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March 29, 2019

British Columbia Utilities Commission
Suite 410, 900 Howe Street
Vancouver, BC
V6Z 2N3

Attention: Mr. Patrick Wruck, Commission Secretary and Manager, Regulatory Support

Dear Mr. Wruck:

Re: FortisBC Energy Inc. (FEI)
Natural Gas Demand-Side Management (DSM) – 2018 Annual Report

Attached please find the Natural Gas DSM Program 2018 Annual Report for FEI.

If further information is required, please contact Ken Ross, Manager, Integrated Resource Planning and DSM Reporting at 604-576-7343 or ken.ross@fortisbc.com.

Sincerely,

FORTISBC ENERGY INC.

Original signed:

Doug Slater

Attachment



FortisBC Energy Inc.

**Natural Gas
Demand-Side Management Programs
2018 Annual Report**

March 29, 2019

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1. REPORT OVERVIEW

FortisBC Energy Inc. (FEI or the Company), is committed to delivering a broad portfolio of cost-effective natural gas Demand-side Management¹ (DSM) measures that address the expectations of customers while meeting the requirements for public utilities to pursue cost-effective DSM. In 2018, total expenditures were \$35.830 million, including \$0.359 million received from third party co-funding such as the British Columbia Ministry of Energy, Mines and Petroleum Resources (MEMPR). Based solely on FEI's DSM expenditures, the Company achieved a combined portfolio Modified Total Resource Cost (MTRC)² of 1.7 on expenditures of \$35.472 million, meeting FEI's goal of cost-effective program delivery.

The FEI DSM Annual Report (the Report) outlines the Company's actual results and expenditures for 2018 – this being the final year of the 2014-2018 DSM Plan accepted by the British Columbia Utilities Commission (BCUC) in its Decision and Order G-138-14 on FEI's FEI's 2014-2018 Performance Based Ratemaking (PBR) Application (2014-2018 PBR Plan). The Report follows a similar format to the 2017 and previous Annual Reports, relying on detailed tables to demonstrate program results and expenditures. The Report compares 2018 actual activity and results to the 2014-2018 DSM Plan. Where the details of individual programs vary substantially from the 2014-2018 DSM Plan, explanations are provided in the applicable Program Area sections of the Report.

1.1 PURPOSE OF REPORT: TRANSPARENCY, ACCOUNTABILITY AND UPDATE ON PROGRESS

The Report details the Company's activities for the overall DSM Portfolio and in each Program Area. Incentive and non-incentive expenditures are reported at the level of each program or measure, as well as at the Program Area and Portfolio levels. Results for the following cost effectiveness tests are provided for the overall Portfolio and each Program Area in Section 2, and for each program as appropriate in the respective Program Area sections:

- Total Resource Cost (TRC),
- Ratepayer Impact Measure (RIM),
- Participant Cost Test (PCT), and
- Utility Cost Test (UCT).

¹ Throughout the Report the use of the term Demand-Side Management or "DSM" is intended to refer to demand-side measures in BC as defined in the BC Demand-Side Measures Regulation.

² Pursuant to the BC Demand-side Measures Regulation, the Portfolio level MTRC is calculated based on costs and benefits of all programs in the Portfolio as well as any Program Area and Portfolio level administration costs, and including the benefit adders for those programs for which the MTRC is relied upon to determine cost effectiveness on an individual program basis (i.e. those programs that have been designated as being under the MTRC Cap as presented in Section 2.1 of this report).

- Modified Total Resource Cost (MTRC) - In accordance with British Columbia's Demand-Side Measures Regulation (DSM Regulation), results of the MTRC calculations are also provided where appropriate (see Section 2.1).

The Report also demonstrates that the Company is meeting the accountability mechanisms directed by the BCUC in Order G-36-09. One such mechanism was the requirement to file DSM Annual Reports, which states:

A requirement that Terasen [now FEI] submit annually to the BCUC, by the end of the first quarter following year-end, for each year of the funding period, a report on all [DSM] initiatives and activities, expenditures and results for TGI and TGV.

It should be noted that the DSM Regulation was amended by the Province in March 2017. These amendments impact some of the cost-effectiveness calculations, increase expenditure limits under the MTRC Cap (see Section 2.1) and expand the adequacy requirements of a DSM Portfolio (see Section 2.3). At the time the 2014-2018 DSM Plan was filed and accepted it was in compliance with the DSM Regulation. Certain of the DSM Regulation amendments made since the filing and acceptance of the 2014-2018 DSM Plan, particularly the adequacy requirements, could not be feasibly implemented in 2018. However, FEI considers its 2014-2018 DSM Plan to be in compliance with the DSM Regulation at the time of acceptance by the BCUC. As such, FEI is reporting its activity as related to adequacy requirements against the DSM Regulation in place at the time of acceptance. FEI has addressed the expanded adequacy requirements of the DSM Regulation noted above in its 2019-2022 DSM Expenditure Plan submitted to the BCUC in 2018 and subsequently approved by Order G-10-19.

1.2 ORGANIZATION OF THE DSM ANNUAL REPORT

The following describes how each section of the Report presents the results of 2018 DSM activities:

Section 1: Report Overview

- Provides a high-level background for the Report.

Section 2: Portfolio Overview

- Provides detail regarding the overall actual 2018 expenditures for DSM activities.
- Section 2.5 discusses any new requirements from the BCUC concerning information to be included in the 2018 DSM Annual Report.

Section 3: Funding Transfers

- Provides a discussion on funding transfers between Program Areas.

Section 4: Advisory Group Activities

- Provides information regarding Energy Efficiency and Conservation Advisory Group (EECAG) activities in 2018.

Sections 5 - 9 provide information on:

- Residential, Low Income, Commercial, Innovative Technologies, and Industrial Energy Efficiency Program Areas, respectively;
- Each section contains a table summarizing the planned and actual expenditures for the respective Program Area in 2018, including incentive and non-incentive expenditures, annual and NPV gas savings, as well as TRC and other cost-effectiveness test results. Additional tables outline the individual 2018 programs, including program and measure descriptions, program assumptions and sources for these assumptions, and a breakdown of incentive and non-incentive expenditures. Where applicable, details on program closures or planned programs that were not launched in 2018 are also included in these program detail sections.

Section 10: Conservation Education and Outreach Initiatives

- Provides both a summary and details regarding actual 2018 expenditures for the Conservation Education and Outreach (CEO) Program Area.

Section 11: Enabling Activities

- Provides both summary and detail regarding actual 2018 expenditures for the Enabling Activities that support the work of the DSM Portfolio as a whole.

Section 12: Evaluation

- Provides detail regarding pending and actual expenditures for 2018 program evaluation activities, as well as summary results from evaluations and studies completed in 2018.

Section 13: Data Gathering, Reporting and Internal Control Processes

- Provides a summary of the Company's data tracking, process control, and reporting for 2018 DSM activities, and a high-level description of the Company's internal approval process for programs.

Section 14: 2018 DSM Annual Report Summary

- Provides a summary of the Report and FEI's 2018 DSM activity.

2. PORTFOLIO OVERVIEW

In this Section, FEI provides its DSM energy savings, expenditures and cost-effectiveness test results at an overall Portfolio level for 2018. A summary of the overall Portfolio results is provided in Table 2-1, demonstrating that the Company achieved a combined Portfolio MTRC of 1.7. FEI achieved DSM expenditures of \$35.472 million and recorded annual natural gas savings of 626,226 GJ in 2018.

Table 2-1: Overall DSM Portfolio Results for 2018

Indicator - 2018 Results		Total
Annual Gas Savings (GJ/yr.)		626,226
NPV of Gas Savings (GJ)		5,401,773
Utility Expenditures, Incentives (\$000s)		21,567
Utility Expenditures, Non-Incentives (\$000s)		13,904
Utility Expenditures, Total (\$000s)		35,472
Benefit/Cost Ratios	TRC	0.8
	MTRC	1.7
	Utility	1.2
	Participant	1.7
	RIM	0.6

Table 2-2 provides the expenditures and cost-effectiveness test results by Program Area for the overall DSM Portfolio.

Table 2-2: Overall DSM Portfolio Level Results by Program Area 2018

Portfolio	Annual Gas Savings (GJ/yr.)		NPV Gas Savings (GJ)	Utility Expenditures (\$000s)						Benefit/Cost Ratios				
				Incentives		Non-Incentives		All Spending		TRC	MTRC	Utility	Participant	RIM
	2014-2018 DSM Plan	2018 Actual		2014-2018 DSM Plan	2018 Actual	2014-2018 DSM Plan	2018 Actual	2014-2018 DSM Plan	2018 Actual					
Portfolio Level Activities														
Total	No Direct Savings			n/a	n/a	n/a	1,450	n/a	1,450	No Direct Savings				
Residential Sector														
Total	157,890	223,507	2,302,014	7,895	9,163	3,488	3,421	11,383	12,584	0.8	2.2	1.8	1.6	0.7
Commercial Sector														
Total	182,258	234,228	1,764,870	8,009	8,151	2,042	1,947	10,051	10,098	1.0	n/a	1.5	1.7	0.7
Industrial Sector														
Total	189,465	123,356	973,261	2,165	2,558	818	637	2,983	3,195	1.3	n/a	2.9	1.7	0.9
Low Income														
Total	28,190	45,135	361,628	1,920	1,482	1,563	1,231	3,483	2,713	5.7	5.7	1.6	3.2	0.7
Conservation Education and Outreach														
Total	No Direct Savings			n/a	n/a	2,400	3,122	2,400	3,122	No Direct Savings				
Innovative Technologies														
Total	29,468	0	0	568	213	642	836	1,210	1,049	No Direct Savings				
Enabling Activities														
Total	No Direct Savings			n/a	n/a	4,365	1,260	4,365	1,260	No Direct Savings				
TOTAL PORTFOLIOS														
Total	587,271	626,226	5,401,773	20,556	21,567	15,318	13,904	35,874	35,472	0.8	1.7	1.2	1.7	0.6

Notes:

- Portfolio Level Activities are those activities for which the costs cannot be assigned to individual DSM programs. It should be noted that these activities are distinct from the Enabling Activities specifically listed in Section 9 of the 2014-2018 DSM Plan. These distinct Portfolio Level Activities include expenditures such as EECAG activities, Portfolio level staff labour, staff training and conferences, research and association memberships, Portfolio level research studies, and regulatory work including consulting fees.

Throughout the Report, the following general notes also apply to all the Program Areas:

- In the above table, and in tables throughout the Report, any difference in the totals between the Portfolio Overview, Program Area, and individual program tables is due to rounding. Some “zero” values are a reflection of rounding to the \$000 expenditure level when expenditures were under \$500.
- A “Non-Program Specific Expense” line item has been included for each Program Area in Sections 5 through 11. These expenditures support multiple programs within that Program Area and, therefore, are not specific to only one program. Generally, these expenditures represent items such as training, travel, marketing collateral and consulting services that support the overall Program Area.

It is FEI’s view that, as with prior annual reports, the savings reported herein continue to be conservative and lower than the savings experienced in the marketplace as a result of the Company’s DSM activities, causing the cost-effectiveness test results reported to be lower than they would be otherwise, for the following reasons:

- Net to Gross Ratio - The Net-to-Gross ratio that FEI is using to report energy savings from DSM activity is highly conservative in that it includes the free ridership impact, which serves to reduce reported energy savings, but in most cases does not include the energy savings benefits of spillover effect.³ FEI intends to continue identifying and incorporating spillover effects into reporting of energy savings impacts from DSM activity on a program-by-program basis, wherever spillover can be supported.
- Attribution from Government Regulation – The introduction of many municipal, provincial and federal minimum equipment and system performance standards is supported by the Company’s DSM activity. Attribution savings for the implementation of a new standard on minimum fireplace efficiency have been identified, estimated and claimed as part of the Residential EnerChoice Fireplace Program (see Section 5.3) in 2018. However, the Company continues to believe the claimed savings are conservative and do not represent all of the savings attributable to FEI’s codes and standards work. FEI continues to look for opportunities to claim energy savings from the implementation of new standards.
- Conservation Education and Outreach – CEO activities had expenditures of \$3.122 million in 2018. These activities do result in energy savings; however, since these savings remain difficult to quantify, FEI does not currently attribute energy savings to them and these benefits are not reflected in the TRC.

³ Free ridership refers to individuals who participate in a program who would have participated in the absence of an incentive. Spillover refers to individuals that adopt efficiency measures because they are influenced by program-related information and marketing efforts, though they do not actually participate in the program. These can be included in the Net-to-Gross ratio employed in the cost-effectiveness analysis to capture the additive effects of spillover to balance the reductive effects of free ridership.

- Enabling Activities – Enabling Activities similarly had expenditures of \$1.260 million in 2018 for work that contributes to energy savings but that cannot currently be quantified. Since these savings are not included in the Portfolio TRC calculation, the Company believes the Portfolio energy savings benefits are higher than reported.

FEI's DSM activities include a number of specified demand side measures as defined in the DSM Regulation. Specified demand-side measures within FEI's Portfolio include the Innovative Technologies programs (see Section 8), education and community engagement programs (see Section 10), and Codes and Standards related DSM activity (see Section 11). The DSM Regulation defines how the BCUC must consider these specified measures. Section 4(4) of the DSM Regulation stipulates that the cost effectiveness of specified measures must be determined by the cost effectiveness of the Portfolio as a whole. These measures are therefore not subject to the 40 percent 'MTRC Cap' (see Section 2.1). Additionally, these measures cannot be determined to be not cost-effective under the Utility Cost Test.

In summary, FEI's 2018 DSM expenditures, including specified DSM, are cost-effective as defined under the DSM Regulation.

2.1 *PORTFOLIO LEVEL MTRC CALCULATION AND RESULTS*

The DSM Regulation specifies that utilities can implement DSM with TRC values less than 1.0 but that meet an MTRC threshold of 1.0⁴ as long as expenditures on these activities do not exceed 40 percent of the total Portfolio expenditure. FEI refers to this 40 percent as the "MTRC Cap". Table 2-3 shows that in 2018, FEI met the conditions of the DSM Regulation, achieving a Portfolio MTRC value of 1.7 with 22 percent of the Portfolio enabled by the MTRC cost-effectiveness test (see Table 2-3). While FEI strives for TRC test results that approach or exceed 1.0 within each program and across all programs, there are benefits to implementing programs that do not meet this threshold. Some of these benefits include making programs available to those customers that would otherwise be underserved (such as low income and residential customers), water savings, increased human health and comfort, and economic benefits such as job creation. These benefits were recognized in the 2011, 2014 and 2017 amendments to the DSM Regulation, which enable the use of an MTRC in determining program and Portfolio cost effectiveness. The MTRC uses the long-run marginal cost of acquiring electricity generated from clean or renewable resources in British Columbia (referred to as the Zero Emission Energy Alternative, or ZEEA) as a proxy for the avoided cost of natural gas and allows for the inclusion of non-energy benefits (NEBs).⁵

⁴ The BCUC approved the assessment of the cost effectiveness using an MTRC of 1 or greater on an overall portfolio basis as part of its Decision and Order G-44-12 on FEI's 2012-2013 Revenue Requirements Application (2012-13 RRA), page 174. While this approval was not explicitly stated in the most recent 2014-2018 PBR Plan Decision and Order G-138-14, FEI interprets this approval to be implicit in the acceptance of the 2014-2018 DSM Plan.

⁵ The DSM Regulation was amended in July 2014 to allow for the whole cost of the long-run marginal cost of acquiring electricity generated from clean or renewable resources in British Columbia to be used as a proxy for the avoided cost of natural gas in the MTRC cost-effectiveness test. As the DSM Regulation stipulates, the updated

Table 2-3: Programs Subject to MTRC and the Relative Proportion of 2018 Portfolio Expenditures

Program	Program TRC	Program MTRC	Expenditure (\$000s) subject to cap	% of Portfolio Spending
ENERGY STAR® Water Heater Program	0.4	1.7	3,129	8.8%
Furnace and Boiler Replacement Program	0.4	1.3	3,104	8.8%
New Home Program	0.3	1.6	346	1.0%
Energy Efficient Home Performance Program - Home Renovation Rebate	0.7	2.4	1,244	3.5%
Total			\$7,824	22.1%

2.2 MEETING APPROVED EXPENDITURE LEVELS

FEI's 2018 DSM expenditure limit of \$35.9 million was accepted on September 12, 2014, pursuant to the Decision on FEI's 2014-2018 PBR Plan.⁶ The Company's 2018 DSM expenditures were within accepted levels for 2018 and have increased from 2017 expenditures of just over \$34 million.

As part of the BCUC's Decision, FEI was granted approval to add \$15 million of the requested annual DSM budget to rate base each year of the PBR period, with any additional DSM expenditure being captured in a DSM non-rate base deferral account attracting a weighted average cost of capital (WACC) return. Any new amounts accumulated in the non-rate base DSM deferral account are then transferred to the FEI rate base DSM deferral account in the following year. The BCUC also approved the amortization of these amounts over 10 years. In accordance with the BCUC's Decision, \$20.5 million was placed in the non-rate base DSM deferral account during 2018 and transferred to the rate base DSM deferral account in early 2019.

FEI has managed its 2018 DSM activity within the funding limits approved by the BCUC. Section 3 discusses funding transfers between Program Areas in 2018 within the overall DSM funding envelope and within rules for transferring funds between Program Areas as set out by the BCUC.

2.3 MEETING ADEQUACY REQUIREMENTS OF THE DSM REGULATION

The adequacy requirements set out in the DSM Regulation at the time the 2014-2018 DSM Plan was accepted are as follows:

value that FEI has used in 2018 for the avoided cost of gas in the MTRC calculation is \$106/MWh, or \$29.45/GJ, as indicated in BC Hydro's F2017 to F2019 Revenue Requirements Application, Appendix X, Table X-1, Exhibit B 1-2: Avoided Cost of Electric Energy. Further, the MTRC Cap was increased from 33% to 40% in the March 24, 2017 amendments to the DSM Regulation.

⁶ BCUC Order G-138-14, page 277 of the Decision.

A public utility's plan portfolio is adequate for the purposes of Section 44.1 (8) c of the Act only if the plan portfolio includes all the following:

- a) A demand-side measure intended specifically to assist residents of low-income households to reduce their energy consumption;
- b) If the plan portfolio is introduced on or after June 1, 2009, a demand-side measure intended specifically to improve the energy efficiency of rental accommodations;
- c) An education program for students enrolled in schools in the public utility's service area;
- d) If the plan portfolio is submitted on or after June 1, 2009, an education program for students enrolled in post-secondary institutions in the public utility's service area.

