IN THE MATTER OF THE

UTILITIES COMMISSION ACT, R.S.B.C. 1996, CHAPTER 473

- AND -

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

2004/05 AND 2005/06 REVENUE REQUIREMENTS APPLICATION

Direct Testimony of
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On Behalf of
The Sierra Club of Canada, BC Chapter

On the Topic of
The Power Smart Programs Contained in BC Hydro's Revenue Requirement Application 2004/05 and 2005/06

April 20, 2004

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1. INTRODUCTION AND QUALIFICATIONS

Q. What is your name, position and business address?

A. My name is Tim Woolf. I am the Vice-President of Synapse Energy Economics, Inc, 22 Pearl Street, Cambridge, MA 02139.

Q. Please describe Synapse Energy Economics.

A. Synapse Energy Economics is a research and consulting firm specializing in electricity industry regulation, planning and analysis. Synapse works for a variety of clients, with an emphasis on consumer advocates, regulatory commissions, and environmental advocates.

Q. Please describe your experience in the area of electric utility regulation and planning.

A. My experience is summarized in my resume, which is attached as Exhibit TW-1. Electric power system planning and regulation have been a major focus of my professional activities for the past twenty-two years. In my current position at Synapse, I investigate a variety of issues related to the electric industry; with a focus on energy efficiency, renewable resources, air quality, environmental policies, and many aspects of consumer protection.

Q. Please summarize your experience in the area of electric utility demand-side management.

A. Energy efficiency has been a central component of my professional work for the past seventeen years. I am currently representing the staff of the Rhode Island Division of Public Utilities and Carriers in a collaborative process to oversee and provide input to the energy efficiency programs offered by the Narragansett Electric Company. I am also representing the Nevada Bureau of Consumer Protection in a collaborative process regarding energy efficiency programs offered in Nevada. Since 1998 I have been the principal designer of the innovative energy efficiency programs offered by the Cape Light Compact, a municipal aggregator on Cape Cod and Martha's Vineyard. I have reviewed and critiqued many utility energy efficiency programs and policies in several regions

of the US, in Québec, and in England. In addition, I have recently prepared several regional or national "clean energy plans," which assess the potential for implementing aggressive levels of energy efficiency and renewable resources over the long-term future.

Q. Please describe your professional experience before beginning your current position at Synapse Energy Economics.

A. Before joining Synapse Energy Economics, I was the Manager of the Electricity Program at Tellus Institute, a consulting firm in Boston, Massachusetts. In that capacity I managed a staff that provided research, testimony, reports and regulatory support to state energy offices, regulatory commissions, consumer advocates and environmental organizations in the US. Prior to working for Tellus Institute, I was employed as the Research Director of the Association for the Conservation of Energy in London, England. I have also worked as a Staff Economist at the Massachusetts Department of Public Utilities, and as a Policy Analyst at the Massachusetts Executive Office of Energy Resources. I hold a Masters in Business Administration from Boston University, a Diploma in Economics from the London School of Economics, a BS in Mechanical Engineering and a BA in English from Tufts University.

Q. On whose behalf are you testifying in this case?

A. I am testifying on behalf of the Sierra Club of Canada, BC Chapter.

Q. Have you testified previously in this docket?

A. No, I have not.

Q. What is the purpose of your testimony.

A. The purpose of my testimony is to identify opportunities for improving BC Hydro's Power Smart Program in order to increase the benefits to ratepayers, to the environment, and to society as a whole.

2. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Q. Please summarize your primary conclusions.

A. My primary conclusions are as follows:

- The Power Smart programs are generally well-designed and are very cost-effective. These programs will result in significant reductions in revenue requirements for BC Hydro (the Company), and will reduce customer electric bills.

- According to BC Hydro's own analyses, there is a substantial amount of achievable, cost-effective efficiency savings that are not being pursued as part of the Power Smart programs.

- If BC Hydro were to expand its Power Smart programs to achieve additional efficiency savings, it could reduce revenue requirements and lower customers bills even further.

- Additional efficiency savings would also result in greater benefits in terms of reduced need for transmission and distribution investments and reduced environmental impacts of electricity generation.

- The Power Smart programs will not have a significant impact on BC Hydro electricity rates.

Q. Please summarize your primary recommendations.

A. I recommend that BC Hydro expand its Power Smart programs in order to capture a larger portion of the achievable, cost-effective efficiency savings available on its system.

- The Company should increase its Power Smart budgets and activities for the earliest possible planning year, and continue with increased budgets and activities in future years.

- The Company should increase its Power Smart budgets so that, at a minimum, it will achieve the Most Likely Achievable Potential efficiency savings identified in its Conservation Potential Review. This would mean saving at

least an additional 1,024 GWh per year from the Power Smart programs by 2010/11, which would represent at 40% increase in the current Power Smart savings goal for that year.

- The increased budgets and activities should focus primarily, but not exclusively, on residential and industrial programs, because the current Power Smart programs capture a smaller share of the achievable potential from these sectors.

