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February 28, 2018

Industrial Customers Group
c/o #301 – 2298 McBain Avenue
Vancouver, BC V6L 3B1

Attention: Mr. Robert Hobbs

Dear Mr. Hobbs:

Re: FortisBC Inc. (FBC)

Project No. 1598934

Application for Approval of 2018 Demand-Side Management (DSM) Expenditures (the Application)

Response to the Industrial Customers Group (ICG) Information Request (IR) No. 1

On November 15, 2017, FBC filed the Application referenced above. In accordance with the British Columbia Utilities Commission Order G-21-18 setting out the Regulatory Timetable for review of the Application, FBC respectfully submits the attached response to ICG IR No. 1.

If further information is required, please contact Sarah Wagner at (250) 469-6081.

Sincerely,

FORTISBC INC.

Original signed:

Diane Roy

Attachments

cc (email only): Commission Secretary
Registered Parties

1.0 Reference: Exhibit B-2, Section 1.3, pp. 2-3

"FBC expects to file a multi-year DSM expenditure plan for 2019 onwards in 2018 that addresses any directives from the Commission's decision on the 2016 LTERP and LT DSM Plan."

1.1 Please describe the level of detail FBC expects to put into the application for the DSM expenditure plan for 2019 and onwards. For instance, will it have more or less detail (on an annual basis) than the current application?

Response:

The Multi-Year DSM Expenditure Schedule is currently in the drafting process and subject to the LTERP decision before filing. It is expected to have more detail that the current application in some respects, for example to address any Commission directives from the LTERP decision, and because FBC intends to include the market potential and demand response reports.

2.0 Reference: Exhibit B-2, Section 4.1.2, Total Resource Cost (TRC) Test, page 14

2.1 Please describe how FBC determines an individual DSM measure's energy and demand savings? In the case of a self-generator, does this include both FBC's and the self-generator's energy and demand savings, and if not, why not?

Response:

DSM measures can be standardized "mass market" products, such as Energy Star residential appliances or commercial lighting products, in which case measure energy and demand savings are based on typical usage patterns, for example the number of annual laundry loads, or average annual lighting burn hours by business type.

Larger custom projects, that may include a number of non-standardized measures, will typically have energy and demand savings calculated by the applicant and/or its retained consultants.

FBC reviews the validity of either approach, including undertaking the necessary measurement and verification protocols to ensure the energy savings materialize as expected.

In the case of a self-generator, FBC undertakes a further analysis to determine what portion of the projected measure(s) or project savings will accrue to the Company in the form of reduced utility sales to that customer.

3.0 Reference: Exhibit B-2, Section 4.2, page 16

"While the TRC and mTRC continue to be the governing tests that FBC used to determine the cost-effectiveness of its 2018 DSM Plan on a portfolio basis, the Company has also historically reported and considered a range of other industry standard cost-effectiveness tests, including the Ratepayer Impact Measure (RIM), the Utility Cost Test (UCT) and the Participant Cost test (PCT) applied at the program, program area (or sector) and portfolio levels."

3.1 Please describe whether and how FBC applies the RIM, UC and PC tests to determine an applicant's eligibility or level of incentive for a particular DSM measure. How does FBC apply these tests to self-generators?

Response:

FBC uses the TRC test to determine if a measure is cost-effective and calculates the other test (RIM, UCT, PCT) results on a program, sector and portfolio level primarily for information purposes (although the UCT can be used to manage the incentive level). The Company does not use the aforementioned tests to determine an applicant's eligibility for a particular DSM measure or project, whether a full-service customer or a self-generator.

4.0 Reference: Exhibit B-2, Section 5.2, Table 5.1 page 18

4.1 Please provide the references cited in Table 5.1.

Response:

The executive summaries of the reports by Evergreen Economics and Sampson Research that are cited in Exhibit B-2, Section 5.2, Table 5.1 are filed as part of the FBC DSM annual reports. These reports can be accessed through the links in the table below. In addition, the following two reports provided by Sampson Research are provided in Attachment 4.1, as indicated in the table below:

- PowerSense New Commercial Building Improvement Program Evaluation – Final Report
- PowerSense Commercial Retrofit Building Improvement Program Evaluation – Final Report.

The Heat Pump report by Research Into Action is preliminary and will be filed with the 2017 DSM Annual report in March 2018.

The other reports are internal management reports that are confidential.