Section 6 provides details regarding FEI's DSM programs for low income customers. FEI also continues to deliver the Rental Apartment Efficiency Program (RAP) through its Residential and Commercial programs as discussed in each of the respective Program Area sections (Sections 5 and 7) and a full program overview for RAP is presented in Section 7.3.1. Section 6 and 7 of the Report also provide details on a number of other Low Income and Commercial energy efficiency programs that are available for use by owners of rental buildings, including the Energy Specialist Program. In terms of education programs, FEI's School Education Program, Commercial and Residential customer education programs, and other energy conservation and education outreach initiatives are presented in Section 10.

2.4 ADDRESSING BCUC DIRECTIVES FROM THE FEI 2014-2018 PBR PLAN APPLICATION DECISION

FEI filed for acceptance of its 2014-2018 DSM Plan and associated funding request as part of the 2014-2018 PBR Plan. The Decision on the 2014-2018 PBR Plan set out a number of Directives for the 2014-2018 DSM Plan. The following section addresses the remaining Directive relevant to the overall 2018 DSM Portfolio. Program specific Directives are addressed in the applicable Program Area sections of the Report.

2.4.1 Labour Costs

Pursuant to Directive 145⁷ of the Decision, labour costs are included in the "Administration" expenditures for each program in the specific Program tables included in the applicable Program Area sections (Sections 5-11). FEI notes that the 2014-2018 DSM Plan was not re-cast with labour included at the program level. This change therefore impacts the direct comparison of actual program and Program Area expenditures to Plan expenditures. The

⁷ Decision, page 273.

inclusion of labour costs at the program level can cause program area expenditures to appear higher than the accepted amounts even though non-labour costs are within accepted amounts. Actual expenditures in the “Enabling Activities” Program Area will also be lower than planned since a substantial amount of labour costs planned for this Program Area are being reported within other Program Areas. This issue is also discussed in Section 3 on funding transfers.

2.5 COLLABORATION & INTEGRATION

The Company continues to collaborate and integrate DSM programming among BC’s largest energy utilities, as well as with other entities such as governments and industry associations. The Company recognizes that doing so will maximize program efficiency and effectiveness. Collaborative activity is captured in the individual Program Area sections and program descriptions found in Sections 5 through 11.

FEI, FortisBC Inc. (FBC) and BC Hydro and Power Authority (BC Hydro) (the BC Utilities) continued to collaborate on various programs and projects through their voluntary Memorandum of Understanding (MOU), the purpose of which is to develop enhanced utility integration in support of government legislation, policy and direction. The MOU was renewed in 2018 to continue to August 2022. The BC Utilities also continue to experience cost efficiencies from their collaboration efforts. In 2018, FEI undertook a quantitative analysis of the cost savings benefits of collaborating with BC Hydro. FEI and FBC worked with BC Hydro to update the assessment of their collective program/initiative collaboration cost savings. The BC Utilities conducted a joint review of incremental cost efficiencies occurring as a direct result of the partnership over the April 1, 2013 to March 31, 2018 time period (based on BC Hydro fiscal years). This review examined the costs incurred for each program and project collaboration that was in place over this time period and determined that FEI, FBC and BC Hydro combined had total incremental cost efficiencies of approximately \$21.5 million as a result of working together. Other benefits continue to include streamlined application processes for customers, extended program reach and consistent and unified messaging resulting in improved energy literacy.

In late 2018, MEMPR introduced EfficiencyBC, a program including an online portal for homeowners and businesses to access information, incentives and support to reduce energy use and greenhouse gas emissions in new and existing homes and buildings. EfficiencyBC is funded by the Province of British Columbia and the Government of Canada under the Low Carbon Economy Leadership Fund. FEI’s collaboration with MEMPR on EfficiencyBC includes administering incentives and enabling applications for EfficiencyBC rebates through FEI’s application processes to provide a streamlined customer experience. The tables contained throughout this Annual Report include only expenditure and savings information for FEI’s expenditure portfolio. They do not include the EfficiencyBC expenditures nor the savings attributed to the EfficiencyBC incentives. In 2018, EfficiencyBC incentives were administered alongside FEI incentives in the Residential Home Renovation Rebate Program, the Low Income - Non-profit Customer Program, and the Commercial Customized Equipment Upgrade Program as noted at Tables 5-2, 6-7 and 7-5 respectively.

2.6 SUMMARY

The Company's DSM Portfolio met the goal of cost effectiveness with a Portfolio MTRC value of 1.7 in 2018. The Company is of the view that both energy savings accounted for in the Portfolio and the resulting TRC remain conservative. Benefits from additional activities, such as CEO, play a very important role in supporting the development and delivery of programs, while creating a culture of conservation in British Columbia. FEI continues to develop and maintain strong, collaborative relationships with other BC utilities and government partners in providing its portfolio of DSM programs.

3. FUNDING TRANSFERS

Four Program Areas – Residential, Commercial, Industrial and CEO – incurred actual program expenditures that appeared to be greater than their respective accepted Program Area funding amounts.⁸ In the case of CEO, Commercial and Industrial, however, exceeding the accepted Program Area funding level was the result of reporting labour expenditures at the program level as directed by the BCUC.⁹ The accepted 2014-2018 DSM Plan was based on labour being reported at the Portfolio level, and planned Program Area expenditure levels were not re-stated subsequent to the BCUC's Decision regarding the reporting of labour costs at the program level. Therefore, the “accepted” or “plan” Program Area funding limits do not include labour. The expenditures for Commercial, Industrial and CEO, as shown in Table 2.2, do not exceed planned values if labour costs are removed, therefore no funding transfer is required.

For the Residential Program Area, expenditures other than labour costs exceeded the accepted funding level by approximately \$450 thousand as a result of the success of the residential programs. To accommodate these additional expenditures in the Residential Program Area, this amount can be transferred from the Commercial Program Area without exceeding 25 percent of approved expenditures for either Program Area, once the above adjustment for labour is also considered for the Commercial Program. For clarity, once labour is removed from the Commercial Program Area to account for the way the Plan was approved, there is sufficient funding room available in the Commercial Program Area to transfer the needed amount to the Residential Program Area.

⁸ Order G-138-14.

⁹ Directive 145, Order No. G-138-14

4. ADVISORY GROUP ACTIVITIES

4.1 OVERVIEW

The Energy Efficiency and Conservation Advisory Group (EECAG) provides insight and feedback on FEI's Portfolio of DSM activities and related issues. This includes DSM program and Portfolio performance, development and design, funding transfers, policy and regulations that may impact DSM activities, and other issues and activities as they arise.

EECAG members may be appointed based on their relevant subject matter expertise, representation of a common interest shared by stakeholders, or representation of a particular organization/group and/or interest. This includes, but is not limited to, governments, regions, First Nations organizations, customers, suppliers, industries, non-governmental organizations, research institutes and other groups that have historically intervened in FEI's regulatory proceedings.

Since the formation of the EECAG in 2009, FEI has gained valuable insight on DSM program design and implementation and developed positive working relationships with stakeholders. EECAG input continues to be instrumental as FEI moves forward with DSM activities, helping to ensure that efforts are aligned with the interests and suggestions of stakeholders.

4.2 SUMMARY OF THE 2018 WORKSHOP

The primary focus of EECAG activities in 2018 was to review and provide feedback on the 2019-2022 DSM Plan under development in the early part of the year. Having provided substantial input into the plan development during the prior year, EECAG members were provided with a near to final draft of the Plan in early 2018 with a request for any final written comments they may have before FEI was to finalize and submit the Plan to the BCUC. Since some changes were made to the Plan after this final EECAG comment period, an additional EECAG meeting was held by teleconference in mid 2018 to review the changes and address any questions or concerns EECAG members might have with respect to the changes. A number of questions for clarification were asked and responded to during this last meeting.

Since 2018 was the final year of a 5-year DSM plan and the Portfolio of activities in recent years had been stable in terms of activities, expenditures and energy savings levels, neither FEI nor EECAG members identified further topics of interest that warranted the hosting of an in-person EECAG workshop or other EECAG meeting format later in 2018. Some EECAG members did take advantage of other opportunities to participate in the development and regulatory review of the 2019-2022 DSM Plan. Those consultation activities were documented in FEI's 2019-2022 DSM funding application to the BCUC.

5. RESIDENTIAL ENERGY EFFICIENCY PROGRAM AREA

5.1 OVERVIEW

The Residential Energy Efficiency Program Area reduced annual natural gas consumption by 223,507 GJ, achieving an overall combined TRC/MTRC of 2.2. Over \$12.5 million was invested in Residential Energy Efficiency programs in 2018, and 73 percent of this investment was customer incentive expenditures. Table 5-1 summarizes the expenditures for the Residential Energy Efficiency Program Area in 2018, including incentive and non-incentive expenditures, annual and NPV gas savings, as well as TRC/MTRC and other cost-effectiveness test results.

Residential programs are offered to over 924,000¹⁰ customers in FEI's service territories. For DSM purposes, these customers predominantly include those living in single-family homes, row houses, town homes or mobile homes.¹¹ Some in-suite measures, such as low flow fixtures and a small number of fireplaces and water heaters in multi-unit residential buildings are also included in this funding envelope. Residential programs serve retrofit and new home applications. In combination with FEI's education and outreach activities, these programs play an important role in driving a culture of conservation in British Columbia.

Table 5-1: Residential Energy Efficiency Program Area Results Summary

Program	Annual Gas Savings (GJ/yr.)		Actual NPV Gas Savings (GJ)	Utility Expenditures (\$000s)						Benefit/Cost Ratios				
				Incentives		Non-Incentives		All Spending		TRC	MTRC	Utility	Participant	RIM
	2014-2018 DSM Plan	2018 Actual		2014-2018 DSM Plan	2018 Actual	2014-2018 DSM Plan	2018 Actual	2014-2018 DSM Plan	2018 Actual					
Non Program Specific Expenses														
Total	No Direct Savings			0	-227	540	1,078	540	851		No Direct Savings			
Energy Efficiency Home Performance (Home Renovation Rebate Program)														
Total	52,367	15,113	214,141	1,365	1,070	450	338	1,815	1,407	0.7	2.4	1.6	1.3	0.7
Furnace Replacement Program														
Total	30,291	29,771	332,769	2,984	2,317	346	788	3,330	3,104	0.4	1.3	1.1	0.8	0.5
EnerChoice Fireplace Program														
Total	8,965	117,798	1,176,147	602	2,231	233	376	835	2,607	7.8		4.4	16.0	0.8
Appliance Service Program														
Total	No Direct Savings			356	394	100	64	456	458	No Direct Savings				
ENERGY STAR® Domestic Hot Water "DHW" Technologies														
Total	15,456	31,075	343,462	1,271	2,820	101	310	1,372	3,129	0.4	1.7	1.1	0.7	0.5
Domestic Hot Water Conservation Program /Low Flow Fixtures														
Total	12,825	2,286	21,674	190	124	100	3	290	127	1.5		1.7	2.2	0.6
New Home Program														
Total	7,321	1,311	17,456	666	161	118	186	784	346	0.3	1.6	0.5	1.4	0.4
New Technologies Program														
Total	2,166	No Direct Savings		285		76		361	0	No Direct Savings				
Rental Apt Efficiency (RAP) Residential Portion														
Total	0	26,151	196,365	0	274	0	136	0	410	n/a				
Customer Engagement Tool for Conservation Behaviours														
Total	28,500	No Direct Savings		0	0	1,290	144	1,290	144	No Direct Savings				
On-Bill Financing														
Total	No Direct Savings			176	0	133	0	309	0	No Direct Savings				
ALL PROGRAMS														
Total	157,890	223,507	2,302,014	7,895	9,163	3,488	3,421	11,383	12,584	0.8	2.2	1.8	1.6	0.7

Notes:

- The Non Program Specific Expenses incentives credit of \$227,000 represents returned funds from the program administration services provider for uncashed customer/contractor cheques

¹⁰ FEI Annual Review for 2019 rates. Table A2-1. 2018 Residential Rate 1 customer count

¹¹ Programs for Multifamily Dwellings served under Rate Schedule 2 or 3 are included in the Commercial Energy Efficiency Program Area (please refer to Section 7) with a few exceptions as noted.

over the time period of 2011 through 2017 which represents less than 0.4% of incentive funds distributed over that time period.

- RAP includes a combination of residential and commercial measures for both low income qualified and the able-to-pay rental apartment market, each funded from their respective Program Areas. RAP expenditures shown here are related only to the residential portion of RAP. Full RAP details are provided in Section 7.3.1, Table 7-9.

5.2 RESIDENTIAL TRC AND MTRC RESULTS

FEI's DSM Program Principles state that programs should be universal, offering access to programs for all residential and commercial customers. Although many Residential programs are challenged in meeting a conventional TRC test where gas costs are relatively low, these programs, with their broad reach, are cost-effective when considering broader societal benefits such as increased human health and comfort, economic benefits such as job creation and greenhouse gas emissions reductions. This is recognized in the DSM Regulation which enables the inclusion of lower TRC programs through the application of the MTRC as discussed in Section 2.1. The overall 2018 Residential Program Area TRC was 0.8 with a combined TRC/MTRC result of 2.2.

5.3 2018 RESIDENTIAL ENERGY EFFICIENCY PROGRAMS

Tables 5-2 through 5-8 outline the specific Residential Energy Efficiency programs undertaken in 2018, including program and measure descriptions and a breakdown of non-incentive expenditures.

Table 5-2: Energy Efficient Home Performance Program - Home Renovation Rebate

Program Description	This utility and government collaboration, administered by FEI, FBC, BC Hydro, and the Ministry of Energy, Mines, and Petroleum Resources (Utility Partners), promotes energy-efficiency home upgrades, while educating homeowners on the value of whole home performance. Provincial and local governments co-promote this program and other related initiatives, including consumer education, capacity building and quality installation for the trades, home labeling, and NRCan's Home Energy Rating System.						
Target Market	Residential customers						
New vs Retrofit	Retrofit						
Partners	BC Hydro, FortisBC (Electric), BC Ministry of Energy, Mines and Petroleum Resources, Natural Resources Canada, and local governments.						
Eligible Measures	Draftproofing	Attic Insulation	Basement Insulation	Wall Insulation	Bonus Offers		
Incremental Measure Cost	\$989	\$1,326	\$838	\$2,714	N/A		
Incentive Amount	Up to \$500	Up to \$600	Up to \$1,000	Up to \$1,200	Varies		
Savings Per Participant	6.6 GJ	8.5 GJ	6.6 GJ	28.9 GJ	N/A		
Measure Life	6 years for draftproofing; 30 years for insulation						
Free Rider Rate	20%						
Sources of Inputs	Dunskey Energy Consulting Analysis, 2013, 2015, 2016, 2018 Analysis of installation costs from participant data, FEI, November 2018 Consultations with BC Hydro 2010 Conservation Potential Review, ICF Marbek, 2010 2017 Conservation Potential Review, Navigant, 2017 Free Rider Rates - Review of 2017 participant data and Analysis of Net-to-gross Survey Results for the ecoENERGY Retrofit Homes program, Bronson Consulting Group, August 2010						
Participants	2018 Total	Projected 4,200	Actual 1,650				
Expenditures (\$,000s)	2018 Total	Incentives 1,070	Industry Support 48	Admin 226	Communication 14	Research & Evaluation 50	Total 1,407

Notes:

- This program is a collaboration between the BC Utilities and MEMPR.
- MEMPR EfficiencyBC rebates were integrated into the utility administered Home Renovation Rebate Program on September 28, 2018. The updated offer included the addition of new rebates, updated Bonus Offers, and increased rebates:
 - Windows and doors rebates were added to the program (funded by EfficiencyBC), while the draft proofing offer was removed
 - Bonus Offers are designed to promote multi-measure upgrades. The \$750 Bonus Offer was restructured into two new Bonus Offers: An EnerGuide performance-based offer, and a \$300 Two Upgrade Bonus for completing two eligible measures. Municipal Partner Offers (MPO) are available in some regions.
 - Insulation incentives were increased in alignment with BC Hydro to provide consistent provincial offers for customers.
- Industry support includes FEI's application support fees to Energy Advisors and contribution to the Home Performance Stakeholder Council (HPSC). The HPSC is an industry led group comprised of key industry players tasked with addressing the fragmented interests, opportunities and challenges that exist in BC's continuously evolving home performance industry. Funding for the HPSC is supported by the BC Utilities and MEMPR.

- Administration expenditures include FEI rebate processing fees, and the enhancement of the existing online application hosted by BC Hydro. This custom form includes all program rebates from the BC Utilities and MEMPR, allowing for centralized, province-wide rebate access and faster rebate processing.
- Research & Evaluation expenditures includes the continued development of the Program Registered Contractor for insulators, training for contractors, and site visits to assess program compliance.

Table 5-3: Furnace and Boiler Replacement Program

Program Description	The Furnace and Boiler Replacement program targets customers with functioning furnaces (standard or mid-efficiency) or boilers. Through a combination of marketing, incentives and industry outreach, the program encourages customers to replace the equipment immediately, rather than waiting for it to fail at some point in the future.					
Target Market	Residential customers					
New vs Retrofit	Retrofit					
Partners	N/A					
Eligible Measures	Standard efficiency	Mid - efficiency	Boilers			
Incremental Measure Cost	\$1,820	\$1,820	\$3,860			
Incentive Amount	\$500	\$500	\$500			
Contractor Incentive	\$100	\$100	\$100			
Savings Per Participant	6.9 GJs	5.0GJs	8.7GJs			
Measure Life	Furnace & boilers - 18 years					
Free Rider Rate	Early Replacement Methodology					
Sources of Inputs	Analysis of 2018 Participant Data, February 2019 Furnace Replacement Pilot Program – Evaluation Results, Sampson Research, May 2014 Furnace Early Replacement Program —Evaluation Year 1 Pilot, Habart & Associates Inc. May 2013 2017 Conservation Potential Review, Navigant, 2017 Measures and Assumptions For Demand Side Management (DSM) Planning, Appendix C: Substantiation Sheets by Navigant Consulting KEMA Measure Life Study: HVAC, 4.1697.190 Furnace (90% AFUE or greater)					
Participants	2018	Projected	Actual			
	Total	3,730	4,633			
Expenditures (\$,000s)	2018	Incentives	Non-Incentive Expenditures			Total
			Dealer Incentives	Admin	Communication	Research & Evaluation
	Total	2,317	326	155	145	162
						3,104

Notes:

- The 2018 Furnace and Boiler Replacement Program now administers an EfficiencyBC \$200 rebate for ≥97% AFUE furnaces, which is funded by MEMPR, in addition to FEI's incentives as described in Table 5-3.
- A greater emphasis continued to be placed on Quality Installation. To be eligible for the rebate, the program required the installation of a two-pipe direct vent system and the completion of a commissioning sheet. To be eligible for the \$100 contractor incentive, contractors were required to sign a set of terms and conditions, pass site verification requirements to assess program

compliance, and agree to install systems according to the best practices outlined in the *High-efficiency furnace installation guide for existing houses*.¹²

- Contractor incentives of \$100 per eligible installation are allocated to the administration portion of non-incentive expenditures.
- Research & Evaluation expenditures include site verification expenditures and the exploration of further Quality Installation initiatives.

