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October 11, 2006

British Columbia Utilities Commission
Sixth Floor, 900 Howe Street, Box 250
Vancouver, BC, V6Z 2N3
Attn: Mr. Robert Pellatt, Secretary
BY WEB FILING

Dear Sir:

Re: 2006 Integrated Electricity Plan-Long Term Acquisition Plan, Project No. 3698419; and F2007-F2008 Revenue Requirements Application, Project No. 3698416

On behalf of the intervenors Sierra Club of Canada (B.C. Chapter), B.C. Sustainable Energy Association, and Peace Valley Environmental Association (SCCBC, *et al*), attached please find the following evidence for filing in these proceedings:

- Testimony of John Plunkett, Green Energy Economics Group, with attachments regarding demand side management.

Please note that the testimony relating to Exhibit JJP-4 uses calendar years, rather than BC Hydro's fiscal years. SCCBC, *et al* anticipates being asked by way of Information Request to restate this testimony and Exhibit JJP-4 using BC Hydro's fiscal years.

All the above is respectfully submitted.

Yours truly,

William J. Andrews

Barrister & Solicitor

cc. BC Hydro and Registered Intervenors by email

BEFORE THE BRITISH COLUMBIA UTILITIES COMMISSION

British Columbia Hydro and Power Authority	**)**	
2006 Integrated Electricity Plan and Long Term Acquisition Plan; and	**)**	**Project No. 3698419**
British Columbia Hydro and Power Authority	**)**	
F2007/F2008 Revenue Requirements Application	**)**	**Project No. 3698416**

DIRECT TESTIMONY OF

JOHN J. PLUNKETT

ON BEHALF OF

SIERRA CLUB OF CANADA (BRITISH COLUMBIA CHAPTER)

BRITISH COLUMBIA SUSTAINABLE ENERGY ASSOCIATION

PEACE VALLEY ENVIRONMENT ASSOCIATION

(SCCBC, ET AL.)

Green Energy Economics Group

OCTOBER 10, 2006

TABLE OF CONTENTS

TABLE OF EXHIBITS

I. Identification and Qualifications

Q: State your name, occupation and business address.

A: I am John J. Plunkett, a partner in Green Energy Economics Group. My address is 1002 Jerusalem Road, Bristol, VT 05443.

Q: Summarize your professional education and experience.

A: I graduated Phi Beta Kappa with a B.A. in Economics, with Distinction, from Swarthmore College. I have twenty-eight years of experience in energy utility planning, concentrating on demand-side management as a resource and business strategy for electric and gas service providers. I recently co-founded Green Energy Economics Group, a consultancy specializing in energy efficiency and renewable resource economics, with Francis Wyatt, my colleague since 1992. We provide technical and strategic assistance with energy-efficiency and distributed generation portfolio development, design, analysis, planning, administration, implementation management support, oversight, performance verification and evaluation, performance incentive mechanisms, and regulatory and ratemaking treatment.

I have testified as an expert witness on energy efficiency as an electricity and gas supply alternative in regulatory proceedings in the U.S. and Canada, including New York, New Jersey, Connecticut, Indiana, Florida, Ontario and Quebec. I have led several major studies of economically achievable efficiency potential, including New York, Vermont, and Maine. I have also led collaborative teams in the estimation of electric, economic, and environmental impacts of energy-efficiency portfolios, including New Jersey, Maryland, and two Chinese provinces.

For the past six years I have served on the senior management team of Efficiency Vermont, the nation's first statewide electric efficiency utility, which has been responsible for managing Vermont's $70 million efficiency portfolio through 2005 since its inception in 2000. Efficiency Vermont has exceeded its energy and economic performance goals on or under budget during both its three-year contracts, and has just entered a third contract through 2008. We are in the midst of planning how to invest the 75% increase in annual efficiency investment recently announced by the Public Service Board in 2007 and 2008.

Since July 2003 I have led the Natural Resources Defense Council consulting team working with China's Jiangsu province to develop and implement energy-efficiency programs as "Energy-Efficiency Power plants" ("EPP"). I am leading an Asian Development Bank consulting team to analyze the energy, economic, financial, and environmental prospects of launching an EPP in Guongdong province in 2007 funded through a $100 million, 24-year loan.

Since April 2005, I have been leading the assessment and development of demand-side alternatives to transmission and distribution investments in Vermont's "southern loop" on behalf of Vermont Electric Power Company and Central Vermont Public Service. In parallel, I am leading the development of first-stage implementation plans for deployment of targeted demand-side management programs on behalf of CVPS. In 2003 I led an analysis of economically deliverable demand-side transmission capacity, submitted by the Vermont Electric Power Company in its application for approval of a major transmission upgrade, and testified in support of this analysis in 2004.

Over the last year and a half I submitted testimony before the Pennsylvania Public Utilities Commission recommending energy-efficiency portfolio investment and savings targets for three utilities in three proceedings. I testified

on behalf of a variety of environmental groups in 2004 before the Quebec Energy Board on the potential for energy efficiency to help displace the need for a planned combined-cycle generating facility, and again in 2005 on ways for Hydro Quebec to increase its acquisition of energy-efficiency resources. I was lead author and witness in support of a comprehensive assessment of utility administration of Connecticut's Conservation and Load Management program on behalf of the Office of Consumer Counsel in 2003-2004.

I testified in 2005 before the New York Public Service Commission supporting the economic achievability of Con Edison's proposed $250 million investment in targeted DSM. I led the economic analysis of the $150 million, five-year Clean Energy Initiative on behalf of the Long Island Power Authority in 1999; since 2002 I have advised LIPA on future energy-efficiency spending and performance goals, most recently involving long-term spending and savings goals for the next ten years.

I have served as an economic advisor to Northeast Energy Efficiency Partnerships since 1998, for which I have led several analyses of a variety of regional utility energy-efficiency initiatives. In 2005 I served as NEEP's technical advisor on regional protocols for interstate Energy-Efficiency portfolio comparison. I have also been an economic advisor to the non-utility parties engaged in energy-efficiency collaboratives with Massachusetts electric and gas utilities since 1999, in New Jersey from 1996-2002, and in Maryland from 1990-1997.

Exhibit JJP-1 provides my full resume.

II. Introduction and Summary

Q: On whose behalf are you testifying?

A: My testimony is sponsored by the Sierra Club of Canada (British Columbia Chapter), British Columbia Sustainable Energy Association, and Peace Valley Environment Association (SCCBC, et al.).

Q: What is the purpose of your direct testimony?

A: I have been asked by my clients to assess the adequacy of the treatment of demand-side management (DSM) in BC Hydro's 2006 Integrated Electricity Plan and Long Term Acquisition Plan and BC Hydro's F2007/F2008 Revenue Requirements Application.

Q: What issues do you address?

A: I answer two questions. First, has BC Hydro included enough energy-efficiency resources in its Integrated Electricity Plan and Long Term Acquisition Plan (IEP/LTAP)? Second, does BC Hydro plan to spend enough on energy-efficiency in its Revenue Requirements Application (RRA)?

The answer to both questions is no.

Q: On what basis do you reach these conclusions?

A: Hydro's demand-side planning artificially restricts how much cost-effective efficiency it will commit to pursuing. By confining the Power Smart portfolio to an average utility cost of no more than 2.5 cents per kWh saved, BC Hydro in effect introduces a bias in its resource planning in favor of more expensive supply options. Within and beyond this limiting factor, Hydro could achieve more cost-effective efficiency savings sooner if it moved quickly to apply well-documented best practices for maximizing market penetration to all its Power

Smart programs. Lifting restrictions on two programs serving its largest customers would also contribute to higher savings, starting now and continuing throughout the planning horizon.