In addition, please refer to BCUC IR 2.5.3 for explanation of corrections to Table 5-1 that are also reflected in the table below.

Program Area	Free-rider	Spill-over	Source of Justification	Source Link
Residential				
Home Improvement Program	20%		LiveSmart, BC Hydro, Apr 2012	BC Hydro report – FBC is not at liberty to share
Heat Pumps - rebates	44%	20%	Research Into Action, 2017 (preliminary)	Final report will be filed with Annual DSM Report 2017 in March 2018
Heat Pumps - loans	15%	20%	Research Into Action, 2017 (preliminary)	Final report will be filed with Annual DSM Report 2017 in March 2018
Heat Pump Water Heaters	0%			
Lighting	36%	77%	Evergreen Economics, 2014	https://www.fortisbc.com/About/RegulatoryAffairs/ElecUtility/Documents/02_FBC_DSM_Annual_Report_ending_December_31_2013.pdf
Appliances	57%	39%	Evergreen Economics, 2014	https://www.fortisbc.com/About/RegulatoryAffairs/ElecUtility/Documents/02_FBC_DSM_Annual_Report_ending_December_31_2013.pdf
New Home Program	20%		per BC Hydro (Cooper and Habart, 2014)	BC Hydro report – FBC is not at liberty to share
Rental (in-suite)	0%		Dunsky Consulting, 2016	Joint report commissioned by FEI, BC Hydro and FBC - FBC is not at liberty to share
Commercial				
Commercial Lighting	34%		Evergreen Economics, 2013	https://www.fortisbc.com/About/RegulatoryAffairs/ElecUtility/Documents/04_FBC_DSM_Semi-Annual_Report_ending_December_31_2012.pdf
Sm Business Direct Install	31%		Evergreen Economics, 2013	https://www.fortisbc.com/About/RegulatoryAffairs/ElecUtility/Documents/04_FBC_DSM_Semi-Annual_Report_ending_December_31_2012.pdf

Program Area	Free-rider	Spill-over	Source of Justification	Source Link
Building & Process Improvement	30%	12%	Sampson Research, 2012	Copy provided in Attachment 4.1
Custom Lighting	31%	9%	Sampson Research, 2009	https://www.fortisbc.com/About/RegulatoryAffairs/ElecUtility/Documents/13_FBC_DSM_Semi-Annual_Report_ending_December_31_2008.pdf
Building Improvement New	25%		Sampson Research, 2011	Copy provided in Attachment 4.1
Industrial				
Industrial Efficiency	12%		Sampson Research, 2013	https://www.fortisbc.com/About/RegulatoryAffairs/ElecUtility/Documents/04_FBC_DSM_Semi-Annual_Report_ending_December_31_2012.pdf
Low Income Housing				
Energy Savings Kit	0%		per BC Hydro	BC Hydro report – FBC is not at liberty to share
Energy Conservation Assistance Program	0%		per BC Hydro	BC Hydro report – FBC is not at liberty to share

4.2 Please explain why there are no spill-over effects for many program areas, such as the New Home Program, Industrial Efficiency and Custom Lighting.

Response:

Please refer to the response to CEC IR 1.3.3.

5.0 Reference: Exhibit B-2, Appx, A, Section A1.3, 2017 DSM Plan Results, Table A1-2, page A4

5.1 Please explain why FBC spent only 21% of the 2017 approved amount in the Industrial Program Area, and furthermore, why there were no energy savings.

Response:

Exhibit B-2, on which this IR is based, only included actual DSM spending and savings results up to September 2017. By the end of September 2017, ten thousand dollars had been spent on incentives for an energy study for which no energy savings were recorded. The rest of the $65,000 expenditure, as of September 30, 2017 was for the allocation of labour charges for the technical advisors who work directly with FBC commercial and industrial customers. No Industrial projects were completed by the end of September, so no energy savings were recorded. By year-end 2017, five Industrial projects were recorded along with their associated savings of 886 kWh. The 2017 Actual (Preliminary) results for the Industrial sector are shown in the response to BCOAPO IR 1.1.1.

5.2 What was the specific Industrial Program Area DSM expenditure in 2017 and what were the expected energy savings? Customer identities are not required.

Response:

Please refer to the response to BCOAPO IR 1.1.1. Industrial program savings are in the area of Industrial Efficiency.

5.3 What does FBC intend to do to ensure the 2018 Industrial Program Area DSM programs are fully subscribed?

Response:

FBC plans to meet the goals for industrial programs by:

- Increasing the industrial custom incentive from approximately $0.15/kWh to $0.25/kWh to increase program participation.

