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August 28, 2006

Mr. Robert J. Pellatt  
Commission Secretary  
British Columbia Utilities Commission  
Sixth Floor – 900 Howe Street  
Vancouver, BC V6Z 2N3

Dear Mr. Pellatt:

**RE: British Columbia Hydro and Power Authority (BC Hydro)  
Conservation Research Initiative – Residential Time-of-Use (TOU)  
Rate Schedules 1141, 1142, 1143, 1144, and 1145**

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BC Hydro is hereby submitting the enclosed Conservation Research Initiative Residential Time-of-Use Rate Application (CRI TOU) (Application). BC Hydro is requesting approval of the Rate Schedules attached as Appendix A and Tariff Supplement No. 73, attached as Appendix E to the Application, all effective November 1, 2006.

BC Hydro respectfully requests that the Application be reviewed and approved on an expedited basis due to the short time period to its implementation. BC Hydro has held briefing sessions with the following intervenor groups: BC Public Interest Advocacy Centre (BCPIAC), Joint Industry Electricity Steering Committee (JIESC) and Commercial Energy Consumers Association (CEC). BC Hydro also provided a review of the Application over the telephone to the BC Sustainable Energy Association (BCSEA).

A market research Internet survey conducted by BC Hydro with province-wide representation of its residential customers, and included as Appendix B to the Application, indicates that there is strong interest in BC Hydro offering time-of-use rates.

BC Hydro is prepared to hold a workshop to give all intervenors the opportunity to obtain further information on the CRI TOU rate.

Yours sincerely,



Joanna Sofield  
Chief Regulatory Officer

Enclosure (1)





## **Conservation Research Initiative**

### **Residential Time of Use**

### **Rate Application**

August, 2006

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1 **1 Introduction**

2 **1.1 Purpose of Application**

3 BC Hydro is seeking approval from the BCUC of a set of residential time of use (TOU) rates.  
4 BC Hydro will be offering these rates under the Conservation Research Initiative Time of Use  
5 (CRI TOU) Program on an optional basis to approximately 2,000 subscribers in total for a one-  
6 year period, commencing November 1, 2006 and ending October 31, 2007.

7 The objective of the CRI TOU Program is to learn more about customer pricing preferences and  
8 customer response to pricing signals. The CRI TOU rates will be available to certain residential  
9 rate customers as an alternative to the standard rate (RS1101) under which they currently  
10 purchase electricity.

11 The CRI TOU Program will test a set of five different time-differentiated pricing options. The  
12 energy prices in the CRI TOU Program vary between designated peak and off-peak periods and  
13 have been designed to reflect marginal cost-based pricing principles. The rate options have also  
14 been designed to reflect specific regional system differences and will be offered in selected  
15 municipalities in three geographic regions – the Lower Mainland, Vancouver Island (Campbell  
16 River) and the North (Fort St. John).

17 The basic CRI TOU rate structure designates peak hours during the winter months of November  
18 through February. All other hours are designated as off-peak. Three of the five rate options have  
19 a single evening peak period and these three options will be available to subscribers in the  
20 Lower Mainland, while two of these single-peak options will be available to subscribers in Fort  
21 St. John. The remaining two rate options have a morning and evening peak period defined and  
22 these two options will be available to subscribers in Campbell River.

23 **1.2 Organization of the Application**

24 This Application is organized as follows:

1 Section 2 outlines the main objectives of the CRI TOU Program, which includes providing  
2 benefits to program participants and BC Hydro, and also discusses the support and drivers for  
3 TOU rates.

4 Section 3 provides details on the CRI TOU rate design. Section 3.1 discusses the rate principles  
5 that were used in designing the rates. Section 3.2 explains in detail the main CRI TOU attributes  
6 and the rate structure. Section 3.3 provides the terms and conditions of service under the CRI  
7 TOU rates. Finally, section 3.4 explains how customers can benefit when they subscribe to the  
8 CRI TOU rate.

9 Section 4 provides details on how BC Hydro will implement the CRI TOU rate.

10 Section 5 explains how the CRI TOU rate will be evaluated to determine if the research  
11 initiative's objectives have been met.

### 12 **1.3 Approvals Sought**

13 Pursuant to the Utilities Commission Act, and in particular sections 58 and 61, BC Hydro applies  
14 for an order from the BCUC approving the Rate Schedules attached as Appendix A to this  
15 Application and Electric Tariff Supplement No. 73, attached as Appendix E, both effective  
16 November 1, 2006

17 All communications regarding this application should be directed to:

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19 Chief Regulatory Officer  
20 BC Hydro  
21 333 Dunsmuir Street  
22 Vancouver, BC V6B 5R3

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24 Email: [regulatory.group@bchydro.com](mailto:regulatory.group@bchydro.com)

1 **2 CRI TOU Objectives**

2 BC Hydro's proposed CRI TOU program is intended to provide the following benefits to  
3 BC Hydro and its residential customers:

4 For BC Hydro:

- 5 • The opportunity to learn about customers' pricing preferences and their response to  
6 pricing signals,
- 7 • To assess whether pricing can be used as a tool to delay future supply needs and  
8 infrastructure investments, and
- 9 • Provide an opportunity for BC Hydro to gain operational experience with advanced  
10 metering infrastructure (AMI).

11 For residential customers:

- 12 • More rate choices
- 13 • More control over their electricity costs, and
- 14 • The CRI TOU rate will provide greater savings on their electricity bill by encouraging  
15 subscribers to reduce consumption during the peak periods and/or to shift load from the  
16 peak periods to the off-peak periods compared to the standard RS1101 rate.

17 It is also expected through the promotion of the CRI TOU program that customers will become  
18 more educated and aware of how their electricity usage affects the province's long term  
19 electricity needs outlined in BC Hydro's 2006 Integrated Electricity Plan (IEP).

20 The residential CRI TOU Program is a first step in BC Hydro's long-term rate strategy. The  
21 strategy is to provide appropriate price signals and options for customers through new rates and  
22 rate structures and is driven by BC Hydro's goals of ensuring reliability of supply, improving

1 customer satisfaction, meeting financial targets and encouraging energy conservation and  
2 efficiency. TOU rates can be of benefit to utilities because by encouraging customers to use  
3 less during peak periods, the utility is able to more efficiently use the system and possibly delay  
4 the need for investments in new supply and supply infrastructure. The CRI TOU program will  
5 help BC Hydro to understand the benefits of TOU rates in the BC Hydro context by starting to  
6 provide information on how customers react to time-based rates.

7 Since the CRI TOU will be using advanced metering infrastructure (AMI), it provides an  
8 opportunity for BC Hydro to gain operational experience with AMI. BC Hydro has been  
9 investigating the benefits of AMI which, since the technology eliminates manual meter reading  
10 and allows monitoring of hourly consumption, includes operational efficiencies, detection of  
11 electricity losses, and the ability to provide better service to customers through outage  
12 notification, more customer billing options, enabling more rate options, and providing enhanced  
13 consumption information.

14 More generally, the BC Government's Energy Plan is supportive of innovative pricing including  
15 TOU rates. The Energy Plan was the driver for new stepped and TOU rates for BC Hydro's  
16 transmission service customers.

17 BC Hydro filed its 2006 IEP with the BCUC in March 2006. The IEP is a long-term plan outlining  
18 how BC Hydro will meet anticipated customer electricity needs over the next 20 years. Within  
19 this plan, BC Hydro highlighted a gap between existing supply and growing customer demand.  
20 BC Hydro is acting now to address this gap by working with all customers – residential,  
21 commercial and industrial – through various conservation and demand-side management  
22 options. Resource acquisition and generation development activities are also underway in order  
23 to meet these forecast electricity requirements.

### 24 **3 Time of Use Rate Design**

25 This section describes the significant provisions of the CRI TOU rates and explains the rationale  
26 behind them. The proposed terms and conditions of the CRI TOU rate are set out in the  
27 proposed rate schedules 1141, 1142, 1143, 1144, and 1145 at Appendix A of this Application.

1    **3.1 Design Principles**

2    The primary design principles used in developing the CRI TOU rates are as follows:

- 3    •       To encourage economic efficiency, by using prices that reflect marginal costs;
- 4    •       To minimize impacts on other ratepayers, by utilizing a rate design that is customer  
5       revenue neutral and that collects the revenue requirement;
- 6    •       To use TOU daily peak periods that are short in duration and simple for customers to  
7       understand and that are easy to administer; and
- 8    •       To select a rate design that is fair and which avoids windfall gains or losses to  
9       subscribers.

10   **3.2 Rate Attributes and Structure**

11   The proposed CRI TOU rates have a two part-rate structure (section 3.2.2). The rates include a  
12   basic charge (section 3.2.6), energy charges based on TOU prices (section 3.2.4) and a  
13   balancing amount (section 3.2.7). The rates all offer a bill guarantee (section 3.2.8).

14   **3.2.1 Voluntary Rate**

15   Since the objective of this initiative is to undertake research and collect information while  
16   providing rate choice, the proposed CRI TOU rates will be offered on a voluntary basis.

17   **3.2.2 Two Part Rate Structure**

18   A TOU rate can be designed as a one-part rate, which collects the class revenue requirement,  
19   or a two-part rate which maintains customer revenue neutrality, in addition to class revenue  
20   neutrality.

21   Under a one-part rate structure, the TOU rates would be set at levels so that the revenue  
22   collected under the average customer class load profile and consumption level would be equal

1 to the revenue collected under the default rate (in BC Hydro's case RS1101). An advantage of  
2 the one-part rate is that it is easy to understand and to implement. However, one disadvantage  
3 of a one-part rate is that there will be winners and losers i.e., some customers may experience  
4 windfall gains through bill decreases, while others could experience losses through bill  
5 increases, even without a change to their consumption pattern. The amount of individual gain or  
6 loss depends on how different the individual consumption profile and consumption level is from  
7 the customer class average. Under a voluntary program, the one-part rate design is susceptible  
8 to customers with beneficial load profiles; those with lower on-peak consumption will subscribe  
9 to the rate and benefit without changing their behaviour (the so called free-rider problem).  
10 Therefore a result of the one-part rate design is that customers do not receive equal benefit for  
11 their response to the TOU prices.

12 Another disadvantage of the one-part rate is that it is more difficult to set TOU prices to reflect  
13 marginal cost when there is a requirement that the same class revenue requirement be  
14 collected. For example, if peak prices are set at the correct marginal cost level, off-peak prices  
15 have to be set so that the same class revenue is collected. However, there is no guarantee that  
16 the resulting off-peak prices will be at the correct marginal cost level.

17 The proposed CRI TOU rate design has a two-part rate structure. This rate structure maintains  
18 customer revenue neutrality (in addition to customer class revenue neutrality, if implemented on  
19 a class basis) through the use of a balancing amount (discussed in section 3.2.7). This means  
20 that the customer is billed the same amount as if they were on the standard rate unless they  
21 change their energy consumption behaviour to benefit from the rate or to incur additional  
22 charges under the two-part TOU rate design. These behaviour changes are based on the TOU  
23 prices that reflect marginal costs for the time periods. Furthermore, customers that make similar  
24 behavioural responses on the two-part TOU rate are treated equally by receiving the same  
25 benefit.

26 A disadvantage of the two-part rate structure is that it may be more difficult to implement in  
27 terms of billing, communication and customer recruitment. However, it is feasible to introduce  
28 such rates and BC Hydro has experience with implementing a similar rate structure which was

1 introduced in late 1999 for a two-year period as a pilot for its large general service customers  
2 (RS1267 General Service Time of Use).

### 3 **3.2.3 Time of Use Seasons and Pricing Periods**

4 The CRI TOU rate seasons and pricing periods are chosen to help meet BC Hydro's system  
5 and regional energy and capacity needs. In terms of energy, BC Hydro's system is generation  
6 constrained in the winter months from November through February. During the winter season,  
7 BC Hydro meets any supply and demand imbalances by buying energy in the market and by  
8 using other discretionary supply sources, particularly when demand for energy is high.

9 Besides energy, BC Hydro's capacity and infrastructure needs are driven by the need to meet  
10 peak demands that occur during peak periods in the winter season. Bulk transmission  
11 investments are usually driven by the need to meet the system peak, while regional and local  
12 area transmission and distribution investments are driven by the need to meet regional demand  
13 peaks.

14 The high demand peak periods typically occur during particular times of the day, such as the  
15 evening period, when people return from work and have their electric appliances and heating  
16 turned on. The peak periods may differ on a regional basis depending on the saturation of  
17 electric heating.

18 Analysis of recent BC Hydro system load data over a three-year period shows that the peak  
19 period occurs in the evening starting from 4pm and ending at 9pm on weekdays, November  
20 through February. This profile is applicable to the Lower Mainland and Northern regions.

21 However, Vancouver Island also has a noticeable morning peak from 7am to 11am on  
22 weekdays because it has a higher saturation of electric space heating. Hence, the peak periods  
23 for Vancouver Island can be defined to include the morning and evening peaks. Therefore, the  
24 proposed CRI TOU rate will have a single peak period defined for non-holiday weekdays from  
25 4pm to 9pm for the Lower Mainland and Fort St. John, November through February. It will have

1 a two peak period defined for non-holiday weekdays from 7am to 11am and from 4pm to 9pm  
2 for Campbell River on Vancouver Island, November through February.

### 3 **3.2.4 Time of Use Prices**

#### 4 **Prototype Rates RS1141 and RS1144**

5 For the prototype CRI TOU prices, the off-peak price was set at the default rate level of 6.33  
6 cents/kWh. This rate level was chosen, as opposed to the marginal energy cost of 5.4  
7 cents/kWh used in the Transmission Service Stepped Rate (RS1823), so that CRI TOU  
8 customers would not have a lower price signal than the default rate and which might discourage  
9 conservation. It was also not set above 6.33 cents/kWh, as setting a higher on-peak and off-  
10 peak price relative to the standard rate would discourage participation.

11 To derive the peak CRI TOU prices, the average system value of capacity was assumed to be  
12 in the range of \$50-55/kW.<sup>1</sup> This value reflects the incremental cost of future generation,  
13 transmission and distribution investment to serve incremental changes in load. To obtain the  
14 prototype CRI TOU peak price, the \$50/kW value was divided by the number of peak hours in  
15 the winter season (400 hours for the single evening peak case) which provides a value of 12.5  
16 cents/kWh. This value was added to the off-peak price of 6.33 cents/kWh and rounded up, to  
17 provide an overall value of 19 cents/kWh. The same method was used to derive the CRI TOU  
18 peak price for the morning and evening peaks on Vancouver Island. Since the number of peak  
19 hours increases to 720, the peak price drops to 13 cents/kWh. The following table shows the  
20 pricing periods and TOU prices for the prototype rates RS1141 and RS1144.

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<sup>1</sup> This value for 2006 is consistent with the BC Hydro reported avoided T&D capacity cost numbers in the response to the BC Hydro F07/F08 RRA BCUC IR # 1.124.0 issued July 26, 2006. The weighted average bulk transmission, area transmission and stations and distribution costs for the four regions is \$28.52 /kW-year (in 2005\$). This value is added to the generation capacity cost assumed to be \$25 /kW-year (the value of additional capacity from Mica unit 5), which provides a total of \$53.52 /kW-year (all in 2005\$).

1

Table 1 Prototype TOU Prices, RS1141 and RS1144

Rate	Availability	Peak Period	Prototype TOU Prices		Balancing amount (refer to section 3.2.6)
			Peak c/kWh	Off-peak c/kWh	
RS1141	Lower Mainland and Fort St. John	4pm-9pm Weekdays, excluding statutory holidays, November- February All other hours are off-peak	19.00	6.33	Yes
RS1144	Campbell River	7am-11am 4pm-9pm Weekdays, excluding statutory holidays, November- February All other hours are off-peak	13.00	6.33	Yes

2 The prototype CRI TOU prices therefore have a peak to off-peak price differential of 3 to 1 for  
3 the single peak period case, and 2 to 1 for the two peak period case.

#### 4 Rate Alternatives

5 One of the objectives of the CRI TOU Program is to test customer response and acceptance to  
6 a range of prices. Therefore, two additional rate alternatives are proposed.

#### 7 Alternative Rate 1

8 The alternative rate 1 proposes a higher peak price of 25 cents/kWh while leaving the off-peak  
9 price at 6.33 cents/kWh, which results in a peak to off-peak price differential of 4:1. The

1 following table shows rate RS1142 for Lower Mainland and Fort St. John with the high peak  
 2 price.

3 **Table 2 Alternative Rate 1 - High TOU Peak Prices, RS1142 and RS1145**

Rate	Availability	Peak Period	Rate Alternative 1 TOU Prices		Balancing amount (refer to section 3.2.6)
			Peak c/kWh	Off-peak c/kWh	
RS1142	Lower Mainland and Fort St. John	4pm-9pm Weekdays, excluding statutory holidays, November-February All other hours are off-peak	25.00	6.33	Yes

4 Alternative rate 1 was not developed for Campbell River in order to limit the number of rates to  
 5 test there since its population is relatively small.

6 **Alternative Rate 2**

7 Alternative rate 2 proposes a high peak price and a lower off-peak price. For the single evening  
 8 peak, applicable to the Lower Mainland, the peak price is 28 cents/kWh and the off-peak price is  
 9 4.5 cents/kWh, which provides a 6:1 peak to off-peak price differential. This rate is not available  
 10 in Fort St. John, once again in order to limit the total number of required CRI TOU participants  
 11 given its smaller population.

12 For Vancouver Island with two peaks, the peak price is 20 cents/kWh and the off-peak price is  
 13 4.5 cents/kWh, which provides a 4.5:1 peak to off-peak price differential.

14 The peak price was lowered for Vancouver Island because the higher peak price would apply to  
 15 more hours given the morning and evening peak and a higher price would likely be  
 16 unacceptable to customers. The off-peak price remains the same at 4.5 cents/kWh.

1 The following table shows the rates for each region (RS1143 and RS1145) with the high peak  
 2 price and lower off-peak price.

3 **Table 3 Alternative Rate 2 - High TOU Peak Prices and Lower TOU Off-Peak**  
 4 **Prices (RS1143 and RS1145)**

Rate	Availability	Peak Period	Rate Alternative 2 TOU Prices		Balancing amount (refer to section 3.2.6)
			Peak c/kWh	Off-peak c/kWh	
RS1143	Lower Mainland	4pm-9pm Weekdays, excluding statutory holidays, November- February All other hours are off-peak	28.00	4.50	Yes
RS1145	Campbell River	7am-11am 4pm-9pm Weekdays, excluding statutory holidays, November- February All other hours are off-peak	20.00	4.50	Yes

5 Alternative rate 2 tests whether customers will respond to lower off-peak prices by consuming  
 6 more during the off-peak period. The peak and off-peak prices were deliberately chosen to test  
 7 higher peak to off-peak price differentials.

8 By offering a range of CRI TOU prices to customers and comparing their consumption to the  
 9 consumption of a control group, BC Hydro should be able to determine customers' response or  
 10 price elasticity. This information will be useful for capacity and total energy requirement planning  
 11 and also the development of any permanent TOU rate program.

1    **3.2.5 Time of Use Bill**

2    The CRI TOU bill will include the following components:

3    Basic charge + [(peak kWh X peak price) + (off-peak kWh X off-peak price)] + monthly  
4    balancing amount

5    The energy charge is the summation of the peak and off-peak energy charges. The peak energy  
6    charge is calculated by multiplying the subscriber's metered kWh consumption in the peak  
7    period by the peak price. The off-peak energy charge is calculated by multiplying the  
8    subscriber's metered kWh consumption in the off-peak period by the off-peak price.

9    The other components are described further below in sections 3.2.6 and 3.2.7.

10   Appendix D provides sample CRI TOU bill calculations assuming first that there is no change in  
11   the customer's consumption pattern from the historical amount. It also provides an explanation  
12   of how the CRI TOU bill changes if there is a change in the customer's consumption pattern as  
13   a result of conservation, load shifting behaviour and an increase in load.

14   **3.2.6 Basic Charge**

15   A Basic Charge of \$3.80 per month is proposed, which is equivalent to the existing Basic  
16   Charge in RS1101 (\$7.60 over a two month period).

17   **3.2.7 Balancing Amount**

18   The balancing amount is an important feature of the proposed two-part CRI TOU rate and is the  
19   feature that ensures individual customer revenue neutrality as discussed in section 3.2.2.

20   The annual balancing amount is defined to be the revenue difference between billing the  
21   historical consumption under RS1101 and the proposed CRI TOU rate. When the balancing  
22   amount is included in the CRI TOU bills, as discussed in section 3.2.5, it ensures that if the

1 customer does not respond by changing their usage, then they pay the same annual bill as  
2 under the standard RS1101 rate.

3 The balancing amount is calculated separately for each subscriber based on 12 months of  
4 consumption data ending with the March 2006 billing cycle date. The customer's previous  
5 twelve months of consumption, normalized for weather, has a generic load profile applied to  
6 estimate the amount of peak and off-peak consumption in the winter months. These estimates  
7 are then used to calculate a TOU revenue (based on the CRI TOU rate). The difference  
8 between this revenue and the revenue calculated for this usage under the RS1101 rate is the  
9 balancing amount.

10 The peak prices for rates RS1141, RS1142 and RS1144 are greater in all cases than the  
11 current RS1101 energy price and the off-peak price for these three CRI TOU rates is identical to  
12 the rate RS1101 energy price, which implies that the balancing amount will be a rebate for these  
13 rates. The only months which have billing differences for these rates are the four winter months  
14 and the rebate compensates for the higher CRI TOU peak price. There is no need to have a  
15 balancing amount in the non-winter months.

16 For rates RS1143 and RS1145, the peak prices are greater than the current RS1101 energy  
17 price and the off-peak price is less than the RS1101 energy price. In addition, the non-winter  
18 month price is also less than the RS1101 energy price. The balancing amount may be positive  
19 or negative depending on the customer's consumption over the year. Since these two rates vary  
20 from RS1101 in all twelve months, the balancing amount will be spread over the twelve months.

21 The use of an assigned generic load profile (as discussed above) may not reflect the load profile  
22 of each individual customer. This could result in some windfall gains or losses which will be  
23 limited, since the peak hours form a relatively small percentage of the total hours in a year. In  
24 the future, BC Hydro may reduce some of this exposure by improving its data collection and  
25 also its understanding of changes in customer consumption.

26 Appendix D outlines in detail the inputs and procedures that are used to derive the balancing  
27 amount for each customer.

1    **3.2.8 Bill Guarantee**

2    A bill guarantee is also proposed for all CRI TOU rate options. If the customer does not find the  
3    CRI TOU prices and terms attractive enough to cause them to respond by adjusting their load  
4    pattern and level of use, then the guarantee ensures they will pay no more for their current  
5    usage than on RS1101. If the CRI TOU bill is greater, BC Hydro will credit the difference after  
6    the four winter months or after twelve months, depending on the applicable CRI TOU rate (as  
7    explained in section 3.3.4).

8    Market research undertaken by BC Hydro (see Appendix B) indicates that the bill guarantee is a  
9    useful feature to help customer subscription in a voluntary program. The bill guarantee helps  
10   lessen any fears that a customer may have when deciding to subscribe to a new rate. In  
11   particular, a customer may have concerns over the high peak prices and whether they can  
12   totally control consumption during the peak period.

13   The bill guarantee also protects the customer if the load profile assigned to the customer is  
14   incorrect and if the balancing amount does not make the customer revenue neutral at its  
15   historical consumption level. For example, the assigned load profile may have less peak  
16   consumption than the customer has historically experienced and the balancing amount is  
17   smaller than it should be. In this circumstance, the bill guarantee ensures that the customer will  
18   not pay more under the CRI TOU rate solely as a result of having the incorrect load profile  
19   allocated to it.

20   Finally, the bill guarantee protects customers if circumstances change such as the occurrence  
21   of a colder than normal winter or a change in household demographic which increases their  
22   peak consumption and CRI TOU bill relative to what they would have paid under the default rate  
23   RS1101, since they will be credited the difference under the bill guarantee. Section 3.3.4  
24   provides further details on how the bill guarantee is calculated.

1    **3.3 Terms and Conditions of Service**

2    **3.3.1 Availability**

3    The CRI TOU program will be available on a limited basis to customers on RS1101 in the Lower  
4    Mainland, Campbell River and Fort St. John. The Lower Mainland area is defined to cover  
5    Vancouver, Burnaby, North Vancouver and West Vancouver.

6    The target market is comprised of single family dwellings. BC Hydro excluded multi-residential  
7    dwellings, since the average consumption of these households is typically smaller and hence  
8    the energy and capacity savings from these households would also be smaller. The meter costs  
9    for these households are also potentially higher (e.g., for apartments).

10   With the exception of Campbell River and Fort St. John, customers that are currently on  
11   BC Hydro's equal payment plan (EPP) will not be included in the CRI TOU sample. Providing  
12   customers with the option to leave the EPP to join the CRI TOU generally results in additional  
13   costs of both programming the billing system and recruitment due to increased complexity. The  
14   exception may be made for the Campbell River and Fort St. John regions, if necessary, to  
15   ensure that an adequate sample can be recruited.

16   **3.3.2 Subscription**

17   Subscription for the CRI TOU rate will take place during September and October 2006.  
18   BC Hydro will have identified the potential participants by region and make a direct mailing  
19   communication outlining the initiative and instructing customers on how to notify BC Hydro of  
20   their interest and request additional information. BC Hydro will pre-assign a CRI TOU rate and  
21   contact the customer providing information on the offer. The customer will then decide whether  
22   to accept the offer. Interested customers that have not been made a CRI TOU offer will be  
23   offered the opportunity to participate as part of the control group.

24   Customers assigned to the control group will not be able to participate in the program, but will  
25   have an hourly TOU meter installed at their residence. As explained in the evaluation plan in

1 Appendix C, the control group and random assignment are important to producing meaningful  
2 evaluation results.

### 3 **3.3.3 Term Length**

4 The proposed CRI TOU rates will take effect on November 1, 2006. The CRI TOU program will  
5 end on October 31, 2007, when customers will be returned to RS1101.

6 For participants that have their meters installed between November 1, 2006 and  
7 December 1, 2006, they will have a shorter period of participation ranging between 11 and 11.5  
8 months.

9 Participating customers that have TOU meters installed after November 1, 2006 will have their  
10 CRI TOU bill start either on November 15, 2006 or on December 1, 2006, as determined by  
11 BC Hydro, following installation of the required meter at the customer's residence. They will also  
12 have their balancing amount adjusted to reflect the shorter time period that they are on the  
13 CRI TOU rate. The balancing amount will still be credited or debited in equal amounts each  
14 month.

### 15 **3.3.4 Bill Guarantee**

16 As discussed in section 3.2.8, BC Hydro will provide a bill guarantee to customers on the  
17 CRI TOU rate. The following describes in more detail the bill guarantee.

18 BC Hydro will credit to the CRI TOU subscriber's account the positive difference between the bill  
19 based on the CRI TOU tariff and the bill based on the RS1101 tariff as described as follows:

20 For prototype rates (RS1141 and RS1144) and alternative rate 1 (RS1142):

- 21 1. the total dollar amount of all bills issued to the subscriber for service under the CRI TOU  
22 rate during the 4 winter months (November-February), minus
- 23 2. the total dollar amount derived by rendering bills on the same metered usage, using the  
24 billing provisions of the otherwise applicable RS1101.

1 For alternative rate 2 (RS1143 and RS1145):

- 2 1. the total dollar amount of all bills issued to the subscriber for service under the CRI TOU  
3 rate during the entire year, minus
- 4 2. the total dollar amount derived by rendering bills on the same metered usage, using the  
5 billing provisions of the otherwise applicable RS1101.

6 Additional conditions and provisions include:

- 7 1. The applicable credit shall be made to the account of the subscriber, within 60 days after  
8 the March 2007 billing date for subscribers on rates RS1141, RS1142, and RS1144, and  
9 within 60 days after the October 2007 billing date for the subscribers on rates RS1143  
10 and RS1145.
- 11 2. The bill guarantee is not applicable to any subscriber that (i) in the case of rate  
12 schedules RS1141, RS1142 and RS1144 ceases taking service before February  
13 28, 2007, and (ii) in the case of rate schedules RS1143 and RS1145 ceases taking  
14 service before October 31, 2007.

15 The second condition will help discourage participants from leaving the program early and will  
16 help maintain the statistical sample.

### 17 **3.4 How Customers Can Benefit from CRI TOU Rates**

18 Customers can save every time they reduce winter peak morning and peak evening usage,  
19 when electricity prices are higher. Conserving energy during peak hours or shifting electricity  
20 usage to off-peak hours will reduce their electricity costs under the CRI TOU rates.

21 The CRI TOU rate offers customers an additional incentive to change their behaviour, as  
22 compared to the standard residential service offering. This is reflected by the following actions  
23 that subscribers can undertake:

1 Control – Subscribers can choose when to use electricity based on the availability of lower  
2 prices during off-peak times;

3 Shift and save – Subscribers can save money during the peak periods by moving discretionary  
4 uses of electricity from the higher priced, peak hours to other, lower cost, off-peak hours of the  
5 day; and

6 Conserve and save – Subscribers can save money during the peak periods by reducing  
7 discretionary uses of electricity during the higher priced, peak hours.

8 Subscribers can do the following to reduce their winter peak period usage:

- 9 • Conserve energy by lowering their thermostat a few degrees during peak hours.
- 10 • Reschedule certain activities that require a lot of electricity and that are not time critical,  
11 to off-peak hours. In particular they can use electrical appliances such as dishwashers,  
12 clothes washers and dryers, and hot tub pumps during less expensive times of the day.
- 13 • Pre-heat their home before 7am/4pm. on weekdays.
- 14 • Use a programmable thermostat (or manually adjust the thermostat) to ensure that the  
15 heater runs less during peak periods.
- 16 • Install a timer to turn off the water heater automatically during the most expensive hours  
17 of the day.
- 18 • Set the timer on the hot tub pump to run during less expensive times of the day.
- 19 • Install general energy efficiency measures that conserve energy during the peak period  
20 e.g., replace incandescent bulbs with compact fluorescent light bulbs, which can last 10  
21 to 20 times longer and use 75 percent less energy.

1 Appendix D contains sample bill calculations under CRI TOU rates. It also explains how the CRI  
2 TOU bill is reduced as a result of conservation during peak periods or by shifting load from peak  
3 periods to off-peak periods.

## 4 **4 Implementation**

5 The following sections describe some of the main CRI TOU rate implementation tasks.

### 6 **4.1 Market Research**

7 BC Hydro held two focus group sessions in Vancouver on July 25, 2006 and two sessions in  
8 Nanaimo on July 26, 2006. These focus groups were conducted to collect the participants'  
9 impressions around TOU rate options, including the proposed CRI TOU prototype and also the  
10 best means to communicate the offering. The qualitative results of these sessions are provided  
11 in Appendix B. The market research provided the following key insights:

12 (a) Customers understood the TOU pricing concept and also the need for such pricing options  
13 to help address the growing supply needs and other infrastructure demands of BC Hydro.

14 (b) Customers expected to have off-peak prices that are lower than the standard RS 1101  
15 energy rate.

16 (c) Although lengthier to explain, the customers generally understood the concept of revenue  
17 neutrality and the role of the balancing amount in keeping the customer whole from a revenue  
18 perspective.

19 (d) Customers generally supported the bill guarantee, and showed greater support for rate  
20 options with the bill guarantee in place.