BC Hydro actually plans to *reduce* spending in F2007 by $11 million to $50 million, increase it again by $28 million in F2008, and then decrease it again in F2009 back to F2006 funding. These fluctuating spending levels range between 0.93 and 1.48 mill per kWh of annual electricity sales. Other utilities with strongly stated commitments to pursuing cost-effective energy exhibit larger and consistently growing efficiency budgets and savings targets several times the pace of BC Hydro's over the next three years.[1]

For example, Pacific Gas & Electric (PG&E) plans to spend roughly CAD$950 million on electric efficiency during 2006-8; this represents five times Hydro's planned spending per kWh sold (0.496 mills/kWh) in F2007, and almost quadruple (3.73 mills/kWh) in F2008. Whereas Hydro plans to reduce forecast consumption with efficiency by 0.4% in F2007 and 0.8% in F2008, PG&E plans to increase savings depth from 1.4% in 2006 to 1.6% in 2008. Leading efficiency portfolios in New England are investing around 2-3 mills per kWh (as shown in Exh. JJP-5); as noted earlier, Vermont recently decided to increase efficiency program spending by 75% from 2006 to 2008.

Considering the accomplishments and plans of other leading utilities with strong commitments to energy-efficiency, Hydro could almost certainly intensify and accelerate its acquisition of cost-effective energy-efficiency resources in F2007 and beyond. Doing so would lower the total cost of meeting British Columbia's expected needs for additional energy requirements over the planning horizon.

[1] As shown in Exh. JJP-5, and discussed further in the final section of this testimony.

Q: How should the Commission direct Hydro to improve its long-term DSM portfolio planning and near-term Power Smart deployment?

A: First, I recommend that the Commission direct BC Hydro to relax its internal requirement that the DSM portfolio Utility Test (levelized) should be less than $0.025/kWh. This requirement means that the portfolio must return benefits at least double the portfolio costs according to Hydro's avoided cost figure of $0.05/kWh and at least triple the portfolio costs according to the $0.08/kWh avoided cost figure I recommend below. A more reasonable guideline would be a minimum portfolio benefit/cost ratio of 1.33. I further recommend that the Commission expect Hydro to move immediately to apply best practices to deepen and expand current Power Smart programs, in parallel to its planned efforts to define and develop new Power Smart initiatives in 2007 for deployment in 2008.

In doing so, BC Hydro should relax immediately two restrictive elements of its Power Smart programs targeting large commercial and industrial customers. It should abandon the policy in the Power Smart Partners program of favoring projects with the lowest levelized costs of saved energy. It should also offer financial incentives to customers served under Tier 2 of the new Transmission Service Rates. Both changes should encourage large customers to pursue greater investment in cost-effective efficiency improvements.

III. Hydro's Procurement of DSM through Power Smart

Q: What materials did you review in preparation of this testimony?

A: I reviewed the following materials:

1. BC Hydro's 2006 Integrated Electricity Plan (IEP) and Long Term Acquisition Plan (LTAP),
   - Exhibit B-1A,
   - Exhibit B-1B,
   - Exhibit B-1C
2. BC Hydro F2007/F2008 Revenue Requirements Application,
   - Exhibit B-5-1,
   - Exhibit B-5-3
3. Selected BC Hydro responses to information requests in these proceedings.

Q: What did you find from your review of this material?

A: I make two major findings. First, Hydro limits long-term acquisition in cost-effective efficiency resources by requiring the portfolio Utility Test (levelized) to be less than $0.025/kWh (i.e., the portfolio must cost half or less than Hydro's figure for the value of avoided supply. This unduly restricts acquisition of efficiency resources available for more than half but less than the full cost of supply avoided.

Second, I find that Hydro could and should act sooner to increase near-term and long-term acquisition of energy efficiency resources, based on my experience with and knowledge efficiency portfolio planning and management elsewhere.

Q: Are these findings new?

A: No. Both findings are consistent with those identified in the direct testimony of Paul Chernick filed last year in the Commission's review of BC Hydro's 2005 REAP.[2]

Q: Is Hydro doing a poor job of DSM resource planning and procurement, by national and continental utility standards?

A: No. Beyond the built-in bias against efficiency costing more than 2.5 cents/kWh, Hydro's resource planning analysis does systematically compare the costs of supply and demand-side alternatives. Hydro concludes that additional energy efficiency resources would be cost-effective, and plans extensive study and analysis to define and develop new initiatives. Furthermore, Hydro's efficiency portfolio spending and savings efforts are well above average. Nonetheless, for the economic well-being of British Columbia, Hydro could and should be doing more to acquire all efficiency resources achievable for less than avoided supply costs.

A. Power Smart in Hydro's Resource Plan

Q: How did Hydro model the Power Smart programs in the 2006 Integrated Electricity Plan and Long-Term Acquisition Plan?

A: The analysis examined three load growth scenarios, and built its plan around the expected case. Hydro evaluated four alternative Power Smart portfolios by computing the revenue requirements and rate effects of resource plans including those portfolios:

EE2 + LD2: continuation of current Power Smart programs through 2012

[2] I conducted the analysis and prepared his testimony on BC Hydro's Power Smart portfolio in 2005.

EE 3: continuation of EE 2 from 2013 through 2017

EE 4: additional efficiency programs commencing 2010 and running through 2024, equivalent to the "upper achievable" potential identified in BC Hydro's 2002 efficiency potential study.

EE 5: Extending from 2008 through 2024, this scenario represents more aggressive programs expected to produce savings beyond those acquired by EE 4.[3]

Q: Would all the Power Smart scenarios contribute significantly to closing the resource gap that Hydro has identified in its IEP/LTAP?

A: Yes, especially over the long term. The combination of EE 2 through EE 5 between F2006 and F2015 would reduce energy requirements (i.e., including losses) by 5,359 GWh annually on a cumulative basis. This represents 8.0 per cent of total projected energy requirement in F2015. As BC Hydro concludes, "The DSM initiatives included in this LTAP are a significant undertaking and are expected to fulfill a substantial amount of the currently projected shortfall in the supply/demand balance over the 20-year planning horizon."[4]

Q: What about over the near term?

A: Over the next five years, Hydro plans to acquire 2,083 GWh of energy efficiency (3.3% of 2010 requirements), about 38 percent of the ten year total. To accomplish this, it would cut spending but increase savings in F2007 from its F2006 pace of incremental energy-efficiency procurement. In F2008 the IEP/LTAP calls for a substantial increase in spending and savings, owing to

[3] Exhibit B-1B, Appendix F, 2005 Resource Options Report, p. 6-8 through 6-10.

[4] BC Hydro 2006 Integrated Electricity Plan, p. 8-18.

higher EE2 investment and the introduction of EE 5. During the period F2009-F2010, BC Hydro's analysis indicates a two-year savings decline accompanying a reduction from and then resumption to F2008 spending levels (by F2010 with the introduction of EE 4). After that, spending and savings both increase substantially.

Q: Would the additional Power Smart savings be cost-effective?

A: Yes. BC Hydro reports that "The 2006 IEP analysis demonstrates that DSM programs EE 3, 4, and 5 are cost-effective resources." [5] BC Hydro also found that pursuing all DSM scenarios together would lower rates: "Rate impacts were assessed by comparing portfolios with EE 3, 4, and 5 to portfolios that excluded EE 3, 4, or 5. It was shown that the rate impact of portfolios with DSM were lower than the rate impact of portfolios that replaced DSM with other sources."[6] "The decision to pursue all identified cost-effective DSM potential is justified based on the 2006 IEP portfolio analysis, which demonstrates that DSM is a cost-effective resource that mitigates exposure to cost risk associated with natural gas and electricity price and GHG offset scenarios, and has a relatively low rate impact.[7]

B. Hydro's Economic Assessment of Power Smart Programs and Portfolios

Q: How did the Utility Commission direct Hydro to assess the economic performance of its proposing its portfolio of DSM programs?

A: In its October 29, 2004 order in Hydro's 2004 Revenue Requirements case, the Commission directed, "For the purpose of regulatory review, the TRC, UC and

[5] BC Hydro 2006 Integrated Electricity Plan, p. 8-17.

[6] Hydro 2006 Integrated Electricity Plan, p. 8-17.

[7] BC Hydro 2006 Integrated Electricity Plan, p. 7-54.

RIM [screening tests] should be presented and calculated for the portfolio, by sector and by program" and that "BC Hydro to seek approval for and file tariffs for all new Power Smart programs with a RIM benefit/cost ratio of less than 0.8 and/or a TRC benefit/cost ratio of less than 1.0. For those Power Smart programs with a RIM benefit to cost ratio of less than 0.8, BC Hydro is directed to justify with each REAP filing the continuation of those programs" (Order at 121, 122).

