



**Diane Roy**  
Vice President, Regulatory Affairs

**Gas Regulatory Affairs Correspondence**  
Email: [gas.regulatory.affairs@fortisbc.com](mailto:gas.regulatory.affairs@fortisbc.com)

**Electric Regulatory Affairs Correspondence**  
Email: [electricity.regulatory.affairs@fortisbc.com](mailto:electricity.regulatory.affairs@fortisbc.com)

**FortisBC**  
16705 Fraser Highway  
Surrey, B.C. V4N 0E8  
Tel: (604) 576-7349  
Cell: (604) 908-2790  
Fax: (604) 576-7074  
Email: [diane.roy@fortisbc.com](mailto:diane.roy@fortisbc.com)  
[www.fortisbc.com](http://www.fortisbc.com)

March 31, 2017

British Columbia Utilities Commission  
6<sup>th</sup> Floor, 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) – 2016 Annual Report**

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Attached please find the Natural Gas DSM Program 2015 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](mailto:ken.ross@fortisbc.com).

Sincerely,

**FORTISBC ENERGY INC.**

***Original signed:***

Diane Roy

Attachments



**FortisBC Energy Inc.**

**Natural Gas  
Demand-Side Management Programs  
2016 Annual Report**

**March 31, 2017**

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## 1. REPORT OVERVIEW

FortisBC Energy Inc. (FEI or the Company),<sup>1</sup> is committed to delivering a broad portfolio of cost effective Demand-Side Management<sup>2</sup> (DSM) measures that address the expectations of customers while meeting the requirements for public utilities to pursue cost effective DSM. In 2016, the company achieved a combined portfolio MTRC<sup>3</sup> of 1.2 on expenditures of \$32.165 million, meeting FEI's goal of cost effective program delivery.

This DSM Annual Report (the Report) outlines the Company's actual results and expenditures for 2016. The Report follows a similar format to the 2015 and other previous Annual Reports, relying on detailed tables to demonstrate Program results and expenditures. The Report compares 2016 activity and results to the Company's 2014-2018 DSM Plan, as provided in the FEI's 2014-2018 Performance Based Ratemaking (PBR) Application and approved by the Commission in Order G-138-14. Where the details of individual programs vary substantially from the 2014-2018 DSM Plan, explanations are provided in the applicable Program Area Sections of this report.

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

This 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 test calculations are provided for the overall portfolio and each Program Area in Section 2, and for each program or measure in the respective Program Area sections: Total Resource Cost (TRC) Ratepayer Impact Measure (RIM), Participant Cost Test (PCT), and Utility Cost Test (UCT). In accordance with British Columbia's *Demand-Side Measures Regulation* (DSM Regulation), results of the modified TRC (MTRC) calculations (see Section 2.1) are also provided where appropriate.

This Report also demonstrates that the Company is meeting the accountability mechanisms directed by the British Columbia Utilities Commission (BCUC or the Commission) in Order G-36-09. One such mechanism was the requirement to file DSM Annual Reports, which states:

<sup>1</sup> The three BC Gas utilities formerly known as FortisBC Energy Inc. (FEI), FortisBC Energy (Vancouver Island) Inc. (FEVI) and FortisBC Energy (Whistler) Inc. (FEW) were amalgamated into a single utility - FortisBC Energy Inc. - in 2014. 2015 was the first complete year that the company operated as a single utility, which is reflected throughout this document by eliminating the breakout of separate FEI, FEVI and FEW statistics and results.

<sup>2</sup> Throughout this Annual Report the use of the term Demand-Side Management or "DSM" is intended to refer to demand-side measures in B.C. as defined in the B.C. *Demand-side Measures Regulation* (DSM Regulation).

<sup>3</sup> Pursuant to the DSM 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).

A requirement that Terasen [now FEI] submit annually to the Commission, 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 TGI.

#### Use of Report:

The energy savings and cost effectiveness results presented in this report are strictly those resulting from FEI's annual DSM activities as calculated according to industry accepted methods. This information should not be interpreted as the total energy savings from all natural gas conservation initiatives in the FEI service territory, nor the total savings an individual customer may experience. Examples of energy savings not reported here because they are achieved through mechanisms other than FEI's DSM activity include natural conservation through ongoing advancements in equipment efficiency and building envelope construction and initiatives funded by individuals or entities other than FEI.

## 1.2 ORGANIZATION OF REPORT

The following describes how each section of the Report presents the results of 2016 DSM activities:

### Section 1: Report Overview

- Provides a high-level background for the Report.

### Section 2: Portfolio Overview

- Provides a summary and detail regarding the actual 2016 expenditures for DSM activities.
- Section 2.5 discusses any new requirements from the Commission concerning information to be included in the 2016 DSM Annual Report.

### Section 3: Funding Transfers

- Provides a discussion on funding transfers between program areas.

### Section 4: Energy Efficiency and Conservation ("EEC") Advisory Group Activities

- Provides information regarding EEC Advisory Group ("EECAG") activities in 2016, including a summary of meetings and accountability considerations.

### Sections 5 - 9 provide information on:

- Residential Energy Efficiency Program Area;
- Low Income Energy Efficiency Program Area;
- Commercial Energy Efficiency Program Area;
- Innovative Technologies Program Area; and



- Industrial Energy Efficiency Program Area.

Each of the above mentioned sections contain a table summarizing the planned and actual expenditures for the respective Program Area in 2016, including incentive and non-incentive spending, annual and NPV gas savings, as well as TRC and other cost effectiveness test results. Additional tables outline the individual 2016 programs, including program and measure descriptions, program assumptions and sources for these assumptions, and a breakdown of incentive and non-incentive spending. Where applicable, details on program closures or planned programs that were not launched in 2016 are also included in these program detail sections.

## **Section 10: Conservation Education and Outreach Initiatives**

- Provides both a summary and details regarding actual 2016 expenditures for the Conservation Education and Outreach (CEO) Program Area.

## **Section 11: Enabling Activities**

- Provides both summary and detail regarding actual 2016 expenditures for the Enabling Activities that support the work of the DSM portfolio as a whole.

## **Section 12: Evaluation**

- Provides both summary and detail regarding pending and actual expenditures for 2016 program evaluation activities, as well as summary results from evaluations and studies completed in 2016.

## **Section 13: Data Gathering, Reporting and Internal Control Processes**

- Provides a summary of the Company's data tracking, process control and reporting for 2016 DSM activities, and a high level description of the Company's internal approval process for programs.

## **Section 14: 2016 DSM Annual Report Summary**

- Summarizes the Report and the Company's 2016 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 2016. A summary of the overall portfolio results is provided in Table 2-1, demonstrating that the Company achieved a combined portfolio MTRC of 1.2. DSM expenditures were almost \$32.2 million and recorded natural gas savings were over 438,827 GJ.

**Table 2-1: Overall DSM Portfolio Results for 2016**

Indicator - 2016 Results		Total
Annual Gas Savings (GJ/yr.)		438,827
NPV of Gas Savings (GJ)		3,682,160
Utility Expenditures, Incentives (\$000s)		21,045
Utility Expenditures, Non-Incentives (\$000s)		11,120
Utility Expenditures, Total (\$000s)		32,165
Benefit/Cost Ratios	TRC	0.7
	MTRC	1.2
	Utility	1.0
	Participant	1.5
	RIM	0.5

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

**Table 2-2: Overall DSM Portfolio Level Results by Program Area 2016**

Portfolio	Annual Gas Savings (GJ/yr.)		NPV Gas Savings (GJ)	Utility Expenditures (\$000s)						Benefit/Cost Ratios				
	2014-2018 EEC Plan	2016 Actual		Incentives		Non-Incentives		All Spending		TRC	MTRC	Utility	Participant	RIM
				2014-2018 EEC Plan	2016 Actual	2014-2018 EEC Plan	2016 Actual	2014-2018 EEC Plan	2016 Actual					
Portfolio Level Activities														
Total	No Direct Savings			n/a	n/a	n/a	1,167	n/a	1,167	No Direct Savings				
Residential Sector														
Total	137,884	121,860	1,230,595	7,872	10,291	3,238	2,240	11,110	12,531	0.5	1.5	0.9	1.2	0.5
Commercial Sector														
Total	192,360	255,408	1,942,328	8,934	8,560	2,038	2,077	10,972	10,637	1.1	n/a	1.6	1.7	0.7
Industrial Sector														
Total	168,173	18,349	157,454	1,925	529	737	474	2,662	1,003	1.0	n/a	1.4	1.9	0.7
Low Income														
Total	27,747	36,918	270,705	1,654	1,597	1,387	679	3,042	2,277	1.2	2.3	1.4	3.0	0.7
Conservation Education and Outreach														
Total	No Direct Savings			n/a	n/a	2,400	2,415	2,400	2,415	No Direct Savings				
Innovative Technologies														
Total	18,937	6,292	81,078	636	67	597	690	1,233	757	0.8	n/a	1.0	6.3	0.5
Enabling Activities														
Total	No Direct Savings			n/a	n/a	4,420	1,378	4,420	1,378	No Direct Savings				
TOTAL PORTFOLIOS														
Total	546,000	438,827	3,682,160	21,020	21,045	14,818	11,120	35,839	32,165	0.7	1.2	1.0	1.5	0.5

**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 2014-18 Plan. These distinct Portfolio Level Activities include expenditures such as EECAG activities, DSM Energy Solutions Managers, portfolio level staff labour, some staff training and conferences, research and association memberships, and portfolio level research studies.

Throughout this 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 tables in the Portfolio Overview or Program Area Sections, 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. These expenditures represent the costs attributable to that program area but support multiple programs 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<sup>4</sup> effect, which serves to increase energy savings.
- Attribution from Government Regulation –The Company continues to believe the claimed savings reported in this report do not represent all of the savings attributable to FEI’s codes and standards work, due to limitations in the rules for reporting these savings.
- Conservation Education and Outreach – CEO activities had expenditures of \$2.4 million in 2016. These activities do result in energy savings; however, since these savings remain difficult to quantify, FEI does not currently attribute energy savings to them.
- Enabling Activities – Enabling Activities similarly had expenditures of \$1.4 million in 2016 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. 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 33 percent ‘MTRC Cap’ (see Section 2.1). Additionally, these measures cannot be determined to be not-cost effective under the UCT.

<sup>4</sup> 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.

In summary, FEI's 2016 DSM expenditures, including specified DSM, were cost effective under the BC DSM Regulation.