21 In addition to the focus group study, a quantitative study was done based on data collected from  
22 1,203 B.C. residents, who responded to an internet survey over a 1 week period in mid-  
23 July, 2006. The sample was representative of the whole province in terms of region and  
24 dwelling type. The survey collected information on customer attributes (e.g., demographic data,

1 income, conservation attitude) as well as on customer preferences around various standard rate  
2 plans and TOU rate attributes. A statistical analysis of customer preferences was undertaken  
3 and the results are also summarized in Appendix B.

4 This analysis identified various sample segments based on their preferences for various pricing  
5 features. The study shows that the balancing amount most influences customer choice along  
6 with the peak prices, the basic charge and the base rate. The results can be used to simulate  
7 the expected take-up of the various CRI TOU offers. Based on a mature market, the results  
8 indicate that about 35% may subscribe to the CRI TOU rates. These results also support the  
9 expectation that there will be voluntary take-up of the proposed rates.

#### 10 **Market Research Results Assessment**

11 One of the recommendations of the focus group study as noted above was to set the off-peak  
12 CRI TOU price lower than the standard RS1101 energy price. Customers generally preferred  
13 the off-peak price to be in the range of 3-4 cents/kWh.

14 However, as discussed earlier in section 3.2.4, BC Hydro believes it is important to set the off-  
15 peak price close to the standard rate to preserve the overall conservation price signal. BC Hydro  
16 also expects that customers will be more receptive to the CRI TOU rates when all the elements  
17 of the rate are explained together. The actual program recruitment campaign will explain to  
18 customers the balancing amount in more detail. It will also be explained to customers that the  
19 higher CRI TOU prices will provide a greater incentive or reward relative to RS1101 for them to  
20 conserve during peak periods and/or to load shift from peak periods to off-peak periods and that  
21 these actions will lower their bills.

22 The quantitative market research results provide a level of comfort that customers would  
23 voluntarily participate in a TOU program, with the proposed rate levels and with a balancing  
24 amount and with a bill guarantee. These results also influenced BC Hydro's decision not to  
25 lower the proposed off-peak prices from 6.33 cents/kWh to a lower price for rates RS1141,  
26 RS1142 and RS1144.

1 **4.2 Customer Recruitment**

2 BC Hydro will be recruiting a sample of approximately 2,000 customers for the CRI TOU rate  
3 program over a two month period in September and October 2006.

4 Customers will initially be contacted by direct mail informing them how to get additional  
5 information on the research initiative. They will be provided with a call centre number which they  
6 can phone. Information will also be provided on BC Hydro's website. Interested customers will  
7 receive information brochures describing the CRI TOU price options and explaining how the rate  
8 works. Participation of BC Hydro employees in the CRI will also be encouraged; however their  
9 participation will be limited to a maximum of 200.<sup>2</sup>

10 If the customer wants to participate in the CRI TOU, BC Hydro will ask for a participation  
11 commitment of one year. In return for this commitment, BC Hydro will guarantee all customers  
12 participating in the CRI TOU that their total annual bills under the CRI TOU rate will not be any  
13 higher than if they had remained under the standard rate, as applied to actual consumption  
14 under the CRI TOU rate.

15 For evaluation purposes, BC Hydro will randomly assign customers to one of the applicable rate  
16 options or to a control group. This is to ensure that there is no bias as a result of self-selection  
17 into the rate options. The population of subscribers will be split into 10 different cells. Seven of  
18 these cells represent the rate choices for the three geographic areas. In addition, there will be  
19 three cells which will be control groups for the three areas.

20 **4.3 Customer education and information**

21 Customers will receive information on how they can benefit from the CRI TOU rate by changing  
22 the times they use their appliances, by changing their behaviour and also by setting back their

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<sup>2</sup> For evaluation purposes, these employees will be excluded from the sample if required. A check will be made as to whether the BC Hydro employee responses from the customer research in early 2007 indicate they are significantly different from the population, and if so, they will be excluded from the sample.

1 thermostats. In addition, customers will be able to view their previous day's hourly consumption  
2 pattern on the internet on an individual basis. They will also receive with their bill their average  
3 monthly consumption load profile.

#### 4 **4.4 Meter installation**

5 BC Hydro will install a TOU meter for each of the selected customers which will be capable of  
6 collecting hourly interval data. This data will be transmitted to BC Hydro by wireless systems in  
7 Campbell River and in Fort St. John, and by two radio frequency collector towers in the Lower  
8 Mainland (covering Vancouver, Burnaby, North Vancouver and West Vancouver). These  
9 collector towers may not be able to receive signals from all areas, depending on the topography.  
10 Hence, it is expected that some interested customers may not be able to subscribe to the  
11 program due to this limitation.

#### 12 **4.5 Billing**

13 Subscribers on the CRI TOU rate will be billed monthly instead of every two months. Customers  
14 will be billed on the CRI TOU rates starting on November 1, 2006. The billing cycle date for  
15 each subscriber will be the same as under RS 1101. For example, if the customer's billing date  
16 is October 25, 2006 this will remain so under the CRI TOU rate, with the next billing date being  
17 November 25, 2006. For bills that cover any periods where the customer pays both the standard  
18 rate and the CRI TOU rate BC Hydro will show the standard rate and CRI TOU amounts  
19 separately on the bill. In the example, the customer would be billed under RS1101 from  
20 October 25, 2006 to October 31, 2006, and under the CRI TOU rate from November 1, 2006 to  
21 November 25, 2006. Amounts owed under the two rates will be shown separately on the  
22 November 25, 2006 bill.

#### 23 **4.6 Rates and Adjustments for Final Rate Roll-back**

24 In the event that BC Hydro does not receive approval from the BCUC for its applied-for rate  
25 increase of 4.65% which was effective as an interim rate increase from July 1, 2006, BC Hydro  
26 will re-calculate the balancing amount based on the final approved rates and will also re-

1 calculate the CRI TOU bills based on the updated balancing amount (for all rates), updated  
2 basic charge based on final approved rates (for all rates) and updated off-peak prices based on  
3 the final approved rates (for RS1141, RS1142, and RS1144). BC Hydro will refund the  
4 customer any difference between actual CRI TOU bills based on the current interim rates and  
5 CRI TOU bills based on the final approved rates. BC Hydro will also update the CRI TOU basic  
6 charge (for all CRI TOU rates) and the off-peak price (for RS1141, RS1142, and RS1144) to the  
7 final approved rates for the remainder of the CRI TOU Program period. The bill guarantee will  
8 also be calculated based on the final approved rates. If the final approved rates are available  
9 only after the bill guarantee has been paid out, the customer will be refunded the difference  
10 between the bill guarantee received under the interim rates and the bill guarantee it would have  
11 received under the final approved rates.

#### 12 **4.7 Budget**

13 The budget for the CRI TOU program is approximately \$3.5 million. This accounts for the capital  
14 costs of the meters and meter data management system and costs for communications,  
15 customer care, demand-side management and program management and support. The  
16 CRI TOU budget is not incremental to the expenditures forecasted in BC Hydro's F07/F08  
17 Revenue Requirements Application.

### 18 **5 Evaluation**

19 BC Hydro intends to undertake an impact evaluation of the CRI TOU rate over the four peak  
20 months as outlined in Appendix C. At the conclusion of the CRI TOU Program, BC Hydro also  
21 proposes to undertake a broader evaluation process, and will expect to have a report and  
22 recommendations by March 2008.

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**Conservation Research Initiative  
Residential Time of Use Rate Application**

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**APPENDIX A**

**Residential Time of Use Rate  
Schedules**

**1141, 1142, 1143,  
1144 and 1145**

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SCHEDULE 1141, 1142, 1143, 1144 and 1145

RESIDENTIAL TIME-OF-USE RATE

Availability: Available to selected customers in the Lower Mainland (Vancouver, Burnaby, North Vancouver and West Vancouver), Campbell River and Fort St. John who apply before October 31, 2006 and at the time of application are taking service under Rate Schedule 1101.

Applicable in: Rate Zone 1 excluding the District of Kingsgate-Yahk and Lardeau-Shutty Bench.

Rate:

Basic Charge: \$3.80 per month.

Balancing Amount: For rates RS1141, RS1142 and RS1144, a Monthly Balancing Amount equal to the annual revenue difference between billing the historical consumption under RS1101 and the Time-Of-Use (TOU) rate, divided into four equal amounts to be applied to the first four bills. For rates RS1143 and RS1145, a Monthly Balancing Amount equal to the annual revenue difference between billing the historical consumption under RS1101 and the TOU rate, divided into twelve equal amounts to be applied to the twelve monthly bills. The Monthly Balancing Amount calculations are defined in Electric Tariff Supplement No. 73, Appendix E of the Conservation Research Initiative Residential Time of Use Application (BC Hydro, August, 2006) (the "CRI TOU Application").

SCHEDULE 1141, 1142, 1143, 1144 and 1145

RESIDENTIAL TIME-OF-USE RATE

Energy Charge: A monthly amount equal to the sum of the quantity of energy delivered during off-peak hours multiplied by the off-peak rate and the quantity of energy delivered during peak hours multiplied by the peak rate, where peak rate, peak hours, off-peak rate and off-peak hours are as defined in the following five rate schedules. Participating customers will be assigned a rate schedule applicable in their service area as outlined in the CRI TOU Application.

For Lower Mainland and Fort St. John

RS 1141: Peak Rate: 19.0 cents per kWh  
Peak hours: 4:00 p.m. to 9:00 p.m. on all weekdays  
that are not Statutory Holidays in each of the months  
November to February inclusive.

Off-peak Rate: 6.33 cents per kWh

Off-peak hours: All hours in a year that are not peak hours.

RS1142: Peak Rate: 25.0 cents per kWh  
Peak hours: 4:00 p.m. to 9:00 p.m. on all weekdays  
that are not Statutory Holidays in each of the months  
November to February inclusive.

Off-peak Rate: 6.33 cents per kWh

Off-peak hours: All hours in a year that are not peak hours.

SCHEDULE 1141, 1142, 1143, 1144 and 1145

RESIDENTIAL TIME-OF-USE RATE (Cont'd)

For Lower Mainland

RS 1143: Peak Rate: 28.0 cents per kWh  
Peak hours: 4:00 p.m. to 9:00 p.m. on all weekdays  
that are not Statutory Holidays in each of the months  
November to February inclusive.  
  
Off-peak Rate: 4.5 cents per kWh  
Off-peak hours: All hours in a year that are not peak hours.

For Campbell River

RS 1144: Peak Rate: 13.0 cents per kWh  
Peak hours: 7:00 a.m. to 11:00 a.m. and 4:00 p.m. to  
9:00 p.m. on all weekdays that are not Statutory Holidays in  
each of the months November to February inclusive.  
  
Off-peak Rate: 6.33 cents per kWh  
Off-peak hours: All hours in a year that are not peak hours

For Campbell River

RS 1145: Peak Rate: 20.0 cents per kWh  
Peak hours: 7:00 a.m. to 11:00 a.m. and 4:00 p.m. to  
9:00 p.m. on all weekdays that are not Statutory Holidays in  
each of the months November to February inclusive.  
  
Off-peak Rate: 4.5 cents per kWh  
Off-peak hours: All hours in a year that are not peak hours

SCHEDULE 1141, 1142, 1143, 1144 and 1145

RESIDENTIAL TIME-OF-USE RATE (Cont'd)

Definitions: Statutory Holidays for the purpose of this Rate Schedule during the months November through February are Remembrance Day, Christmas Day and New Years Day.

- Special Conditions:
1. Service under this rate schedule will be provided from November 1, 2006 through October 31, 2007. For meters that are installed after November 1, service under this rate schedule will be provided from November 15, 2006 or from December 1, 2006, as determined by BC Hydro following installation of the required meter at the customer's premises, through October 31, 2007. After October 31, 2007, or if the customer earlier terminates or is no longer eligible for service under the residential TOU rate, service will be provided under rate schedule RS1101.
  2. A bill guarantee which is defined in Electric Tariff Supplement No. 73, Appendix E, of the CRI TOU Application, is provided under this rate schedule.

Taxes: The rate charges contained herein are exclusive of the Goods and Services Tax.

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**Conservation Research Initiative  
Residential Time of Use Rate Application**

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**APPENDIX B**

**Market Research**

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# **BC Hydro AMI Time-based Rates Pilot - Survey Research of Customer Preferences -**

## **Developing the Best Strategy for Introducing A Residential Time-based Rates Pilot**

**Report – August 4, 2006**

**Dr. Ken Deal**

**President, marketPOWER research inc.**

## Agenda

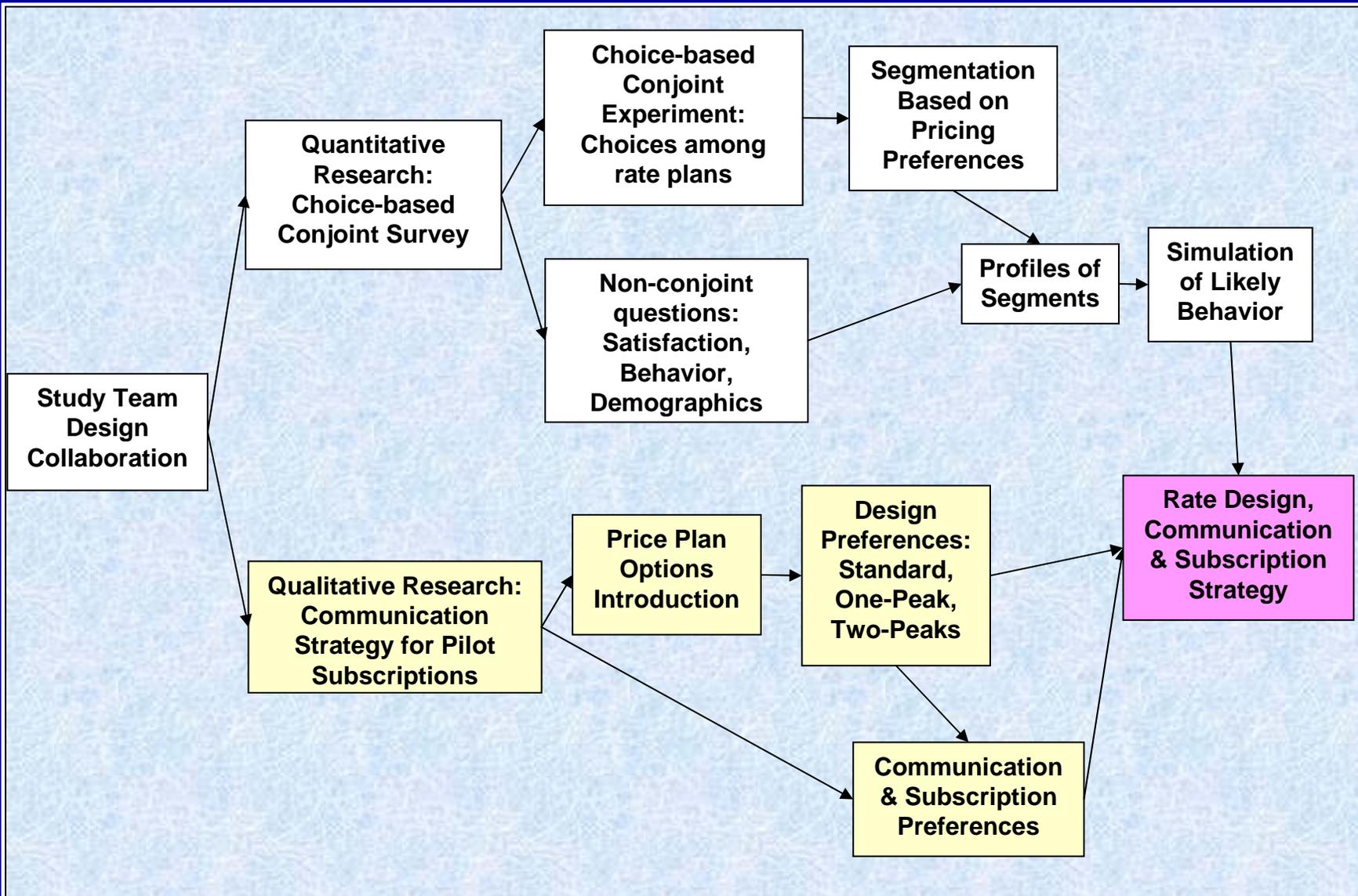
- Objectives
- Execution
- Key Findings
- Summary
- Recommendations

# Objectives of the Study

## Primary objectives related to the rate-design and customer acceptance aspects:

- Provide a baseline measure of customer attitudes and likely behaviours regarding energy efficiency and new time-based pricing offers;
- Determine preferred features of time based pricing offers that will encourage more efficient use of electricity and the drivers of customer satisfaction;
- Identify potential motivators and barriers to pilot participation (e.g., expected threshold incentive or bill savings, existence of a bill guarantee, subscription incentive, etc.);
- Identify market potential for time-based pricing and whether this would change depending on the different design characteristics;
- Measure success of the pilot in terms of shifts in energy efficiency attitudes, behaviours and customer satisfaction;
- Measure effectiveness of the energy usage information, educational information and/or other DSM related tools that may be made available to help customer take advantage of the rate (in related qualitative report);
- Determine the types of information/education and communication channels required to maximize customer acceptance and response to time base pricing pilot and future time-based offers (in related qualitative report).
- Provide recommendations for potential improvements to the time-based pricing pilot before further roll out or for future rate strategy consideration;

# Understanding Likely Subscription to Time-based Pilot



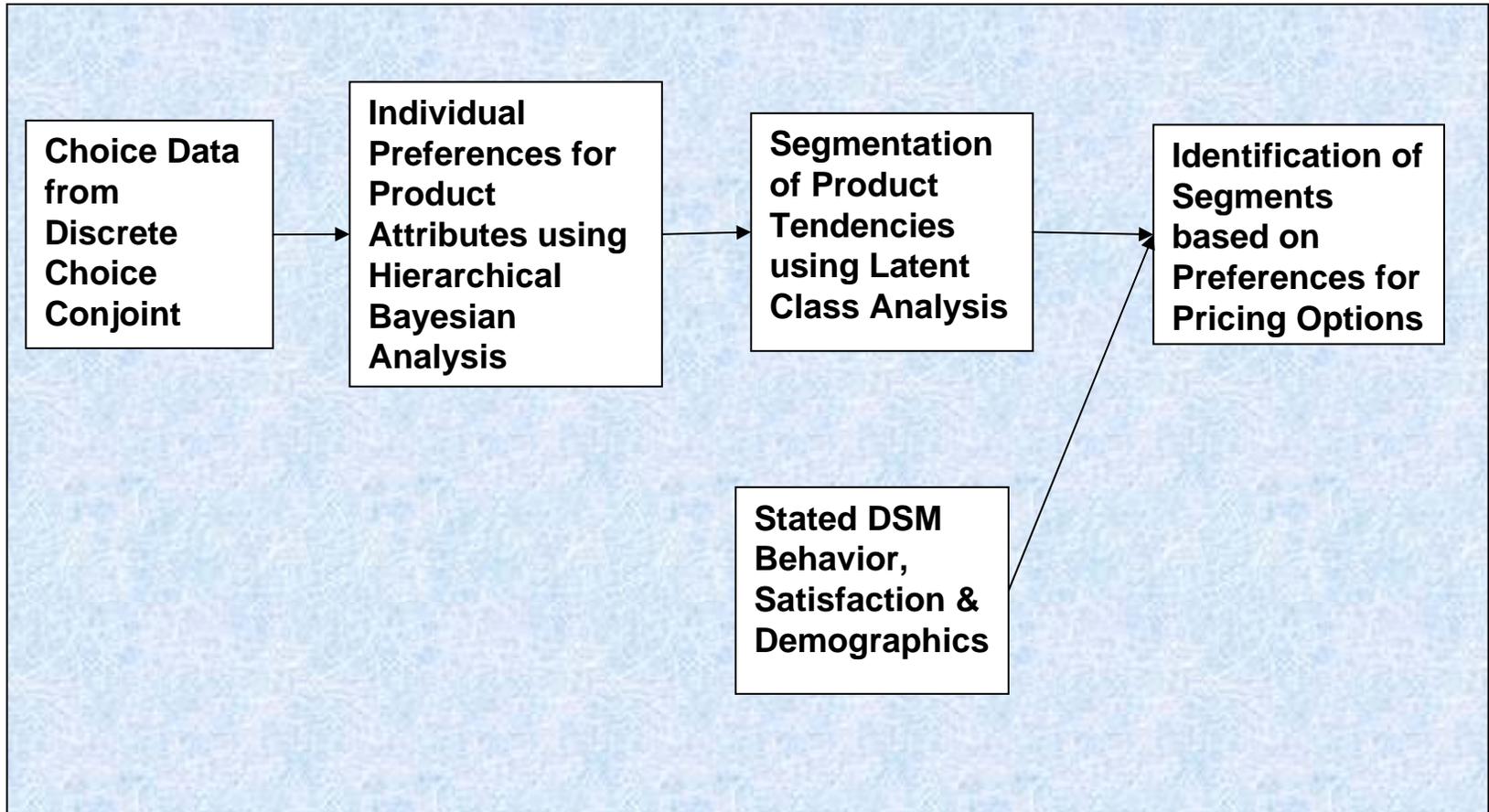
# Sample and Fieldwork

# Execution of the Residential Study

- **Designed & Executed to estimate the likely responses of BC Hydro residential customers to a time-based rate pilot based on a discrete choice conjoint study**
- **The sample drawn from an internet panel of BC residents**
- **Field survey started on July 10, 2006 and was completed on July 17, 2006.**
- **A total sample of 1203 residents of British Columbia was obtained.**
  - **The sample was representative of BC Hydro's service territory in terms of regional representation and dwelling types.**
  - **The sample was comprised of 945 Mainland customers and 238 customers on Vancouver Island.**

# The Analysis Process

# The Analysis Process, Including Methodologies



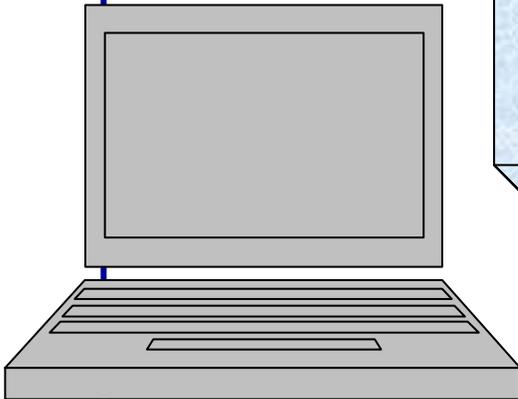
# The Questionnaire

# Internet Choice-Based Conjoint Study

## Introduction

- Qualification
- Satisfaction
- Bill behavior
- Conservation attitudes

• ...



## Choice Task 16

## Choice Task 1

- Understanding of rate attributes
- Likely behavior to new rates
- Energy profile
- Demographics
- *Incentives? &*

*Thanks*

# Key Attributes and Levels of Each Attribute: Standard & Time-based Plans

Attributes	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7
<b>Pricing Products</b>	Standard Plan	Time-based Rates					
<b>Standard: Customer Charge</b>	\$7.26	\$10.00	\$15.00	\$20.00			
<b>Standard: Base Rate</b>	\$0.06	\$0.07	\$0.08	\$0.09			
<b>TOU: On-Peak Period, Morning</b>	None	7AM – 9AM	7AM – 10AM	7AM – 11AM			
<b>TOU: On-Peak Period, Evening</b>	4PM – 6PM	4PM – 7PM	4PM – 8PM	4PM – 9PM			
<b>On-Peak Price</b>	\$0.075	\$0.10	\$0.15	\$0.20	\$0.29		
<b>Off-Peak Price</b>	\$0.045	\$0.050	\$0.055	\$0.06	\$0.07		
<b>Balancing Charge</b>	You Pay \$20/month	You Pay \$15/month	You Pay \$10/month	No payment either way	You're Paid \$10/month	You're Paid \$15/month	You're Paid \$20/month
<b>Guarantee</b>	No guarantee	Guarantee to be no higher					

## **Choice Sets: Choice-based Conjoint Experiment**

- **Each respondent was exposed to 16 choice sets.**
- **The choice sets were slightly different for each respondent.**
- **Four sample choice sets are presented on the following slides.**

Suppose that BC Hydro were to offer new ways for you to buy electricity for your household.

Three alternative pricing plan options are provided below. If these were your only options, which one would you choose?  
Choose by clicking one of the buttons below:

<b>Time-of-Use Pricing</b>	<b>Standard Plan</b>	<b>Standard Plan</b>
	<b>Customer Charge:</b> \$10.00 for 2 months	<b>Customer Charge:</b> \$15.00 for 2 months
	<b>Base Rate:</b> 7¢ per kWh	<b>Base Rate:</b> 6¢ per kWh
No morning peak.		
<b>On-Peak:</b> 4:00PM to 6:00PM Weekdays		
<b>Off-peak:</b> All non-peak hours All weekends All holidays All hours, March 1st through October 30th		
<b>On-Peak Price:</b> 20.0¢ per kWh		
<b>Off-peak Price:</b> 6.0¢ per kWh		
<b>You Pay BC Hydro:</b> \$20 per month		
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Suppose that BC Hydro were to offer new ways for you to buy electricity for your household.

Three alternative pricing plan options are provided below. If these were your only options, which one would you choose?  
Choose by clicking one of the buttons below:

<b>Standard Plan</b>	<b>Time-of-Use Pricing</b>	<b>Time-of-Use Pricing</b>
<b>Customer Charge:</b> \$7.26 for 2 months		
<b>Base Rate:</b> 8¢ per kWh		
	<b>On-Peak:</b> 7:00 AM to 10:00 AM Weekday mornings	<b>On-Peak:</b> 7:00 AM to 11:00 AM Weekday mornings
	<b>On-Peak:</b> 4:00PM to 9:00PM Weekdays	<b>On-Peak:</b> 4:00PM to 7:00PM Weekdays
	<b>Off-peak:</b> All non-peak hours All weekends All holidays All hours, March 1st through October 30th	<b>Off-peak:</b> All non-peak hours All weekends All holidays All hours, March 1st through October 30th
	<b>On-Peak Price:</b> 10.0¢ per kWh	<b>On-Peak Price:</b> 29.0¢ per kWh
	<b>Off-peak Price:</b> 7.0¢ per kWh	<b>Off-peak Price:</b> 5.5¢ per kWh
	<b>You Pay BC Hydro:</b> \$15 per month	<b>BC Hydro Pays You:</b> \$20 per month
	<b>Guarantee</b> that your bill on this new rate during the year will be no higher than if you had been on the Standard Plan in effect during this same year.	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Suppose that BC Hydro were to offer new ways for you to buy electricity for your household.

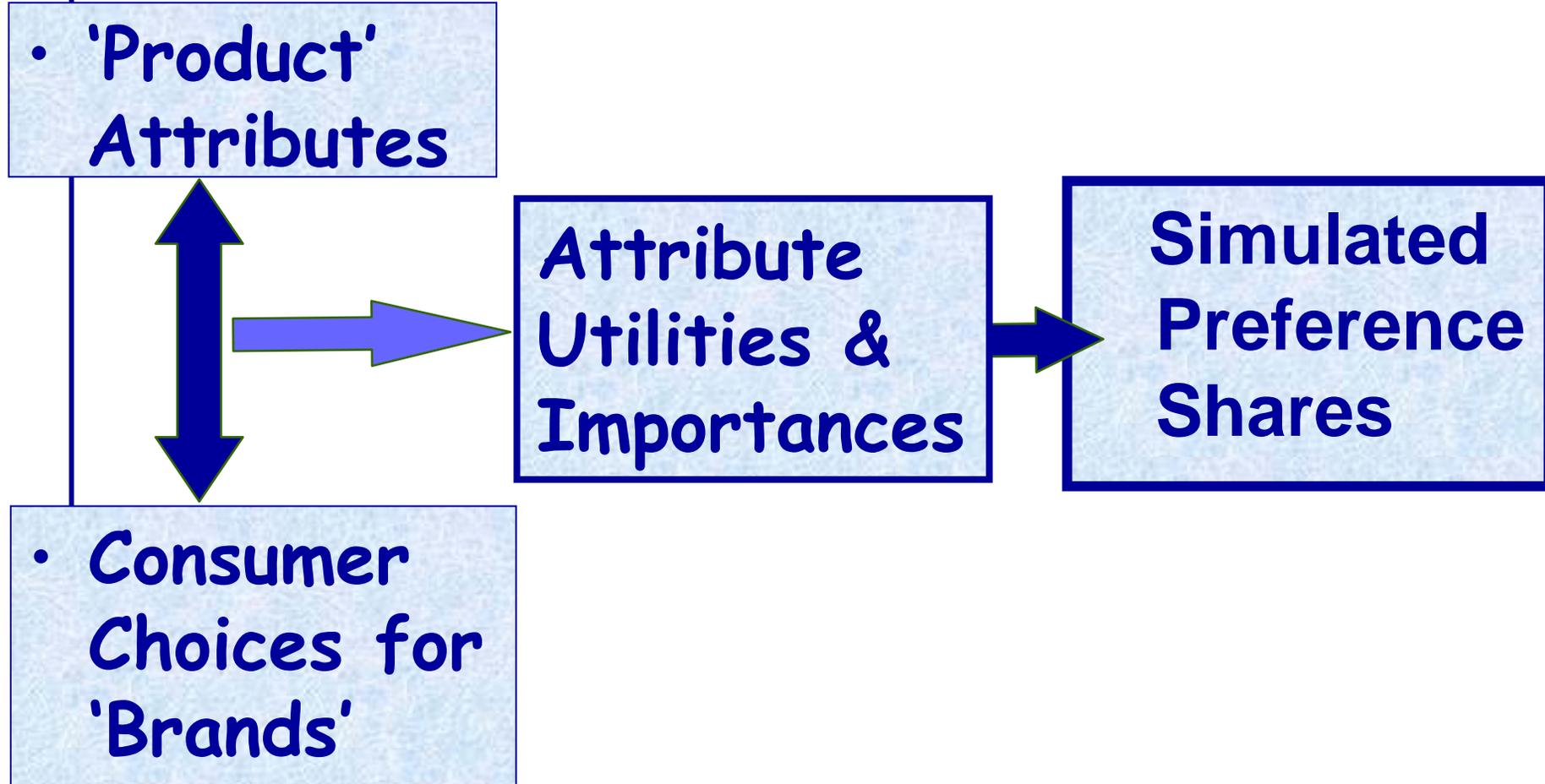
Three alternative pricing plan options are provided below. If these were your only options, which one would you choose?  
Choose by clicking one of the buttons below:

<p><b>Time-of-Use Pricing</b></p> <hr/> <p><b>On-Peak:</b> 7:00 AM to 10:00 AM Weekday mornings</p> <p><b>On-Peak:</b> 4:00PM to 6:00PM Weekdays</p> <p><b>Off-peak:</b> All non-peak hours All weekends All holidays All hours, March 1st through October 30th</p> <p><b>On-Peak Price:</b> 7.5¢ per kWh</p> <p><b>Off-peak Price:</b> 5.0¢ per kWh</p> <p><b>BC Hydro Pays You:</b> \$10 per month</p> <p><input type="checkbox"/></p>	<p><b>Time-of-Use Pricing</b></p> <hr/> <p><b>On-Peak:</b> 7:00 AM to 11:00 AM Weekday mornings</p> <p><b>On-Peak:</b> 4:00PM to 8:00PM Weekdays</p> <p><b>Off-peak:</b> All non-peak hours All weekends All holidays All hours, March 1st through October 30th</p> <p><b>On-Peak Price:</b> 15.0¢ per kWh</p> <p><b>Off-peak Price:</b> 6.0¢ per kWh</p> <p>No payment in either direction.</p> <p><b>Guarantee</b> that your bill on this new rate during the year will be no higher than if you had been on the Standard Plan in effect during this same year.</p> <p><input type="checkbox"/></p>	<p><b>Standard Plan</b></p> <p><b>Customer Charge:</b> \$20.00 for 2 months</p> <p><b>Base Rate:</b> 9¢ per kWh</p> <p><input type="checkbox"/></p>
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Suppose that BC Hydro were to offer new ways for you to buy electricity for your household.