- Leveraging industrial energy study offers to identify more complex energy efficiency projects. This also allows consultants to assist FBC in marketing custom industrial program offers.

- Continuing to utilize FBC's four regional technical advisors, trained as Certified Energy Managers, to market FBC's industrial programs to industrial key accounts annually and assist customers in identifying new industrial energy efficiency projects.

6.0 Reference: Exhibit B-2, Appx, A, Section A4, Industrial Program Area, Table A4-1, page A13

6.1 Please explain why for the Industrial Program Area, Non-program specific expenses almost triple in 2018 over 2017 ($124,000), while the actual industrial initiatives increase by only 26% ($63,000) for the same period.

Response:

The apparent increase in industrial non-program specific expenses was due to an internal misallocation of non-program specific expenses. FBC's industrial and commercial portfolio share many resources and tools. In the development of the 2018 DSM Plan, FBC incorrectly apportioned the share of non-program specific expenses between the industrial and commercial portfolio. While the total estimate of non-program specific expenses shared between the commercial and industrial portfolios is correct, the allocation between the commercial and industrial portfolio is not. The reallocated non-program specific expenses for industrial represents a 14 percent increase over non-program expenses in the 2017 DSM Plan and are in line with the 2017 actual non-program expenses.

The reallocated industrial non-program expenses for 2018 and actual non-program specific expenses for 2017 are provided in the below table:

Non-Program Specific Expenses	2018 Plan	2017 Actual
Labour	$64	$56
Travel, Supplies, Vehicles, Training	$8	$5
Total	**$72**	**$61**

The revised Table 5-1 is being filed in an Errata concurrent with these IR responses.

6.2 Please provide a detailed line-item description of all the cost elements in the proposed 2018 Industrial Program Area "Non-program specific expenses".

Response:

Please refer to the response to ICG IR 1.6.1.

6.3 Please provide a detailed line-item description of all the expenditures in the actual 2017 Industrial Program Area “Non-program specific expenses”.

Response:

Please refer to the response to ICG IR 1.6.1.

7.0 Reference: Exhibit B-2, Appx, A, Section A8, Appendix A, Table A8-1, page A20

7.1 Please provide as a working spreadsheet the calculations for the Industrial Program Area TRC, mTRC, UCT, PCT and RIM values.

Response:

Attachment 7.1 contains a spreadsheet that includes the calculations for the Industrial Program Area TRC, mTRC, UCT, PCT, RIM, and levelized cost values.

Attachment 4.1

SAMPSON RESEARCH

Consulting Project

POWERSENSE NEW COMMERCIAL BUILDING IMPROVEMENT PROGRAM EVALUATION

FINAL REPORT

Prepared for:

PowerSense Dept.
FortisBC Inc.
Kelowna, British Columbia

By:

Sampson Research Inc.

With:

Innes Hood Consulting Inc.

May 31, 2011

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Disclaimer

The opinions expressed in this report are the responsibility of the author, Sampson Research, and do not necessarily represent the views of FortisBC.

Currency Units

All dollar figures presented in this report, unless stated otherwise, are expressed in Canadian funds.

1 EXECUTIVE SUMMARY

1.1 Introduction

This report summarizes the findings from a process and impact evaluation of the PowerSense New Commercial Building Improvements Program (New BIP). During the evaluation period of September 2006 to September 2009, New BIP processed 64 participant applications from 37 FortisBC retail or wholesale customers, and expended $517,245 in rebates. Total claimed energy and demand savings are 10.8 GW.h and 2.8 MW respectively.

1.2 Evaluation Objectives and Methodology

The evaluation included process, market and impact components. Information and data collected via program tracking records and documentation, interviews and on-site visits with program participants, interviews with program management and program delivery staff, and a desk review of program records. Energy and demand savings were calculated for each site visit participant using either modelling or engineering calculations. Current program baseline assumptions for HVAC, lighting, building envelope, motors and other systems were reviewed for relevancy.

1.3 Summary of Evaluation Findings

Summary comments are provided on the review of program documents, the review of program baselines, program operations, site visits, and program savings.

