

FortisBC Inc.

Semi-Annual DSM Report for the Year Ended December 31, 2012



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REPORT OBJECTIVE

This report provides highlights of FortisBC Inc.'s (FortisBC or the Company) Demand Side Management (DSM) programs for the year ended December 31, 2012. The report reviews the progress of FortisBC's PowerSense program in meeting the approved DSM Plan and incenting FortisBC's customers to improve their energy efficiency. The report also provides a summary of the progress on integration and collaboration of its DSM programs with other BC Utilities¹. A summary of PowerSense program activities in 2012 is also presented, with a comparison of actual energy savings and costs to Plan, where applicable, and provides a statement of financial results including benefit/cost ratios. Finally, a summary of historical FortisBC DSM costs and energy savings for the past five years is included in Appendix B.

OVERVIEW OF RESULTS FOR THE YEAR ENDED DECEMBER 31, 2012

Energy efficiency savings for the year ended December 31, 2012 were 31.6 GWh, or 99 percent of the 32.0 GWh Plan. The commercial sector led performance, achieving more than 17 GWh of savings. Company costs incurred were \$7,300,000 or 94 percent of the \$7,731,000 Plan. Adding customer costs to the Company's program costs yields a Total Resource Cost (TRC) of \$12,833,000 with an overall TRC benefit/cost ratio of 1.6. The method used to determine benefits is provided in the Financial Results section.

OVERVIEW OF PROGRAM ACTIVITIES

The four priorities PowerSense identified in early 2012 continued through to the end of the year. The priorities were: 1) existing program process improvements; 2) new program development; 3) continued partnership and program delivery collaboration with other BC utilities and municipal, provincial and federal governmental agencies; and 4) integration planning with FortisBC Energy Utilities' (FEU) Energy Efficiency and Conservation (EEC) department. The following section provides a brief overview of each priority and is concluded with a summary of the programs offered by PowerSense in 2012.

1. PROGRAM PROCESS IMPROVEMENT

Due to changing circumstances and expanded budgets, many programs required fine-tuning to improve efficiency and effectiveness. Therefore, process improvement was a focus for the whole of 2012. This included refining marketing strategies and improving marketing materials, as well as reinvigorating a number of major programs.

The FortisBC PowerSense brand was reaffirmed for use for both gas and electricity programs in the Shared Service Territory² (SST) and the PowerSense website redesign was started.

¹ British Columbia Utilities Commission (BCUC or the Commission) Order G-110-12, Directive 51.

² The Shared Service Territory (SST) is where the service territory of FortisBC Energy Utilities' (comprised of FortisBC Energy Inc., FortisBC Energy Vancouver Island Inc. and FortisBC Energy Whistler Inc.) and the service territory of FortisBC Inc. overlap.



PowerSense also partnered with FEU's EEC to reach and actively engage contractors and trade organizations to help disseminate energy efficiency programs and PowerSense messaging.

Emphasis was placed on the commercial and industrial sector custom offer programs to improve monitoring, verification and evaluation, legal documentation and program structure to ensure that energy savings can be documented and verified consistently.

PowerSense received approval from the British Columbia Utilities Commission (BCUC or the Commission) in Order G-110-12 to procure an end-to-end DSM business process management platform. Business case scenarios and process mapping were undertaken to define the requirements for the new system.

2. NEW PROGRAMS

A number of new programs that broadened PowerSense's reach and product offerings were introduced in 2012. In the early part of the year, programs including a heat pump tune-up program, known as the TLC Heat Pump program, Irrigation Pumping, and Low-Income Lighting Direct Installation were introduced. The Reduce Your Use program was launched in mid-year to coincide with the introduction of the inclining block Residential Conservation Rate (RCR).

The Product Rebate Program and its companion On-Line Energy Assessment tool were introduced in the fall. The program was designed to help small to medium size businesses determine which energy efficiency improvements would suit their business and to provide them with easy access to a large set of prescribed rebates. Customers access the program via a custom-built online application form, which assists in addressing the issue of customer attribution. The online format provides a cost-effective means of reaching a more difficult to reach customer segment. The Product Rebate Program replaces the Wholesale Lighting Program, which was successful but had issues with customer attribution.

The On-Bill Finance pilot project, which is marketed as the Residential Energy Efficiency Loan Program, was mandated by the provincial government and provides loans of up to \$10,000 to residential customers in the South Okanagan to make energy efficiency improvements to their homes. The loans are to be repaid on the customers' electricity bills over the next 10 years. This pilot program was launched in the fall and by the end of 2012 none of the customers who applied had successfully met the eligibility requirements. The stringency of the eligibility requirements will be reviewed as part of the assessment of the pilot project.

3. COLLABORATION

The successful collaboration with the British Columbia Ministry of Energy, Mines and Natural Gas' (the Ministry) LiveSmart BC residential and commercial programs continued. The small business lighting installation program FLIP (FortisBC/LiveSmart BC Lighting Incentive Program) garnered a large amount of savings for the commercial sector, as did the LiveSmart BC residential program for the residential sector. As the LiveSmart BC program structure and funding is changing for 2013, PowerSense worked closely with the Ministry, BC Hydro and EEC staff in 2012 to support and redesign the program.



PowerSense also worked with several municipal governments to conduct pilot projects using high-impact marketing strategies to encourage residents and small businesses to make energy efficiency improvements. The Rossland Energy Diet and Nelson Hydro Eco-Save programs were so successful that Natural Resources Canada (NRCan) and Columbia Basin Trust provided significant funding to test program scalability in 2013. PowerSense won the Climate and Energy Action Award for Public Sector Collaboration for the Rossland Energy Diet project.

PowerSense staff also provided expertise to the Cities of Kelowna and Penticton to help develop their Greenhouse Gas Emissions Reduction Plans. Similarly, they worked with First Nations in the region to secure extra funding and rebates and made design recommendations for efficiency improvement projects. An example of this collaboration is the Penticton Indian Band's unique super-efficient housing project, with seven EnerGuide 90³ rated houses and one Passivhaus⁴ under construction.

4. INTEGRATION

PowerSense worked together with the FEU EEC team to design a number of new dual-fuel programs in the SST, which were launched in the later part of 2012, including:

- The above-mentioned Product Rebate Program, which provides online access to prescriptive rebates for a range of electric and gas energy efficiency measures including lighting, pumps and motors, space heating and cooling, and hot water systems. The program will address the often underserved small to medium commercial sector and incorporates EEC's Commercial Boiler and Water Heater programs;
- A combined Contractor program to better communicate with the contractors that provide and install energy efficiency measures in the SST. Direct marketing to these important stakeholders will also help PowerSense reach more customers at the time when they are making buying decisions;
- The above-mentioned On-Bill Financing pilot project in the South Okanagan for lowinterest loans up to \$10,000 for both gas and electricity customers to install Energy Efficiency (EE) improvements in their homes; and
- The EEC and PowerSense New Home program measures were combined into a joint application process to serve gas and electric customers in the SST.

These efforts added to the list of existing jointly marketed programs: the Tap by Tap program (water-savings measures), Energy Star clothes washer rebate program, and Energy Saving Kits for low-income households. PowerSense and EEC also collaborated and shared costs on print materials, educational tools, community outreach and advertising campaigns in the SST. A cost-

³ EnerGuide is an energy efficiency rating system for houses, where 0 is least efficient and 100 is most efficient, requiring no purchased energy. EnerGuide - http://oee.nrcan.gc.ca/residential/personal/16352

⁴ Passivhaus is an energy efficiency standard for buildings that incorporates passive heating and cooling in the building design. Canada passive house website - http://www.passivehouse.ca/



sharing principles agreement was developed to ensure the appropriate allocation of costs for joint DSM projects⁵.

POWERSENSE PROGRAMS OFFERED IN 2012

The following tables summarize the PowerSense program offerings and indicate program status and progress of integration with FEU's EEC programs.