- The Company should design a program targeted to low-income residential customers, in order to address the barriers unique to these customers.

- The Company should enhance those programs that address "lost opportunities," such as the residential and commercial/industrial new construction programs.

- The Company should enhance those programs that are likely to offer the greatest benefits, such as those targeted to customers in regions subject to capacity or transmission constraints in the near future.

3. OVERVIEW OF BC HYDRO'S POWER SMART PROGRAMS

Q. Please briefly describe the Power Smart programs offered by BC Hydro.

A. The Power Smart programs are described in the BC Hydro Revenue Requirement Application, in Volume 2, Appendix I and Appendix N. They are a set of programs designed to increase the efficiency of electricity consumption of residential, commercial and institutional, and industrial customers. These programs assist customers in adopting a variety of efficiency measures by providing information, education, increased access to technologies, technical support, and financial incentives. Power Smart also includes a Load Displacement program that assists industrial customers in installing on-site generators to reduce their energy requirements from BC Hydro.

Power Smart was originally initiated by BC Hydro in 1989/90. The Company has recently proposed a 10-Year Plan covering a new level of Power Smart activities for 2002/03 through 2011/12.

The total costs for Power Smart for the 10-year period are $690 million. (BC Hydro Application, Volume 2, Appendix I, page 21.) The majority of the costs are incurred in the first five years of the program, and activities are assumed to taper off in the latter half of the period. The Company estimates that these programs will save a total of 3,618 GWh of electricity per year, as a result of the cumulative activity over this period. (BC Hydro Application, Volume 2, Appendix I, page 15.)

Q. Are the Power Smart programs generally cost-effective?

A. Yes, the Power Smart programs are very cost-effective. According to the 10-Year Plan, every Power Smart program passes the Utility Cost Test, and all of the programs combined have a Utility Benefit-Cost Ratio of 2.9. In addition, almost all of the programs pass the Total Resource Cost (TRC) test, and all of the programs combined have a TRC Benefit-Cost Ratio of 1.3.

Furthermore, the Company's Integrated Electricity Plan (IEP), filed with the Commission on March 31, 2004, notes that the Company has modified its assumption regarding the discount rate used to calculate the costs and benefits of the supply-side and demand-side resources, including the Power Smart programs. (BC Hydro IEP, Part 3, Appendix B, page B-18.) This modification suggests that the Power Smart programs are significantly more cost-effective than indicated by the 10-Year Plan. This issue will be addressed in more detail in Section 5 below.

Q. Are the Power Smart programs generally well-designed?

A. Yes, in general the Power Smart programs are well-designed. The programs address several different customer types, address many different efficiency measures, and adopt a variety of techniques for overcoming the barriers that inhibit customers from adopting cost-effective energy efficiency measures on their own. The programs also address some key lost opportunity markets, such as new construction markets in the residential, commercial and industrial sectors. Some of the Company's residential programs are coordinated with those offered by NRCan, and can thereby address relevant customers more effectively and efficiently.

4. POWER SMART DOES NOT CAPTURE A SIGNIFICANT AMOUNT OF ACHIEVABLE EFFICIENCY OPPORTUNITIES

Q. Is BC Hydro taking full advantage of the opportunities available from Power Smart?

A. No, it is not. According to BC Hydro's own analyses, there is a significant amount of achievable, cost-effective efficiency savings that is not being pursued as part of the Power Smart programs. If the Company were to expand the Power Smart programs by increasing the budgets and increasing the activity levels, it could achieve significantly more efficiency savings than is now planned. These additional savings would provide even greater benefits to ratepayers by reducing the Company's overall revenue requirements. These additional savings would also result in greater benefits in terms of reduced need for transmission and distribution investments, and reduced environmental impact of electricity generation. Furthermore, these additional efficiency savings can be achieved with little, or no, increase in electricity prices. In sum, the Company's analyses indicate that there are many reasons to expand the Power Smart programs, and no reasons not to.

Q. Please explain why you believe that Power Smart programs do not capture a significant amount of achievable efficiency savings.

A. In June 2003 the Company completed a study of the potential for cost-effective efficiency savings available from BC Hydro residential, commercial and industrial customers, referred to as the Conservation Potential Review (CPR). (Application, Volume 2, Appendix H, and BC Hydro Response to Sierra #1.8.0.) This study demonstrates that there is a large amount of achievable efficiency savings that are not being pursued by the Company in its Power Smart programs.

Q. Please describe the CPR study.

A. The Company's CPR study identified three levels of cost-effective efficiency savings potentials. First, the Economic Potential was defined as all efficiency measures whose levelized "cost of conserved energy" (CCE) was less than $60/MWh. Then the study authors identified two other levels of efficiency

savings that they considered to be "achievable," recognizing that it is very difficult to convince electricity customers and other market actors to adopt or implement all efficiency measures that are cost-effective.