1.3.1 Document Review

FortisBC appears to be doing a reasonable job of records management. All participant records requested for purposes of the evaluation were available. Billing histories for the site visit participants were readily available.[1]

1.3.2 Program Operations

There is no standard program application form for New BIP. No additional terms or conditions are placed on New BIP participants beyond those indicated as part of FortisBC's Electric Tariff.[2]

Customer processing and record keeping for the New BIP program is about to be improved with the adoption of the Nexus customer management system expected in 2012. This system is expected to provide program personnel with access to active projects, allowing for real time updates of program status.

The consistent application of baseline assumptions among the regions was highlighted during staff interviews.

[1] Billing records for wholesale customers are maintained by the municipal utilities. Copies of these records were requested and obtained via FortisBC staff.

[2] Additional detail available through Schedule 90 - Energy Management Service, Terms and Conditions, Electric Tariff, B.C.U.C. No. 1, Sheet 73.

1.3.3 Barriers to Participation

The relatively small size of the FortisBC rebate means that some trade allies are reluctant to recommend the program to their new building clients.

1.3.4 Program Baselines

The qualifying technology list for New BIP is broad, ranging from water treatment plants to computer systems.

There was general agreement among those interviewed that baselines are moving up in the industry. However, some new construction projects continue to be built to code (minimum) despite attempts by the FortisBC advisor to convince the owners to improve their design.

A significant and recent development affecting New BIP is the elimination of rebates for ground source heat pump systems except for designated market segments (condominiums) and where natural gas service is not available. Prior to this, the baseline assumption was that electric resistance heating was the baseline regardless of whether gas service was available or not.

In addition to changes in the program baseline, adoption of an Energy Code (ASHRAE 90.1-2004) by the Province of BC in September 2008 has an impact on the program baseline as minimum performance requirements are now established for a range of building systems and components.

1.3.5 Site Visits & Modelling

Nine New BIP participants received a site visit from the evaluation engineer. Modeling of their building's energy savings was completed using information gathered on site, program records, and billing records.

Agreement between program incentive calculations and current calculations of energy savings for the nine projects was poor. The primary reasons for the discrepancies include:

- Variable frequency drives rendered redundant by oversized pumps and/or pump operating procedures
- Discrepancies between program records and installed light fixture counts
- Calculation of program savings for projects where electricity is assumed to be the baseline fuel for space and domestic water heating when natural gas is the baseline fuel (e.g., geothermal, ice plant heat recovery)

1.4 Evaluated Program Savings

1.4.1 Free Riders

Free riders were qualitatively assessed using information collected during site visits, interviews with program management and delivery staff, and a literature search of studies that assessed free rider rates in commercial new building programs in other jurisdictions. Based on this research a free rider rate of 25% is recommended as a reasonable but not unduly punitive free rider percentage, falling within the range of estimates from other commercial new construction programs.

1.4.2 Energy and Demand Savings

Exhibit 1 presents the evaluated savings for the 2006-2009 fiscal years, discounted for fuel switching in geothermal projects. After adjustments, evaluated savings are equivalent to 28% of gross energy savings, and 38% of gross demand savings. Free riders are applied to adjusted gross savings to avoid double counting.[3]

Exhibit 1: Net Program Savings (Run Rates)
January 2006 to December 2009

	GW.h/yr Run Rate	MW Run Rate
Gross Program Savings	**18.974**	**2.489**
Unrealized Savings *	11.764	1.220
Adjusted Gross Savings	**7.210**	**1.269**
Free Riders (25%)	1.803	0.317
Net Program Savings	**5.407**	**0.952**
Net Savings (%)	28%	38%

** Energy (1 – 0.38), Demand (1 - 0.51)*
Totals may not sum due to rounding

Exhibit 2 presents the evaluated savings for New BIP allowing for fuel switching in geothermal projects. The primary reason for presenting these results is to demonstrate the net savings percentage that is reasonable for non-fuel switching projects. It entails adjustments for (1) non-fuel switching variances noted during the site visits, and (2) an estimate of free riders. After adjustments, evaluated savings are equivalent to 48% of gross energy savings, and 49% of gross demand savings. As in the previous exhibit, free riders are calculated using adjusted gross savings as the base to avoid the potential for double counting.