Program and Measures	Status	Integrated with FortisBC Energy Utilities for combined offer
Energy Star Appliances	Ongoing	Yes ⁶ (clothes washers)
Energy Star Electronics	Ongoing	No (electricity only)
Energy Star Retail Lighting Rebate	Ongoing	No (electricity only)
Heat Pump (Air Source and Geo-Exchange)	Ongoing	No (electricity only)
TLC Heat Pump Maintenance	Enhanced	No (electricity only)
New Home Performance EnerGuide Ratings 80/85 Prescriptive Lighting Appliances Insulation Heat pumps NEW: Fireplaces (gas) NEW: Hot water (gas)	Ongoing	In progress
Home Improvement (Retro-fit) • Windows and doors • Lighting • Appliances • Insulation • Heat pumps • Heat pump loan option • NEW: Fireplaces (gas) • NEW: Hot water (gas)	Ongoing	In progress

Table 1 - Residential Programs 2012

⁵ For joint non-program specific projects, a customer base ratio is used to allocate costs depending on whether the project applies to the overall FEU service region (including FortisBC's service area) or to the SST only. For programs that are customer specific, the cost allocation is determined by number of participants and/or respective electricity and natural gas savings realized.

⁶ Based on fuel source of hot water tank.



Program and Measures	Status	Integrated with FortisBC Energy Utilities for combined offer
LiveSmart BC (Retro-fit) • Windows and doors		
Insulation	Ongoing	Yes
Heat pumps Hot water		
Reduce Your Use (energy assessments)	New	No (electricity only)
On-Bill Financing	New	Yes
Low Income – Direct Installation Lighting	Ongoing	No (electricity only)
Low Income – Energy Savings Kits	Ongoing	In progress
Rental and Low-Income Housing	In-Design	Yes
Supporting Initiatives	Ongoing	Yes (where appropriate)
Contractor program	New	Yes (where appropriate)
WaterSavers (Tap by Tap)	Enhanced	Yes

Table 2 - Commercial and Industrial Programs 2012

Program and Measures	Status	Integrated with FortisBC Energy Utilities for combined offer
Product Rebate Program • Lighting • Pumps and fans • Compressors • Refrigeration • HVAC • Boilers (gas) • Water Heaters (gas)	New	Yes
Building Improvement – New	Ongoing	No
Building Improvement – Retro-fit	Ongoing	No
Building Optimization	Ongoing	In progress
Partners in Energy	Ongoing	No
Energy Efficiency Studies	Ongoing	In progress
Industrial Efficiency	Ongoing	No
Irrigation Pumping	New	No (electricity only)
Green Motors (motor rewinds)	Ongoing	No (electricity only)

ENERGY SAVINGS BY SECTOR

The energy savings that PowerSense achieved in the year ended December 31, 2012, are shown in the table below.

SECTOR	Plan	Actual	% of Plan
SECTOR	GW	/h	Achieved
Residential	16.1	12.8	79%
Commercial	13.4	17.9	134%
Industrial	2.5	0.9	38%
Total Savings (GWh)	32.0	31.6	99%

Table 3 - Lifergy Savings by Sector	Table 3	3 -	Energy	Savings	by	Sector
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Note: Minor differences due to rounding.

Overall PowerSense was just under the Plan goal of 32.0 GWh savings. Commercial sector energy savings were above Plan at 134 percent. Residential and Industrial sector energy savings were under Plan at 79 percent and 38 percent respectively. These results are discussed in more detail in the following sections.

DETAIL OF ENERGY SAVINGS

The following tables provide details on the DSM energy savings in each sector, including DSM activities in the service territories of the Municipal Wholesale customers.

	Plan	Actual	% of Plan
RESIDENTIAL	GW	Achieved	
Home Improvement Program	8.3	5.9	71%
Low Income	1.8	1.1	59%
Residential Lighting	2.5	2.6	103%
Heat Pumps	3.4	2.2	64%
New Home Program	0.1	1.0	1155%
Total Savings (GWh)	16.1	12.8	79%

 Table 4 - Residential Energy Savings

Note: Differences due to rounding.

In the year ended December 31, 2012, the energy saving results from Residential programs were 79 percent of Plan. The New Home and Residential Lighting programs exceeded Plan. The Heat Pump, Home Improvement and Low Income programs fell short of forecast. Customer participation in the New Home program continues to exceed plan expectations. The point-of-purchase incentive campaign in March-April and October-November were effective and contributed to the success in Residential Lighting.

The LiveSmart BC collaboration resulted in 2.1 GWh of retrofit energy savings, which are recorded in the Heat Pump and Home Improvement (HIP) programs. Decreased customer



uptake of the LiveSmart BC program was likely due in part to the cancellation of the federal ecoEnergy residential retrofit incentive program.

In 2012, the Low Income program distributed approximately 950 Energy Saving Kits (ESKs) and concluded the direct install lighting program in the Okanagan. By year end, auditing for the Kootenay phase of the direct install lighting program was well under way, with installations to be completed in the following year.

COMMERCIAL	Plan	Actual	% of Plan
COMMERCIAL	GW	/h	Achieved
Lighting	7.4	14.3	193%
Building and Process Improvement	3.4	2.0	57%
Water Handling and Infrastructure	2.6	1.7	65%
Total Savings (GWh)	13.4	17.9	134%

Table 5 - Commercial Energy Savings

Note: Minor differences due to rounding.

The Commercial sector recorded savings of 17.9 GWh, or 134 percent of Plan. The majority of these savings were realized through the Commercial lighting programs, which include both "at the counter" product rebates and custom lighting retrofits, such as those installed at a large department store, producing 0.3 GWh of savings. Another large component of the Commercial lighting programs was the FLIP direct installation program, a collaborative effort with the LiveSmart BC Business program. FLIP continued to be very popular in 2012 and contributed 3.7 GWh of savings.

Examples of Building and Process Improvement (BIP) projects include a district heating system at a post-secondary educational institution in the Okanagan (0.6 GWh savings) and insulation and heating system upgrades at a community recreation complex in the Kootenays (0.2 GWh savings).

The second half of a large water infrastructure project with an Okanagan municipality was concluded in 2012, which contributed 1.5 GWh of the savings in the Water Handling and Infrastructure program. The Irrigation Pumping program was launched in June and no savings were realized in 2012.

	Plan	Actual	% of Plan
INDUSTRIAL	GWI	Achieved	
Industrial Efficiency	2.3	0.9	41%
Integrated EMIS	0.2	0.0	0%
Total Savings (GWh)	2.5	0.9	38%

Table 6 - Industrial Energy Savings

Note: Minor differences due to rounding.

The Industrial Programs achieved savings of 0.9 GWh, or 38 percent of the 2.5 GWh Plan. Although a number of industrial customers started major retro-fit projects in 2012, few of them were completed in 2012. As a result, the industrial sector's savings were below Plan. An example of an Industrial Efficiency project from 2012 is the installation of variable speed drives on process equipment at a Kootenay lumber mill resulting in 0.3 GWh of energy savings.

An example of an industrial project that was initiated in 2012 involves collaboration between EEC and PowerSense to co-fund an energy assessment for a sawmill in the South Okanagan to determine energy savings opportunities. This project will also involve the use of an Energy Management Information System (EMIS) that will enable the customer to manage both electricity and gas use.

The table below disaggregates the Wholesale DSM savings, which are included in the sector tables above.

WHOLESALE ACTIVITY	GWh	MW	% of GWh*
Kelowna	3.4	0.5	60%
Penticton	0.8	0.1	15%
Summerland	0.5	0.2	10%
Grand Forks	0.1	0.02	3%
Nelson	0.8	0.1	13%
Total Savings (Wholesale)	5.6	1.0	100%

 Table 7 - Wholesale Energy Savings by Municipality

*Of savings attributable to the Wholesale class

Note: Minor differences due to rounding

The total Wholesale energy savings, which were acquired within the service areas of the five municipal electric utilities served by FortisBC, were 5.6 GWh and 1.0 MW in 2012. The largest DSM savings results occurred within Kelowna and Penticton municipal utility service areas (the municipalities with the largest number of customers).



PROGRAM COSTS BY SECTOR

The table below presents the actual costs incurred in the year ended December 31, 2012, compared to the approved Plan. The percent of plan savings achieved is shown in the table for comparison purposes.