Q: Has Hydro complied with these directions?

A: Yes, it has, in its request for approval of continued investment in EE2. BC Hydro reports that it expects all Power Smart programs to produce TRC benefit-cost ratios in excess of 1.0 (over a range of 1.1 for high-efficiency traffic lighting to 4.6 for small business CFL lighting). RIM benefit/cost ratios equal or exceed 0.8 for all except two Power Smart programs: traffic lighting (0.6) and residential seasonal LED lighting (0.7). Note that BC Hydro has renamed both tests in its current planning: the TRC is now termed the All-Ratepayers (ARP) test, and the RIM is now the Non-Participant Test (NPT).

Q: Has Hydro adequately justified continuation of the Power Smart programs with NPT benefit-to-cost ratios of less than 0.8?

A: Yes. Section §3.6 of the RRA demonstrates that the seasonal LED (SLED) program would create no significant equity problems. These programs would collectively provide DSM services to a large percentage of Hydro customers and would have minimal effects on the bills of non-participants. In addition, as Hydro notes, these programs will help transform equipment and design markets, producing additional savings that Hydro has not quantified. Hydro does not plan continued expenditures on the traffic lighting program.

Q: When a DSM program passes the ARP test, but not the NPT test, how should Hydro modify the program?

A: In general, Hydro should not modify the program. The NPT does not test the equity of a program in any meaningful way. The equity effect of a DSM program depends on the following factors:

- whether the customer group served by the program is otherwise served more or less than other groups,
- whether the customer group served by the program is more in need of Hydro's assistance to overcome the barriers to efficiency,
- whether the program is available to a large group of customers, and
- whether the magnitude of the program results in a significant rate effect.

Programs with RIM ratios of 0.6 or 0.7 can have miniscule effects on the bills of non-participants. This is the case with the SLED program, on which BC Hydro plans to spend only $1.5 million in F2007 and F2008. If non-participants in this small program chose to participate in any Smart Power program, they would almost certainly save more than the miniscule costs that might be shifted to them by low-RIM programs.

Avoiding adverse effects on groups of customers is certainly an important consideration for Hydro and the Commission. Those effects can be better understood by assessing the relative sizes of potential cost shifts, or more detailed analyses of rates that would be charged to specific customer groups, rather than the uninformative, restrictive, and misleading NPT benefit/cost ratio.

Q: What value of avoided electricity supply costs did Hydro use to assess the benefits of future energy-efficiency investment?

A: Hydro appears to value avoided electric production at around 5.5 cents/kWh. In its IEP analysis, BC Hydro evidently has refined its previous analysis to count avoided dependable generating capacity as well as avoided transmission and distribution capacity costs. Hydro does not appear to reflect this additional

value when it applies the unit costs of avoided electricity supply in setting the maximum acceptable threshold for utility-test results for the Power Smart portfolio. Also, Hydro currently assigns a value of zero to the future market value of tradable carbon emission reductions.

Q: Would a higher value of levelized avoided electricity costs be more appropriate for assessing the value of additional energy-efficiency investment?

A: Yes. A value of 8.0 cents/kWh would be more accurate under BC Hydro's current expectations regarding future supply costs.

Q: On what do you base your avoided-cost figure of 8.0 cents/kWh?

A: I referred to the Report on the F2006 Call for Tender Process Conducted by BC Hydro, August 31, 2006. Page two of this report provides levelized average Adjusted Bid Prices (ABP) for large and small projects. Large projects are $87.5/MWh and Small projects are $76.8/MWh. I chose $80/MWh as a reasonable representation of the avoided generation costs that falls within the range of new small and large project generation costs. This does not include the value of avoided T&D costs, or the future market value of tradable carbon emission reductions.

C. BC Hydro's Ceiling on Power Smart Portfolio Costs

Q: What is the upper limit BC Hydro places on an acceptable unit energy cost for DSM?

A: In 2005, Hydro (REAP at 4-9) stated that "the complete portfolio UC (levelized) should be less than $0.025/kWh." Hydro continues to maintain this requirement

today, reiterating it in the 2006 Energy Efficiency Plan.[8] Its responses to information requests in this proceeding confirm that Hydro plans to hold the portfolio to a levelized cost of saved energy of no more than 2.5 cents/kWh.[9]

Q: Why do you object to the 2.5-cent/kWh ceiling on the portfolio's levelized cost of saved energy?

A: Striving to hold portfolio-wide costs to 2.5¢/kWh or less is equivalent to requiring the portfolio to return a minimum benefit-cost ratio of 3.2, assuming a levelized avoided supply cost of 8.0 cents/kWh. The problem with this rule in practice is that it has the potential to unduly and artificially restrict Hydro's acquisition of cost-effective supply alternatives. In an effort to keep the levelized cost per kWh below 2.5¢/kWh, Hydro would tend to dismiss all efficiency portfolio options costing between 2.5¢/kWh and 8.0¢/kWh, the updated avoided supply cost I discussed above. This would lead Hydro to favor more-expensive supply over less-expensive efficiency resources. It could also lead Hydro to select only the easiest and cheapest efficiency savings, leaving behind lost opportunities for more comprehensive and more costly but still cost-effective efficiency savings, requiring Hydro to substitute more expensive supply.

Q: Isn't this just a theoretical concern that will have no real limiting effect on DSM investment in practice?

A: No, not if Hydro is going to substantially increase its near-term and long-term commitments to cost-effective energy efficiency investment. Other leading

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[8] Exhibit B-5-3, Appendix P, Energy Efficiency Plan, April 6, 2006, p.1, 7.

[9] While originally BC Hydro explains the 2.5-cent limit as representing roughly half the avoided cost of supply, its responses to information requests indicate that the 2.5-cent limit will continue to apply even if avoided costs are higher. See BC Hydro response to BCUC IR 2.392.1.

efficiency portfolios with greater spending per kWh sold than Hydro, such as Vermont's, would fail Hydro's requirements by a wide margin.

Q: Why do you believe that this poses a serious problem in Hydro's long-term efficiency planning and acquisition?

A: There are two mutually-reinforcing dynamics at work that will needlessly restrict maximum acquisition of cost-effective efficiency.

First, efficiency potential is subject to diminishing marginal returns, as is true for other energy sources. The deeper the well, the higher the cost of acquiring the next barrel of oil. The deeper the savings, the more the next kWh of efficiency savings will cost. Examples of diminishing returns abound throughout efficiency markets abound – from HVAC equipment to motors. The cost of saved energy from going to a chiller using 0.7 kW per ton of cooling capacity from one using 1.0 kW/ton efficiency is higher than the cost of going from 1.3 kW/ton down to 1.0. Still more expensive per kWh saved is going to from 0.7 kW/ton to 0.5.

Second, pursuing the maximum amount of economically achievable efficiency potential with best practices in DSM program design will tend to increase the share of total resource costs that Hydro will need to cover. To achieve maximum market penetration in new construction and end-of-life equipment replacement, for example, efficiency programs across North America for years have been paying most if not all the incremental costs of high-efficiency equipment and design over their standard-efficiency counterparts. And in hard-to-reach markets like small businesses, programs have and do use free, direct installation in order to achieve maximum cost-effective savings as quickly as possible.

Both these dynamics will tend to operate in tandem as BC Hydro begins to expand and deepen its investment in cost-effective efficiency.

Q: Can you illustrate how BC Hydro's 2.5-cent rule would collide with diminishing returns to limit cost-effective efficiency investment?

A: Yes. Exhibit JJP-2 reproduces an energy-efficiency supply curve developed from estimated achievable costs and savings from thousands of efficiency technologies and practices analyzed for New York's residential, commercial, and industrial sectors in 2003 (a study I led for the New York State Energy Research and Development Authority). This supply curve plots the cumulative annual achievable energy savings over ten years, ranked in order of increasing levelized total resource cost of saved energy. All costs of saved energy have been inflated and converted to 2006 Canadian dollars.