Exhibit 2: Net Program Savings (Run Rates) for Program Planning Purposes

	GW.h/yr Run Rate	MW Run Rate
Gross Program Savings	**18.974**	**2.489**
Unrealized Savings *	6.831	0.871
Adjusted Gross Savings	**12.143**	**1.618**
Free Riders (25%)	3.036	0.405
Net Program Savings	**9.107**	**1.213**
Net Savings (%)	48%	49%

** Energy (1 – 0.64), Demand (1 - 0.65)*
Totals may not sum due to rounding

[3] The proportion of gross energy savings represented by participants that are free riders is often determined by multiplying gross savings by the free rider percentage. This approach assumes that savings attributed to free riders are mutually exclusive of unrealized savings due to fuel switching, variances in hours of use, technology counts, and the like when, in fact, the two likely overlap to some degree (i.e., the energy savings associated with a free rider may also have been discounted for other variances).

1.5 Summary & Recommendations

1.5.1 Summary

The primary conclusions from this evaluation are as follows:

1. FortisBC's interpretation of eligible technologies and projects for New BIP is generous. This has led to decisions to allow technologies and projects to qualify under the program where there is no reasonable or cost-effective method to evaluate the energy and capacity savings.

2. There is limited post-installation / construction follow-up to verify measure installations, and their efficient operation. These two factors mean that some project savings have not been fully realized, and, in some cases, not realized at all. Limited follow-ups and inspections are a lost opportunity for FortisBC to fully capture savings and to gain valuable experience from the field.

3. More than half of the program energy savings claimed under the 2006-2009 evaluation window were based on geothermal heat pump projects where, in the majority of cases examined, natural gas was the baseline fuel for space and water heating. These projects effectively represented fuel switching and load growth rather than energy and load reduction. FortisBC no longer allows these projects to participate under New BIP.

1.5.2 Recommendations

The following recommendations are organized under program design, program operations, and other.

Program Design and Targeting

1. Opportunities remain for New BIP to influence building design and equipment specifications for its commercial customers. However, the current scope of projects that are eligible for program incentives is too broad to effectively ensure the delivery of cost-effective energy and demand savings. FortisBC should review its list of technologies and projects eligible for program assistance to manage both free ridership and the risk associated with incentivising projects where local expertise to evaluate the legitimacy of the savings estimates is lacking. Provincial and Federal Energy Efficiency Acts and ASHRAE 90.1 provide a basis for updating the technical thresholds for rebate eligibility.

2. The 2006-10 Demand Side Management Five Year Business Plan prepared by FortisBC in October 2005 identified "significant" savings opportunities in municipal water and sewer treatment plants, and load management of municipal water pumps and district irrigation systems with reservoir capabilities. The findings of this evaluation for these two sectors suggests that there is the need to:

   - revisit the decision to include municipal water and waste treatment facilities under New BIP;
   - improve the methods and rigor used to assess opportunities in these sectors; and
   - assign resources to verify savings once the projects are operational.

3. With direction and support provided by provincial and federal governments, the SUCH sector (schools, universities, colleges and hospitals) has taken on a leadership role in energy efficient and green building design and construction. Continued support for this sector under New BIP should be

reviewed and consideration given to transferring it to an advanced or innovative building program stream. This would allow the cost-effectiveness criteria to recognize the influence and complementary mandate of multiple stakeholders and that the baseline for these projects is significantly higher than the commercial sector norm.

4. The value of program designs like New BIP is derived in large part from the advice and interventions of FortisBC's technical advisors. The evaluation identified situations where claims to energy savings were made but incentives not paid out (e.g., payback criteria not met, inability to deliver the rebate, etc.). Claims to energy savings where rebates were not issued need to be fully documented to validate the legitimacy of the savings claims.

5. An updated business case for New BIP is due. The preparation of the business case should include a review and confirmation of the program's strategic goals, objectives, eligibility requirements, and baseline assumptions. The cost effectiveness of the program should be evaluated under a range of assumptions for realized savings and free riders.

6. Incentives for geothermal projects where natural gas service is available, if offered, should be based on incremental electricity savings from installing ground source heat pumps that exceed the efficiency of a standard (baseline) ground source heat pump.

7. Some technologies listed as eligible for rebates under FortisBC New BIP will become the industry standard pending the implementation of ASHRAE 90.1-2010 and the upcoming update to the National Energy Code for Buildings.

    - The baseline for New BIP should be ASHRAE 90.1-2004, and updated to ASHRAE 90.1-2010 when adopted in 2012.
    - The list of qualifying technologies listed on the PowerSense website should be updated to reflect these baselines.

Program Operations

8. Technical advisors expressed uncertainty about whether program baselines are common to, and consistently applied in, all FortisBC's regions. The impact on gross savings is inconclusive, but the downside risk is that older baselines for some technologies might still be used in some areas. All regions should consistently apply the same baseline for evaluating savings opportunities and evaluating the cost effectiveness of participant applications.