	Plan	Actual	% of Plan	% of Plan
SECTOR/COMPONENT	(\$000s)		Costs	Savings
Residential	3,717	2,564	69%	79%
Commercial	2,199	3,020	137%	134%
Industrial	350	173	49%	38%
Supporting Initiatives	725	816	113%	-
Monitoring & Evaluation	303	303	100%	-
Planning & Admin	437	425	97%	-
Total	7,731	7,300	94%	99%

Table 8 - Costs by Sector

Note: Minor differences due to rounding.

Costs amounted to \$7,300,000, or 94 percent of the 2012 Plan. A breakdown of utility program costs per sector or program component follows. Appendix A contains an additional breakdown of total program costs, including the customer portion of project costs.

DETAIL OF COSTS

The following tables provide details on the DSM program costs for each sector and component in the PowerSense portfolio.

DESIDENTIAL	Plan	Actual	% of Plan
RESIDENTIAL	(\$00	Achieved	
Home Improvement Program	1,966	969	49%
Low Income	677	308	45%
Residential Lighting	328	337	103%
Heat Pumps	703	636	90%
New Home Program	43	314	731%
Total	3,717	2,564	69%

Table 9 - Residential Costs

Note: Minor differences due to rounding.



The utility cost of Residential programs was \$2,564,000, or 69 percent of Plan for 2012. The New Home program continues to be very successful and while the costs are over budget, they are commensurate with savings. Low uptake of energy efficiency renovations in existing homes contributed to expenditures below plan for the Home Improvement program. The Low Income program was also underspent, partly due to the fact that installations for the Low Income Direct Install Lighting program in the Kootenays were delayed into the beginning of 2013.

COMMERCIAL	Plan	Actual	% of Plan
	(\$00	Achieved	
Lighting	1,157	2,152	186%
Building and Process Improvement	659	612	93%
Water Handling and Infrastructure	383	255	67%
Total	2,199	3,020	137%

Table	10 -	Commercial	Costs
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Note: Minor differences due to rounding.

Commercial sector costs in 2012 amounted to \$3,020,000 or 137 percent of Plan. While this is over budget, it is commensurate with the savings achieved in the Commercial sector, which were 134 percent of Plan. The largest cost component of Commercial programs was the Lighting program, which includes incentives paid through the LiveSmart BC FLIP collaboration. Incentives paid to Commercial Lighting program participants in 2012 amounted to \$1,786,000 compared to \$794,000 Plan, a variance of \$992,000. The expenditures for Water Handling and Infrastructure are under budget, partially because it incorporates the Irrigation program. PowerSense launched the Irrigation program in June, but had low uptake from the irrigation rate class. In 2013 the program will be assessed to determine causes of low participation and the steps to be taken to improve it.

	Plan	Plan Actual			
INDUSTRIAL	(\$00	Achieved			
Industrial Efficiency	323	163	51%		
Integrated EMIS	27	10	36%		
Total	350	173	49%		

Fable 11 ·	Industrial	Costs
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Note: Minor differences due to rounding.

Industrial sector costs incurred by the Company were \$173,000 for the period, or 49 percent of Plan. The Industrial sector is characterized by large projects that generally occur less frequently than in other sectors. A couple of large projects were initiated in 2012 but were not completed by year end and thus, FortisBC incentive costs will not be incurred until project completion. Energy Management Information System (EMIS) software is a long-term program with up-front costs and savings that will be realized later in the process. In 2012 the Company committed to co-funding the EMIS software at an Okanagan lumber mill.



Portfolio level costs, which are not specifically associated with individual programs, include the following components: Supporting Initiatives, Monitoring and Evaluation, and Planning and Administration. These costs are summarized in the table below.

COMPONENTS	Plan	Actual	% of Plan		
COMPONENTS	(\$0	Achieved			
Supporting Initiatives*	725	816	113%		
Monitoring & Evaluation	303	303	100%		
Planning & Administration	437	425	97%		
Total	1,465	1,544	105%		

Table 12 - Portfolio Costs by Component

*Including Conservation Culture Note: Minor differences due to rounding

The Supporting Initiative costs for 2012 were \$816,000 or 113 percent of the \$725,000 Plan. The Conservation Culture costs included in Supporting Initiatives were \$360,000. Supporting Initiatives and Conservation Culture spending continues to drive community outreach and direct customer communication, which is a strong component of PowerSense programming. The three community ambassadors attended more than 200 community events and distributed clotheslines at over 80 locations. Whenever possible, outreach and community event sponsorship was done in collaboration with EEC.

The Earth Hour and Caught Hanging Out (clotheslines) promotions were expanded for 2012, and were once again well received. As part of Earth Hour, customers across the FortisBC service area sent in approximately 6,000 pledges, each committing to turn their lights off for one hour. This was more than triple the number of participants from 2011. The Caught Hanging Out campaign won the Natural Resources Canada ENERGY STAR Regional Utility of the Year award.

The Planning and Evaluation budget is separated into two main components: Monitoring and Evaluation (M&E), and Planning and Administration. M&E was on budget with costs of \$303,000, or 100 percent of Plan. The Planning and Administration expenditure was \$425,000, or 97% of Plan.

In Appendix A, Program Development costs are further broken out from the Planning and Administration costs.



FINANCIAL RESULTS

This section reviews the financial and benefit cost test results for 2012 and includes information about how the benefits were calculated for the Total Resource Cost test (TRC) and for the Modified Total Resource Cost test (MTRC)⁷.

The table below presents the financial and benefit cost tests by program. It also includes the Planning and Evaluation costs, which are allocated to the programs by savings achieved.

		Utility	Plannin	g & Evaluatio	on Costs	Customer	Total	Benefits	Total R	esource
Program	Program	Program	Planning	Monitoring	Program	Incurred	Resource	less	Benefit	t/Cost
Flogram	Benefits	Costs	& Admin.	& Eval.	Dev.	Costs	Costs	Costs	Rat	tio
				(\$00)0s)				TRC	MTRC
Residential										
Home Improvement	4,961	969	66	57	13	1,819	2,924	2,037	1.7	1.7*
Low Income	376	308	12	10	2	42	374	2	1.0	1.3**
Residential Lighting	1,063	337	29	25	6	181	577	485	1.8	1.8
Heat Pumps	1,774	636	24	21	5	1,050	1,735	39	1.0	1.5*
New Home Program	1,121	314	12	10	2	441	780	341	1.4	1.4
Residential Total	9,295	2,564	143	122	29	3,532	6,390	2,905	1.5	1.6
Commercial										
Lighting	7,737	2,152	159	137	32	1,044	3,525	4,212	2.2	2.2
Building and Process Improvement	1,689	612	22	19	4	607	1,264	425	1.3	1.3
Water Handling Infrastructure	1,433	255	19	16	4	261	555	877	2.6	2.6
Commercial Total	10,858	3,020	200	172	41	1,912	5,344	5,514	2.0	2.0
Industrial										
Industrial Efficiency	541	163	10	9	2	89	274	267	2.0	2.0
Integrated EMIS	-	10	-	-	-	-	10	(10)	-	- *
Industrial Total	541	173	10	9	2	89	284	258	1.9	1.9
Supporting Initiatives		816					816		-	-
Total	20,694	6,572	353	303	72	5,533	12,833	7,861	1.6	1.7

Table 13 - Financial Results for Year Ended December 31, 2012 by Program

Note: Minor differences due to rounding.

* MTRC benefits used with some of the program measures.

** Low Income benefits increased by 30 percent.

An overall total resource benefit/cost ratio of 1.6 was achieved in 2012. The benefit/cost ratios for the individual programs are also detailed in the table above. The Residential sector program performance resulted in a benefit/cost ratio of 1.5 and the Commercial sector achieved a benefit/cost ratio of 2.0 and the Industrial sector benefit/cost ratio was 1.9.

The Low Income program attained a benefit/cost ratio of 1.0, and with the 30 percent benefits lift as per the DSM Regulation, s4(2)(b), the benefit/cost ratio increased to 1.3.