Three alternative pricing plan options are provided below. If these were your only options, which one would you choose?  
Choose by clicking one of the buttons below:

<b>Standard Plan</b>	<b>Time-of-Use Pricing</b>	<b>Time-of-Use Pricing</b>
<b>Customer Charge:</b> \$10.00 for 2 months		
<b>Base Rate:</b> 6¢ per kWh		
	<b>On-Peak:</b> 7:00 AM to 9:00 AM Weekday mornings	No morning peak.
	<b>On-Peak:</b> 4:00PM to 6:00PM Weekdays	<b>On-Peak:</b> 4:00PM to 7:00PM Weekdays
	<b>Off-peak:</b> All non-peak hours All weekends All holidays All hours, March 1st through October 30th	<b>Off-peak:</b> All non-peak hours All weekends All holidays All hours, March 1st through October 30th
	<b>On-Peak Price:</b> 20.0¢ per kWh	<b>On-Peak Price:</b> 7.5¢ per kWh
	<b>Off-peak Price:</b> 7.0¢ per kWh	<b>Off-peak Price:</b> 5.0¢ per kWh
	<b>BC Hydro Pays You:</b> \$20 per month	<b>You Pay BC Hydro:</b> \$20 per month
		<b>Guarantee</b> that your bill on this new rate during the year will be no higher than if you had been on the Standard Plan in effect during this same year.
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



# Key Deliverables

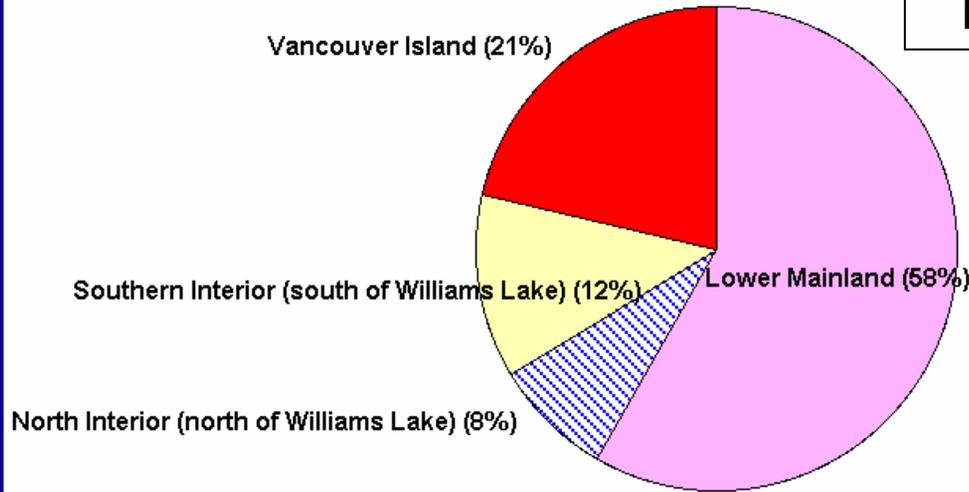
- **How sensitive are customers to variations in key attributes?**
- **What drives choice of pricing plan?**
- **What are the best estimates of customer responses to variations in the Standard Plan, One-Peak TOU and Two-Peak TOU?**

# Whose preferences were measured?

**Description of the sample customers'  
demographic and energy characteristics**

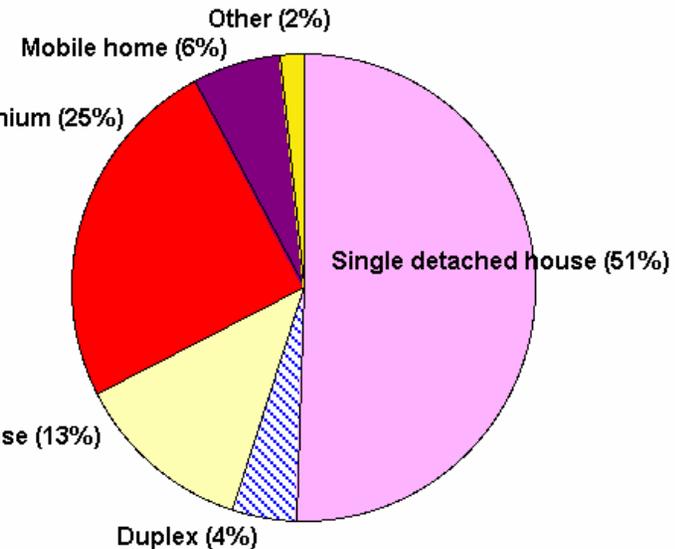
# Region of BC & Dwelling Types

## Residence Location



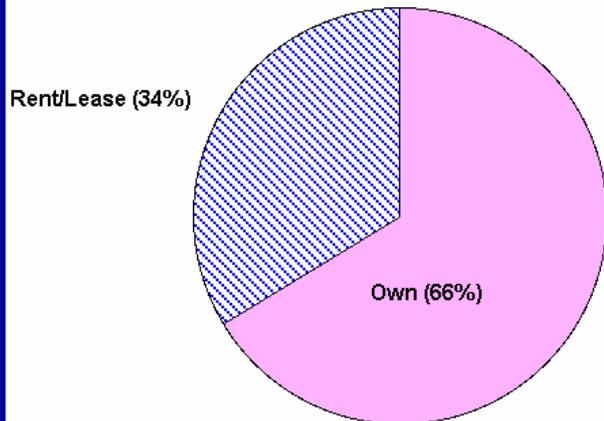
- The profile of dwelling types by region fairly closely followed actual customer profiles.

## Residence Type



Base = 1203

## Do you own or rent your home?



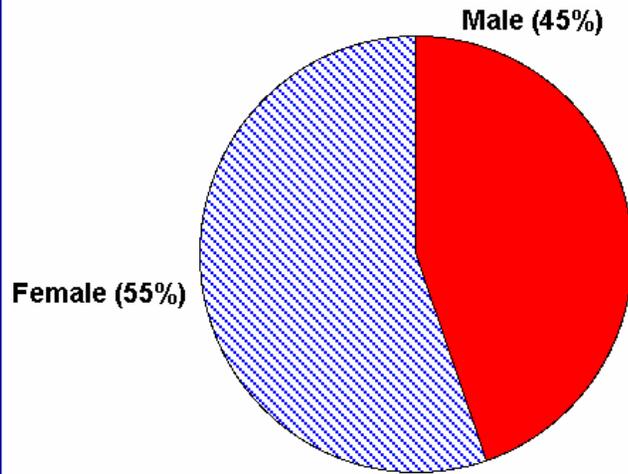
Base = 1203

- Only those who paid their own electricity costs were qualified.

Base = 1203

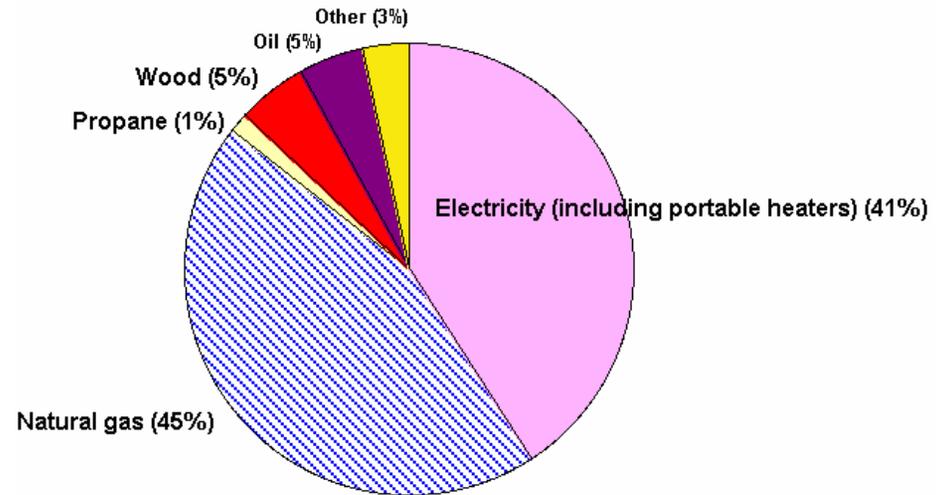
# Demographics: Sex & Main Fuel

**Sex**



Base = 1203

**Main Heating Fuel**

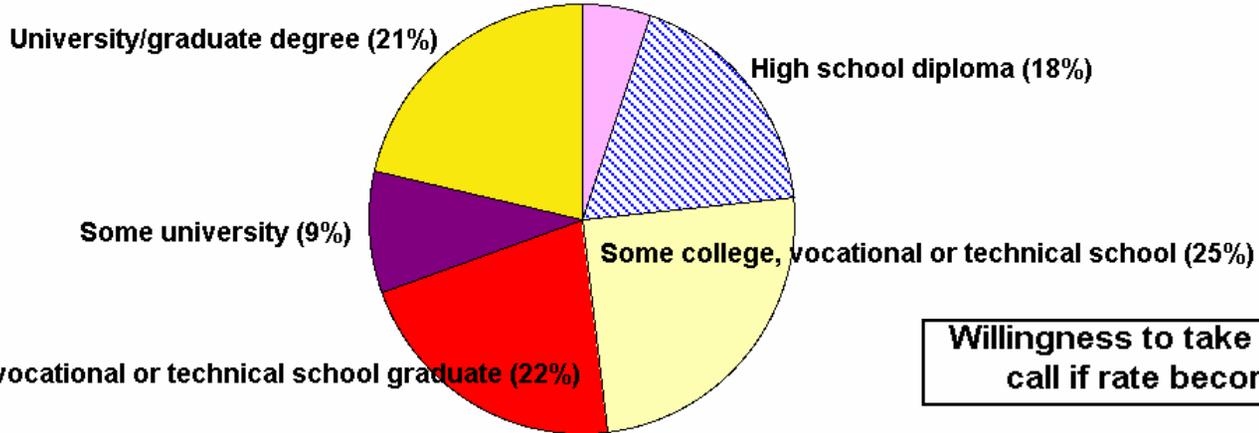


Base = 1203

# Demographics: Education & Sales Call

## Education

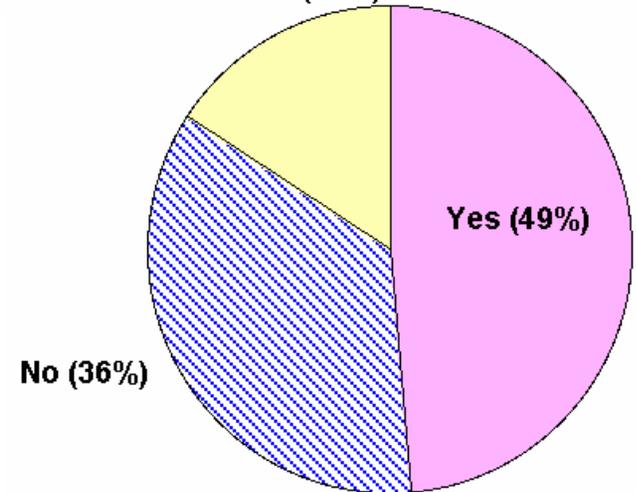
Less than Grade 12 (5%)



Base = 1203

## Willingness to take a BC Hydro sales call if rate becomes available.

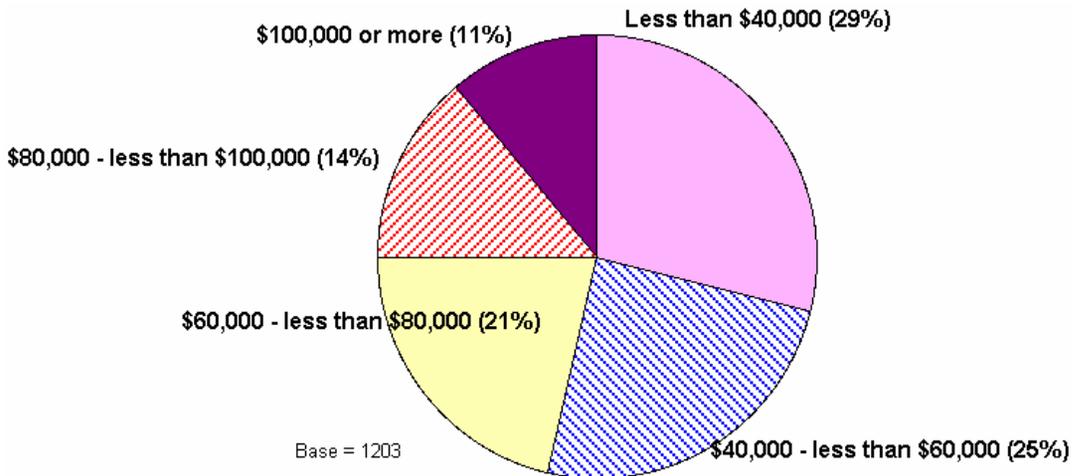
Don't know/refused (16%)



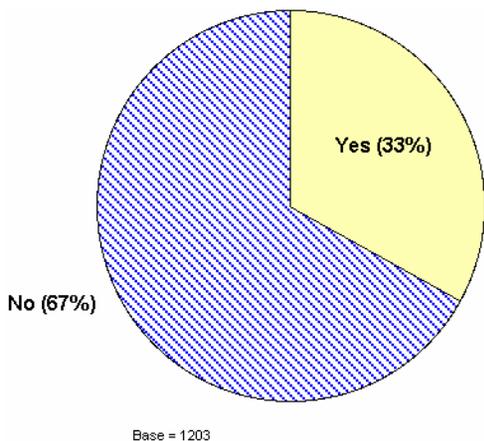
Base = 1203

# Demographics: Income & Bill

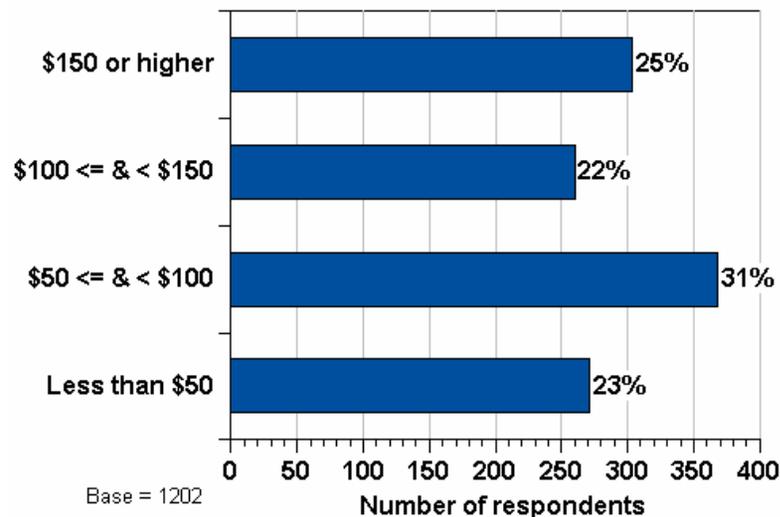
## Household Income



## Programmable Thermostat in Home?

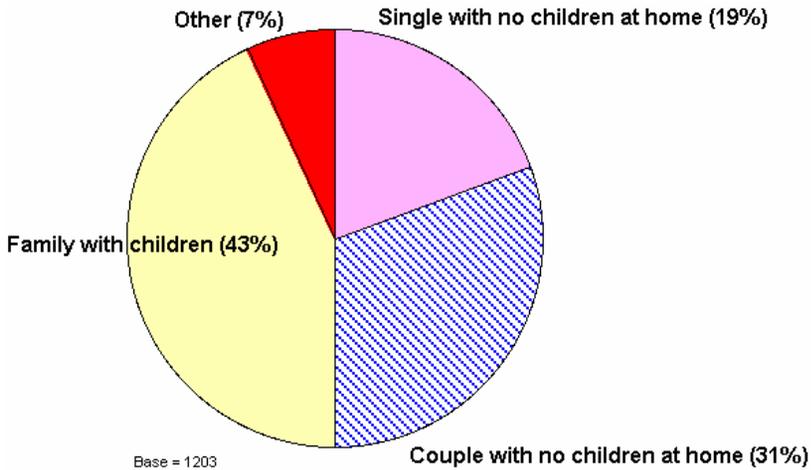


## Amount of Last Two Month Electricity

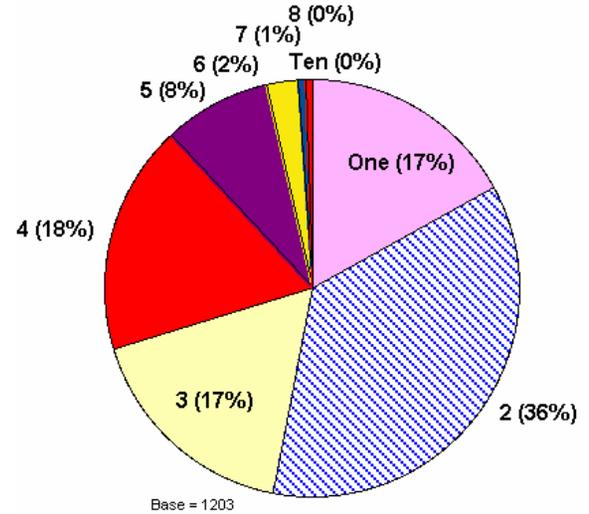


# Demographics: Income & Bill

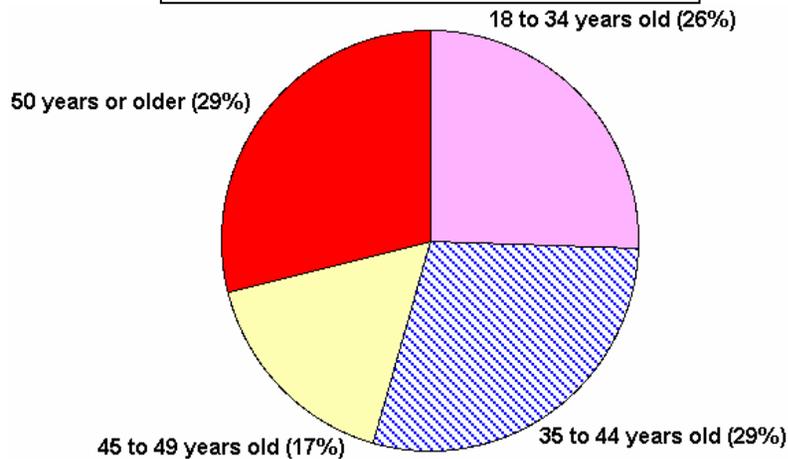
**Stage of Life**



**Household Size**



**Respondents' Ages**



# Whose preferences were measured?

**Description of the sample customers' attitudes regarding energy.**

# Satisfaction with BC Hydro

	Thinking over the past year, how satisfied are you with the OVERALL SERVICE you have received from BC Hydro	How satisfied are you with the TOTAL price you pay to BC Hydro for your electricity service overall?	How satisfied are you with the customer service you receive from BC Hydro -- the interaction you have with BC Hydro staff.
	%	%	%
Completely Satisfied 10	24.9	7.8	18.6
9	14.5	5.2	13.7
8	20.5	14.5	19.5
7	11.8	16.5	13.5
6	8.2	12.8	10.1
5	12.5	15.1	13.0
4	3.1	10.9	4.0
3	2.2	8.1	4.4
2	1.1	4.8	1.5
Completely Dissatisfied 1	1.2	4.2	1.7
Total	100	100	100
Base	1203	1203	1203
Top 3 Boxes, 8-10	59.9	27.5	51.8
Means	7.60	5.91	7.19

- **Satisfaction with service from BC Hydro is at a fairly good level of satisfaction across these three questions:**
  - 60% are satisfied (8-10) with the overall service from BC Hydro
  - 52% are satisfied (8-10) with the interactions they have had with BC Hydro staff
- **28% are satisfied with the total price they pay to BC Hydro for electricity service overall**
  - Most (55%) fall in the middle between 4 & 7 on the satisfaction scale for price

# Conservation attitudes & pricing

	I really don't care much about energy and see little reason to conserve	There is not very much any individual can do to conserve energy that will have much effect in the long run	We could all use a lot less energy than we do and if many people conserved, we could all make a big difference overall	By making my home more energy efficient, I am helping to do my part for the environment	I would be willing to do my part of reducing my usage of electricity if it allows the province to delay the construction of new electricity generation projects	I am an active energy conserver who looks for opportunities to save energy in everything I do	When buying products and services, I always look for the best price	Electricity in British Columbia is reasonably priced	I am knowledgeable about ways to save electricity around my home
	%	%	%	%	%	%	%	%	%
Strongly agree	3.1	2.6	64.3	57.9	32.9	27.4	41.8	10.1	32.5
Somewhat agree	2.7	5.5	20.1	27.6	28.8	37.2	33.7	34.4	49.7
Neither agree nor disagree	4.5	6.1	6.7	7.5	24.5	22.4	14.3	28.6	10.9
Somewhat disagree	23.9	26.5	3.5	3.4	8.1	9.2	7.7	19.8	5.5
Strongly disagree	65.8	59.4	5.4	3.7	5.7	3.7	2.5	7.1	1.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Base	1203	1203	1203	1203	1203	1203	1203	1203	1203

- Customers were quite positive in their responses to these generally conservation-minded questions.
- Top 2 boxes are over 65% for all conservation questions with some over 80%
- 90% care about energy and see reasons to conserve.
- 82% agreed that they were knowledgeable about ways to save electricity.
- 44% agreed that electricity in BC is reasonably priced, 27% disagreed and 29% were uncertain.

# Understanding of Pricing Plan Attributes

	Customer charge - understanding	Base rate - understanding	On-peak hours - understanding	Off-peak hours - understanding	On-peak price - understanding	Off-peak price - understanding	BC Hydro Pays You / You Pay BC Hydro - understanding	Guarantee - understanding
	%	%	%	%	%	%	%	%
Very easy	36.6	46.0	44.8	44.7	43.6	44.0	26.8	35.9
Somewhat easy	39.1	40.0	37.4	37.8	36.1	36.1	28.5	38.2
Somewhat difficult	20.3	11.7	13.7	13.6	16.1	16.1	31.3	19.0
Very difficult	4.1	2.3	4.1	3.8	4.2	3.8	13.3	6.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Base	1203	1203	1203	1203	1203	1203	1203	1203

- **80% or more of respondents found most attributes easy to understand**
- **74% found the guarantee to be somewhat or easy to understand**
- **55% found the balancing charge to be somewhat or easy to understand**
  - This lower level of understand might be due to the fact that the concept of BC Hydro paying customers money is new to them.

# Anticipated Response to TOU rates

	TOU DSM: Use a programmable thermostat to pre-heat the home before on-peak periods commence and lower temperature setting during on-peak times	TOU DSM: Avoid laundry during on-peak period	TOU DSM: Avoid dishwasher usage during on-peak period	TOU DSM: Install water heater timer to take advantage of off-peak rate and avoid on-peak rates
	%	%	%	%
Definitely Would	23.8	47.9	51.7	14.3
Probably Would	34.1	30.6	28.3	23.9
Might or Might Not	21.3	12.1	11.5	32.9
Probably Would Not	11.9	5.5	4.7	17.3
Definitely Would Not	9.0	3.9	3.8	11.6
Total	100.0	100.0	100.0	100.0
Base	1203	1203	1203	1203
Means	3.5	4.1	4.2	3.1

- **Avoiding dishwasher usage during peak times (80% saying probably would or definitely would) and avoiding laundry during peak times (78%) were the two most popular DSM activities if the household were on a TOU pricing plan.**
- **58% said they would use a programmable thermostat to pre-heat their home before on-peak periods and lower temperatures during on-peak periods.**
- **Only 38% said that they would install a water heater timer to take advantage of off-peak rates and avoid on-peak rates.**
  - **Since 33% indicated that they might or might not, there might have been some misunderstanding regarding this process for conserving.**

# Usage of Electricity, Rates & Bill

	How extensively do you review your electricity bill statement?	How well do you understand the rates on which the bill is calculated?	How extensively do you monitor the actual usage of electricity in your home?	How extensively do you modify the usage of electricity in your home in response to bills and rates?
	%	%	%	%
Extensively (10)	21.3	11.0	11.5	11.6
9	10.6	8.3	10.3	8.0
8	17.2	16.1	15.0	15.4
7	15.2	15.0	16.8	17.2
6	9.7	12.0	13.4	15.4
5	10.3	13.0	11.8	11.8
4	4.6	8.1	6.5	5.2
3	5.9	6.7	5.1	5.1
2	2.1	4.3	3.7	3.8
Not at all (1)	3.2	5.4	6.1	6.7
Total	100.0	100.0	100.0	100.0
Base	1203	1203	1203	1203
Means	7.05	6.22	6.39	6.32

- Most customers take reasonable, but not particularly high, diligence in reviewing their bills, monitoring their electricity usage and modifying their usage in response to their bills and rates.
- 19% either extensively (10) or nearly extensively (9) understood the rates on which their bills were calculated. 37.6% provided answers of 5 or less

## Key Findings

**Understanding Customers'  
Preferences for Pricing Plans**

# Estimating Basic Electricity Price Plan Choices

- **What is the appeal of level within each attribute (utilities)?**
- **What are the key drivers of customer choices? (importance of attributes)**
- **What are customers likely to do when presented with pricing plan choices? (simulations)**

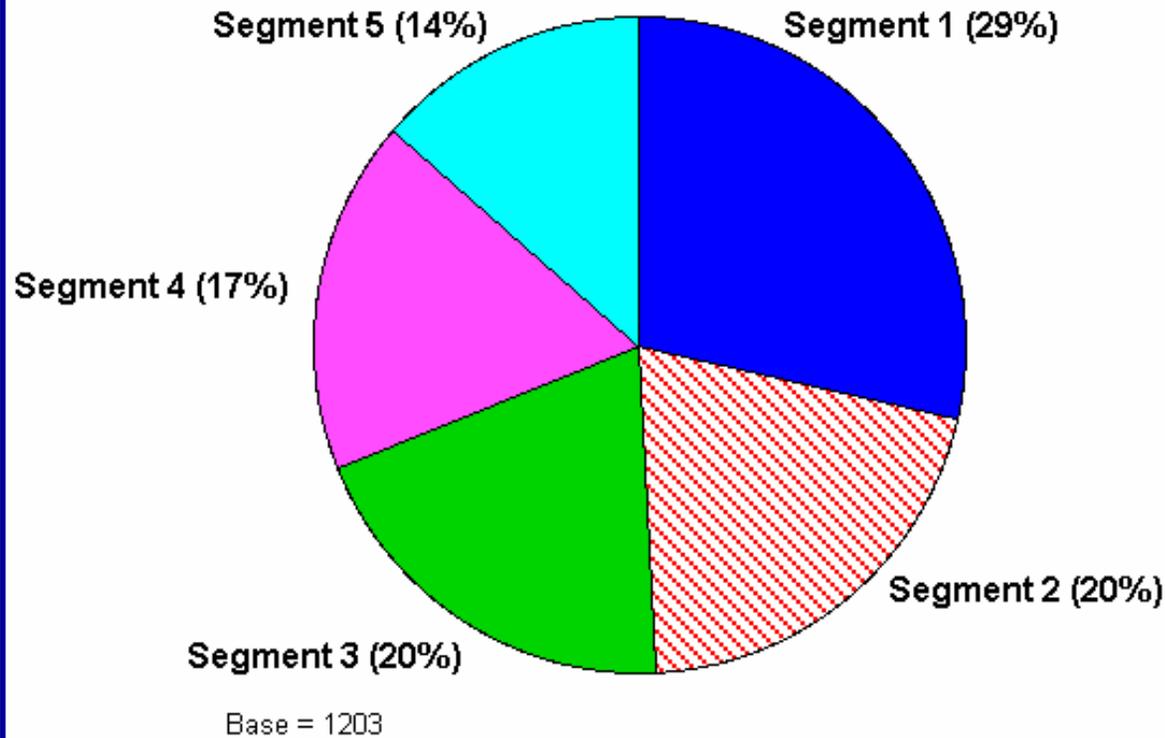
# Customer Segmentation is Absolutely Essential

**“If you’re not thinking segments, you’re not thinking.”**

**Ted Levitt, 1983, Harvard**

**“To think segments means you have to think about what drives customers, customer groups, and the choices that are or might be available to them.”**

# Segmentation based on Customer Preferences



- Segmentation by latent class analysis produced 5 segments that have significant differences.
- The 5 segments are all of reasonable sizes.
- The segments react differently when offered an assortment of pricing plans.

# 5 Segments Based on Choices of Pricing Plan Options

Preference Segments (Total 1203)	Description of segments based on pricing plan attributes
<b>Segment 1</b> 28.6% (344)	Mildly prone to Standard Plan Most price sensitive of all segments Most sensitive to Balancing Charge Highly sensitive to On-peak prices Highly sensitive to Guarantee
<b>Segment 2</b> 20.4% (246)	Only slightly more attracted to Standard Plan over TOU 2 <sup>nd</sup> most price sensitive, overall. Much less sensitive to Balancing Charge than is Segment 1 Most influenced by Guarantee
<b>Segment 3</b> 19.9% (239)	Most attracted to TOU among segments 2 <sup>nd</sup> most sensitive (highly) to Balancing Charge Not nearly as sensitive to other attributes Highly influenced by Guarantee
<b>Segment 4</b> 17.5% (210)	Highly attracted to TOU Least price sensitive among all segments Much less influenced by Balancing Charge, only mildly sloped utility function Finds Guarantee very appealing
<b>Segment 5</b> 13.6% (164)	Extremely prone to Standard Plan, most so among segments Third most price sensitive across segments Mildly sensitive to Balancing Charge Among price attributes, most sensitive to Customer Charge and On-Peak prices Least influenced by Guarantee among segments

- These 5 segments were derived from customers' choices among pricing plan options.
- The segments are distinctly different in their preferences for the attributes of the Standard and TOU pricing plans

# Segment Description: Demographics

- Based on the Preference Segments, 10 Demographic Segments were derived.
- These help describe who resides in each of the Preference Segments.