Monitoring, Tracking, and Verification of Program Savings

9. There appears to be limited follow-up with program participants to assess whether the energy savings are being fully realized. Three of the nine site visits conducted under this evaluation had unrealized energy savings because the rebated technology was not being used as intended (variable frequency drives), or rebated quantities differed from those used to estimate savings (lighting). In addition to unrealized energy savings, these examples highlight missed opportunities to learn from experience and to apply this knowledge to new projects. Post-construction confirmation of energy savings for projects exceeding $10,000 in incentives, as specified in FortisBC's Electric Tariff, is designed to address these issues and should be maintained.

10. Provisions for free riders should be mandatory for all new PowerSense business cases. Free rider estimates should be periodically reviewed and updated. In the case of New BIP, a free rider estimate of 25% is reasonable and within industry norms.

Program Evaluation

11. FortisBC should continue program market and impact evaluations at regular intervals (e.g., every three years) and allocate sufficient resources for completing these evaluations.

Other

12. FortisBC should actively consider implementing a project commissioning program, either as a separate program or as requirement for larger projects participating under New BIP. This program would help commercial customers optimize their energy use in the post-construction / building commissioning phase. Commissioning includes documentation, review, fine-tuning and verification of equipment and systems to ensure they are integrated effectively, performing efficiently, and meeting the expectations of building owners and tenants.

* * * * *

SAMPSON
RESEARCH

Consulting Project

POWERSENSE COMMERCIAL RETROFIT BUILDING IMPROVEMENT PROGRAM EVALUATION

FINAL REPORT

Prepared for:

PowerSense Dept.
FortisBC Inc.
Kelowna, British Columbia

By:

Sampson Research Inc.

With:

Mike Wilson, Enerficiency Consulting

February 29, 2012

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Disclaimer

The opinions expressed in this report are the responsibility of the author, Sampson Research, and do not necessarily represent the views of FortisBC.

Currency Units

All dollar figures presented in this report, unless stated otherwise, are expressed in Canadian funds.

1 EXECUTIVE SUMMARY

1.1 Introduction

This report summarizes the findings from a process and impact evaluation of the PowerSense Retrofit Commercial Building Improvements Program (Retro BIP) for the 2008-10 period. During this time, the program processed 94 applications and spent $303,514 in rebates. Energy and demand savings for the period totalled 6.944 GW.h and 1.1 MW respectively. The evaluation was conducted between November 2011 and January 2012.

1.2 Evaluation Objectives and Methodology

The evaluation included process, market, and impact components. Information and data were collected from program tracking records and documentation, a participant survey, participant on-site visits, interviews with program management and program delivery staff, and a desk review of randomly selected program records. Energy and demand savings were assessed for each site visit participant. Estimates of program free ridership and spillover were derived and used to develop a net-to-gross (NTG) estimate of program savings.

1.3 Summary of Evaluation Findings

Summary comments are provided on the participant perspectives (survey), review of program documents, program operations, site visits, and program savings.

1.3.1 Document Review

Documentation of Retro BIP participants needs improvement. While the participant records requested for evaluation (survey, site visits, document review) were made available, the contents of these files varied considerably in terms of project details and key assumptions supporting program savings claims. The evaluators acknowledge that many Retro BIP projects are relatively small from an energy savings perspective. However, a minimum level of documentation is required to ensure program accountability and oversight. Billing histories for the site visit participants were successfully extracted although some files were missing customer account numbers which necessitated considerable effort by FortisBC staff to cross reference and correctly identify the appropriate billing records.[1]

1.3.2 Program Operations

Commercial and institutional customers of FortisBC are not required to complete an application form to participate in the Retro BIP program. No additional terms or conditions are placed on Retro BIP participants beyond those indicated as part of FortisBC's Electric Tariff.[2]

[1] Billing records for wholesale customers are maintained by the municipal utilities. Copies of these records were requested and obtained via FortisBC staff.

[2] Additional detail available through Schedule 90 - Energy Management Service, Terms and Conditions, Electric Tariff, B.C.U.C. No. 1, Sheet 73.

A general move to improving access and standardizing the data captured electronically was underway at the time of the evaluation. Shared (common) computer hard drives are being used to improve access to tracking reports and other information by program staff. Support personnel have been added which is enabling this move to standardized electronic data capture, storage and access.

