area is greatest when the next
25 unit of savings would exceed the avoided cost of the supply it would displace.

1 This amount of efficiency produces the economically optimal allocation of
2 resources toward gas efficiency procurement.

3 3. The green line in Exhibit JJP-3 represents the utility program cost of achieving
4 gas efficiency savings. Observe that utilities can acquire efficiency savings by
5 paying for less than the total resource costs of the investments by convincing
6 participants to contribute toward investment costs. As discussed below,
7 customized financial strategies for retrofit projects combining electricity and gas
8 savings can secure substantial customer investment with no negative cashflow,
9 thereby stretching program dollars to achieve greater savings.

10

11 ***B. Comparing and Selecting Between Gas Energy-Efficiency Programs***

12 **Q: How are cost-benefit analyses typically structured for integrated planning**
13 **purposes?**

14 A: Best practice is for program benefit/cost analysis to take place in three stages:
15 first at the level of individual efficiency measures likely to apply to eligible
16 customers; the second is at the program level, involving multiple scenarios; the
17 third and final analysis stage takes place at the portfolio level, which involves
18 different combinations of programs.

19 **Q. What steps does this multi-stage cost-effectiveness analysis involve?**

20 A: The analysis starts by characterizing the size and composition of each of the
21 three major efficiency markets in each sector over time: new construction; new
22 purchases of products and equipment; and retrofit of existing building and
23 equipment stock. Best analytical practice is to consider a range of efficiency
24 technologies and combinations thereof to determine likely cost-effective savings
25 for typical eligible customers in each market.

1 The analysis accomplishes this by characterizing costs and performance of
2 efficiency measures and efficiency bundles in terms of gas savings and life
3 expectancy. A cost-effectiveness calculator (aka screening tool) is then used to
4 determine which measures and measure bundles offer total resource benefits in
5 excess of their total resource costs for different customer types in each market.
6 Measures whose costs exceed their benefits are either dropped from the analysis,
7 or included only in limited, customized applications where they would be likely
8 to be cost-effective.

9 From the measure-level benefit/cost analysis follows conceptual program
10 design to promote increased adoption of efficiency measures and packages
11 found to be cost-effective in each efficiency market. Based on these strategies,
12 total resource savings from each program are estimated by projecting annual
13 market penetration increases over time, which are then valued at avoided costs.
14 Program costs are estimated on the basis of budget projections for delivering
15 program services using best program design and implementation practices. Cost-
16 effectiveness analysis is conducted over the lifetime of the programs and
17 measures installed under the TRC and the UC tests.

18 The final stage amounts to a program potential analysis of cost-effective
19 achievable gas savings comparing the benefits and costs of alternative portfolios
20 combining different program scales. Portfolio benefits and costs are again
21 compared under the total resource and utility cost tests.

22 In practice, this approach should lead to the definition of multiple scenarios
23 involving progressively higher levels of portfolio investment budget and savings
24 over the integrated resource planning horizon. The minimum portfolio scale
25 should contain programs designed and planned to achieve maximum market
26 penetration of cost-effective efficiency upgrades in new construction and
27 renovation markets and in product, appliance, and equipment sales. Additional

1 portfolios are defined by including discretionary programs involving
2 progressively greater annual and cumulative budgets and savings.

3 **Q: How should utilities choose between competing DSM procurement**
4 **scenarios?**

5 A: According to principles of least-cost planning, the choice of efficiency
6 procurement portfolio should be based on the utility's resource need and the net
7 benefits achievable at different levels of portfolio investment.¹

8 **Q: Aside from simply maximizing net benefits, are there other principles that**
9 **should guide the assembly of alternative portfolios comprised of different**
10 **program types and scales?**

11 A: Yes. Best practices in energy-efficiency resource procurement developed over
12 twenty years of experience with program design and implementation throughout
13 North America have established three guiding tenets for long-range electric and
14 gas energy-efficiency program planning:

- 15 1. Give first priority to capturing efficiency opportunities in market-driven
16 transactions like new construct and renovation as well as purchases of
17 products, appliances and equipment at the time of scheduled replacement.
18 These transitory opportunities for cost-effective efficiency investment will
19 be lost if not realized by effective market intervention. Because of
20 relatively slow turnover within, and expansion of, the existing building and
21 equipment stock, budgets for these programs are relatively small compared
22 to effective retrofit programs.