Moving to the right from the origin, costs of saved energy actually start out negative, since non-energy benefits (such as generating capacity and non-electric energy and resource savings) exceed the total resource costs of the efficiency measures. As market penetration and savings deepen, costs of saved energy progressively rise, succumbing to diminishing marginal returns.

Q: How does this illustrate the potential impact of Hydro's 2.5-cent rule on its long-term DSM acquisition?

A: The exhibit also shows two horizontal lines. The lower line reflects the 2.5 cent rule Hydro applies to the portfolio. The upper horizontal line shows the 8.0 cents/kWh I estimate as a rough approximation of Hydro's long-run avoided electric energy cost. The intersection of the upper horizontal line with the supply curve shows how much efficiency would be considered cost-effective at full avoided cost. For New York by 2012, this is roughly 20,000 GWh over ten years.

BC Hydro's rule would automatically place its maximum acquisition somewhere to the left of this economically achievable potential and to the right of the intersection of the 2.5 cent line with the supply curve. How far to the left depends on two things: (1) the shape of the supply curve further to the left of this point, and (2) how much of the total costs of these lower savings Hydro would have to cover through the programs. These two factors would determine the *average* cost of saved energy from the entire portfolio.

To see this, ignore the region of the curve for the first 2,500 GWh showing negative costs; in reality utilities incur some positive costs to help customers achieve savings with measure that pay for themselves in non-electric savings. To the right of 2,500 GWh, it is clear that there is an extremely large amount of achievable savings costing between 2 and 5 cents/kWh. The curve turns sharply steeper at costs of saved energy beyond 5 cents/kWh.

The farther to the right New York invests, the higher the average cost will climb. It is not difficult to envision Hydro's 2.5 cent rule unintentionally precluding significant amounts of highly cost-effective savings, depending on the shape of the efficiency supply curve its upcoming CPR describes. For example, if Hydro found a supply curve shaped similarly to New York's, its requirement of an average cost of 2.5 cents/kWh could lead it to reject savings beyond 12,000 GWh, when the full potential would be 20,000.

Q: What is Hydro's rationale for imposing this requirement?

A: The answer to this question is not clear to me. Hydro answered as follows in response to a supplemental information request by SCCBC, et al:

> The utility cost guideline of $0.025 per kWh does not indicate whether or not DSM is cost-effective from BC Hydro's perspective. The utility test benefit-cost ratio indicates that. The rationale for the guideline is to encourage active participation and investment from customers to increase customer commitment and sustain energy savings. The guideline was not established to balance equity between participants and non-participants.[10]

Q: Do you agree?

A: No, I do not. The "guideline" is merely a re-expression of the utility test using levelized costs and benefits instead of discounted net present values. The utility test indicates whether DSM expenditures are a good use of ratepayer funds, by costing less than the avoided supply expenditures they otherwise would have to support. It is not a measure of the economic efficiency of resource allocation. It is in effect an indicator of distributional fairness in the use of funds provided by electricity ratepayers as a whole. This is different from the distributional fairness of expenditures between participants and non-participants, as Hydro points out in its response.

Q: Can you suggest a more reasonable utility-test requirement BC Hydro's Power Smart portfolio?

A: A portfolio minimum benefit cost ratio of 1.33 would be far more reasonable. It would still ensure that electric ratepayers as a whole receive a good deal on the use of their money, without unduly restricting cost-effective efficiency investment. A minimum utility benefit/cost ratio of 1.33 would make sure ratepayers paid no more than 6 cents/kWh for DSM resources on average. Such a guideline would be far less likely to choke off investment in cost-effective savings than BC Hydro's current 2.5-cent rule.

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[10] SCCBC, et al Information Request No. 2.1.2 Dated: August 22, 2006 British Columbia Hydro & Power Authority Page 2 Response issued September 18, 2006 British Columbia Hydro & Power Authority F07/F08 Revenue Requirements Application Exhibit: B-16.

Q: Can you cite examples of other efficiency portfolio administrators that require savings to meet such a utility test?

A: Yes. The Vermont Public Service Board's contract for Efficiency Vermont requires the entire three-year portfolio to yield a utility benefit/cost rate of at least 1.2 before the contractor is eligible for earning any performance incentive it might otherwise qualify for (e.g., based on annual MWh savings and total resource benefits). The PSB explicitly states that this requirement is intended to advance the policy goal of "equity for all Vermont electric customers as a group by assuring that the overall electric benefits are greater than the costs incurred to implement and evaluate the efficiency utility."[11]

Q: What was the levelized cost of electric energy saved by Efficiency Vermont in 2005?

A: Both the TRC and the ratepayer-supported costs of saved energy averaged about 4 cents/kWh in 2005.[12] Levelized avoided electric supply costs, including avoided T&D, were about 10 cents/kWh. While Efficiency Vermont's 2005 investments were clearly less expensive than the supply they avoided, the portfolio exceeded 2.5 cents per kWh on average. Going forward, Efficiency Vermont is committed to spending 75 percent more annually on energy efficiency investment by 2008. Diminishing returns will invariably drive up the average cost of saved energy. It is reasonable for the Commission to expect BC Hydro to face similar circumstances with increased energy-efficiency investment. Consequently, BC Hydro should lift the ceiling on the utility levelized cost of saved energy from the Power Smart portfolio.

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[11] Public Service Board contract for Efficiency Vermont services, 2006-2008, Attachment C, Table C-4.

[12] Efficiency Vermont 2005 Annual Report, September, 2005.

D. Removing Restraints on Current Power Smart Programs

Q: Are there changes that Hydro could make to its current program designs that would improve the performance of its Power Smart portfolio?

A: Yes. Several aspects of Hydro's Energy Efficiency Plan limit the acquisition of cost-effective savings. Removing these restraints can be expected to produce more cost-effective savings by attracting more participants and inducing them to make deeper efficiency investments.

Q: How would increased program activity improve economic performance of the portfolio?

A: Any well-designed and well-run energy-efficiency portfolio entails substantial fixed administrative costs. Hydro can achieve broader participation and deeper savings among participants in its programs by intensifying marketing, financial, technical, and delivery strategies. Increasing electricity savings by stimulating more investment in cost-effective technologies would spread Hydro's fixed program costs over more electricity savings, thus resulting in reduced costs of saved energy and disproportionately greater increases in electricity savings.

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

A: Two aspects of BC Hydro's non-residential Power Smart program designs discourage comprehensiveness and/or customer participation: the emphasis in the commercial Power Smart Partner program on choosing project with the lowest levelized cost of saved energy; and the denial of financial incentives to the largest customers billed at stepped rates.

Q: Explain why the commercial Power Smart Partners program discourages cost-effective efficiency investment

A: Hydro's program design for commercial and governmental Power Smart Partners tends to unduly restrict savings from potential efficiency projects. In this program, projects that "prove to be the most cost-effective on a $/kWh basis receive incentives." (2006 EEP, at 13). If Hydro actually follows this decision rule in practice, then it will tend to favor *cream skimming*—encouraging only the cheapest and easiest savings. Declining to provide incentives for more-comprehensive-yet-cost-effective efficiency projects will tend to favor more expensive supply that otherwise could have been avoided. The proper economic approach is to encourage the competing project alternative that offers the maximum present worth of net benefits under the TRC. By contrast, maximizing the TRC benefit/cost ratio, as discussed earlier, is the same as minimizing the levelized cost of saved energy. Consequently, this feature of Hydro's commercial Power Smart program further aggravates the effect of Hydro's 2.5-cent guideline, namely, to restrict Hydro's acquisition of cost-effective DSM.

Q: How could lifting the restriction on financial incentives to customers billed at the T2 rate increase cost-effective savings acquisition?

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

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

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

E. Appropriate Power Smart Spending and Savings Goals

Q: How much should BC Hydro be expected to spend on and save from its energy-efficiency portfolio over the planning horizon?

A: Eventually, it is reasonable to expect Hydro to spend and save as much on energy-efficiency as Pacific Gas & Electric plans to accomplish over the 2006-2008 period. PG&E's actual and planned spending and savings are presented in Exhibit JJP-3. Adjusted for its size and sector split between residential and nonresidential customers relative to PG&E, BC Hydro should plan on increasing total spending to $267 million annually. This is roughly double Hydro's planned expenditures starting in F2013, when it plans to roll out EE 3 in conjunction with EE 4 and 5. Annual savings would reach 787 GWh/yr,

compared with the 644 GWh/yr Hydro expects to realize by F2013. Exhibit JJP-4 shows EE spending and savings levels I recommend for BC Hydro based on PG&E's plans.