1.3.3 Barriers to Participation

Barriers to program participation highlighted through staff interviews and inferred from results of the participant survey include the lack of readily accessible information on the program (particularly via the FortisBC website), the general economic climate, and the high turnover of contacts (building and property managers) within the commercial building sector. Occasional delays in cheque processing appear to have been addressed.

1.3.4 Program Baselines

The list of technologies eligible for Retro BIP is broad. It includes HVAC technologies, brine pumps, solar DWH, controls, refrigeration, high efficiency motors, variable speed drives, and building envelope. During the 2008-10 evaluation window, the program also provided rebates for several "one-off" projects including computer monitors and server upgrades, personal electric heaters, a dip tank process, high efficiency welders, a steam-on-demand sauna, and a cable-pull elevator.

Like many commercial retrofit programs, the baseline technology for calculating energy and demand savings is the equipment being replaced. Several projects rebated equipment that was very expensive compared to the energy savings. In these cases the baseline should be current practice, not the existing equipment.

1.3.5 Participant Survey

Highlights from the participant survey include:

- The overwhelming majority (96%) of participants indicated they had installed the measures that had received an incentive from FortisBC. Only one survey respondent indicated that some of them were not installed.
- The three most frequently mentioned sources of awareness about the program were a FortisBC representative (33% of all mentions), an equipment manufacturer's representative (30%), and FortisBC marketing materials (19%).
- The primary reasons why energy efficient measures were installed were to save energy and to save money (56% and 52% of responses respectively).
- Participants were most satisfied with communications with FortisBC staff (87% satisfied), and least satisfied with information available on the FortisBC Retro BIP program (44% satisfied).
- Overall, 88% of Retro BIP participants surveyed indicated they were satisfied with the program, 4% were neither satisfied or unsatisfied, and 8% were dissatisfied.

1.3.6 Site Visits

Gross energy and demand savings for the program were evaluated based on walk-through site visits conducted with a sample of participant facilities (n=11) by a LEED accredited engineer. The site visits addressed issues of measure installation and persistence, building schedules / control schemes / hours-of-operation, equipment specifications (HVAC, lighting, motors), and structure or equipment changes in the post-program participation period that would affect energy savings. On-site observations were used to inform an analysis of savings using weather-normalized pre- and post-retrofit billing histories.

The site visits confirmed that rebated measures had been installed and were operating. Evaluated gross savings, however, were found to be two-thirds of that claimed by the program. Seven of the eleven sites were found to be saving less energy than program estimates, three matched program records, and two were found to be saving more than claimed. The reduction in gross savings is primarily due to discrepancies in program assumptions and observed on-site hours of operation, motor loadings and efficiencies, and baseline loads. Program documentation was found to be incomplete for some projects, limiting the engineer's abilty to assess the nature of the discrepancy between program-claimed savings and those calculated using on-site information.

1.4 Evaluated Program Savings

Gross energy and demand savings were adjusted by the findings from the site visits, and then for estimates of free riders and spillover.

1.4.1 Free Riders and Spillover

Program attribution in the form of free ridership and program spillover was evaluated using a probabilistic determination methodology applied to participant survey responses. Free riders were found to represent 30% of program energy savings, and spillover was estimated at 12%. A survey of published research for comparable commercial retrofit programs found free ridership to vary from 8% to 43%. Spillover is less frequently measured in evaluation literature due to the inherent difficulties in its estimation.

1.4.2 Energy and Demand Savings

Evaluated energy and demand savings for the 2008-10 Retro BIP program are provided in Exhibit 1. After adjustments to gross savings, free riders and spillover, evaluated energy savings are equivalent to 44% of gross energy savings, and 55% of gross demand savings.

Exhibit 1: Net Program Savings (Run Rates)
FortisBC Retro BIP Program: 2008-10

	GW.h/yr Run Rate	MW Run Rate
Gross Program Savings	**6.944**	**1.084**
Unrealized Savings *	2.361	0.358
Adjusted Gross Savings	**4.583**	**0.726**
Free Riders (30%)	-1.375	-0.218
Spillover (12%)	0.550	0.087
Net Program Savings	**3.025**	**0.595**
Net Savings (%)	44%	55%

** Energy Savings * (1 – 0.66), Demand Savings * (1 - 0.67)*
Totals may not sum due to rounding

1.5 Recommendations

The following recommendations are organized under program design and targeting, program operations, monitoring, tracking and verification of program savings, and program evaluation.