## 2.1 *PORTFOLIO LEVEL MTRC CALCULATION AND RESULTS*

In 2016, FEI met the conditions of the Province's DSM Regulation, achieving a portfolio MTRC value of 1.2 (see Table 2-2). 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 are recognized in 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 as a proxy for the avoided cost of natural gas and allows for the inclusion of non-energy benefits (NEBs).<sup>5</sup>

Utilities can implement DSM with TRC values less than 1.0 but that meet an MTRC threshold of 1.0<sup>6</sup> as long as expenditures on these activities do not exceed 33 percent of the total portfolio expenditure. FEI refers to this 33 percent as the "MTRC Cap". Table 2-3 shows both the TRC and MTRC of those programs to which the MTRC cost effectiveness test is applied and confirms that these programs make up 30.7 percent of FEI's 2016 DSM portfolio spending.

**Table 2-3: Programs Subject to MTRC and the Relative Proportion of 2016 Portfolio Spending**

Program	Program TRC	Program MTRC	Expenditure (\$000s) subject to cap	% of Portfolio Spending
Energy Star Domestic Hot Water	0.3	1.5	2,685	8.3%
Furnace Replacement	0.4	1.3	3,294	10.2%
EnerGuide 80 New Construction	0.3	1.1	50	0.2%
Energy Efficiency Home Performance (HERO)	0.4	1.6	2,282	7.1%
Domestic Hot Water Conservation Program/Low Flow fixtures	0.5	1.2	2	0.0%
Energy Conservation Assistance Program (ECAP)	0.5	1.9	1,553	4.8%
<b>Total</b>			<b>\$9,864</b>	<b>30.7%</b>

<sup>5</sup> The DSM Regulation was amended in July, 2014 by allowing 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 value that the FEI has used for the avoided cost of gas in the MTRC calculation is \$100/MWh, or \$27.78/GJ, as indicated in BC Hydro's November 2013 Integrated Resource Plan, Section 9.2.12, "Long Run Marginal Cost" (pgs. 9-51 to 9-55).

<sup>6</sup> The Commission approved the assessment of the cost effectiveness using an MTRC of 1 or greater on an overall portfolio basis as part its decision on the 2012-2013 RRA, page 174. While this approval was not explicitly stated in the most recent 2014-2018 PBR application decision, FEI interprets this approval to be implicit in the approval of the 2014-2018 DSM Plan.

## 2.2 MEETING APPROVED SPENDING LEVELS

FEI's 2016 DSM expenditure limit of \$35.8 million was approved on September 12, 2014, as part of the Commission's decision on the Company's 2014-2018 PBR Application<sup>7</sup>, pursuant to section 44.2 of the *Utilities Commission Act*. The Company's DSM expenditures were within the approved levels and have increased from 2015 spending of just under \$32 million. As part of the Commission'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 spend being captured in a DSM non-rate base deferral account attracting AFUDC. 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 Commission also approved the amortization of these amounts over 10 years. In accordance with the Commission's decision \$16.4 million was placed in the non-rate based DSM deferral account in 2016.

FEI notes a difference in the total DSM rate base (\$15 million) plus non-rate base deferral account amount (\$16.4 million) versus the total 2016 expenditures (\$32.2 million) reported in Tables 2-1 and 2-2. This difference is due to funding from the Provincial government in support of residential and low income programs in partnership with the Utility and on a few cases of amounts being reported in the annual report in one year and processed in the FEI accounting system in the next at year-end.

FEI has managed its 2016 DSM activity within the funding limits approved by the Commission. Section 3 discusses funding transfers between program areas in 2016 within the overall DSM funding envelope and within rules for transferring funds between program areas as set out by the Commission.

## 2.3 MEETING ADEQUACY REQUIREMENTS OF THE DEMAND-SIDE MEASURES REGULATION

The DSM Regulation has the following requirements for a utility's portfolio of DSM activity to be considered adequate:

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;

<sup>7</sup> BCUC Order G-138-14, page 277 of the Decision.

- 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.

The Company has met all the requirements for adequacy. There are a number of programs for low income customers, which are discussed in Section 6. FEI operates a Rental Apartment Efficiency Program specifically to address the unique market barriers to energy efficiency faced by renters in addition to a number of Commercial and Low Income energy efficiency programs intended for use by owners of rental buildings. In 2016, the Rental Apartment Efficiency Program ("RAP") program has been expanded to include incentives as part of the Low Income Program Area.

In terms of education programs, FEI's School Education Program, Commercial and Residential customer education programs and other energy efficiency and conservation outreach initiatives are presented in Section 10.

## **2.4 ADDRESSING BCUC DIRECTIVES FROM THE FEI 2014-2018 PERFORMANCE BASED RATEMAKING DECISION**

The Company filed their 2014-2018 DSM Plan and associated funding request to the BCUC with the FEI 2014-2018 PBR Application. There were a number of Commission Directives from that Decision that are specific to the 2014-2018 DSM Plan. In this section, FEI addresses Directives relevant to the overall 2016 DSM Portfolio. Program specific directives are addressed in the applicable program area sections of this report.

### **2.4.1 Labour Costs**

As with the 2015 Annual Report, FEI has included labour cost coded to each DSM program in the reported "Administration" expenditures for each program as directed by the Commission in the FEI PBR<sup>8</sup> approval. This information is included in the specific Program tables included in each DSM Program Area section of this Report (Sections 5-11). FEI notes that while the 2014–2018 DSM Plan was approved by the Commission as set out in FEI's application, program and program area costs were not re-cast with labour included at the program level. This change therefore impacts the direct comparison of actual program and program area spending to plan. The inclusion of Labour costs at the Program level can cause program area expenditures to appear higher than the approved amounts even though non-labour costs are within approved amounts. Actual spending 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.

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<sup>8</sup> Order G-138-14.

## 2.5 *COLLABORATION & INTEGRATION*

The Company continues to collaborate and integrate DSM programming among B.C.'s largest energy utilities - FEI, FortisBC Inc. (FBC) and BC Hydro and Power Authority (BC Hydro), or together the "BC 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.

The BC Utilities continued collaborating on a wide range of programs and projects in 2016 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 BC Utilities are currently working under a collaborative MOU covering August 2015 through August 2018.

## 2.6 *SUMMARY*

The Company's DSM portfolio met the goal of cost effectiveness with a MTRC value of 1.2 in 2016. 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.



### 3. FUNDING TRANSFERS

Two program areas – Residential and CEO – incurred actual program expenditures that were greater than their respective approved Program Area funding amounts. In the case of CEO, exceedance of the approved Program Area funding level was the result of reporting labour expenditures at the program level as directed by the Commission<sup>9</sup>. The approved 2014-2018 DSM Plan was based on labour being reported at the portfolio level, and planned Program Area expenditure levels were not re-cast subsequent to the Commission's decision regarding the reporting of labour costs. Therefore, the approved Program Area funding limits do not include labour. Since the expenditures for CEO as shown in Table 2-2 include labour, and since the approved CEO funding level would not be exceeded if labour costs were removed, no funding transfer is required.

For the Residential Program Area, expenditures including labour and other costs exceed the approved funding level by \$1,421,000 as a result of the success of the residential programs. This amount can be drawn from a combination of funds remaining in other program areas without exceeding 25 percent of the respective program areas' approved funding levels<sup>10</sup>, notwithstanding the inclusion of labour in actual program area expenditures, but not in approved plan expenditures for those program areas.

<sup>9</sup> Order G-138-14, Directive 145

<sup>10</sup> According to Order G-128-14, Directive 151, funding transfers in excess of 25 percent of program area approved funding levels require prior approval from the Commission.

## 4. EEC ADVISORY GROUP ACTIVITIES

### 4.1 OVERVIEW

The Energy Efficiency and Conservation Advisory Group (EECAG) provide 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 may arise.

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 had the opportunity to gain valuable insight on DSM program design and implementation and develop 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 2016 WORKSHOP

EECAG workshops provide a forum for stakeholders to learn about DSM programs and engage in constructive dialogue with FEI. Since FEI was in the third year of an approved plan for DSM activities and both the regulatory framework and market dynamics for DSM programming has remained stable during this time, a single workshop in 2016 was sufficient to update EECAG members and seek their input on programming issues. The EECAG workshop was held on November 23, 2016 in Vancouver and was well attended by EECAG members or their alternate delegates. The EECAG Independent Facilitator was engaged in workshop design and facilitation of the workshop. Copies of materials and minutes for these meetings were distributed to EECAG members and other workshop attendees.

The design and outcomes of the November EECAG workshop recognized that FEI is currently operating its portfolio of DSM activities in a stable period of programming and DSM funding. This stability offered an opportunity for the EECAG to reflect on milestones achieved and lessons learned over the past several years of DSM program implementation. The group also examined what future trends and issues might impact the Company's DSM programming going forward as FEI begins planning the preparation of its next DSM Plan for submission to the BCUC. At the workshop, EECAG Members:

- Updated the rest of the group on initiatives related to energy efficiency that they have been either following or directly involved with;
- Identified concerns around implementing upcoming step code changes, including a potential shortage of trades people and contractors to implement changes;

- Identified challenges in reaching target audiences with key messages and resources needed to implement energy efficiency;
- Presented considerations and ideas for working with indigenous communities to improve and implement energy efficiency programs;
- Suggested potential new partnerships and areas to strengthen existing partnerships;
- Identified opportunities to improve communications with customers and other industry players;
- Suggested alternatives for resourcing initiatives and communication efforts;
- Provided alternate view points on how customers might respond to various energy efficiency initiatives;
- Provided comparisons with other initiatives (recycling programs, for example) from which to draw ideas,
- Suggested alternative incentive approaches for consideration, and
- Identified a number of trends / opportunities to watch / explore.

The purpose of these discussions was to identify potential ways that FEI DSM programs might help to overcome barriers and challenges to implementing energy efficiency, as well as identify potential opportunities for future DSM programming so that this information can be considered as FEI prepares its next DSM Plan for 2019 and beyond.

## 5. RESIDENTIAL ENERGY EFFICIENCY PROGRAM AREA

### 5.1 OVERVIEW

The Residential Energy Efficiency Program Area was successful in reducing annual natural gas consumption by 121,860 GJ and achieving an overall blended TRC/MTRC of 1.5. Over \$12.5 million was invested in Residential Energy Efficiency programs in 2016, and 82 percent of this investment was customer incentive spending.