Demographic Segments	Description of Preference Segment by Demographic Characteristics
1	32% Segment 1
	46% Electricity & 49% Natural gas
10.4% (125)	100% Lower Mainland
	76% want a sales call from BC Hydro / 24% DK/Ref
	48% (high) family with children
	100% males
	43% (highest) in 35 to 44 year old group
2	<b>27% Segment 4 (highest concentration)</b>
	31% Electricity & 66% Natural gas
5.3% (64)	100% Lower Mainland
	77% want a sales call from BC Hydro (highest) / 23% DK/Ref
	52% couple with no children (highest)
	100% males
	100% 59 years or older (highest)

# Segment Description: Demographics

Demographic Segments	Description of Preference Segment by Demographic Characteristics
<b>3</b>  20.0% (241)	36% Segment 1 (2 <sup>nd</sup> highest) / 7% Segment 5 (3 <sup>rd</sup> lowest)
	44% Electricity / 48% Natural gas
	100% Lower Mainland
	69% want a sales call / 32% DK/Ref
	50% family with children (2 <sup>nd</sup> highest)
	100% female
	33% 18 to 34 years old (tie for highest)
<b>4</b>  22.7% (273)	Segments: less like segments 1 & 2, more like 4 & 5
	46% Electricity & 47% Natural gas
	100% Lower Mainland
	100% do not want a sales call
	22% single with no children (slightly more than average)
	Male/Female split even
	33% 18 to 34 years old (tie for highest)
<b>5</b>  8.1% (97)	Segments: slightly higher in 1 & 5
	16% Electricity (very low) & 66% Natural gas (2 <sup>nd</sup> highest)
	100% Northern
	56% want sales call / 30% do not
	53% family with children (highest)
	38% Male / 62% Female
	26% 45 to 49 years old (highest)

# Segment Description: Demographics

Demographic Segments	Description of Preference Segment by Demographic Characteristics
<b>6</b>	<b>33% Segment 2 (highest) / 30% Segment 3 (2<sup>nd</sup> highest) / 9% Segment 1 (lowest)</b>
	70% Electricity (highest) / 0% Natural gas / 12% Propane (highest)
2.7% (33)	100% Southern Interior
	64% want sales call
	42% couple with no children (high)
	49% Male / 51% Female
	42% 50 years old or older (2 <sup>nd</sup> highest)
<b>7</b>	<b>49% Segment 1 (highest)</b>
	0% Electricity / 79% Natural gas (highest) / 17% Wood (2 <sup>nd</sup> highest)
6.4% (77)	100% Southern Interior
	86% want a sales call / 14% DK/Ref
	13% single with no children (2 <sup>nd</sup> lowest), otherwise typical
	34% Male / 66% Female
	39% 50 years old or older (high)
<b>8</b>	<b>26% Segment 5 (highest)</b>
	0% Electricity / 77% Natural gas / 23% Wood (highest)
2.9% (35)	100% Southern Interior
	100% do not want a sales call
	26% single with no children (highest) / 49% family with children (high)
	60% Male / 40% Female
	23% 45 to 49 years old (high)

# Segment Description: Demographics

Demographic Segments	Description of Preference Segment by Demographic Characteristics
<b>9</b>	<b>37% Segment 3 (highest)</b>
	61% Electricity / 11% Natural Gas / 6.5% Propane (2 <sup>nd</sup> highest) / 11% Other (2 <sup>nd</sup> highest)
3.8% (46)	100% Vancouver Island
	41% want sales call / 44% do not
	100% single with no children
	48% Male / 52% Female
	22% 45 to 49 years old (high) / 33% 50 or older (high)
<b>10</b>	Typical representation across segments
	56% Electricity (high) / 16% Oil (highest)
17.6% (212)	100% Vancouver Island
	56% want sales call / 31% do not
	47% couple with children / 44% family with children / 0% single with no children
	43% Male / 57% Female
	34% 50 years or older (3 <sup>rd</sup> highest)

# Segments: attitudinal descriptors

- Preference Segments and their relationship to non-conjoint attitudinal variables.

Preference Segments (Total 1203)	Description of differences among the 5 segments on the non-conjoint attitudinal variables
<b>Segment 1</b>	Most satisfied with overall service received from BC Hydro during the past year.
	Tends to have highest level of understanding of attributes
28.6% (344)	Most likely to, "Avoid laundry during on-peak period."
<b>Segment 2</b>	Tends to have a high level of understanding of attributes
	Highly likely to, "Avoid laundry during on-peak period."
20.4% (246)	Most agrees with, "I am knowledgeable about ways to save electricity around my home."
<b>Segment 3</b>	Highest in, "Use a programmable thermostat to pre-heat the home before on-peak periods commence and lower temperature setting during on-peak times".
	Highly likely to, "Avoid laundry during on-peak period."
19.9% (239)	Most satisfied with, "the total price you pay to BC Hydro for your electricity service overall?"
	Most agrees with, "Electricity in British Columbia is reasonably priced."

# Segments: attitudinal descriptors

Preference Segments (Total 1203)	Description of differences among the 5 segments on the non-conjoint attitudinal variables
	2 <sup>nd</sup> highest in, "Use a programmable thermostat to pre-heat the home before on-peak periods commence and lower temperature setting during on-peak times."
17.5% (210)	Least agrees with, "I am knowledgeable about ways to save electricity around my home."
<b>Segment 5</b>	Importance of alternative pricing plans to satisfaction is significantly lower than for other segments.
	Significantly less likely to avoid using dishwasher during peak periods.
13.6% (164)	Least likely to, "Use a programmable thermostat to pre-heat the home before on-peak periods commence and lower temperature setting during on-peak times."
	Least satisfied with "the total price you pay to BC Hydro for your electricity service overall?"
	Least agrees with, "Electricity in British Columbia is reasonably priced."
	Least satisfied with overall service received from BC Hydro during the past year.

# How sensitive are customers to variations in attributes?

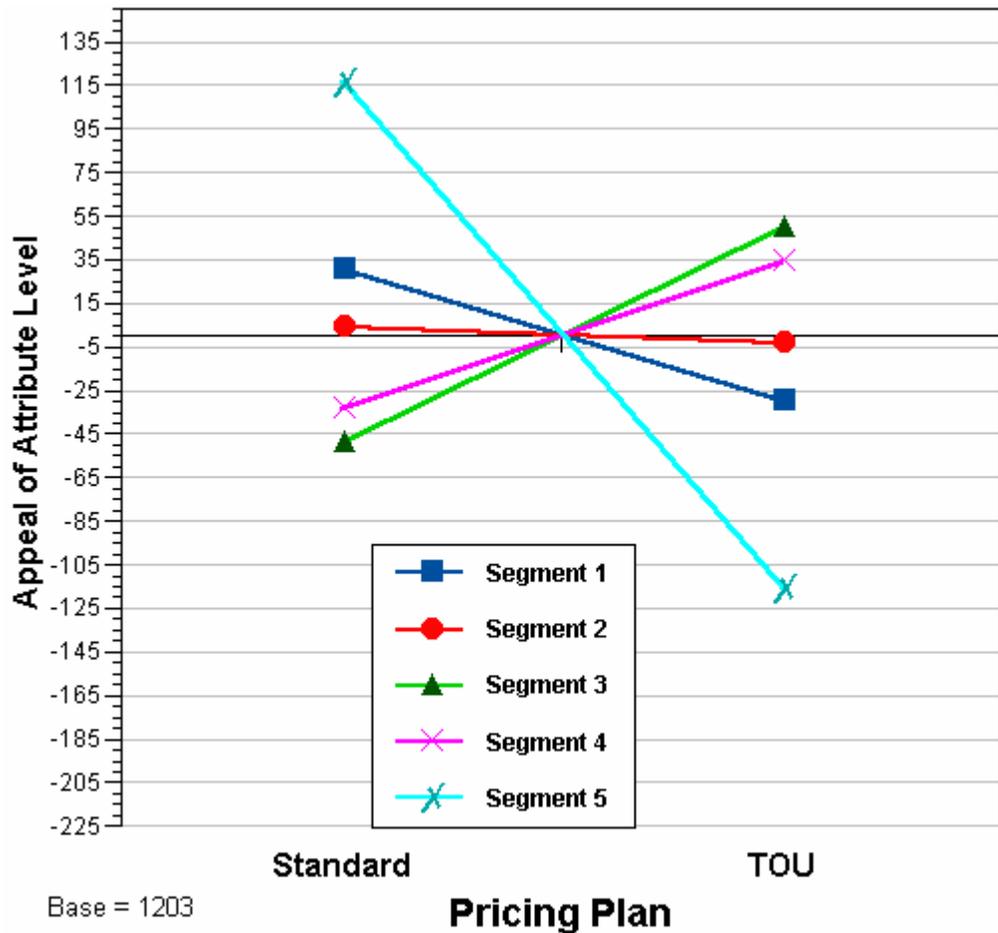
## Attributes & Levels

- Type of Pricing Plan Option
- Standard Plan Customer charge
- Standard Plan Base rate
- TOU On-peak period (morning)
- TOU On-peak period (afternoon)
- On-peak price
- Off-peak price
- Balancing charge
- Guarantee

# NOTES: Utilities, or attractiveness, of the pricing plan attributes

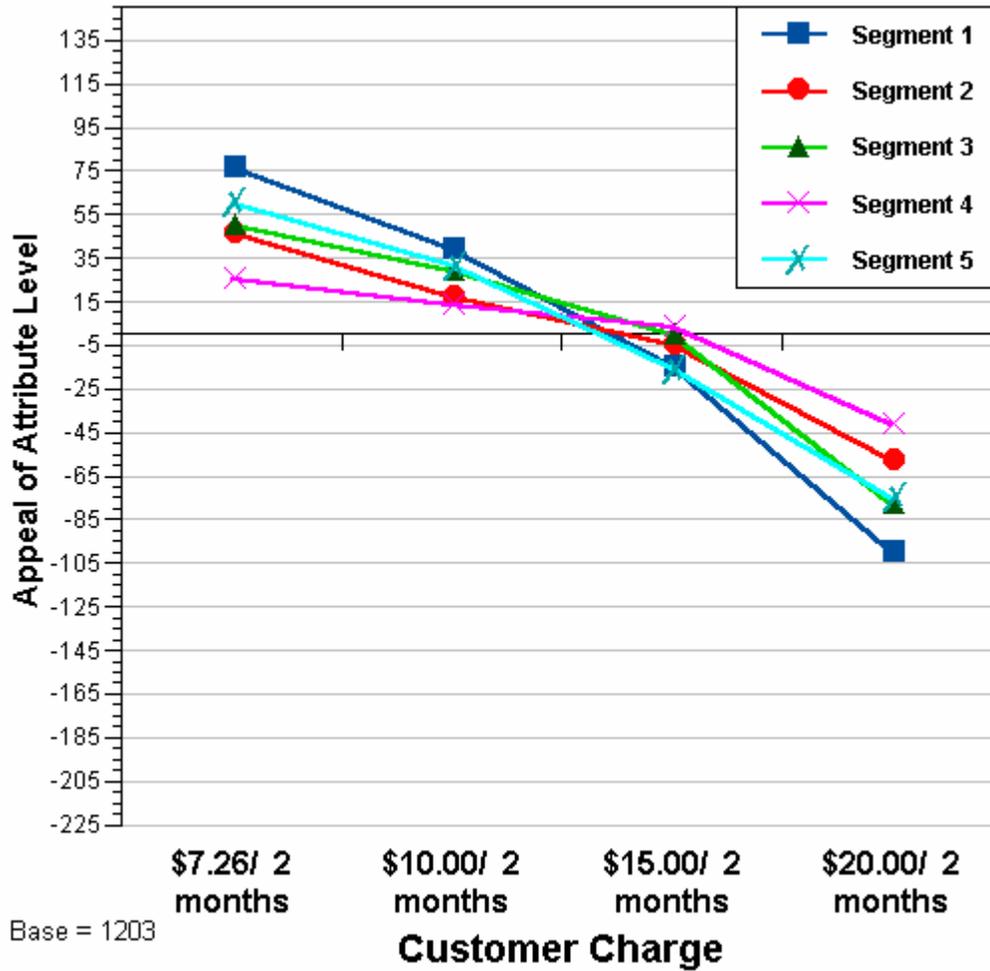
- The following slides show the “utilities” of the levels for each of the pricing plan attributes.
- Utilities can also be interpreted as appeal or attractiveness.
- Notice the range from highest utility to lowest utility on each graph. This is directly related to the relative importance of each attribute.

# Plan Type by Segments



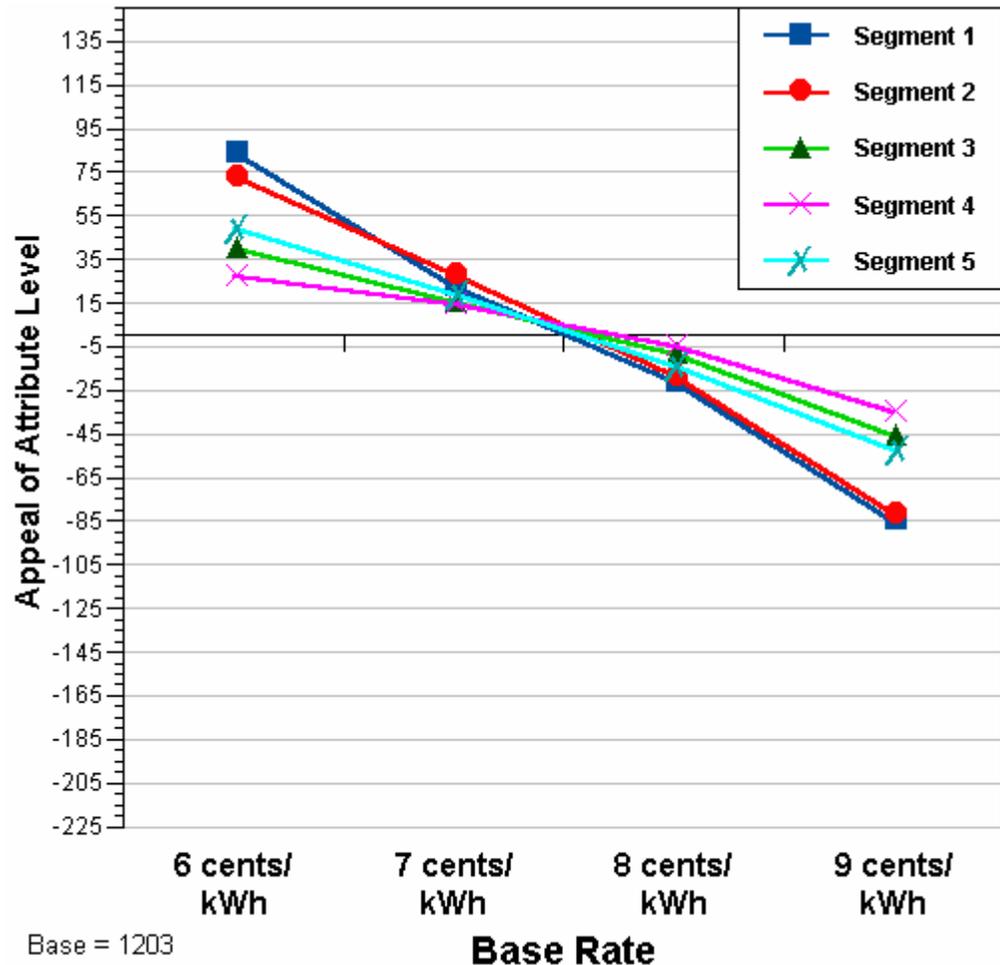
- Segment 5 found the Standard Plan very appealing
- Segment 1 was mildly attracted to the Standard Plan
- Segment 2 was indifferent between Standard and TOU
- Segments 3 and 4 were more attracted to TOU than to the Standard Plan

# Appeal of Customer Charge Levels by Segments



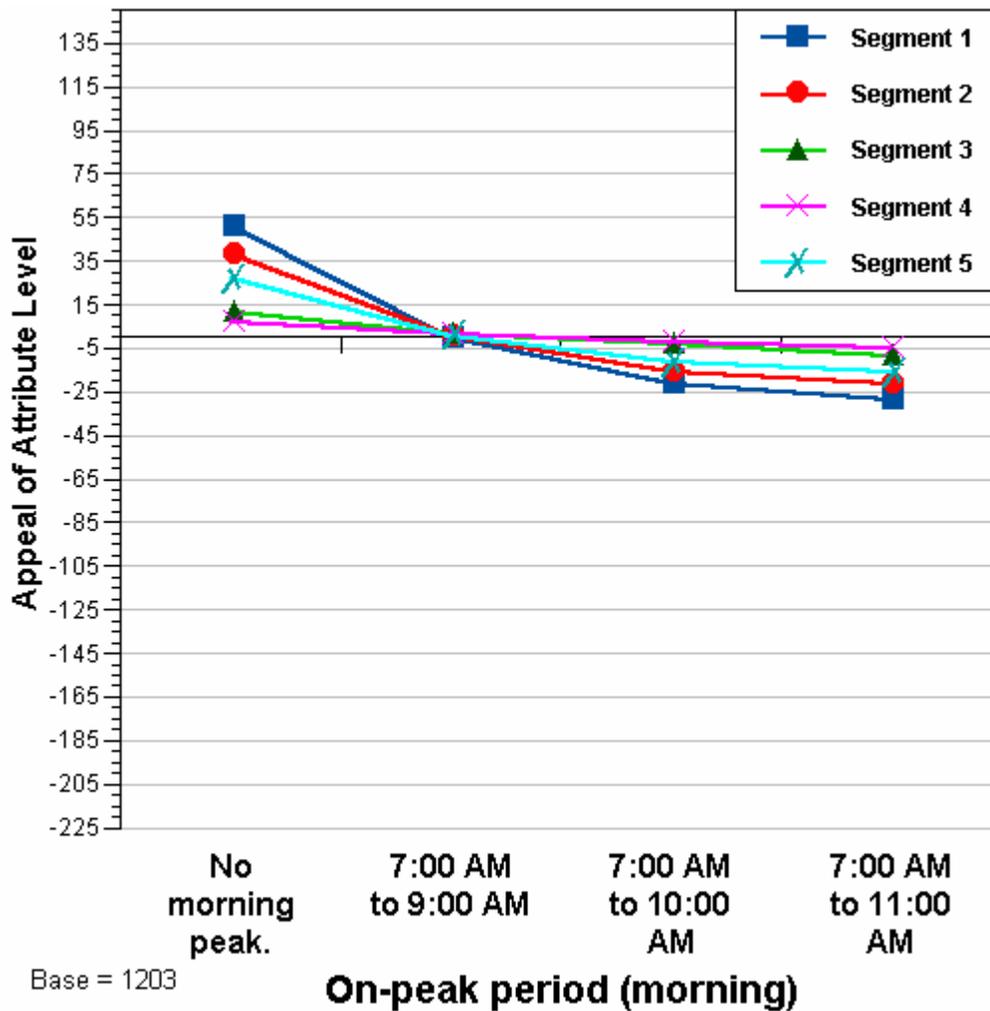
- As expected, lower levels of price were more appealing for all segments.
- Segment 1 was more price sensitive than are the other 4 segments
- Segment 4 was least sensitive to variation in the Customer Charge

# Appeal of Base Rate Levels by Segments



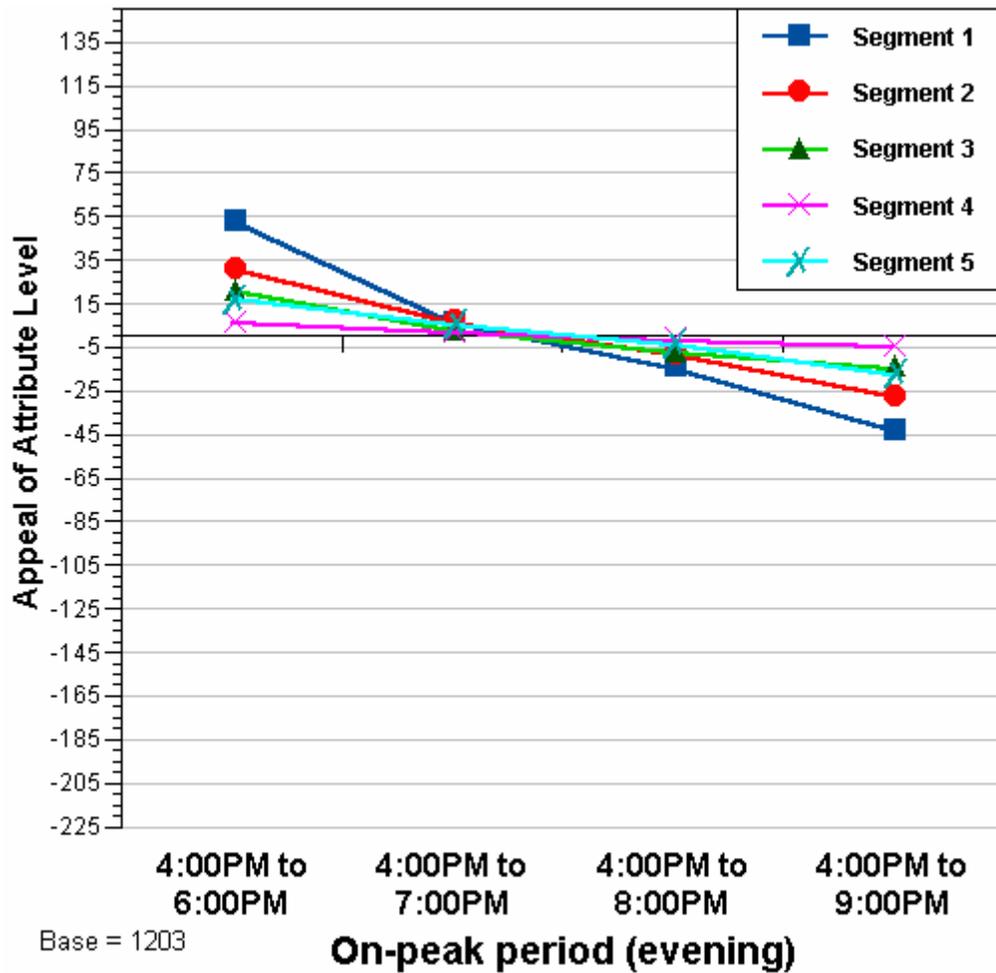
- Segments 1 and 2 were most sensitive to variations in the base rate for the Standard Plan
- Segment 4 was must less influenced by base rate prices

# Appeal of On-peak Periods (Mornings) by Segments



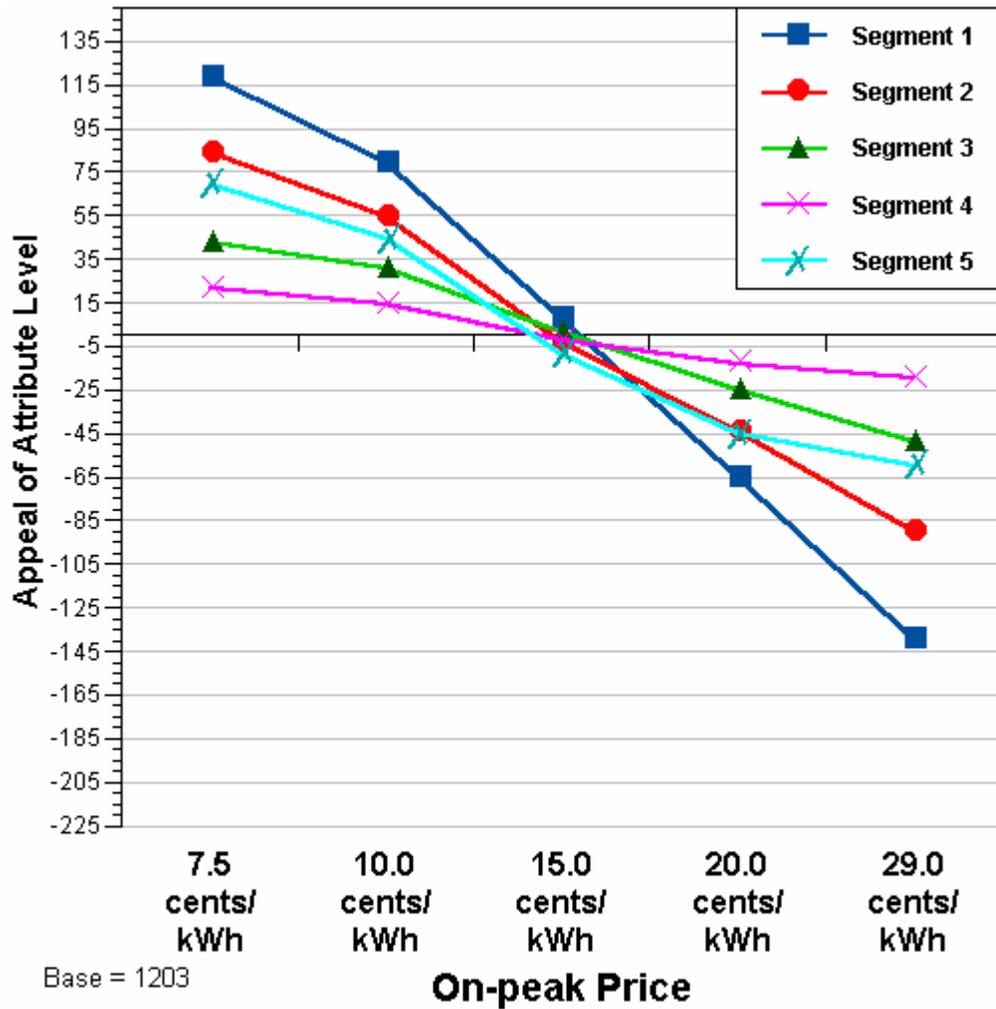
- All segments were attracted to narrower on-peak periods.
- This attribute did not highly influence choices
- Segments 3 and 4 were quite insensitive to morning on-peak period length
- Segments 1 and 2 were most sensitive to longer morning on-peak periods
- The most sensitive interval occurs when moving from no morning peak to the 2 hour peak.

# Appeal of On-peak Periods (Evenings) by Segments



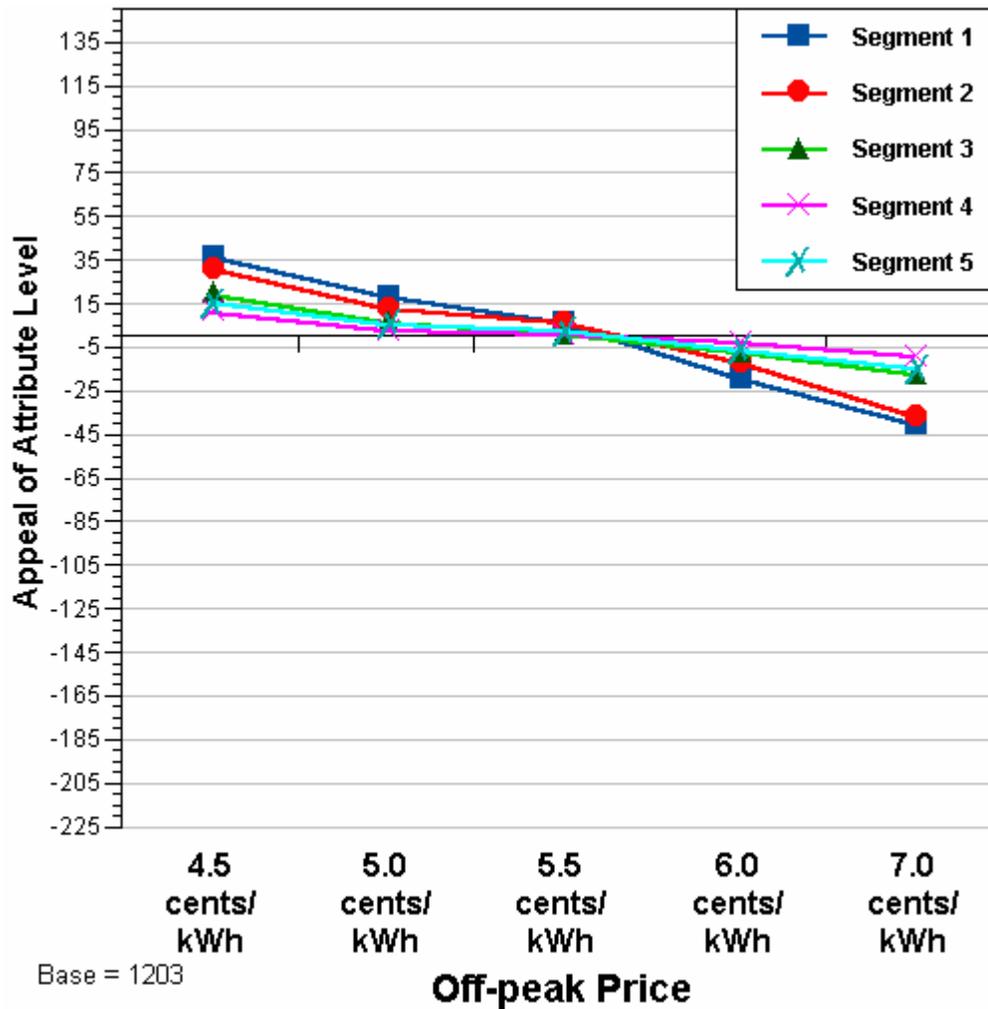
- Customers found shorter on-peak periods more attractive than longer exposure to higher prices.
- Customers were slightly more sensitive to variations in the evening on-peak intervals than to the morning periods
- Segment 1 was most sensitive to these time intervals
- Segment 4 was almost indifferent to the length of the evening peak period

# Appeal of On-Peak Prices by Segments



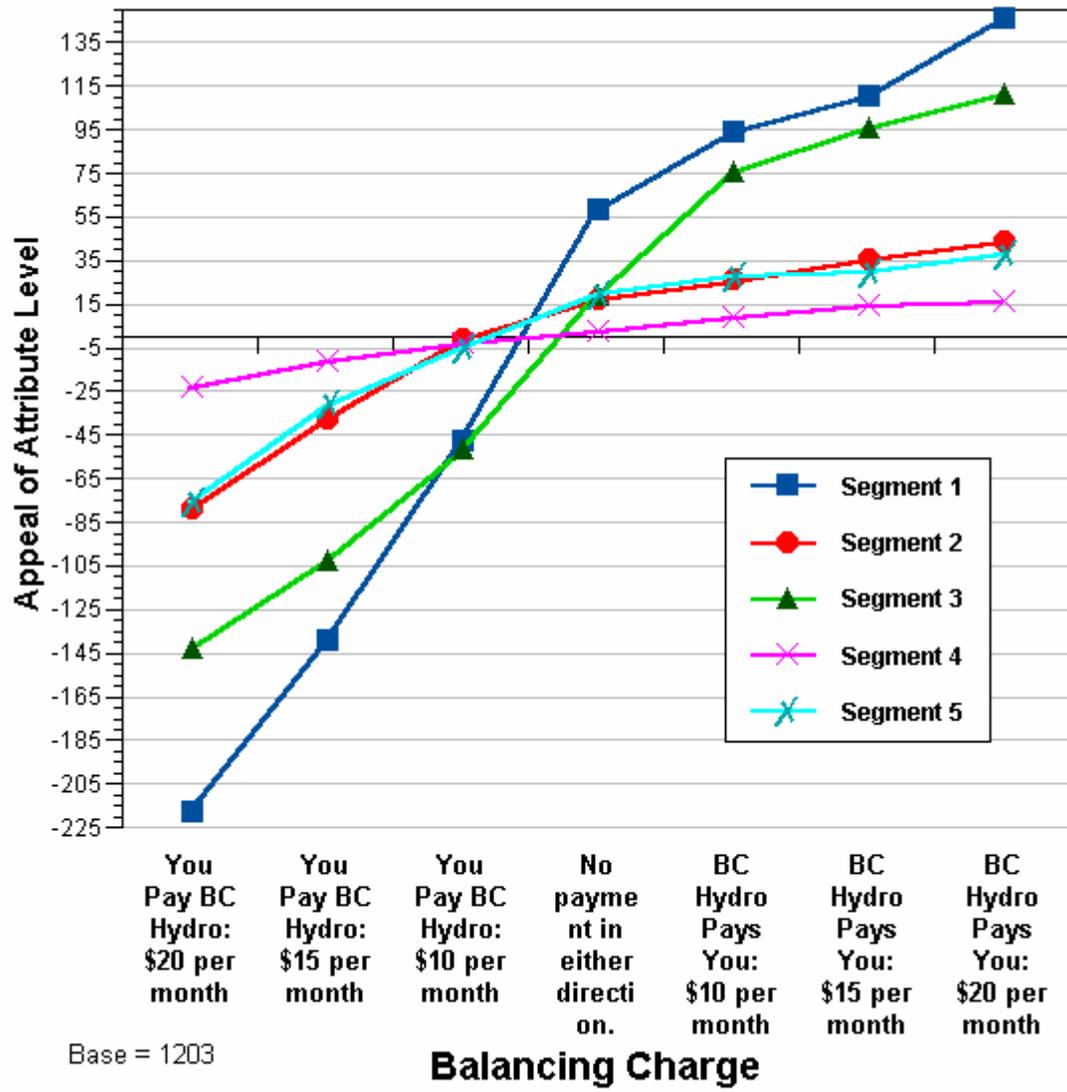
- Lower prices were significantly more attractive than higher prices
- Segment 1 was very sensitive to on-peak prices
- Segment 4 was only slightly influenced by these prices

