



**Tom A. Loski**  
Chief Regulatory Officer  
Phone: 604-623-4046  
Fax: 604-623-4407  
[bhydroregulatorygroup@bhydro.com](mailto:bhydroregulatorygroup@bhydro.com)

December 14, 2015

Ms. Erica Hamilton  
Commission Secretary  
British Columbia Utilities Commission  
Sixth Floor – 900 Howe Street  
Vancouver, BC V6Z 2N3

Dear Ms. Hamilton:

**RE: British Columbia Utilities Commission (BCUC or Commission)  
British Columbia Hydro and Power Authority (BC Hydro)  
2004/05 and 2005/06 Revenue Requirements Application  
Commission Decision: Order No. G-96-04, October 29, 2004, Directive 66 (page 197)**

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BC Hydro writes to submit its F2015 Demand Side Management Milestone Evaluation Summary Report (**the Report**), dated November 2015 in compliance with Directive 66 (page 197) of the Commission Decision dated October 29, 2004. Directive 66 directs BC Hydro to file the executive summaries of its milestone evaluation reports and full final evaluation reports for all its Power Smart programs. The Report summarizes the impact evaluations completed during F2015 for the following:

1. Large and Medium General Service Conservation Rates: F2014 (F2014 LGS and MGS Evaluation Report). BC Hydro notes that a copy of the F2014 LGS and MGS Evaluation Report has been submitted as part of the 2015 Rate Design Application (Exhibit B-1, Appendix C-4A, pages 399 to 560 of 813).
2. Power Smart Partners Commercial Program: F2011 – F2012.

For further information, please contact Geoff Higgins at 604-623-4121 or by email at [bhydroregulatorygroup@bhydro.com](mailto:bhydroregulatorygroup@bhydro.com).

Yours sincerely,

Original signed by Fred James

(for) Tom Loski  
Chief Regulatory Officer

sh/ma

Enclosure (1)



# **Demand Side Management Milestone Evaluation Summary Report F2015**

**November 2015**

## Table of Contents

|            |  |    |
|------------|--|----|
| 1.0        | Introduction.....  | 1  |
| 1.1        | Completed Evaluations.....                                       | 1  |
| 2.0        | Large and Medium General Service Conservation Rates: F2014 ..... | 2  |
| 2.1        | Introduction .....   | 2  |
| 2.2        | Approach.....  | 3  |
| Table 2.1  | Evaluation Objectives and Research Questions.....                | 3  |
| Table 2.2  | Evaluation Objectives, Data and Methods.....                     | 4  |
| 2.3        | Results.....   | 4  |
| Table 2.3  | Summary of Energy and Peak Demand Savings, F2014.....            | 7  |
| Figure 2.1 | Net Evaluated Savings for Each Year Evaluated.....               | 7  |
| 2.4        | Findings and Recommendations.....                                | 8  |
| 2.5        | Conclusions .....  | 9  |
| 3.0        | Power Smart Partners Commercial Program: F2011-F2012 .....       | 10 |
| 3.1        | Introduction .....   | 10 |
| 3.2        | Approach.....  | 10 |
| Table 3.1  | Evaluation Objectives and Research Questions.....                | 11 |
| Table 3.2  | Evaluation Objectives, Data Sources and Methods .....            | 11 |
| 3.3        | Results.....   | 12 |
| Table 3.3  | Summary of Electric Energy and Peak Demand Savings.....          | 13 |
| 3.4        | Findings and Recommendations.....                                | 13 |
| 3.5        | Conclusions .....  | 15 |

## 1.0 Introduction

This report summarizes the milestone evaluations of demand-side management (**DSM**) initiatives completed by BC Hydro in fiscal year 2015 (**F2015**). It is filed in compliance with Directive 66 of the British Columbia Utilities Commission (**BCUC**) decision on BC Hydro's F05/F06 Revenue Requirements Application (dated October 29, 2004), which "*directs BC Hydro to file the executive summaries of its milestone evaluation reports and full final evaluation reports of all its Power Smart programs*" (page 197).

BC Hydro evaluates its DSM initiatives to improve its estimates of realized DSM electricity savings and to improve their effectiveness and efficiency.

DSM evaluation activities are guided by the following six principles:

- **Objectivity and Neutrality:** Evaluations are to be objective and neutral;
- **Professional Standards:** Evaluation work is guided by industry standards and protocols;
- **Qualified Practitioners:** BC Hydro employs qualified staff and consultants to conduct evaluations;
- **Appropriate Coverage:** BC Hydro strives to achieve defined coverage levels for its evaluation of DSM initiatives;
- **Business Integration:** The evaluation function is integrated into BC Hydro's DSM business process of planning, implementation, reporting and evaluation; and
- **Coordination:** BC Hydro evaluation work is coordinated with FortisBC and other DSM partners where feasible.

BC Hydro DSM evaluations are subject to an independent oversight process to ensure that they are neutral and unbiased, of sufficient quality for their intended purposes, and consistent with industry standards and protocols.

### 1.1 Completed Evaluations

Impact evaluations summarized in this report include the following:

- **Large and Medium General Service Conservation Rates:** F2014; and
- **Power Smart Partners Commercial Program:** F2011 – F2012.