¹ Other regulatory policy objectives, such as equitable distribution of portfolio net benefits, can lead to deviations from the least-cost portfolio. This is the case in Vermont, where a significant fraction of the available efficiency portfolio budget has been and will continue to be constrained by the goals of inter-class and geographical equity.

- 1 2. Choose the pace and scale of discretionary resource procurement based on
2 economic benefits and portfolio funding constraints. Retrofit investments
3 involve supplement measures (e.g., insulation) and/or early retirement of
4 functioning inefficient equipment and replacement with new high-
5 efficiency equipment. Very little market-driven retrofit investment takes
6 place on its own. Unlike programs aimed at new construction or normal
7 equipment replacement, retrofit programs seek to create transactions that
8 ordinarily would not take place naturally in the marketplace. The timing of
9 these transactions can be controlled by the program and is therefore
10 discretionary.
- 11 3. Avoid the creation of lost opportunities in discretionary efficiency markets.
12 Retrofit investments can create lost opportunities by cream-skimming.

13 **Q: Define “cream skimming.”**

14 A: “Cream skimming” in the DSM context includes any action that captures some
15 low-cost savings while leaving behind opportunities that are higher in cost or
16 more difficult to achieve but are nonetheless cost-effective compared to the
17 supply resources they avoid. Cream skimming can consist of ignoring
18 opportunities during the process or site visit that can be captured later at higher
19 cost. For example, visiting a home to assess savings potential without wrapping
20 the water heater forfeits savings among those customers who do not make
21 recommended efficiency investments. Another example of cream-skimming
22 would be installing equipment that is less efficient than economically optimal
23 (e.g., early retirement of an inefficient gas furnace and replacing it with one with
24 an AFUE of 90 percent rather than one with an AFUE of 92% be cost-effective).

25 **Q: How can efficiency programs create “lost opportunities?”**

1 A: A lost opportunity occurs whenever an opportunity for cost-effective energy
2 savings passes and would hence cost more to capture later. That opportunity can
3 be market-driven (an old heating system wears out, a restaurant is remodeled) or
4 driven by an energy-efficiency program (e.g., the program encourages the
5 customer to replace its aging boiler, but fails to improve building shell efficiency
6 to reduce heating load and downsize the new boiler).

7 In terms of Exhibit JJP-2, cream-skimming results in an upward and
8 leftward shift of the efficiency supply curve over time by creating lost
9 opportunities.

10 **IV. Leading North American Gas DSM Portfolio**

11 **Q: How does Terasen's proposed DSM program portfolio compare to other gas**
12 **utilities in North America**

13 A: Exhibit JJP-3 provides comparisons of some of the leading gas utility DSM
14 spending and savings. The comparisons exclude the spending and impacts of
15 fuel-switching programs. Terasen's projected GJ savings as a percent of GJ sales
16 compares favorably to the other gas utilities.

17 **Q: How does Terasen's proposed DSM program spending compare to other gas**
18 **utilities in North America**

19 A: The residential sector spending per annual GJ saved is similar to the experience
20 and projections of other gas utilities. Terasen's non-residential spending per
21 annual GJ saved is considerably higher than the other utilities in the comparison.

22 **V. Terasen's proposed DSM program portfolio**

23 **Q: Which aspects of Terasen's proposed energy efficiency plan do you address?**

1 A: I address two broad areas: The Companies' proposed evaluation methodology;
2 and specific program areas.

3 **A. *Evaluation methodology***

4 **Q: Summarize Terasen's proposed evaluation approach.**

5 A: In the executive summary to the plan, Terasen summarized its approach as
6 follows:

7 The Companies are proposing a portfolio approach to cost-benefit analysis, so that
8 rather than evaluating cost-effectiveness on a program-by-program basis, the overall
9 EEC portfolio must maintain a TRC ratio of 1.0 or higher. This approach will allow the
10 Companies to undertake the important portfolio-level activities needed to support the
11 EEC activity, as well as to encourage market penetration of technologies that have a
12 TRC of less than one because they not yet reached economies of scale but have longer
13 term potential for a higher TRC ratio.

