
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
Tim Woolf
Synapse Energy Economics**

**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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Exhibit TW-1: Resume of Tim Woolf

1 **1. INTRODUCTION AND QUALIFICATIONS**

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

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

5 **Q. Please describe Synapse Energy Economics.**

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

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

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

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

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

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

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

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

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

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

21 **Q. Have you testified previously in this docket?**

22 A. No, I have not.

23 **Q. What is the purpose of your testimony.**

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

1 **2. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS**

2 **Q. Please summarize your primary conclusions.**

3 A. My primary conclusions are as follows:

- 4 • The Power Smart programs are generally well-designed and are very cost-
- 5 effective. These programs will result in significant reductions in revenue
- 6 requirements for BC Hydro (the Company), and will reduce customer electric
- 7 bills.
- 8 • According to BC Hydro’s own analyses, there is a substantial amount of
- 9 achievable, cost-effective efficiency savings that are not being pursued as part
- 10 of the Power Smart programs.
- 11 • If BC Hydro were to expand its Power Smart programs to achieve additional
- 12 efficiency savings, it could reduce revenue requirements and lower customers
- 13 bills even further.
- 14 • Additional efficiency savings would also result in greater benefits in terms of
- 15 reduced need for transmission and distribution investments and reduced
- 16 environmental impacts of electricity generation.
- 17 • The Power Smart programs will not have a significant impact on BC Hydro
- 18 electricity rates.

19 **Q. Please summarize your primary recommendations.**

20 A. I recommend that BC Hydro expand its Power Smart programs in order to capture

21 a larger portion of the achievable, cost-effective efficiency savings available on its

22 system.

- 23 • The Company should increase its Power Smart budgets and activities for the
- 24 earliest possible planning year, and continue with increased budgets and
- 25 activities in future years.
- 26 • The Company should increase its Power Smart budgets so that, at a minimum,
- 27 it will achieve the Most Likely Achievable Potential efficiency savings
- 28 identified in its Conservation Potential Review. This would mean saving at

1 least an additional 1,024 GWh per year from the Power Smart programs by
2 2010/11, which would represent at 40% increase in the current Power Smart
3 savings goal for that year.

- 4 • The increased budgets and activities should focus primarily, but not
5 exclusively, on residential and industrial programs, because the current Power
6 Smart programs capture a smaller share of the achievable potential from these
7 sectors.
- 8 • The Company should design a program targeted to low-income residential
9 customers, in order to address the barriers unique to these customers.
- 10 • The Company should enhance those programs that address “lost opportunities,”
11 such as the residential and commercial/industrial new construction programs.
- 12 • The Company should enhance those programs that are likely to offer the
13 greatest benefits, such as those targeted to customers in regions subject to
14 capacity or transmission constraints in the near future.

15 **3. OVERVIEW OF BC HYDRO’S POWER SMART PROGRAMS**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

26 **Q. Please describe the CPR study.**

27 A. The Company's CPR study identified three levels of cost-effective efficiency
28 savings potentials. First, the Economic Potential was defined as all efficiency
29 measures whose levelized "cost of conserved energy" (CCE) was less than
30 \$60/MWh. Then the study authors identified two other levels of efficiency

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

4 In order to estimate the Achievable Potential, the study authors met with a number
5 of experts to estimate what portion of the Economic Potential customers were
6 likely to install as a result of BC Hydro efficiency programs and other important
7 factors. The authors (a) grouped the energy efficiency measures by technology
8 type, (b) identified various actions for adopting those technologies, and (c)
9 prepared profiles of the various factors that would influence adoption of those
10 technologies, including: likely users, key barriers to adoption, and possible
11 actions to overcome those barriers. The experts then used their knowledge,
12 experience and judgment to estimate the Most Likely Achievable Potential and
13 Upper Achievable Potential efficiency savings. (BC Hydro Application, Volume
14 2, Appendix H, page 5.) According to the CPR:

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

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

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

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

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

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

3 **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

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

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

10 **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

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

13 **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%

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

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

1 **Q. What conclusions do you draw from these comparisons?**

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

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

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

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

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

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

1 include all of the Most Likely Achievable efficiency savings from the residential
2 and industrial sectors in the Power Smart programs, there would be an additional
3 1,024 GWh per year from these programs by 2010/11, which would represent
4 nearly a 40% increase in the current Power Smart savings goal for that year.

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

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

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

17 The CPR results for Commercial are potentially conservative leading
18 to the long term plan results being greater than the Most Likely
19 Achievable Potential but still below the Upper Achievable Potential.
20 There are also energy savings potential opportunities that fell outside
21 the scope of the CPR.