In order to estimate the Achievable Potential, the study authors met with a number of experts to estimate what portion of the Economic Potential customers were likely to install as a result of BC Hydro efficiency programs and other important factors. The authors (a) grouped the energy efficiency measures by technology type, (b) identified various actions for adopting those technologies, and (c) prepared profiles of the various factors that would influence adoption of those technologies, including: likely users, key barriers to adoption, and possible actions to overcome those barriers. The experts then used their knowledge, experience and judgment to estimate the Most Likely Achievable Potential and Upper Achievable Potential efficiency savings. (BC Hydro Application, Volume 2, Appendix H, page 5.) According to the CPR:

> The range of estimates from Most Likely to Upper allows for the uncertainty associated with factors such as new program effectiveness, the state of the economy, Kyoto implications, the level of investment by BC Hydro and so forth, all of which can significantly influence the Achievable Potential. (BC Hydro Application, Volume 2, Appendix H, page 5.)

Q. Why is the CPR study so important in your assessment of the Power Smart programs?

A. The Company used the results of the CPR as inputs in developing the amounts and types of efficiency savings that could be achieved by the Power Smart programs. (BC Hydro Application, Volume 2, Appendix I, Power Smart 10-Year Plan, page 3.) The CPR study presents a diagram that indicates the process of developing the CPR and the Power Smart programs. (BC Hydro Application, Volume 2, Appendix H, page 3.)

Q. Please compare the efficiency savings identified by the CPR to those included in the Power Smart programs.

A. Table 1 below presents a summary of efficiency savings from the CPR study and the Power Smart programs. It presents the electricity savings (in GWh per year)

for the year 2010/11, because this is a year for which information is available from both studies and it captures nine years of the Power Smart 10-Year Plan.

Table 1. Efficiency Savings Comparison: Power Smart Versus CPR; 2010/11 (GWh/year)

	Residential	Commercial	Industrial	Total
CPR: Economic Potential	2,951	2,754	5,102	10,807
CPR: Upper Achievable	1,184	1,105	3,058	5,257
CPR: Likely Achievable	719	585	2,151	3,455
Power Smart	648	738	1,198	2,584

Source: BC Hydro CPR Study, and Power Smart 10-Year Plan. Industrial Load Displacement savings are not included.

Table 2 presents the difference between the efficiency savings planned for Power Smart and those identified in the CPR. Table 3 presents the percent differences between the efficiency savings planned for Power Smart and those identified in the CPR.

Table 2. Savings Comparison: Difference Between PS and CPR; 2010/11 (GWh/year)

	Residential	Commercial	Industrial	Total
CPR: Economic Potential	-2,303	-2,106	-3,904	-8,223
CPR: Upper Achievable	-536	-277	-1,860	-2,673
CPR: Likely Achievable	-71	153	-953	-871
Power Smart	0	0	0	0

Source: Table 1. Differences are calculated by subtracting the CPR savings from the Power Smart savings.

Table 3. Savings Comparison: Percent Difference Between PS and CPR; 2010/11

	Residential	Commercial	Industrial	Total
CPR: Economic Potential	22%	27%	23%	24%
CPR: Upper Achievable	55%	73%	39%	49%
CPR: Likely Achievable	90%	126%	56%	75%
Power Smart	100%	100%	100%	100%

Source: Table 1. Percentages are calculated by dividing the Power Smart savings by the CPR savings.

It is important to note that the CPR apparently does not include energy "savings" that are assumed to be available from the Industrial Load Displacement program, while the Power Smart documentation and descriptions do include such energy savings. In order to compare the savings from CPR and Power Smart, I have subtracted the Load Displacement savings from the Power Smart savings numbers.

Q. What conclusions do you draw from these comparisons?

A. One key conclusion is that there is a tremendous amount of cost-effective energy efficiency savings available from BC Hydro customers. The Economic Potential represents the amount of efficiency savings that is most desirable – i.e., the amount of efficiency savings that could be achieved for less than the costs of generating electricity. The Economic Potential of 10,807 GWh per year represents roughly 20% of the Company's Reference Case demand forecast in 2010/11, and additional savings are available in later years. (BC Hydro Application, Volume 2, Appendix H, page 8.) Energy efficiency is clearly an important resource option that can be used to meet a large portion of the Company's future electricity demands.

Q. What other conclusions do you draw from these comparisons?

A. The Power Smart programs do not come close to capturing the full amount of the Achievable potential for energy efficiency savings identified in the CPR. First , the Power Smart programs are not reaching even the Mostly Likely Potential identified in the CPR. Across all the sectors combined, the Power Smart programs are designed to achieve only 75% of the Most Likely Achievable potential, and are thus missing as much as 871 GWh per year in savings. While the Power Smart programs are designed to exceed the CPR estimates in the commercial sector, they are 90% short in the residential sector and 56% short in the industrial sector.