Table 5-1 summarizes the projected and actual expenditures for the Residential Energy Efficiency Program Area in 2016, including incentive and non-incentive spending, annual and NPV gas savings, as well as TRC/MTRC and other cost effectiveness test results.

Residential programs serve over 890,000 customers in the FEI service territories. For DSM purposes, these customers predominantly include those living in single-family homes, row houses, townhomes or mobile homes.<sup>11</sup> 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 the Company's education and outreach activities, these programs play an important role in driving the culture of conservation in British Columbia.

**Table 5-1: 2016 Residential Energy Efficiency Program Area Results Summary**

Program	Annual Gas Savings (GJ/yr.)		Actual NPV Gas Savings (GJ)	Utility Expenditures (\$000s)						Benefit/Cost Ratios				
	2014-2018 EEC Plan	2016 Actual		Incentives		Non-Incentives		All Spending		TRC	MTRC	Utility	Participant	RIM
				2014-2018 EEC Plan	2016 Actual	2014-2018 EEC Plan	2016 Actual	2014-2018 EEC Plan	2016 Actual					
Non Program Specific Expenses														
Total	No Direct Savings			0	0	540	396	540	396			No Direct Savings		
Energy Efficiency Home Performance (Home Renovation Rebate Program)														
Total	41,894	19,803	243,551	1,092	2,231	450	433	1,542	2,663	0.4	1.6	0.9	0.8	0.5
Furnace Replacement Program														
Total	31,104	26,885	294,180	2,984	3,294	356	349	3,340	3,642	0.4	1.3	0.7	0.9	0.4
EnerChoice Fireplace Program														
Total	14,670	24,338	238,552	986	1,536	312	360	1,298	1,896	2.1	n/a	1.1	7.1	0.5
Appliance Service Program														
Total	No Direct Savings			356	494	100	83	456	577			No Direct Savings		
ENERGY STAR® Domestic Hot Water "DHW" Technologies														
Total	12,997	23,081	244,284	1,078	2,332	137	393	1,215	2,725	0.3	1.5	0.8	0.8	0.4
Domestic Hot Water Conservation Program /Low Flow Fixtures														
Total	12,825	1,034	9,691	190	50	100	8	290	57	0.5	1.2	1.2	1.7	0.5
New Home Program														
Total	8,347	427	5,533	848	50	188	99	1,036	149	0.3	1.1	0.3	1.5	0.3
New Technologies Program														
Total	1,798	No Direct Savings		237	0	74	0	310	0			n/a		
Rental Apt Efficiency (RAP) Residential Portion														
Total	0	26,292	194,803	0	306	0	116	0	422			n/a		
Customer Engagement Tool for Conservation Behaviours														
Total	14,250	No Direct Savings		0	0	848	2	848	2			n/a		
On-Bill Financing														
Total	No Direct Savings			102	0	133	0	235	0			n/a		
ALL PROGRAMS														
Total	137,884	121,860	1,230,595	7,872	10,291	3,238	2,240	11,110	12,531	0.5	1.5	0.9	1.2	0.5

<sup>11</sup> 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 in text.

## Notes:

- 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 7-10.
- Cost effectiveness values for the *Residential Portion* of RAP are not provided as they do not represent a complete program view. Please refer to Table 7-10 for the programs cost effectiveness results.

## 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, including greenhouse gas (GHG) emissions reductions. This is recognized in the DSM Regulation which enables the inclusion of lower TRC programs through the application of the MTRC. The overall 2016 Residential Program Area TRC was 0.5 with a blended TRC/MTRC result of 1.5.

## 5.3 2016 RESIDENTIAL ENERGY EFFICIENCY PROGRAMS

Tables 5-2 through 5-8 outline the specific Residential Energy Efficiency programs undertaken in 2016, including program and measure descriptions and a breakdown of non-incentive spending.

**Table 5-2: Energy Efficient Home Performance Program -Home Renovation Rebate (formerly known as Home Energy Rebate Offer “HERO”)**

Program Description	This collaborative program promotes energy-efficient home upgrades while educating homeowners on the value of whole home performance. Utility partners administer the program. Federal, provincial and local governments co-promote this program and other related initiatives, including capacity building for the trades, home labeling and the introduction of NRCan's updated Home Energy Rating System in the spring of 2016.					
Target Market	Residential customers					
New vs Retrofit	Retrofit					
Partners	BC Hydro, FortisBC (Electric), BC Ministry of Energy and Mines, Natural Resources Canada and local governments					
Eligible Measures	Draftproofing	Attic Insulation	Basement Insulation	Wall Insulation	\$750 Bonus Offer	
Incremental Measure Cost	\$100	\$1,147	\$1,463	\$1,953	N/A	
Incentive Amount	Up to \$500	Up to \$600	Up to \$1,000	Up to \$1,200	\$750	
Savings Per Participant	2.4 GJ	8.9 GJ	6.1 GJ	5.6 GJ	N/A	
Measure Life	6 years for Draftproofing, 25 years for Insulation Consultations with BC Hydro, Habart & Hood, 2010 Conservation Potential Review and Dunskey Energy Consulting.					
Free Rider Rate	20% average assumed based on past program analysis and NRCan evaluation. <i>Final Report: Analysis of Net-to-gross Survey Results for the ecoENERGY Retrofit for Homes Program.</i> Bronson Consulting Group. August, 2010					
Sources of Assumptions	2010 Conservation Potential Review Dunskey Energy Consulting, Hot 2000 Modeling 2012, 2013, 2015 2012 Residential End Use Study, FortisBC BC Hydro PowerSmart, Evaluation of the LiveSmart BC Efficiency Incentive Program F2009-F2011 BC Hydro, DSM Standard - Effective Measure Life and Persistence - Revision 10 (June 2016) Analysis of program participants and data					
Participants	2016	Projected	Actual			
	Total	3,360	2,251			
Expenditures (\$,000s)	2016	Incentives	Non-Incentives			Total
			Industry Support	Admin	Communication	Research & Evaluation
	Total	2 231	65	252	67	49
						2 663

**Notes:**

- In 2016, the Home Energy Rebate Offer was renamed Home Renovation Rebate Program as this title more accurately describes the program for customers.
- This program is a collaboration between FEI, FBC and BC Hydro with support from BC Ministry of Energy and Mines and Natural Resources Canada
- Industry support includes application support fees to energy advisors and FEI's contribution to Year-two support of 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 B.C.'s nascent home performance industry which is continuously evolving.

**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	\$1,899	\$1,899	\$3,756				
Incentive Amount	\$800	\$800	\$800				
Contractor Incentive	\$50	\$50	\$50				
Savings Per Participant	7.0 GJs	5.1 GJs	9.0 GJs				
Measure Life	Furnace & boilers - 18 years						
Free Rider Rate	Early Replacement Methodology						
Sources of Assumptions	2012 and 2013 Furnace Replacement Pilot Program Evaluation - Habart and Associates Furnace Replacement Program - Billing Analysis of 2012 Participant Savings - Sampson Research Inc. 2012 FortisBC Residential End Use Study Navigant Consulting report BC Hydro Power Smart QA Standard NRCan Analysis of program participants and data						
Participants	2016	Projected	Actual				
	Total	3,730	4,117				
Expenditures (\$,000s)	2016	Incentives	Non-Incentive Expenditures				Total
			Dealer Incentives	Admin	Communication	Research & Evaluation	
	Total	3,294	211	72	66	0	3,642

**Notes:**

- As in previous years, the Furnace & Boiler Replacement program pre-qualification period was run outside of heating season to reduce the incidence of emergency replacements.
- Contractor incentives of \$50 per participant are allocated to the administration portion of non-incentive spend.
- Based on industry feedback received during 2016, FEI is considering some program design updates.

**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. The program was out of market from January 1 to April 30, 2016, to re-evaluate the eligible models directory and reintroduced May 1, 2016.					
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): 7.8GJ EnerChoice Fireplace (New Construction): 5.0GJ					
Measure Life	15 years					
Free Rider Rate	2015 program participants - 30% based upon participant questionnaire responses 2016 program participants - 38% based upon participant questionnaire responses					
Sources of Assumptions	Impact of Terasen Gas Pilot Fireplace Program (2004) by Habart and Associates 2010 Conservation Potential Review 2012 FortisBC Residential End Use Study 2013 FortisBC Fireplace Upgrades Pre-Feasibility Study 2015 FortisBC EnerChoice Fireplace Program Impact Evaluation 2016 FortisBC EnerChoice Market Effects Study 2016 FortisBC Apartment Fireplace Efficiency Pilot Gas Fireplace Regulatory Proposal - BC Ministry of Energy and Mines, Energy Efficiency Branch (September 2016) Analysis of program participants and data					
Participants	2016	Projected		Retrofit	New Construction	Total
		Total	2015 Program	2,832	0	2,832
			2016 Program	1,270	1,017	2,287
	Total	3,285		4,102	1,017	5,119
Expenditures (\$,000s)	2016	Incentives	Dealer Incentives	Admin	Communication	Research & Evaluation
	Total	1,536	203	82	75	0
						1,896

**Notes:**

- 2016 EnerChoice fireplace program was out of market from Jan through April, while FEI developed a new eligible products directory.
- The EnerChoice Fireplace Program evaluation suggested the need to update the EnerChoice eligible products directory to improve minimum efficiency standards. Therefore the EnerChoice retrofit program was temporarily suspended to undertake industry and government consultation for 2016 program design. The 2016 program was launched May 1, 2016 with a new eligible products directory as the key program enhancement.
- Models included in the FEI eligible EnerChoice fireplace directory must be direct-vented and not have a standing pilot. These requirements support the B.C. Building Code and provincial policy. In addition, the models must be modulating as reported in the Natural Resources Canada fireplace models directory.
- Contractor incentives of \$50 per participant are allocated to the administration portion of non-incentive spend.



- In 2016, the Energy Efficiency Branch of the B.C. Government introduced a regulatory proposal to increase the standard of efficiency for fireplaces sold in B.C. that will take effect in 2018. This announcement presents an opportunity for FEI to claim savings, pursuant to the DSM Regulation, as a result of advancing a standard. FEI is assessing the benefits of this advancement for inclusion in the 2017 portfolio results.