# Appeal of Off-peak Prices by Segments



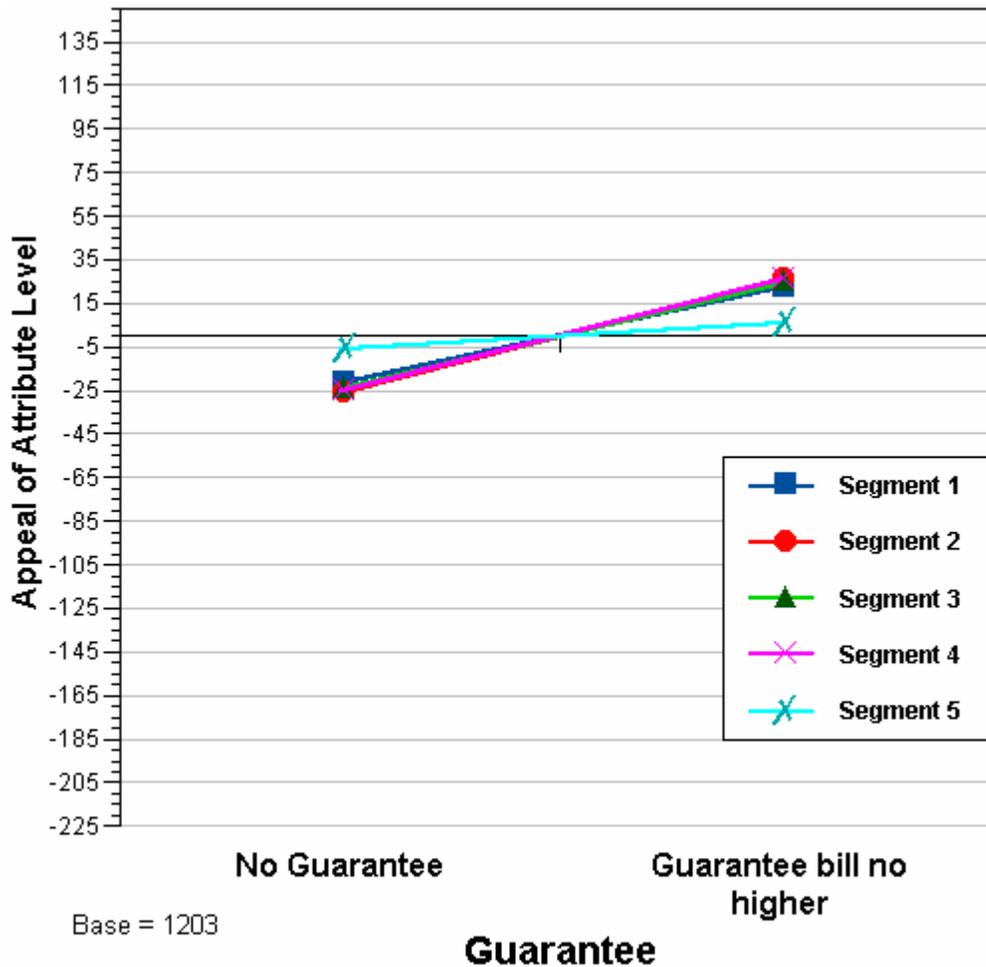
- Customers in all segments showed less response to off-peak prices than to on-peak prices
- Segments 1 and 2 were most sensitive
- Segments 3, 4 & 5 were only barely influenced by these off-peak rates

# Appeal of Balancing Charge Levels by Segments



- All segments found increased balancing charge payments more attractive.
- This is a key driver of customer choices
- Most found payments to BC Hydro more unattractive than payments from BC Hydro are attractive
- Segments 1 and 3 were highly influenced by the balancing charge
- Segments 2 and 5 were only moderately influenced
- Segment 4 was influence only mildly by the balancing charge

# Appeal of Guarantee Levels by Segments

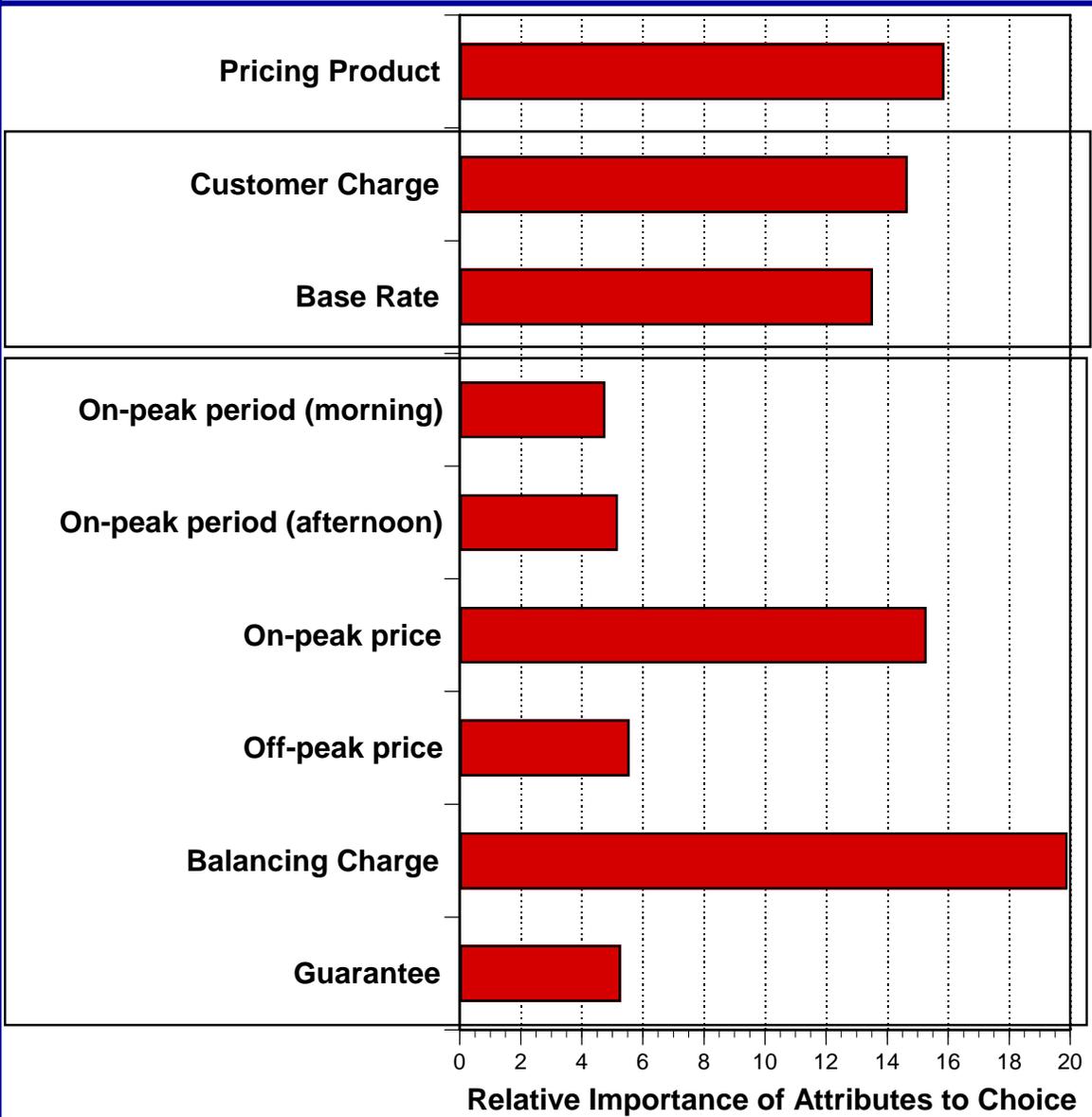


- All segments found a guarantee more appealing than no guarantee
- Segment 4 was most influenced by a guarantee
- Segment 5 was only slightly influenced by the guarantee.

**What most influences customers' choices among pricing plan option?**

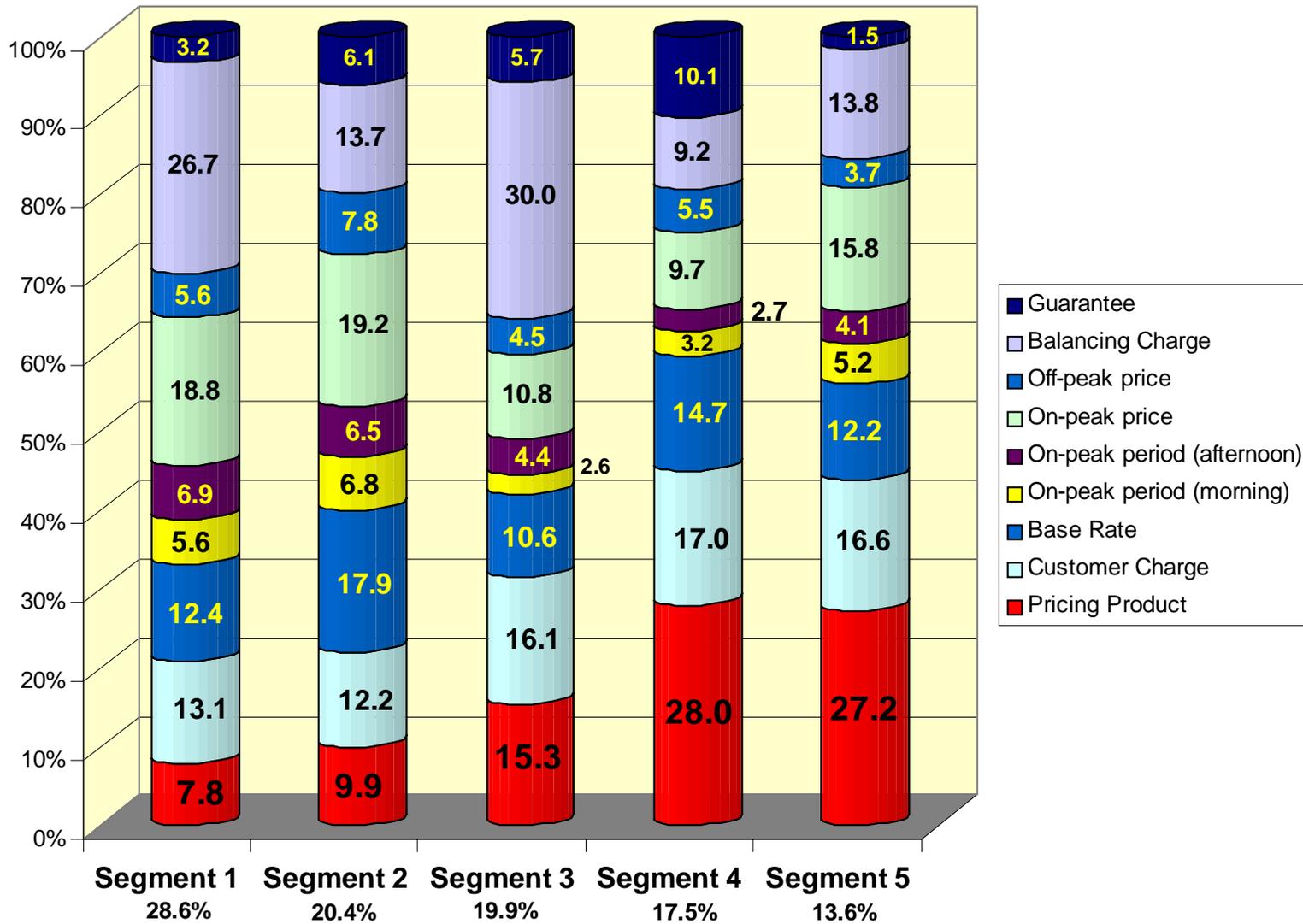
**Identifying the Key Drivers**

# What drives the choice of pricing plans, overall?



- Over all, the Balancing Charge most influences the choices
- Pricing Product Type, On-peak Price, Customer Charge and Base Rate have similar influences on choices
- Off-peak price, guarantee, and the On-Peak periods have the least influence on choices
- These were similar across demographic segments

# What drives the choice of pricing plans, by segment?



# Estimating Customers' Choices Among Basic Electricity Price Plans

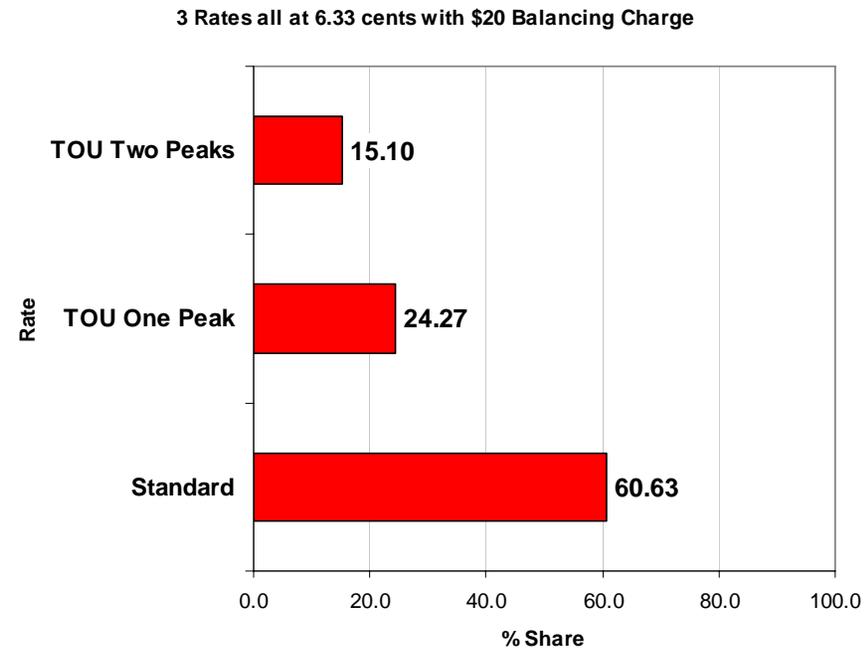
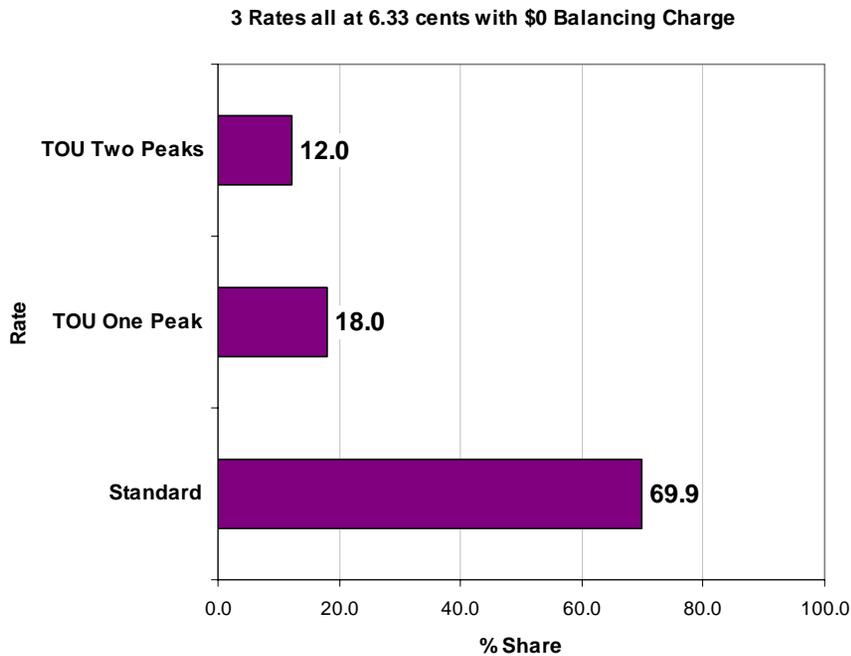
- **What are customers likely to do when presented with choices among alternative pricing plans?**

**Simulating likely responses to pricing plans**

# Simulations of Likely Behavior

- **A highly effective next step in the design of time-based pricing plans is to use the attribute importance and utility information to simulate those programs that would have the greatest chance of success for customers overall and within each the demographic segments and within each of the latent class segments.**
- **The simulations produce estimates of “share of preferences” among the customers.**

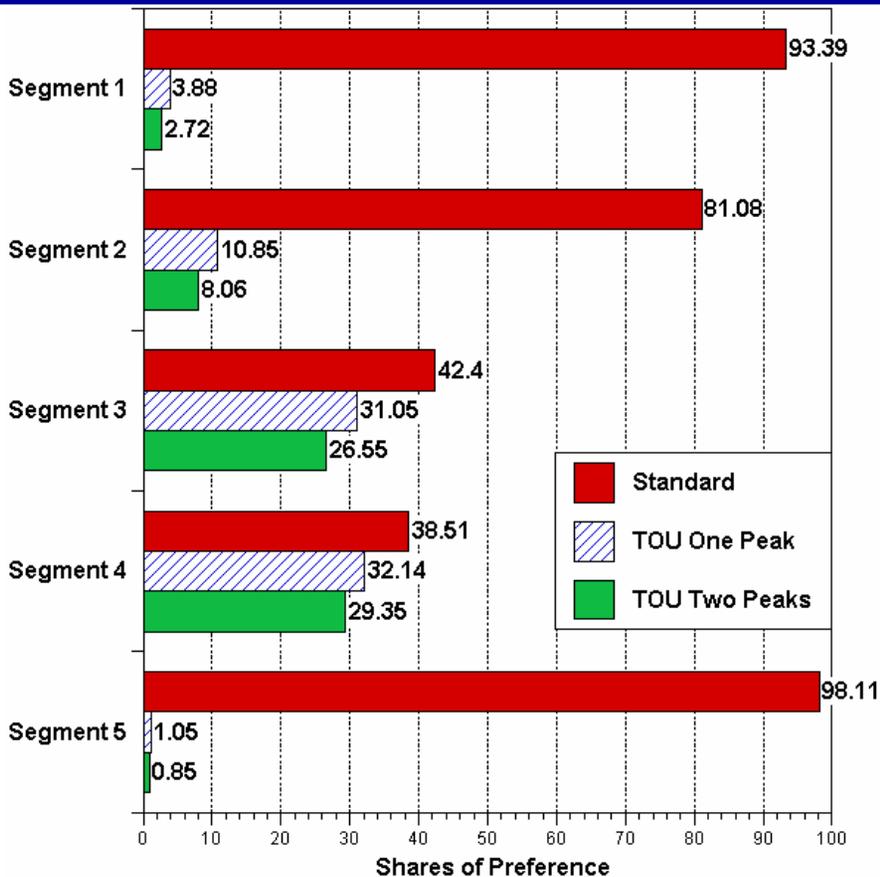
# Impact of Off-peak price and Balancing Bonus on Shares



- The plans below were simulated.
- On the left, the balancing charge was \$0. On the right, the balancing charge was \$20 for both TOUs.

Scenario	Standard Rate		Time-based Rates					Guarantee
	Customer Charge/ 2 months	Base rate/ kWh	On-Peak Period: morning	On-Peak Period: afternoon	On-Peak Price	Off-Peak Price	Balancing Charge Monthly	
Standard Plan	\$7.60	\$0.0633						
TOU One-Peak				4PM - 9PM	\$0.25	\$0.0633	\$0, -\$20	Yes
TOU Two-Peaks			7AM - 11AM	4PM - 9PM	\$0.25	\$0.0633	\$0, -\$20	Yes

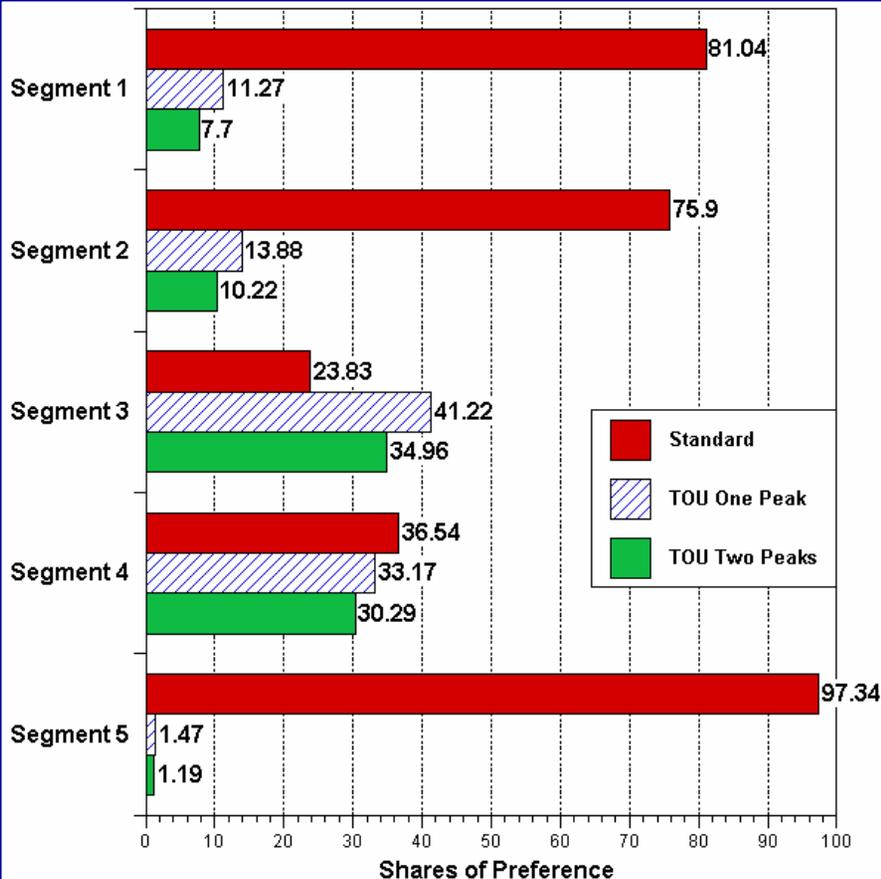
# Base Case by Segments, No Balancing Charge



- The base case has 6.33 cent off-peak rate and 25 cent on-peak rate with \$0 balancing charge.
- Simulated shares varied dramatically by segments
- Almost no take-up of TOU in Segments 5 and 1
- Slight subscriptions in Segment 2
- Substantial subscriptions in Segments 3 & 4.
- Targeting subscription marketing to segments 3 & 4 is likely to be most productive.

Scenario	Standard Rate		Time-based Rates					Guarantee
	Customer Charge/ 2 months	Base rate/ kWh	On-Peak Period: morning	On-Peak Period: afternoon	On-Peak Price	Off-Peak Price	Balancing Charge Monthly	
Standard Plan	\$7.60	\$0.0633						
TOU One-Peak				4PM - 9PM	\$0.25	\$0.0633	\$0	Yes
TOU Two-Peaks			7AM - 11AM	4PM - 9PM	\$0.25	\$0.0633	\$0	Yes

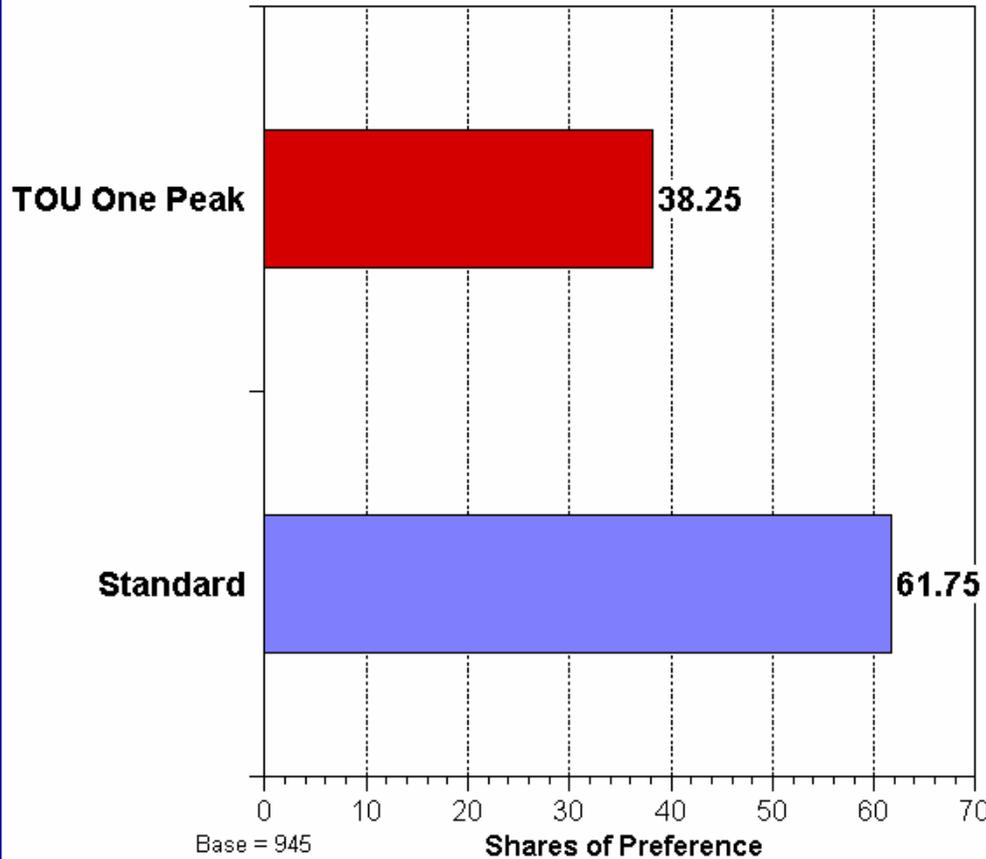
# Base Case by Segments, \$20 Balancing Charge Payment to the Customer



- The base case has 6.33 cent off-peak rate and 25 cent on-peak rate with \$-20 balancing charge.
- Simulations varied dramatically by segments
- The balancing charge resulted in increased shares for the TOUs, especially in the TOU-prone segments 3 & 4
- Almost no take-up in Segment 5
- Modest subscription levels in Segments 1 & 2
- TOU subscriptions are higher than the Standard Plan in Segment 3 and Segment 4

Scenario	Standard Rate		Time-based Rates					
	Customer Charge/ 2 months	Base rate/ kWh	On-Peak Period: morning	On-Peak Period: afternoon	On-Peak Price	Off-Peak Price	Balancing Charge Monthly	Guarantee
Standard Plan	\$7.60	\$0.0633						
TOU One-Peak				4PM - 9PM	\$0.25	\$0.0633	-\$20	Yes
TOU Two-Peaks			7AM - 11AM	4PM - 9PM	\$0.25	\$0.0633	-\$20	Yes

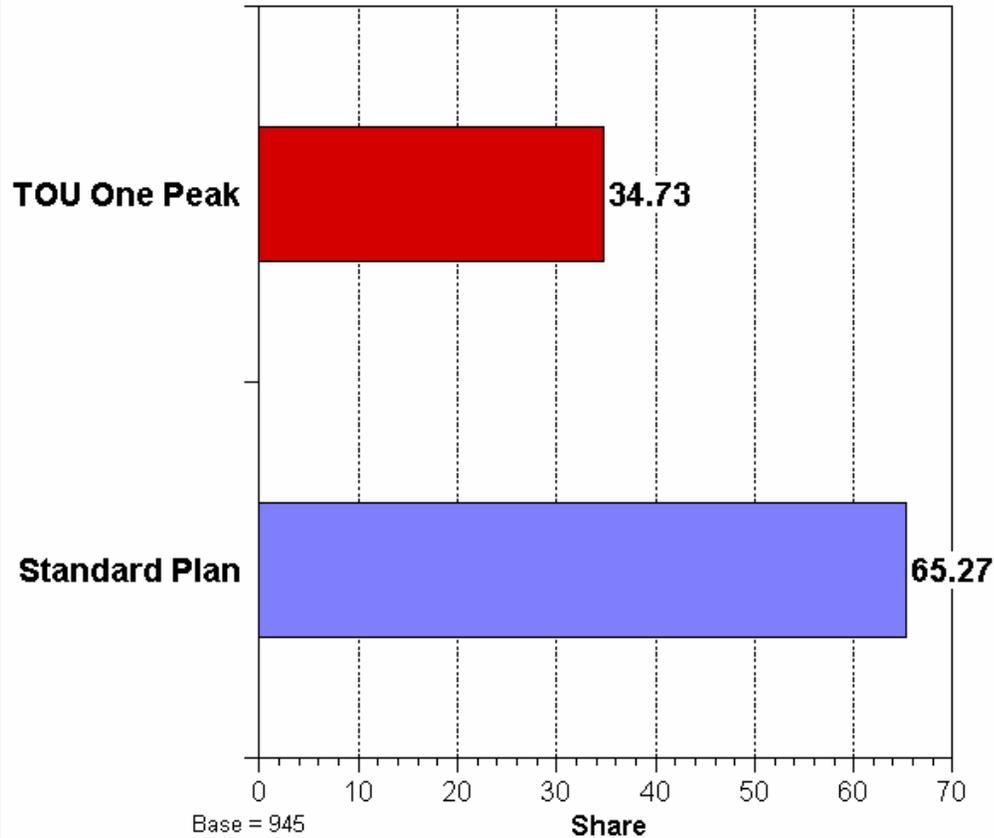
# Simulation of Preferences: Pro-Type Scenario (Mainland)



- Mainland residents are likely to be more likely to choose the Standard Plan and the One-peak TOU described below.
- However, 38% are likely to choose a One-Peak TOU.