Second, the Power Smart programs are designed to only capture roughly half of the Upper Achievable potential identified by the CPR, on an aggregate basis. The Power Smart programs are designed to capture as much as 73% of the Upper Achievable potential in the commercial sector, but only 55% of that potential in the residential sector and only 39% of that potential in the industrial sector.

Q. Should the Company pursue a larger portion of the efficiency savings identified by the CPR?

A. Yes. At a minimum, the Company should pursue all of the savings identified in the CPR as the Most Likely Achievable potential. If the Company were to

include all of the Most Likely Achievable efficiency savings from the residential and industrial sectors in the Power Smart programs, there would be an additional 1,024 GWh per year from these programs by 2010/11, which would represent nearly a 40% increase in the current Power Smart savings goal for that year.

However, the Power Smart programs should not stop there. They should seek to achieve at least a portion of the savings identified in the CPR as the Upper Achievable potential. It is encouraging to see that the Company has designed the commercial programs to go beyond the Most Likely Achievable efficiency savings. The same approach should be applied to the residential and commercial sectors.

Q. Does the Company explain why the commercial savings in Power Smart are higher than those in the Most Likely Achievable case in the CPR?

A. Yes. In response to an information request from the Commission, the Company notes that differences arise as a result of the differences in how the CPR findings are translated into the Power Smart programs. In particular, the Company notes the following key differences between the two studies:

> The CPR results for Commercial are potentially conservative leading to the long term plan results being greater than the Most Likely Achievable Potential but still below the Upper Achievable Potential. There are also energy savings potential opportunities that fell outside the scope of the CPR.
>
> The CPR results for Commercial are also potentially conservative in estimating the timing of Achievable Potential. Power Smart was able to re-establish relationships with customer through the Key Account Management approach and through the design of the Power Smart Partners program as well as re-establish relationships with trade allies faster than was credited in the CPR. (BC Hydro response to BCUC #1.49.0.)

Q. Does the Company explain why the residential and industrial savings in Power Smart are lower than those of the Most Likely Achievable in the CPR?

A. Yes. In response to another information request from the Commission, the Company lists the following factors that contribute to why the Power Smart (the Plan) savings estimates are lower than the CPR estimates:

A reduction in assumed industrial DSM potential in the Plan, to allow for the longer lead-times and higher risk of successfully implementing projects in that sector;

A higher amount of industrial load displacement potential assumed in the Plan, which offsets somewhat lower assumed DSM savings potential for the industrial sector;

A higher savings potential assumed for the Commercial and Government sector in the Plan to reflect accelerated market acceptance and opportunities that were not quantified in the CPR;

Exclusion from the Plan of savings potential identified in the CPR for residential appliances; and

Inclusion in the Plan of savings potential associated with the residential fuel switching program, which were not included in the CPR. (BC Hydro response to BCUC #1.52.3.)

Q. Do these explanations confirm your conclusion that the Company should pursue a larger portion of the efficiency savings identified in the CPR?

A. Yes, they do. It is encouraging to see that the Company has decided to utilize new and existing relationships with customers and trade allies in order to accelerate the implementation of the commercial programs. This important aspect of program design will allow the Power Smart programs to exceed the Most Likely Achievable savings identified in the CPR for this sector.

The Company can and should use the same approach to accelerate the implementation of the industrial programs. As indicated above, one of the key reasons that the industrial sector Power Smart programs do not achieve the Most Likely Achievable potential is that the Power Smart programs allow for longer lead times for these customers to implement efficiency measures. While it is true that industrial customers frequently require longer lead times than commercial and residential customers, it is also true that industrial Account Managers and trade allies play a key role in promoting industrial efficiency investments. BC Hydro can and should utilize existing and new relationships with customers and trade allies in order to at least achieve the implementation schedule assumed in the CPR, if not to accelerate this schedule as it has done for the commercial sector.

The Company also notes that a higher amount of Load Displacement is assumed in the Power Smart industrial programs. The Company appears to have replaced a significant portion of the industrial efficiency savings with the industrial Load Displacement savings. By 2010/11 the Load Displacement savings represent roughly one third of the total industrial savings, but the two types of savings combined are less than the industrial efficiency savings in the Most Likely Achievable scenario in the CPR. (Application, Volume 2, Appendix I, Power Smart 10-Year Plan, page 15.) The industrial Load Displacement program should not be used to replace the end-use efficiency savings in the industrial sector. Instead, the Load Displacement program should be used *in addition* to the end-use efficiency savings. Otherwise, there will be a significant amount of readily-available, cost-effective efficiency savings in the industrial sector that remains untapped.

Finally, the Company notes that the residential efficiency savings in the Power Smart programs are somewhat lower than those in the CPR as a result of excluding some residential appliances, but are somewhat higher as a result of including the fuel-switching programs on Vancouver Island. There are several ways that the residential Power Smart programs could be modified to achieve greater efficiency savings. These opportunities are described below in Section 7 of my testimony.