## 2.0 Large and Medium General Service Conservation Rates: F2014

### 2.1 Introduction

The purpose of this report is to provide a comprehensive evaluation of the impacts and customer response to BC Hydro's Large General Service (**LGS**) and Medium General Service (**MGS**) conservation rates for BC Hydro's fiscal year 2014 (**F2014**), which covers the period April 1, 2013 through March 31, 2014. The scope of this evaluation includes electric energy conservation effects as well as customer understanding and experience with the LGS and MGS rates. BC Hydro previously completed an evaluation of the LGS and MGS conservation rates for calendar years 2011 and 2012. The current evaluation extends that analysis.

BC Hydro's LGS and MGS rate classes are made up of all BC Hydro general service accounts that purchase electricity at distribution voltage and have a monthly peak demand above 35 kilowatts (**kW**). MGS refers to general service accounts with a monthly peak demand that is equal to or greater than 35 kW but less than 150 kW, or whose energy consumption in any 12 consecutive periods is less than or equal to 550,000 kilowatt-hours (**kWh**). LGS refers to general service accounts with a monthly peak demand equal to or greater than 150 kW, or whose energy consumption in any 12-month period is greater than 550,000 kWh.

This diverse group of customers includes a wide range of facility types, such as hospitals, manufacturing facilities, office buildings, retail, and the common areas of multi-unit residential buildings. The total electricity purchases of these rate classes was approximately 13,600 gigawatt hours (**GWh**) in F2014, covering approximately 23,000 accounts.

Prior to the implementation of the conservation rates, LGS and MGS customers were served under a declining block energy charge. Starting in January 2011, conservation rates were introduced that were designed to encourage customers to conserve electric energy. Under the LGS and MGS conservation rate, this encouragement is provided through a credit when consumption is lower than historical average consumption, and an additional charge when consumption is higher. The credit and charge (referred to as Part 2 of the conservation rate) are priced at a higher level than the base rate (referred to as Part 1). In effect, the conservation rates deliver a marginal price signal to customers that approximates BC Hydro's long run marginal cost (**LRMC**) of new energy supply.

To evaluate the impact of the conservation rates, and with the approval of the BCUC, in 2010 BC Hydro assigned 400 accounts to control groups before the implementation of the conservation rates. Experimental design methods were used to select control accounts. Two hundred accounts were drawn from the MGS population and 200 from the LGS population. The control group accounts were maintained on the pre-existing rate, with prices increasing each year in concert with general rate increases. The remaining population of accounts (called the **treatment groups** in this report) started a transition to the conservation rate on January 1, 2011.

LGS customers transitioned as one group to the conservation rate structure on January 1, 2011. MGS customers were divided into two groups (MGS1, and MGS2/3) for the purpose of transitioning to the conservation rate structure. MGS1 was made up of 4,000 accounts, and MGS2/3 was made up of 12,500 accounts. All MGS customers completed transition to the conservation rate by April 1, 2013.

## 2.2 Approach

Table 2.1 summarizes the evaluation objectives and research questions for this evaluation.

Table 2.1 Evaluation Objectives and Research Questions

| Evaluation Objective  | Research Questions   |
|---|--|
| 1. Assess customer awareness, understanding and acceptance of the LGS and MGS rates.                | <ul style="list-style-type: none"> <li>• What is the current level of unaided awareness of the energy charges?</li> <li>• How easy or difficult is it to understand how the rate works?</li> <li>• What is the customers' level of understanding on using the rate as a tool in managing their energy bill?</li> <li>• How much support do customers have for the conservation rate? Do customers believe the rate is fair? How does this compare between customers experiencing growth vs. those who are conserving?</li> <li>• What changes were observed in awareness, understanding and acceptance since the previous evaluation?</li> </ul> |
| 2. Understand customer response to the conservation rates.  | <ul style="list-style-type: none"> <li>• How much of an incentive to conserve does the energy charge (Part 1 and Part 2) provide?</li> <li>• How easy or difficult is it for customers to manage their energy consumption?</li> <li>• How much effort are customers putting into minimizing their energy charge?</li> <li>• What are the major factors behind customer efforts to manage electricity use?</li> <li>• What is the price signal to which customers are responding?</li> <li>• What changes were observed in customer response since the past evaluation?</li> </ul>  |
| 3. Assess the effectiveness of the LGS and MGS control groups for the evaluation of energy savings. | <ul style="list-style-type: none"> <li>• Are the control groups still equivalent to the treatment groups?</li> <li>• What is the relative precision of the control groups?</li> </ul>  |
| 4. Estimate the energy and peak demand savings attributable to the LGS and MGS conservation rates.  | <ul style="list-style-type: none"> <li>• What are the energy and peak demand savings due to the LGS and MGS conservation rates in F2014, relative to calendar year 2010?</li> <li>• What changes are observed in energy savings since the past evaluation?</li> <li>• What are possible explanations for any variance between reported and evaluated electricity savings?</li> </ul>   |
| 5. Large customer impact analysis   | <ul style="list-style-type: none"> <li>• Can a response to the introduction of the LGS conservation rate be detected at the site level for a selection of key account customers<sup>1</sup> with energy management initiatives?</li> </ul>   |

<sup>1</sup> Key account customers are BC Hydro's largest Industrial, Commercial, Institutional and Government accounts.

Table 2.2 summarizes, for each of the evaluation objectives, the evaluation data and methods used.