	Standard Rate		Time-based Rates					
Pro-Type Scenario	Customer Charge/ 2 months	Base rate/ kWh	On-Peak Period: morning	On-Peak Period: afternoon	On-Peak Price	Off-Peak Price	Balancing Charge Monthly	Guarantee
Standard Plan	\$7.60	\$0.0633						
TOU One-Peak				4PM - 8PM	\$0.19	\$0.0633	-\$10.88	Yes

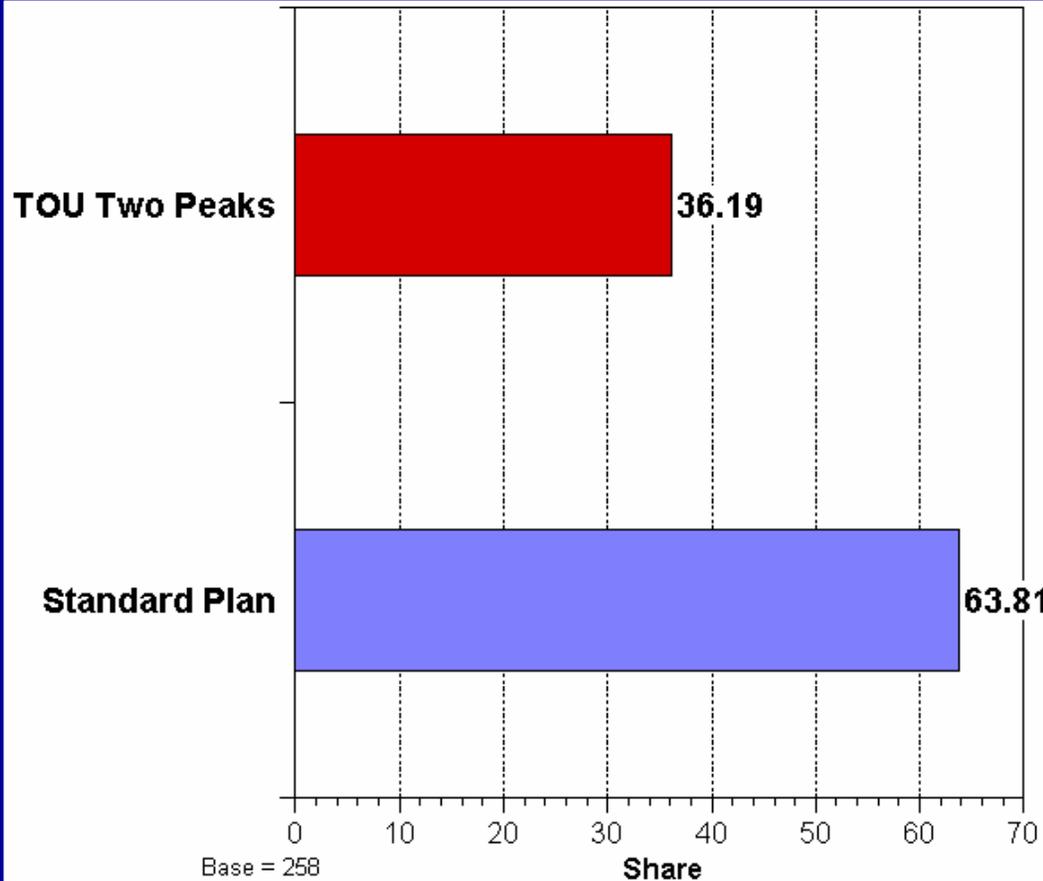
# Simulation of Preferences: Low Off-Peak Price Scenario (Mainland)



- A lower off-peak price was not able to off-set the negative impact of a longer on-peak period, higher on-peak price and lower balancing charge.

	Standard Rate		Time-based Rates					
	Customer Charge/ 2 months	Base rate/ kWh	On-Peak Period: morning	On-Peak Period: afternoon	On-Peak Price	Off-Peak Price	Balancing Charge Monthly	Guarantee
Standard Plan	\$7.60	\$0.0633						
TOU One-Peak				4PM - 9PM	\$0.28	\$0.045	-\$9.27	Yes

# Simulation of Preferences: Low Off-Peak Price (Vancouver Island)

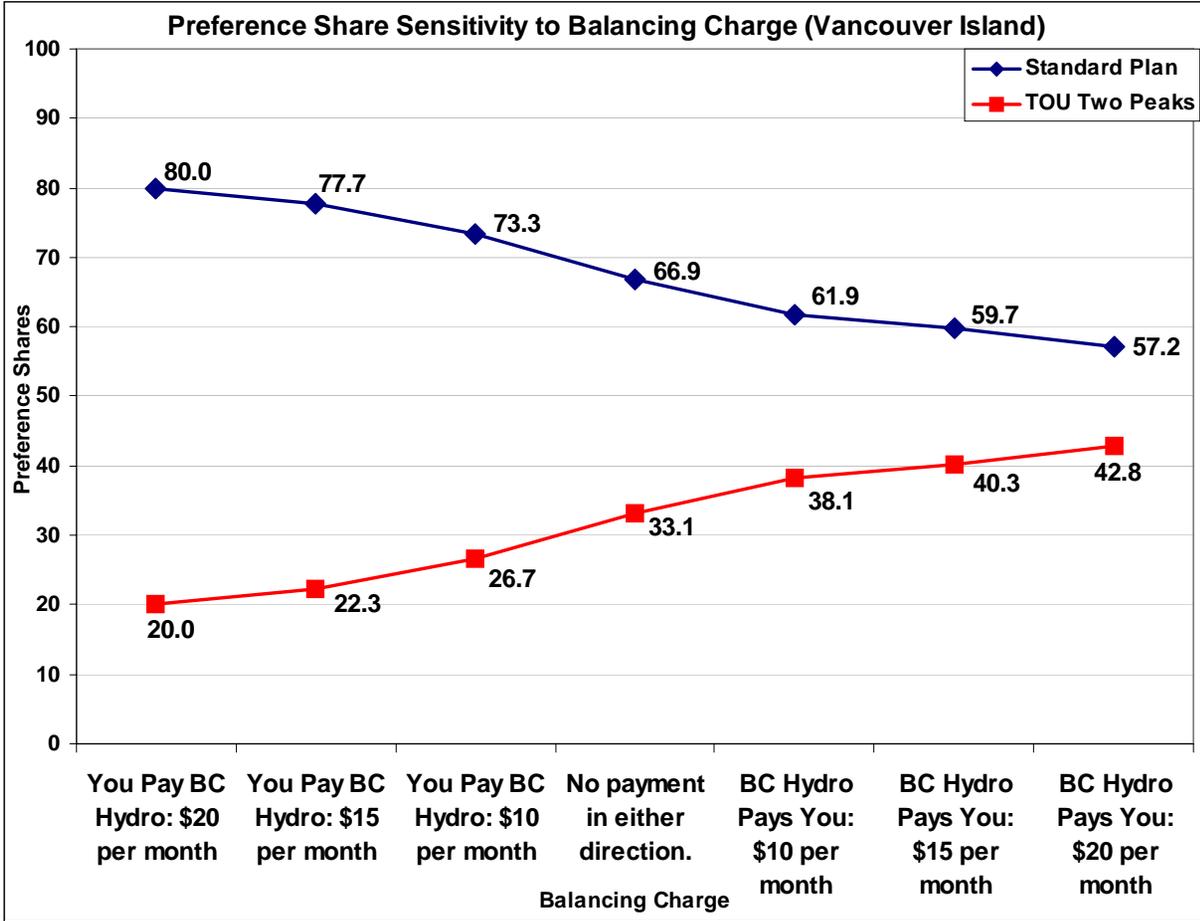


- A morning 4 hour peak period reduces the impact of a lower off-peak price for Vancouver Island residents.

	Standard Rate		Time-based Rates					
	Customer Charge/ 2 months	Base rate/ kWh	On-Peak Period: morning	On-Peak Period: afternoon	On-Peak Price	Off-Peak Price	Balancing Charge Monthly	Guarantee
Low Off-Peak Price Scenario: Vancouver Island								
Standard Plan	\$7.60	\$0.0633						
TOU Two-Peak			7AM - 11AM	4PM - 9PM	\$0.20	\$0.045	-\$8.69	Yes

- **The following slide shows the sensitivity of choice to variations in the balancing charge over the range tested, i.e., -\$20 to +\$20.**
- **Sensitivity analyses can be executed for any of the attributes**

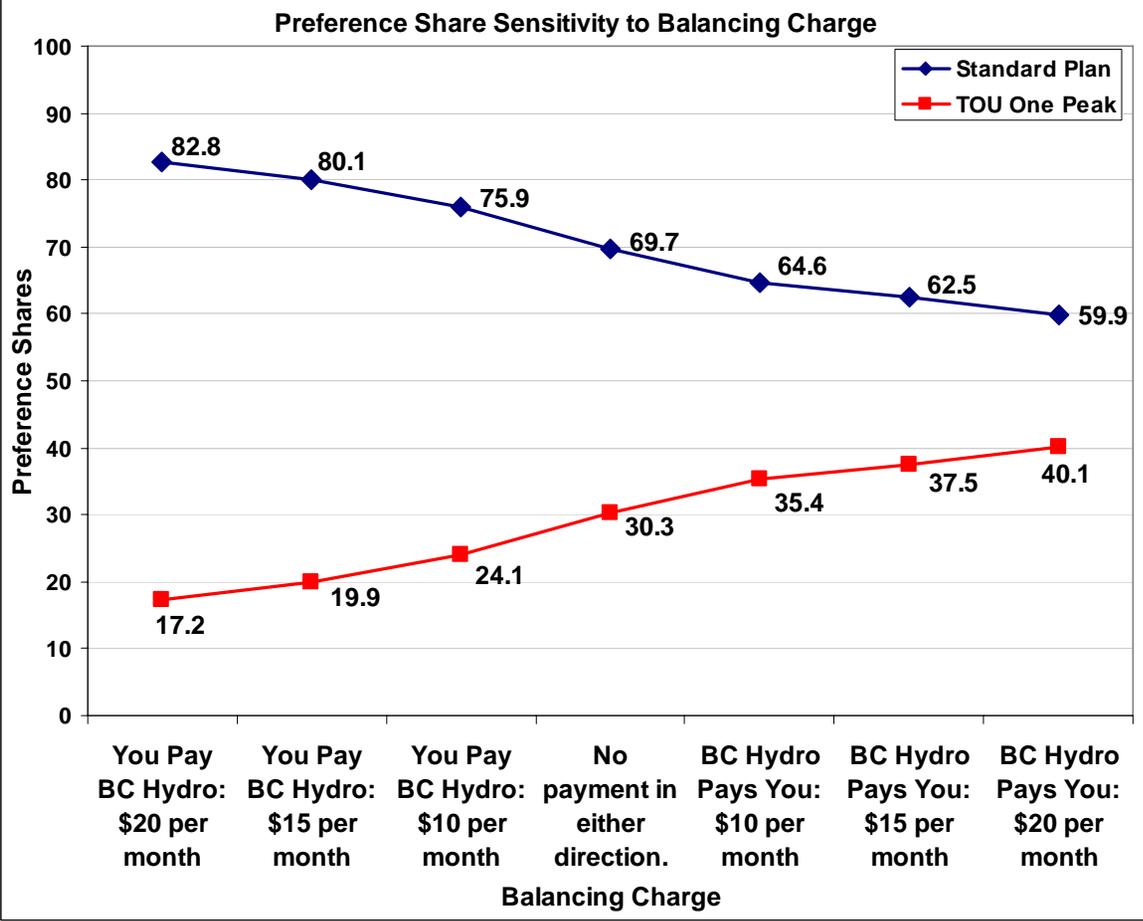
# Simulation of Reaction of Preference Shares to Variation in the Balancing Charge (Vancouver Island)



- Standard Plan was held constant
- TOU balancing charge varied from \$20 to -\$20
- Other TOU attributes held constant
- The influence of decreasing the payment to BC Hydro has slightly greater influence than increasing the payment to customers

Pro-type scenario	Standard Rate		Time-based Rates					
	Customer Charge/ 2 months	Base rate/ kWh	On-Peak Period: morning	On-Peak Period: afternoon	On-Peak Price	Off-Peak Price	Balancing Charge	Guarantee
Standard Plan	\$7.60	6.33						
TOU Two-Peaks (for Vancouver Island)			7AM - 11AM	4PM - 9PM	13	6.33	+20 to -20'	Yes

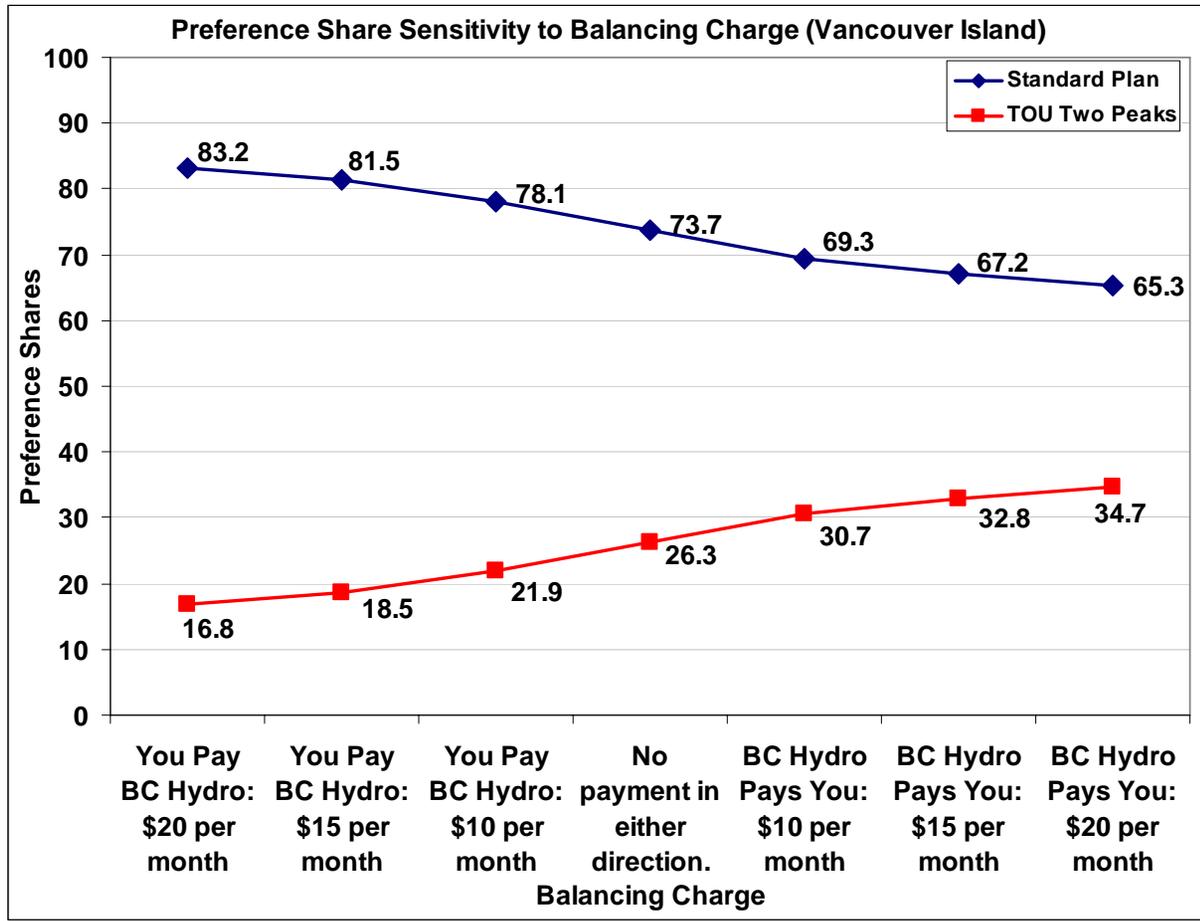
# Simulation of Reaction of Preference Shares to Variation in the Balancing Charge (Total Sample)



- Standard Plan was held constant
- TOU balancing charge varied from \$20 to -\$20
- Other TOU attributes held constant
- The influence of decreasing the payment to BC Hydro has slightly greater influence than increasing the payment to customers

1a	Standard Rate		Time-based Rates					Balancing Charge Monthly	Guarantee
	Customer Charge/ 2 months	Base rate/ kWh	On-Peak Period: morning	On-Peak Period: afternoon	On-Peak Price	Off-Peak Price			
Standard Plan	\$7.60	6.33							
TOU One-Peak				4PM - 9PM	28	4.5	-\$20 to +\$20	Yes	

# Simulation of Reaction of Preference Shares to Variation in the Balancing Charge (Vancouver Island)

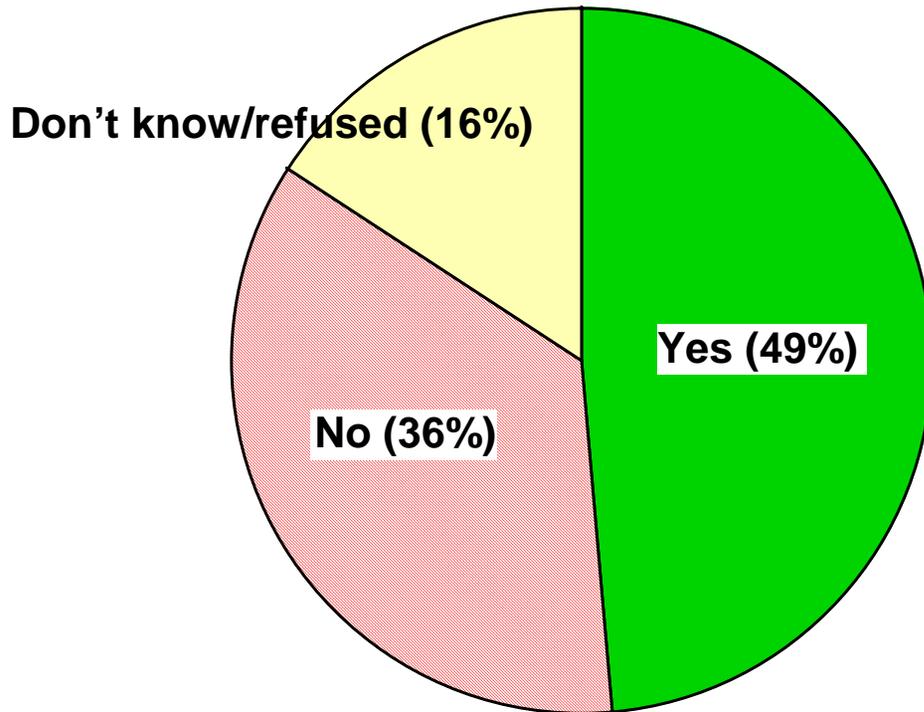


- Standard Plan was held constant
- TOU balancing charge varied from \$20 to -\$20
- Other TOU attributes held constant
- The influence of decreasing the payment to BC Hydro has slightly greater influence than increasing the payment to customers

1a	Standard Rate		Time-based Rates					
	Customer Charge/ 2 months	Base rate/ kWh	On-Peak Period: morning	On-Peak Period: afternoon	On-Peak Price	Off-Peak Price	Balancing Charge Monthly	Guarantee
Standard Plan	\$7.60	6.33						
TOU Two-Peaks			7AM - 11AM	4PM - 9PM	20	6.33	-\$20 to +\$20	Yes

# Interest in Exploring New Ways to Buy Electricity

**“This concludes the survey. If any of these electricity price options become available, would you want a BC Hydro representative to contact you?”**



Base = 1203

- Almost half of respondents wanted a BC Hydro contact if time-based rates were available.
- This invitation into their lives represents a strong interest in exploring new ways to buy electricity.
- Furthermore, it is likely that some of the “don't know/refused to answer” respondents will accept calls from BC Hydro and respond positively if approached responsibly.

# Summary

- **Segments of customers have been identified for each of the pricing plans based on expressed preferences for plan attributes.**
- **Five segments were identified and related to preferences, demographics and attitudes**
- **These segments help to explain the differences among customers in their needs for pricing plans, pricing plan attributes and motivators of energy conservation.**
- **Targeting the marketing of the subscriptions for the pilot can have quite different responses by segment.**

# Recommendations

- **Subscription marketing should be targeted most strongly to segments 3 and 4**
- **Segment 3 is expected to react quite strongly to increasing balancing charge payments**
- **Segment 4 is quite influenced by the guarantee**

# Recommendations

- **New ways to buy electricity, DSM programs and demand response programs (DRP) will become increasingly important as BC Hydro attempts to more consistently supply customers' needs for energy while energy resources become increasingly scarce, more expensive and pollution controls become more stringent.**
- **Future studies need to begin with the type of research that was used in this study; in particular, designing more highly effective programs based on customers' stated choices in discrete choice conjoint experiments. This information provides substantial advantages over other methods for program design.**

# **BC Hydro AMI Time-based Rates Pilot - Focus Group Research of Customer Preferences -**

## **Developing the Best Strategy for Introducing A Residential Time-based Rates Pilot**

**August 4, 2006**

**Dr. Ken Deal**

**President, marketPOWER research inc.**

## Agenda

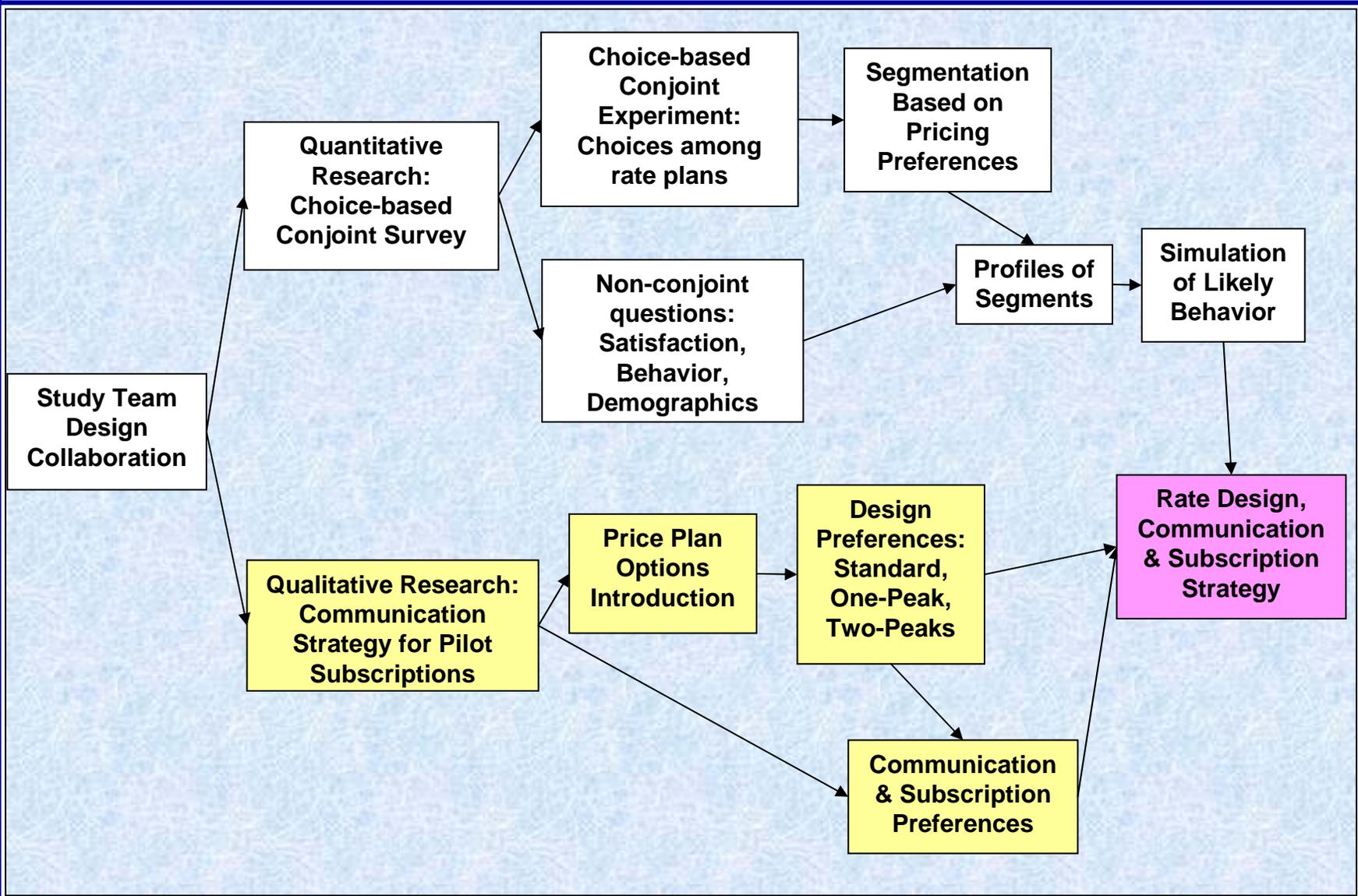
- Objectives
- Execution
- Key Findings
- Summary
- Recommendations

# Objectives of the Study

## Primary objectives related to the rate-design and customer acceptance aspects:

- Provide a baseline measure of customer attitudes and behaviours regarding energy efficiency and new time based pricing offers;
- Identify potential motivators and barriers to pilot participation (e.g. expected threshold incentive or bill savings in % as well as in \$, existence of a bill guarantee, subscription incentive, etc.);
- Determine the types of information/education and communication channels required to maximize customer acceptance and response to time-base pricing pilot and future time-based offers;
- Identify market potential for time-based pricing and whether this would change depending on the different design characteristics.
- Measure effectiveness of the energy usage information, educational information and/or other DSM related tools that may be made available to help customers take advantage of the rate;
- Provide recommendations for potential improvements to the time-based pricing pilot before further roll out or for future rate strategy consideration.

# Understanding Likely Subscription to Time-based Pilot



# Sample and Fieldwork

# Screeners

## marketPOWER Screener (Vancouver & Nanaimo)

**DO NOT MENTION BC HYDRO AS SPONSOR OF THE STUDY.  
RECRUIT 12 FOR 10 TO SHOW. \$65 INCENTIVE FOR 2 HOURS.**

**Good afternoon, evening. My name is \_\_\_\_\_ and I'm from Synovate, a professional marketing research company located here in BC. We're holding a paid focus group in (Vancouver / Nanaimo) for adults 18 years or older about household issues. May I ask you a few questions to see if you qualify?**

- A. Great, my first question is... could you tell me whether anyone in your household works for any of the following:**
- **marketing, market research, advertising, communications, media**
  - **fast food restaurant**
  - **the provincial, municipal or federal government**
  - **transportation company**
  - **organization related to energy services**

**IF YES TO A OR E, THANK AND TERMINATE**

# Screenener

**Do you own or rent your residence?**

**[ ] OWN → ABOUT 75% OF PARTICIPANTS → GO TO Q3**

**[ ] RENT → ABOUT 25% OF PARTICIPANTS**

**For the following services, are they included in your rent payment or do you pay for them separately yourself?**

**2a. Is the cable bill included in your rent or do pay that separately?**

**[ ] INCLUDED IN RENT**

**[ ] PAY SEPARATELY**

**2b. Is the electricity bill included in your rent or do pay that separately?**

**[ ] INCLUDED IN RENT → THANK AND TERMINATE**

**[ ] PAY SEPARATELY**

**2c. Is the natural gas bill, if any, included in your rent or do pay that separately?**

**[ ] INCLUDED IN RENT**

**[ ] PAY SEPARATELY**

# Screenener

3. In what type of dwelling do you live, would that be a single detached house, a townhouse, a condominium, an apartment or some other type of dwelling? PLEASE GET A RANGE OF DWELLING TYPES

SINGLE DETACHED HOUSE

TOWNHOUSE

CONDOMINIUM

APARTMENT

OTHER – SPECIFY: \_\_\_\_\_

4. Are you the person in your household who makes the decisions regarding paying bills, such as the cable or satellite bill, the electricity bill, the gas bill, etc?

NO, I DON'T PAY THE BILLS → TERMINATE

YES, I PAY THE BILLS, INVOLVED IN HH DECISIONS

5. Which of the following categories best describes your age?

Under 18 → THANK AND TERMINATE

18 – 34

35 – 49

49 – 64

65 or older

AIM FOR MIX

6. Which of the following best describes your highest level of education?

- HIGH SCHOOL OR LESS
  - SOME COLLEGE/UNIVERSITY
  - COMPLETED COLLEGE/UNIVERSITY
  - POST GRADUATE
- AIM FOR MIX

7. Which of the following categories best describes your household's annual total income for 2005?

- LESS THAN \$25,000
- \$25,000 - \$44,000
- \$45,000 – 64,000
- \$65,000 – 84,000
- \$85,000 OR OVER

AIM FOR MIX

8. What is your current occupation? \_\_\_\_\_

AIM FOR MIX, CHECK AGAINST QA SCREENER QUESTION

# Screeners

9. How long have you lived in BC? \_\_\_\_\_

**MUST BE TWO YEARS, OTHERWISE TERMINATE  
VANCOUVER RECRUITS – GO TO Q12  
NANAIMO RECRUITS – CONTINUE TO Q10**

10. How long have you lived in on the Island, outside of Victoria? \_\_\_\_\_

**MUST BE TWO YEARS, OTHERWISE TERMINATE**

11. Do you commute to Vancouver for work?

YES → TERMINATE

NO

12. For this last question, I'd like you to answer quickly and without considering your answer too much. If you could transform into a superhero, which super power would you like to have and what would you do with that super power?

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**EVALUATE THE RESPONSE, LOOK FOR AN IMAGINATIVE RESPONSE AND TERMINATE ANYONE WHO DOES NOT HAVE A READY ANSWER TO THIS QUESTION.**

# Screenener

The focus group is being held at (see below). Are you able to attend?

Vancouver – Tuesday, July 25th: 6pm & 8:15pm  
Sixth Line Solutions  
1156 Hornby Street  
Vancouver, BC V6Z 1V8

Nanaimo – Wednesday, July 26th: 6pm & 8:15pm  
Coast Bastion Inn  
11 Bastion Street  
Nanaimo, BC V9R 6E4

The discussion lasts about two hours. Please arrive 15 minutes prior to the start of your group and bring a photo ID, because you won't be accepted without it. More importantly, if you arrive after the group has started, you should expect to be turned away without being paid. If for any reasons, you should be unable to attend, please call us as soon as possible so that we can replace you. You can call us at \_\_\_\_\_. Please remember to bring your glasses if you use them.

Name: \_\_\_\_\_

May I please have a telephone number where I can reach you the day before the discussion to confirm your presence?