**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 (62%), Fireplace Service (33%), Boiler (5%)					
Incremental Measure Cost	N/A					
Incentive Amount	\$25 incentive per service; Average of \$31 per participant					
Savings Per Participant	N/A					
Measure Life	N/A					
Free Rider Rate	N/A					
Participants (no. of services)	2016 Total	Projected 14,250	Actual 19,743			
Expenditures (\$,000s)	2016	Incentives	Non-Incentives			Total
			Admin	Communication	Research & Evaluation	
Total		494	51	32	0	577

1

**Table 5-6: ENERGY STAR® Water Heater Program**

Program Description	This program promotes the replacement 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. The new technologies include condensing and non-condensing tankless water heaters, hybrids 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	\$333	\$1,705	\$2,496		\$2,113					
New Construction	\$200	\$472	\$866		\$2,113					
Incentive Amount	\$200	\$400	\$500		\$1,000					
Savings Per Participant	3.0 GJ	6.5 GJ	8.3 GJ		5.0 GJ					
Measure Life	17.2 years (Weighted average - Manufacturers and other utilities)									
Free Rider Rate	25%									
Sources of Assumptions	ACEEE Emerging Hot Water Technologies and Practices for Energy Efficiency as of 2011. (Report Number A112) Sachs, H., Jacob Talbot and Nate Kaufman Canadian Residential Water Heater Market Assessment. 2009. Caneta Research Inc. 2012 A Canadian high efficiency natural gas water heater pilot project. Project # 417311. Natural Gas Technologies Centre. Prepared by Adam Neale. 2012 FortisBC Residential End Use Study 2010 Conservation Potential Review Analysis of program participants and data									
Participants	2016	Projected	Actual							
		Total	ESTAR 0.67 EF Storage Tank		Non-Condensing Tankless		Condensing Tankless & Hybrids		Condensing Storage Tank	
			Retrofit	New Const.	Retrofit	New	Retrofit	New Const.	Retrofit	New Const.
	Total	3,159	3,042	96	135	90	1,404	635	438	157
Expenditures (\$,000s)	2016	Incentives	Non-Incentives				Total			
			Dealer Incentives	Admin	Comm.	Research & Evaluation				
	Total	2,332	242	76	75	0	2,725			

2

**1      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, Non-Governmental Organizations (NGOs), and Municipalities					
Eligible Measures	Low-Flow Fixtures; ENERGY STAR® Washers and Dryers					
ENERGY STAR Washers:						
Incremental Measure Cost	\$77					
Incentive Amount	<b>Partnership with BC Hydro:</b> <ul style="list-style-type: none"><li>• \$50 rebate (FEU contributes \$25) on qualifying ENERGY STAR® clothes washers - IMEF of 2.82 to 2.91, and WF of 3.50 or less</li><li>• \$100 rebate (FEU contributes \$75) on qualifying ENERGY STAR clothes washers - IMEF of 2.92 or higher, WF of 3.20 or less</li></ul> <b>Partnership with FBC:</b> <ul style="list-style-type: none"><li>• \$50 rebate (FEU contributes \$25) on qualifying ENERGY STAR® clothes washers - IMEF of 2.74 to 2.91, and IWF of 3.50 or less</li><li>• \$100 rebate (FEU contributes \$75) on qualifying ENERGY STAR clothes washers - IMEF of 2.92 or higher, IWF of 3.20 or less</li></ul>					
Savings Per Participant	1.0 GJ Natural Gas plus 0.25 GJ electric - BC Hydro					
Measure Life	14 years					
Free Rider Rate	20%- BC Hydro based on market share of eligible washers					
Low Flow Fixtures:						
Incremental Measure Cost	*No applicants in 2016 - activity was undertaken in the Rental Apartment Efficiency Program					
Incentive Amount						
Savings Per Participant						
Measure Life						
Free Rider Rate						
Sources of Assumptions	Ontario Power Authority "2010 Prescriptive Measures and Assumptions: Release 1" 2010 Conservation Potential Review BC Hydro, DSM Standard - Effective Measure Life and Persistence - Revision 10 (June 2016) Analysis of program participants and data					
Participants	2016 Total	Projected N/A	Actual 1,273			
Expenditures (\$,000s)	2016	Incentives	Admin	Non-Incentives Communication	Research & Evaluation	Total
	Total	50	8	0	0	57

**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.					
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 Townhome/Rowhome			
Incremental Measure Cost	\$3,007		*No applicants to date			
Incentive Amount	\$2,000					
Savings Per Participant	20.1 GJs					
Measure Life	25 years					
Free Rider Rate	15% for ENERGY STAR					
Sources of Assumptions	New Construction Costs and Savings and Life Cycle Costs, First published in 2011 and updated in 2014, Cooper and Habart, and Dunsy Energy Consulting Analysis of program participants and data					
Participants	2016	Projected	Actual			
	Total	1,520	ENERGY STAR SFD 25		Total 25	
Expenditures (\$,000s)	2016	Non-Incentives				
		Incentives	Program Administration	Communication	Research & Evaluation	Total
	Total	50	40	57	2	149

**Notes:**

- FEI has collaborated with BC Hydro Power Smart and FBC on this program in past years. As of January 2016, BC Hydro removed their incentives although they continue to collaborate with FEI in providing education to builders and energy advisors and support policy regarding High Performance Homes in the province.
- The participant counts in this table are for the ENERGY STAR whole home component of the program. Incentives for natural gas water heaters and fireplaces installed in new home construction are noted under their respective program tables.

## **5.4 2016 RESIDENTIAL ENERGY EFFICIENCY PROGRAMS PLANNED BUT NOT LAUNCHED**

### **5.4.1 Customer Engagement Tool**

The Customer Engagement Tool pilot, being developed in partnership with FBC, was postponed to ensure that customer data exchanged with the service provider is secure and in compliance with the *Personal Information Protection Act* (PIPA) and corporate privacy policies. Work is currently underway to further develop and move forward with this pilot.

### **5.4.2 On-Bill Financing**

On-bill financing pilots were found to be expensive and administratively burdensome for utilities. Pilot implementations were unsuccessful with very low uptake rates. However, in 2016 FEI

continued to partner with CIBC to offer a competitive financing package through the Trade Ally Network. Partnerships with additional financial institutions, such as Vancity, also continued through 2016 in collaboration with BC Hydro and marketed through the Home Renovation Rebate Program.

### 5.4.3 New Technologies

FEI continues to explore New Technologies through the Innovative Technologies Program. There were no new technologies introduced in 2016. A combination space and water heating system program is under consideration based on results from the combination space and water heating system pilot (refer to Table 8-2).

## 5.5 SUMMARY

Residential Energy Efficiency Program Area activity in 2016 resulted in over 120,000 GJs/year of natural gas savings. 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 their ongoing success in generating natural gas savings and fostering market transformation in the residential sector.

## 6. LOW INCOME ENERGY EFFICIENCY PROGRAM AREA

### 6.1 OVERVIEW

Investments in Low Income DSM programs increased by more than 46 percent in 2016 over 2015. FEI saw the highest participation in Energy Saving Kit (ESK) since 2011, the highest participation in Energy Conservation Assistance Program (ECAP) since the program inception, maintained the Residential Energy Efficiency Works (REnEW) session, and launched three new programs: Low Income Space Heat Top Up, Low Income Water Heating Top Up and the Non-Profit Custom Program.

In addition to FEI's own Low Income programs, progress continues to be made on investing the \$5.155 million in funds granted to FEI by the Ministry of Energy, Mines and Natural Gas in 2009 to enable energy efficiency in low income households. In 2016, the Company invested \$499 thousand of this funding primarily on retrofits in First Nations bands, Low Income households, outreach focused on the ECAP program, partnership funding of the REnEW program, development of a building operator online training system, and an energy advisor position focused on the non-profit building sector. None of these investments are included in the spending amounts shown in Table 6-1. The remaining granted funds, \$867 thousand, will be invested in 2017.

Table 6-1 summarizes the planned and actual expenditures for the Low Income Program Area in 2016, including incentive and non-incentive spending, annual and NPV gas savings, as well as the cost effectiveness test results. The TRC and MTRC for low income programs use a value of 140 percent of the benefits in accordance with July 2014 amendments to Section 4(2)(b) of the DSM Regulation. This amendment effectively increases the deemed cost effectiveness of the Low Income programs.

**Table 6-1: 2016 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 EEC Plan	2016 Actual		2014-2018 EEC Plan	2016 Actual	2014-2018 EEC Plan	2016 Actual	2014-2018 EEC Plan	2016 Actual					
Non Program Specific Expenses														
Total	No Direct Savings			0	0	305	106	305	106	No Direct Savings				
Energy Saving Kit (ESK)														
Total	8,381	22,145	164,078	78	254	51	115	129	369	5.3	n/a	5.0	9.2	0.9
Energy Conservation Assistance Program (ECAP)														
Total	8,324	8,199	69,268	1,211	1,216	822	336	2,033	1,553	0.5	1.9	0.5	1.6	0.4
Residential Energy Efficiency Works (REnEW)														
Total	No Direct Savings			0	0	81	74	81	74	n/a				
Low Income Space-Heat Top Up														
Total	2,827	1,164	13,499	78	62	16	2	94	64	2.7	n/a	2.6	3.5	0.8
Low Income Water-Heating Top Up														
Total	826	105	890	13	6	5	1	17	7	1.9	n/a	1.5	3.3	0.7
Non-Profit Custom Program														
Total	7,389	0	0	274	0	108	31	383	31	n/a				
Rental Apt Efficiency (RAP) <i>Low Income Portion</i>														
Total	0	5,305	22,970	0	59	0	14	0	73	n/a				
ALL PROGRAMS														
Total	27,747	36,918	270,705	1,654	1,597	1,387	679	3,042	2,277	1.2	2.3	1.4	3.0	0.7

Notes:

- The Space-Heat Top Up, Water-Heating Top Up and Non-Profit Custom Programs are new programs launched in 2016, following BCUC approval.
- During implementation of the Non-Profit Custom Program, FEI determined that some program objectives could be more easily met by extending RAP eligibility to low-income customers. Hence the introduction of the Low-Income RAP line item in Table 6-1.
- 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 Low Income portion of RAP. Full RAP details are provided in Section 7.3.1, Table 7-10
- Cost effectiveness values for *the Low Income Portion* of RAP are not provided as they do not represent a complete program view. Please refer to Table 7-10 for the program's cost effectiveness results.

## 6.2 2016 LOW INCOME PROGRAMS

Tables 6-2 through 6-7 outline the specific Low Income programs undertaken in 2016, including program and measure descriptions and a breakdown of non-incentive spending.