Program benefits are calculated using the present value of avoided power purchase costs. For the TRC test, the present value of avoided power purchase costs is based on the long-term avoided power purchase cost⁸ over the measure lifespan, plus a deferred construction expenditure factor. Total resource costs shown are a total of Company costs and customer

⁷ As described in the Demand Side Management Regulation (326/2008 as amended in December 2011) of the *Utilities Commission Act.*

⁸ As per the 2012-2013 Long Term Demand Side Management (DSM) Plan, approved by BCUC Order G-110-12, the long-term avoided power purchase cost is \$84.94/MWh.



costs. The customer portion of costs are the incremental costs of new construction measures and the energy efficiency "portion" of retrofit measure costs.

The estimated modified total resource benefit/cost ratio is also shown in the table above. The benefits used in the MTRC were estimated using a long-term avoided power purchase $cost^9$ plus a fifteen percent adder for non-energy benefits (NEB), consistent with the Company's application of the DSM Regulation in its 2012-13 DSM Plan filed as part of the 2012 – 2013 Revenue Requirements Application and approved by Order G-110-12¹⁰. The MTRC benefits were estimated based on the following measures that were subject to the MTRC in the 2012 – 2013 RRA:

- Residential:
 - Building Envelope windows;
 - Heat Pumps geo exchange, air source conversion, and ductless; and
 - Appliances freezers.
- Industrial:
 - Integrated EMIS.

The MTRC benefits estimation does not include the commercial lighting – controls measure, as it was not feasible to separate it from the other commercial lighting measures in the program results.

The MTRC does not differ substantially from the TRC results. Overall, the benefit/cost ratio increased from 1.6 to 1.7 with the MTRC. The Residential benefit/cost ratio increased from 1.5 to 1.6. Most notably, the heat pump benefit/cost ratio increased from 1.0 to 1.5 with the use of the MTRC. Commercial and Industrial benefit/cost ratios were unaffected by incorporation of the MTRC.

The Company's DSM expenditure related to the measures that are subject to the MTRC was estimated to be \$692,000 or 9.5 percent of total DSM expenditure, which is within the regulated MTRC impact cap.

⁹ As per the 2012-2013 Long Term Demand Side Management (DSM) Plan, approved by BCUC Order G-110-12, the long-term avoided power purchase cost is \$111.96/MWh, for BC "clean" new resources.

¹⁰ FortisBC 2012-2013 Revenue Requirements Application, Exhibit B-23, Oral Hearing Undertakings from March 8, 2012, Table 31-1.



APPENDIX A - DSM SUMMARY REPORT IN BCUC FORMAT

Table 14 - FortisBC Demand Side Management Summary Report for Year Ended December 31, 2012

U		Utility Program Costs			Planning and Evaluation		Total	Customer	Total				Benefit/Cost Ratios			
Sector/Program	Direct	Direct	Program	Planning	Monitoring	Program	Utility	Incurred	Resource	Program	Energy	Total	Modified Total	Rate	Uility	Levelised
	Incentives	Information	Labour	& Admin.	& Eval.	Dev.	Costs	Cost	Cost	Benefits*	Savings	Resource	Resource	Impact	Cost	Cost
					(\$000)s)					MWh					¢/kWh
Residential																
Home Improvements Program	696	35	238	66	57	13	1,105	1,819	2,924	4,961	5,903	1.7	1.7	0.7	4.5	5.4
Low Income	199	10	98	12	10	2	332	42	374	376	1,054	1.0	1.3	0.5	1.1	8.9
Residential Lighting	225	41	71	29	25	6	397	181	577	1,063	2,599	1.8	1.8	0.7	2.7	5.6
Heat Pumps	450	38	148	24	21	5	686	1,050	1,735	1,774	2,161	1.0	1.5	0.6	2.6	8.9
New Home Program	217	18	79	12	10	2	338	441	780	1,121	1,040	1.4	1.4	0.7	3.3	6.7
Residential Total	1,787	144	633	143	122	29	2,858	3,532	6,390	9,295	12,757	1.5	1.6	0.7	3.3	6.4
Commercial																
Lighting	1,786	47	320	159	137	32	2,481	1,044	3,525	7,737	14,256	2.2	2.2	0.6	3.1	3.3
Building and Process Improvement	393	78	141	22	19	4	657	607	1,264	1,689	1,959	1.3	1.3	0.7	2.6	6.6
Water Handling Infrastructure	186	6	64	19	16	4	294	261	555	1,433	1,677	2.6	2.6	0.8	4.9	3.4
Commercial Total	2,365	131	524	200	172	41	3,432	1,912	5,344	10,858	17,892	2.0	2.0	0.7	3.2	3.7
Industrial																
Industrial Efficiency	102	4	57	10	9	2	185	89	274	541	937	2.0	2.0	0.8	2.9	4.4
Integrated EMIS	-	4	5	-	-	-	10	-	10	-	-	0.0	0.0	0.0	0.0	-
Industrial Total	102	8	63	10	9	2	195	89	284	541	937	1.9	1.9	0.8	2.8	4.5
Supporting Initiatives	-	515	301	-	-	-	816	-	816			-	-	-		-
TOTAL	4,254	797	1,522	353	303	72	7,300	5,533	12,833	20,694	31,586	1.6	1.7	0.7	2.8	5.1

Note: Minor differences due to rounding

* Benefits calculated using the long-term avoided power purchase cost of \$84.94/MWh.



APPENDIX B - HISTORICAL SUMMARY OF FORTISBC'S DSM COSTS AND ENERGY SAVINGS

Table 15 - Historical FortisBC DSM Costs and Energy Savings 2007- 2008

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
					2007 (Act	tual)				2008 (Actual)					
		Sp	end (\$000)s)	Energy	Savings	(MWh)	TRC ³	Sp	Spend (\$000s) Energy Savings (MWh) TR					TRC ³
		Planned	Actual	Variance	Planned	Actual	Variance	(B/C)	Planned	Actual	Variance	Planned	Actual	Variance	(B/C)
1	Residential														
2	Home Improvements	98	78	20	500	500	-	1.5	135	62	73	385	331	(54)	0.8
3	Building Envelope ¹														
4	Heat Pumps	513	651	(138)	6,200	9,600	3,400	1.6	446	682	(236)	4,889	8,444	3,555	1.4
5	Residential Lighting	170	116	54	2,200	2,700	500	5.6	156	151	5	1,796	2,562	766	4.1
6	New Home Program	424	458	(34)	1,700	2,500	800	2.3	286	340	(54)	1,332	1,596	265	2.8
7	Appliances ¹														
8	Electronics ¹														
9	Water Heating ¹														
10	Low Income ¹														
11	Behavioural ¹														
12	Residential Total	1,205	1,303	(98)	10,600	15,300	4,700	1.9	1,023	1,236	(213)	8,401	12,933	4,531	1.7
13	Commercial														
14	Lighting	257	240	17	3,000	5,500	2,500	2.8	257	375	(118)	3,000	5,960	2,960	2.4
15	Building and Process Improvements	469	499	(30)	6,200	4,900	(1,300)	1.5	497	506	(9)	6,103	5,081	(1,022)	1.6
16	Computers														
17	Municipal (Water Handling) ²														
18	Irrigation ²														
19	Commercial Total	726	739	(13)	9,200	10,400	1,200	2.0	754	881	(127)	9,103	11,042	1,939	1.9
20	Industrial														
21	Compressed Air	37	30	7	700	400	(300)	1.0	58	22	36	700	210	(490)	1.2
23	EMIS														
22	Industrial Efficiencies	131	153	(22)	1,300	1,800	500	1.6	142	124	18	1,285	3,083	1,798	2.3
24	Industrial Total	168	183	(15)	2,000	2,200	200	1.5	200	147	53	1,985	3,294	1,309	2.3
25	Programs Total	2,099	2,225	(126)	21,800	27,900	6,100	-	1,977	2,264	(287)	19,489	27,268	7,779	-
26	Supporting Initiatives	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	Planning & Evaluation	375	324	51	-	-	-	-	378	419	(41)	-	-	-	-
28	Total	2,474	2,549	(75)	21,800	27,900	6,100	1.9	2,355	2,683	(328)	19,489	27,268	7,779	1.8