House: \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_

Work: \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_

**THANK YOU! Your co-operation is greatly appreciated!**

## **July 25, 2006 (Tuesday)**

- **Vancouver 6:00PM: 10**
- **Vancouver 8:15PM: 10**

## **July 26, 2006 (Wednesday)**

- **Nanaimo 6:00PM: 7**
- **Nanaimo 8:15PM: 4**

- 1. Introduction**
- 2. Risk Taking**
- 3. Your regular bills**
- 4. General opinions about electricity**
- 5. Introduction to the current and likely future states of electricity in BC**
- 6. Load profiles – draw & discuss**
  - Show & tell, comparison
  - Stack graphs – peak periods
  - What happens across BC at the same time of day?
  - What are the implications of evening & morning peaks?
- 7. Regulation & “Electricity 101”**

- 8. The Standard Plan: show & discuss**
- 9. A One-peak TOU Plan: show & discuss**
  - Parity between Standard & One-peak
  - Which encourages conservation?
  - On which might you save money?
- 10. A Two-peak TOU Plan: show & discuss**
  - Parity among the 3 plans
- 11. Balancing Charge**
- 12. Communication of time-based plans**
- 13. Other topics: bills, parting comments for BC Hydro**
- 14. Thanks**

# Wall Charts Used in Vancouver Groups

# Electricity 101

- A kilowatt-hour is a measure of electrical energy
- A typical home uses 1,700 kWh per month.
- Your bill is = # kWh x price per kWh, plus

# The Standard Plan

**6.33¢/kWh** the base rate for the energy used

**Plus**

**\$7.60** Two month customer charge

midnight

noon

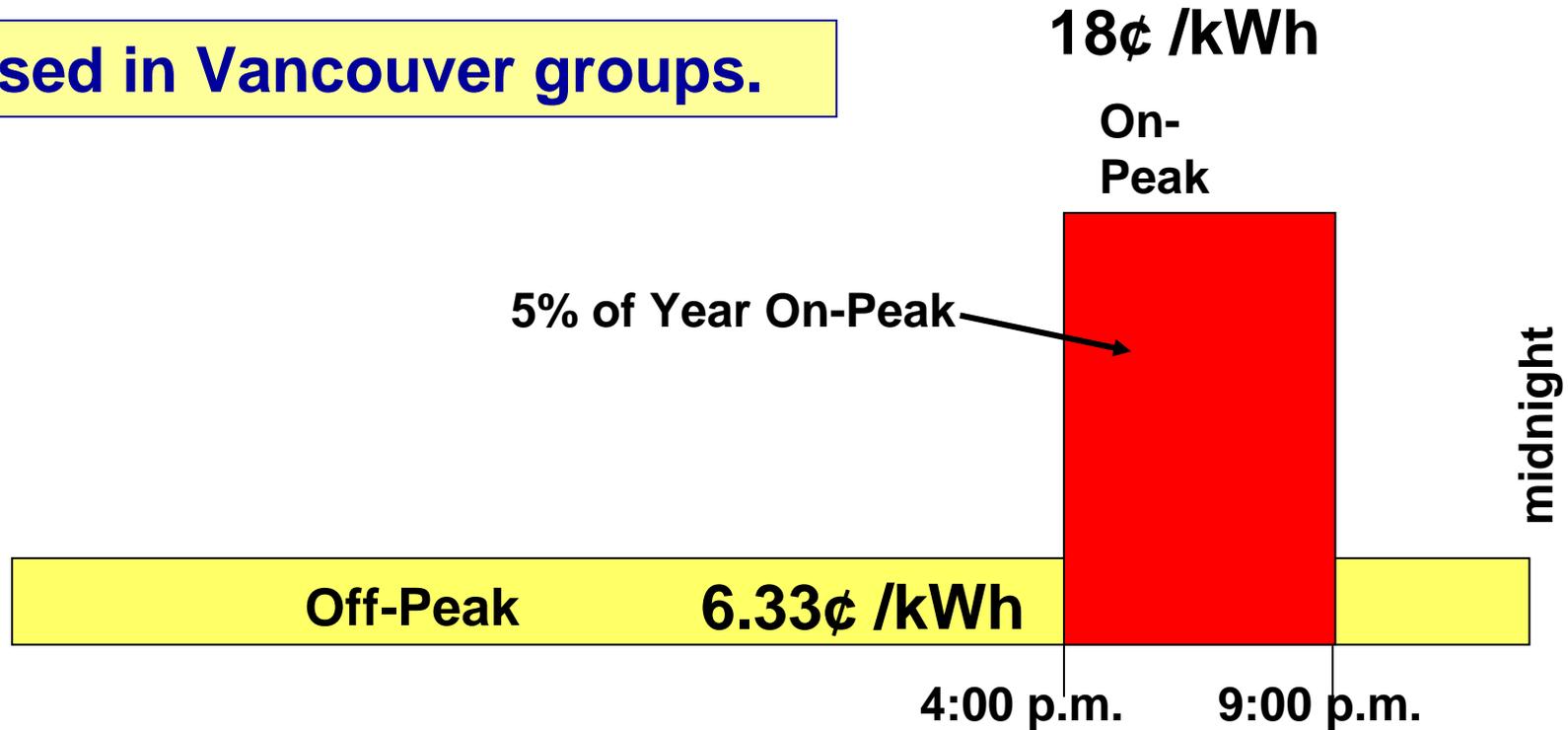
midnight

**6.33¢ /kWh**

**24 hours / day, every day, all year round**

# Time-based Pricing with One Peak Period per Day

Used in Vancouver groups.

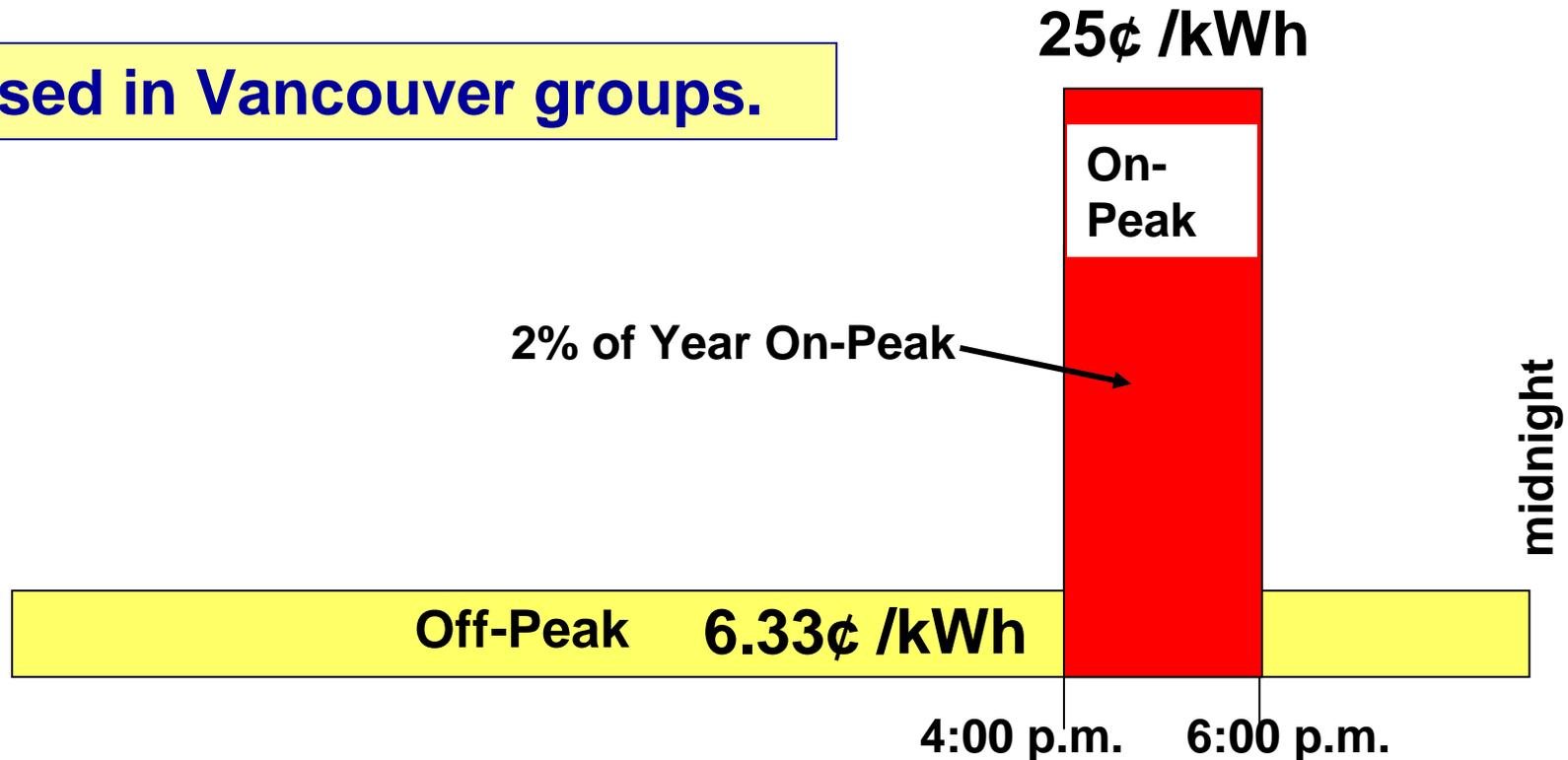


Weekdays only, excluding statutory holidays, November through February

All other months and statutory holidays are at off-peak price

# Time-based Pricing with One Peak Period per Day

Used in Vancouver groups.

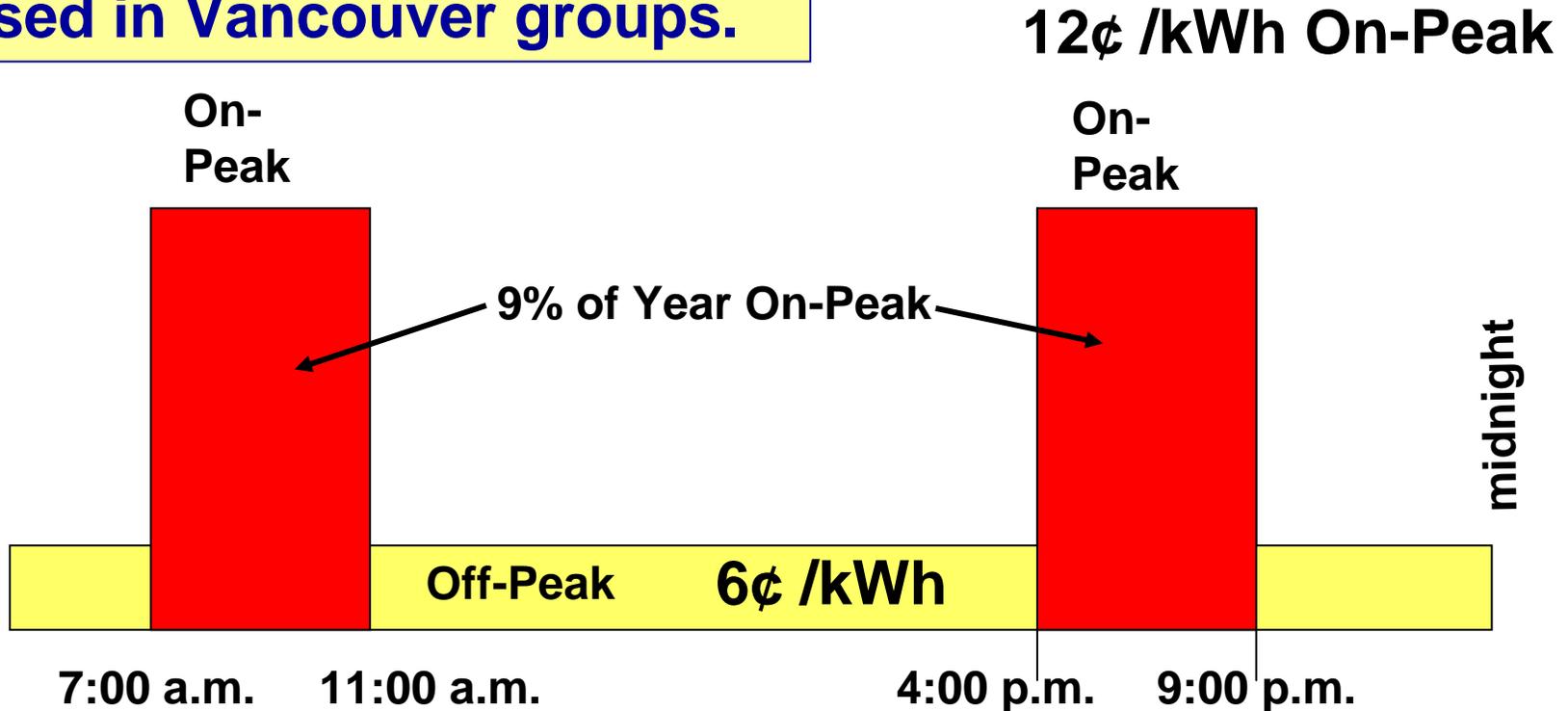


Weekdays only, excluding statutory holidays, November through February

All other months and statutory holidays are at off-peak price

# Time-based Pricing with Two Peak Periods per Day

Used in Vancouver groups.



Weekdays only, excluding statutory holidays, November through February

All other months and statutory holidays are at off-peak price

# The Discussion Guide: Nanaimo

1. Introduction
2. Risk Taking
3. Your regular bills
4. General opinions about electricity
5. Introduction to the current and likely future states of electricity in BC
6. Load profiles – draw & discuss
  - Show & tell, comparison
  - Stack graphs – peak periods
  - What happens across BC at the same time of day?
  - What are the implications of evening & morning peaks?
7. Regulation & “Electricity 101”

# The Discussion Guide: Nanaimo

- 8. The Standard Plan: show & discuss**
- 9. A One-peak TOU Plan: show & discuss**
  - Parity between Standard & One-peak TOU
  - Balancing Charge – what influence on your parity prices?
  - Guarantee – what influence on your parity prices?
  - Which encourages conservation?
  - On which might you save money?
- 10. Balancing Charge – alternative names**
- 11. Balancing Charge -- disbursement**

- 12. A Two-peak TOU Plan: show & discuss**
  - Parity among the 3 plans
- 13. Balancing Charge**
- 14. Communication of time-based plans**
- 15. Other topics: bills, parting comments for BC Hydro**
- 16. Thanks**

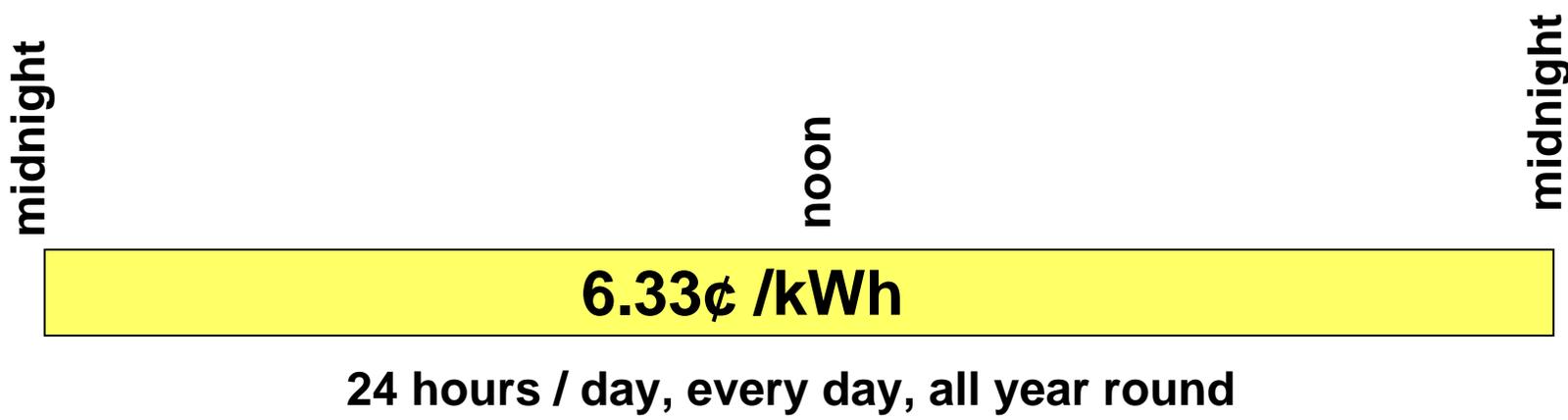
# Wall Charts Used in Nanaimo Groups

# Electricity 101

- **A kiloWatt-hour is a measure of electrical energy**
- **A typical home uses 1,700 kWh per month.**
- **Your bill is = # kWh x price per kWh, plus**

# The Standard Plan

**6.33¢/kWh** the base rate for the energy used  
**Plus**  
**\$7.60** Two month customer charge



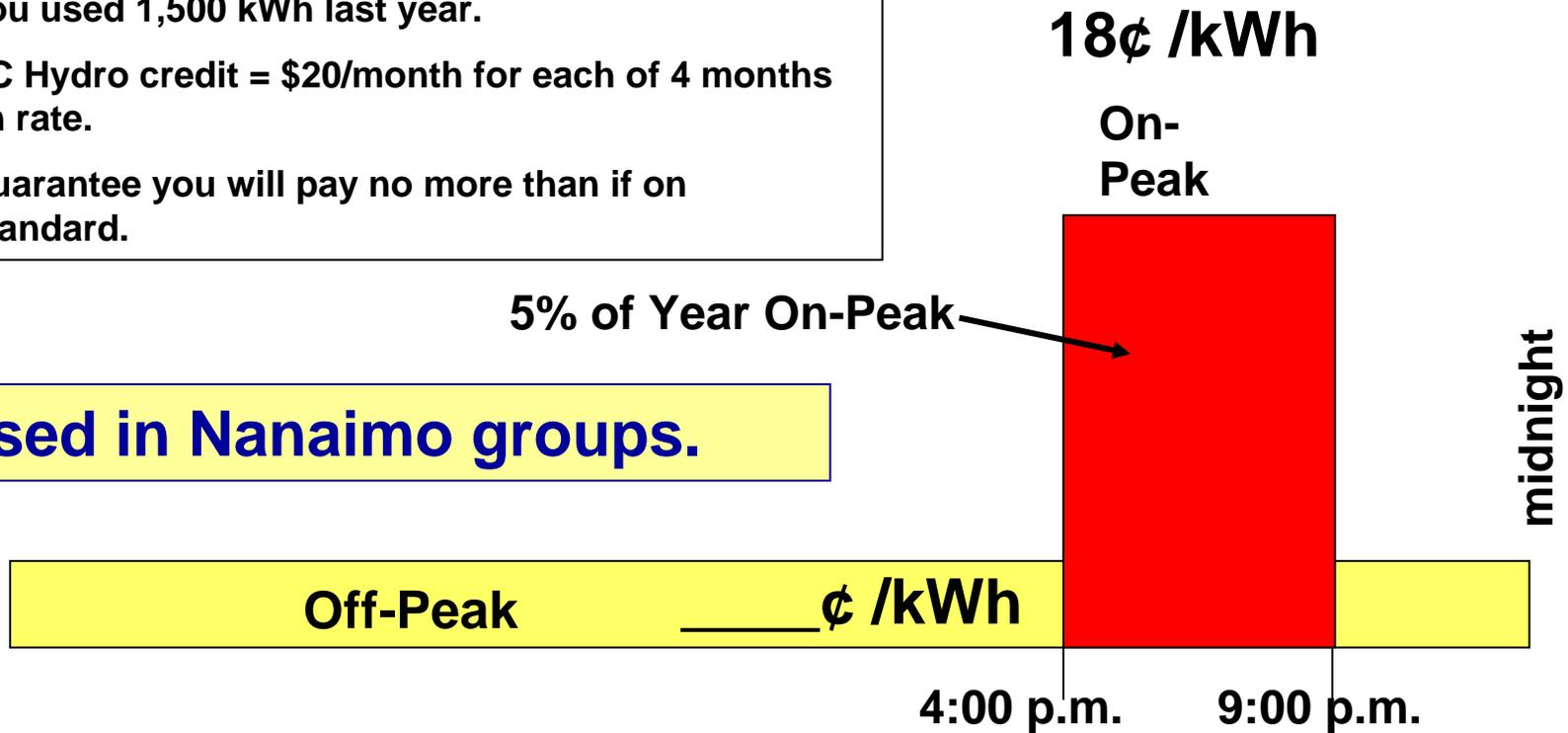
# Time-based Pricing with One Peak Period per Day

You used 1,500 kWh last year.

BC Hydro credit = \$20/month for each of 4 months on rate.

Guarantee you will pay no more than if on Standard.

Used in Nanaimo groups.



Weekdays only, excluding statutory holidays, November through February

All other months and statutory holidays are at off-peak price

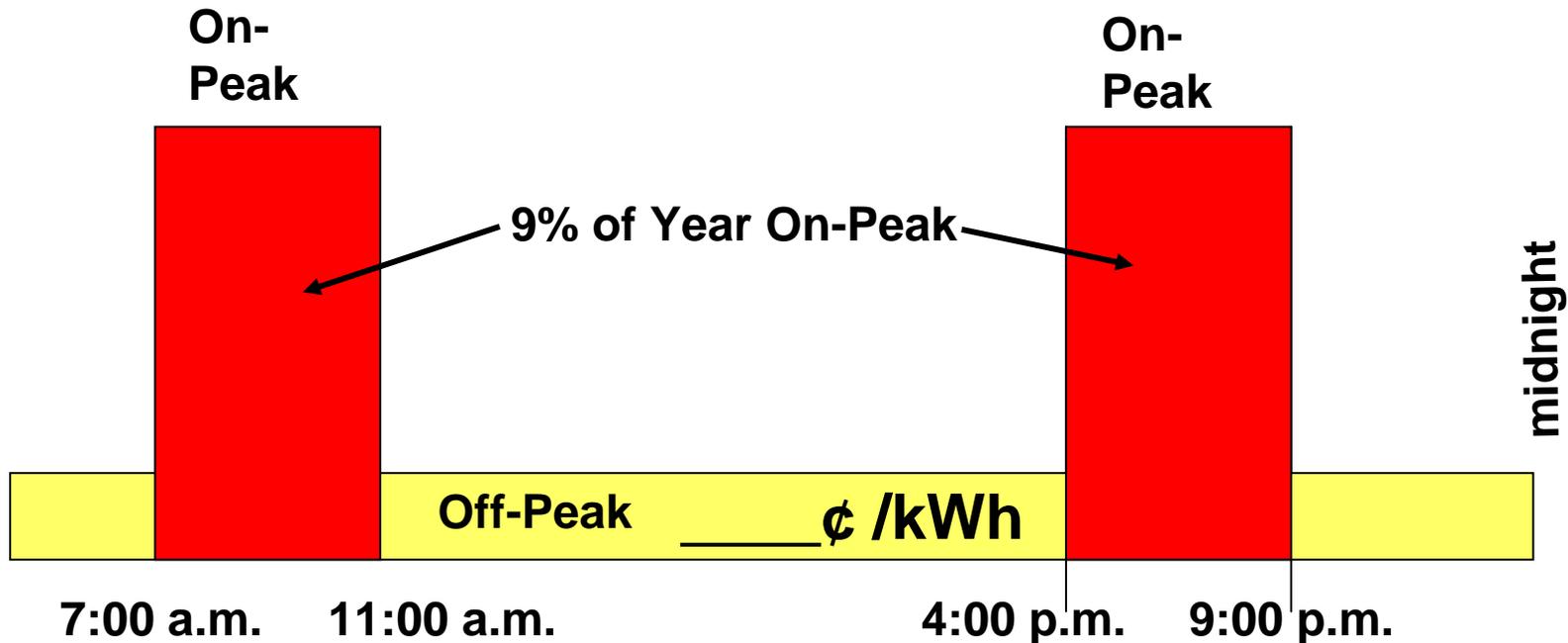
You used 1,500 kWh last year.

BC Hydro credit = \$10/month for each of 4 months on rate.

Guarantee you will pay no more than if on Standard.

## Two Peak Periods per Day

12¢ /kWh On-Peak



**Used in Nanaimo groups.**

Weekdays only, excluding statutory holidays, November through February

All other months and statutory holidays are at off-peak price

# Key Focus Group Findings

**Summarized from the  
Vancouver Groups (2) & the  
Nanaimo Groups (2)**

# Key Findings: Vancouver Groups

- **Many participants actively participated in conservation activities and understood the importance of conservation.**
  - Some conserved to help the environment and preserve resources.
  - Others conserved in order to reduce their household costs.
- **An off-peak price equal to the base rate on the Standard Plan was initially and persistently viewed by most as BC Hydro imposing a penalty on customers and could defeat the acceptance of time-based rates.**
  - A balancing charge and a guarantee were seen positively and may convince some to subscribe to time-based rates.
  - All agreed that they should be rewarded for conserving electricity during high on-peak periods.
- **Participants wanted simple, straight-forward and informative communication about any new pricing options.**
  - Public relations was seen as very convincing.
  - Bill inserts, ads on television, radio, the internet were seen as good secondary sources but should be handled carefully.

# Key Findings: Nanaimo Groups

- Only a few participants were involved in conservation activities and understood the importance of conservation.
  - Most of those conserved to reduce their household costs.
- When the On-peak rate was \$0.18 with a 5 hour peak period; participants wanted a \$0.03 to \$0.035 off-peak rate.
  - A balancing charge and a guarantee were seen positively and may convince many to subscribe to time-based rates.
  - All agreed that they should be rewarded for conserving electricity during high on-peak periods.
- Balancing charge disbursement: all of group 3 and half of group 4 wanted  $\frac{1}{4}$  of the credit in each of the 4 peak months.
- Participants wanted simple, straight-forward and informative communication about any new pricing options.
  - Public relations was seen as very convincing.
  - Bill inserts, ads on television, radio, the internet were seen as good secondary sources but should be handled carefully.

# Summary

- **The TOU off-peak rate of \$0.0633 was interpreted as a punishment by almost all respondents. Many mentioned that the off-peak rate needed to be between \$0.03 and \$0.04**
  
- **Customers want to see a simple, clear, measurable and meaningful reward for subscribing to time-based rates.**
  - **Those who are willing to conserve for the public benefit do not want to be “punished” for doing the right thing.**
  - **Those who might subscribe to save money often were not able to see past their perception that almost everything about the TOU was worse than the Standard Plan.**
  - **The balancing charge and guarantee helped to ease anxieties, but only after lengthy explanation.**

# Summary: Balancing Charge

- **The Balancing Charge wording had a negative connotation for most customers.**
  - Balancing Refund, Balancing Rebate, Balancing Reward were some recommendations
  - Even Balancing Credit was seen as negative
- **Lengthy and careful explanation necessary.**
- **The concept was viewed positively by many. Others felt there would be a “catch”.**
- **Balancing Charge disbursement**
  - Provide 25% in each of the 4 months during the on-peak period.

# Summary: Communication

- **Provide 3 messages of increasing complexity**
  - **Message 1: build awareness of the need for conservation, especially during evening and morning peak periods.**
    - Blend public relations with media advertising
    - PR, new articles and documentaries have substantial credibility
    - Provide reference to BC Hydro web site for more information
  - **Message 2: Provide somewhat more information pertaining to the need to move electricity usage out of peak periods.**
    - Begin to mention new ways to buy electricity
    - Providing choices is seen as very positive
    - Support understanding that time-based rates are provided as options – Standard Plan will still be available
    - Media advertising can be used more
  - **Message 3: Explain the basics of the time-based rate**
    - Very simple explanations
    - Provide basic examples to show savings and conservation

# Recommendations

- **Introduce time-based rates only if the off-peak price is lower than the base rate for the Standard Plan.**
  - 6.33 cents is immediately translated as a punishment and is likely to stifle any movement towards TOU rates
  - 3 cents to 4 cents seemed to be an acceptable range
- **Rename the Balancing Charge and find ways to very simply communicate its benefits**
- **Develop a 3 wave communication campaign with simple and effective messages that emphasize the need to shift load, that viable choices will be provided to do so and that shifting and shedding load will be rewarded.**

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**Conservation Research Initiative  
Residential Time of Use Rate Application**

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**APPENDIX C**

**Draft Evaluation Plan**

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## **DRAFT Evaluation Plan**

### **Residential Time of Use (TOU) Rate Program**

#### **Introduction and Background**

A CRI TOU rate program involving approximately 2,000 residential customers is being developed for the winter of 2006/07 (November 1, 2006 – February 28, 2007). Customers participating in the program will have an advanced meter installed at their house which will report interval data on their demand and consumption on an hourly basis. Participants will be divided into ten groups (3 control groups and 7 treatment groups).

The goal of the CRI TOU program is to determine whether customers respond to pricing signals and the magnitude of the responses.

#### **Evaluation Plan**

An impact evaluation of the demand and energy savings associated with the CRI TOU rate program will be completed following program launch.

##### *Evaluation Objectives –*

- A. To estimate the average impact of time-varying rates on energy use by rate period.
- B. To assess customer preferences on TOU rates and seek feedback/response on aspects of rate design.
- C. To evaluate the effectiveness of various pilot design features (for example customer information, billing information).
- D. To estimate the impact of rebound or the increase in off-peak consumption as a result of a lower rate.

##### *Method –*

The recommended approach requires random assignment of participants to treatment and control groups and ongoing monitoring to ensure the integrity of the control groups is maintained throughout the pilot. This approach simplifies the data analysis and will therefore minimize the time required to analyze and report the energy impacts of the pilot.

The basic method will be a post only comparison with a control group and three treatment groups. Participants will be randomly assigned to one of the groups. This means that there will be no significant market effects such as free riders or self selection. There will be three basic designs, a one peak period design for the Mainland, a one peak period design for the North and a two peak

period design for Vancouver Island. By using regions that are reasonably homogenous with respect to heating requirements, as measured by, say, heating degree days, there will be no need to weather normalize the data.

Metered data will be used to calculate: (a) average hourly consumption and its standard deviation during the peak period; (b) average hourly consumption and its standard deviation during the off peak period; and (c) average hourly consumption and its standard deviation for all hours in the day. These statistics will be calculated separately for the control group and for each of the treatment groups in each of the three regions. They will also be calculated separately for the winter period (Nov 2006 to Feb 2007) and the extended summer period (Mar 2007 to Oct 2007).

The impact for each treatment is then defined as the average hourly consumption for the control group minus average hourly consumption for the treatment group. The relevant standard deviation here is based on the assumption of (possibly) unequal variances for the relevant control and treatment groups. The standard deviation of the difference is used to test for the statistical significance of the difference.

A similar procedure will be used to test for the statistical significance of differences between alternative treatments.

The relevant analysis for each region will take the form of the following table. A minimum of 50 observations in each cell will be needed.

Analysis Framework for Each Region

	Peak (kWh per hour)	Off Peak (kWh per hour)	All hours (kWh per hour)
Basic statistics			
Control	Mean (st. dev.)	Mean (st. dev.)	Mean (st. dev.)
Treatment 1	Mean (st. dev.)	Mean (st. dev.)	Mean (st. dev.)
Treatment 2	Mean (st. dev.)	Mean (st. dev.)	Mean (st. dev.)
Treatment 3	Mean (st. dev.)	Mean (st. dev.)	Mean (st. dev.)
Analysis			
Control minus Treatment 1	Mean of difference (st. dev. of difference)	Mean of difference (st. dev. of difference)	Mean of difference (st. dev. of difference)
Control minus Treatment 2	Mean of difference (st. dev. of difference)	Mean of difference (st. dev. of difference)	Mean of difference (st. dev. of difference)
Control minus Treatment 3	Mean of difference (st. dev. of difference)	Mean of difference (st. dev. of difference)	Mean of difference (st. dev. of difference)
Treatment 1 minus Treatment 2	Mean of difference (st. dev. of difference)	Mean of difference (st. dev. of difference)	Mean of difference (st. dev. of difference)
Treatment 1 minus Treatment 3	Mean of difference (st. dev. of difference)	Mean of difference (st. dev. of difference)	Mean of difference (st. dev. of difference)
Treatment 2 minus Treatment 3	Mean of difference (st. dev. of difference)	Mean of difference (st. dev. of difference)	Mean of difference (st. dev. of difference)

The following simple regression model will also be estimated using the grouped data. Equation (1) will provide an estimate of the elasticity of substitution  $\beta$  between peak and off peak energy use. Equation (2) will provide an estimate of the price elasticity of demand  $\gamma$ .

$$(1) \quad \log(\text{kWh peak/kWh off peak}) = \alpha + \beta \log(\text{peak price/off peak price}) + \text{error}$$

$$(2) \quad \log(\text{kWh all hours}) = \alpha + \beta \log(\text{av price}) + \gamma \text{ heating degree days} + \delta \text{ cooling degree days} + \text{error}$$

*Data requirements –*

<b>Data Required</b>	<b>Source/Details</b>
1. Hourly consumption data for each customer for each period.	Detailed metered information for each participant will be collected.
2. Weather information	Each participant will be assigned to a local weather station to determine appropriate heating degree day information. This is not needed for the basic analysis but may be used in supplementary regression modeling.
3. Customer survey	A household survey of participants will be completed to determine variables such as satisfaction with the program, actions undertaken to change usage, appliance use and holdings, housing characteristics, sociodemographic information, and other information.
4. Pricing Information for each participant	A database of customers including details of pricing levels.

*Timing –*

Preparation and background research for the evaluation will commence in August 2006. A preliminary report will be delivered in February 2007. A second report will be delivered in April 2007 covering the winter period. A third report will be delivered by Feb 2008 covering the extended summer period.