**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	\$ 20.10 Average based on the full cost of the gas measures included in the ESK.					
Incentive Amount	\$ 20.10 Since the program is free to participants, the incentive equals the incremental cost.					
Savings Per Participant	2.7 GJ per year					
Measure Life & Source	10 years - Average based on the individual gas measures included in the Energy Saving Kit					
Free Rider Rate & Source	27% - Based on 2010 BC Hydro participant survey.					
Participants	2016	Projected	Actual			
	Total	5,740	12,640			
Expenditures (\$,000s)	2016	Incentives	Admin	Communication	Research & Evaluation	Total
	Total	254	53	62	0	369

**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.</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	\$627 Based on average cost of the customized bundle of measures installed. Includes the full cost of the gas measures installed in gas heated homes.					
Incentive Amount	\$627 Since the program is free to participants, the incentive equals the incremental cost.					
Savings Per Participant	4.4 GJ per year					
Measure Life & Source	12 years - Average based on the individual gas measures installed.					
Free Rider Rate & Source	4% (Source: Primarily third-party studies)					
Participants	2016	Projected	Actual			
	Total	1,495	1,941			
Expenditures (\$,000s)	2016	Incentives	Admin	Communication	Research & Evaluation	Total
	Total	1,216	191	63	82	1,553



**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	2016	Projected	Actual			
	Total	20	13			
Expenditures (\$,000s)	2016	Incentives	Admin	Communication	Research & Evaluation	Total
	Total	0	72	2	0	74

**Table 6-5: Low Income Space Heat Top Up**

Program Description	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.  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.					
Target Market	The Low Income Space Heat Top Up Program is primarily focused on apartment buildings that are owned or operated by a First Nations band, a non-profit housing provider, or a housing co-operative.					
New vs Retrofit	Both					
Partners	N/A					
Eligible Measures	Condensing boilers and mid-efficiency boilers.					
Incremental Measure Cost	\$7,683 per appliance					
Incentive Amount	Condensing: \$6/MBH Mid-efficiency: \$3/MBH					
Savings Per Participant	129 GJ/yr					
Measure Life & Source	20 years - ASHRAE Handbook and Conservation Potential Review					
Free Rider Rate & Source	18% - Efficient Boiler Program Impact Evaluation, June 12, 2003					
Participants	2016	Projected	Actual			
	Total	27	11			
Expenditures (\$,000s)	2016	Incentives	Admin	Communication	Research & Evaluation	Total
	Total	62	2	0	0	64

Note:

- The Low Income Space Heat Top Up program was launched mid-year which led to fewer participants than planned. It's expected that participation will grow in 2017.

**Table 6-6: Low Income Water Heating Top Up**

Target Market	<p>The existing Commercial Water Heating Program offers rebates to commercial customers for the installation of high efficiency water heating equipment in commercial applications. The Low Income Water Heating Top Up Program is an add-on to the existing Commercial Water Heating 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>					
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	\$4890 per appliance					
Incentive Amount	<p>Storage tank water heater: \$2/MBH  Hot water supply boiler (84%-89.9% thermal efficiency): \$1/MBH  Hot water supply boiler (90%+ thermal efficiency): \$2/MBH  High-efficiency tankless water heater: \$1/MBH</p>					
Savings Per Participant	34 GJ/year per appliance					
Measure Life & Source	12 years -2010 Conservation Potential Review, Navigant Consulting (16 April 2009) Measures and Assumptions for Demand Side Management Planning Appendix C: Substantiation Sheets Ontario Energy Board pp. 210-226.					
Free Rider Rate & Source	38% - Efficient Commercial Water Heater Evaluation 2016, Prism Engineering					
Participants	2016 Total	Projected 22	Actual 5			
Expenditures (\$,000s)	2016 Total	Incentives 6	Admin 1	Communication 0	Research & Evaluation 0	Total 7

**Note:**

- The Low Income Water Heating Top Up program was launched mid-year which lead to fewer participants than planned. It's expected that participation will grow in 2017.

**Table 6-7: Non-Profit Custom Program**

Program Description	<p>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:</p> <p>1) An energy study: Currently there are two avenues available to non-profit housing providers to receive a free energy audit and study. Most participants are having their energy study performed by BC Non-Profit Housing Association (BCNPHA). Some participants are opting to go through the RAP Low Income program for these services.</p> <p>2) Implementation support: Currently the implementation support is available through the RAP Low Income program. There is additional work still under development for this component of the program. Future implementation support could be offered to housing providers that have used BCNPHA for their energy study.</p> <p>3) Incentives for Measures: At this point, it is only the Space Heat Top Up and the Water Heater Top Up measures that are available. Analysis is currently being performed on additional measures to offer additional incentives for.</p>					
Target Market	The Non-Profit Custom Program is primarily focused on apartment buildings that are owned or operated by First Nations bands, non-profit housing providers, or housing co-operatives.					
New vs Retrofit	Both					
Partners	N/A					
Eligible Measures	Eligible measures include boilers and water heaters. Additional measures may in the future include items such as heating controls (i.e. zone controls, temperature set back controls, etc.) and potentially building envelope 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	2016 Total	Projected 11	Actual 0			
Expenditures (\$,000s)	2016 Total	Incentives 0	Admin 23	Communication 0	Research & Evaluation 8	Total 31

**Notes:**

- Before FEI could bring this program to market several things changed that caused FEI to consider a modified path to achieving the program objectives. These changes include:
  - a desire to ensure that there is no confusion between existing FEI programs (e.g..RAP) and the Non-Profit Custom Program
  - the energy audits that were envisioned to be included in the Non-Profit Custom Program are now being performed by staff at BCNPHA (two of which are FEI-funded Energy Specialists); and
  - RAP is open to low income buildings and thus there are some low income buildings that have participated in RAP Low Income. Please refer to Table 7-10 for the cost effectiveness results for the RAP Low Income Portion and Table 7-11 for program details.
- FEI believes that it is on a path to achieving many of the objectives outlined in the Non-Profit Custom Program through a phased approach that began in 2016 by allowing Low Income Non-Profit Housing Providers to be eligible for RAP.

### 6.3 SUMMARY

The Low Income Program Area has been an important priority for the Company since the initial creation of the DSM Program Principles. In 2016 all historical Low Income programs were operating at their highest levels to date and three new programs were introduced.

## 7. COMMERCIAL ENERGY EFFICIENCY PROGRAM AREA

### 7.1 OVERVIEW

In 2016, 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 255,400 GJs and achieved an overall TRC of 1.1. \$10.637 million was invested in Commercial Energy Efficiency, of which 80 percent was incentive spending.

Table 7-1 summarizes the projected and actual expenditures for the Commercial Energy Efficiency Program Area in 2016, including incentive and non-incentive spending, annual and NPV gas savings, as well as TRC and other cost effectiveness test results.

**Table 7-1: 2016 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 EEC Plan	2016 Actual		Incentives		Non-Incentives		All Spending		TRC	MTRC	Utility	Participant	RIM
				2014-2018 EEC Plan	2016 Actual	2014-2018 EEC Plan	2016 Actual	2014-2018 EEC Plan	2016 Actual					
Non Program Specific Expenses														
Total	No Direct Savings			0	0	1,100	474	1,100	474	No Direct Savings				
Space Heating Program														
Total	61,824	82,890	961,647	2,053	3,208	75	265	2,128	3,473	1.6	n/a	2.5	2.2	0.9
Water Heating Program														
Total	15,389	10,608	89,625	245	319	38	191	283	510	0.6	n/a	1.5	1.0	0.7
Commercial Food Service Program														
Total	14,107	14,107	125,910	319	385	155	236	473	622	1.1	n/a	1.8	1.9	0.7
Customized Equipment Upgrade Program														
Total	51,817	56,124	507,620	2,226	2,017	215	466	2,441	2,483	1.1	n/a	1.6	1.7	0.6
EnerTracker Program														
Total	0	12,707	12,707	0	204	13	26	13	230	0.7	n/a	0.4	2.0	0.3
Continuous Optimization Program														
Total	173,381	36,116	152,715	1,553	390	171	28	1,724	418	0.9	n/a	2.9	1.4	0.8
Commercial Energy Assessment Program														
Total	0	8,687	8,687	379	36	108	29	487	65	0.8	n/a	0.9	2.8	0.5
Energy Specialist Program														
Total	0	6,257	6,257	2,160	1,634	162	147	2,322	1,780	n/a				
Rental Apt Efficiency (RAP) Commercial Portion														
Total	0	27,911	77,159	0	367	0	215	0	581	n/a				
ALL PROGRAMS														
Total	192,903	255,408	1,942,328	8,934	8,560	2,038	2,077	10,972	10,637	1.1	n/a	1.6	1.7	0.7

Notes:

- 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 commercial portion of RAP. Full RAP details are provided in Section Table 7-10.
- Cost effectiveness values for the *Commercial Portion* of RAP are not provided as they do not represent a complete program view. Please refer to Section 7.3.1, Table 7-10 for the program's cost effectiveness results.

## 7.2 2016 COMMERCIAL ENERGY EFFICIENCY PROGRAMS

The following tables outline the specific Commercial Energy Efficiency programs undertaken in 2016, including program and measure descriptions and a breakdown of non-incentive spending.