Table 5-4: EnerChoice Fireplace Program

Program Description	This program promotes the purchase and installation of energy-efficient EnerChoice fireplaces for zone heating. The program educates consumers and dealers about the EnerChoice label and the benefits of selecting natural gas fireplaces based on energy-efficiency and heating attributes, rather than just decorative features. Program awareness and participation was promoted through a combination of customer and dealer incentives and promotional activities.					
Target Market	Residential customers					
New vs Retrofit	Both					
Partners	N/A					
Eligible Measures	EnerChoice Fireplace					
Incremental Measure Cost	\$132					
Customer Incentive	\$300					
Contractor Incentive	\$50 (Retrofit only)					
Savings Per Participant	EnerChoice Fireplace (Retrofit): SFD: 7.4 GJ; MURB: 14.0 GJ EnerChoice Fireplace (New Construction): SFD: 5.0 GJ; MURB: 5.0 GJ					
Measure Life	15 years					
Free Rider Rate	37%					
Spillover	14% (SFD Retrofit only)					
Sources of Inputs	2019 BES Residential Fireplace Program Savings Review 2019 Posterity Group Fireplace Savings Assumptions Update 2017 Conservation Potential Review, Navigant, 2017 Fireplace Impact Evaluation, Sampson Research, 2016 2010 Conservation Potential Review, ICF Marbek, 2010 AFER Study, Apartment Fireplace Efficiency Retrofit (AFER) Project, Building Energy Solutions, April, 2017 Regulatory Proposal (Sept 2016), Prepared by: Energy Efficiency Branch, BC Ministry of Energy and Mines Pre-Feasibility Study: Upgrades for Decorative Fireplaces-Ref: P132144JGW Analysis of 2018 Participant Data John Sampson Analysis, February 2017					
Participants			Actual			
	2018	Projected Total	Retrofit	New Construction	Total	
	Total	2,008	5,689	1,747	7,436	
Expenditures (\$,000s)	Non-Incentives					
	2018	Incentives	Dealer Incentives	Admin	Communication	Research & Evaluation
	Total	2,231	280	78	0	18
						2,607

Notes:

- The FortisBC eligible EnerChoice fireplace directory includes equipment that must be direct-vented, temperature modulating and not have a standing pilot. These requirements support the BC Building Code and provincial policy.

¹² This furnace installation guide was developed in collaboration with industry associations including the Thermal Environmental Comfort Association (TECA) and the Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI), and was co-funded by FEI and MEMPR.

- Contractor incentives of \$50 per participant are allocated to the administration portion of non-incentive expenditure.
- Based on industry feedback and a significant opportunity for energy savings, Multi-Unit Residential Buildings (MURBs) were added to the eligibility requirement starting April 2018.
- The March 2018 Regulatory Bulletin,¹³ Energy Efficiency Standards Regulation Amendment, outlines increased efficiency standards for fireplaces manufactured on or after January 1, 2019. The regulatory change in increasing the fireplace minimum efficiency standards presents an opportunity for FEI to claim attribution savings, pursuant to the DSM Regulation, as a result of FEI's efforts towards advancing fireplace standards. FEI has estimated the attributed savings as 103,000 GJs as of 2018. With the fireplace regulation in effect January 1, 2019, FEI will claim the program attributed savings in this 2018 report and will update cost effectiveness inputs for 2019 and onwards reflecting the new baseline. The approach to attributing savings from codes and standards, similar to reporting DSM program savings, will continue to be done through the annual DSM report and will be applied to the Program Area for each respective measure.

Table 5-5: Appliance Service Program

Program Description	This program provides customer education related to the importance of regular appliance maintenance to ensure efficient operation of natural gas appliances. This program also creates opportunities for contractors to dialogue with customers about upgrading appliances to more efficient models.				
Target Market	Residential customers				
New vs Retrofit	Retrofit				
Partners	N/A				
Eligible Measures	Furnace Service (61%), Fireplace Service (33%), Boiler (6%)				
Incremental Measure Cost	N/A				
Incentive Amount	\$25 incentive per service; Average of \$32 per participant				
Savings Per Participant	N/A				
Measure Life	N/A				
Free Rider Rate	N/A				
Participants (no. of services)	2018 Total	Projected 14,250	Actual 15,760		
Expenditures (\$,000s)	2018 Total	Incentives 394	Non-Incentives Admin Communication Research & Evaluation 35 14 15		
					Total 458

Notes:

- The Appliance Service Program continues to be the most popular program for FEI customers with over 12,000 participants and 15,000 appliances serviced.

¹³ https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/electricity-alternative-energy/energy-efficiency/eesr_amendment_6_regulatory_bulletin_march_7_2018.pdf

Table 5-6: ENERGY STAR® Water Heater Program

Program Description	This program promotes the upgrade of standard efficiency water heaters with efficient ENERGY STAR® models. As part of a longer term market transformation strategy, the program introduced 0.67 EF storage tank water heaters and new technologies with energy factors (EF) greater than 0.80. Additional technologies include condensing and non-condensing tankless water heaters, and condensing storage tanks. The program is available to both retrofit and new construction markets. The program supports upcoming federal and provincial Minimum Efficiency Act Standards for natural gas- and propane-fired water heaters.									
Target Market	Residential customers									
New vs Retrofit	Both									
Partners	N/A									
Eligible Measures	ESTAR 0.67 EF Storage Tank	Non-Condensing Tankless	Condensing Tankless		Condensing Storage Tank					
Incremental Measure Cost Retrofit	\$246	\$1,727	\$2,561		\$2,273					
New Construction	\$210	\$1,210	\$1,790		\$1,590					
Incentive Amount	\$200	\$400	\$500		\$1,000					
Savings Per Participant	3.0 GJ	6.9 GJ	9.5 GJ		6.9 GJ					
Measure Life	17 years (Weighted average)									
Free Rider Rate	28% (Weighted average)									
Sources of Inputs	Energy Savings Assumptions Review (of multiple energy savings data sources), FEI, November 2014, revisited February 2018 including Final Report 0.67 Energy Star Water Heater Pilot Project, June 12, 2014 Review of program participant data from 2017, FEI, February 2018 2017 Conservation Potential Review, Navigant, 2017 Review of Technical Reference Manuals from other jurisdictions applied to actual program measure installation data from 2017. FEI, February 2018 including BC Hydro Powersmart F13 Effective Measure Life and Persistence									
Participants	2018	Projected Total	Actual							
			ESTAR 0.67 EF Storage Tank		Non-Condensing Tankless		Condensing Tankless		Condensing Storage Tank	
			Retrofit	New Const.	Retrofit	New	Retrofit	New Const.	Retrofit	New Const.
	Total	2,418	2,321	72	122	194	2,219	886	284	378
Expenditures (\$,000s)	2018	Incentives	Non-Incentives				Total			
			Dealer Incentives	Admin	Comm.	Research & Evaluation				
			240	70	0	0	3,129			

Notes:

- Almost 6,500 water heaters were upgraded through the ENERGY STAR Water Heater Program with about two-thirds of the installations being in retrofit and one-third being in new home construction to further long-term market transformation for energy efficient natural gas water heating.

Table 5-7: Domestic Hot Water Conservation - Low Flow Fixtures and Washer Promotions

Program Description	The objective of this program is to reduce hot water consumption in houses, row houses and MURBS through partnerships with utilities or government. Initiatives include the installation of low-flow fixtures and ENERGY STAR® washers and dryers.					
Target Market	Residential customers					
New vs Retrofit	Retrofit					
Partners	BC Hydro, FBC, and Municipalities					
Eligible Measures	Low-Flow Fixtures; ENERGY STAR® Washers and Dryers					
ENERGY STAR Washers:						
Incremental Measure Cost	\$77					
Incentive Amount	Partnership with BC Hydro: <ul style="list-style-type: none">• \$50 rebate (FEI contributes \$25) on qualifying ENERGY STAR® clothes washers - IMEF of 2.82 to 2.91, and WF of 3.50 or less• \$100 rebate (FEI contributes \$75) on qualifying ENERGY STAR® clothes washers - IMEF of 2.92 or higher, WF of 3.20 or less Partnership with FBC (also offered in FortisBC New Home Program): <ul style="list-style-type: none">• \$50 rebate (FEI contributes \$25) on qualifying ENERGY STAR® clothes washers - IMEF of 2.74 to 2.91, and IWF of 3.50 or less• \$100 rebate (FEI contributes \$75) on qualifying ENERGY STAR clothes washers - IMEF of 2.92 or higher, IWF of 3.20 or less					
Savings Per Participant	1.0 GJ Natural Gas plus 0.25 GJ electric - BC Hydro					
Measure Life	14 years					
Free Rider Rate	20%					
ENERGY STAR Dryers:						
Incremental Measure Cost	\$50					
Incentive Amount	Partnership with BC Hydro and FBC: <ul style="list-style-type: none">• \$100 rebate (FEI contributes \$100) on qualifying ENERGY STAR® gas dryers - CEF of 3.93 or higher					
Savings Per Participant	0.7 GJs					
Measure Life	12 years					
Free Rider Rate	0%					
Low Flow Fixtures:						
Incremental Measure Cost	No Activity in 2018					
Incentive Amount						
Savings Per Participant						
Measure Life						
Free Rider Rate						
Participants	2018	Projected	Actual			
	Total	N/A	2,884			
Expenditures (\$,000s)	2018	Incentives		Non-Incentives		Total
			Admin	Communication	Research & Evaluation	
	Total	124	3	0	0	127

Notes:

- The Washer promotion was a collaboration with BC Hydro for a spring promotion in May-June and fall promotion in October-November. In addition, FEI collaborated with FBC throughout 2018.

Table 5-8: New Home Program

Program Description	This program provides education and financial incentives to support energy-efficient building practices for the Residential sector. This program supports efficiency updates to the BC Building Code (effective Dec. 2014). In June 2015, the utilities launched ENERGY STAR® for New Homes as the new whole home performance standard. In 2018, The BC Energy Step Code became the new whole home performance standard.					
Target Market	Builders of residential properties – single family homes and townhomes and homeowner builders					
New vs Retrofit	New Construction					
Partners	BC Hydro and FBC					
Eligible Measures	ENERGY STAR® Single Family Dwellings		ENERGY STAR® TH/RH/Duplex			
Incremental Measure Cost	\$3,093		\$1,873			
Incentive Amount	\$2,000		\$700			
Savings Per Participant	19.5 GJs		10.4 GJs			
Measure Life	25 years					
Free Rider Rate	15% for ENERGY STAR					
Sources of Inputs	New Construction Costs and Savings and Life Cycle Costs, First published in 2011 and updated in 2014, Cooper and Habart, and Dunskey Energy Consulting ISE Consulting Group Analysis, March 2014 2017 Conservation Potential Review, Navigant, 2017 Analysis of 2018 Participant Data					
Participants	2018	Projected	Actual			
			SFD	Row/Townhome	Duplex	Total
	Total	1,338	77	1	3	81
Expenditures (\$,000s)	2018	Non-Incentives				
		Incentives	Program Administration	Communication	Research & Evaluation	Total
	Total	161	138	11	36	346

Notes:

- In 2018, FEI, in collaboration with FBC, transitioned its whole home incentives from the ENERGY STAR standard to align with the five tiers of the BC Energy Step Code for Part 9 Buildings, as directed in the 2017 Amendment to the DSM Regulation. The Amendment supports a utility's ability to provide incentives for builders who adopt and comply with the Energy Step Code in municipalities across BC. Program uptake was below plan as 2018 was a transitional year. ENERGY STAR requirements are complex and builders did not readily adopt this label. Step Code incentives were formally introduced in September. Applications started to come in towards the end of the year as local governments began to integrate Step Code policy into their building bylaws and builders and energy advisors became more aware of the program.
- FEI collaborates with FBC, BC Hydro, MEMPR and BC Housing to provide education to builders and energy advisors, and support policy regarding High Performance Homes in BC.
- The participant counts in this table are for the whole home incentive component of the program. Although incentives for natural gas water heaters and fireplaces installed in new home construction are noted under their respective program tables, rebate administration expenditures are included within this New Home administration funding envelope.

5.4 2018 RESIDENTIAL ENERGY EFFICIENCY PROGRAMS PLANNED BUT NOT LAUNCHED

5.4.1 Customer Engagement Tool

FEI and FBC completed a Request for Proposal (RFP) process for the Customer Engagement Tool (CET), resulting in a CET vendor being selected. The CET will include both an online portal and home energy reports. Development has commenced with an expectation to launch by the end of 2019.

5.4.2 New Technologies

FEI continues to explore new technologies through the Innovative Technologies Program. There were no new technologies deployed in 2018.

5.5 SUMMARY

Residential Energy Efficiency Program Area activity in 2018 resulted in over 223,000 GJ/year of natural gas savings including savings from fireplace attribution achieving an overall combined TRC/MTRC of 2.2. These programs enabled customers to upgrade appliances and capture energy savings, and continued to build on relationships with the trades for education and program awareness. The combination of financial incentives, policy support, contractor outreach, and effective marketing in these programs is instrumental to the ongoing success of these programs in generating natural gas savings and fostering market transformation in the residential sector.

6. LOW INCOME ENERGY EFFICIENCY PROGRAM AREA

6.1 OVERVIEW

In 2018, DSM investments in the Low Income Program Area were \$2.7 million and annual gas savings were 45 thousand GJ/yr. Table 6-1 summarizes the planned and actual expenditures for the Low Income Program area in 2018, including incentive and non-incentive expenditures, annual and NPV gas savings, as well as the cost-effectiveness test results. The TRC for Low Income programs uses the same inputs as the MTRC (i.e. uses the ZEEA as the avoided cost of energy and a value of 140 percent of the benefits – see Section 2.1) without impacting the MTRC Cap in accordance with the DSM Regulation.

Table 6-1: 2018 Low Income Program Results Summary

Program	Annual Gas Savings (GJ/yr.)		Actual NPV Gas Savings (GJ)	Utility Expenditures (\$000s)						Benefit/Cost Ratios				
				Incentives		Non-Incentives		All Spending		TRC	MTRC	Utility	Participant	RIM
	2014-2018 DSM Plan	2018 Actual		2014-2018 DSM Plan	2018 Actual	2014-2018 DSM Plan	2018 Actual	2014-2018 DSM Plan	2018 Actual					
Non Program Specific Expenses														
Total	No Direct Savings			0	0	305	290	305	290	No Direct Savings				
Energy Saving Kit (ESK)														
Total	6,829	34,379	258,146	63	301	42	100	105	401	28.0	28.0	7.9	9.0	1.1
Energy Conservation Assistance Program (ECAP)														
Total	10,079	7,195	61,735	1,466	1,022	990	628	2,456	1,650	1.6	1.6	0.5	1.6	0.3
Residential Energy Efficiency Works (REnEW)														
Total	No Direct Savings			0	0	81	90	81	90	No Direct Savings				
Low Income Space-Heat Top Up														
Total	1,809	3,074	36,496	50	132	10	1	60	133	10.1	10.1	3.6	3.0	1.0
Low Income Water-Heating Top Up														
Total	528	486	5,251	8	11	5	1	13	12	5.5	5.5	5.7	1.5	1.1
Non-Profit Custom Program														
Total	8,946	0	0	332	16	131	121	463	137	n/a				
Rental Apt Efficiency (RAP) <i>Low Income Portion</i>														
Total	0	0	0	0	0	0	0	0	0	n/a				
ALL PROGRAMS														
Total	28,190	45,135	361,628	1,920	1,482	1,563	1,231	3,483	2,713	5.7	5.7	1.6	3.2	0.7

Notes:

- In 2018 all low income qualified rental apartment buildings applied to the Non-Profit Custom Program instead of the RAP Program. Therefore, no expenditures for RAP are reported above and the RAP summary table (Table 7-9) no longer includes RAP expenditures for Low Income participants.

6.2 2018 LOW INCOME PROGRAMS

Tables 6-2 through 6-7 outline the specific Low Income programs undertaken in 2018, including program and measure descriptions and a breakdown of non-incentive expenditures.

Table 6-2: Energy Saving Kit (ESK) Program

Program Description	<p>The goal of this program is to reach a broad audience of Low Income customers and enable them to take some simple steps towards saving energy by installing a bundle of easy-to-install items that are delivered to their door.</p> <p>Promotional activities include bill inserts, event promotions such as food banks, targeted digital campaigns and partnerships with government ministries and non-profits that serve the low income population.</p>					
Target Market	Low Income Residential Customers					
New vs Retrofit	Retrofit					
Partners	BC Hydro and FortisBC Inc. (FBC)					
Eligible Measures	Bundle of measures including high efficiency water fixtures, draft proofing tape, outlet gaskets, window film, etc.					
Incremental Measure Cost	\$21					
Incentive Amount	\$21 Since the program is free to participants, the incentive equals the incremental cost.					
Savings Per Participant	2.4 GJ					
Measure Life & Source	10 years					
Free Rider Rate & Source	0%					
Sources of Inputs	<p>GJ Savings per participant average is based upon 2018 actual participation.</p> <p>Incremental cost is an average based on the full cost of the gas measures included in the ESK.</p> <p>Measure Life is an average based on the individual gas measures included in the Energy Saving Kit.</p> <p>FRR - E Source review of Low-income Net to Gross in Other Jurisdictions; Low Income, Income Assisted Customers or Charitable Programs Oct. 30, 2017; BC Hydro, Oct. 30, 2017</p>					
Participants	2018	Projected	Actual			
	Total	4,677	14,506			
Expenditures (\$,000s)	2018	Incentives	Admin	Communication	Research & Evaluation	Total
	Total	301	31	69	0	401

Notes:

- The Energy Saving Kit (ESK) Program performed well in 2018 with participation well beyond the projected participation in the 2014-2018 EEC Plan. Participation increased nearly 30 percent over 2017. One factor influencing these results is the pilot initiative FEI undertook in 2018 to re-engage past ESK participations for measures that are temporary in nature; specifically window film. This pilot resulted in 1,639 past participants taking up new measures.