14 Further, the portfolio approach will allow the Companies to offer programs to
15 customers in service areas where the TRC may have a result of less than 1.0 due to lower
16 usage patterns, to support the Companies' goal of making the same programs available to
17 customers across the service territory.

18 The Companies propose that the "benefits" input to the cost-benefit analysis be
19 based on gross energy savings rather than net savings (thus eliminating consideration of
20 the perceived effects of free riders), due in part to uncertainties around free ridership
21 rates. Free riders are customers who participate in an EEC program, who notionally
22 would have undertaken the same conservation actions even if the program were not
23 offered. The Companies are of the view that the inclusion of the notional free rider
24 effects in the cost-benefit tests for EEC programs will distort test results and
25 consequently may lead to results that run counter to the objectives of energy policies.

1 The Companies further propose that the “benefits” input to the cost-benefit
2 analysis include energy savings resulting from future regulations that may be introduced
3 partly as a result of the Companies’ EEC activity. The TRC ratios referenced in the
4 Application have been derived using this approach.^{2\}

5 **Q: What are your findings with regard to Terasen’s proposed evaluation**
6 **methodology?**

7 A: I find that two aspects of Terasen’s proposed methodology are problematic from
8 the perspective of integrated resource planning. First, the Companies propose
9 that economic performance be judged at the portfolio level only, and further, that
10 the portfolio be considered successful as long as it returns a benefit/cost ratio of
11 1.0 or better. Second, I find that Terasen’s proposal not to deduct program
12 savings that would have occurred without the program to be inconsistent -- both
13 with best DSM planning practices and with the Companies’ proposal to attribute
14 savings to the program from future standards Terasen claims would result.

15

16 1. *Economic objectives*

17 **Q: Why do you find fault with Terasen’s proposed economic objectives for the**
18 **portfolio?**

19 A: The Companies’ proposal does not propose that the magnitude of net resource
20 benefits be the primary measure of economic performance of the portfolio, and
21 therefore is not aligned with the objectives of integrated resource planning
22 described earlier in my testimony. The proposal’s objective of producing a

² Energy Efficiency and Conservation Programs Application, Terasen Utilities, May 2008, pp. E-7 – E-8, Exhibit B-1.

1 benefit/cost ratio of at least 1.0 is only appropriate as a minimum performance
2 standard, and as a minimum performance standard it should apply at the
3 measure, project, and program levels, not just to the entire portfolio.

4 **Q: Why is it inappropriate to require that Terasen only produce a portfolio-**
5 **wide benefit/cost ratio of 1.0?**

6 A: To maximize net benefits, efficiency programs should not encourage efficiency
7 investments that are not cost-effective without compelling policy reasons to do
8 otherwise. The prospective cost-effectiveness of each measure and project
9 should either be established on a prescriptive basis for universal application, or
10 on a customized basis for individual customer circumstances. In addition to
11 establishing measure and project cost-effectiveness, Terasen's efficiency
12 portfolio should demonstrate prospective benefits in excess of costs at the
13 program level. By incorporating cost/benefit analysis into program planning
14 and implementation, programs will end up producing the maximum net resource
15 benefits within the available portfolio budget.

16 2. *Accounting for out-of-program savings*

17 **Q: Why do you disagree with Terasen's proposed methodology for accounting**
18 **for program savings?**

19 A: The Companies' proposal would depart from well-established Commission
20 practice of accounting for savings from program free riders. This not only
21 distorts economic assessment but is also inconsistent with resource planning,
22 since it will overstate how much Terasen should expect to reduce energy supply
23 requirements. It will also distort program design, especially in appliance and
24 equipment replacement markets where the high-efficiency market penetration
25 can change rapidly. Ignoring free ridership would tend to prevent adjustments in

1 minimum qualifying efficiency levels due to a higher-efficiency market
2 baseline.