**Evaluation Summary**

<b>Evaluation Activity</b>	<b>Timing</b>
Planning, background research and survey design	Aug 2006 to Sep 2006
Data collection	Nov 2006 to Feb 2007
Survey One (n = 400)	Jan 2007
Preliminary report and presentation	Feb 2007
Analysis	Feb 2007 to Apr 2007
Second report and presentation	Apr 2007
Survey Two (n = 400)	Nov 2007
Analysis	Nov 2007 to Dec 2007
Third report and presentation	Feb 2008

**References:**

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**Conservation Research Initiative  
Residential Time of Use Rate Application**

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**APPENDIX D**

**Sample Bill and Balancing Amount  
Calculations**

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## 1 Sample CRI TOU Bill Calculation

This section provides the CRI TOU bill calculation for an illustrative Lower Mainland customer assuming no change in actual energy consumption during the CRI TOU program period (November 1, 2006 through October 31, 2007) from the historical energy consumption (April 2005 through March 31, 2006).

The following Table D-1 shows the historical revenue under RS1101 based on historical consumption for the customer. The determination of historical consumption is described in section 2 below and the derivation of this data for the illustrative customer is provided in section 3 below.

**Table D-1 BC Hydro Standard RS1101 Residential Revenue**

Values and Standard Rate Revenue					
Month	Monthly kWh	Basic Charge \$	Energy Revenue \$	Total \$	Eff. Rate (¢/kWh)
		\$3.80	\$0.0633		
April 2005	925	\$3.80	\$58.55	\$62.35	6.74
May 2005	857	\$3.80	\$54.25	\$58.05	6.77
June 2005	725	\$3.80	\$45.89	\$49.69	6.85
July 2006	697	\$3.80	\$44.12	\$47.92	6.88
August 2005	660	\$3.80	\$41.78	\$45.58	6.91
September 2005	671	\$3.80	\$42.47	\$46.27	6.90
October 2005	714	\$3.80	\$45.20	\$49.00	6.86
November 2005	820	\$3.80	\$51.91	\$55.71	6.79
December 2005	915	\$3.80	\$57.92	\$61.72	6.75
January 2006	1,117	\$3.80	\$70.71	\$74.51	6.67
February 2006	1,050	\$3.80	\$66.47	\$70.27	6.69
March 2006	897	\$3.80	\$56.78	\$60.58	6.75
<b>Total</b>	<b>10,048</b>	<b>\$45.60</b>	<b>\$636.04</b>	<b>\$681.64</b>	<b>6.78</b>

Based on the consumption and the customer's balancing amount determined in section 3 below, the following Table D-2 shows their CRI TOU bill based on rate 1142 with the balancing amount. The table shows that the rate is customer revenue neutral at the original consumption level and assigned

load profile since the CRI TOU revenue is the same as the standard revenue which is shown above (\$681).

**Table D-2 TOU Bill Including “Balancing Amount” Calculation – Revenue Neutral**

Values				TOU Charges per billing unit				TOU Revenues	
Month	Monthly kWh	Peak	Off-Peak	Basic Charge \$	Balancing Amount	Peak \$	Off-Peak \$	Total \$	Eff. Rate (¢/kWh)
				\$3.80	-\$35.00	\$0.2500	\$0.0633		
November 2006	820	156	664	\$3.80	(\$35.00)	\$39.00	\$42.03	\$49.83	6.08
December 2006	915	192	723	\$3.80	(\$35.00)	\$48.00	\$45.77	\$62.57	6.84
January 2007	1,117	212	905	\$3.80	(\$35.00)	53.00	\$57.29	\$79.09	7.08
February 2007	1,050	189	861	\$3.80	(\$35.00)	\$47.25	\$54.50	\$70.55	6.72
March 2007	897	0	897	\$3.80	\$0.00	\$0.00	\$56.78	\$60.58	6.75
April 2007	925	0	925	\$3.80	\$0.00	\$0.00	\$58.55	\$62.35	6.74
May 2007	857	0	857	\$3.80	\$0.00	\$0.00	\$54.25	\$58.05	6.77
June 2007	725	0	725	\$3.80	\$0.00	\$0.00	\$45.89	\$49.69	6.85
July 2007	697	0	697	\$3.80	\$0.00	\$0.00	\$44.12	\$47.92	6.88
August 2007	660	0	660	\$3.80	\$0.00	\$0.00	\$41.78	\$45.58	6.91
September 2007	671	0	671	\$3.80	\$0.00	\$0.00	\$42.47	\$46.27	6.90
October 2007	<u>714</u>	<u>0</u>	<u>714</u>	<u>\$3.80</u>	<u>\$0.00</u>	<u>\$0.00</u>	<u>\$45.20</u>	<u>\$49.00</u>	6.86
<b>Total</b>	<b>10,048</b>	<b>749</b>	<b>9,299</b>	<b>\$45.60</b>	<b>(\$140.00)</b>	<b>\$187.25</b>	<b>\$588.69</b>	<b>\$681.48</b>	<b>6.78</b>

## 2 Balancing Amount Calculation

This section describes in detail the various inputs and procedures that are used to calculate the balancing amount for each individual customer account. The balancing amount is a component of the total CRI TOU bill.

BC Hydro’s historical extraction data files provide basic residential customer identification, account number, heating fuel code, region, and monthly consumption data by account (this is the calendar month equivalent kWh). The three regions for the CRI TOU are Lower Mainland (LM), Vancouver Island (VI) - Campbell River, and Northern Interior (NI) – Fort St. John.

### 2.1 Step 1 Weather normalization

BC Hydro proposes to account for differences from “normal” weather by adjusting the monthly 2005/06 historical consumption by the monthly regional residential consumption weather normalization adjustment factors, which are defined by electric and non-electric heating.

BC Hydro’s market forecast analysis indicates that the 2005/06 fiscal year was warmer than usual for the winter months based on its definition of “normal” weather (measured over a ten year rolling average). If consumption was lower during the winter months because of the warmer than normal weather, it means that the balancing amount would be smaller on an absolute basis than what would occur under “normal” weather. To account for this, the historical consumption needs to be weather normalized.

The monthly consumption data is weather normalized by applying the weather normalization factors in the following Table D-3. The factors for Vancouver Island (VI Elec for electrically heated and VI Nelec for non-electrically heated) will be applicable to subscribers in Campbell River. Similarly, the factors for Lower Mainland (LM Elec and LM Nelec) will be applicable to subscribers in the Lower Mainland and factors for the North (NI Elec and NI Nelec) will be applicable to subscribers in Fort St. John.<sup>3</sup>

**Table D-3 Weather Normalization Factors**

Month	VI Elec	VI Nelec	LM Elec	LM Nelec	NI Elec	NI Nelec
April 2005	0.053	0.039	0.071	0.039	0.09	0.062
May 2005	0.106	0.065	0.1	0.042	0.101	0.055
June 2005	0.097	0.058	0.065	0.024	0.088	0.05
July 2005	0.022	0.015	0.012	0.003	0.019	0.012
August 2005	-0.001	0.004	0.003	0	-0.032	-0.02
September 2005	0	0	0.003	0.001	-0.042	-0.022
October 2005	-0.013	-0.008	0.014	0.005	-0.013	-0.007
November 2005	-0.038	-0.023	0	0	0.03	0.017
December 2005	-0.039	-0.029	-0.02	-0.012	0.033	0.026
January 2006	0.032	0.027	0.042	0.029	0.087	0.085
February 2006	0.045	0.038	0.051	0.037	0.096	0.092
March 2006	-0.01	-0.008	-0.008	-0.005	0.001	0.001

The factor used to adjust each subscriber’s consumption is chosen according to their area of residence and their heating code (i.e., electrically heated or non-electrically heated) in BC Hydro’s records. The weather normalization adjustment is made by multiplying the monthly consumption data by (1+weather normalization factor). The 12 months of weather normalized data is then used to determine the historical revenue under RS1101, as shown in Table D-1.

<sup>3</sup> Note that the shaded column (LM Elec) in Table D-3 and the following Table D-4, denotes information used in the balancing amount and TOU bill example that is provided in this Appendix.

## 2.2 Step 2 Determine Peak and Off-Peak Consumption

Since individual baseline load profiles are not available for each customer, BC Hydro will assign a load profile to each customer. The load profiles will allow the monthly calculation of the percentage of peak consumption during the winter months used to calculate each subscriber's peak and off-peak consumption for the balancing amount calculation.

The weather normalized monthly kWh is split into peak and off-peak kWh for the peak period of November through February utilizing the peak percentages calculated from average load profiles. These load profiles were collected as part of the load research monitoring project and differ according to region, and heating type. The load monitoring project is a load research initiative by BC Hydro which began in the early 1990's and which collects metered hourly data from customers. Lower Mainland average load profiles are used for Lower Mainland and Fort St. John<sup>4</sup> and Vancouver Island average load profiles are used for Campbell River.

The peak percentage represents the portion of the month's consumption which occurred in the peak period. The percentages are provided by peak period month, heating fuel type, and regions LM and VI. As indicated above, for Fort St. John the LM percentages are applied. The following table shows these percentages:

**Table D-4 Peak Usage (%)**

<b>Single Peak – AM TOU rates 1141, 1142 and 1143</b>		
<b>Months</b>	<b>LM Elec</b>	<b>LM Nelec</b>
<b>January</b>	<b>16%</b>	<b>19%</b>
<b>February</b>	<b>17%</b>	<b>18%</b>
<b>November</b>	<b>16%</b>	<b>19%</b>
<b>December</b>	<b>18%</b>	<b>21%</b>
<b>Dual Peak – AM + PM TOU 1144 and 1145</b>		
<b>January</b>	<b>30%</b>	<b>33%</b>
<b>February</b>	<b>30%</b>	<b>33%</b>
<b>November</b>	<b>29%</b>	<b>32%</b>
<b>December</b>	<b>33%</b>	<b>34%</b>

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<sup>4</sup> There were not enough load profiles for Fort St. John and the Northern region in the monitoring project sample to provide a representative load profile. Therefore the Lower Mainland load profile is used as a proxy for Fort St. John.

The percentages applied to each subscriber's consumption are chosen according to their CRI TOU rate, their area of residence and their heating code (i.e., electrically heated or non-electrically heated) in BC Hydro's records.

### **2.3 Step 3 Calculate Balancing Amount**

The annual balancing amount is defined to be the annual revenue difference between billing the historical consumption under RS1101 and the proposed CRI TOU rate.

The historical consumption used to determine the revenue under the applicable CRI TOU rates is the peak and off-peak consumption for the four winter months (November-February). For the remaining months, all consumption is treated as off-peak consumption, which will be billed at the applicable CRI TOU off-peak rates.

The historical revenue under RS1101 is determined by applying RS1101 to the 12 months of weather normalized data to determine the twelve monthly bills, which are then summed to provide the annual RS1101 revenue.

For the Lower Mainland, the CRI TOU revenue for the winter months is the sum of the basic charge and the CRI TOU energy charge, which is determined by applying CRI TOU rates 1141, 1142, and 1143 to the monthly peak and off-peak kWh. For the non-winter months, the CRI TOU revenue is the sum of the basic charge and the energy charge, determined by applying the CRI TOU 1141, 1142 and 1143 off-peak rates to the monthly total consumption. The annual CRI TOU revenue is the sum of the monthly CRI TOU revenue.

For Fort St. John CRI TOU rates 1141 and 1142 are used to determine the CRI TOU revenue.

For Campbell River, CRI TOU rates 1144 and 1145 are used to determine the CRI TOU revenue.

The RS1101 revenue less the CRI TOU revenue is the annual balancing amount. For CRI TOU rates 1141, 1142, and 1144 the annual balancing amount is divided by four and rounded to the nearest whole dollar and becomes the amount of the balancing amount to be applied to the first four monthly CRI TOU bills. For CRI TOU rates 1143 and 1145 the annual balancing amount is divided by twelve and rounded to the nearest whole dollar and becomes the amount of the balancing amount to be applied to the twelve CRI TOU bills.

### 3 Sample Balancing Amount Calculation

This section provides the calculation of the balancing amount for the illustrative Lower Mainland customer discussed in section 1.

The following Table D-5 shows the adjusted monthly consumption data for this customer that uses electric heat. The weather normalization factors and peak percentage numbers are from tables D-3 and D-4.

**Table D-5 Lower Mainland Heating Fuel Type – Electric**

Months	LM Elec	WN Adj Factor	WN Adj kWh	On Peak % Factors	On Peak KWh	Off Peak kWh
April 2005	864	0.071	925	0	0	925
May 2005	779	0.1	857	0	0	857
June 2005	681	0.065	725	0	0	725
July 2005	689	0.012	697	0	0	697
August 2005	658	0.003	660	0	0	660
September 2005	669	0.003	671	0	0	671
October 2005	704	0.014	714	0	0	714
November 2005	820	0	820	19%	156	664
December 2005	834	-0.02	915	21%	192	723
January 2006	1,072	0.042	1,117	19%	212	905
February 2006	999	0.051	1,050	18%	189	861
March	904	-0.008	897	0	0	897
	9,773		10,048		749	9,299

The following Table D-6 shows the calculation of the balancing amount based on the CRI TOU rate RS1142:

**Table D-6 Balance Amount**

Month	Std Rate \$	TOU \$ W/O Balancing Amount RS1142	Difference (Std – TOU)	“Balancing Amount:
April 2005	\$62.35	\$62.35	\$0.00	\$0.00
May 2005	\$58.05	\$58.05	\$0.00	\$0.00
June 2005	\$49.69	\$49.69	\$0.00	\$0.00
July 2005	\$47.92	\$47.92	\$0.00	\$0.00
August 2005	\$45.58	\$45.58	\$0.00	\$0.00
September 2005	\$46.27	\$46.27	\$0.00	\$0.00
October 2005	\$49.00	\$49.00	\$0.00	\$0.00
November 2005	\$55.71	\$84.83	-\$29.12	-\$35.00
December 2005	\$61.72	\$97.57	-\$35.85	-\$35.00
January 2006	\$74.51	\$114.09	-\$39.58	-\$35.00
February 2006	\$70.27	\$105.55	-\$35.29	-\$35.00
March 2006	\$60.58	\$60.58	\$0.00	\$0.00
<b>Total</b>	<b>\$681.64</b>	<b>\$821.48</b>	<b>\$-139.84</b>	<b>-\$140.00</b>

#### **4 Bill Impact of Load Conservation**

If the customer conserves during the peak period, they will receive a savings equal to the peak price for every kWh reduction in the peak period.

For example, if the customer reduces monthly peak consumption by 10 kWh and the peak price is 25 cents/kWh, they will realize \$2.50 in bill savings for the month compared to the standard rate savings of \$0.63.

#### **5 Bill Impact of Load Shifting**

If the customer load shifts from the peak period to the off-peak period, they will receive the difference between the peak price and the off-peak price for every kWh shifted from the peak period to the off-peak period.

For example, if the customer shifts 10 kWh from the peak period to the off-peak period, and the peak price is 25 cents/kWh and the off-peak period price is 6.33 cents/kWh (18.7 cents/kWh difference), they will realize \$1.87 in bill savings compared to no savings under the standard rate.

## **6 Bill Impact of Load Increase**

For customers on rates 1141, 1142, and 1144, the only difference in revenue for increased usage between the CRI TOU rate and RS 1101 is caused by the difference in the CRI TOU peak price and 6.33 cents per kWh price for energy in RS1101. There is no difference in revenue for increased usage during off-peak hours because the CRI TOU off-peak price is the same as RS1101. For these three CRI TOU rates, the bill guarantee will credit to the customers any revenue difference caused only by the peak increased usage.

For customers on rates 1143 and 1145, increased usage during the peak hours results in additional revenue caused by the difference in the CRI TOU peak price and 6.33 cents per kWh price for energy in RS1101. Increased usage during the off-peak hours results in a revenue reduction under these two CRI TOU rates because the CRI TOU off-peak price of 4.5 cents per kWh is less than the 6.33 cents energy price in RS1101. For these two CRI TOU rates, the bill guarantee will net the change in revenue for the peak and off-peak periods caused by increased usage.

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**Conservation Research Initiative  
Residential Time of Use Rate Application**

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**APPENDIX E**

**Electric Tariff Supplement No. 73**

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**Electric Tariff Supplement No. 73**  
**Conservation Research Initiative**  
**Residential Time of Use (CRI TOU) Program**

This Electric Tariff Supplement outlines additional terms and conditions for RS 1141, 1142, 1143, 1144 and 1145 herein referred to as the CRI TOU rates. In particular, it defines the calculation of the Annual and Monthly Balancing Amounts and also defines the provisions under the Bill Guarantee.

## **1 Balancing Amount**

### **1.1 Definition**

The Annual Balancing Amount is defined to be the annual revenue difference between the customers Historical Consumption under RS1101 and the applicable CRI TOU rate. The CRI TOU revenue used in this calculation is based on revenue from the CRI TOU basic charge and energy charges only.

The Monthly Balancing Amount is determined by dividing the Annual Balancing amount equally over four or twelve months, depending on the applicable CRI TOU rate, and appears as part of the CRI TOU bill. The exception is for participants that start after November 1, 2006, as outlined in section 1.3.1 below.

### **1.2 Historical Consumption**

The Historical Consumption under RS1101 is the 12 months of weather normalized historical data for each customer ending at the completion of the customers March 2006 billing cycle.

For purposes of the CRI TOU rates, this data is further separated into monthly consumption for peak and off-peak periods for the winter months as defined in the applicable CRI TOU rate (November-February). For the non-winter months, the data does not need to be separated since all consumption in these months is treated as off-peak consumption.

The following first outlines the derivation of the Historical Consumption under RS1101, and then the derivation of the Historical Consumption under the applicable CRI TOU rate.

### 1.2.1 Historical Consumption under RS1101

The historical monthly consumption data for the twelve month period ending March 2006 is weather normalized by applying the weather normalization factors in the following table. The factors for Vancouver Island (VI Elec for electrically heated and VI Nelec for non-electrically heated) will be applicable to subscribers in Campbell River. Similarly, the factors for Lower Mainland (LM Elec and LM Nelec) will be applicable to subscribers in the Lower Mainland and factors for the North (NI Elec and NI Nelec) will be applicable to subscribers in Fort St. John.

Weather Normalization Factors						
Months	VI Elec	VI Nelec	LM Elec	LM Nelec	NI Elec	NI Nelec
April 2005	0.053	0.039	0.071	0.039	0.09	0.062
May 2005	0.106	0.065	0.1	0.042	0.101	0.055
June 2005	0.097	0.058	0.065	0.024	0.088	0.05
July 2005	0.022	0.015	0.012	0.003	0.019	0.012
August 2005	-0.001	0.004	0.003	0	-0.032	-0.02
September 2005	0	0	0.003	0.001	-0.042	-0.022
October 2005	-0.013	-0.008	0.014	0.005	-0.013	-0.007
November 2005	-0.038	-0.023	0	0	0.03	0.017
December 2005	-0.039	-0.029	-0.02	-0.012	0.033	0.026
January 2006	0.032	0.027	0.042	0.029	0.087	0.085
February 2006	0.045	0.038	0.051	0.037	0.096	0.092
March 2006	-0.01	-0.008	-0.008	-0.005	0.001	0.001

The factor used to adjust each subscriber's consumption is chosen according to their area of residence and their heating code (i.e., electrically heated or non-electrically heated) in BC Hydro's records. The weather normalization adjustment is made by multiplying the monthly consumption data by (1+weather normalization factor). The 12 months of weather normalized data is then used to determine the revenue from the Historical Consumption under RS1101.

### 1.2.2 Historical Consumption under CRI TOU rates

The weather normalized historical monthly consumption data is split into consumption for peak and off-peak periods for the four winter months (November through February) according to the percentages shown in the following table:

<b>Peak Usage %</b>		
<b>Single Peak – AM TOU Rates 1141, 1142 and 1143</b>		
<b>Months</b>	<b>LM Elec</b>	<b>LM Nelec</b>
<b>January</b>	<b>16%</b>	<b>19%</b>
<b>February</b>	<b>17%</b>	<b>18%</b>
<b>November</b>	<b>16%</b>	<b>19%</b>
<b>December</b>	<b>18%</b>	<b>21%</b>
<b>Dual Peak – AM + PM TOU 1144 and 1145</b>		
<b>January</b>	<b>30%</b>	<b>33%</b>
<b>February</b>	<b>30%</b>	<b>33%</b>
<b>November</b>	<b>29%</b>	<b>32%</b>
<b>December</b>	<b>33%</b>	<b>34%</b>

The percentage represents the portion of the month’s consumption which occurs in the peak period. The percentages are provided by peak period month, heating fuel type, and Lower Mainland (LM) and Vancouver Island (VI) regions. For Fort St. John the Lower Mainland (LM) percentages will be applied.

The percentages used to adjust each subscriber’s consumption are chosen according to their CRI TOU rate, their area of residence and their heating code (i.e., electrically heated or non-electrically heated) in BC Hydro’s records.

### **1.3 Determination of Monthly Balancing Amounts**

The Annual Balancing Amount is defined to be the annual revenue difference between billing the historical consumption under RS1101 and the applicable CRI TOU rate.

The RS1101 revenue is determined by applying RS1101 to the 12 months of weather normalized data to determine the twelve monthly bills, which are then summed to provide the annual RS1101 revenue.

The CRI TOU Revenue for the Lower Mainland for the winter months is the sum of the basic charge and the CRI TOU energy charge, which is determined by applying the applicable CRI TOU rates to the monthly peak and off-peak kWh. For the non-winter months, the CRI TOU revenue is the sum of the basic charge and the energy charge, determined by applying the applicable CRI TOU off-peak rates to the monthly total consumption. The annual CRI TOU revenue is the sum of the monthly CRI TOU revenue.

For Fort St. John CRI TOU rates 1141 and 1142 are used to determine the CRI TOU revenue.

For Campbell River, CRI TOU rates 1144 and 1145 are used to determine the CRI TOU revenue.

The RS1101 revenue less the CRI TOU revenue is the Annual Balancing Amount. For CRI TOU rates 1141, 1142, and 1144 the Annual Balancing Amount is divided by four and rounded to the nearest whole dollar and becomes the Monthly Balancing Amount to be applied to the first four of the customers CRI TOU bills.

For CRI TOU rates 1143 and 1145 the Annual Balancing Amount is divided by twelve and rounded to the nearest whole dollar and becomes the Monthly Balancing Amount to be applied to the twelve CRI TOU bills.

### ***1.3.1 Balancing Amounts for Participants that Start After November 1***

Participating customers that have TOU meters installed after November 1, 2006, will have their CRI TOU bill start either on November 15, 2006, or on December 1, 2006, as determined by BC Hydro, following installation of the required meter at the customer's residence. They will also have their balancing amount adjusted to reflect the shorter time period that they are on the CRI TOU rate. The Annual Balancing Amount will be determined by estimating the standard and CRI TOU revenue based on the 11.5 months (for those starting November 15) and 11 months (for those starting December 1) of historical consumption data rather than the full 12 months.

For participants with CRI TOU billing starting on November 15, or December 1, 2006, and on CRI TOU rates 1141, 1142, and 1144, the Annual Balancing Amount is divided by three and rounded to the nearest whole dollar and becomes the Monthly Balancing Amount to be applied to the first three of the customers CRI TOU bills.

For participants with CRI TOU billing starting on November 15, or December 1, 2006, and on CRI TOU rates 1143 and 1145, the Annual Balancing Amount is divided by the number of remaining CRI TOU bills and rounded to the nearest whole dollar and becomes the Monthly Balancing Amount to be applied to the remaining CRI TOU bills.

## **2 Bill Guarantee**

BC Hydro will provide a Bill Guarantee to customers on the CRI TOU rate calculated as follows.

BC Hydro will credit to the CRI TOU subscriber's account the positive difference between the amount billed to the customer based on the CRI TOU tariff and the amount billed to the customer based on the RS1101 tariff as described as follows:

For rates RS1141, RS1142 and RS1144:

1. the total dollar amount of all bills issued to the subscriber for service under the CRI TOU rate during the 4 winter months (November-February), minus,
2. the total dollar amount derived by rendering bills on the same metered usage, using the rates in RS1101.

For rates RS1143 and RS1145:

3. the total dollar amount of all bills issued to the subscriber for service under the CRI TOU rate during the entire year, minus,
4. the total dollar amount derived by rendering bills on the same metered usage, using the rates in RS1101.

Additional conditions and provisions include:

1. The applicable credit shall be made to the account of the subscriber, within 60 days after the March 2007 billing date for subscribers on rates RS1141, RS1142, and RS1144, and within 60 days after the October 2007 billing date for the subscribers on rates RS1143 and RS1145.
2. The bill guarantee is not applicable to any subscriber that (i) in the case of rate schedules RS1141, RS1142 and RS1144 ceases taking service before February 28, 2007, and (ii) in the case of rate schedules RS1143 and RS1145 ceases taking service before October 31, 2007.

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**Conservation Research Initiative  
Residential Time of Use Rate Application**

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**APPENDIX F**

**Residential Time of Use Rate  
Experience from Other  
Jurisdictions**

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## **1 Early U.S. Experience**

TOU pricing experiments were sponsored by the U.S. federal government in the 1970's and early 1980's which indicated that residential customers would respond to TOU rates. The studies also showed that commercial and industrial customers were typically less responsive (e.g., EPRI CU-7131). In the 1980's, many utilities continued to test TOU rates, and studies show an average reduction in peak consumption of about 20%, or 0.7 kW per residential customer, and an average reduction in total consumption of about 4.5%, or 450 kWh per year.

## **2 Current U.S. Policy - 2005 U.S. Energy Policy Act (EPACT)**

The 2005 EPACT contains Section 1252 which provides the following policy direction:

- Amends PURPA by adopting one new section 111 (d) standard on time-based metering and communications for the consideration and determination by state commissions. For those states where their commissions' determination supports time-based rates, metering and/or communications, then:
- Not later than 18 months after the enactment of this paragraph – February 2007, each electric utility shall offer each of its customer classes, and provide individual customers upon customer request, a time-based rate schedule under which the rate varies during different time periods and reflects the variance, if any, in the utility's cost of generating and purchasing electricity at the wholesale level.

Each electric utility shall provide each customer requesting time-based rates with a time-based meter capable of enabling the utility and the customer to offer such a rate. Hence, there is a current nation-wide interest in AMI and time-based rates in the United States.

### **3 Residential Time of Use Programs in Various U.S. States**

#### **Washington**

Puget Sound Energy in 2001 had an opt-out TOU program with about 240,000 customers on the rate. Peak prices were about 15% higher than the intermediate price, and off-peak prices were 9% lower. The recorded impacts were a low of about 4% reduction in peak usage in the summer increasing to 6% reduction in the winter. The program was unsuccessful since customers eventually determined that their bill would have been lower under the alternative flat rate, even after their load shifting was taken into account. They therefore opted out to the flat rate and Puget discontinued the TOU program.

#### **Oregon**

Portland General Electric has had a voluntary residential and small commercial (<30kW) TOU program offered since 2002. There are roughly 1,800 customers enrolled. The peak to off-peak price ratio is almost 3:1. Many of the participants are smaller households, with fewer than half being renters/apartments. This customer profile may not capture the households that have the most peak usage, which is a problem with a voluntary program approach. In addition, voluntary programs will attract customers who already have low on-peak usage if the rate is designed on a class revenue neutral basis rather than on a customer revenue neutral basis. The Portland TOU program had a mean residential load impact of 0.27 kW in the winter morning and 0.13 kW in the evening.

#### **Georgia**

Time of use rates were first implemented in the mid 90's in the state of Georgia. The purpose was to ensure pricing products would be available to manage demand. Time of use rates are available to all classes, at the option of the customer. They are generally popular with commercial customers, and not widely selected by residential customers. The structure is seasonal, with time of day differentiation in the summer season only.

For residential customers choosing the time of use rate, a monthly fixed charge applies, which is slightly higher than the charge under the basic rate (\$9.75 per month), to recover the additional costs of metering and administration. The peak and off peak rate differential applies in summer months only, with peak hours being 2:00 p.m. to 7:00 p.m. Monday through Friday excluding holidays. The

differential is slightly greater than 3:1. In the non-summer months, a simple two-block declining structure applies to all kWh.

## **California**

Current action areas driven by the California Public Utilities Commission focus on rate-driven demand response programs. These are to be supported by state-wide installation of advanced metering infrastructure for all small and residential customers of investor-owned utilities. Rates are intended to make dynamic pricing available to all customers, and technology is planned to provide customers with access to their energy use information and allow participation in demand response programs.

A current regulator-driven rate program is the State-wide Pricing Pilot (SPP) mandated by the CPUC. The investor-owned utilities were required to offer selected customers an opportunity to participate in the pilot program described briefly below, which is in effect until the end of 2006, or until cancelled by the CPUC.

Customers on the SPP receive an experimental critical peak pricing (CPP) mechanism. Pricing in this rate is also based on blocks related to the baseline. There are three pricing periods: a super peak, peak and off peak. The super peak price is approximately 10 times greater than the off peak price. The peak price is approximately 3 times the off peak price.

Conditions during which a super peak can be declared are set out in the tariff book, and are limited to a maximum of 12 days in summer and 3 days in winter, between 2 p.m. and 7 p.m. Customers are notified on the prior day, before 5 p.m., by a predetermined mechanism such as email or fax.

Customers have the option to refuse participation in the experimental program.

The impact studies found that there was a significant reduction in peak usage during the CPP peak hours (27% for customers with enabling technology).

## **Florida**

Gulf Power in Northwest Florida offers a TOU rate with a CPP. The four rate categories are a low price of 5.4 cents/kWh (available for 28% of hours in a year), a medium price of 6.7 cents/kWh (59% of hours in a year), a high price of 11.2 cents/kWh (12% of hours in a year) and a critical price of 32.1 cents/kWh (1% of hours in a year). The program has about 7,200 participants who pay \$4.95 per month to participate and receive free surge protection, thermostat control and over-ride option,

free installation, automatic meter reading and automatic outage notification. These participants receive about 15% savings on their bill annually. The program delivers about 2kW coincident peak demand saving in the summer and 3kW of coincident peak winter demand reduction.

## **4 Residential Time of Use Programs in Canada**

### **Ontario**

The Ontario government has committed that all of the province's 4.1 million electricity customers will have an interval meter by 2010, thereby enabling time of use pricing to apply universally. However, the installation of the interval meters is still in the very early stages, and many aspects of the program, including data management issues, remain to be clarified. As a result, the Ontario Energy Board (OEB) has postponed the date at which it will become mandatory for utilities to apply time of use pricing to their interval metered customers. A utility may choose to apply the time of use rates to its interval metered Regulated Price Plan (RPP) customers when it is ready to do so; choice is with the utility, rather than with the individual customer.

The OEB's Regulated Price Plan Manual, published August 22, 2005, sets out a framework for the time of use pricing. It is intended, based on analysis of the provincial load profile and cost data, that there be two seasons, winter and summer, and three price periods in each—off-peak, mid-peak and on-peak. The times in each price period will be different between the two seasons. Effective May 1st, 2006, time of use prices are 3.5 cents/kWh for off-peak consumption; 7.5 cents/kWh for mid-peak consumption, and 10.5 cents/kWh for peak hour consumption.

### **Quebec**

Hydro-Québec recently has been mandated to file a new pricing structure with the Regie de l'énergie, which must include:

- a wider gap between the two rate levels currently paid by residential consumers, or the introduction of a third rate level (without changing the total bill for consumers).
- rates that vary by season and time of use, thus allowing consumers to manage their electricity consumption more effectively.