Table 6-3: Energy Conservation Assistance Program (ECAP)

Program Description	<p>This program enables deep energy savings in low income customer homes that have moderate to high energy consumption. The program includes sending a contractor to the customer's home to install energy saving measures and provide customized energy efficiency coaching.</p> <p>Promotional activities include bill inserts, customer endorsements, outreach, promotion at events and conferences, and partnerships with government ministries, housing providers, and other organizations that serve the low income population.</p>					
Target Market	Low Income Residential Customers					
New vs Retrofit	Retrofit					
Partners	BC Hydro and FortisBC Inc. (FBC)					
Eligible Measures	Bundle of customized measures, which may include low-flow fixtures, water heater pipe wrap, professional draft proofing, outlet gaskets, window film, insulation, improved ventilation, CO detectors, and furnaces.					
Incremental Measure Cost	\$479					
Incentive Amount	\$479 Since the program is free to participants, the incentive equals the incremental cost.					
Savings Per Participant	3.4 GJ					
Measure Life & Source	12 years					
Free Rider Rate & Source	0%					
Sources of Inputs	<p>GJ Savings per participant average is based upon 2018 actual participation.</p> <p>Incremental cost is based on average cost of the customized bundle of measures installed.</p> <p>Includes the full cost of the gas measures installed in gas heated homes.</p> <p>Measure Life is an average based on the individual gas measures installed.</p> <p>FRR - E Source review of Low-income Net to Gross in Other Jurisdictions; Low Income, Income Assisted Customers or Charitable Programs Oct. 30, 2017; BC Hydro, Oct. 30, 2017</p>					
Participants	2018 Total	Projected 1,810	Actual 2,135			
Expenditures (\$,000s)	2018 Total	Incentives 1,022	Admin 214	Communication 219	Research & Evaluation 195	Total 1,650

Notes:

- Expenditures in 2018 were lower than the 2014-2018 DSM Plan due to a transition in program contractors. However, changes made in 2018 have resulted in increased program delivery capacity as the program has transitioned from just one contractor to two contractors.

Table 6-4: Residential Energy Efficiency Works (REnEW) Program

Program Description	The goal of this program is to enhance the energy efficiency trade sector in BC in a manner that also enhances communities. This program targets individuals facing barriers to employment and provides training in energy efficiency retrofitting. The training is delivered by industry experts at no cost to participants.					
Target Market	Low income individuals facing barriers to employment					
New vs Retrofit	N/A					
Partners	Ministry of Energy and Mines, FortisBC Inc. (FBC)					
Eligible Measures	N/A					
Incremental Measure Cost	N/A					
Incentive Amount	N/A					
Savings Per Participant	N/A					
Measure Life & Source	N/A					
Free Rider Rate & Source	N/A					
Participants	2018	Projected	Actual			
	Total	20	5			
Expenditures (\$,000s)	2018	Incentives	Admin	Communication	Research & Evaluation	Total
	Total	0	90	0	0	90

Notes:

- In 2018 a REnEW cohort was implemented in Kelowna in partnership with the John Howard Society of Central and Southern Okanagan. A strong building construction sector appears to have resulted in lower participation and a high rate of transition into employment in the building trades industry.

Table 6-5: Low Income Space Heat Top Up

Program Description	<p>The existing Commercial Space Heat Program offers rebates to commercial customers for the installation of high efficiency space heating equipment in commercial applications. The Low Income Space Heat Top Up Program is an add-on to the existing Commercial Space Heat Program and offers an additional rebate over and above the commercial rebate if the customer meets the eligibility criteria.</p> <p>Promotional activities include partnerships with BC Housing, BC Non-Profit Housing Association (BCNPHA), and the provincial and regional BCNPHA conferences, trade shows and educational seminars.</p>					
Target Market	<p>The Low Income Space Heat Top Up Program is primarily focused on buildings that are owned and/or operated by a charity providing assistance to low income persons or a non-profit housing provider including housing co-operatives and Indigenous Bands.</p>					
New vs Retrofit	Both					
Partners	N/A					
Eligible Measures	Condensing boilers and mid-efficiency boilers.					
Incremental Measure Cost	\$5,378					
Incentive Amount	\$4,559					
Savings Per Participant	106 GJ					
Measure Life & Source	20 years					
Free Rider Rate & Source	0%					
Sources of Inputs	<p>GJ Savings - EBP Deemed Savings Analysis by applying results from Update of Energy Savings Analysis from FortisBC Efficient Boiler Program - Final Report, August 2013, Prism Engineering</p> <p>Incremental cost - Analysis of 2018 program participant data.</p> <p>Measure Life - Review of Technical Reference Manuals from other jurisdictions, FEI, 2017 including KEMA: Boilers & Burners 1.2796.040 High Efficiency Modulating Hot Water Boiler</p> <p>ASHRAE Equipment Life Tables.</p> <p>FRR - E Source review of Low-income Net to Gross in Other Jurisdictions; Low Income, Income Assisted Customers or Charitable Programs Oct. 30, 2017; BC Hydro, Oct. 30, 2017</p>					
Participants	2018 Total	Projected 17	Actual 29			
Expenditures (\$,000s)	2018 Total	Incentives 132	Admin 1	Communication 0	Research & Evaluation 0	Total 133

Note:

- The Low Income Space Heat Top Up program participation was higher than anticipated in the 2014-2018 EEC Plan and nearly double 2017 participation. 2018 was only the second full year in market. The results achieved are likely attributable to the greater awareness that comes with program continuity as well as to strong partnerships with BC Non-Profit Housing Association and BC Housing.

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Table 6-6: Low Income Water Heating Top Up

Program Description	<p>The existing Commercial Water Heater Program was launched in 2010 and it offers rebates to commercial customers for the installation of high efficiency water heating equipment in commercial applications. The Low Income Water Heater Top Up Program is an add onto the existing Commercial Water Heater Program and offers an additional incentive over and above the commercial rebate if the customer meets the eligibility criteria.</p> <p>Promotional activities include partnerships with BC Housing, BC Non-Profit Housing Association (BCNPHA), and the provincial and regional BCNPHA conferences, trade shows and educational seminars.</p>					
Target Market	<p>The Low Income Water Heating Top Up Program is primarily focused on buildings that are owned and/or operated by a charity providing assistance to low income persons or a non-profit housing provider including housing co-operatives and Indigenous Bands.</p>					
New vs Retrofit	Both					
Partners	N/A					
Eligible Measures	High Efficiency Storage Tanks, High Efficiency Domestic Hot Water Boilers, High Efficiency Tankless Domestic Hot Water					
Incremental Measure Cost	\$4,524					
Incentive Amount	\$1,237					
Savings Per Participant	54 GJ					
Measure Life & Source	17 Years					
Free Rider Rate & Source	0%					
Sources of Inputs	<p>GJ Savings - Efficient Commercial Water Heater Evaluation - Final Report, Prism Engineering February 2017.</p> <p>Incremental cost - Analysis of 2018 program participant data.</p> <p>Measure Life -Review of Technical Reference Manuals from other jurisdictions, FEI, 2017 including MEASURES AND ASSUMPTIONS FOR DEMAND SIDE MANAGEMENT (DSM) PLANNING, Appendix C: Substantiation Sheets by Navigant Consulting and KEMA Measure Life Study.</p> <p>FRR - E Source review of Low-income Net to Gross in Other Jurisdictions; Low Income, Income Assisted Customers or Charitable Programs Oct. 30, 2017; BC Hydro, Oct. 30, 2017</p>					
Participants	2018 Total	Projected 14	Actual 9			
Expenditures (\$,000s)	2018 Total	Incentives 11	Admin 1	Communication 0	Research & Evaluation 0	Total 12

2

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Table 6-7: Non-Profit Custom Program

Program Description	This program is designed to encourage social housing apartment buildings to replace inefficient equipment and systems with high-efficiency solutions. The program is built around three components: 1. Energy study: Up to \$5,000 is available for an energy study conducted by a professional engineer to identify energy savings potential in their multi-unit residential building. 2. Implementation support: Up to \$7,000 is available for engineering support to install and commission energy efficiency measures. 3. Measure Incentives: Approximately 90 gas and electric measures are eligible for an incentive rebate.					
Target Market	The programs is primarily focused on apartment buildings that are owned and operated by Indigenous bands, non-profit housing providers and housing co-operatives.					
New vs Retrofit	Retrofit					
Partners	FBC, BC Hydro, BC Housing and MEMPR					
Eligible Measures	24 natural gas energy efficiency measures and 66 electrical energy efficiency measures.					
Incremental Measure Cost	N/A					
Incentive Amount	N/A					
Savings Per Participant	N/A					
Measure Life & Source	N/A					
Free Rider Rate & Source	N/A					
Participants	2018 Total	Projected 13	Actual 0			
Expenditures (\$,000s)	2018 Total	Incentives 16	Admin 99	Communication 6	Research & Evaluation 16	Total 137

Notes:

- In 2018, the Non-Profit Custom Program was introduced to the market in mid-February and fully launched at the end of June. Program participation has been strong with a total of 90 program applicants (57 seeking natural gas energy efficiency measures and eight seeking electrical energy efficiency measures in the FBC territory. The remainder are seeking electrical energy efficiency measures in the BC Hydro territory.) Retrofit projects in this program require a longer timeline for completion (between one and two years) depending on whether an energy study is being conducted. For this reason, costs in the Non-Profit Custom Program were low in 2018.
- The Non-Profit Custom Program offer meets the needs of low income rental buildings. This has resulted in low income apartment buildings that would have participated in RAP participating in the Non-Profit Custom Program instead.
- The program launched in partnership with FBC and BC Hydro and then later incorporated BC Housing and MEMPR as part of the EfficiencyBC initiative.

6.3 SUMMARY

The Low Income Program Area achieved 45,135 GJ annual natural gas savings in Low Income customer homes and achieved a TRC/MTRC of 5.7. This overall result reflects continued growth in low income expenditures and energy savings. The launch of the Non-Profit Custom program provides another way in which non-profit housing societies and co-operative housing can improve the efficiency of the buildings which house Low Income customers.

7. COMMERCIAL ENERGY EFFICIENCY PROGRAM AREA

7.1 OVERVIEW

In 2018, Commercial Energy Efficiency programs continued to encourage commercial customers to reduce their overall consumption of natural gas and their associated energy costs. The Commercial Energy Efficiency Program Area reduced annual natural gas consumption by approximately 234,228 GJs and achieved an overall TRC of 1.0. Over \$10.1 million was invested in Commercial Energy Efficiency, of which 80 percent was incentive expenditures. Table 7-1 summarizes the projected and actual expenditures for the Commercial Energy Efficiency Program Area in 2018, including incentive and non-incentive expenditures, annual and NPV gas savings, as well as TRC and other cost-effectiveness test results.

Table 7-1: 2018 Commercial Energy Efficiency Program Results Summary

Program	Annual Gas Savings (GJ/yr.)		Actual NPV Gas Savings (GJ)	Utility Expenditures (\$000s)						Benefit/Cost Ratios				
	2014-2018 DSM Plan	2018 Actual		Incentives		Non-Incentives		All Spending		TRC	MTRC	Utility	Participant	RIM
				2014-2018 DSM Plan	2018 Actual	2014-2018 DSM Plan	2018 Actual	2014-2018 DSM Plan	2018 Actual					
Non Program Specific Expenses														
Total	No Direct Savings			0	0	1,100	437	1,100	437	No Direct Savings				
Space Heating Program														
Total	61,824	68,864	817,520	2,053	2,905	138	353	2,191	3,258	1.5	n/a	2.5	2.1	0.9
Water Heating Program														
Total	17,292	11,678	126,133	275	381	59	172	334	553	0.9	n/a	2.3	1.2	0.8
Commercial Food Service Program														
Total	22,251	16,088	130,910	490	393	145	121	635	514	1.6	n/a	2.6	2.6	0.8
Customized Equipment Upgrade Program														
Total	51,818	54,373	504,506	2,226	1,967	215	545	2,441	2,512	1.0	n/a	1.2	1.7	0.5
Continuous Optimization Program														
Total	29,073	23,317	99,352	966	276	171	8	1,137	284	0.5	n/a	3.0	0.8	0.8
Commercial Energy Assessment Program														
Total	0	16,864	17,207	379	70	87	31	466	101	1.0	n/a	1.1	2.9	0.5
Energy Specialist Program														
Total	0	14,820	14,820	1,620	1,625	126	128	1,746	1,753	n/a	n/a	n/a	n/a	n/a
Commercial EDX/Portfolio Manager														
Total	0	0	0	0	0	0	-12	0	-12	n/a	n/a	n/a	n/a	n/a
Commercial MURB Program														
Total	0	0	0	0	0	0	-2	0	-2	n/a	n/a	n/a	n/a	n/a
Rental Apt Efficiency (RAP) Commercial Portion														
Total	0	28,225	54,422	0	534	0	166	0	700	n/a	n/a	n/a	n/a	n/a
ALL PROGRAMS														
Total	182,258	234,228	1,764,870	8,009	8,151	2,042	1,947	10,051	10,098	1.0	n/a	1.5	1.7	0.7

Note:

- The negative expenditures of \$12,000 and \$2,000 were coding corrections made in early 2018 for an invoice received in late 2017 for the Commercial EDX/Portfolio Manager and Commercial MURB programs, respectively.

7.2 2018 COMMERCIAL ENERGY EFFICIENCY PROGRAMS

The following tables outline the specific Commercial Energy Efficiency programs undertaken in 2018, including program and measure descriptions and a breakdown of non-incentive expenditures.

Table 7-2: Space Heat Program

Program Description	This program provides rebates for the installation of high efficiency space heating equipment in commercial applications. Currently only rebates for high efficiency boilers are offered. Rebates for condensing rooftop units were considered for 2018 but not offered under the Space Heat Program.					
Target Market	Commercial					
New vs Retrofit	Both					
Partners	N/A					
	Retrofit		New Construction			
Incremental Measure Cost	\$19,247		\$29,575			
Incentive Amount	\$11,767		\$18,047			
Savings Per Participant	349 GJ		482 GJ			
Measure Life	20 years					
Free Rider Rate	18%					
Sources of Inputs	GJ Savings -EBP Deemed Savings Analysis by applying results from Update of Energy Savings Analysis from FortisBC Efficient Boiler Program - Final Report, August 2013, Prism Engineering Incremental cost - Analysis of 2018 program participant data. Measure Life -Review of Technical Reference Manuals from other jurisdictions, FEI, 2017 including KEMA: Boilers & Burners 1.2796.040 High Efficiency Modulating Hot Water Boiler ASHRAE Equipment Life Tables. FRR - Habart & Associates, BC Gas - Efficient Boiler Program Impact Evaluation, 2013					
Participants	2018	Projected	Actual			
	Total	204	225			
Expenditures (\$,000)	2018	Incentives	Admin	Communication	Research & Evaluation	Total
	Total	2,905	348	0	5	3,258

Note:

- Rebates for condensing rooftop units were considered for 2018 but not offered. Measure development work related to condensing rooftop units started in 2018 so that the rebate offer can be launched in 2019 as part of FEI's 2019-2022 DSM Plan.

Table 7-3: Water Heating Program

Program Description	This program provides rebates for the installation of high-efficiency commercial water heaters with thermal efficiencies greater than or equal to 84%.					
Target Market	Commercial					
New vs Retrofit	Both					
Partners	N/A					
	Retrofit		New Construction			
Incremental Measure Cost	\$8,620		\$16,045			
Incentive Amount	\$1,772		\$4,983			
Savings Per Participant	96 GJ		229 GJ			
Measure Life & Source	17 years					
Free Rider Rate & Source	38%					
Sources of Inputs	GJ Savings - Efficient Commercial Water Heater Evaluation - Final Report, Prism Engineering February 2017. Incremental cost - Analysis of 2018 program participant data. Measure Life -Review of Technical Reference Manuals from other jurisdictions, FEI, 2017 including MEASURES AND ASSUMPTIONS FOR DEMAND SIDE MANAGEMENT (DSM) PLANNING, Appendix C: Substantiation Sheets by Navigant Consulting and KEMA Measure Life Study. FRR - Prism Engineering - Efficient Commercial Water Heater Evaluation Executive Summary, 2017					
Participants	2018	Projected	Actual			
	Total	144	135			
Expenditures (\$,000)	2018	Incentives	Admin	Communication	Research & Evaluation	Total
	Total	381	172	0	0	553

Table 7-4: Commercial Food Service Program

Program Description	This program offers a suite of rebates for the installation of high-efficiency cooking appliances and it may also provide other incentives relevant to commercial food service participants such as low-flow pre-rinse spray valve or faucet aerator installations.				
Target Market	Commercial				
New vs Retrofit	Both				
Partners	N/A				
Food Service Equipment	Retrofit		New Construction		
Incremental Measure Cost	\$2,970		\$7,955		
Incentive Amount	\$1,921		\$3,769		
Savings Per Participant	98 GJ		192 GJ		
Low Flow Fixtures	Pre-Rinse Spray Valve; Low Flow Aerator				
Incremental Measure Cost	Pre-Rinse Spray Valve \$125; Low Flow Aerator \$319				
Incentive Amount	direct install				
Savings Per Participant	PreRinse Spray Valve 16 GJ; Low Flow Aerator 0.8 GJ				
Measure Life & Source	Food Service - 12 Years; Pre-Rinse Spray Valve - 5 Years; Aerator - 10 Years				
Free Rider Rate & Source	20%				
Sources of Inputs	Commercial Food Service Incentive Program Evaluation, Final Report, Fish and River Consultants, February 2018. Food Service Incentive Program Study, Fisher_Nickel, Inc. (FNI), November 2012. Review of actual program data 2010- 2018, FEI. Program Cost Data Review, FEI, 2018 and Vendor costing survey 2018-2018. Review of TRMs from other jurisdictions, FEI, 2018 including KEMA Measure Life Study. Ontario Energy Board: OEB-2015-0344 New and Updated DSM Measures - Joint Submission from Union Gas Ltd. and Enbridge.				
Participants	2018	Projected	Actual:	Equipment	Low Flow
	Total	612		192	76
Expenditures (\$,000)	2018	Incentives	Admin	Communication	Research & Evaluation
	Total	393	121	0	0
					Total
					514

Notes:

- In 2018 as part of the Commercial Food Service Program, FEI, in partnership with the City of Vancouver, offered a program to install low-flow pre-rinse spray valves (PRSV) and faucet aerators in food service establishments. As a result, 76 participants were provided with PRSVs and faucet aerators in the City of Vancouver in 2018.
- The GJ savings from the PRSV and food service equipment are reported as separate line items.