3 **Q: What about Terasen's proposal to attribute future savings to the programs**
4 **from predicted future tighter efficiency standards?**

5 A: This is an extreme version of accounting for spillover effects of programs, that
6 is, savings that occur outside the program because of the program. An example
7 of spillover would be the purchase of higher-efficiency furnaces on their own
8 without a program incentive, when the higher-efficiency furnaces become more
9 widely available and less costly because of the program. What sets Terasen's
10 proposal apart from what I have observed is that it seeks to attribute future
11 savings well beyond the initial installation.

12 **Q: How is this relevant to Terasen's request to ignore the effects of program**
13 **free-ridership?**

14 A: In many jurisdictions, gross program savings are adjusted for the compound
15 effects of in-program free-ridership and beyond-program spillover with a net-to-
16 gross ratio (NTGR). In effect, the Companies are trying to have it both ways by
17 seeking to ignore one factor in the NTGR while claiming credit for the other.

18 **B. Program areas**

19 **Q: What do you find from your review of Terasen's proposed expenditures by**
20 **program area?**

21 A: I find that the Companies' program budget priorities are misaligned with the
22 economic objective of maximizing net benefits within funding constraints. I
23 also find that the residential and commercial gas efficiency programs are not
24 designed to integrate gas and electricity efficiency investments that arise in new
25 construction and in retrofit opportunities among Terasen's customers.

1 *I. Budget priorities*

2 **Q: What is wrong with the budget allocation proposed in Terasen's plan?**

3 A: I find two problems with the Companies' proposed budget allocation between
4 the various programs in the portfolio. The first is that the budgets do not focus
5 sufficiently on lost-opportunity markets as distinct from retrofit markets.
6 Second, the amount of money Terasen proposes to spend on communication and
7 outreach is too high in proportion to the overall funding and should be re-
8 allocated to higher-priority use, i.e., lost-opportunity markets.

9 **Q: On what do you base your finding that the plan devotes inadequate**
10 **resources to lost-opportunity markets?**

11 A: Table 6.1a at Exhibit B-1, p.50 of the plan shows total spending on residential
12 and commercial efficiency programs of \$9.3 and \$21.8 million, respectively, out
13 of a total budget of \$56 million for 2008-2010. The efficiency programs
14 described in Section 6 of the plan indicate that each program will cover both
15 new construction and what the Company calls "retrofit" of existing customers.
16 Terasen's definition of retrofit matches what Efficiency Vermont terms "existing
17 buildings," which consists of two subcategories: "market opportunities," i.e.,
18 scheduled replacement or new purchase by existing customers, and "retrofit,"
19 i.e., projects involving early retirement of existing inefficient equipment and/or
20 installation of supplemental measures.

21 Consequently, the Companies' budgets for the efficiency programs in each
22 sector are designed to cover three markets within each sector – new
23 construction, routine equipment purchases, and retrofit. No clear priority is
24 given to the two lost-opportunity markets within each sector's budget. More
25 detailed budgets and savings estimates for each of the lost-opportunity and
26 retrofit markets would provide more clarity on the relative emphasis between

1 the two markets. Given the relatively small size of each program area’s budget
2 in proportion to the entire portfolio – 16% and 39%, respectively, for residential
3 and commercial efficiency – Terasen’s plan needs to concentrate limited
4 resources allocated for each sector’s efficiency savings to these transitory, high-
5 value opportunities.

6 By contrast, retrofit investment is discretionary. Each retrofit project
7 should be evaluated for its prospective cost-effectiveness under the TRC.
8 Terasen can design its retrofit programs to offer customized financial incentives
9 and assistance that obtain significant customer contributions toward efficiency
10 investments as a package that produces immediate positive cashflow for the
11 participating customers. This will tend to lower expenditures on incentives
12 relative to total program expenditures, possibly to the point that it violates
13 Terasen’s requirement that no more than 50% of a program’s budget be spent on
14 non-incentive costs. Relaxing this requirement would enable Terasen to
15 concentrate on lost opportunities and pursue less expensive (from a budget
16 perspective) financial strategies to stretch the remaining budget available to treat
17 more customers.