Table 2.2 Evaluation Objectives, Data and Methods

| Evaluation Objective  | Data   | Methods  |
|---|--|--|
| 1. Assess customer awareness, understanding and acceptance of the LGS and MGS conservation rates.   | <ul style="list-style-type: none"> <li>Customer surveys</li> <li>Customer focus groups</li> <li>Key Account Manager<sup>2</sup> interviews</li> </ul>  | <ul style="list-style-type: none"> <li>Qualitative analysis</li> <li>Cross tabulations</li> </ul>  |
| 2. Understand customer response to the conservation rates.  | <ul style="list-style-type: none"> <li>Customer surveys</li> <li>Customer focus groups</li> <li>Key Account Manager interviews</li> </ul>  | <ul style="list-style-type: none"> <li>Qualitative analysis</li> <li>Cross tabulations</li> </ul>  |
| 3. Assess the effectiveness of the LGS and MGS control groups for the evaluation of energy savings. | <ul style="list-style-type: none"> <li>BC Hydro billing data on electricity purchases from January 2010 to March 2014</li> <li>BC Hydro account data on customers characteristics (e.g., region, account sector)</li> <li>Power Smart program tracking data</li> </ul> | <ul style="list-style-type: none"> <li>Statistical tests</li> <li>Stratified sampling design analysis</li> </ul>   |
| 4. Estimate the energy and peak demand savings attributable to the LGS and MGS conservation rates.  | <ul style="list-style-type: none"> <li>BC Hydro billing data from January 2010 to March 2014</li> </ul>  | <ul style="list-style-type: none"> <li>Experimental design with randomized controlled trial</li> <li>Statistical outlier identification (Grubbs' test)</li> <li>Difference-in-differences</li> <li>Statistical bootstrapping</li> <li>Rate class average peak to energy ratio</li> </ul> |
| 5. Large customer impact analysis   | <ul style="list-style-type: none"> <li>BC Hydro billing data</li> <li>Customer-level data (e.g., production)</li> </ul>  | <ul style="list-style-type: none"> <li>Customer-level regression models</li> </ul>   |

## 2.3 Results

### Results for Objective 1: Customer Awareness, Understanding and Acceptance of the Conservation Rates

Unaided awareness of the conservation rate in 2014 was 35 per cent for LGS customers, 26 per cent for MGS1 customers and 22 per cent for MGS2/3 customers. Of these three groups, LGS customers have been on the conservation rate the longest (since January 2011). For these customers, unaided awareness has remained fairly steady since 2012, when it was at 33 per cent. These levels of unaided awareness are lower than found for other BC Hydro conservation rates. Unaided awareness of their conservation rate was measured at 50 per cent for residential customers<sup>3</sup> and 83 per cent for large industrial customers<sup>4</sup>.

<sup>2</sup> Key Account Managers manage BC Hydro's relationship with its largest Industrial, Commercial, Institutional and Government accounts.

<sup>3</sup> BC Hydro, 2014, Evaluation of the Residential Inclining Block Conservation Rate F2009-F2012, page 33.

<sup>4</sup> BC Hydro, 2013, F2012 Demand Side Management Milestone Evaluation Summary Report, page 43

Fewer than one quarter of LGS and MGS customers reported that, following a written description and illustration of the rate, it is very easy to understand how the rate works. Reported levels of ease of understanding how the rate works, again following a written description and illustration of their conservation rate, stayed fairly constant between 2012 and 2014, with the exception of LGS customers reporting that the rate is very easy to understand, where an increase from 16 per cent to 23 per cent was observed. These levels of understanding are lower than found for the residential conservation rate structure, where the same approach to testing understanding resulted in 44 per cent of residential customers reporting that their rate was very easy to understand.<sup>5,6</sup>

Focus group participants, who were decision makers regarding energy at LGS and MGS sites, demonstrated key gaps in understanding how to use the rate as a tool to manage their energy bill through changes in consumption, even after video and moderator explanations.

After being informed that the intent of the rate was to promote conservation, between 9 per cent and 21 per cent of customers strongly supported the rate, depending on their rate class, while 5 per cent to 7 per cent strongly opposed it. The share of LGS customers who strongly supported the rate increased from 14 per cent in 2012 to 21 per cent in 2014. Most focus group participants and key account customers complained about the mechanics of the rate. The energy charge was viewed as a penalty by customers with growing electricity consumption. The complexity of the rate structure created an administrative burden for customers with a single BC Hydro account and multiple tenants.

### Results for Objective 2: Customer Response to the Conservation Rates

Of the 35 per cent of LGS, 26 per cent MGS1, and 22 per cent of MGS2/3 customers who could correctly identify the energy charge component of their rate unaided, 41 per cent indicated that it served as a major incentive to conserve electricity while 35 per cent indicated that it served as no incentive at all. These results indicate that the overall incentive effect of the energy charge was modest.

Focus group participants reported that the conservation rate was too complicated to act on because there are various inputs to the rate that were perceived as too difficult for customers to measure and manage themselves.

Most customers did not find it easy to minimize their energy charges. In 2014, 64 per cent of LGS customers, 55 per cent of MGS1 customers and 59 per cent of MGS2/3 customers said that it was very difficult or somewhat difficult to manage their account to minimize energy charges. Nonetheless, 63 per cent of LGS customers, 57 per cent of MGS1 customers, and 47 per cent of MGS2/3 customers reported putting a great or fair deal of effort into minimizing energy charges. The share of customers reporting a great deal of effort to minimize energy charges increased from 2012 to 2014 across all customer groups. Particularly large increases are seen for the MGS1 group (from 6 per cent to 17 per cent) and for the LGS group (from 17 per cent to 25 per cent)

Customers were asked about the various factors that were major drivers of managing their electricity consumption. The most commonly cited major driver was wanting operating costs to be as low as possible (76 per cent of respondents), followed by the overall level of electricity prices (59 per cent of respondents). The incentive to save electricity built into the rate was assessed as a major driver of managing electricity consumption by 21 per cent of respondents.