Table 7-5: Customized Equipment Upgrade Program

Program Description	This program provides eligible customers with funding towards the completion of a detailed Energy Study, to identify energy saving opportunities specific and customized to their facilities, and subsequent capital incentive funding to encourage the implementation of any cost effective measures identified therein. The program seeks to capture energy savings associated with measures that are otherwise difficult to incent as part of a prescriptive program because they are complex, and one project may include multiple measures with interactive effects. The expected energy savings, measures, capital cost, incentives etc., will necessarily vary depending on the customer, though each project is submitted to a TRC test and must be approved by the utility.					
Target Market	Commercial customers					
New vs Retrofit	Both					
Partners	BC Hydro (New Construction) FortisBC (New Construction and Retrofit programs - Program development/testing stage) MEMPR					
Eligible Measures	Utility funded energy study, and utility incented Energy Saving Measures as identified in the energy study and approved by the utility. Energy Saving Measures are variable.					
Incremental Measure Cost	Variable. Dependent upon participant's proposed Energy Saving Measures.					
Incentive Amount	If TRC \geq 1.0 then \$5 / discounted GJ saved over 50% of the Energy Measure Life (EML), up to 10 yrs.					
Savings Per Participant	Variable. Dependent upon participant's proposed Energy Saving Measures.					
Measure Life & Source	Variable. Dependent upon participant's proposed Energy Saving Measures.					
Free Rider Rate & Source	Variable. Dependent upon participant's proposed Energy Saving Measures.					
Participants	2018	Projected	Actual			
	Total	78	52			
Expenditures (\$,000s)	2018	Incentives	Admin	Communication	Research & Evaluation	Total
	Total	1,967	385	1	159	2,512
Expenditures (\$,000s)	2018	Incentives	Admin	Communication	Research & Evaluation	Total
New Construction	Total	395	79	0	110	584
Expenditures (\$,000s)	2018	Incentives	Admin	Communication	Research & Evaluation	Total
Retrofit	Total	1,572	307	1	49	1,928

Notes:

- **New Construction Program:**

- Participation in this program can last for approximately five years. This is broken down into approximately 24 months to prepare the required whole building energy simulation, followed by up to 36 months to build the proposed building. The program incurs incentive expenditures upon the successful completion of the energy simulation, as well as upon completion of the building, while natural gas savings are only obtained upon completion of the proposed building.
- This program is in partnership with BC Hydro. Participants are recorded when the energy simulations or the new buildings are complete, and the incentive becomes payable.
- The '2018 Actual' participants include seven completed energy simulations, and five completed buildings with implemented measures.

- **Retrofit Program:**

- Participation in this program can last for approximately two years. This is broken down into approximately six months to prepare the required energy study, followed by 18 months to implement the proposed Energy Conservation Measures. The program incurs incentive expenditures upon the successful completion of the energy study, as well as

upon installation of the approved Energy Conservation Measures, while natural gas savings are only obtained upon installation of the approved Energy Conservation Measures.

- The '2018 Actual' participants includes 21 completed energy studies, and 19 projects where Energy Conservation Measures were installed.
- FEI administered EfficiencyBC incentives supporting non-cost-effective commercial natural gas energy efficiency projects, not eligible for existing FEI programs. The costs for administering the additional EfficiencyBC offers are administered separately and are not included program reporting herein.

Table 7-6: Continuous Optimization Program

Program Description	<p>The Continuous Optimization Program (C.Op) is designed to help commercial building owners identify and correct energy wasting operation faults, and continuously monitor building performance to help maintain and improve energy efficiency, resulting in reduced operating costs. C.Op is offered in partnership with BC Hydro. In the FortisBC electric service territory, C.Op is offered in partnership with FortisBC Inc. as the Building Optimization Program (B.Op).</p> <p>The program funds re-commissioning services to study the participant's building and recommend energy efficiency improvements, as well as access to an energy management information system (EMIS) to assist in tracking the building's performance after the re-commissioning work is complete. In return, participants must implement, at their costs, measures identified by the re-commissioning study that when combined have a payback period of two years or less.</p>					
Target Market	Commercial customers with buildings >50,000 ft ² who consume an average of 7,500 GJ of natural gas per year or natural gas is 40% of their building's total energy consumption.					
New vs Retrofit	Retrofit					
Partners	BC Hydro FortisBC					
Eligible Measures	RE/Retro-commissioning study, employee training, and "near time" energy consumption monitoring.					
Incremental Measure Cost	2018 observed average implemented incremental cost: \$41,738					
Incentive Amount	2018 observed average implemented incentive amount: \$9,208					
Savings Per Participant	2018 observed average implemented natural gas savings: 777 GJ/year					
Measure Life & Source	5 years - the duration of utility support for the energy management information system, plus one year.					
Free Rider Rate & Source	0% - BC Hydro					
Participants	2018	Projected	Participants Implementing in 2018	Cumulative Program Participants		
	Total	600	30	373		
Expenditures (\$,000s)	2018	Incentives	Admin	Communication	Research & Evaluation	Total
	Total	276	8	0	0	284

Notes:

- The Continuous Optimization Program is conducted in partnership with BC Hydro. BC Hydro acts as the primary administrator of program activities, with FEI providing financial and process support for gas customer participants.
- Participation in this program lasts for approximately seven years for a typical participant. The seven years are composed of approximately 12 months of baseline data collection, 24 months of re-commissioning study work plus the implementation of a recommended bundle of energy conservation measures, and 48 months of monitoring and continuous improvement.
- Participants are recorded as soon as they are accepted into the program, however natural gas savings do not occur until they have completed the implementation of a recommended bundle of energy conservation measures, approximately 36 months later. As such, the program incurs incentive expenses (for the upgrading of meter equipment, re-commissioning costs and EMIS costs) before natural gas savings are obtained.
- The average nominal program duration incremental cost represents the total incremental cost expected to be incurred when an average participant completes the full 7 year run in the program. The 2018 observed average implemented incremental cost represents the incremental costs incurred specifically in 2018 divided by the total number of participants who implemented in 2018.
- The average nominal program duration incentive amount represents the total incentive expected to be paid when an average participant completes the full seven year run in the program. The 2018 observed average implementation incentive amount represents the incentive paid specifically in 2018 divided by the total number of participants who implemented in 2018. Due to the nature of the program, the incentive amount paid is not solely attributable to those who implemented in 2018.
- The average expected annual natural gas savings represent the expected annual natural gas savings per participant after they have completed the implementation of a recommended bundle of energy conservation measures. The 2018 observed average implemented natural gas savings represent natural gas savings attributed to customers who have completed the implementation of a recommended bundle of energy conservation measures specifically in 2018 divided by the total number of participants who implemented in 2018.

Participant count clarification:

- "2018 Actual" represents the number of new participants who were approved in 2018. There were no new participants because the current program is fully subscribed and closed to new participants.
- "Participants implementing in 2018" represents the number of participants who have successfully completed implementing the bundle of energy conservation measures in 2018.

"Cumulative Program Participants" represent the total number of approved program participants from the entire multi-year duration. Program participants have the option to discontinue participation in the program during the multi-year duration. A number of program participants chose to discontinue participation in 2018 which, combined with the program being closed to new participants, resulted in a lower cumulative participation number than the previous year.

Table 7-7: Commercial Energy Assessment Program

Program Description	This program identifies inefficiencies at the participant's facilities via an on-site walkthrough assessment by an energy-efficiency consultant. The consultant then produces a report that describes the observed inefficiencies, outlines proposed solutions, and identifies any applicable incentive programs. FortisBC then forwards the report to the participant. Simple measures, such as low-flow faucet aerators and pre-rinse spray valves, are provided to the participant at no charge.					
Target Market	Medium commercial and small industrial customers with an average annual consumption between 1,500 and 10,000 GJ.					
New vs Retrofit	Retrofit					
Partners	FortisBC Inc.					
Incremental Measure Cost	\$1,512					
Incentive Amount	\$1,318					
Savings Per Participant	490 GJ					
Measure Life & Source	Energy Assessment - 1 Years - Conservative estimate based on the implementation of low-cost, simple recommendations (such as operational adjustments) from the energy assessment report, past spray valve program data and database for Energy Efficiency Resources (DEER). San Francisco, CA, California Public Utilities Commission, 2011. Pre-Rinse Spray Valve - 5 Years - KEMA – State of Wisconsin Public Service Commission of Wisconsin, Focus on Energy Evaluation, Ontario Energy Board, Measures and Assumptions for DSM Planning, February 6, 2009 Aerator - 10 Years - Terasen Gas TRC Model RES (3/4/2013) & Navigant Consulting, Measures and Assumptions For Demand Side Management Planning (April 16, 2009; Page C-102)					
Free Rider Rate & Source	35% - 2010 Friuch Energy Assessment Evaluation, past spray valve program data					
Participants	2018	Projected	Actual			
	Total	524	53			
Expenditures (\$,000s)	2018	Incentives	Admin	Communication	Research & Evaluation	Total
	Total	70	31	0	0	101

Notes:

- At the time of writing the 2014-2018 DSM Plan, FEI was unsure whether the Provincial Government's Business Energy Advisor (BEA) Program would continue or not. A contingency measure was planned for this program to ensure small businesses had access to energy analysis if the BEA Program was discontinued. Participation from small business customers was foreseen in the 2014-2018 DSM Plan. As the BEA Program was continued, the scope of the Commercial Energy Assessment Program was not expanded to include small businesses.

The number of participants in 2018 is significantly less than was estimated in the 2014-2018 DSM Plan. In anticipation of the 2019-2022 FEI DSM Plan approval it was decided not to make any changes to existing program structure or to proceed with active promotion of the program. With the approval of the 2019-2022 DSM Plan the prescriptive program area will be completely re-designed. Once the re-design is completed, the Commercial Energy Assessment will be re-designed to support small and medium commercial customers with high-level energy assessments with rebate recommendations of the re-designed suites or prescriptive rebates. Note that in 2018 a significant number of multi-family apartment customers received energy assessments through the RAP Program.

Table 7-8: Energy Specialist Program

Program Description	This program funds Energy Specialist positions within customers' organizations, up to \$60,000 based on an annual contract. Funded Energy Specialists' key priority is to identify and implement opportunities for their organization to participate in FortisBC's DSM programs, while also identifying and implementing non-program specific opportunities to use natural gas more efficiently. This program is funded as an enabling program.					
Target Market	Large Commercial and Institutional Customers					
New vs Retrofit	Retrofit					
Partners	BC Hydro, FortisBC Inc.					
Eligible Measures	Energy Specialist position					
Incremental Measure Cost	\$60,000					
Incentive Amount	\$60,000					
Savings Per Participant	Total 2018 (non-C&EM program) annual natural gas savings = 14,820 GJ.					
Measure Life & Source	N/A					
Free Rider Rate	13% - Based on an evaluation study conducted in 2017 by Prism on projects that were outside of the incentive funding.					
Participants	2018	Projected	Actual			
	Total	27	26			
Expenditures (\$,000s)	2018	Incentives	Admin	Communication	Research & Evaluation	Total
	Total	1,625	82	0	46	1,753

Notes:

- The Energy Specialist Program continues to experience success as an enabling program. In 2018, organizations with Energy Specialists were responsible for 34 percent of the natural gas savings and 29 percent of the incentives paid out by Commercial C&EM programs. This is in addition to the Conservation Education and Outreach, Innovative Technologies, Low Income, and Residential programs and incentives that Energy Specialists promoted and used in 2018.
- Some organizations had Energy Specialists for part of the year only as their funding agreements concluded and were not renewed.
- The energy savings of 14,820 GJs / year is an estimation, based on natural gas efficiency projects submitted by Energy Specialists for savings that are not captured by other C&EM programs. These energy savings are only reported and have not been included in the calculations for the benefit/cost tests, as the required inputs are not available.
- In 2018, FEI provided funding to six organizations as a pilot to support hiring Community Energy Specialists. These Community Energy Specialists (also known as Senior Energy Specialists) were funded through both Conservation and Energy Management funds as well as External Relations funds. They are tasked with similar objectives as Energy Specialists, along with other activities beyond C&EM. These other areas of focus include renewable natural gas, natural gas for transportation, refreshing community or corporate energy and emissions plans, policy analysis, and supporting local government greenhouse gas emissions reporting requirements.

7.3 2018 PROGRAMS WITH JOINT PROGRAM AREA BUDGETS

7.3.1 Rental Apartment Efficiency Program (RAP)

RAP includes a combination of residential and commercial measures for the rental apartment market, each funded from their respective Program Areas. This program is specifically designed to overcome barriers to adopting energy efficiency measures otherwise experienced by rental building owners and their tenants, and includes expenditures from each of the Residential and Commercial Program Areas. The expenditures and related savings for this program attributable to each Program Area are provided in Table 7-9 and correspond to the RAP expenditures shown in the Program Area Summary Tables for each.

Table 7-9: Rental Apartment Efficiency (RAP) – Full Program Summary

Program	Annual Gas Savings (GJ/yr.)		Actual NPV Gas Savings (GJ)	Utility Expenditures (\$000s)						Benefit/Cost Ratios				
				Incentives		Non-Incentives		All Spending						
	2014-2018 DSM Plan	2018 Actual		2014-2018 DSM Plan	2018 Actual	2014-2018 DSM Plan	2018 Actual	2014-2018 DSM Plan	2018 Actual	TRC	MTRC	Utility	Participant	RIM
Rental Apt Efficiency (RAP) - Commercial Portion														
Total	0	28,225	54,422	0	534	0	166	0	700	0.7	n/a	0.7	2.2	0.6
Rental Apt Efficiency (RAP) - Low Income Portion														
Total	0	0	0	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a
Rental Apt Efficiency (RAP) - Residential Portion														
Total	0	26,151	196,365	0	274	0	136	0	410	3.3	n/a	4.5	7.6	0.8
Overall Program														
Total	0	54,376	250,787	0	808	0	302	0	1,111	1.9	n/a	2.1	4.2	0.8

Table 7-10: Rental Apartment Efficiency (RAP)

Program Description	There are three components to the RAP program. The first component is to provide direct install in-suite energy efficiency upgrades. These devices will be installed by an agent of FortisBC into each individual rental suite. The second component is to provide those participants with energy assessments recommending building-level energy efficiency upgrades such as condensing boilers, high efficiency water heaters and control upgrades. The last component is to provide participants with support in implementing those energy efficiency recommendations and applying for rebates. Expenditures for RAP are budgeted within 2 program areas based on the in-suite versus the common area expenses. All the in-suite related expenses are budgeted in the Residential Program Area, while the common area related expenses are budgeted in the Commercial Program Area. This includes expenditures associated with the energy assessment, implementation support common area upgrades.					
Target Market	Purpose-Built Rental Apartment Buildings					
New vs Retrofit	Retrofit					
Partners	FortisBC Inc.					
Eligible Measures	1.5 GPM Showerheads, 1.5 GPM Handheld Showerheads, 0.8 GPM Bathroom Aerators, 0.8 GPM Kitchen Aerators Walkthrough Energy Audits, Implementation Support, Condensing Boilers, Energy Efficiency Water Heaters					
Incremental Measure Cost	Varies					
Incentive Amount	Varies					
Savings Per Participant	Varies					
Measure Life & Source	Varies					
Free Rider Rate & Source	Varies					
Participants	2018	Total	Commercial	Residential		
	Projected	0				
	Actual	27257	221	27036		
Participants by Measure Type			Commercial	Residential		
	Non-SST 1.5 Showerhead			7712		
	Non-SST 1.5 GPM Handheld			1334		
	Non-SST 1.5 GPM Bathroom Aerator			9519		
	Non-SST 1.5 GPM Kitchen Aerator			8471		
	Energy Assessment Reports		199			
	Implementation Support Partial		1			
	Implementation Support Full		10			
	Boiler Top Ups (40% of the rebate)					
	Water Heaters					
	Condensing Boilers		11			
		Total	221	27,036		
Expenditures (\$,000s)			Non-Incentives			
	2018	Incentives	Admin	Communication	Research & Evaluation	Total
	Commercial	534	116	39	11	700
	Residential	274	94	29	14	410
	Total	808	209	69	25	1,111

7.4 SUMMARY

Commercial Energy Efficiency Program Area activity in 2018 successfully achieved approximately 234,228 GJ of annual natural gas savings and a TRC of 1.0. All programs continue to maintain steady performance in terms of participation, incentive expenditures and natural gas savings. Of particular note are the Space Heat Program and Commercial Custom Design Program which remain cornerstone programs for the Commercial Program Area. These programs invested close to \$3 million and close to \$2 million respectively in customer natural gas efficiency projects in 2018. Moving forward, the programs will continue to focus on generating natural gas savings and fostering market transformation in the commercial sector.

8. INNOVATIVE TECHNOLOGIES PROGRAM AREA

8.1 OVERVIEW

A primary objective of the Innovative Technologies Program Area is to identify technologies that are not yet widely adopted in British Columbia, and which are suitable for the development of or inclusion in the Portfolio of ongoing DSM programs in other Program Areas. This is accomplished through pilot and demonstration projects, pre-feasibility studies and the use of Industry Standard Evaluation, Measurement and Verification (EM&V) protocols to validate manufacturers' claims related to equipment and system performance. Results from Innovative Technologies activities are used in making future DSM programming decisions and technology inclusions.