¹ These programs were included in Home Improvements program

² Water Treatment and Wastewater Handling infrastructure were part of Building and Process Improvement

³ Benefits calculated using RS3808 applicable at the time



		1	2	3	4	5	6	7	8	9	10	11	12	13	14
					2009 (Act	tual)			2010 (Actual)						
		Sp	end (\$000)s)	Energy	Savings (MWh)	TRC ³	C ³ Spend (\$000s)			Energy	Savings (MWh)	TRC ³
		Planned	Actual	Variance	Planned	Actual	Variance	(B/C)	Planned	Actual	Variance	Planned	Actual	Variance	(B/C)
1	Residential														
2	Home Improvements	273	145	128	1,024	1,032	8	1.4	294	434	(140)	953	4,948	3,995	3.1
3	Building Envelope1														
4	Heat Pumps	515	677	(162)	5,642	3,188	(2,454)	0.7	624	749	(125)	6,377	3,239	(3,138)	1.2
5	Residential Lighting	263	306	(44)	2,822	3,349	526	2.8	243	278	(35)	2,383	2,589	206	2.4
6	New Home Program	341	496	(155)	1,216	1,735	518	2.2	254	247	7	1,392	477	(915)	1.1
7	Appliances ¹														
8	Electronics1														
9	Water Heating ¹														
10	Low Income ¹								100	131	(31)	1,000	385	615	0.7
11	Behavioural ¹														
12	Residential Total	1,391	1,624	(233)	10,705	9,304	(1,401)	1.3	1,515	1,838	(323)	12,105	11,638	764	1.9
13	Commercial														
14	Lighting	724	422	302	5,505	7,638	2,133	3.0	722	526	196	5,304	7,971	2,667	3.5
15	Building and Process Improvements	563	639	(75)	6,095	8,713	2,618	1.8	658	597	61	6,751	6,685	(67)	1.5
16	Computers														
17	Municipal (Water Handling) ²														
18	Irrigation ²														
19	Commercial Total	1,287	1,060	227	11,600	16,351	4,751	2.2	1,380	1,123	257	12,055	14,655	2,600	2.1
20	Industrial														
21	Compressed Air	71	41	30	811	398	(413)	0.9	87	25	62	938	114	(823)	0.7
23	EMIS														
22	Industrial Efficiencies	274	195	79	2,189	2,305	116	1.6	302	216	86	2,412	2,853	441	2.1
24	Industrial Total	345	236	109	3,000	2,703	(297)	1.5	389	241	148	3,350	2,967	(383)	2.0
25	Programs Total	3,023	2,920	103	25,305	28,358	3,053	-	3,284	3,203	81	27,510	29,261	2,981	2.1
26	Supporting Initiatives	141	141	0	-	-	-	-	148	155	(7)	-	-	-	
27	Planning & Evaluation	503	402	101	-	-	-	-	519	354	165	-	-	-	-
28	Total	3,667	3,464	204	25,305	28,358	3,053	1.7	3,951	3,712	239	27,510	29,261	2,981	2.0

Table 16 - Historical FortisBC DSM Costs and Energy Savings 2009-2010

¹ These programs were included in Home Improvements program

² Water Treatment and Wastewater Handling infrastructure were part of Building and Process Improvement

³ Benefits calculated using RS3808 applicable at the time



		1	2	3	4	5	6	7
					2011 (Act	tual)		
								TRC ³
		Planned	Actual	Variance	Planned	Actual	Variance	(B/C)
1	Residential							
2	Home Improvements	2,145	479	1,666	8,960	3,692	(5,268)	1.6
3	Building Envelope ¹							
4	Heat Pumps	694	532	162	3,397	2,257	(1,140)	1.0
5	Residential Lighting	438	239	199	3,420	3,308	(112)	2.2
6	New Home Program	54	205	(151)	105	689	584	1.0
7	Appliances ¹							
8	Electronics ¹							
9	Water Heating ¹							
10	Low Income	305	245	60	540	1,447	(907)	1.0
11	Behavioural ¹							
12	Residential Total	3,636	1,700	1,936	16,422	11,393	(6,843)	1.3
13	Commercial							
14	Lighting	1,114	1,995	(881)	7,370	20,577	13,207	2.3
15	Building and Process Improvements	572	606	(34)	3,010	1,386	(1,624)	0.7
16	Computers							
17	Municipal (Water Handling)	432	231	201	3,560	2,199	(1,361)	1.6
18	Irrigation ²							
19	Commercial Total	2,118	2,832	(714)	13,940	24,162	10,222	1.9
20	Industrial							
21	Compressed Air							
23	EMIS	10	9	1	80	-	(80)	-
22	Industrial Efficiencies	603	128	475	9,280	794	(8,486)	2.5
24	Industrial Total	613	137	476	9,360	794	(8,566)	2.4
25	Programs Total	6,367	4,669	1,698	39,722	36,349	(5,187)	1.8
26	Supporting Initiatives	725	658	67	-	-	-	-
27	Planning & Evaluation	750	590	160	-	-	-	-
28	Total	7,842	5,918	1,924	39,722	36,349	(5,187)	1.6

Table 17 - Historical FortisBC DSM Costs and Energy Savings 2011

¹ These programs were included in Home Improvements program

² Irrigation was included in Municipal (Water Handling)
 ³ Benefits calculated using RS3808 applicable at the time

APPENDIX C - EXECUTIVE SUMMARY OF INDUSTRIAL EFFICIENCY PROGRAM EVALUATION REPORT



POWERSENSE INDUSTRIAL EFFICIENCY PROGRAM EVALUATION

FINAL REPORT

Prepared for:

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January 29, 2013

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Disclaimer

The opinions expressed in this report are the responsibility of the authors, Sampson Research and Clearlead Consulting, 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 FortisBC's PowerSense Industrial Efficiency Program for 2007-10. Over these four years, 20 companies participated in the program and \$325.7 thousand was paid out in financial incentives for 46 projects. Claimed energy and demand savings totalled 10.102 GWh and 1.2 MW respectively.

1.2 Evaluation Objectives and Methodology

The objectives of the evaluation included generating a program logic model, assessing the effectiveness of program communications, program tracking, customer satisfaction, and determining the program's net impact on energy and demand savings.

Methods used to evaluate the program included interviews with program management and delivery staff (n=4), review of program tracking records and documentation (n=18), survey of participants (n=16), and site-visits (n=9). Realization rates for energy and demand savings were derived based on the findings from site visits. An estimate of free ridership was derived using the participant survey. Participant spillover was assessed qualitatively.

1.3 Evaluation Findings

Highlights from the participant survey, review of program documents, site visits, desk reviews, and program savings are provided below.

1.3.1 Documentation and Record Keeping

Participant records and billing histories were reviewed for all participants. The level of documentation retained for participants varied considerably from project to project. Some files contained a substantial amount of data which were well described and annotated, while other project files contained very little data, or undocumented data and assumptions. Documentation was insufficient to assess program energy savings claims in 36% of the project measures evaluated.

Interviews with program staff identified an internal effort that begun in 2011 to standardize the information collected on projects. The primary objective of this effort is to address many of the deficiencies in record keeping identified through evaluations of PowerSense programs. Based on the review of program records and documentation for this evaluation, there is considerable room for improvement in this area. Future evaluations of the Industrial Efficiency Program should pay particular attention to this area.

The evaluation identified two projects in which energy savings were claimed despite no incentives being paid. In both cases, customer payback without the incentive was already less than two years. However, there was no documentation to support the claims to non-rebated energy savings.



1.3.2 Program Operations

The administrative burden on participants of the Industrial Efficiency Program is minimal. Participants are not required to complete an application, and no terms or conditions are placed on participants beyond those specified in FortisBC's Electric Tariff. Feedback provided via the site visits and the participant survey confirmed that participants like the ease of participating in the program and are satisfied with the amount time required to receive their rebate. There was some evidence of pre- and/or post-monitoring to confirm some operating parameters but there was no clear indication of the criteria used to determine whether measurement and verification (M&V) was required.