Over the next three years, Hydro should ramp up its spending and savings to approach these longer-term goals as expeditiously and effectively as possible. Rather than reduce spending as planned in F2007 from F2006 levels, I recommend that Hydro raise 2007 spending by a third over 2006. For 2008, I recommend that Hydro raise spending by 75% compared to F2006. In order to make as much progress as soon as possible toward the long-term portfolio spending goals based on PG&E's plans, I recommend that spending in 2009 increase by 125% over F2006.

Consequently, I recommend that the Commission expect BC Hydro to budget $82 million for 2007 and $107 million for 2008. I estimate that these expenditure levels will produce incremental savings of 373 GWh/yr in 2007 and 584 GWh/yr in 2008. Exhibit JJP-4 presents and compares these recommended spending and savings goals.

Q: What is the basis for these recommendations?

A: PG&E's planned spending and savings form the basis for my long-term recommendations for Hydro. I base my near-term recommendations regarding how quickly BC Hydro could ramp up effectively on my professional judgment, informed by my knowledge and experience with efficiency portfolio administration elsewhere.

Q: Why do PG&E's investment and performance represent a reasonable basis for projecting BC Hydro's?

A: PG&E shares several characteristics that make it an apt model for comparison with and making projections for BC Hydro. Aside from relative geographic

proximity, they are roughly comparable in size (in terms of annual electric energy sales) and sector splits (PG&E's residential sales are a somewhat higher fraction of its total than BC Hydro's). Both utilities share a strong stated commitment to pursuing all cost-effectively achievable energy efficiency in their long-term resource plans. And both have been pursuing energy-efficiency for well over a decade with mature, evolving program portfolios. Moreover, both openly encourage gas fuel substitution.

Q: Explain why you believe that BC Hydro could effectively ramp up its spending and savings over the next three years to the degree you recommend.

A: Efficiency portfolio administrators in several jurisdictions are in the midst of planning to increase efficiency spending significantly and rapidly, including California, Oregon, Wisconsin, and most recently, Vermont. As shown in Exhibit JJP-3, PG&E plans to more than double its 2004 spending of $121 million to $267 million this year, with subsequent annual spending increases of 14% and 22% in 2007 and 2008.

My own ongoing experience on Efficiency Vermont's senior management team reinforces my conviction that BC Hydro can successfully ramp up its spending and savings in the near term. We are committed to increasing 2008 spending by almost 80% over 2006 levels, after increasing our 2007 budget by more than a third. We will accomplish this in the short term by "taking our feet off the brakes" by meeting pent-up demand in the marketplace without major changes in current program designs. At the same time, we are seriously investigating new program designs using more aggressive strategies to get more savings faster, based on best practices that have succeeded in California and elsewhere.

Q: What other evidence can you provide that your ramp-up recommendations are reasonably achievable by BC Hydro?

A: Exhibit JJP-5 presents energy-efficiency spending and savings depth for utilities in the northeastern U.S. Leading states in this region include Massachusetts, Connecticut, New York, New Jersey, and Vermont. The ramped-up spending and savings levels I recommend for BC Hydro over the next three years are well within the range realized by these utilities over the last few years.

Q: Is there anything in BC Hydro's own DSM program plans or experience that supports your belief that it can accomplish more sooner?

A: Yes. Between April 2001 and December 2005, BC Hydro's EE 2 and LD 2 portfolio achieved 110% of its target at 72% of planned costs.[13] Hydro could reverse course and increase rather than decrease spending next year. Finally, Hydro could move immediately to incorporate best practices into its current program designs to increase activity and comprehensiveness, starting with removing the undue restraints built into its largest nonresidential programs.

Q: Are you testifying that BC Hydro should not go through the long-term DSM planning process it proposes?

A: No, I am not. I am testifying that BC Hydro should proceed with this process in parallel with renewed effort to redeploy existing program to maximize efficiency investment under current designs in 2007. Simultaneously, Hydro should undertake a prompt review of the readily available research on best practices in DSM program design.[14] Engaging experts experienced with more aggressive programs in California, the Pacific Northwest, and the northeastern

[13] BC Hydro 2006 Integrated Electricity Plan, p. 4-19

[14] Best Practices website: http://www.eebestpractices.com/

U.S., as well as British Columbia stakeholders, BC Hydro should then re-design programs as needed to maximize achievement of cost-effective efficiency savings in all markets. BC Hydro should prepare to stage the implementation of these redesigned programs starting in mid-2007. By year-end 2008, Hydro should have fully launched the revamped Power Smart portfolio, and be planning to spend the $138 million I recommend for 2009. This in effect advances by three years Hydro's planned spending for F2013. By 2008, Hydro can begin using the results of its proposed planning process, including the new CPR, to guide its long-term DSM planning and acquisition.

Q: Does this conclude your testimony?

A: Yes.

RESUME

John J. Plunkett
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Trained as an economist, I have 27 years of experience in energy utility planning, concentrating on energy-efficiency as a resource and business strategy by energy service providers. I have played key advisory and negotiating roles for clients on virtually 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 planning, and their respective roles in business, regulatory, ratemaking, resource planning and policy decisions. I have also led and/or prepared numerous analyses and reports on the achievable potential for cost-effective efficiency and renewable resources. I have testified as an expert witness in regulatory proceedings throughout North America.

PROFESSIONAL EXPERIENCE

November 2005-present
Partner, **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, my colleague since 1992. Technical and strategic assistance with portfolio development, design, analysis, planning, administration, implementation management support, oversight, performance verification and evaluation, performance incentive mechanisms, and regulatory and ratemaking treatment. Current assignments include:

- Leading Natural Resources Defense Council consulting team working with China's Jiangsu province to develop and implement "energy-efficiency power plants." (July 2003 – present)

- Senior policy advisor to and senior management team member of Efficiency Vermont, the nation's first statewide energy-efficiency utility. (2000-present)

- Leading assessment and development of demand-side alternatives to transmission and distribution investments in Vermont's "southern loop" on behalf of Vermont Electric Power Company and Central Vermont Public Service, including implementation planning. (April 2005 – present)

On these and other assignments I work closely on design, planning, implementation support and evaluation with Optimal Energy on commercial/industrial efficiency investments and with Vermont Energy Investment Corporation on residential and renewable investments.

1996 – 2005
Partner, **Optimal Energy, Inc.**, Bristol, VT.
Strategic planning, implementation management and regulatory support on energy-efficiency

investment by regulated and unregulated businesses. Lead technical consultant for Natural Resources Defense Council (NRDC) on demand-side management portfolio design and economic analysis in Shanghai and Jiangsu province. Part of Efficiency Vermont senior management team responsible for administering statewide energy efficiency portfolio from inception through third three-year contract. 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, on behalf of Vermont transmission utility. Advisor on economic analysis of clean energy initiative for the Long Island Power Authority, and on program cost-effectiveness in Massachusetts and New Jersey collaboratives, and regional market transformation initiatives on behalf of 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.

EDUCATION

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

HIGHLIGHTS OF PROJECT EXPERIENCE

EFFICIENCY PORTFOLIO DESIGN AND PLANNING

- 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.

- Team leader for domestic and international consultants engaged in a pre-feasibility analysis for the Asian Development Bank of a potential loan to support a demonstration Efficiency Power Plant (EPP) project in Guangdong province. June 2006 – present.

- Consulting team leader on development, assessment, and implementation of demand-side management investment portfolios for China, for the Natural Resources Defense Council. (July 2003 – present) Responsible for framing and conducting benefit/cost analysis of efficiency program portfolios for Jiangsu province and Shanghai municipality, including assessment of 300-MW Efficiency Power Plants for prospectus by Asian Development Bank; co-authoring portfolio analysis report; and program implementation planning and support. Led development and application of program and portfolio economic analysis tool based on model developed with Optimal Energy for U.S. DSM planning. Assisting Jiangsu Province with design and planning for first-stage implementation of two Efficiency Power Plant (EPP) programs investing 100 million RMB in 2006 on high-efficiency retrofits to industrial motors and drives and commercial lighting and cooling. October 2005 – present.