All 2018 activities undertaken in this Program Area meet the definition of technology innovation programs as set out in the DSM Regulation. It should be noted that Innovative Technologies are considered a "specified demand-side measure"¹⁴, meaning that the Program Area or the measures therein are not subject individually to a cost-effectiveness test. Instead the cost effectiveness of these expenditures is evaluated as part of the DSM Portfolio as a whole.¹⁵ Innovative Technologies expenditures are also not subject to the MTRC cap set out in subsection 4(4) of the DSM Regulation according to Request for Clarification of Order G-44-12.¹⁶

Table 8.1 summarizes expenditures for the Innovative Technologies Program Area in 2018, including incentive and non-incentive expenditures, annual and NPV gas savings, as well as TRC and other cost-effectiveness test results where applicable.

Table 8-1: 2018 Innovative Technologies Program Area Results Summary

Program	Annual Gas Savings (GJ/yr.)		Actual NPV Gas Savings (GJ)	Utility Expenditures (\$000s)						Benefit/Cost Ratios				
				Incentives		Non-Incentives		All Spending		TRC	MTRC	Utility	Participant	RIM
	2014-2018 DSM Plan	2018 Actual		2014-2018 DSM Plan	2018 Actual	2014-2018 DSM Plan	2018 Actual	2014-2018 DSM Plan	2018 Actual					
Non Program Specific Expenses														
Total	No Direct Savings			n/a	0	n/a	442	n/a	442	No Direct Savings				
Pilot/Demonstration Projects														
Total	29,468	0	0	568	213	462	213	1,030	426	No Direct Savings				
Studies														
Total	No Direct Savings			n/a	0	180	181	180	181	No Direct Savings				
ALL PROGRAMS														
Total	29,468	0	0	568	213	642	836	1,210	1,049	No Direct Savings				

¹⁴ BCUC Log No. 36730, Request for Clarification of Order G-44-12 and Decision on the 2012 – 2013 Revenue Requirements Application and Natural Gas Rates Application

¹⁵ Subsection 4(4) of the Demand-Side Measures Regulation, and the Decision on the 2012 – 2013 Revenue Requirements Application and Natural Gas Rates Application, page 175.

¹⁶ BCUC Log No. 36730, Request for Further Clarification of Order G-44-12 and Decision on the 2012 – 2013 Revenue Requirements Application and Natural Gas Rates Application and the Commission's May 11, 2012 letter.

1 **8.2 2018 INNOVATIVE TECHNOLOGIES ACTIVITIES**

- 2 Table 8-2 outlines the specific Innovative Technologies Pilot activities undertaken in 2018,
3 including program and measure descriptions and a breakdown of non-incentive expenditures.¹⁷

¹⁷ As Innovative Technologies activities are considered pilots rather than DSM programs, they were not presented in individual program tables as in other Program Area sections in the Report.

Table 8-2: Pilots

Program Description	The Pilot Program focused on evaluating market-ready technologies and conducting small scale pilots to gather data to validate manufacturers' claims about measure system performance and energy savings. The data from pilots can also be used to help improve the quality and installation of future systems, and to understand and reduce market barriers. Technologies that successfully emerge from the Innovative Technologies Program will be considered for inclusion in the various program areas within the larger C&EM portfolio.					
Target Market	Variable					
New vs Retrofit	Retrofit					
Carbon Capture Pilot Project	FEI partnered with CleanO2 to test and demonstrate energy efficiency and GHG reduction for 10 carbon capture and conversion technology installations in the Lower Mainland and Vancouver Island. The pilot will test if the CleanO2 Carbon Capture Technology can meet the energy conservation and greenhouse gas (GHG) reduction objectives of commercial and small business clients. Pilot results expected Q4 2019.					
	2018 Total	Participants 10				
Smart Learning Thermostat Pilot	This joint pilot between FortisBC Energy Inc. and FortisBC Inc. is designed to gauge the customer acceptance and energy savings associated with smart learning thermostats where the results will inform future Demand Side Management (DSM) and Demand Response (DR) program offerings. Smart Learning Thermostat ("SLT") pilot focuses on the Nest, Ecobee3 and Honeywell Lyric products. The objectives of the pilot are to fill the information gaps identified with customer acceptance, costing and savings for SLTs for both natural gas and electric residential customers. Pilot results expected Q2 2019.					
	2018 Total	Participants 0				
Gas Technology Demonstration Pilot ("GTD")	The Gas Technology Demonstration ("GTD") program provides funding to FortisBC Energy Specialists to explore innovative technologies through three main program offerings: Technology Feasibility Study, Technology Demonstration, Technology Measurement and Verification. In 2018, GTD provided funding for Endotherm and mechanical insulation systems.					
	2018 Total	Participants 14				
On-Demand Recirculation Demonstration Project ("RCP")	Objectives of the pilot is to verify the energy savings, customer acceptance and installation of on-demand recirculation controls for central domestic hot water recirculation systems. The pilot subscribed 19 rental apartment buildings located in the Lower Mainland of British Columbia. Pilot results expected Q1 2019.					
	2018 Total	Participants 19				
New Construction Combo Unit Demo Pilot ("NCCURP")	FortisBC conducted a pilot program for retrofit specific market on Combination systems. Although the pilot results were promising, they were only indicative of the retrofit market. The New Construction Combination Pilot will be conducted to assess the technical characteristics, market opportunity and projected energy savings of combination systems in new construction market. This project will target two townhome development projects located in FortisBC service territories. Pilot results expected Q2 2019.					
	2018 Total	Participants 22				
Participants	2018 Total	Projected n/a	Actual 65			
Expenditures (\$,000s)	Non-Incentive Expenditures					
	2018	Incentives	Admin	Communication	Research & Evaluation	Total
	Total	213	103	12	98	426

Note:

- Participants and savings in the Smart Learning Thermostat Pilot will be attributed when final incentive payments are provided. No final incentive payments made in 2018, therefore no participants reported.

Table 8-3: Studies

Description	Studies are used to assess the market opportunity, technical characteristics and projected energy savings of commercially available DSM technologies. The results can be used to determine the feasibility of launching a pilot or to make future program area inclusion decisions.					
Target Market	Variable					
New vs Retrofit	N/A					
<i>Connected Homes Prefeasibility Study</i>	Connected Home technologies, also commonly known as Smart Home technologies, use hardware, software, sensors, and network connectivity to control their environment, allow for remote control over the internet or local networks, and provide varying levels of home automation. The aim of this prefeasibility study is to characterize the energy and non-energy benefits of Connected Home technologies and to estimate their energy savings potential in FortisBC's service area. FortisBC intends to use this study to determine the feasibility of launching a pilot project and using Connected Home technologies as Demand Side Management (DSM) measures.					
<i>Micro-CHP Prefeasibility Study</i>	Micro-combined heat and power (Micro-CHP) systems are power plants that generate two forms of energy from a single fuel source. Micro-CHP systems generally provide both heat and power to a single building and have a capacity of less than 50 kW. They can provide space heating (hydronic and warm air) and/or water heating along with grid-parallel and backup electricity. While uncommon, some systems also provide space cooling. The aim of this prefeasibility study is to characterize the energy and non-energy benefits of Micro-CHP technologies and estimate their energy savings potential in FortisBC's service area.					
<i>Mobile Home Technology Prefeasibility Study</i>	Manufactured homes are distinct from their site-built counterparts and accordingly present unique opportunities for energy savings that have been traditionally overlooked by DSM programs due to their relatively small presence. The objective of the study is to identify innovative Energy Conservation Measures ("ECM's") and the achievable potential for Mobile Homes within the residential and low-income household market sectors across British Columbia.					
<i>Low Carbon Technologies in Commercial Buildings</i>	The objective of the study is to identify strategies for natural gas Emission Reduction Measures (ERMs) for the commercial and large residential market sectors in southwest BC while still meeting natural gas Demand Side Management (DSM) regulation requirements. This study will clarify what percent (%) emission reduction is possible for buildings that undergo deep energy retrofits while maintaining use of natural gas systems. Results expected Q1 2019.					
Expenditures (\$,000s)	Non-Incentive Expenditures					
	2018	Incentives	Admin	Communication	Research & Evaluation	Total
	Total	0	181	0	0	181

8.3 SUMMARY

Innovative Technologies represent a key component of FEI's overall commitment to DSM activities by identifying viable technologies and projects that have the potential to support the development of new programs within the larger DSM Portfolio.

Overall, the Innovative Technologies initiatives achieved results in evaluating the feasibility of new technologies and providing insights used towards the design of future DSM programs. The Innovative Technologies Program Area continues to use consistent criteria to ensure the greatest potential for screening technologies for further development as full programs in other areas of the DSM Portfolio.

9. INDUSTRIAL ENERGY EFFICIENCY PROGRAM AREA

9.1 OVERVIEW

In 2018, the Industrial Energy Efficiency Program Area continued to encourage industrial customers to consume natural gas more efficiently, achieving an overall TRC of 1.3 with a combined net natural gas savings of 123,356 GJ/yr. Table 9-1 summarizes the projected and actual expenditures for the Industrial Energy Efficiency Program Area in 2018, including incentive and non-incentive expenditures, annual and NPV gas savings, as well as TRC and other cost-effectiveness test results.

Table 9-1: 2018 Industrial Energy Efficiency Program Results Summary

Program	Annual Gas Savings (GJ/yr.)		Actual NPV Gas Savings (GJ)	Utility Expenditures (\$000s)						Benefit/Cost Ratios				
	2014-2018 DSM Plan	2018 Actual		Incentives		Non-Incentives		All Spending		TRC	MTRC	Utility	Participant	RIM
				2014-2018 DSM Plan	2018 Actual	2014-2018 DSM Plan	2018 Actual	2014-2018 DSM Plan	2018 Actual					
Non Program Specific Expenses														
Total	No Direct Savings			n/a	n/a	262	224	262	224		No Direct Savings			
Industrial Optimization Program														
Total	122,474	82,240	643,413	1,609	1,943	475	359	2,084	2,302	1.2	n/a	2.7	1.7	0.9
Specialized Industrial Process Technology Program														
Total	66,991	41,116	329,848	555	615	81	54	636	669	1.6	n/a	4.7	1.8	1.0
ALL PROGRAMS														
Total	189,465	123,356	973,261	2,165	2,558	818	637	2,983	3,195	1.3	n/a	2.9	1.7	0.9

Note:

- For the purpose of cost-effectiveness tests, 123,356 GJ in savings have been claimed for 2018. Since a project's total incentive can be made across multiple years, the annual natural gas savings are pro-rated based on the proportion of the project's incremental cost that is reported in that year. Please refer to the Industrial Optimization Program description below for further details on this methodology.

9.2 2018 INDUSTRIAL ENERGY EFFICIENCY PROGRAMS

Tables 9-2 and 9-3 show the Industrial Energy Efficiency Program Area activity undertaken in 2018, including program and measure descriptions and a breakdown of non-incentive expenditures.

Table 9-2: Industrial Optimization Program

Program Description	Includes measures that allow customers to identify, assess, and implement customized cost-effective energy efficiency projects for industrial processes using natural gas as process heat or an energy source.					
Target Market	Medium and large industrial facilities					
New vs Retrofit	Both					
Eligible Measures	Variable. Natural gas measures with a TRC \geq 1.0					
Incremental Measure Cost	Dependent upon participant's proposed energy conservation measures.					
Incentive Amount	Variable. Dependent on project characteristics.					
Savings Per Participant	Variable. Dependent on project characteristics.					
Measure Life & Source	Variable. Dependent upon participant's proposed energy conservation measures					
Free Rider Rate & Source	10% Technology Implementation; 20% Industrial Energy Audit, Plant Wide Audit, Feasibility Study. Source: Best estimate.					
Participants	2018	Projected	Actual			
	Total	31	25			
Expenditures (\$,000s)	2018	Incentives	Admin	Communication	Research & Evaluation	Total
	Total	1,943	283	0	76	2,302

Notes:

- The Industrial Optimization Program includes measures that allow industrial customers to identify, investigate and implement energy efficiency projects. Participation in the program can span multiple years due to the timescales associated with completing an energy study, procuring and installing an energy conservation measure, and multi-year measurement and verification analysis.
- The net natural gas savings reported in 2018 under the Industrial Optimization Program are solely attributable to projects implemented through the Technology Implementation measure. Natural gas savings from energy conservation measures identified, installed, but not incented through the Technology Implementation measure of the Industrial Optimization Program are also claimed at this time.
- In 2018, three Plant Wide Audits and six Feasibility Studies were completed. Eight projects progressed to Technology Implementation measures and are expected to save 82,240 GJ of natural gas once installed.
- Depending on the size of the incentive, Technology Implementation project incentive payments are either paid fully on project commissioning or are paid across several years after commissioning and based on the natural gas saving performance. Hence, for larger incentives, only a portion of the incentive is paid on project commissioning. For consistency in performing cost benefit analyses, only a prorated portion of the natural gas savings and project costs are included in the determination of the cost benefit ratios.

Table 9-3: Specialized Industrial Process Technology Program

Program Description	This program provides prescriptive incentives to Industrial customers to encourage the implementation of specific technologies and best practices targeted at particular industrial processes using natural gas as process heat or an energy source.					
Target Market	Small, Medium and Large Industrial Facilities					
New vs Retrofit	Both.					
Incremental Measure Cost	Variable. Dependent on measure.					
Incentive Amount	Variable. Dependent on measure.					
Savings Per Participant	Variable. Dependent on measure.					
Measure Life & Source	Variable. Dependent on measure.					
Free Rider Rate & Source	20% - steam trap audit and replacement; 18% - hot water process boilers; 20% - steam boiler upgrades; 18% pipe insulation; 27% - thermal curtains; 20% other measures. Sources: Specialized Industrial Process Technology Program business case.					
Participants	2018 Total	Projected 17	Actual 15			
Expenditures (\$,000s)	2018	Incentives	Admin	Communication	Research & Evaluation	Total
	Total	615	37	2	15	669

Notes:

- In 2018, two Steam Trap projects, five Unit Heaters, two Hot Water Boiler, two Thermal Curtains and four insulation projects were completed. The estimated total savings from these projects is 41,116 GJ.
- FEI launched the steam trap audit and replacement, pipe and tank insulation, air curtains and direct contact water heater prescriptive measures in Q4 2017. FEI launched the thermal curtains and unit heater prescriptive measures in Q3 2018.

9.3 SUMMARY

The Industrial Energy Efficiency Program Area activity in 2018 resulted in 123,356 GJ of net natural gas savings and a TRC of 1.3. The addition of new cost-effective measures in the Specialized Industrial Process Technology Program not only increased the overall savings achieved by the Portfolio, but also increased the diversity of industrial customers participating in FEI's industrial programs. This confirms FEI's commitment to supporting energy efficiency in the province regardless of sector or size.

10. CONSERVATION EDUCATION AND OUTREACH INITIATIVES

10.1 OVERVIEW

The CEO Program Area continues to support the DSM Portfolio goals of energy conservation in a variety of ways. In order to foster a culture of conservation, several initiatives and campaigns were undertaken in 2018, providing new information about behaviour change and customer attitudes on efficiency. Educating all types of customers and students who are future customers remains a strong priority and FEI is continuing to ensure steps are taken to make the information provided relevant and timely.

FEI continued its collaboration with FBC in 2018 to maximize efficiencies across both teams. Costs continue to be shared on school, residential and commercial outreach as applicable. The fifth annual Efficiency in Action awards were held recognizing natural gas commercial organizations that have most effectively used C&EM programs and achieved natural gas savings. FEI's partnership with BC Hydro continued in 2018. This included collaboration on the Energy Wise Network Program for commercial customers that led to over 40 natural gas behaviour change projects being submitted in 2018 with a completion date of March 31, 2019. In collaboration with FBC and BC Hydro, FEI developed and promoted four commercial behaviour change kits for use by businesses to engage their employees in energy conservation. The choice of four kits allowed businesses to tailor their employee behaviour campaigns to best meet their business' needs and resources. Through this collaborative initiative, businesses requested and received over 150 kits in 2018. The multi-lingual outreach program, Empower Me, continued to reach new Canadians in eleven languages through a community based social marketing approach.

CEO continued to provide information to customers and the public on natural gas conservation and energy literacy and sought out new opportunities to reach customers. In collaboration with FBC, a municipal landing page was created to support municipalities in their efforts to promote FEI and FBC incentives and behaviour change. The online, curriculum-connected "Energy Leaders" resource program for BC elementary and secondary school teachers moved to its second year in market and expanded to include Grade 10 lessons. FEI also continues to support various training seminars and educational workshops in collaboration with such organizations as the Greater Vancouver Home Builders Association and other industry associations.

As these are not incentive-based programs, FEI has not attributed direct savings to them in 2018. The following tables do not contain information about eligible measures, incentive amounts, savings levels, free-ridership, spillover or participation levels. CEO costs are included at the Portfolio level and incorporated into the overall DSM Portfolio cost-effectiveness results. Although there were no energy savings attributed to the CEO Program Area in 2018, FEI continues to focus on behavioural change opportunities to foster a culture of conservation in British Columbia while driving program awareness and participation. Additional research and evaluation has taken place to report energy savings and it is expected that savings will be reported in coming years.

Table 10-1 summarizes expenditures for the CEO Program Area in 2018. The approved expenditures for 2018 were \$2.400 million and actual expenditures in 2018 were \$3.122 million once labour was included.

Table 10-1: 2018 CEO Initiative Results Summary

Program	Annual Gas Savings (GJ/yr.)		Actual NPV Gas Savings (GJ)	Utility Expenditures (\$000s)						Benefit/Cost Ratios				
				Incentives		Non-Incentives		All Spending						
	2014-2018 DSM Plan	2018 Actual		2014-2018 DSM Plan	2018 Actual	2014-2018 DSM Plan	2018 Actual	2014-2018 DSM Plan	2018 Actual	TRC	MTRC	Utility	Participant	RIM
Non-Program Specific Expenses														
Total	No Direct Savings			0	0	240	153	240	153			No Direct Savings		
Residential Education Program														
Total	No Direct Savings			0	0	990	1,728	990	1,728			No Direct Savings		
Commercial Education Program														
Total	No Direct Savings			0	0	450	522	450	522			No Direct Savings		
School Education Program														
Total	No Direct Savings			0	0	720	718	720	718			No Direct Savings		
ALL PROGRAMS														
Total	No Direct Savings			0	0	2,400	3,122	2,400	3,122			No Direct Savings		

10.2 2018 CEO PROGRAMS

Tables 10-2 through 10-4 outline the CEO initiatives undertaken in 2018. This includes program descriptions as well as a breakdown of expenditures, all of which is classified as “non-incentive expenditures”.