Communication between delivery staff and program management is frequent. Monthly progress reports allow staff to keep up to date on progress made towards energy savings targets. Program staff felt informed as to the status of the program and did not require improvements or changes to this area.

1.3.3 Program Marketing and External Communications

Outbound marketing for the Industrial Efficiency Program consists primarily of direct contact between field representatives and industrial customers, networking with industry stakeholders, training sponsorships, and activities through the Partners in Efficiency (PIE) program.

There is minimal marketing collateral for the program, and the PowerSense website for industry provides a high level overview of the program. Delivery staff bear primary responsibility for raising awareness of the program, primarily through direct customer contact. From the perspective of some participants, obtaining information about the program is an area needing improvement. The source of dissatisfaction revolved primarily around the difficulty reaching a field representative and/or obtaining information on the program through other means, notably the PowerSense website. Program staff acknowledged that the PowerSense website for the program needs improvement.

1.3.4 Other Barriers to Participation

Barriers to program participation that were highlighted by staff and/or inferred from the results of the participant survey included:

- A lack of published information on the program, primarily via the PowerSense website. The difficulty obtaining information on the program and its qualifying technologies was the most common reason for dissatisfaction with the program among surveyed program participants.
- The FortisBC tariff requirement that measurement and verification of savings occur for large projects (incentives exceeding \$10,000). The cost of disrupting processes and operating systems for monitoring purposes was argued to sometimes exceed the amount of the rebate.
- The lack of an internal champion within the customer's organization to "sell" the energy efficient upgrade to management.
- Some program staff felt the payback criteria are too stringent and should be reduced to something less than two years. However, with a couple of exceptions, most participants surveyed indicated their internal payback criteria for energy and non-energy related projects were two years or longer.



1.3.5 Program Satisfaction

Overall, 81% of participants of the Industrial Efficiency Program during 2007-10 indicated they were satisfied with the program. Participants were most satisfied with the time it took to approve their application to the program, the time it took to receive the incentive from FortisBC, and the overall effort to participate in the program.

1.3.6 Free Riders and Spillover

Free ridership for the program during 2007-10 is estimated at 12%. This is an energy savings weighted estimate, based on the self-reported influence of the program and its incentive on the decision to implement the energy efficient investment.

Spillover for the Industrial Efficiency Program was explored qualitatively, and considered only nonincentivised investments in energy efficient equipment and processes within participants' facilities. Sixty-three percent (63%) of participants surveyed indicated their company had made additional energy efficient investments since participating in the Industrial Efficiency Program. Of these, 82% felt FortisBC had some influence on these decisions.

1.3.7 Persistence

Measure persistence for participants contacted during the evaluation was high. Of those surveyed by phone or receiving site visits, only one indicated that less than 100% of equipment that received a rebate was installed and operational. In that case, the rebated equipment was temporarily out of service awaiting parts for repair. Two participants of the 2007-10 program are no longer in business. In one case, FortisBC has completed proceedings for return of the rebate. Given the effort to recapture the incentive, energy and demand savings for this participant were excluded from both claimed and evaluated program savings. In the second case, the savings were too small to justify the expense of pursuing the return of the incentive. Evaluated program energy savings reflect this plant closure.

1.4 Impact Results

The findings from the site visits formed the primary basis for adjusting gross energy and demand savings claims. Evaluated gross energy savings were found to closely monitor claimed savings (99%), although there were several examples where the evaluators were unable to assess program savings claims due to either inadequate documentation or changes in personnel at the customer site which meant the on-site contacts were unable to recall or otherwise confirm the specifics of their company's participation in the FortisBC industrial program. In the absence of information or evidence to contradict program savings claims, savings estimates were accepted as is, subject to the recommendation that documentation of program assumptions and M&V procedures need to be significantly improved.

Realized energy and demand savings were then adjusted for free riders.

1.4.1 Evaluated Energy and Demand Savings

Evaluated energy and demand savings for the 2007-10 PowerSense Industrial Efficiency Program are summarized in Table 11. After adjustments, evaluated net energy savings (run rate) were 5.878 GWh, or



EXECUTIVE SUMMARY

87% of program claimed energy savings. Demand savings were 0.605 MW, equivalent to 84% of program claimed demand savings.

Table 1: Net Program Savings (Run Rates)FortisBC Industrial Efficiency Program: 2007-10

	GW.h/yr	MW
	Run Rate	Run Rate
Gross Program Savings ¹	6.764	0.717
Less closed / non-operating businesses	0.018	0.000 ²
Adjusted Gross Program Savings	6.746	0.717
Unrealized Savings ³	0.067	0.029
Evaluated Gross Savings	6.679	0.688
Free Riders (12%)	0.801	0.083
Net Program Savings	5.878	0.605
Net Program Savings (%)	87%	84%

¹Excludes energy and demand savings repatriated from closed sawmill.

² No demand savings.

³ Energy Savings x (1 - 0.99), Demand Savings x (1 - 0.96)

1.5 Recommendations

Recommendations stemming from the Industrial Efficiency Program evaluation include:

- 1. Increase the comprehensiveness and consistency of project documentation Documentation of projects receiving incentives under the Industrial Efficiency Program needs to be improved. The evaluation found that several projects could not be evaluated due to missing or poorly documented records. Recommendations for improving program documentation and record keeping include:
 - Ensure each file contains all the key documentation including a project description, pre- and post-monitoring data, annotated savings calculations, photos, correspondence, TRC test, incentive application, and contact details.
 - Develop a standardized documentation checklist for field representatives to follow. The list should be reviewed, signed off by the field representative and/or supervisor, and included within the project file.
 - Include a description of each project that will allow others to clearly understand the rebated measure(s) and the assumptions used to support the savings claims.
 - Ensure that contact details, phone numbers and site addresses are correct. Contact information should clearly differentiate who received the rebate cheque and a site specific contact.
 - Savings calculations, spreadsheets, and schedules for monitored data should be clearly documented and labelled. Methodologies and assumptions should accompany M&V findings.
 - For equipment installations, pre- and post-installation photos should be taken and kept with participant records.
 - Missing data or information should be noted and reasons for the omission provided.



- 2. **Consider requiring participants to complete and sign an application form** Not intended as a barrier to participation, an application form would formalize the relationship between the customer and PowerSense program, including obligations and responsibilities for both parties. The form should include a project description, a description or check list of measures rebated, energy and demand savings, the amount of the financial incentive, and the obligation for monitoring if incentives exceed the threshold specified in the Tariff.
- 3. Improve industrial customers' access to information about the program Participants of the Industrial Efficiency Program want improved access to information about the Industrial Efficiency Program, including application criteria and which technologies qualify for incentive. The PowerSense website is a low-cost but highly effective vehicle for providing this information. Improvements to the quality and quantity of information about the program on the site should be made a priority.
- 4. **Minimize claims to un-incentivized energy savings** The evaluation identified situations where FortisBC claimed energy savings from projects where the customer payback was less than two years and no incentive was paid. Given the difficulty in evaluating the legitimacy of these claims in an expost context, the practice of claiming savings without incentive payout should be discouraged. If not discontinued, claims to un-incentivised energy savings claims should have documentation that supports the legitimacy of the savings claims.
- 5. Increase the rigor of savings estimates by the use of pre- and post-retrofit M&V The use of M&V is strongly encouraged as a means of increasing the legitimacy of savings estimates. This can be as simple as a series of spot measurements taken over several days pre- and post-installation/retrofit. In cases where no 'before' situation exists (e.g., new construction), baseline assumptions should be clearly indicated, and post-installation measurements taken to confirm key savings assumptions.
- 6. **Consider load factor for savings from motor upgrades** The review of program records identified cases where motor loading factors were not used, potentially overstating the energy savings. As motors seldom run fully loaded most of the time, projects rebating energy efficient motors should consider a motor load factor in the calculation of energy savings.
- Include an assumption for free riders Provisions for free riders should be mandatory for all new PowerSense business cases. Free rider estimates should be periodically reviewed and updated. Based on evaluation findings, a free rider rate of 10% to 15% is reasonable for future Industrial Efficiency Program business cases.