- Senior Policy Advisor and member of senior management team, Efficiency Vermont, the world's first Energy Efficiency Utility, currently operating under a US$52 million three-year contract with the Vermont Public Service Board to deliver statewide energy-efficiency programs for the customers of Vermont's twenty-one electric utilities. Senior management team member from inception in 2000 to present; policy advisor, 2002-present; led program development and planning, 2000-2002. Responsibilities included leading development and negotiation of energy-efficiency portfolio performance goals and performance incentive mechanism for three successive contracts totaling US$147 million over nine years.

- Advisor to consulting team leader on planning and management support for Long Island Power Authority's Clean Energy Initiative, which is currently investing US$40 million annually (January 2003 – present). Assisting with development and economic analysis of ten-year US$700 million efficiency power plant portfolio. Previously, consulting team leader on energy-efficiency program planning and implementation management support. (July 1998 – January 2001). Coordinated development of core energy-efficiency and renewable

programs in LIPA's first five-year clean energy portfolio, investing US$160 million in efficiency, load-management, and solar power programs.

- Consulting team leader for assessment of economically achievable potential for distributed resources to solve a variety of transmission and distribution contingencies in the "southern loop" of Vermont, on behalf of the Vermont Electric Power Company and Central Vermont Public Service. 2005-present.

- Leading program planning for local, accelerated targeted efficiency investment demonstration in Vermont's southern loop, on behalf of Central Vermont Public Service (in progress)

- Economic advisor to Northeast Energy Efficiency Partnerships (NEEP) on cost-effectiveness of regional market-transformation initiatives. Most recently served as technical advisor on a report assessing need for and approaches to standardizing protocols for estimating DSM savings throughout the northeastern US. (1998-present)

- 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.

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

- Report and testimony on Opportunities for Accelerated Electrical Energy Efficiency in Quebec 2005 – 2012, on behalf of Regroupment National des Conseils Regionaux de L'environnement du Quebec, Regroupment des Organisms Environnementaux en Energie and Regroupment pour la Responsabilite Sociale des Entrepreses. (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)

- 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 – present)

- Economic advisor to Northeast Energy Efficiency Partnerships, a not-for-profit regional consortium of utilities pursuing market transformation in efficiency markets. Economic analysis and report on cost-effectiveness of NEEP initiatives involving high-efficiency motors, clothes washers, and residential lighting. (1998 – in progress)

- "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 designs 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)

- Consultant on various 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)

- 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)

- 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)

- 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)

ENERGY AND REGULATORY POLICY

- 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)

- 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 – present)

- 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)

- 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)

- 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)

- 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)

- Provided technical and policy advice for the South Carolina Department of Consumer Affairs in PSC investigation into Electric Utility Least-Cost Planning, Docket No. 87-223-E. (September 1987 – November 1992)

RESOURCE PLANNING AND ASSESSMENT

- 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)

- 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)

- 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)

- 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)

- 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)

- 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)

<u>LOW-INCOME ENERGY PROGRAMS</u>

- 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).

RENEWABLE ENERGY

- 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)

- 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 PURPA 210. U.S House of Representatives Subcommittee on Energy Conservation and Power. (1981)

- Written and oral testimony in rulemaking for PURPA on behalf of the Institute for Local Self-Reliance, before the Federal Energy Regulatory Commission. (1979)

PUBLICATIONS/PRESENTATIONS

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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.

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"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.

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"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.

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"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.

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"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.

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"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.

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

Exhibit JJP-2
NYSERDA Supply Curve

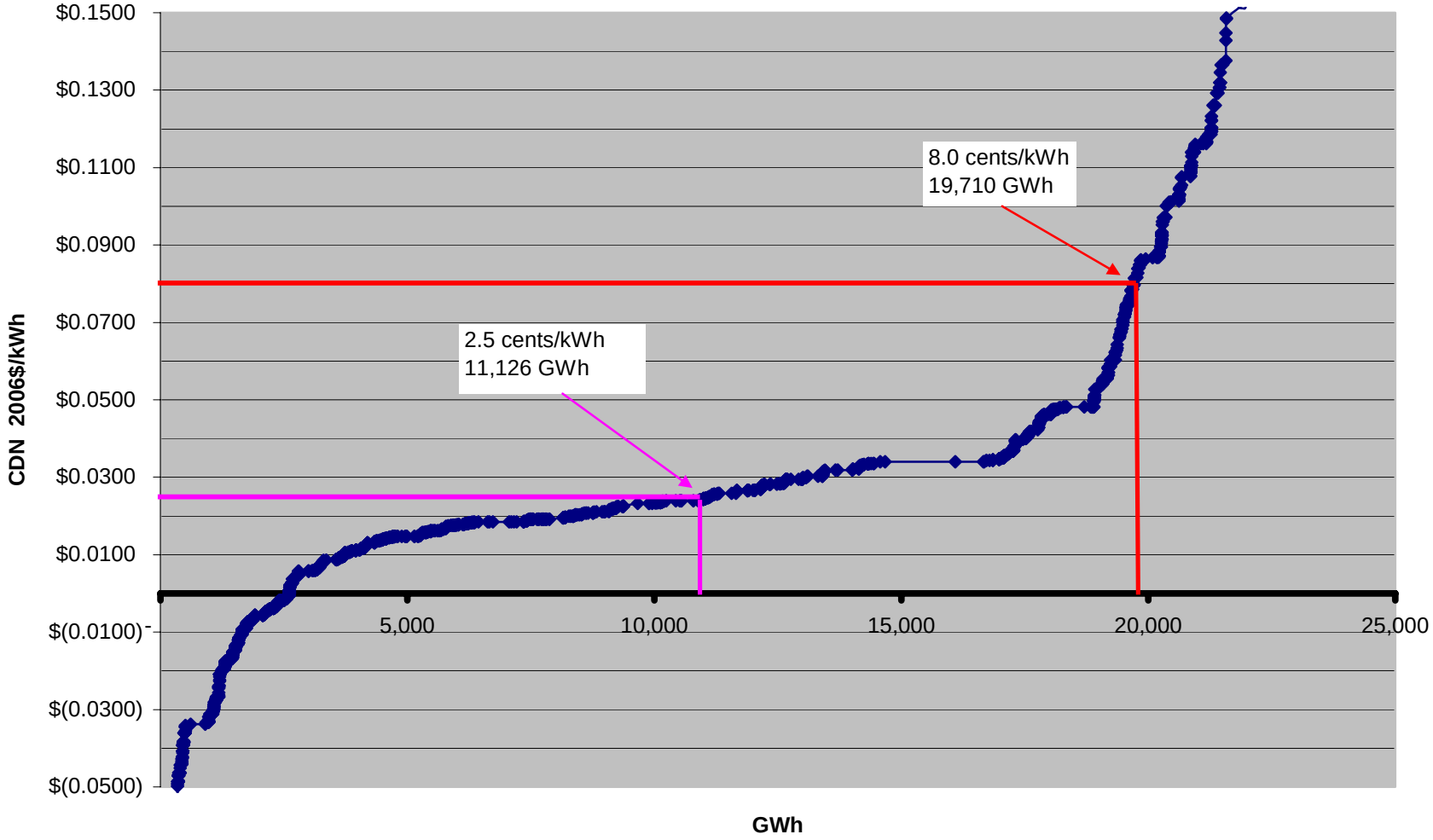

Exhibit JJP-3

PG&E Efficiency Spending and Savings

	Actual	Projected		
	2004	2006	2007	2008
Electric Efficiency Spending (CDN$)				
Residential	$ 61,567,000	na	na	na
Non-Residential	$ 59,746,410	na	na	na
Total	$ 121,313,410	$ 267,443,775	$ 305,458,176	$ 375,372,841
Savings (GWh)				
Residential	251	581	674	793
Non-Residential	312	275	303	337
Total	564	856	977	1,130
Sales (GWh)				
Residential	21,389	25,186	27,331	29,657
Non-Residential	32,506	36,581	38,854	41,300
Total	53,895	61,768	66,185	70,958
Savings yield (kWh Savings/Spending CDN$)				
Residential	4.08	2.88	2.87	2.69
Non-Residential	5.22	3.68	3.67	3.44
Total	4.65	3.28	3.26	3.06
Savings depth (kWh Savings/kWh Sales)				
Residential	1.2%	2.3%	2.5%	2.7%
Non-Residential	1.0%	0.8%	0.8%	0.8%
Total	1.0%	1.4%	1.5%	1.6%