Table 10-2: Residential Education Program

Program Description	<p>This program provides information to Residential customers and the general public on natural gas conservation and energy literacy by seeking opportunities to engage with customers broadly and directly. This audience also included low income and multi-lingual customers.</p> <p>Promotional activities in 2018 included a multimedia general rebates awareness campaign, engagement campaigns as well as educational workshops and participation in home shows and community events. The Program also included the cost of production of materials for events and pricing for audience engagement that are utilized at events targeting Residential customers.</p> <p>In addition, continuing partnerships with the regional Canadian Home Builders' Associations and local sports organizations expanded outreach opportunities to engage with Residential customers.</p> <p>FEI continues to focus on behavioural change opportunities that lead to energy savings however we currently do not verify and report on those savings.</p> <p>Collaborations between internal departments, FortisBC Inc., as well as other utilities, were pursued to achieve cost efficiencies, particularly for paid media and for outreach events.</p>					
Target Market	Residential customers and general public					
New vs Retrofit	Both					
Expenditures (\$,000s)	2018	Incentives	Non-Incentive Expenditures			Total
			Admin	Communication	Research & Evaluation	
Total		0	1,060	637	31	1,728

Table 10-3: Commercial Education Program

Program Description	<p>This program provides ongoing communication and education about energy conservation initiatives as well as encourages behavioural changes that help Commercial customers reduce their organization's energy consumption. The Commercial sector is made up of small and large businesses in a variety of sub sectors such as retail, offices, multi-family residences, schools, hospitals, hospitality services and municipal/institutions.</p> <p>Promotional activities for 2018 included print and online communications, industry association meetings and tradeshow and face-to-face engagement opportunities specific to small businesses. Our fifth annual Efficiency in Action Awards, which recognizes Commercial customers for their innovation in energy efficiency also took place.</p> <p>In addition, continuing partnerships with the Business Improvement Associations of BC (BIABC) and Climate Smart expanded outreach to small to medium-sized businesses.</p> <p>This program area continued to guide and support behaviour education campaigns delivered by energy specialists (or an energy manager) in their respective organizations. Collaborations between internal departments, FortisBC Inc. as well as with other utilities, were pursued to achieve cost efficiencies such as the Energy Wise Network joint initiative with BC Hydro.</p>																							
Target Market	Commercial customers, multi-family, energy specialists, energy management staff																							
New vs Retrofit	Retrofit																							
Expenditures (\$,000s)	<table><tr><td></td><td></td><td colspan="3">Non-Incentive Expenditures</td><td></td></tr><tr><td>2018</td><td>Incentives</td><td>Admin</td><td>Communication</td><td>Research & Evaluation</td><td>Total</td></tr><tr><td>Total</td><td>0</td><td>202</td><td>313</td><td>7</td><td>522</td></tr></table>								Non-Incentive Expenditures				2018	Incentives	Admin	Communication	Research & Evaluation	Total	Total	0	202	313	7	522
		Non-Incentive Expenditures																						
2018	Incentives	Admin	Communication	Research & Evaluation	Total																			
Total	0	202	313	7	522																			

Table 10-4: School Education Program

Program Description	<p>This is an education program for students enrolled in [K-12] schools and post secondary schools in the Company's service area. This program now has an online resource for teachers directly linking to the K-10 curriculum.</p> <p>Other activities include assembly style presentations related to conserving energy for K-7 students, delivered internally through our Energy is Awesome presentations and externally through our BC Lions Energy Champions initiative. These activities also include distribution of energy efficient fixtures and colouring books.</p> <p>Partnerships and funding support for post-secondary activities included on-campus education campaigns and the development of a natural gas DSM focused presentation delivered in a lecture format to individual classes.</p>																							
Target Market	Students and teachers																							
New vs Retrofit	Retrofit																							
Expenditures (\$,000s)	<table><tr><td></td><td></td><td colspan="3">Non-Incentive Expenditures</td><td></td></tr><tr><td>2018</td><td>Incentives</td><td>Admin</td><td>Communication</td><td>Research & Evaluation</td><td>Total</td></tr><tr><td>Total</td><td>0</td><td>325</td><td>258</td><td>135</td><td>718</td></tr></table>								Non-Incentive Expenditures				2018	Incentives	Admin	Communication	Research & Evaluation	Total	Total	0	325	258	135	718
		Non-Incentive Expenditures																						
2018	Incentives	Admin	Communication	Research & Evaluation	Total																			
Total	0	325	258	135	718																			

10.3 SUMMARY

The initiatives described in CEO are designed to foster a culture of energy conservation in BC through activities designed to deliver overall conservation messaging, support energy efficiency literacy, and assist with increasing program awareness. By changing attitudes and

- 1 behaviours, the Company will help communities reach their goals, help customers save
- 2 energy and money, increase participation in DSM programs, and support public policy
- 3 objectives to increase energy efficiency and reduce greenhouse gas emissions. In 2018, this
- 4 Program Area continued to explore new ways and seek out new opportunities and channels to
- 5 connect with customers to ultimately grow the culture of energy conservation.

11. ENABLING ACTIVITIES

11.1 OVERVIEW

In 2018, Enabling Activities continued to support and supplement FEI's DSM program development and delivery, advancing energy efficiency in British Columbia. This included:

- the ongoing Trade Ally Network Program;
- work completed in advancing national and provincial building codes, appliance/equipment standards, and regulations;
- maintenance and support for the Company's current DSM program tracking system, as well as development costs for a new replacement DSM program tracking and management system;
- completion of the Residential End-Use Study; and
- continued support of post-secondary energy management programs.

These activities play an important role in FEI's Portfolio of DSM activities by advancing the delivery of all Program Areas. However, the Company has not claimed any energy savings in 2018 for work completed in this area except for energy savings related to the advancement of codes and standards. As codes and standards advance, FEI examines the impact that its DSM programs have had on that advancement. FEI then claims energy savings in the respective Program Area where appropriate when a new regulation or standard is adopted.

In the 2017 DSM Annual Report FEI stated its intention to claim energy savings in the 2018 DSM Annual report from the BC Government's adoption of a new standard for minimum fireplace efficiency in January 2019 and apply these to the applicable program area; i.e. the EnerChoice Fireplace program. Please see Section 5.3 for details of these energy savings.

No other opportunities to identify attribution savings were identified in 2018. FEI will continue to examine and, where appropriate, claim energy savings for Codes and Standards advancement for future programs.

Table 11-1 summarizes the projected and actual expenditures for the Enabling Activities in 2018.

Table 11-1: 2018 Enabling Activities Results

Program	Annual Gas Savings (GJ/yr.)		Actual NPV Gas Savings (GJ)	Utility Expenditures (\$000s)						Benefit/Cost Ratios				
				Incentives		Non-Incentives		All Spending		TRC	MTRC	Utility	Participant	RIM
	2014-2018 DSM Plan	2018 Actual		2014-2018 DSM Plan	2018 Actual	2014-2018 DSM Plan	2018 Actual	2014-2018 DSM Plan	2018 Actual					
Trade Ally Network														
Total	No Direct Savings			n/a	n/a	500	694	500	694			No Direct Savings		
Codes and Standards														
Total	No Direct Savings			n/a	n/a	35	100	35	100			No Direct Savings		
DSM Systems Maintenance and Development														
Total	No Direct Savings			n/a	n/a	80	439	80	439			No Direct Savings		
Residential End-Use Study														
Total	No Direct Savings			n/a	n/a	0	25	0	25			No Direct Savings		
Energy Management Education Funding														
Total	No Direct Savings			n/a	n/a	150	3	150	3			No Direct Savings		
ALL PROGRAMS														
Total	No Direct Savings			n/a	n/a	765	1,260	765	1,260			No Direct Savings		

Notes:

- See Table 11-4 for an explanation of the variance on the DSM System Maintenance and Development Initiative.
- 2018 activities for Energy Management Education Funding initiative were limited to planning work for future implementation.

11.2 2018 ENABLING ACTIVITIES BY PROGRAM

The following tables outline the specific Enabling Activities undertaken in 2018 by activity, including activity descriptions and a breakdown of expenditures. Note that all expenditures under Enabling Activities are considered non-incentive expenditures.

Table 11-2: Trade Ally Network

Program Description	This program develops and manages a contractor network to promote DSM programs and energy-efficiency messaging. FEI identifies trade allies as equipment manufacturers, service contractors, and distributors, and recognizes the influence these industry groups have with the end-use Residential and Commercial customers who make energy-efficiency decisions. This program also supports funding energy efficiency training as outlined in the DSM Regulation.				
Expenditures (\$,000s)	2018	Admin	Communication	Research & Evaluation	Total
	Total	139	555	0	694

1

Table 11-3: Codes and Standards

Program Description	Utilities have a unique understanding of energy supply and customer demand cycles, which can be of assistance in the development of codes and standards. The content and timing of code implementation directly affects market transformation in all program areas. FEI's level of regulatory involvement typically includes one of three involvement classifications: monitoring, stakeholder engagement and developing regulations. The Codes & Standards area "supports the development of or compliance with specified standard or a measure respecting energy conservation or the efficient use of energy" as referred to in the definition of "specified demand-side measures" in the DSM Regulation.				
Policy Initiatives consultation process	Evaluation, analysis and review of national, provincial and municipal initiatives for energy efficiency.				
Industry consultation process	Collaboration with entities like BC Hydro and BC Housing for the development of industry training and guidelines on implementation of new energy efficiency measures. Collaboration with BC Energy Step Code Council on the development of BC Energy Step code via active participation on steering and technical committees				
Involvement with supporting projects	Continued active participation with Natural Resources Canada in supporting Leadership in Energy Efficiency Partnerships (LEEP).				
Codes and Standards Strategy	Active participation on the Canadian Standards Association (CSA) Strategic Steering Committee on Fuel Burning Equipment. This committee is the highest level committee in the fuel sector at CSA and oversees all committees and sub-committees in the fuel burning sector. Consultation with Canadian Institute of Plumbing and Heating (CIPH), Heating Refrigeration and Air-conditioning Institute (HRAI) and the Canadian Home Builders Association (CHBA) on codes and regulations that are common to our industries. Research on the new provincial performance path for residential and commercial buildings i.e. the BC Energy Step Code was conducted. The research study focused on understanding technical changes to traditional building approaches, along with choices of mechanical and HVAC systems.				
Codes and Standards Maintenance	Active participation on the CSA Technical Committee on Energy Efficiency and Related Performance of Fuel-Burning Appliances and Equipment. This committee oversees all of the eleven existing performance standards for gas-fired equipment and is looking to develop new needed standards for equipment.				
Internal awareness of Code and Regulatory changes	Development of internal documents and updates for relevant program areas and personnel.				
Standards library	Purchase of up to date testing standards and up to date building codes for reference.				
Expenditures (\$,000s)	2018	Admin	Communication	Research & Evaluation	Total
	Total	83	11	6	100

2

Table 11-4: DSM Systems Maintenance and Development

Program Description	Ongoing IT license and maintenance costs related to the portfolio DSM tracking system (TrakSmart) currently in operation in 2018. Development costs for new DSM program tracking and management system (Dynamic DSM) under development in 2018 as a replacement for the outdated TrakSmart system.				
Expenditures (\$,000s)	2018	Admin	Communication	Research & Evaluation	Total
	TrakSmart	123	0	0	123
	Dynamic DSM	316	0	0	316
	Total	439	0	0	439

Notes:

- As a result of the improvements in available technologies and the need for more advanced tools to improve service to customers while managing a growing portfolio of DSM expenditures, implementation of a new DSM system (Dynamic DSM) was initiated in 2018.
- \$Can/\$US exchange rate included in actuals for TrakSmart costs, but not included in the 2014-2018 DSM Plan.

Table 11-5: Residential End-Use Study

Program Description	The REUS provides a snapshot of the FortisBC Residential customer base. It provides information about the building characteristics, the fuel choice for heating, cooling and cooking, the types and ages of appliances installed, energy-use behaviours, and customer attitudes towards energy issues. The REUS also includes a billing analysis to determine natural gas consumption by appliance type. The cost of this study is shared with other FEI departments.				
Expenditures (\$,000s)	2018	Admin	Communication	Research & Evaluation	Total
	Total	25	0	0	25

Notes:

- The total REUS costs are shared among the departments at FEI that are direct users of the results. Table 11-5 shows only those costs incurred by the C&EM Group as part of DSM expenditures.

Table 11-6: Energy Management Education Funding

Program Description	Funding to support post-secondary energy management programs such as the UBC Master of Engineering Leadership Program in Clean Energy Engineering and the BCIT Sustainable Energy Management Advanced Certificate.				
Expenditures (\$,000s)	2018	Admin	Communication	Research & Evaluation	Total
	Total	3	0	0	3

11.3 SUMMARY

Enabling Activities are critical initiatives that support and supplement DSM program development and delivery. The Trade Ally Network provides FEI the opportunity to quickly communicate new programs or revisions to existing programs. 75 percent of the 2018 Residential Furnace and Boiler Replacement Program participants used contractors who were members of the Trade Ally Network. The value of the Trade Ally Network Program was demonstrated by the success in the adoption of adding the requirement of a commissioning sheet for the Residential Furnace and Boiler Replacement Program. FEI was able to successfully implement this commissioning sheet by way of input and feedback from Trade Ally Network members.

FEI's involvement in codes and standards work in 2018 continued to encompass various activities including monitoring, reviewing and responding to existing and proposed regulatory changes and direct participation in working groups that explore the development of future targets, codes and standards.

The development work initiated in 2018 to implement a new DSM management system (Dynamic DSM – see Table 11-4) will help to improve the customer experience and service delivery for DSM programs. Once fully implemented, this new system will replace the current system and provide improved tools and reports to help FEI manage its expanding portfolio of DSM activities and enable new and improved online functions for customers.

12. EVALUATION

In alignment with the Company's Evaluation, Measurement and Verification (EM&V) Framework and industry standard practice, program evaluation activities are assessed at different stages of each program's lifecycle.¹⁸ Based on this ongoing assessment, all programs are evaluated when appropriate. The 2018 evaluation activities presented here reflect the number of programs in market, the different stages of their lifecycle, and the type of evaluation activities required to provide program feedback.

12.1 2018 PROGRAM EVALUATION AND EVALUATION RESEARCH ACTIVITIES

In 2018, FEI's various evaluation activities included quantifying energy savings, assessing participant awareness and satisfaction, identifying barriers to participation, assessing customer usability and engagement with various DSM outreach activities, conducting industry research, and conducting quality assurance site visits. Measurement and Verification (M&V) activities focused on identifying and verifying project and measure level savings assumptions and understanding any issues associated with equipment installation in the field.

Table 12-1 provides a summary of all program evaluation and evaluation research related activities undertaken in 2018. Expenditures for these activities have been accounted for within the applicable program or Program Area non-incentive costs reported in previous sections. These expenditures are also reported here in order to provide a concise, easy-to-view summary of evaluation activities. Included in the table are: a list of all the 2018 evaluation activities; the Program Area each activity occurred in; the general type of evaluation activity undertaken; the Company's actual 2018 evaluation expenditures; and a status update on each activity. The total expenditure for program evaluation and research activities in 2018 was approximately \$754,900.

¹⁸ Types of evaluation activities include: Communications evaluations, which focus on advertising and media outreach, and focus groups; Evaluation studies, where quality assurance or inspection is conducted to gain more insight on the incented measure; Market studies, research and interviews with industry stakeholder to assess market penetration; Process evaluations, where surveys and interviews are used to assess customer satisfaction and program success; Impact evaluations, to measure the achieved energy savings attributable from the program; Market Analysis, to characterized the industry and the program's effect on market penetration and, Measurement & Verification, to monitor real time energy savings associated with energy conservation measures.

1

Table 12-1: Inventory of DSM Program Evaluation and Evaluation Research Activities Conducted in 2018¹⁹

Evaluation Name	Program Area	Type of Evaluation	Years the program has been running ²⁰	Evaluation Partnership	Actual Evaluation Expenditure (000's)	Evaluation Status ²¹
FortisBC Communication Tracking: Energy Efficiency Conservation	C&EM Portfolio	Communication	ongoing	none	\$22	Customer engagement and awareness of C&EM activities. Completed October 2018 by Sentis Research
MyVoice Panel Software	C&EM Portfolio	Communication	ongoing	none	\$21	Various online testing projects: • Residential Rebate Ad Testing Completed July 2018 by Vision Critical Communication Inc. • Commercial Rebates Landing Page Testing Completed January 2018 by FortisBC Energy Inc. • Street Team Energy Efficiency Free Giveaway Testing Completed May 2018 by FortisBC Energy Inc.
Appliance Maintenance Rebate Program - Evaluation 2017	Residential	Process	9	none	\$15	Quantitative research study among 2017 program participants to assess the program and gather feedback for future program design. Completed May 2018 by Sentis Research
EnerChoice Fireplace Program - Evaluation 2018	Residential	Evaluation Study	6	none	\$18	Simulation modeling to assess program savings assumptions. Expected completion by Q1 2019
New Construction Program - Step Code Modeling	Residential	Evaluation Study	1	none	\$3	Research and document review to support program inputs and modeling. Completed September 2018 by RDH Building Science
Home Renovation Rebate Program - Insulation & Program Compliance Site Visits	Residential	Evaluation Study	4	FortisBC Energy Inc. & FortisBC Inc.	\$45	Ongoing site visit of homes with insulation and draft proofing measures with a focus on quality assurance and program compliance.
Furnace Replacement Program - Market Evaluation for Quality Installation	Residential	Market Study	6	none	\$1	Market assessment to gather feedback and recommendations for furthering quality installation of furnaces. Completed April 2018 by RDH Building Science and Ecolighten Energy Solutions Ltd.
Furnace Replacement Program - Quality Assurance & Program Compliance Site Visits	Residential	Evaluation Study	6	none	\$161	Ongoing site visit of homes with furnace/boiler upgrades with a focus of quality assurance and program compliance.

2

¹⁹ Table 12.1 does not include Prefeasibility Studies. Please refer to the Innovative Technologies section (Section 8) for details.

²⁰ Measurement & Verification studies require time to conduct activities which include, but are not limited to, project commissioning, installing and removal of monitoring equipment, data collection and, data analysis and reporting. The column 'Years the program has been running' will refer to the time required to conduct the M&V activities. M&V activities align with the International Performance Measurement and Verification Protocol (IPMVP) Concepts and Options for Determining Energy and Water Savings. Prepared by the Efficiency Valuation Organization: www.evo-world.org. January 2012.