* * * * *



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APPENDIX D - EXECUTIVE SUMMARY OF COMMERCIAL LIGHTING PROGRAM EVALUATION REPORT



Evaluation of the FortisBC Commercial Lighting Program

March 25, 2013



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1 Executive Summary

1.1 Introduction

This report presents the findings of the impact and process evaluation of the FortisBC Commercial Lighting Program. As part of this effort, three program components were evaluated as part of the overall Commercial Lighting Program:

- 1. **FLIP.** The FortisBC Lighting Incentive Program (FLIP) is a direct install program that covers 100 percent of the installation costs of eligible lighting measures up to \$5,500. Customers are eligible for this program if they install eligible lighting and their annual electricity costs are less than \$20,000 annually.
- 2. **Custom Lighting.** The Custom program provides incentives for customers that are not eligible for the FLIP program. Through this program, a rebate is provided to cover a portion of the installation costs.
- 3. **Wholesale Products.** The Wholesale program provides discounted high efficiency lighting equipment to contractors through electrical distributors. The eligible lighting measures for the Wholesale program are the same as those for the Custom and FLIP programs.

1.2 Evaluation Methods

The evaluation relied on several analysis methods to collect information and derive results for both the impact and process evaluation:

- **Engineering analysis.** For the Custom program, a sample of lighting project applications was selected for a desk review (n = 30). Based on the review of the available information (and the spreadsheet tools used by the program to calculate savings), an engineering adjustment factor was calculated from the sample and then applied to the Custom participant population. A review of the Excel savings calculators for both the Custom and FLIP programs was also conducted.
- **Billing regression.** For the FLIP program, a fixed effects billing regression model was used to estimate savings for a sample of program participants, taking into account equipment installed, seasonal fluctuations, and weather conditions.
- **Participant phone survey.** Phone surveys were conducted on a sample of FLIP (n = 200) and Custom (n = 35) participants. These surveys were used to collect feedback on the program experience for the process evaluation as well as customer and equipment information used for the impact evaluation.
- **Self-report free-ridership analysis.** A separate component of the phone survey for both the FLIP and Custom programs was a battery of questions asking what equipment would have been installed if the FortisBC program had not been available. Responses for these questions were scored and used to create an estimate of program free-ridership. The evaluation did not attempt to estimate program spillover.

• **Trade ally interviews.** Interviews were conducted with contacts provided by FortisBC (n = 8) to evaluate the effectiveness of the Program's design and delivery and remaining market potential for measures covered by the Program.

1.3 Evaluation Results

1.3.1 Impact Evaluation

Engineering Review

The engineering analysis involved conducting a desk review of project applications files for a sample of custom projects and making adjustments (if needed) to savings parameters such as operating hours, baseline conditions, and/or changes in wattages with the new equipment. The original stratified sample design called for 36 projects to be reviewed, but due to incomplete documentation on several projects only 30 were reviewed for the impact calculation. As a consequence, our relative precision is less than the original goal of "90/10", meaning that we would be 90 percent confident that the analysis results would be within 10 percent of the true population average.

After fully reviewing FortisBC's lighting analysis template used to calculate savings for the FLIP program, it was found that all of the proposed fixture and lamp types are reasonable and are not yet standard practice and should therefore be eligible for incentive. Several small errors in the spreadsheet were found, but these did not have a significant effect on the overall savings estimates. Conversations with FortisBC staff indicate that some of those errors have already been corrected in the latest versions of the spreadsheet.

In the calculation spreadsheets for the FLIP program, the annual operating hours are set at a default value of 4,000. This number is replaced by customer-specific information for each project, and our comparison of the recorded hours with the participant survey data for these same customers indicate that these values match fairly well. We do recommend that the default value be replaced with a range of operating hours by business type so that a more accurate savings calculation can be achieved in those cases where the default values need to be used.

Based on the engineering review of 30 Custom project applications, a realization rate of 102.1 percent was applied to the Custom program. Although the energy savings estimated by the program were generally found to be accurate, the lack of documentation for these projects limited the amount of review that could be performed. For the projects reviewed, information such as fixture type, wattages, operating hours, and project descriptions were often missing from the project documentation. It is recommended that a complete file be kept for all Custom projects that includes detailed information on existing equipment, installed equipment, and other factors such as operating hours. If FortisBC performs a site visit, a full site report should be included with the project file.

Billing Regression

An additional impact evaluation component was a fixed effects billing regression model for FLIP customers, which was used to estimate realized savings for these lighting projects. The model utilizes several data screens that were designed to eliminate erroneous data points and reduce some of the variation introduced across businesses (and not related to energy savings) and isolate the impact of the lighting measures. From the billing regression, a realization rate of 63.3 percent was estimated for FLIP participants.

In addition to the billing regression, we also examined information about the number of burnt out lamps that existed at the time the new lighting was installed. Field data provided by the 3^{rd} party lighting auditor indicated that approximately 12 percent of the existing lamps replaced for FLIP participants were burnt out at the time of the energy assessment. As a consequence, the billing regression does not adequately account for savings for these customers without adjusting the savings results to account for lamp burnout. Given that lighting is typically about 40 percent of commercial load (based on 2008 US Energy Information Administration data for the Pacific Northwest), we estimate that the 12 percent burnout rate was artificially reducing the savings estimates from the FLIP billing regression by approximately 8.8 percent. This adjustment factor was added to the realization rate from the FLIP billing regression to get a gross realization rate of 72.1 percent (63.3 + 8.8). No similar adjustment is needed for the Custom program, as a billing regression was not used to estimate savings for this program.

Free-Ridership Rate

A key goal of the participant survey was to collect information needed to support the calculation of a free-ridership rate; that is, the extent to which program participants would have installed the same program-qualifying equipment or taken the same action (e.g., installed energy efficient lighting) in the absence of the program. For this evaluation, we utilized the self-report approach, which, despite its recognized shortcomings, remains a widely used and a cost-effective method for estimating net program savings.

For both Custom and FLIP customers, each project was assigned a Free-Ridership Score ranging from 0 to 1.0 based on response to phone survey questions and then weighted based on the original estimated savings values provided by FortisBC. After weighting the participant survey responses by savings, the estimated free-ridership rates are 11 percent for FLIP and 34 percent for Custom. The Net-to-Gross ratio was then calculated as 1 minus the Free-Ridership Score. For Wholesale Products, the Custom free-ridership rate was applied, as these projects are not part of the direct install FLIP program (e.g., the FLIP installation contractor does not also apply for Wholesale rebates for the same projects).

Total Program Impacts

Realized savings for each of the program components is calculated from the various analysis components discussed above. Specific calculations for each program are as follows:

- FLIP combination of billing regression and survey free-ridership calculations
- Custom combination of Custom application file review and survey free-ridership calculations
- Wholesale Products combination of documentation review and survey freeridership calculations

The combined effect of these adjustments is shown in the table below. The Original Savings (estimated by FortisBC) are multiplied by the Realization Rate to determine Gross Annual Savings. This is multiplied by the Net-to-Gross ratio determined from the phone survey data to estimate Net Annual Savings.

Net-to-Gross ratios are higher for FLIP (.89) than Custom (.66) participants, since the former would have had to come up with the full cost of their lighting retrofits in the absence of the program and therefore would have been less likely to pursue them. Similarly, large commercial customers doing customer projects often have higher free-ridership rates, as they are more likely to both understand the benefits of high efficiency measures and have the means to purchase these upgrades. These projects are also often completed as part of larger remodels, which tends to increase free-ridership rates.

	<i>Original</i> Savings kWh	Gross Realization Rate (%)	Gross Annual Savings (kWh)	Weighted Net-to-Gross Ratio (1-FR)	Net Savings (kWh)
FLIP	4,567,748	72.1%	3,293,346	0.89	2,931,078
Custom	7,106,503	102.1%	7,255,740	0.66	4,788,788
Wholesale Products	21,851,797	102.1%	22,310,685	0.66	14,725,052

Table 1: Summary of Gross and Net Energy Savings By Program

Source: Analysis by Evergreen Economics of impact evaluation results combined with participation data provided by FortisBC.