The economic price signal to which customers responded is varied. Focus group participants reported that they mainly look at the total bill amount only. Few customers took the time to dissect their energy

<sup>5</sup> BC Hydro, 2012, Residential Rate Survey

<sup>6</sup> Comparable results are not available for the Transmission Service Rate



bill because they had limited understanding of the rate structure. However, some key account customers did understand the rate structure and managed their electricity to minimize Part 2 charges.

### **Results for Objective 3: Assess the Effectiveness of the Control Group**

Of the 400 control accounts assigned in 2010, 295 were found to still be valid at the time of this evaluation (i.e., they remained in the control group). The other 105 accounts were lost from the control groups either because of account closure, or migration to a different rate class as a result of significant changes in account consumption. A similar proportion of LGS and MGS treatment accounts also experienced account closure or migration to a different rate class, and these accounts were not included in the analysis<sup>7</sup>.

Effective control groups are equivalent to their treatment groups on all observable factors that are expected to impact electricity consumption, with the exception of their electricity rate. Analysis of the factors listed below was completed to test the effectiveness of the control groups:

- Equivalent average electricity consumption in the base year prior to conservation rate implementation (calendar year 2010);
- Distribution of consumption by percentile;
- Equivalent average base year consumption by major account sector (industrial, commercial, and multi-unit residential);
- Equivalent average base year consumption by region;
- Equivalent average participation rates in Power Smart programs;
- Relative precision, indicating how closely a sample can predict a variable of interest for a population; and
- Control group contamination resulting from control accounts with parent corporations in the treatment group.

The control groups were found to be effective for the purpose of evaluating energy savings due to the LGS and MGS conservation rates. The control groups were equivalent to their treatment groups on the basis of electricity consumption in the year prior to conservation rate implementation, account sector and region. Further, the percentile distribution of annual electricity consumption and the level of Power Smart program participation were found to be similar between the control and treatment groups. The relative precision was found to be good for the MGS control group (overall 2 per cent relative to a target of 20 per cent or lower) and fair for the LGS control group (overall 12 per cent relative to a target of 20 per cent or lower). Finally, the control groups were found to be uncontaminated by having a parent corporation in the treatment group.

### **Results for Objective 4: Energy and Peak Demand Savings**

The past evaluation estimated the annual rate of savings at 144 GWh/year by the end of 2011 and 200 GWh/year by the end of 2012, both relative to calendar year 2010. These results were statistically significant at the 90 per cent confidence level. The current evaluation estimated the annual rate of savings at 77 GWh/year by the end of F2014, relative to calendar year 2010. The F2014 results are statistically significant at the 85 per cent confidence level, but not at the 90 per cent confidence level that was achieved in the past evaluation. This means that the F2014 savings have a lower level of certainty than did the 2011 and 2012 savings, and that the F2014 savings are statistically equivalent to zero at the 90 per cent confidence level.

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<sup>7</sup> 16,500 valid treatment accounts were identified for the purpose of this analysis, relative to a population of 23,000 in 2010.

The minimum acceptable level of certainty varies by industry and needs to be determined by each user of the information. BC Hydro aims for a confidence level of 80 per cent or better for net evaluated energy savings derived from sampling based methods such as the one employed in this evaluation. Results that meet or exceed this level are reported as statistically significant, along with their associated confidence level.

Shown below are the reported and evaluated energy and peak demand savings for the LGS and MGS conservation rates during the evaluation time period. Energy savings are shown as an annual rate of savings in F2014, relative to calendar year 2010. This annual rate of savings includes any savings that commenced in 2011 or 2012 and continued to persist in F2014. This means that the F2014 energy savings are cumulative since the implementation of the conservation rates, and cannot be added to savings from 2012 and 2011.

Evaluated net energy savings for F2014 are 77 GWh per year, which is substantially less than the forecasted (reported) savings of 919 GWh per year. All evaluated net savings resulted from the LGS conservation rate with no savings from the MGS conservation rate.

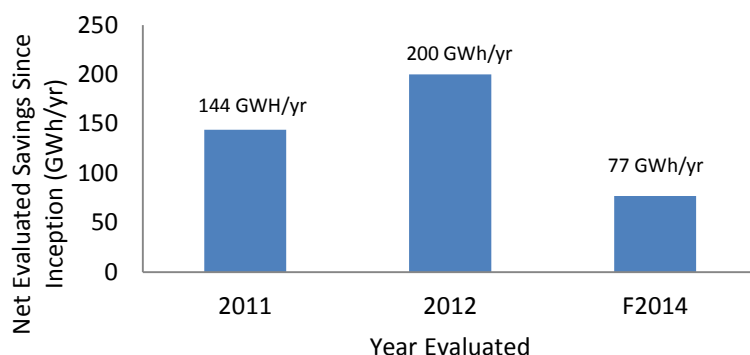
Table 2.1 Summary of Energy and Peak Demand Savings, F2014

| Year  | Cumulative Energy Savings (GWh/year) |               | Peak Demand Savings (MW) |               |
|-------|--------------------------------------|---------------|--------------------------|---------------|
|       | Reported                             | Evaluated Net | Reported                 | Evaluated Net |
| F2014 | 919                                  | 77*           | 128                      | 11            |

\* Statistically significant at the 85 per cent confidence level. p-value = 0.14.