In sum, the Company has explained why the Power Smart savings are lower than those of the Mostly Likely Achievable potential in the CPR. However, the explanations do not justify the lower savings estimates in Power Smart. Instead, they confirm my conclusion that the Company can and should pursue additional efficiency savings.

5. EXPANDING POWER SMART WILL RESULT IN ADDITIONAL BENEFITS TO BC HYDRO CUSTOMERS

Q. You noted above that expanding the Power Smart programs would result in significant benefits. Please explain what these benefits would be.

A. There would be several benefits from expanding the Power Smart programs. First and foremost, additional energy efficiency savings from the Power Smart programs would reduce the revenue requirements that BC Hydro collects from all customers. As noted above, according to the 10-Year Plan, all of the programs combined have a Utility Benefit-Cost Ratio of 2.9. This means that for every $1.00 spent by BC Hydro on Power Smart programs, there will be a reduction in Company costs of $2.90. This is a remarkable opportunity to reduce revenue requirements that should be taken full advantage of.

Secondly, expanding Power Smart would allow additional customers to participate in the Company's energy efficiency programs, thereby allowing more customers the opportunity to lower their electric bills.

Q. Would expanding the Power Smart programs require the Company to pursue higher-cost efficiency measures, thereby making them less cost-effective?

A. Not necessarily. Power Smart programs can be expanded to address more customers than are currently included in the 10-Year Plan. This will not necessarily increase the cost of saved energy for the efficiency measures adopted. Power Smart programs can also be expanded to address more efficiency measures than are currently included in the 10-Year Plan. This might include some efficiency measures that cost more than the average efficiency measures already in the 10-Year Plan.

However, efficiency programs include a significant amount of fixed costs associated with program planning, design, administration and implementation. Most of those fixed costs will not increase as a result of expanding Power Smart programs, and therefore the additional efficiency activities might cost less than the average in the 10-Year Plan, thereby reducing the cost of saved energy and

increasing the Benefit-Cost Ratios. In response to a discovery request, the Company notes that "residential program costs are lower today than those in the past because much of the program costs and time spent with the earlier programs to develop and build the industry did not have to be repeated." (BC Hydro Response to IPPABC #1.28.1.)

Q. Has the Company provided information to suggest that the Power Smart programs are even more cost-effective than indicated in the 10-Year Plan?

A. Yes. On March 31, 2004 BC Hydro released its Integrated Electricity Plan (IEP), which includes a detailed assessment of many different supply-side and demand-side resources available to the Company. In the IEP the Company provides some information regarding the Power Smart 2 programs, as well as additional energy efficiency activities referred to as Power Smart 3 and Power Smart 4. The Company notes that in preparing the IEP it updated some of its methodologies, and therefore estimated different costs and benefits for the Power Smart 2 program relative to what was estimated in the 10-Year Plan. In particular, in the 10-Year Plan the Company used a real discount rate of 8% for calculating present value figures, whereas in the IEP the Company used a real discount rate of 6%. (BC Hydro IEP, Part 3, Appendix B, page B-18.)

Q. What does this new information indicate with regard to the costs and benefits of the Power Smart program?

A. Reducing the discount rate this way will significantly increase the Benefit-Cost Ratios for every efficiency program, because most of the costs are incurred in the early years of a program while most of the savings occur in the later years. BC Hydro notes that this change, along with another change in the way that transmission losses are accounted for, results in reducing the Total Resource Costs of the Power Smart programs from $44/MWh in the 10-Year Plan to $35/MWh in the IEP. This also results in reducing the Utility Costs of the Power Smart programs from $21/MWh in the 10-Year Plan to $17/MWh in the IEP. (BC Hydro IEP, Part 3, Appendix B, page B-18.)

Although the Company did not provide such estimates, this change in the methodology will also increase all the programs' Benefit-Cost Ratios from the

perspective of the Total Resource Costs, the Utility Costs and the Rate Impact Measure (RIM). In sum, all of the Power Smart programs are significantly more cost-effective than indicated by the Power Smart 10-Year Plan.

Furthermore, using a lower discount rate would change the results of the CPR, and suggest that the amount of cost-effective efficiency potential is even greater. Thus, the Economic Potential and Achievable Potential savings presented in Table 1 above understate the real potential for economic and achievable efficiency savings in British Columbia.

Q. Are there additional benefits of Power Smart programs that are not captured in the Company's estimates in the 10-Year Plan?

A. Yes. There are several ways that the cost-benefit analysis in the 10-Year Plan understate the true avoided costs of the energy efficiency programs. If avoided costs are understated, then the benefits of the programs will be understated as well. There are at least five areas where the avoided costs in the 10-Year Plan are understated:

- The avoided costs used in the 10-Year Plan do not consider generator capacity savings from the energy efficiency programs. (BC Hydro Application, Volume 2, Appendix I, Power Smart 10-Year Plan, page 8.) While the capacity savings from the efficiency programs may be small in the short-term, they will certainly increase in later years when the Company will require new sources of energy and capacity. According to the BC Hydro IEP, the Company's system-wide demand for generation capacity will exceed its expected system-wide supply of dependable capacity by 2013. (BC Hydro IEP, Part 2, page 35.)