Table 12-1: Inventory of DSM Program Evaluation and Evaluation Research Activities Conducted in 2018 (continued)

Evaluation Name	Program Area	Type of Evaluation	Years the program has been running ²⁰	Evaluation Partnership	Actual Evaluation Expenditure (000's)	Evaluation Status ²¹
Rental Apartment Efficiency Program (RAP) - Evaluation	Residential / Commercial	Evaluation Study	3	None	\$3	Ongoing performance testing for RAP participants.
Rental Apartment Efficiency Program (RAP) - Evaluation 2017	Residential / Commercial	Process	3	FortisBC Energy Inc. & FortisBC Inc.	\$2	Building owner and tenant surveys for program evaluation with 2017 program participants. Completed December 2017 by Cohesium Research. Results reported in 2017 Annual Report.
Rental Apartment Efficiency Program (RAP) - Evaluation 2018	Residential / Commercial	Process	3	FortisBC Energy Inc. & FortisBC Inc.	\$20	Building owner and tenant surveys for program evaluation with 2018 program participants. Expected completion by Q1 2019
Energy Conservation Assistance Program (ECAP)	Low Income	Evaluation Study	7	FortisBC Energy Inc., FortisBC Inc. & BC Hydro	\$77	Ongoing Quality Assurance to ensure products are installed according to program policies and procedures.
Energy Conservation Assistance Program (ECAP) - Overall Program Evaluation 2017	Low Income	Process & Impact	7	FortisBC Energy Inc. & FortisBC Inc.	\$39	Participant survey and monthly consumption usage conducted for the program. Completed August 2018 by Sampson Research
Energy Conservation Assistance Program (ECAP) - Ongoing Feedback Survey	Low Income	Process	7	FortisBC Energy Inc., FortisBC Inc. & BC Hydro	\$15	Ongoing survey with program participants to gather frequent and ongoing feedback on customer experience, satisfaction with the program and its program evaluators. Expected completion by Q1 2019
Energy Conservation Assistance Program (ECAP) - Measure Characterization Study	Low Income	Evaluation Study	7	none	\$9	A review and update on the energy savings assumption of the measures currently promoted through the program. Expected completion Q2 2019
Energy Specialist Program - Evaluation 2017	Commercial	Process & Impact	8	FortisBC Energy Inc. & FortisBC Inc.	\$46	The evaluation study includes program and industry stakeholder surveys and an energy savings audit on a subset of completed 2017 projects. Completed August 2018 by Prism Engineering
Custom Design Retrofit Program - Evaluation 2018	Commercial	Process	5	none	\$49	Survey with program participants and consultants to assess the level of program satisfaction, speed of receiving program decision, and overall feedback which provide feedback for program recommendation. Expected completion Q1 2019

Table 12-1: Inventory of DSM Program Evaluation and Evaluation Research Activities Conducted in 2018 (continued)

Evaluation Name	Program Area	Type of Evaluation	Years the program has been running ²⁰	Evaluation Partnership	Actual Evaluation Expenditure (000's)	Evaluation Status ²¹
Smart Learning Thermostat Pilot	Innovative Technologies	Measurement & Verification	2	FortisBC Energy Inc. & FortisBC Inc.	\$43	Gauging customer acceptance and energy savings associated with smart learning thermostats. Expected completion Q3 2019
Carbon Capture Pilot	Innovative Technologies	Measurement & Verification	1	none	\$28	Measurement of energy savings and technology performance associated with the carbon capture system. Expected completion Q4 2019
On Demand Recirculation Controls Pilot	Innovative Technologies	Measurement & Verification	1	none	\$27	Measurement of energy savings, installation and customer acceptance of the on-demand recirculation controls technology. Expected completion Q1 2019
Industrial Optimization Program - Evaluation 2018	Industrial	Process	7	none	\$36	Survey with program participants and consultants, verification of program enabled savings and program M&V structure to provide feedback to program design. Expected completion Q2 2019
Industrial Optimization Program	Industrial	Measurement & Verification	7	none	\$14	M&V was conducted on 13 projects in 2018 of which 3 completed its M&V requirements. The M&V activities include the completion of an M&V plan, commissioning validation site visits, and M&V reports.
Residential - Community Outreach Survey	CEO	Communication	ongoing	none	\$31	Customer engagement and awareness of behavior change and C&EM programs through participation at events. Expected completion Q1 2019
Commercial - Building Operators In-Depth Interviews	CEO	Process	ongoing	none	\$7	Interviews with building operators to identify opportunities and barriers to increase program participation. Expected completion Q1 2019
Energy Leaders Grade 10 Lesson Reviews	CEO	Process	2	FortisBC Energy Inc. & FortisBC Inc.	\$13	Assessment with teachers to assess the usability of the lesson plans and corresponding materials. Completed December 2018 by Kidnetic Education Inc.
Energy Is Awesome Focus Groups	CEO	Communication	ongoing	none	\$10	Focus group with program participants and presenters to assess content effectiveness and delivery of the presentation. Completed May 2018 by Participant Research

- 1 Table 12-2 contains a summary of all program evaluation studies and pilot program reports completed in 2018 and includes a brief
 2 description of the methodologies and key findings.

3 **Table 12-2: Summary of Key Findings and Methodology for 2018 Completed DSM Program Evaluation Studies and Pilot Program**
 4 **Reports**

Evaluation Name	Program Area	Type of Evaluation	Methodology	Outcome from Key Findings
FortisBC Communication Tracking: Energy Efficiency Conservation	C&EM Portfolio	Communications	Three waves of online interviews conducted with 800 British Columbia adults living within the FortisBC service territory.	<p>Results: The percentage of participants that had aided awareness of at least one of the three main energy efficiency activities undertaken by FortisBC trended upward from 78% in 2017 to 81% in 2018.</p> <p>The engagement index was redefined to provide greater differentiation between levels of engagement. Overall, nearly three-quarters of participants were at least moderately engaged, just over two-thirds (35%) were extremely or highly engaged.</p> <p>Outcome of Key Findings: Continue to emphasize the overarching energy efficiency activities rather than individual programs to build awareness.</p>
MyVoice Panel Software	C&EM Portfolio	Communications	FortisBC MyVoice online community panel.	<p>Results: Residential Rebate Ad Testing - Two-thirds of participants found the ad overall to be appealing with clear messaging; however, the call to action was unclear.</p> <p>Outcome of Key Findings: Adjust ad to clarify the call to action.</p> <p>Results: Commercial Rebates Landing Page Testing – Seven-in-ten participants preferred a combination of text and images when looking for specific rebate, while three-in-ten preferred text only.</p> <p>Outcome of Key Findings: Retain current approach to presenting rebate offers.</p> <p>Results: Street Team Free Giveaways Testing – Eight-in-ten participants considered the free energy conservation giveaways useful.</p> <p>Outcome of Key Findings: Retain current giveaway program</p>

Table 12-2: Summary of Key Findings and Methodology for 2018 Completed DSM Program Evaluation Studies and Pilot Program Reports (continued)

Evaluation Name	Program Area	Type of Evaluation	Methodology	Outcome from Key Findings
Appliance Maintenance Rebate Program - Evaluation 2017	Residential	Process	Online surveys were conducted with 626 program participants between December 18, 2017 to January 19, 2018. The purpose of the survey was to assess program awareness, customer satisfaction, ease of application process, and general program delivery.	<p>Results: Overall, participants are highly satisfied with the program with 79% rating the program as "excellent" or "very good". Participants of the program agree that there are a lot of important reasons for participating, but the strongest reasons are safety/peace of mind and extending appliance life.</p> <p>Outcome of Key Findings: Results were taken under consideration for 2019 program design.</p>
Furnace Replacement Program - Market Evaluation for Quality Installation	Residential	Market Study	The study consisted of technical research on leading HVAC QA program solutions in North America and interviewed key stakeholders to determine best applications to the BC market.	<p>Results: Technical research identified four leading Quality Assurance (QA) programs as potential programmatic solutions that could support improvements in contractor workmanship and verify installation performance for the program.</p> <p>Outcome of Key Findings: As a result of the study and recommendations, FortisBC will implement one of the recommended QA programs in 2019.</p>
Energy Conservation Assistance Program (ECAP) - Overall Program Evaluation 2017	Low Income	Process & Impact	A combination of telephone and online surveys were conducted with 381 basic stream program participants, 77 advanced stream participants, and 16 housing service providers. A billing consumption analysis using a fixed effects model was conducted with 883 basic stream participants and 194 advanced stream participants.	<p>Results: Overall, 81% of the basic stream participants and 91% of the advanced stream participants were satisfied with the program. More than half of the participants increased their energy conserving behaviors since participating in the program. Consistent with program expectations, GJ savings for participants receiving high-efficiency furnaces with insulation upgrades were larger than for furnaces without upgrades to insulation.</p> <p>Outcome of Key Findings: Results were taken under consideration for future program design and a measure characterization study commissioned as a result of this study.</p>

Table 12-2: Summary of Key Findings and Methodology for 2018 Completed DSM Program Evaluation Studies and Pilot Program Reports (continued)

Evaluation Name	Program Area	Type of Evaluation	Methodology	Outcome from Key Findings
Energy Specialist Program - Evaluation 2017	Commercial	Process & Impact	<p>Literature review of similar programs in Canada and US, and interviews with 65 program stakeholders, including Energy Managers, Key Account Managers and Energy Specialists were consulted to assess the effectiveness and delivery of the program. In addition, project specific details and calculations were reviewed for 16 completed projects from 2016 and 2017. Project savings were verified on a project by project basis.</p> <p>Energy Specialist gas savings projects verified were those that did not take advantage of an existing FortisBC incentive program.</p>	<p>Results: Overall, participants are highly satisfied with the program with 89% of respondents rating the program as "satisfied" and "very satisfied". 94% of all survey respondents feel that the program is "effective" or "very effective" at helping organizations use natural gas more efficiently.</p> <p>The total verified savings of the 16 projects completed in 2016 and 2017 are 9,060 GJ/year.</p> <p>Outcome of Key Findings: Results were taken under consideration for future program design.</p>
Industrial Optimization Program	Industrial	Measurement & Verification	<p>M&V Plan: Complies with the International Performance Measurement & Verification Protocol. The selected IPMVP option and measurement boundary was Option B²².</p> <p>M&V: M&V was conducted on ITRP009 for a heat recovery energy saving measure.</p>	<p>Results: Three year M&V completed with a total verified natural gas savings of 66,730 GJ, with an average annual savings of 22,243 GJ per year.</p> <p>Outcome of Key Findings: M&V project completed with the full incentive payment issued to the participant as the natural gas savings met target savings.</p>
Industrial Optimization Program	Industrial	Measurement & Verification	<p>M&V Plan: Complies with the International Performance Measurement & Verification Protocol. The selected IPMVP option and measurement boundary was Option C²³.</p> <p>M&V: M&V was conducted on ITRP013 for installation of three modular high efficiency condensing boilers.</p>	<p>Results: Three year M&V completed with a total verified natural gas savings of 10,155 GJ, with an average annual saving of 3,385 GJ per year.</p> <p>Outcome of Key Findings: M&V project completed with the full incentive payment issued to the participant as the natural gas savings met target savings.</p>

²¹ IPMVP Option B - Measurement of all parameters governing energy use to assess consumption. www.evo-world.org

²² IPMVP Option C - Measurement of the whole facility to assess the energy performance of a total facility. www.evo-world.org

Table 12-2: Summary of Key Findings and Methodology for 2018 Completed DSM Program Evaluation Studies and Pilot Program Reports (continued)

Evaluation Name	Program Area	Type of Evaluation	Methodology	Outcome from Key Findings
Industrial Optimization Program	Industrial	Measurement & Verification	<p>M&V Plan: Complies with the International Performance Measurement & Verification Protocol. The selected IPMVP option and measurement boundary was Option A²⁴.</p> <p>M&V: M&V was conducted on IOP004 for the installation of a dryer heat recovery system.</p>	<p>Results: One year M&V completed with a total verified natural gas savings of 7,652 GJ.</p> <p>Outcome of Key Findings: M&V project completed with the full incentive payment issued to the participant as the natural gas savings met target savings.</p>
Energy Leaders Grade 10 Lesson Reviews	CEO	Process	Interactive approach where teachers access the online portal to download the lesson materials. Feedback and comments are documented during usage.	<p>Results: Overall feedback has remained positive with only minor lesson plan changes recommended.</p> <p>Outcome of Key Findings: As a result of this study, lesson plans were revised as needed.</p>
Energy Is Awesome Focus Group	CEO	Communications	Two separate focus group sessions with employee volunteers and teacher participants. In the teacher group, FortisBC employees walked participants through the presentation. For those who were unable to attend the focus group sessions, an online survey was completed.	<p>Results: Overall feedback indicated the Energy is Awesome presentation required updates to increase its ability to engage students. Recommendations to better engage students include having more hands-on experience for students within the presentation context, and training for the employees who volunteer as presenters.</p> <p>Outcome of Key Findings: As a result of this study, the presentation will be redesigned to meet the needs of the students and teachers.</p>

²³ IPMVP Option A - Measurement of key parameters governing energy use to assess consumption. www.evo-world.org

12.2 EVALUATION COLLABORATION

In 2018, FEI continued to seek opportunities to increase collaboration with FBC, BC Hydro, and other entities on program evaluation for DSM programs. The number of collaboration activities depends on the timing of the activity, program participants, legal and privacy concerns, and available budget to conduct the study. Table 12-1 provides information on program evaluation activities conducted in partnership with other organizations. FEI, FBC and BC Hydro continue to collaborate in the evaluation projects for the Energy Conservation Assistance Program (ECAP) – Ongoing Feedback Survey, and Quality Assurance study.

In keeping with the MOU on collaboration discussed in Section 2.5, FEI and BC Hydro held update meetings to review the evaluation plans and discuss future evaluation activities. FEI, FBC and BC Hydro continue to hold update meetings and explore opportunities for future collaboration on program evaluations.

13. DATA GATHERING, REPORTING AND INTERNAL CONTROLS PROCESSES

13.1 OVERVIEW

The following section outlines FEI's business practices to ensure DSM activities and associated expenditures are in compliance with the Company's internal control processes and BCUC Decision and Order G-36-09, which directed the Company to include a discussion in the DSM Annual Report of the Company's internal data gathering, monitoring and reporting control practices.

13.2 PROGRAM TRACKING, EVALUATION AND REPORTING FUNCTIONS

FEI staff responsible for tracking, evaluation and reporting of DSM activities continue to report to a different Director than staff responsible for program development and implementation in order to:

- conduct independent evaluation activities;
- maintain an independent library of inputs into cost effectiveness calculations; and
- centralize tracking and reporting processes.

13.3 ROBUST BUSINESS CASE PROCESS APPLIED TO ALL PROGRAMS

Before a new DSM pilot or program can be implemented, a business case must first be developed. FEI is committed to putting each pilot or program through the appropriate level of internal scrutiny before moving ahead, and believes doing so ensures an increased chance of pilot or program effectiveness.

Business cases include information about program rationale and purpose, as well as a description of the target audience, assumptions, cost-benefit tests and proposed evaluation methods. Cost effectiveness analysis is performed using the California Standard Tests (CST) as outlined in the California Standard Practice Manual. FEI uses an in-house cost-benefit modeling tool developed in partnership with expert industry consultants²⁴ to apply the program costs and benefits in each of the four standard cost-effectiveness tests based on the California Standard Practice Manual (Rate Impact Measure ["RIM"], Utility, Participant, and TRC) and the MTRC in accordance with DSM Regulation. The results from this modelling are used as inputs for the business cases, which are approved in accordance with FEI's policy on financial authorization levels.

²⁴ Willis Energy Services Ltd. and The Cadmus Group Inc. provided input into this in-house cost-benefit modelling.

In addition to the internal business case process, the Decision directed FEI to submit a detailed plan for new programs for approval prior to the expenditure of any funds.²⁵ No new programs were submitted for approval to the BCUC in 2018.

13.4 INCENTIVE APPLICATIONS VETTED FOR COMPLIANCE WITH PROGRAM REQUIREMENTS

Ensuring that all customer applications are compliant with program eligibility requirements as laid out in program terms and conditions is also part of the internal control process. The Company has a number of mechanisms in place to ensure DSM incentive funding applications are in compliance with program requirements. The verification process is specific to each program and is dependent on the type of program, its complexity, the financial value of the incentive and other parameters. The general principles applied are as follows:

- Each application is reviewed for completeness and accuracy;
- Applications must meet the criteria outlined in the terms and conditions of the program put forward through the approval process;
- Once approved, incentives are distributed to participants; and
- Copies of applications and supporting documents are filed and stored for seven years.

13.5 INTERNAL AUDIT SERVICES

On an approximately biannual basis, FEI engages its own Internal Audit Services (IAS) group to review the internal controls associated with the DSM activities. Such an audit was performed in 2017, concluding that key controls are in place and operating effectively to mitigate risk around program development, program administration including rebate payments, and program reporting and evaluation to an appropriately low level. This audit report was appended to the 2017 Annual Report. Due to the bi-annual timing of these audit activities, an audit study was not completed in 2018.

13.6 SUMMARY

FEI is committed to strong internal controls in all aspects of the DSM programs. As demonstrated in this section, the Company's business practices related to program development, application processing and ongoing monitoring are all sound and subject to continuous improvement.

²⁵ Decision, page 278

14. 2018 DSM PROGRAMS ANNUAL REPORT SUMMARY

FEI achieved 99 percent of its total approved DSM budget in 2018. Of this total expenditure, incentives were \$1 million higher than Plan, making incentive spending 61 percent of the total 2018 DSM budget expenditure. 2018 also saw the highest level of energy savings achieved by FEI's DSM Portfolio to date at 626,000 GJ annually, for a total lifetime energy savings estimate of 5,401,700 GJ for all the measures implemented as a result of FEI's DSM programs during the year. The Report details how FEI cost-effectively delivered these programs within the expenditure limits accepted by the BCUC, and in accordance with the DSM Regulation. FEI continues to offer a robust portfolio of DSM programming accessible to all customer groups and locations, meeting the adequacy requirements of the DSM Regulation and operating according to the Company's DSM Guiding Principles. FEI also continues to implement strong internal data gathering, monitoring and reporting control practices.