Net evaluated savings for each year, at a confidence level of at least 85 per cent, are shown below.

Figure 2.1 Net Evaluated Savings for Each Year Evaluated



Research<sup>8</sup> indicates that more informed customers are more responsive to price changes than are less informed customers. Evidence from this evaluation indicates that unaided awareness and demonstrated understanding of the conservation rate was low, and that customers found the rate structure to be too complex to inform their decision making on investment in energy efficiency. This suggests that one reason for the variance between evaluated and reported savings was low levels of customer awareness and understanding of the conservation rates, due at least in part to their complexity.

<sup>8</sup> Carter, D. W. and J. W. Milon 2005. Price Knowledge in Household Demand for Utility Services. Land Economics 81(2): 265 to 283.

## Results for Objective 5: Large Customer Impact Analysis

Regression modelling of 12 industrial key account LGS customers with dedicated energy managers on staff did not detect a statistically significant response to the introduction of the LGS conservation rate. These customers would be expected to be responsive to the conservation rate, because they consume considerable amounts of electricity and have staff dedicated to energy management.

### 2.4 Findings and Recommendations

#### Findings

1. Only a small portion of LGS and MGS customers were able to correctly identify their rate structure without assistance. Unaided awareness of the rate structure was 35 per cent, 26 per cent, and 22 per cent among LGS, MGS1, and MGS2/3 customers respectively;
2. Survey results indicated that most customers (between 68 per cent and 77 per cent across the rate groups) believed that how the rate works was very or somewhat easy to understand after reading a description and illustration of their conservation rate. However, only a minority of these believed that it was very easy to understand and further exploration of this issue in the focus groups revealed that the rate may be much harder to understand than these survey results would suggest. Even though focus group participants were decision makers around the management of energy accounts and had previously completed the survey which aided their understanding of the rate structure, few demonstrated a good understanding of the rate structure. Key gaps in their understanding persisted even after video and moderator explanations of the rate;
3. After being informed that the intent of the rate was to conserve electricity, between 9 per cent and 21 per cent of customers strongly supported the conservation rate structures, depending on their rate class, while 5 per cent to 7 per cent strongly opposed it. Qualitative research indicated that customers experiencing consistent moderate growth did not support the rate, and saw the Part 2 energy charge as a penalty for growth. Some customers complained that the complexity of the rate structure created an administrative burden;
4. The incentive effect of the Part 2 energy charge and credit appeared to be modest. A total of 41 per cent of customers with unaided awareness of the energy charge reported that it served as a major incentive to conserve electricity. However, another 35 per cent of these customers reported that it served as no incentive at all. Qualitative research indicated that customers found the Part 2 energy charge and credit mechanism to be too complex to serve as a motivator for conservation;
5. The control groups closely matched the treatment groups in a number of important ways, and they were therefore valid and effective control groups for the purpose of evaluating the LGS and MGS rates;
6. The MGS conservation rate structure did not produce statistically significant energy savings. This result is consistent with the past evaluation;
7. Evaluated net energy savings for the LGS conservation rate structure were 77 GWh per year in F2014, relative to calendar year 2010 while evaluated net energy savings for the MGS conservation rate were zero. This is 8 per cent of reported savings (919 GWh/year for both MGS and LGS combined as of March 2014);

8. The variance between evaluated and reported savings is substantial. Evidence from this evaluation suggests that one reason for the variance is low levels of customer awareness and understanding of their conservation rates due at least in part to their complexity; and
9. Regression modeling of 12 large LGS sites failed to detect an effect on energy consumption due to the introduction of the LGS conservation rate in 2011.

### **Recommendations**

10. Maintain the LGS and MGS control groups, so long as the MGS and LGS conservation rates are continued in their current form. Maintenance of the control group is required for future evaluation of the LGS and MGS conservation rates;
11. Consider revising the LGS and MGS conservation rates. Unaided awareness of the rate structure has remained low at approximately one third of LGS customers, demonstrated understanding of the conservation rate structures is low, customers indicated that the rate is too complex to inform their decision-making on energy efficiency and energy savings remain well below forecast; and
12. Consider revising the LGS and MGS savings forecast model, given the variance between evaluated and reported energy savings.

### **2.5 Conclusions**

Multiple lines of evidence indicate that the customer response to the LGS and MGS conservation rates was considerably less than forecast. Awareness and demonstrated understanding of the conservation rates was low. Evaluated net energy savings in F2014 were 77 GWh per year, or 8 per cent of reported savings. Analysis of 12 key account customers, who would be expected to be responsive to the LGS rate, did not detect a statistically significant response to the introduction of the LGS rate.

## 3.0 Power Smart Partners Commercial Program: F2011-F2012

### 3.1 Introduction

BC Hydro's Power Smart Partners Commercial Program (**PSP-Commercial**) is a multi-year market transformation and energy acquisition initiative that encourages BC Hydro's largest commercial, government, institutional and First Nations customers to undertake energy-efficient investments in existing facilities. It also aims to transform the market to higher levels of energy efficiency by encouraging and assisting customers in integrating energy efficiency into their ongoing business practices and corporate culture.