- The avoided costs in the 10-Year Plan do not consider the value of generator capacity savings in capacity constrained areas, such as Vancouver Island. Vancouver Island is expected to need new electricity supply relatively soon, as a result of high load growth and the anticipated retirement of the high voltage direct current transmission interconnection to the island. (BC Hydro IEP, Part 2, page 37.) While the Power Smart programs recognize this need by including programs targeted to Vancouver Island electricity demands, the avoided costs

used to assess these programs do not account for this additional benefit. Therefore, to the extent that the Power Smart programs, or expansions of the Power Smart programs, can assist with relieving the capacity constraints on Vancouver Island, the benefits presented in the 10-Year Plan are understated.

- The avoided costs in the 10-Year Plan do not consider any transmission and distribution costs that are avoided by the efficiency savings. According to the IEP, BC Hydro will need to reinforce the Interior to Lower Mainland transmission connection, under all foreseeable portfolios. However, "the timing of this upgrade depends upon whether future supply is from remote generation or load-centered generation." (BC Hydro IEP, Part 6, page 11.) The timing of this upgrade could also be delayed as a result of the efficiency savings from the Power Smart programs, or an expansion of the Power Smart programs. Since efficiency measures address electricity demand at the source, they are especially well-suited to reducing the need for load-centered generation, and therefore the need for new transmission lines. To the extent that the Power Smart programs, or expansions of the Power Smart programs, can assist with delaying the need for transmission or distribution upgrades, the benefits presented in the 10-Year Plan are understated.

- The benefit-cost analyses in the 10-Year Plan do not account for the benefit of selling excess generation as exports. In those hours when BC Hydro's energy sources exceed its energy demand, additional efficiency savings will allow the Company to sell the freed-up generation in neighboring regions, including the US. Given the potentially large difference between the cost of electricity generation from BC Hydro's generators (particularly the Heritage Resources) and the cost of generation in the US electricity market (particularly during peak periods), BC Hydro could potentially generate a considerable amount of trade revenue from the Power Smart programs, or expansions of the Power Smart programs. These potential export trade revenues were not included in the Power Smart cost-benefit analyses in the 10-Year Plan. (BC Hydro Response to Sierra #18.0 and BC Hydro Response to BCUP #1.61.2). Therefore, the

benefits of the Power Smart programs presented in the 10-Year Plan are understated.

Q. Would there be additional benefits of BC Hydro expanding its Power Smart programs?

A. Yes, there would also be environmental benefits due to the electricity generation avoided by the efficiency savings. BC Hydro currently has a very low rate of air emissions, due to its reliance upon so much hydro generation. Therefore, in the short-term the environmental benefits of additional energy efficiency programs would be primarily due to the avoided generation in neighboring regions as a result of increased exports to those regions. In the long-term, the environmental benefits of additional energy efficiency programs will be significantly greater to the extent that the programs can help defer or displace the capacity and energy from new facilities on the BC Hydro system. Similarly, to the extent that additional efficiency programs can defer or avoid the construction of new transmission lines, there would also be environmental benefits associated with less transmission line siting, construction and operation.

Q. Has the Company provided any analyses regarding the benefits of expanding the Power Smart program, beyond the programs included in the 10-Year Plan.

A. Yes. In the IEP, BC Hydro considers two efficiency scenarios where Power Smart is expanded beyond the programs in the 10-Year Plan. They are defined as follows:

> Power Smart 3 is derived from the Likely Achievable scenario and is based on a continuation of Power Smart 2 over the 5-year period 2012/13 to 2016/17. Technologies employed in Power Smart 3 are similar to those in Power Smart 2, but with updates and additions, as newer energy efficiency technologies become available. (BC Hydro IEP, Part 3, Appendix B, Option Page 1 of 3.)

> Power Smart 4 is derived from the Upper Achievable scenario and is based on an even more aggressive Power Smart program, including additional government actions that mandate energy efficiency through regulation and legislation. It also includes aggressive promotion of new technologies and efforts to advance the availability of these

technologies. (BC Hydro IEP, Part 3, Appendix B, Option Page 1 of 3.)

In the IEP, the Company constructs a variety of resource portfolios, i.e., different combinations of supply-side and demand-side resources. The Company finds that both Power Smart 3 and Power Smart 4 reduce the net present value of the portfolio electricity costs, and thus are cost-effective. In fact, the Company notes that "the combination of Power Smart 3 and Power Smart 4 has the lowest NPV (net present value) across all gas and electricity price forecasts." (BC Hydro IEP, Part 6, page 37.) This finding confirms that additional energy efficiency activities and savings will result in additional benefits in terms of reduced costs and therefore reduced revenue requirements.