**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 may also be offered via the program in 2017.					
Target Market	Commercial					
New vs Retrofit	Both					
Partners	N/A					
	Retrofit		New Construction			
Incremental Measure Cost	\$21,777		\$24,436			
Incentive Amount	\$13,111		\$20,142			
Savings Per Participant	402 GJ		757 GJ			
Measure Life & Source	20 years - ASHRAE Handbook and Conservation Potential Review					
Free Rider Rate & Source	18% - Efficient Boiler Program Impact Evaluation, June 12, 2003					
Participants	2016	Projected	Actual			
	Total	204	234			
Expenditures (\$,000)	2016	Incentives	Admin	Communication	Research & Evaluation	Total
	Total	3,208	232	33	0	3,473

**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	\$9,274		\$13,199			
Incentive Amount	\$2,028		\$4,222			
Savings Per Participant	119 GJ		188 GJ			
Measure Life & Source	12 years -2010 Conservation Potential Review, Navigant Consulting (16 April 2009) Measures and Assumptions for Demand Side Management Planning Appendix C: Substantiation Sheets Ontario Energy Board pp. 210-226.					
Free Rider Rate & Source	38% - Efficient Commercial Water Heater Evaluation 2016, Prism Engineering					
Participants	2016	Projected	Actual			
	Total	128	128			
Expenditures (\$,000)	2016	Incentives	Admin	Communication	Research & Evaluation	Total
	Total	319	117	22	52	510

**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				
	Retrofit		New Construction		
Incremental Measure Cost	\$1,968		\$6,793		
Incentive Amount	\$1,050		\$3,224		
Savings Per Participant	47 GJ		160 GJ		
Measure Life & Source	13 Years - Foodservice Incentive Program Study 2012, Fisher-Nickel Inc., Marbek Conservation Potential Review (2010) and Database for Energy Efficiency Resources (DEER). San Francisco, CA, California Public Utilities Commission, 2011.				
Free Rider Rate & Source	20% - Foodservice Incentive Program Study 2012, Fisher-Nickel Inc. and Database for Energy Efficiency Resources (DEER). San Francisco, CA, California Public Utilities Commission, 2011.				
Participants	2016	Projected	Actual		
	Total	398	307		
Expenditures (\$,000)	2016	Incentives	Admin	Communication	Research & Evaluation
	Total	385	122	104	10
					Total
					622

**Notes:**

- In 2016 as part of the Commercial Food Service Program, FEI in partnership with The City of Richmond and The City of Victoria offered a program to install low-flow pre-rinse spray valves and faucet aerators in food service establishments.
- The savings, participation and incremental costs for these measures are included in the average values for the retrofit market. The low cost and savings of these measures has resulted in comparatively low average incentives, savings and incremental costs for retrofit participants.

**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)					
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	2016	Projected	Actual			
	Total	78	64			
Expenditures (\$,000s)	2016	Incentives	Admin	Communication	Research & Evaluation	Total
	Total	2,017	432	17	17	2,483

**Notes:**

- The Customized Equipment Upgrade Program is complex in nature and has variable measure savings, costs, incentives and/or cash flows which, unlike in prescriptive programs, occur over a period of years. Consequently, providing results for this program within an annual report format is challenging. In general, the savings in this program occur in later years after the participants have had the time to implement customized Energy Conservation Measures, while some program incentives and costs are payable at the outset. Please refer to the notes provided below for additional details.
- New Construction Program:
  - Participation in this program can last for approximately 5 years. This is broken down into approximately 12 months to prepare the required whole building energy simulation, followed by up to 48 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.
  - Participants are recorded when the energy simulations or the new buildings are complete, and the incentive becomes payable.
  - The 2016 Actual participants include 14 completed energy simulations, and 3 completed buildings with implemented measures. The associated gross natural gas savings from these 3 projects is approximately 25,269 GJ/year.



- Retrofit Program:
  - Participation in this program can last for approximately 2 years. This is broken down into approximately 6 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 '2016 Actual' participants included 23 completed energy studies, and 24 projects where Energy Conservation Measures were installed. The associated gross natural gas savings from these 24 projects is approximately 56,756 GJ/year.

**Table 7-6: EnerTracker Program**

Program Description	This pilot program is a subset of the continuous optimization (C.Op) program. It provides participants who are otherwise unable or unwilling to participate in the full C.Op program with access to an Energy Management Information System (EMIS). EMIS software provides customers with a detailed picture of their natural gas consumption in "near time". Timely access to this information is expected to speed up fault detection, thereby enabling more rapid corrective action to avoid wasted gas consumption, and to assist in the identification of additional natural gas conservation measures.					
Target Market	Commercial customers with existing AMR devices (FEI only)					
New vs Retrofit	Retrofit					
Partners	N/A					
Eligible Measures	Energy Management Information System					
Incremental Measure Cost	\$799/yr (Average)					
Incentive Amount	\$799/yr (Average)					
Savings Per Participant	2% of annual natural gas consumption -- Proof of concept study					
Measure Life & Source	1 year -- Measure Life is based on annual EMIS software subscription					
Free Rider Rate & Source	65% - EnerTracker Pilot Program Evaluation 2016, Prism Engineering					
Participants	2016	Projected	Actual			
	Total	0	255			
Expenditures (\$,000s)	2016	Incentives	Admin	Communication	Research & Evaluation	Total
	Total	204	14	7	5	230

**Notes:**

- An Evaluation of the pilot was completed in 2016. As described therein the program was not found to be particularly effective, and is thus discontinued after 2016.
- As there is currently insufficient AMR (Automated Meter Reader) infrastructure in the Vancouver Island service territory to support the rollout of this pilot, program availability was limited to the Lower Mainland and Interior service territories.
- Note that participation in the program is cumulative, meaning that a participant is enrolled for multiple years, claiming savings and incurring costs on an annual basis for the duration of the EMIS software license.

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**Table 7-7: 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 <sup>2</sup> 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	Average nominal program duration incremental cost (7 years): \$41,275 2016 observed average implemented incremental cost: \$28,435					
Incentive Amount	Average nominal program duration incentive amount (7 years): \$15,915 2016 observed average implemented incentive amount: \$10,834					
Savings Per Participant	Average expected annual natural gas savings: 1,465 GJ/year 2016 observed average implemented natural gas savings: 1,033 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	2016	Projected	Participants Implementing in 2016	Cumulative Program Participants		
	Total	467	36	395		
Expenditures (\$,000s)	2016	Incentives	Admin	Communication	Research & Evaluation	Total
	Total	390	10	19	0	418

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3 Notes:

4 • The C.Op Program is conducted in partnership with BC Hydro and FBC. BC Hydro and FBC Inc.  
5 act as the primary administrators of program activities, with CEM providing financial and process  
6 support.

7 • Participation in this program lasts for approximately 7 years for a typical participant. The 7 years  
8 are composed of approximately: 12 months of baseline data collection; 24 months of re-  
9 commissioning study work, plus the implementation of a recommended bundle of energy  
10 conservation measures; and, 48 months of monitoring and continuous improvement.

11 • Participants are recorded as soon as they are accepted into the program; however, natural gas  
12 savings do not occur until they have completed the implementation of a recommended bundle of  
13 energy conservation measures, approximately 36 months later. As such, the program incurs  
14 incentive expenses (for the upgrading of meter equipment, re-commissioning costs and EMIS  
15 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 2016 observed average implemented incremental cost represents the incremental costs incurred specifically in 2016 divided by the total number of participants who implemented in 2016.
  - The average nominal program duration incentive amount represents the total incentive expected to be paid when an average participant completes the full 7 year run in the program. The 2016 observed average implementation incentive amount represents the incentive paid specifically in 2016 divided by the total number of participants who implemented in 2016. Due to the nature of the program, the incentive amount paid is not solely attributable to those who implemented in 2016.
  - 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 2016 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 2016 divided by the total number of participants who implemented in 2016.
- Participant count clarification:
- "2016 Actual" represents the number of new participants who were approved in 2016. There were no new participants because the program is currently closed to new participants.
  - "Participants Implementing in 2016" represents the number of participants who have successfully completed implementing the bundle of energy conservation measures in 2016.
  - "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 2016 which, combined with the program being closed to new participants, resulted in a lower cumulative participation number than the previous year.

**Table 7-8: 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	\$1,548					
Incentive Amount	\$1,347					
Savings Per Participant	495.3 GJ					
Measure Life & Source	1.17 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.					
Free Rider Rate & Source	35% - 2010 Friuch Energy Assessment Evaluation, past spray valve program data					
Participants	2016	Projected	Actual			
	Total	524	27			
Expenditures (\$,000s)	2016	Incentives	Admin	Communication	Research & Evaluation	Total
	Total	36	26	3	0	65

**Notes:**

- At the time of writing the 2014-2018 DSM Plan, the FEI were 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 had the BEA program been 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 and the number of participants in 2016 is significantly less than was estimated in the 2014-2018 DSM Plan. In addition, a significant number of multi-family apartment customers now receive their energy assessments through RAP.

**Table 7-9: 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					
Eligible Measures	Energy Specialist position					
Incremental Measure Cost	\$60,000					
Incentive Amount	\$60,000					
Savings Per Participant	Total 2016 verified (non-C&M program) annual natural gas savings = 6,257 GJs/ year					
Measure Life & Source	N/A					
Free Rider Rate	0% - Internal Engineering review					
Participants	2016	Projected	Actual			
	Total	36	27			
Expenditures (\$,000s)	2016	Incentives	Admin	Communication	Research & Evaluation	Total
	Total	1,634	122	0	25	1,780

**Notes:**

- The Energy Specialist Program continues to experience success as an enabling program. In 2016, organizations with Energy Specialists were responsible for 28 percent of the natural gas savings and 33 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 utilized in 2016.
- Some organizations had Energy Specialists for part of the year only.
- The energy savings listed only apply to natural gas projects completed by Energy Specialists in 2016 that did not directly receive incentive funding from another C&EM program. 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 July 2016, BC Hydro discontinued funding for the Business Energy Advisors (BEAs). Prior to this FEI had been co-funding eight BEAs with BC Hydro. FEI was a minority funding contributor in this arrangement, contributing \$60,000 per funding year for all eight BEAs combined. This is equivalent to the funding of one Energy Specialist. BEAs were tasked with the same objectives as Energy Specialists but targeted small to medium sized businesses. As a collective they were expected to achieve FEI C&EM program participation results similar to that of one Energy Specialist. Hence, this has been counted as one participant in the participant total for the Energy Specialist Program.

## 7.3 2016 PROGRAMS WITH JOINT PROGRAM AREA BUDGETS

### 7.3.1 Rental Apartment Efficiency Program (RAP)

RAP includes a combination of residential and commercial measures for both the low income and the able to pay 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, low income and commercial program areas. The expenditures and related savings for this program attributable to each program area are provided in Table 7-10 and correspond to the RAP expenditures shown in the Program Area Summary Tables for each of the three program areas.

**Table 7-10: 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		TRC	MTRC	Utility	Participant	RIM
	2014-2018 EEC Plan	2016 Actual		2014-2018 EEC Plan	2016 Actual	2014-2018 EEC Plan	2016 Actual	2014-2018 EEC Plan	2016 Actual					
Rental Apt Efficiency (RAP) - Commercial Portion														
Total	0	27,911	77,159	0	367	0	214	0	581	0.9	n/a	1.1	2.5	0.9
Rental Apt Efficiency (RAP) - Low Income Portion														
Total	0	5,305	22,970	0	59	0	14	0	73	3.5	n/a	3.5	5.0	2.3
Rental Apt Efficiency (RAP) - Residential Portion														
Total	0	26,292	194,803	0	306	0	116	0	422	3.2	n/a	3.9	7.1	0.7
Overall Program														
Total	0	59,508	294,931	0	731	0	345	0	1,076	1.9	n/a	2.4	4.5	0.8

Notes:

- RAP was launched in October 2015 and addresses Commission directive 148 of Order G-138-14.