1.5.1 Program Design and Targeting

1. **Review project and technology eligibility criteria -** The scope of projects and technologies eligible for Retro BIP incentives is too broad to effectively ensure the delivery of cost-effective energy and demand savings. FortisBC should review its list of technologies and projects eligible for program assistance to manage both free ridership and the risk associated with incentivising projects where local expertise to evaluate the legitimacy of the savings estimates is lacking.

2. **Minimize claims of un-incentivized energy savings -** A large part of the success of program designs like the Retro BIP program stem from the advice and interventions of its technical advisors. The evaluation identified several situations where energy savings were claimed by the program but incentives were not paid because the projects had paybacks of less than two years prior to incentivising. Given the difficultly in evaluating the legitimacy of these claims in an ex-post context, the practice of claiming savings without incentive payout should be discouraged. Any future claims to energy savings when rebates are not issued need to be fully documented to validate the legitimacy of the savings claims.

1.5.2 Monitoring, Tracking, and Verification of Program Savings

3. **Improve the comprehensiveness and consistency of documentation of Retro BIP participants** - It is recommended that documentation on Retro BIP participants include:

   - Customer identification, including account number
   - Written description of the project including, where possible, the type of building, floor area (ft^2) affected by the retrofit, specifics of equipment installed and replaced, and any other information that would impact the energy consumption or savings
   - An estimate of the pre-retrofit kWh consumption (where feasible), preferably as a printout of monthly data going back 2-3 years

- Payment request form
- A clear description of how savings were calculated, including copies of applicable savings calculations, third party reports, and spreadsheet printouts
- Dates and sources of information and assumptions

4. **Improve the accuracy of Retro BIP savings estimates** - Consistent with the variety of projects, building types, and building sizes represented in the Retro BIP program, there is a wide variety of savings calculations used, from consultants' reports to simple subtraction of loads. While it is difficult to estimate savings for many of these projects without the luxury of a thorough audit and detailed calculations, the accuracy of savings estimates for the Retro BIP program can be improved by:
   - *Comparing savings to existing consumption* – In particular, it is difficult to achieve savings in excess of 30% in a building and individual measures will rarely save more than 20% of consumption. While there will always be exceptions, comparing the estimated savings to the consumption will usually help avoid significant overestimation of savings.
   - *Comparing hours to bills* - If demand is billed, annual load factor for a building can be determined by dividing consumption by peak demand. Although hours of use for individual systems will vary, the building load factor can help guide the choice of operating hours in savings calculations. A list of typical operating hours for different types of buildings could also be prepared.
   - *Considering load factor* - Many calculations did not consider existing load factor or motor efficiency when converting hp into kW. Most motors are not fully loaded, with constant duty motors typically operating in the 80% range. Motor efficiency should also be considered (nominally 90% if not known).
   - *Heating/cooling savings* - These calculations were usually done with a standard spreadsheet. Although this sometimes was based on the correct type of building, in most cases it was for office space. The spreadsheet should be updated with more appropriate building types.

5. **Apply greater scrutiny to the choice of baseline used to estimate savings** – It is generally accepted in commercial retrofit programs that baseline is usually the equipment that is being replaced. However, quite a few Retro BIP projects were for equipment that was very expensive compared to the energy savings. In these cases the baseline should be current practice, not the existing equipment.
6. ***Review the procedures used to set the parameters for depreciation, comfort, and process improvements.*** The evaluation found several cases where the project cost was decreased by an allowance for depreciation, comfort, and process improvement of more than 50%. These assessments are extremely subjective and appear to have been done to meet TRC requirements. Arguably, cases where the cost is reduced by more than 50% suggest that energy savings did not play a significant role in the decision to replace, and the baseline energy use and equipment cost should be based on current practice not what was replaced.
7. ***An estimate of free ridership should be mandatory -*** Provisions for free riders should be mandatory for all new PowerSense business cases. Free rider estimates should be periodically reviewed and updated. In the case of future Retro BIP program business cases, a net-to-gross ratio of 75% is reasonable and within industry norms.

Program Evaluation

8. FortisBC should continue program market and impact evaluations at regular intervals (e.g., every three years) and allocate sufficient resources for completing these evaluations.

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Attachment 7.1

REFER TO LIVE SPREADSHEET MODEL

Provided in electronic format only

(accessible by opening the Attachments Tab in Adobe)