6. POWER SMART WILL NOT RESULT IN SIGNIFICANT RATE INCREASES

Q. Please explain how energy efficiency programs can lead to increases in electricity prices.

A. Energy efficiency programs result in reduced electricity sales, relative to sales that would have occurred in the absence of the programs. These reduced sales in turn cause the utility to recover less revenues from ratepayers. In order for the utility to be made whole, it must collect these "lost revenues" by increasing electricity rates. Therefore, the rate impact caused by an energy efficiency program is partially driven by the amount of savings achieved by that program.

However, these lost revenues will be offset by the net reduction in total electricity costs created by the efficiency programs. In other words, as efficiency programs can reduce the costs associated with generating, transmitting and distributing electricity, the revenue requirements and rate impacts will be reduced. Therefore, the rate impact caused by an energy efficiency program will be reduced as efficiency savings increase and as avoided costs increase. Furthermore, if efficiency savings result in increased exports, then the increased revenues from these exports can lower the utility's revenue requirements and lower the rate impacts of the efficiency programs.

When estimating rate impacts from efficiency programs it is important to properly account for all these effects. Efficiency savings, avoided costs and export revenues all play important roles in determining the rate impact.

Q. Has the Company properly estimated the rate impacts from its Power Smart programs in the 10-Year Plan?

A. No, it has not. Table 4.9 of the Power Smart 10-Year Plan presents a summary of the rate impact results, both in terms of the RIM $/MWh and the RIM Benefit-Cost Ratio. While this table shows that rate impacts from the Power Smart programs are likely to be small, and in some cases zero, these results significantly overstate the rate impacts, for several reasons.

Q. How does the 10-Year Plan overstate the rate impacts of the Power Smart programs?

A. There are four ways by which the 10-Year Plan overstates the rate impacts of the Power Smart programs. First, the costs of the efficiency programs were attributed to the year in which the costs were incurred. The Company amortizes these efficiency costs over a 10-year period, and therefore they will have a more gradual, reduced impact on electricity rates than if the Company were to collect them in the year they were incurred. BC Hydro pointed this out in response to a discovery request, and noted that the proper way to calculate rate impacts is to assume that efficiency costs are amortized over 10-years. The Company, therefore, recalculated the rate impacts and provided them in response to the discovery request. (BC Hydro Response to BCUC #2.144.1) Unfortunately, the results provided in the discovery response are on an annual basis, while the results provided in the 10-Year Plan are on a levelized basis, so it is difficult to identify the impact of this improved methodology. Nonetheless, it is clear that this approach will result in lower rate impacts than those presented in the 10-Year Plan.

Second, as noted above, in its IEP the Company reduced its assumed real discount rate from 8% to 6%. This will increase the benefits of the energy efficiency programs, because they tend to occur over the long-term. Consequently, this new

assumption will significantly reduce the rate impact of every Power Smart program, as estimated in the 10-Year Plan.

Third, to the extent that avoided costs are understated, the rate impacts will be overstated. As described in Section 5 of my testimony, there are several reasons why the 10-Year Plan understates the avoided costs of the Power Smart programs. For each of these reasons the rate impacts of the Power Smart programs will be overstated.

Fourth, the 10-Year Plan does not account for the revenues that energy efficiency programs might generate from increasing exports to neighboring regions. (BC Hydro Response to Sierra #2.18.0(a).) Revenues generated from increasing exports will result in lower rate impacts. During peak periods, when the price for exports tend to be especially high, opportunities to increase trade revenues are also especially high.

Q. You mentioned that the Company revised its estimates of rate impacts in response to discovery request BCUC #2.144.1. Do these revised estimates properly estimate the rate impacts of the Power Smart programs?

A. No. These revised estimates provided in response to BCUC #2.144.1 suffer from some of the same problems identified above with regard to the 10-Year Plan. These rate impacts are calculated with a real discount rate of 8% instead of 6%, which will overstate the rate impacts. These rate impacts are calculated with avoided costs that are understated, which will overstate the rate impacts. Finally, these rate impacts do not account for the revenues that energy efficiency programs might generate from increasing exports, which will also overstate rate impacts.

Furthermore, these rate impacts are for two years only, and as BC Hydro points out "the rate impact over a longer period of time provides a more meaningful indication of DSM's effect." (BC Hydro Response to BCUC #2.144.1.) The rate impact over a longer period of time will be lower than that in an early year, as the net benefits of the energy efficiency programs are greater in the later years.

Q. Do the Company's revised estimates of rate impacts indicate that the impacts of the Power Smart programs are likely to be significant?

A. No, they do not. The Company's response to BCUC #2.144.1 indicates that in F2006 the total portfolio of Power Smart programs might increase electricity rates by 0.33%. Given that (a) rate impacts in later years will be smaller, and that (b) this rate impact estimate is significantly overstated, it is safe to conclude that the Power Smart programs will not have a significant impact on rates. In fact, under certain circumstances, these programs might even be able to reduce electricity rates to all of BC Hydro's customers.