18 **Q: Why do you find the budget for education and outreach to be excessive?**

19 A: Terasen proposes to spend \$13.8 million on conservation education and
20 outreach. This is 24% of the entire portfolio budget, and it is almost half (44%)
21 as much as is proposed to be spent on the residential and commercial programs
22 (\$31 million). [Table 6.1a, Exhibit B-1, p.50] Terasen indicates in the plan that
23 this is above and beyond program specific marketing, and is intended to build a
24 conservation “ethic” in the Province. While a laudable goal, the primary
25 purpose of education and outreach should be to support the successful operation
26 of the portfolio’s efficiency programs.

1 As I testified above, Terasen’s efficiency programs need to be refocused on
2 lost-opportunity markets like new construction and routine market purchases of
3 new and replacement gas products and equipment. Focusing education and
4 outreach directly on this narrower program focus should require less effort than
5 a more broad-based campaign to encourage discretionary investments.

6 Given that program marketing costs are already included in the plan’s
7 proposed efficiency program budgets, the stand-alone budget for education and
8 outreach would be more productively spent if Terasen shifted half of this budget
9 to residential and commercial efficiency budgets. Redirecting these funds --
10 \$6.8 million -- to new construction and market-driven appliance and equipment
11 purchases in the residential and commercial efficiency programs would go a
12 long way toward balancing program priorities between lost-opportunity and
13 discretionary resource investment.

14 2. *Program design*

15 **Q: What do you find with regard to the program designs Terasen proposes in**
16 **its plan?**

17 A: In general, I find that the market strategies Terasen proposes for its residential
18 and commercial programs are sound with respect to routine purchases of gas-
19 fired appliances and equipment. However, market strategies proposed for new
20 construction and retrofit markets in both sectors (residential and commercial)
21 are inadequate. This is primarily because Terasen fails to address combining
22 electricity and gas savings from efficiency measures in assessing measure and
23 project cost-effectiveness, formulating financial strategies, and delivering
24 program services.

1 **Q: Substantiate your finding that Terasen’s new construction and retrofit**
2 **strategies inadequately treat gas and electricity savings in combination.**

3 A: Terasen’s *residential* new construction strategies only address gas appliances.
4 Additional residential efficiency upgrades save both gas and electricity, such as
5 building shell improvements that save gas heating and gas cooling. However,
6 there are additional residential efficiency measures, such as building shell
7 improvements, that save both gas and electricity. Typically such measures are
8 cost-effective under the TRC when both (gas and electricity) savings are
9 counted but not so on the basis of one or the other. This applies in both
10 residential new construction and residential retrofit. Failure to integrate
11 electricity and gas savings into program design and delivery could easily lead to
12 the false conclusion that efficiency investments are not cost-effective. This
13 appears to be the case in the Companies’ finding that residential air-sealing is
14 not cost-effective.³ This lack of integration is apparent in Terasen’s discussion
15 of a province-wide home retrofit initiative under development with the
16 Government and other stakeholders.

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

20 **Q: Does the commercial efficiency program suffer from the same problem of**
21 **lack of integration with electricity?**

22 A: Yes. Among larger gas customers, the primary concern is that the planning and
23 execution of gas and electric efficiency upgrades in new construction or in
24 retrofits be coordinated. In retrofit projects producing both gas and electricity

³ See Terasen’s response to BCSEA SCBC Information Request No. 1, question 6.1.

1 savings, it is imperative that customized offers be made on the basis of cash
2 flows they produce in combination. In this way Terasen and BC Hydro can
3 maximize customer contributions toward efficiency investments, thereby
4 minimizing the share of investment costs borne by ratepayers at large and
5 maximizing the savings that can be achieved with a fixed program budget.