Sources:

1. Pacifc Gas and Electric Company's Energy Efficiency Programs Annual Report - May 2005, Table 1.1, Summary of Costs (Electric), page I-6
2. Pacifc Gas and Electric Company's Energy Efficiency Programs Annual Report - May 2005, Table 1.2a Summary of EEP Effects (Annual Energy Reductions, Net MWH), page I-7
3. California Public Utility Commissions 9/22/05 Decision, Application 05-06-004, Attachment 4
4. PG&E filing to the CPUC 7/15/05, 2006-2008 Energy Efficiency Program Portfolio Additional Program Details
5. US Energy Information Agency, Table 6. Class of Ownership, Number of Bundled Ultimate Consumers, Revenue, Sales, and Average Retail Price for the Residential Sector by State Utilitiy, 2004
6. US Energy Information Agency, Table 7. Class of Ownership, Number of Bundled Ultimate Consumers, Revenue, Sales, and Average Retail Price for the Residential Sector by State Utilitiy, 2004
7. US Energy Information Agency, Table 8. Class of Ownership, Number of Bundled Ultimate Consumers, Revenue, Sales, and Average Retail Price for the Residential Sector by State Utilitiy, 2004

Exhibit JJP-4

BC Hydro Projected from PG&E Planned Efficiency Spending and Savings

	2005	2006	2007	2008	2009
BC Hydro Sales (GWh)					
Residential			17,202	17,559	17,916
Non-Residential			36,498	37,128	37,800
Total			53,700	54,687	55,716
Projection Based on PG&E Planned Efficiency for 2006-2008					
Incremental Savings % of Sales					
Residential			2.3%	2.5%	2.7%
Non-Residential			0.8%	0.8%	0.8%
Total			1.2%	1.3%	1.4%
Savings yield (kWh/CDN$)					
Residential			2.88	2.87	2.69
Non-Residential			3.68	3.67	3.44
Total			3.16	3.14	2.94
Incremental Savings (GWh)					
Residential			397	433	479
Non-Residential			274	290	308
Total			671	723	787
Spending (CDN$)					
Residential			$ 137,774,586	$ 151,026,460	$ 177,980,864
Non-Residential			$ 74,502,348	$ 78,976,195	$ 89,621,046
Total			$ 212,276,934	$ 230,002,655	$ 267,601,910
$/kWh sales			$ 0.0040	$ 0.0042	$ 0.0048
BC Hydro Planned (EE2, EE3, EE4, EE5)					
Incremental Savings (GWh)					
Total	450	209	246	468	388
Spending (CDN$)					
Total	$ 50,927,000	$ 61,172,000	$ 50,000,000	$ 78,000,000	$ 61,000,000
$/kWh sales			$ 0.0009	$ 0.0014	$ 0.0011
kWh/yr yield per $ spent	8.84	3.41	4.92	6.00	6.36
Recommended BC Hydro DSM Spending Ramp-Up					
% increase, from 2006			33%	75%	125%
Recommended DSM ramp-up budget			$ 81,562,667	$ 107,051,000	$ 137,637,000
$/kWh sales			$ 0.0015	$ 0.0020	$ 0.0025
Increase over BC Hydro proposed			63%	37%	126%
Projected savings, GWh/yr			373	584	701
Projected savings, % of forecast sales			0.7%	1.1%	1.3%
Projected savings, increase over BC Hydro projected			52%	25%	81%

Sources:

1. BC Hydro Exhibit B-1C, 2006 IEP, Appendix K2, 2005 load Forecast, Table 5.1
2. BC Hydro 07/08 RRA, Volume 3, Appendix P, Energy Efficiency Plan (4/6/06), Table 1.
3. BC Hydro Exhibit B-1A, 2006 IEP, Table 4-9.
4. BC Hydro Exhibit B-1B, Appendix F, 2005 Resource Options Report, Table 6-1, p. 6-8.
3. Exhibit JJP-3

Please note: BC Hydro figures are for fiscal years.

Energy Efficiency Portfolio Performance Comparison

Residential		Spending Depth (4) / (5)	Savings Yield (6) / (4)	Savings Depth (6) / (5)		Data		
State	Year	(1) $ Spent (2005$) per Retail Sector MWh Sales	(2) Annual kWh Savings per $ Spent (2005$)	(3) Annual MWh Savings per Retail Sector MWh Sales		(4) Spending ($ millions)	(5) Retail Sector Sales (MWh)	(6) Annual MWh Savings
Connecticut	2004	$1.4	5.1	0.65%		$16.4	12,366,484	80,617
	2003	$1.2	1.9	0.20%		$14.4	12,331,116	25,000
	2002	$1.7	4.3	0.62%		$18.3	11,772,238	72,460
	2001	$2.0	5.1	0.81%		$20.2	11,446,846	92,550
Maine	2004	$0.4	4.0	0.13%		$1.5	NAV	5,580
	2003	$0.1	4.6	0.04%		$0.4	4,359,020	1,918
	2002	-	-	-		NAV	NAV	NAV
	2001	-	-	-		NAP	NAV	NAP
Massachusetts	2004	$3.3	4.3	1.29%		$51.7	16,430,880	211,781
	2003	$2.3	2.8	0.55%		$34.6	16,114,567	88,913
	2002	$1.8	2.3	0.36%		$25.9	15,522,546	55,241
	2001	$2.2	2.5	0.45%		$30.1	15,159,987	68,291
New Hampshire	2004	$1.7	2.3	0.35%		$6.9	4,218,015	14,896
	2003	$1.7	2.2	0.32%		$6.5	4,129,405	13,344
	2002	-	-	-		NAV	NAV	NAV
	2001	-	-	-		NAP	NAV	NAP
New Jersey	2004	$1.5	3.5	0.46%		$37.4	26,947,140	124,369
	2003	$1.5	2.6	0.33%		$36.7	26,384,718	88,230
	2002	$1.1	1.0	0.09%		$26.8	26,598,261	24,161
	2001	$1.0	1.1	0.09%		$23.0	24,783,958	22,882
Long Island Power Authority (LIPA)	2004	$2.0	2.8	0.51%		$16.1	9,182,520	43,312
	2003	$2.7	2.7	0.64%		$21.8	8,489,702	54,742
	2002	$2.8	2.3	0.54%		$21.6	8,489,702	46,102
	2001	$2.4	2.7	0.52%		$17.3	8,143,069	42,574
New York State Energy Research and Development Authority (NYSERDA)	2004	$1.4	1.9	0.24%		$44.8	33,582,007	80,900
	2003	$0.7	3.3	0.19%		$20.3	33,260,213	62,700
	2002	$0.6	3.5	0.17%		$17.9	33,305,596	57,800
	2001	-	-	-		NAV	NAV	NAV
Vermont	2004	$3.6	4.3	1.44%		$7.0	2,016,715	29,026
	2003	$3.4	3.3	0.99%		$6.1	1,917,142	18,969
	2002	$3.2	3.8	1.02%		$5.7	1,955,203	19,991
	2001	$2.7	4.4	0.99%		$4.7	1,919,617	18,917

Notes:

1. NAV = Information Not Available; NAP = Not Applicable (No Program)
2. 2001, 2002, 2003 and 2004 sector sales as reported by US EIA
3. Maine sales are from Bangor Hydro (2003), Central Maine Power (2004) and Maine Public Service (2002); in addition, all others are assumed to be 5% of these sales
4. U.S. Bureau of Labor and Statistics Consumer Price Index Inflation Calculator used to calculate present worth in 2005$
5. Connecticut programs were suspended for part of 2003
6. New Hampshire annual savings = lifetime savings / assumed average 15 year measure life
7. Vermont data excludes Burlington Electric Department