**Table 7-11: 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 to building owners or property management companies of rental properties (hereinafter referred to as Participant(s)). These devices will be installed by an agent of FortisBC into each individual rental suite. The second component is to simultaneously provide those Participants with energy assessments recommending building-level energy efficiency upgrades such as condensing boilers, high efficiency water heaters and lighting upgrades. The last component is to provide the Participant with support in implementing those energy efficiency recommendations and applying for rebates. Expenditures for RAP are covered by 3 program areas based on the in-suite versus the common area expenses and the able-to-pay versus the low income rental apartment customer. For the able-to-pay rental customer, all the in-suite related expenses associated with the direct install activities are covered by the Residential Program Area, while the common area related expenses are covered by the Commercial Program Area. This includes expenditures associated with the energy assessment, implementation support, and boiler/water heater rebates. For the low income rental customer all expenditures related to both the in-suite and common area expenses are covered by the Low Income Program Area.					
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	2016	Total	Commercial	Low Income	Residential	
	Projected	23397	0	0	23397	
	Actual	30190	219	2752	27219	
Participants by Measure Type			Commercial	Low Income	Residential	
	Non-SST 1.5 Showerhead			606	8191	
	Non-SST 1.5 GPM Handheld			278	843	
	Non-SST 1.5 GPM Bathroom Aerator			927	9142	
	Non-SST 1.5 GPM Kitchen Aerator			919	9043	
	Energy Assessment Reports	177		20		
	Implementation Support Partial	15		1		
	Implementation Support Full	4				
	Boiler Top Ups (40% of the rebate)			1		
	Condensing Boilers		23			
		Total	219	2,752	27,219	
Expenditures (\$,000s)	2016	Incentives	Non-Incentives			Total
			Admin	Communication	Research & Evaluation	
	Commercial	367	202	7	5	581
	Low Income	59	14	0	0	73
	Residential	306	104	4	8	422
	Total	731	320	11	14	1,076

## 7.4 2016 COMMERCIAL ENERGY EFFICIENCY PROGRAM CLOSURES

### 7.4.1 EnerTracker Program

Since inception the EnerTracker pilot has not achieved a TRC 1.0 or better, nor is it expected to do so moving forward. Further, the evaluation revealed that although some participants utilized the EMIS tool consistently, a significant portion of participants (25 percent) had not logged into the provided software since starting the program. Moreover, program participants who actively used the provided EMIS tool were found to have reduced natural gas consumption by no more

than those participants who did not use the provided EMIS or indeed any energy management software. This program was closed as of December 31, 2016.

## 7.5 SUMMARY

Commercial Energy Efficiency Program Area activity in 2016 successfully achieved approximately 255,400 GJ of annual natural gas savings and a positive TRC of 1.0. The Space Heat program continues to act as the cornerstone program as it invests more in natural gas efficiency projects than the other commercial programs. On the other hand all programs continue to experience growth in participation, incentive spend and natural gas savings. The Commercial Custom Design Program in particular experienced significant growth in 2016, investing over \$2 million in energy saving measures that would not otherwise be able to obtain incentives via a prescriptive rebate program. 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 market-ready 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.

Just as important as identifying new technologies to be incorporated into the DSM portfolio are findings that indicate which technologies to not include. Section 8.3 summarizes how the activities and processes for the Innovative Technologies Program Area were successful in identifying proposed projects that should not proceed to full pilot phase or further.

All 2016 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,"<sup>12</sup> meaning that the Program Area or the measures therein are not subject to a cost effectiveness test. Instead the cost effectiveness of these expenditures will be evaluated as part of the DSM portfolio as a whole.<sup>13</sup> Innovative Technologies expenditures are also not subject to the 33 percent cap on programs for which the MTRC is utilized as a cost effectiveness measure according to Section 4 (4) of the DSM Regulation.<sup>14</sup>

Table 8-1 summarizes the projected and actual expenditures for the Innovative Technologies Program Area in 2016, including incentive and non-incentive spending, annual and NPV gas savings, as well as TRC and other cost effectiveness test results where applicable.

**Table 8-1: 2016 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 EEC Plan	2016 Actual		2014-2018 EEC Plan	2016 Actual	2014-2018 EEC Plan	2016 Actual	2014-2018 EEC Plan	2016 Actual					
Non Program Specific Expenses														
Total	No Direct Savings			n/a	0	n/a	209	n/a	209	No Direct Savings				
Pilot/Demonstration Projects														
Total	18,937	6,292	81,078	636	67	597	229	1,233	296	1.7	n/a	2.6	6.3	0.7
Studies														
Total	No Direct Savings			n/a	0	n/a	252	n/a	252	No Direct Savings				
ALL PROGRAMS														
Total	18,937	6,292	81,078	636	67	597	690	1,233	757	0.8	n/a	1.0	6.3	0.5

<sup>12</sup> BCUC Letter 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

<sup>13</sup> Subsection 4(4) of the DSM Regulation, and the Decision on the 2012 – 2013 Revenue Requirements Application and Natural Gas Rates Application, page 175.

<sup>14</sup> BCUC Letter 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.

Notes:

- Innovative Technologies are considered a “specified demand-side measure,” meaning that the Program Area or the measures therein are not subject to a cost effectiveness test. Instead the cost effectiveness of these expenditures will be evaluated as part of the DSM/C&EM portfolio as a whole.

## 8.2 2016 INNOVATIVE TECHNOLOGIES ACTIVITIES

Tables 8-2 to 8-3 outline the specific Innovative Technologies activities undertaken in 2016, including program and measure descriptions and a breakdown of non-incentive spending<sup>15</sup>.

<sup>15</sup> Innovative Technologies activities are distinct from C&EM programs and are not presented in individual program tables as in other Program Area sections in this report.

1

**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																						
Heat Reflector (HRP) Pilot	To assess energy savings, costing and customer acceptance data related to the installation of a Reflector Panel behind a perimeter heating system in rental MURBs. Energy saving details will be achieved through analysis of billing consumption data on a building level, costing data from the completion of 30 installations and customer acceptance from surveying all building managers at the end of the heating season. Results are expected Q2 2017.																						
	2016 Total	Participants 30																					
Apartment Fireplace Efficiency Retrofit (AFER) Pilot	Objectives of the pilot are to verify energy savings from replacing older decorative style “B” vented fireplaces with Direct Vent EnerChoice level heating style fireplaces in Multi Unit Residential Buildings (MURB’S). The results will be used to determine the feasibility of launching a rebate program for high efficient EnerChoice direct vent fireplaces in MURB’s or to extend the existing fireplace rebate offers to MURB’S. Results were handed off to the Residential program team in Q4 2016.																						
	2016 Total	Participants 32																					
Combination Space and Water Heating System (CURP) Pilot	Objectives of the pilot are to identify field-validated energy performance of each combination system type, technical issues, field-validated incremental costs, customer acceptance and the effective marketing channels for promoting a combination system retrofit rebate. The results will provide insight into a cost-effective rebate program for residential customers to upgrade their existing space and water heating equipment to combination systems. Results are expected Q1 2017.																						
	2016 Total	Participants 19																					
Participants	2016 Total	Projected n/a	Actual 81																				
Expenditures (\$,000s)	<table><tr><td></td><td></td><td colspan="3">Non-Incentive Expenditures</td><td></td></tr><tr><td>2016</td><td>Incentives</td><td>Admin</td><td>Communication</td><td>Research &amp; Evaluation</td><td>Total</td></tr><tr><td>Total</td><td>67</td><td>104</td><td>0</td><td>125</td><td>296</td></tr></table>							Non-Incentive Expenditures				2016	Incentives	Admin	Communication	Research & Evaluation	Total	Total	67	104	0	125	296
		Non-Incentive Expenditures																					
2016	Incentives	Admin	Communication	Research & Evaluation	Total																		
Total	67	104	0	125	296																		

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3 Notes:

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- Final results from the Apartment Fireplace Efficiency Pilot (AFER) were received in 2016, the findings of which will inform future program design for the Residential Program area. The primary purpose of the study was to compare sub metered gas consumption and run-time on existing natural gas B-vent style fireplaces with EnerChoice natural gas vertical direct-vent fireplaces in apartments. Please refer to Section 12 Evaluation, Table 12-2 for more information on the AFER pilot.

1

**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>Drain Water Heat Recovery Prefeasibility Study</i>	Drain Water Heat Recovery (DWHR) systems recover part of the energy from the warm drain water to preheat the cold mains water that enters the domestic hot water heating system. DWHR units usually consist of copper piping that is tightly wrapped around a vertical section of a copper drainpipe. The objective of the study is to assess the technical characteristics, market opportunity, and projected energy savings of installing DWHR systems in both new construction and retrofit applications for all suitable residential building types. The study is expected to be completed by Q1 2017.
<i>LEEP BC Climate Zone 5 Study</i>	BC Housing and its BC Partners have defined the target for selection of innovative technologies for new homes to be at 25% reduction in annual space heating energy use from applicable building code, bylaw or green rezoning policy requirements for Climate Zone 5 (Southern Interior and Island North) and Climate Zone 6-8 (Central and Northern BC). NRCAN, through the Innovative and Energy Technology Sector (IETS) will lead a series of Local Energy Efficiency Partnership (LEEP) builder group meetings to assess, screen and report on technologies based on their suitability and marketability. The project is expected to be completed by Q4 2017.
<i>LEEP Low Use Homes Study</i>	The objective of this project is to support the home building industry's ability to find and apply new and existing gas based mechanical systems for the growing market share of homes with design heating loads of up to 30,000 BTUs. A companion guide will be developed to support builders and their mechanical designers as they make decisions together on the type of natural gas fuelled mechanical system they want to use in homes with low space heating loads. Some of the technologies considered are drain water heat recovery systems, combined space and water heating units and direct vent wall furnaces. Workshops for the first 2 markets are expected to be conducted by Q4 2017 and workshops for the remaining 6 markets by Q2 2018.
<i>Residential HVAC Zoning Prefeasibility Study</i>	Forced-air zoning systems allow central heating ventilation and air conditioning (HVAC) equipment to be controlled by multiple thermostats or sensors, each serving specific zones of the home. This strategy allows for programmed or occupancy-based temperature set-back or set-forward by zone. The objective of the study is to conduct a technology, market and energy savings assessment of Residential HVAC zone controls for forced air systems. The scope of the study is limited to residential HVAC zoning controls and equipment in single family homes/duplexes, and row/townhouses for all applicable building vintages. The study is expected to be completed in Q1 2017.
<i>Steam Trap Market Characterization Study</i>	Steam traps are installed inline in steam distribution pipe systems, and are used to remove steam condensate from pipes. Improving steam trap maintenance practices provides an opportunity for natural gas energy savings, as failed steam traps are a source of steam losses. The objective of the Steam Trap Market Characterization study was to identify the process of steam trap system surveys and the process of maintaining the steam traps in an attempt to understand why steam traps are not being replaced at the point of failure in the Industrial sector. The study was concluded in Q3 2016.