6 **Q: Does this logic extend to industrial customers?**

7 A: Yes. While Terasen has not included industrial EEC programs in this
8 application, in the future Terasen can make customized financial offers to
9 industrial customers to pursue cost-effective retrofit investments of their own
10 choosing, subject to cost-effectiveness and cashflow analysis involving gas,
11 electricity, water, operation and maintenance, and other cost savings. Terasen
12 could arrange extended and/or discounted financing for the customer's
13 contribution after incentives toward to the investment to provide immediate
14 positive cashflow.

15 Terasen should also offer customized incentives for replacement/addition
16 of high-efficiency gas-fired equipment for process heating.

17 **VI. Conclusions and Recommendations**

18 **Q: On the basis of your earlier findings, what conclusions do you reach?**

19 A: I draw the following conclusions from my review and analysis of the DSM
20 plans proposed by Terasen:

- 21 1. Terasen's proposed aggregate spending and savings targets are reasonable for
22 this early stage in its long-term plans to expand procurement of cost-effective
23 efficiency resources.
- 24 2. Terasen's evaluation methodology for efficiency investment planning is not
25 consistent with the economic objectives of integrated resource planning, nor is its

1 proposal to account for program effects consistent with standard practice
2 established by this Commission and others.

3 3. Terasen's program budget priorities are not consistent with the economic
4 objectives of least cost planning. Not enough priority is placed on achieving
5 savings in lost-opportunity markets such as routine appliance and equipment
6 purchases relative to retrofits.

7 4. The amount of spending proposed for education and outreach efforts has not
8 been aligned with the narrower priorities appropriate for Terasen's plan at this
9 stage and is out of proportion to the overall budget.

10 5. The residential and commercial efficiency programs for new construction and
11 retrofit do not adequately integrate electricity savings into their design and
12 delivery. This will tend to raise costs and lower benefits from the total provincial
13 investment in these markets.

14 6. Based on the foregoing conclusions, I further conclude that Terasen's plan
15 has a long way to go to fully address the first two Government policy actions
16 recommended in the 2007 energy plan:⁴

17 Policy Action 1: Set an ambitious conservation target, to acquire 50 per cent of
18 BC Hydro's incremental resource needs through conservation by 2020.

19 Policy Action 2: Ensure a coordinated approach to conservation and efficiency
20 is actively pursued in British Columbia

21 **Q: What are your recommendations to the Commission based on these**
22 **conclusions?**

23 A: I recommend that the Commission direct Terasen to modify its plan in the
24 following ways:

25 1. Design and deploy the program portfolio to maximize net resource
26 benefits as the primary economic objective.

⁴ Terasen plan, pp. 100-102, Exhibit B-1.

1 2. In designing and implementing programs, conduct prospective
2 benefit/cost analysis at the measure and project level, and at the program level,
3 in addition to analysis of the entire portfolio. Only pursue savings that are cost-
4 effective under the TRC test, and encourage the selection of competing
5 efficiency measures and projects with the maximum net benefits.

6 3. Develop net-to-gross ratios for each efficiency program at the market
7 level based on best estimates of free-ridership and spillover effects of the
8 programs, incorporating them into program planning and design.

9 4. Place a higher priority on efficiency investments in market driven gas
10 appliances and equipment purchases in relation to discretionary retrofit
11 spending.

12 5. Reduce the general education and outreach budget by half, redirecting
13 the savings to the residential and commercial efficiency programs.

14 6. Integrate electricity savings into the design and delivery of gas
15 efficiency programs serving new construction and retrofit markets in both the
16 residential and commercial efficiency programs.

17 7. Offer customized financial strategies to larger commercial and
18 industrial customers that combine financial incentives with extended repayment
19 terms on the participant's share of efficiency investment costs to eliminate
20 negative cash flow.

21 **Q: Does this conclude your testimony?**

22 **A: Yes.**

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
Consultancy specializing in energy-efficiency and renewable resource portfolios investing in electricity and gas savings, co-founded with Francis Wyatt, PE, Plunkett's colleague of 16 years. 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 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 advocacy on campuses of Georgetown and George Washington Universities.