Energy Efficiency Portfolio Performance Comparison

Nonresidential		Spending Depth (4) / (5)	Savings Yield (6) / (4)	Savings Depth (6) / (5)		Data		
State	Year	(1) $ Spent (2005$) per Retail Sector MWh Sales	(2) Annual kWh Savings per $ Spent (2005$)	(3) Annual MWh Savings per Retail Sector MWh Sales		(4) Spending ($ millions)	(5) Retail Sector Sales (MWh)	(6) Annual MWh Savings
Connecticut	2004	$1.5	5.7	0.76%		$23.4	16,779,631	127,385
	2003	$1.2	6.1	0.63%		$18.6	16,756,800	105,700
	2002	$1.7	5.1	0.73%		$26.2	16,622,278	122,036
	2001	$1.7	5.5	0.76%		$26.1	16,867,301	128,200
Efficiency Maine	2004	$0.3	6.4	0.17%		$2.0	NAV	12,338
	2003	$0.1	8.5	0.05%		$0.5	7,462,290	3,909
	2002	-	-	-		NAV	NAV	NAV
	2001	-	-	-		NAP	NAV	NAP
Massachusetts	2004	$3.4	3.2	1.10%		$68.6	19,173,983	210,152
	2003	$2.9	4.7	1.18%		$56.2	21,030,110	247,488
	2002	$3.4	3.5	1.02%		$63.4	20,247,516	205,856
	2001	$3.4	5.2	1.44%		$60.5	19,728,983	284,286
New Hampshire	2004	$1.3	5.7	0.65%		$7.6	6,457,719	41,879
	2003	$1.2	6.7	0.70%		$6.9	6,241,509	43,412
	2002	-	-	-		NAV	NAV	NAV
	2001	-	-	-		NAP	NAV	NAP
New Jersey	2004	$0.7	7.8	0.50%		$27.2	32,295,198	204,144
	2003	$0.7	7.6	0.48%		$27.6	41,105,248	197,347
	2002	$0.9	4.5	0.32%		$35.4	45,129,424	144,635
	2001	$0.3	2.9	0.07%		$11.8	43,671,352	30,943
Long Island Power Authority (LIPA)	2004	$0.8	3.7	0.27%		$7.2	9,666,377	25,828
	2003	$0.9	2.8	0.22%		$7.9	9,593,209	20,884
	2002	$0.9	4.0	0.31%		$7.5	9,026,264	27,542
	2001	$0.9	3.0	0.22%		$7.3	9,002,154	19,510
New York State Energy Research and Development Authority (NYSERDA)	2004	$1.3	9.0	1.21%		$52.5	37,897,275	456,900
	2003	$0.6	12.3	0.69%		$24.7	41,500,182	284,500
	2002	$0.6	10.1	0.49%		$25.8	48,471,686	239,100
	2001	-	-	-		NAV	NAV	NAV
Efficiency Vermont	2004	$1.6	6.0	0.86%		$4.9	3,294,004	28,410
	2003	$1.9	5.7	0.93%		$5.4	3,069,837	28,453
	2002	$1.6	4.6	0.63%		$4.9	3,291,679	20,630
	2001	$1.3	5.5	0.56%		$3.8	3,293,986	18,572

Notes:

1. NAV = Information Not Available; NAP = Not Applicable (No Program)
2. 2001, 2002, 2003 and 2004 sector sales as reported by US EIA
3. Maine sales are from Bangor Hydro (2003), Central Maine Power (2004) and Maine Public Service (2002); in addition, all others are assumed to be 5% of these sales
4. U.S. Bureau of Labor and Statistics Consumer Price Index Inflation Calculator used to calculate present worth in 2005$
5. Connecticut programs were suspended for part of 2003
6. 2003 Connecticut savings are for United Illuminating only
7. New Hampshire annual savings = lifetime savings / assumed average 15 year measure life
8. Vermont data excludes Burlington Electric Department

Energy Efficiency Portfolio Performance Comparison

Residential and Nonresidential		Spending Depth (4) / (5)	Savings Yield (6) / (4)	Savings Depth (6) / (5)	Data		
State	Year	(1) $ Spent (2005$) per Retail Sector MWh Sales	(2) Annual kWh Savings per $ Spent (2005$)	(3) Annual MWh Savings per Retail Sector MWh Sales	(4) Spending ($ millions)	(5) Retail Sector Sales (MWh)	(6) Annual MWh Savings
Connecticut	2004	$1.4	5.4	0.71%	$39.8	29,146,115	208,002
	2003	$1.2	4.2	0.45%	$33.0	29,087,916	130,700
	2002	$1.7	4.8	0.68%	$44.5	28,394,516	194,497
	2001	$1.8	5.3	0.78%	$46.3	28,314,147	220,750
Efficiency Maine	2004	$0.3	5.4	0.15%	$3.5	NAV	17,918
	2003	$0.1	6.6	0.05%	$0.9	11,821,310	5,827
	2002	-	-	-	NAV	NAV	NAV
	2001	-	-	-	NAP	NAV	NAP
Massachusetts	2004	$3.4	3.6	1.19%	$120.3	35,604,863	421,933
	2003	$2.6	4.0	0.91%	$90.7	37,144,677	336,401
	2002	$2.7	3.2	0.73%	$89.3	35,770,062	261,097
	2001	$2.9	4.3	1.01%	$90.6	34,888,970	352,577
New Hampshire	2004	$1.5	4.1	0.53%	$14.5	10,675,734	56,776
	2003	$1.4	4.5	0.55%	$13.4	10,370,914	56,756
	2002	-	-	-	NAV	NAV	NAV
	2001	-	-	-	NAP	NAV	NAP
New Jersey	2004	$1.0	5.3	0.49%	$64.5	59,242,338	328,513
	2003	$1.0	4.8	0.42%	$64.3	67,489,966	285,577
	2002	$0.9	3.0	0.24%	$62.2	71,727,685	168,796
	2001	$0.6	1.7	0.08%	$34.8	68,455,310	53,825
Long Island Power Authority (LIPA)	2004	$1.3	3.1	0.37%	$23.3	18,848,897	69,140
	2003	$1.8	2.7	0.42%	$29.6	18,082,911	75,626
	2002	$1.8	2.8	0.42%	$29.1	17,515,966	73,644
	2001	$1.6	2.8	0.36%	$24.6	17,145,223	62,084
New York State Energy Research and Development Authority (NYSERDA)	2004	$1.4	5.7	0.75%	$97.3	71,479,282	537,800
	2003	$0.6	8.3	0.46%	$45.0	74,760,395	347,200
	2002	$0.6	7.4	0.36%	$43.7	81,777,282	296,900
	2001	-	-	-	NAV	NAV	NAV
Efficiency Vermont	2004	$2.3	5.0	1.08%	$12.0	5,310,719	57,436
	2003	$2.5	4.4	0.95%	$11.5	4,986,979	47,422
	2002	$2.2	4.2	0.77%	$10.6	5,246,882	40,621
	2001	$1.8	4.9	0.72%	$8.5	5,213,603	37,489

Notes:

1. NAV = Information Not Available; NAP = Not Applicable (No Program)
2. 2001, 2002, 2003 and 2004 sector sales as reported by US EIA
3. Maine sales are from Bangor Hydro (2003), Central Maine Power (2004) and Maine Public Service (2002); in addition, all others are assumed to be 5% of these sales
4. U.S. Bureau of Labor and Statistics Consumer Price Index Inflation Calculator used to calculate present worth in 2005$
5. Connecticut programs were suspended for part of 2003
6. 2003 Connecticut savings are for United Illuminating only
7. New Hampshire annual savings = lifetime savings / assumed average 15 year measure life
8. Vermont data excludes Burlington Electric Department

Source: ACEEE 2006 Summer Study, "Comparative Performance of Electrical Energy Efficiency Portfolios in Seven Northeast States", Stuart Slote, Optimal Energy, Inc., Glenn Reed, Vermont Energy Investment Corporation, John Plunkett, Green Energy Economics Group, Inc.