This study provides an impact evaluation of net electricity savings achieved by the PSP-Commercial program for BC Hydro fiscal years 2011 and 2012 (**F2011 and F2012**), as well as elements of a process and market evaluation. The scope of the impact evaluation includes PSP-Commercial's two incentive offers: the custom incentive offer and the Express offer (PSP-X), as well as savings claimed for custom projects through the program enabled process. The custom incentive and PSP-X offers both provided capital incentives for retrofits, with a large focus on lighting projects. The custom incentive offer accepted a wider range of configurations than did PSP-X, while PSP-X offered a faster customer application process. Program enabled savings came from custom projects that received technical and/or strategic support from the program, but did not receive direct capital incentives. Energy savings from the Workplace Conservation Awareness initiative were claimed by the program in F2011 and F2012, but are excluded from the scope of the impact analysis as this initiative was previously evaluated under separate cover.<sup>9</sup>

### 3.2 Approach

Table 3.1 summarizes the evaluation objectives and research questions for this evaluation.

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<sup>9</sup> The Workplace Conservation Awareness initiative targeted energy saving through employee behavioural changes. Refer to BC Hydro, *Workplace Conservation Awareness Initiative Evaluation*. April 30, 2013

Table 3.1 Evaluation Objectives and Research Questions

| Objectives  | Research Questions  |
|---|---|
| 1. Assess customer and Power Smart Alliance <sup>10</sup> participation, satisfaction, and attitudes towards conservation | <ul style="list-style-type: none"> <li>What are the motivators of energy management?</li> <li>What is the level of awareness for the various program components?</li> <li>How satisfied are program participants and trade allies with the various program components?</li> <li>What is trade ally level of knowledge and participation in the program?</li> <li>How many trade allies use the program as a sales tool and how influential do they believe it is in encouraging their customers to implement energy saving projects?</li> </ul> |
| 2. Assess the results of the Energy Manager offer and trends related to market transformation                             | <ul style="list-style-type: none"> <li>How many Energy Manager positions were funded?</li> <li>What percentage of program energy savings results from participants with Energy Managers?</li> <li>How many Strategic Energy Management Plans (<b>SEMPs</b>) were completed and signed off by an executive?</li> <li>How have organizations changed their approach to energy management over time?</li> <li>How engaged are participants' senior management with the Energy Manager?</li> </ul>  |
| 3. Assess other trends related to market transformation   | <ul style="list-style-type: none"> <li>Are there changes in customer implementation of behavioral and operational energy conservation measures?</li> <li>What are the trends in participant experience with energy efficiency measures?</li> </ul>  |
| 4. Estimate gross and net electricity and peak demand savings   | <ul style="list-style-type: none"> <li>What are the gross realization rates?</li> <li>How much free ridership and participant spillover occurred?</li> <li>What are the net electric energy and peak demand savings?</li> </ul>   |

Table 3.2 summarizes, for each of the evaluation objectives, the evaluation data and methods used.

Table 3.2 Evaluation Objectives, Data Sources and Methods

| Objectives  | Data sources   | Method  |
|---|--|---|
| 1. Assess customer and Power Smart Alliance participation, satisfaction, and attitudes towards energy conservation. | <ul style="list-style-type: none"> <li>• Participant survey (n = 248)</li> <li>• Power Smart Alliance survey (n = 35)</li> </ul>   | <ul style="list-style-type: none"> <li>• Cross tabulations</li> </ul>   |
| 2. Assess the results of the Energy Manager offer and trends related to market transformation                       | <ul style="list-style-type: none"> <li>• Energy Manager survey (n = 60)</li> <li>• Program tracking data</li> </ul>  | <ul style="list-style-type: none"> <li>• Cross tabulations</li> </ul>   |
| 3. Assess other trends related to market transformation   | <ul style="list-style-type: none"> <li>• Power Smart Alliance survey (n = 35)</li> <li>• Participant survey (n = 248)</li> </ul>   | <ul style="list-style-type: none"> <li>• Cross tabulations</li> </ul>   |
| 4. Estimate gross and net electricity and peak demand savings   | <ul style="list-style-type: none"> <li>• Participant survey (n = 248)</li> <li>• Program tracking data</li> <li>• On-site inspections (21 sites)</li> <li>• Measurement and verification of a selection of projects(n = 70)</li> <li>• Power Smart Standard Procedure for Cross Effects</li> <li>• Rate class average peak to energy factor</li> </ul> | <ul style="list-style-type: none"> <li>• Evaluated gross savings based on ratio estimation using measurement and verification</li> <li>• Free ridership and spillover based on survey data and algorithms</li> <li>• Peak demand savings based on rate class average peak to energy factor</li> </ul> |

<sup>10</sup> The Power Smart Alliance are a network of consultants, equipment vendors and other trade allies involved in the study, sale and installation of energy efficient technologies and solutions.

### 3.3 Results

#### Results for Objective 1: Customer and Trade Ally Experience with the Program

Participants in the custom offer (custom incentive and program enabled) most commonly cited reducing operating costs (89 per cent) and participation in the PSP-Commercial program (88 per cent) as their top two drivers of conservation. PSP-X participants most commonly cited reducing operating costs (89 per cent), and to benefit the environment (78 per cent).

Key Account Managers<sup>11</sup> were the highest rated individual program component for both custom and PSP-X participants (94 per cent and 78 per cent respectively rated them as either excellent or good). The highest rated program experience among custom offer participants was the service provided by BC Hydro personnel (94 per cent excellent or good). Among PSP-X participants the highest rated program experience was the service provided by their contractor (80 per cent excellent or good).