1.3.2 Process Evaluation

Trade Ally Interviews

Interviews were conducted with eight trade ally contacts provided by FortisBC; seven of these completed the full survey, while one provided only limited responses because they considered the requested information proprietary. Most of the firms surveyed were a combination of electrical and lighting installation and maintenance contractors. The interviews were designed to elicit feedback on the Lighting Program as well as obtain perspective on the larger lighting market in the area.

Participants first learned of the FortisBC lighting program either in the last few years, or a number of years ago, through predecessor programs. Four respondents who are active in the program estimated that 70-80 percent of their lighting equipment sales in the coming

year, by dollar volume, would be accounted for by equipment that receives a rebate through the FortisBC programs. Respondents reported the main reasons eligible customers are not participating in the programs are: 1) high cost of equipment; 2) lack of awareness of the program; 3) program is too complicated and 4) the economy.

Firms reported a wide range in terms of the number of business lighting projects they completed in the past year, the average value of projects, and the percentage that received Fortis BC rebates.

It appears that larger lighting contractors (those with more projects) are generally less likely to be involved in the FortisBC program. All the respondents reported that in the course of bidding, proposing or marketing business lighting projects they take steps to encourage their customers to select options that are more efficient than standard equipment available or required by code.

Responses indicate that T8 lamps are the most widely sold lighting technology, with standard T8s outselling high-performance T8s, and both sold at least twice as often as T5 fluorescent lamps, which in turn were sold more frequently than high-bay T8s or T5s. Very few customers are purchasing T12s within the past year. Likewise, standard CFL bulbs far outsold either specialty CFLs or hardwired CFL fixtures. Among other lighting types, only a single vendor reported selling more than 1,000 T1 or LED exit signs, other indoor LED lighting and occupancy sensors. All contractors said they sold fewer than 1,000 high-bay metal halide lamps and outdoor LEDs within the past year.

Trade allies were also asked to characterize the remaining market potential for each of the above lighting technologies. On average, outdoor LED lights, occupancy sensors, high performance T8s, indoor LEDs and high-bay T8s or T5s all had medium to large potential, while T5 lamps and high efficiency exit signs had medium potential. Lowest potential was seen for high-bay metal halides, specialty CFLs and T12 lamps.

When asked if there were lighting technologies that should be eligible for rebates through the FortisBC program but that currently are not covered, participants suggested T5s, more LEDs and 8 foot T8s. The fact that these technologies are, in fact, already eligible for rebates suggests a need for improved communication to contractors regarding programqualifying equipment.

On average, trade allies were moderately satisfied with the FortisBC lighting program, with respondents noting that the rebates are adequate to secure their customer's participation. The greatest concerns expressed were regarding the length of time to receive rebate payments.

Participant Phone Surveys

Among both Custom and FLIP participants responding to the phone surveys, a high level of satisfaction was expressed for overall service by FortisBC, the lighting programs overall and the new lighting equipment itself. When asked about their overall satisfaction with the Lighting Program, over 90% of FLIP participants provided a rating of 8 or greater on a 10-

point satisfaction scale. Similarly, over 80% of Custom participants provided an overall satisfaction rating of 8 or greater.

Participants are also generally concerned about energy efficiency at their business. Among those surveyed, 56% percent of FLIP participants and 51% of Custom participants indicated that they did 'everything they can' or 'a lot' to reduce energy costs. There was a split, however, in knowledge about energy efficiency, with a significant portion considering themselves very knowledgeable (19% FLIP, 31% Custom), while another significant group indicating that they did not know much about energy efficiency (12% for FLIP, 17% for Custom). This indicates that there is a role for the FortisBC Lighting Program in reaching these customers and educating them regarding their efficiency options.

Both FLIP and Custom participants do not have the much infrastructure to support energy efficiency, which further illustrates a need for the FortisBC program. Few businesses have staff devoted to energy efficiency (24% for FLIP, 26% for Custom) or have documented energy savings goals (15% for FLIP, 15% for Custom).

1.4 Conclusions and Recommendations

General evaluation conclusions include the following:

Participants are generally very satisfied with the program. Survey responses from both the FLIP and Custom participants indicate a high level of satisfaction, with over 80 percent of respondents rating their satisfaction as an 8 or higher on a 10-point scale.

Program measures are appropriate for rebates. Based on our review of the rebated measures, it appears that the program is providing incentives for measures with efficiency levels that are above what would be generally considered standard practice. In this regard, the program is appropriately designed and encouraging the installation of lighting that is of higher efficiency than what would normally be installed.

Net impacts consistent with similar programs. The net-to-gross ratios estimated for these programs are consistent with expectations and the Evergreen team's experience with similar programs. For the direct install FLIP program, the estimated free ridership was relatively low as would be expected for the targeted small business market segment. For the Custom component, estimated free ridership was higher. However, large commercial customers often have higher free ridership rates as they are often more likely to understand the benefits of high efficiency measures and have the means to purchase these upgrades. These projects are also often completed as part of larger remodels, which tends to further increases free ridership rates.

Contractors report selling a mix of standard and high efficiency measures. Responses from contractors regarding sales within the previous year indicate that T8 lamps are the most widely sold lighting technology, with standard T8s outselling high-performance T8s, and both sold at least twice as often as T5 fluorescent lamps, which in turn were sold more frequently than high-bay T8s or T5s. Very few customers are purchasing T12s: only three

contractors reported selling T12 lamps, and none sold more than a thousand T12s within the prior year. Standard CFLs bulbs far outsold either specialty CFLs or hardwired CFL fixtures.

Contractors suggest a wide variety of areas with remaining market potential. Remaining market potential is considered by respondents to be medium to large for outdoor LED lights, occupancy sensors, high performance T8s, indoor LEDs and high-bay T8s or T5s. Similarly, the specific technology most commonly identified as having good potential over the next two years was LED lighting.

Customers are concerned about energy efficiency but have limited internal resources. Both the FLIP and Custom participant surveys indicate that customers make energy efficiency a priority in their purchase decision and do as much as they can to reduce their energy bills. However, most do not have an internal staff member devoted to these issues and few have explicitly defined energy savings goals. Similarly, the trade ally interviews also indicate that the cost of efficiency measures is a primary barrier for their customers. Taken together, these findings indicate that customers are interested and willing to adopt energy efficient lighting, but need some assistance from FortisBC to make these installations happen.

Recommendations for program improvement are as follows:

Tracking additional project details is strongly recommended. Both FLIP and Custom projects would benefit substantially from having additional detail maintained in the program tracking system. For Custom projects, at a minimum, a simple description of the basic project should be included so it is clear what is actually being installed. For the FLIP program, the project details should include estimated savings for each individual measure installed. For both FLIP and Custom projects, additional detail on baseline assumptions should also be tracked. If a site visit is conducted, then a full site report should also be included with the project documentation.

Adjust default operating hours in the calculation spreadsheets. The program should continue to collect operating hours data from the customer whenever possible. In cases where this information is not available, however, the calculation spreadsheets should have default operating hour data by building type. This additional detail will result in more accurate estimates of project savings by tailoring the impact estimates by building or business type. The default number of 4,000 operating hours should also be adjusted downward, as this is likely too high for the average project type.

Minor issues in the FLIP calculation spreadsheet should be addressed. As discussed in the engineering review (and provided in a separate spreadsheet to FortisBC), our analysis revealed several areas for suggested revision in the FLIP savings calculation spreadsheet. These suggested corrections are relatively minor, however.

Improve application review and rebate payment times to contractors. The length of time it took to receive payments from FortisBC was a common complaint among the contractors we interviewed. Contractors also mentioned the length of time for project

application review as an area of some dissatisfaction. Improvements in these areas should increase contractor satisfaction with the program.

FortisBC should incorporate interactive effects into savings calculations. Interactive effects adjustments are appropriate for HVAC and certainly for refrigerated space applications where lighting heat gain to the space is always impacting refrigeration load. By not including these interactive effects, significant amounts of energy savings are being overlooked. In the case of refrigerated space applications, this could add 30 percent or more additional savings. In non-refrigerated spaces that are heated, a lighting interaction heating penalty may be appropriate.