22 The CPR results for Commercial are also potentially conservative in
23 estimating the timing of Achievable Potential. Power Smart was able
24 to re-establish relationships with customer through the Key Account
25 Management approach and through the design of the Power Smart
26 Partners program as well as re-establish relationships with trade allies
27 faster than was credited in the CPR. (BC Hydro response to BCUC
28 #1.49.0.)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

8 A. Yes. On March 31, 2004 BC Hydro released its Integrated Electricity Plan (IEP),
9 which includes a detailed assessment of many different supply-side and demand-
10 side resources available to the Company. In the IEP the Company provides some
11 information regarding the Power Smart 2 programs, as well as additional energy
12 efficiency activities referred to as Power Smart 3 and Power Smart 4. The
13 Company notes that in preparing the IEP it updated some of its methodologies,
14 and therefore estimated different costs and benefits for the Power Smart 2
15 program relative to what was estimated in the 10-Year Plan. In particular, in the
16 10-Year Plan the Company used a real discount rate of 8% for calculating present
17 value figures, whereas in the IEP the Company used a real discount rate of 6%.
18 (BC Hydro IEP, Part 3, Appendix B, page B-18.)

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

21 A. Reducing the discount rate this way will significantly increase the Benefit-Cost
22 Ratios for every efficiency program, because most of the costs are incurred in the
23 early years of a program while most of the savings occur in the later years. BC
24 Hydro notes that this change, along with another change in the way that
25 transmission losses are accounted for, results in reducing the Total Resource
26 Costs of the Power Smart programs from \$44/MWh in the 10-Year Plan to
27 \$35/MWh in the IEP. This also results in reducing the Utility Costs of the Power
28 Smart programs from \$21/MWh in the 10-Year Plan to \$17/MWh in the IEP.
29 (BC Hydro IEP, Part 3, Appendix B, page B-18.)

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

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

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

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

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

16 • The avoided costs used in the 10-Year Plan do not consider generator capacity
17 savings from the energy efficiency programs. (BC Hydro Application, Volume
18 2, Appendix I, Power Smart 10-Year Plan, page 8.) While the capacity savings
19 from the efficiency programs may be small in the short-term, they will certainly
20 increase in later years when the Company will require new sources of energy
21 and capacity. According to the BC Hydro IEP, the Company's system-wide
22 demand for generation capacity will exceed its expected system-wide supply of
23 dependable capacity by 2013. (BC Hydro IEP, Part 2, page 35.)

24 • The avoided costs in the 10-Year Plan do not consider the value of generator
25 capacity savings in capacity constrained areas, such as Vancouver Island.
26 Vancouver Island is expected to need new electricity supply relatively soon, as
27 a result of high load growth and the anticipated retirement of the high voltage
28 direct current transmission interconnection to the island. (BC Hydro IEP, Part
29 2, page 37.) While the Power Smart programs recognize this need by including
30 programs targeted to Vancouver Island electricity demands, the avoided costs

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

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

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

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

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

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

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

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

23 Power Smart 3 is derived from the Likely Achievable scenario and is
24 based on a continuation of Power Smart 2 over the 5-year period
25 2012/13 to 2016/17. Technologies employed in Power Smart 3 are
26 similar to those in Power Smart 2, but with updates and additions, as
27 newer energy efficiency technologies become available. (BC Hydro
28 IEP, Part 3, Appendix B, Option Page 1 of 3.)

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

1 technologies. (BC Hydro IEP, Part 3, Appendix B, Option Page 1 of
2 3.)

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

12 **6. POWER SMART WILL NOT RESULT IN SIGNIFICANT RATE**
13 **INCREASES**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

10 **7. RECOMMENDATIONS FOR EXPANDING POWER SMART**
11 **PROGRAMS**

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

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

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

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

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

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

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

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

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

- 17 • Design a new program, or set of programs, targeted specifically for low-income
18 residential customers. These customers are less likely to implement energy
19 efficiency measures than other residential customers, due to their inability to
20 pay for the up-front costs of efficiency measures. Thus, they require additional
21 financial incentives to participate in efficiency programs. These customers can
22 also be marketed through different channels than other residential customers.
23 Low-income efficiency programs offer additional benefits, relative to other
24 programs, as a result of reduced arrearages for the utility, and improved health
25 and safety of the participating customers.
- 26 • Expand the budgets and activities of the residential new construction programs.
27 This would include the New Home Program, the Home Energy Upgrade
28 Program, and the Vancouver Island New Home Furnace Program.

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

11 **Q. Does this conclude your testimony at this time?**

12 A. Yes, it does.

13

14

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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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