Trade ally knowledge of PSP-X was moderate, with 45 per cent reporting that they were somewhat or very knowledgeable about the offer. Among those who reported that they were somewhat or very knowledgeable, 20 per cent reported that they were very active with the program and 40 per cent that they were somewhat active. Eighty per cent of those who reported that they were somewhat or very knowledgeable of PSP-X reported it was either somewhat or very influential at encouraging their customers to purchase and install energy-efficient products.

#### Results for Objective 2: The Energy Manager Offer

In F2011 there were 79 Energy Managers in place, and participants with Energy Managers accounted for 62 per cent of overall program savings across all program offers. By F2014, 92 per cent of organizations with Energy Managers had completed a Strategic Energy Management Plan. However, only 43 per cent had a dedicated budget for its implementation.

Participants with Energy Managers improved their energy management practices over time, as measured by Energy Manager Assessment scores. Average scores increased from 0.89 to 1.59 over three years, moving the scores from the tactical approach category (0.00 – 1.00) to the strategic approach category (1.01 – 2.00).

#### Results for Objective 3: Trends Related to Market Transformation

Custom incentive and program enabled participants reported that, relative to 2009, they ‘more often discussed energy use and conservation measures’, ‘more often turned-off lights when not in use’ and ‘more often checked the settings for the energy management system’. PSP-X participants reported that, relative to 2009, they ‘more often turned-off lights when not in use’, ‘more often discussed energy use and conservation measures’ and ‘more often turned-off computers when they have not been used’.

Through the program, 42-49 per cent of custom or PSP-X participants implemented projects involving measures or technologies with which they had little or no prior experience, indicating that the program has broadened participant awareness of energy efficiency opportunities and technologies.

#### Results for Objective 4: Electricity and Peak Demand Savings

Results for electric energy and peak demand savings are summarized below.

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<sup>11</sup> Key Account Managers manage BC Hydro’s relationship with its largest Industrial, Commercial, Institutional and Government accounts.

Table 3.3 Summary of Electric Energy and Peak Demand Savings

| Fiscal Year                   | Offer                  | Energy Savings (GWh/year) |              | Peak Demand Savings (MW) |                         |
|-------------------------------|------------------------|---------------------------|--------------|--------------------------|-------------------------|
|                               |                        | Reported                  | Evaluated    | Reported                 | Evaluated <sup>12</sup> |
| F2011                         | PSP-X                  | 27.0                      | 25.3         | 3.4                      | 3.1                     |
|                               | Custom Incentive       | 28.2                      | 31.5         | 3.3                      | 3.8                     |
|                               | Program Enabled        | 6.5                       | 7.1          | 0.8                      | 0.9                     |
|                               | <b>F2011 Sub-Total</b> | <b>61.7</b>               | <b>63.9</b>  | <b>7.5</b>               | <b>7.7</b>              |
| F2012                         | PSP-X                  | 48.1                      | 43.1         | 5.8                      | 5.2                     |
|                               | Custom Incentive       | 35.4                      | 38.4         | 4.3                      | 4.6                     |
|                               | Program Enabled        | 4.5                       | 5            | 0.5                      | 0.6                     |
|                               | <b>F2012 Sub-Total</b> | <b>88.1</b>               | <b>86.5</b>  | <b>10.7</b>              | <b>10.5</b>             |
| <b>Sum of F2011 and F2012</b> |                        | <b>149.8</b>              | <b>150.3</b> | <b>18.1</b>              | <b>18.2</b>             |

Evaluated net savings are 150.3 GWh/year over F2011 and F2012, which is approximately 100 per cent of reported savings.

### 3.4 Findings and Recommendations

#### Findings

1. Overall satisfaction among custom incentive and program enabled participants was very high with 97 per cent of participants reporting that they were either 'very satisfied' (69 per cent) or 'somewhat satisfied' (28 per cent) with the program. Overall satisfaction with the PSP-X offer among participants was slightly lower at 89 per cent and was more evenly distributed between those who reported being 'very satisfied' (43 per cent) and those who reported being 'somewhat satisfied' (46 per cent);
2. Eighty per cent or more of program participants rated the service provided by BC Hydro personnel, their suppliers and distributors, and their contractors as excellent or good. In contrast, the lowest ratings for both offer participants (40 per cent PSP-X, 52 per cent custom rated as excellent or good) were for direct mail about the program. In addition PSP-X participants provided relatively lower ratings on the usability of the online application (52 per cent excellent or good), and the overall application procedure to receive funding (54 per cent excellent or good);
3. The most common program improvement suggestions from PSP-X participants were to provide more information and training about the program, and to increase the incentive amounts and range of eligible products. The most common program improvement suggestions from custom incentive and program enabled participants were to simplify the application process and provide more information and training about the program;

<sup>12</sup> Peak demand savings were calculated by applying a peak-to-energy ratio of 0.121 MW/GWh. This ratio is calculated using the ratio of average kWh to peak kWh from BC Hydro internal calculations, based on the commercial rate class load shape. The rate class load shapes are developed based on hourly load data collected for a sample of sites. The shapes were generated based on data collected for F2004 and F2005.