EDUCATION

B.A., Economics, with Distinction, *Phi Beta Kappa*, Swarthmore College, Swarthmore, PA, 1983. Awarded Economics Department's 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 two 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 other is a collaborative effort with Consolidated Edison's gas division to design a portfolio of gas efficiency programs. 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 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.

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 the Institute for Local Self-Reliance, 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.

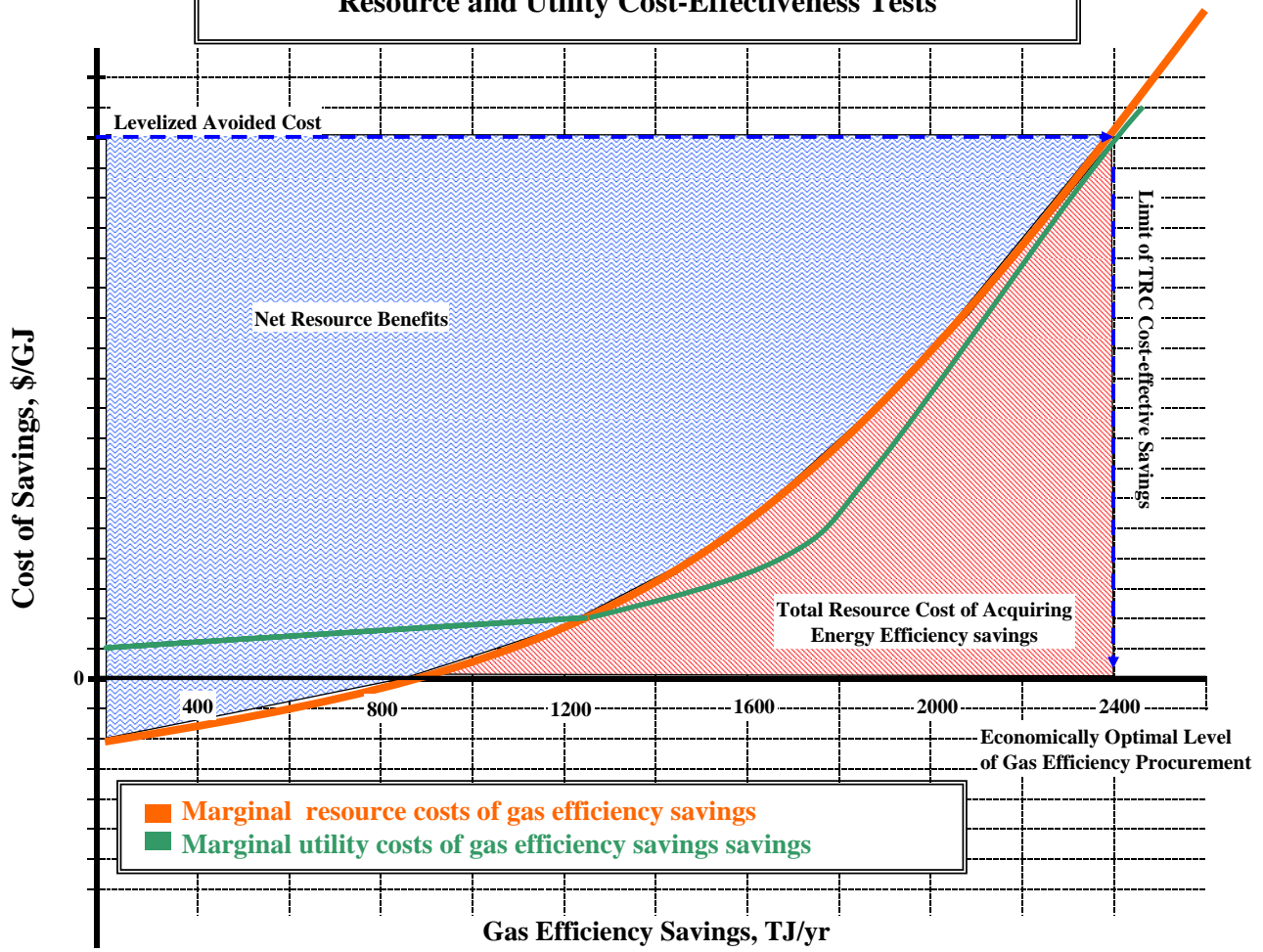
"There They Go Again: A Critique of the AER/UDI Report on Future Electricity Adequacy through the Year 2000" (with C. Komanoff, H. Geller and C. Mitchell), Presentation NASUCA (also debated AER/UDI co-author before NARUC annual meeting), New Orleans, Louisiana, November 1987.