7. RECOMMENDATIONS FOR EXPANDING POWER SMART PROGRAMS

Q. Please describe your overall recommendation for how BC Hydro should expand its Power Smart programs.

A. Given the significant benefits that are available from the Power Smart programs, I recommend that the Company increase its overall budgets and corresponding efficiency activities. These increased budgets and activities should be applied to the earliest possible planning year, and continue in future years. The budgets and activities should be increased to implement a greater portion of the achievable energy efficiency potential identified in the CPR. At a minimum, the Company should seek to implement all of the Most Likely Achievable Potential, in addition to the Load Displacement savings included in Power Smart 2. Ideally, the Company should also seek to implement a portion of the Upper Achievable Potential for both the residential and industrial sectors, as it is seeking to do in the commercial sector.

Q. Are there some general principles that you recommend BC Hydro to consider with expanded Power Smart programs?

A. Yes. In general, the Company should increase its activities in the residential and industrial sectors, to make up for the shortfalls identified in Tables 1, 2 and 3 above. This does not mean that the Company should reject additional efficiency

opportunities in the Commercial sector. It means that there should be more emphasis on the other two sectors.

In addition, the Company should seek to enhance those programs that address lost opportunity markets. For example, the new construction programs address a key lost opportunity market, because implementing efficiency savings after a building has been constructed might be much less cost-effective and prohibitively expensive.

Furthermore, BC Hydro should focus additional activities on those customers located in regions where the Company expects to see energy, capacity, or transmission constraints in the near future. Efficiency savings in these regions will generally offer the greatest opportunities for reducing BC Hydro's revenue requirements.

Q. Are there some specific program areas that you recommend BC Hydro to consider in expanding the Power Smart programs?

A. Yes. Based on the principles outlined above, I recommend that BC Hydro consider expanding the Power Smart programs in at least the following ways:

- Design a new program, or set of programs, targeted specifically for low-income residential customers. These customers are less likely to implement energy efficiency measures than other residential customers, due to their inability to pay for the up-front costs of efficiency measures. Thus, they require additional financial incentives to participate in efficiency programs. These customers can also be marketed through different channels than other residential customers. Low-income efficiency programs offer additional benefits, relative to other programs, as a result of reduced arrearages for the utility, and improved health and safety of the participating customers.

- Expand the budgets and activities of the residential new construction programs. This would include the New Home Program, the Home Energy Upgrade Program, and the Vancouver Island New Home Furnace Program.

- Expand the budgets and activities of the Commercial New Construction Program. This program should actively target all commercial, government and industrial facilities in British Columbia, and should also address renovations, rehabilitations and refurbishments that offer significant efficiency savings.
- Use BC Hydro Account Managers to work with industrial customers and relevant trade allies to accelerate the participation in the Industrial Power Smart Partners Program.
- Use program outreach and marketing activities to increase the participation of customers in regions where the Company expects to see energy, capacity, or transmission constraints in the near future.

Q. Does this conclude your testimony at this time?

A. Yes, it does.

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PROFESSIONAL EXPERIENCE

Synapse Energy Economics Inc., Cambridge, MA. Vice President, 1997-present. Conducting research, writing reports, and presenting expert testimony pertaining to consumer, environmental, and public policy implications of electricity industry regulation. Primary focus of work includes electricity industry regulation and restructuring, electric power system planning, energy efficiency programs and policies, renewable resources, power plant performance and economics, air quality, market power, and many aspects of consumer and environmental protection.

Tellus Institute, Boston, MA. Senior Scientist, Manager of Electricity Program, 1992-1997. Responsible for managing six-person staff that provided research, testimony, reports and regulatory support to consumer advocates, environmental organizations, regulatory commissions, and state energy offices throughout the US.

Association for the Conservation of Energy, London, England. Research Director, 1991-1992. Researched and advocated legislative and regulatory policies for promoting integrated resource planning and energy efficiency in the competitive electric industries in the UK and Europe.

Massachusetts Department of Public Utilities, Boston, MA. Staff Economist, 1989-1990. Responsible for regulating and setting rates of Massachusetts electric utilities. Drafted integrated resource planning regulations. Evaluated utility energy efficiency programs.

Massachusetts Office of Energy Resources, Boston, MA. Policy Analyst, 1987-1989. Researched and advocated integrated resource planning regulations. Participated in demand-side management collaborative with electric utilities and other parties.

Energy Systems Research Group, Boston, MA. Research Associate, 1983-1987. Performed critical evaluations of electric utility planning and economics, including production cost modeling and assessment of power plant costs and performance.

Union of Concerned Scientists and Massachusetts Public Interest Research Group, Cambridge and Boston, MA. Energy Analyst, 1982-1983. Analyzed environmental and economic issues related to nuclear plants, renewable resources and energy efficiency.

EDUCATION

Masters, Business Administration. Boston University, Boston, MA, 1993.
Diploma, Economics. London School of Economics, London, England, 1991.
B.S., Mechanical Engineering. Tufts University, Medford, MA, 1982.
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