4. Key Account Managers appear to be playing an important role in promoting this program and helping customers access it. The Key Account Managers' role in relation to their support of the program emerged as the highest rated component among participants in both offers (94 per cent 'excellent' or 'good' for custom participants, and 78 per cent for PSP-X participants). Key Account Managers also emerged as the program component with the highest awareness among custom participants (89 per cent awareness);
5. Alliance members reported modest levels of knowledge about the PSP-X program, and few PSP-X participants recalled having been contacted by an Alliance member about the offer. Alliance members who did report being very or somewhat knowledgeable about the PSP-X offer found it to be a useful sales tool that influenced customers decisions to implement energy efficient products. Alliance members rated the promotional materials provided by the program and the e.catalogue lowest among all elements rated;
6. The Energy Manager offer appears to have been successful in achieving energy savings and organizational changes over time. Between 2009 and 2014, organizations that undertook repeated Energy Manager Assessments increased their average scores from 0.89 to 1.59, moving them from a tactical to a strategic approach to energy management. By F2014, program participants with energy managers were achieving average savings over twice that of participants without energy managers;
7. Free ridership was 16 per cent for custom incentive and program enabled savings and 25 per cent for PSP-X. Participant spillover was 22 per cent for custom incentive and program enabled savings and 9 per cent for PSP-X; and
8. Evaluated net savings for the custom incentive, program enabled and PSP-X offers were 63.9 GWh/year in F2011 and 86.5 GWh/y in F2012. This is 104 per cent of reported savings in F2011 and 98 per cent of reported savings in F2012.

## Recommendations

### Recommendations for program management:

1. Explore ways to improve trade ally awareness and satisfaction with the PSP-X offer, for example through marketing and training;
2. Consider improving the usability of the online application for PSP-X participants, streamlining the overall application process for custom incentive participants, and increasing communication and training activities for both offers; and
3. Continue support for the Energy Manager initiative, which appears to be achieving its intended medium term outcomes of achieving energy and bill savings and improving energy management practices at participating organizations.

### Recommendations for future evaluations:

4. Consider revising the M&V criteria to improve M&V coverage across all offers and size ranges for future evaluations;
5. Investigate options to increase the number of non-participant survey responses, in order to estimate non-participant spillover, explore barriers to participation, inform baselines for savings estimation, and better understand market trends and program market effects; and

6. Investigate ways to improve data collection of market trends for future evaluations. Options may include leveraging the existing trade ally survey and creating data collection tools for contractors, suppliers and consultants outside the Power Smart Alliance.

### **3.5 Conclusions**

The PSP-Commercial program's PSP-X, custom incentive and program enabled offers achieved 150.3 GWh/year of net energy savings in F2011 and F2012, which is equivalent to 100 per cent of reported savings. Customer satisfaction with the program is generally high, while trade ally satisfaction with the PSP-X offer is more mixed.

## Glossary

**Baseline** - Energy consumption based on the existing or pre-implementation stage of the process. This level of consumption can be established by the measurements and or engineering calculations and is based on a specific level of production or operation.

**Cross Effects (CE)** - Change in energy consumption of one process due to change of energy consumption of another process (usually in heating ventilation and air conditioning, HVAC, systems due to change in lighting).

**Difference-of-Differences Method (Double Difference)** – Compares a treatment and a comparison group before and after an intervention. This method can be applied in both experimental and quasi-experimental designs and requires baseline and follow-up data from the same treatment and control group.

**End Use** - The final level of electrical energy use considered for an industrial application.

**Energy** - Energy refers to the amount of electricity consumed (or produced) over a certain time period, measured in watt-hours. Energy savings are the reduction in the amount of electricity consumed over a certain time period.

**Experiment** - In an experimental design, participants are randomly assigned to a treatment group or to a control group.

**Free Ridership** - Free-riders are those participants who would have made similar energy efficiency improvements in the absence of the program.

**Gross Savings** - The change in energy consumption and/or associated demand that results directly from program-related action taken by the participants in the demand side management program irrespective of why they participated.

**Net savings** - The change in energy consumption and/or associated demand that is attributable to the utility DSM program. The change in consumption or associated demand may include the effects of free riders and spillover.

**Net to Gross Ratio** - The combination of free rider and spillover estimates which are then applied to the gross savings to provide an estimate of net savings attributable to the program. Reflects program influence, does not reflect project performance in terms of energy savings estimated or measured.

**Peak Demand** - Demand refers to the amount of electricity that is consumed at any instant in time, measured in multiples of watts. Peak demand savings are the reduction in amount of electricity that is consumed at system peak demand, which for BC Hydro occurs on a winter weekday between approximately 5 p.m. and 7 p.m.

**Price Elasticity** - The most commonly used measure in the electricity industry when analyzing consumption changes due to rate adjustments. It provides a straightforward and easy-to-compare means to measure the price impacts on electricity consumption and the magnitude of customers' price sensitivity. It is defined as the percentage change in quantity demanded divided by the percentage change in price. For example, a price elasticity assumption of -0.10 means that for each one per cent increase in real price, electricity usage declines by 0.10 per cent.

**Realization Rate** - The ratio of initial estimates of gross savings to gross savings adjusted for evaluation, measurement and verification results. The realization rate does not reflect program attribution or influence on the (net) savings achieved.

**Reported Savings** – Initial estimate of net savings based on engineering calculations, review and site inspection, adjusted by program assumptions for free-ridership, spillover and market effects. These estimates represent the unevaluated savings.

**Spillover** - Spillover occurs when individuals are influenced or impacted by the program (either directly as program participants or indirectly as non-participants) to make additional energy efficiency improvements without additional assistance from the program.