"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
Supply Curves for Gas Energy-Efficiency Savings Under Total Resource and Utility Cost-Effectiveness Tests



Exhibit__ JJP-3
Actual and Planned Expenditures and Savings
For Leading Gas Efficiency Program Administrators
(Nominal \$)

	Residential					Non-Residential					Total				
	Cost (Nominal \$M)	Savings (GJ)	Sales (GJ)	Savings % of Sales	Spending per Annual GJ saved	Cost (Nominal \$M)	Savings (GJ)	Sales (GJ)	Savings % of Sales	Spending per Annual GJ saved	Cost (Nominal \$M)	Savings (GJ)	Sales (GJ)	Savings % of Sales	Spending per Annual GJ saved
Terasen															
2008	\$ 7.46	0.10	75	0.13%	\$75.77	\$ 8.33	0.18	66	0.27%	\$46.61	\$ 15.79	0.28	141	0.20%	\$56.97
2009	\$ 7.59	0.12	75	0.17%	\$60.88	\$ 10.04	0.26	66	0.40%	\$38.23	\$ 17.63	0.39	141	0.27%	\$45.53
2010	\$ 6.65	0.10	75	0.13%	\$66.20	\$ 12.84	0.37	66	0.56%	\$35.07	\$ 19.49	0.47	141	0.33%	\$41.77
NSTAR															
2004	\$ 3.06	0.03	24	0.13%	\$98.39	\$ 1.02	0.05	25	0.18%	\$21.98	\$ 4.08	0.08	50	0.16%	\$52.63
2006	\$ 2.98	0.03	20	0.14%	\$101.87	\$ 0.96	0.06	24	0.27%	\$14.98	\$ 3.94	0.09	44	0.21%	\$42.21
2007	\$ 3.18	0.03	23	0.12%	\$115.08	\$ 1.04	0.05	26	0.21%	\$19.14	\$ 4.22	0.08	49	0.17%	\$51.51
Keyspan Long Island															
2009	\$ 1.78	0.02	4	0.06%	\$75.95										
2010	\$ 2.29	0.03	4	0.08%	\$73.08										
2011	\$ 3.46	0.04	40	0.10%	\$89.78										
Keyspan New York															
2009	\$ 1.99	0.02	94	0.02%	\$97.62										
2010	\$ 3.40	0.04	94	0.04%	\$91.39										
2011	\$ 5.76	0.07	94	0.07%	\$83.28										
Southern California Gas															
2006	\$ 12.98	0.30	262	0.11%	\$43.66	\$ 13.22	0.93	400	0.23%	\$14.23	\$ 26.20	1.23	661	0.19%	\$21.36
2007	\$ 41.15	0.37	260	0.14%	\$110.28	\$ 24.74	2.46	409	0.60%	\$10.07	\$ 65.89	2.83	669	0.42%	\$23.29
2008											\$ 62.00	2.46	669	0.37%	\$25.22
2009											\$ 73.20	2.87	669	0.43%	\$25.51
2010											\$ 76.80	2.99	669	0.45%	\$25.72
2011											\$ 82.20	3.15	669	0.47%	\$26.06
2012											\$ 89.60	3.41	669	0.51%	\$26.29
2013											\$100.30	3.78	669	0.56%	\$26.56
Enbridge															
2007		1.97	167	1.18%			1.54	271	0.57%		\$ 22.00	3.51	438	0.80%	\$6.27
Union Gas															
2007	\$ 4.09	0.50	109	0.46%	\$8.25	\$ 5.80	2.84	408	0.70%	\$2.04	\$ 16.13	3.34	517	0.65%	\$4.83