2

**Table 8-3: Studies Continued**

<i>Direct Vent Wall Furnace Study Feasibility Study</i>	Direct Vent Wall Furnaces are compact self-contained combustion units that are installed on exterior walls so that combustion by-products are discharged outside through a vent. Direct Vent Wall Furnaces can be a good alternative to central heating systems, especially if a home does not have existing ducting or is built on a concrete slab. The objective of the study is to investigate Direct Vent Wall Furnaces that can be installed to replace lower efficiency space heating systems and lower efficiency fireplaces in both new construction and retrofit applications for all suitable residential building types. The study is expected to be completed in Q2 2017.					
<i>Net Zero Homes study</i>	A recent significant research project done through Natural Resources Canada and with builders across Canada has demonstrated the feasibility of net zero energy homes in five Canadian cities. The main objective of this project is to identify the barriers and opportunities for the natural gas industry in a net zero energy home context. The report aims to define a net zero energy home case and to provide sufficient information for the selection of an all-electric scenario and a natural gas and electric combination scenario. The project is expected to be completed in Q3 2017.					
<i>Gas fired Heat Pump Feasibility Study</i>	Gas heat pumps extract heat from air, ground, or water sources using thermally-driven cycles (engines or absorption), and can achieve high efficiencies in low temperature operation. The objective of the study is to conduct a technology, market and energy savings assessment of all relevant Gas Heat Pump technologies for space and water heating being installed in both Commercial and Residential buildings for all applicable vintages. The study is expected to be completed in Q2 2017.					
Expenditures (\$,000s)	2016	Incentives	Non-Incentive Expenditures			Total
			Admin	Communication	Research & Evaluation	
	Total	0	252	0	0	252

**Notes:**

- Outcomes from the Steam Trap Market Assessment study were received in 2016, resulting in steam trap replacements and audits to be considered as future eligible measures under the Industrial Program Area. The goal of the study was to better understand the operator decision making process and whether certain elements that prevent replacement can be mitigated through utility programming intervention. Insights gained from steam trap market characterization enhanced FEI's understanding of steam trap use and maintenance practices within industrial facilities.

### 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 successfully 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 2016, the Industrial Energy Efficiency Program Area continued to encourage industrial customers to consume natural gas more efficiently and achieved an overall TRC of 1.0, with a combined net natural gas savings of 18,349 GJ per year.

Table 9-1 summarizes the projected and actual expenditures for the Industrial Energy Efficiency Program Area in 2016, including incentive and non-incentive spending, annual and NPV gas savings, as well as TRC and other cost effectiveness test results.

**Table 9-1: 2016 Industrial Energy Efficiency 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 EEC Plan	2016 Actual		2014-2018 EEC Plan	2016 Actual	2014-2018 EEC Plan	2016 Actual	2014-2018 EEC Plan	2016 Actual					
Non Program Specific Expenses														
Total	No Direct Savings			0	0	262	75	262	75	No Direct Savings				
Industrial Optimization Program														
Total	117,575	17,740	150,395	1,545	511	394	356	1,939	867	1.0	n/a	1.5	2.0	0.7
Specialized Industrial Process Technology Program														
Total	50,597	608	7,059	380	18	81	44	461	62	0.8	n/a	1.1	1.0	0.9
ALL PROGRAMS														
Total	168,173	18,349	157,454	1,925	529	737	474	2,662	1,003	1.0	n/a	1.4	1.9	0.7

Notes:

- For the purpose of cost effectiveness tests, 18,349 GJ in savings have been claimed for 2016. As 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 2016 INDUSTRIAL ENERGY EFFICIENCY PROGRAMS

The following tables outline the Industrial Energy Efficiency Program Area activity undertaken in 2016, including program and measure descriptions and a breakdown of non-incentive spending.

**Table 9-2: Industrial Optimization Program**

Program Description	The program 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	2016	Projected	Actual			
	Total	29	14			
Expenditures (\$,000s)	2016	Incentives	Admin	Communication	Research & Evaluation	Total
	Total	511	279	18	59	867

**Notes:**

- The Industrial Optimization Program includes measures that allow industrial customers to identify, investigate, and implement natural gas 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.
- Measures include Industrial Energy Audit, Plant Wide Audit, Feasibility Study, and Technology Implementation. FEI is no longer accepting applications for the Energy Audit measure as this was replaced by the Plant Wide Audit and Feasibility Study measures in 2015. Energy Audit participants that completed energy studies and received incentives in 2016 are reported herein.
- The net natural gas savings reported in 2016 are solely attributable to projects implemented through the Technology Implementation measure. The other measures are aimed only at identifying energy saving opportunities and the participant is not bound to implement energy conservation measures identified in the energy study process.
- In 2016, three energy audits, one plant wide audit and four feasibility studies were completed. Five projects progressed to Technology Implementation measure and are expected to save 75,802 GJ per year 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. In 2016, FEI reviewed and revised the proration methodology adopted in 2013. The revised methodology results in a more accurate reflection of program cost effectiveness by mitigating the risk of not fully reporting a project's incremental cost and more accurately presenting natural gas savings in a given year. The revised approach has been adopted for the 2016 reporting period.



- In the 2012 DSM Annual Report, the cost effectiveness ratios for the project commissioned under the Technology Retrofit Program were calculated using the NPV of the total estimated natural gas savings, the total estimated project cost, but only twenty five percent of the calculated incentive. As such, the incentive paid in 2016 towards this project was necessarily included as an input to the 2016 cost effectiveness ratios, though any energy savings, project costs, and participant count were not, as these had been recorded in full in 2012. Any subsequent incentives paid for this project will be included in future reports, without any corresponding costs, benefits, and participant counts until such time as the full value of the incentive commitment has been accounted for.

**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; 20% pipe insulation; 20% other measures. Source: Specialized Industrial Process Technology Program business case					
Participants	2016 Total	Projected 11	Actual 1			
Expenditures (\$,000s)	2016	Incentives	Admin	Communication	Research & Evaluation	Total
	Total	18	21	16	6	62

**Notes:**

- The Commission approved FEI's detailed plans for the Specialized Industrial Process Technology Program under Order G-11-16 in January 2016.
- FEI launched the hot water process boiler measure in Q2 2016. Applications for this measure are administered through the Commercial Program Area's Space Heating Program for efficiency, however, incentives, non-incentives, participation counts, incremental costs, and natural gas savings are reported under the Specialized Industrial Process Technology Program.
- Incentive structure, natural gas savings methodology, and free ridership rates used for the hot water process boiler measure are sourced from the Commercial Program Area's Space Heating Program.
- Development of the steam trap audit and replacement, steam boiler upgrades, and pipe insulation measures continued in 2016 but were not released to market.

### 9.3 SUMMARY

The Industrial Energy Efficiency Program Area activity in 2016 resulted in 18,349 GJ per year of net natural gas savings and a TRC of 1.0. Enhancements to the Industrial Optimization Program have resulted in increased participation and greater natural gas savings in 2016 relative to 2015. Launching the Specialized Industrial Process Technology Program into market



- 1 is a significant milestone as it represents the first time FEI has been able to support a customer  
2 consuming less than 10,000 GJ per year to implement high efficiency equipment for their  
3 industrial processes. This showcases FEI's commitment to supporting energy efficiency in the  
4 province regardless of sector or size.
- 5 FEI looks forward to continuing its support of industrial sector energy efficiency in British  
6 Columbia in 2017 and expects growth in program participation and implementation of natural  
7 gas energy efficiency projects.

## 10. CONSERVATION EDUCATION AND OUTREACH INITIATIVES

### 10.1 OVERVIEW

The CEO portfolio continues to support the DSM portfolio goals of energy conservation in a variety of ways. In order to foster a culture of conservation, several programs and campaigns were undertaken in 2016, giving the team new information and new insights into behaviour change and customer attitudes on efficiency. Educating all types of customers including residential, commercial and students – remains a strong priority and FEI continues to ensure steps are taken to make the information relevant and timely for these customers.

Collaboration with FBC continued in an effort to maximize efficiencies across both teams. Costs continue to be shared on school, residential and commercial outreach as applicable. The second annual Efficiency in Action awards were held recognizing both electric and gas commercial organizations that have most effectively utilized C&EM programs. FEI's partnership with BC Hydro continued in 2016. This included collaboration on the Energy Wise Network Program for commercial customers (formerly known as the Workplace Conservation Awareness Program) which led to 40 natural gas behavior change projects being submitted by participating commercial customers in 2016. The ethnic outreach program, Empower Me continued to reach new Canadians in 8 languages through a community based social marketing approach. BC Hydro and FEI worked closely together in that development and continued to support the program expansion into new audiences. Empower Me received an honourable mention for its public sector collaboration at the 2016 Community Energy Association Climate & Energy Action Awards.

CEO continued to provide information to customers and the general public on natural gas conservation and energy literacy and sought out new opportunities to reach customers, both face-to-face and online. FEI launched its curriculum-connected online resource program called Energy Leaders for B.C. elementary and secondary school teachers. Currently in the pilot phase, teachers can download bias-balanced lesson plans to assist them with the energy related sections of the curriculum. 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 2016. 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 2016, it should be noted that FEI continues to explore ways to identify and confirm energy savings from CEO activities. In late 2016 through the Clean Energy Research Centre a University of British Columbia student completed a research paper on FEI's behalf to further examine energy savings attributed to the CEO Program Area. The results from this paper will be reviewed and considered in 2017.

Table 10-1 summarizes the projected and actual expenditures for the CEO Program Area in 2016. The approved spending for 2016 was \$2.400 million and actual spending in 2016 was \$2.415 million.

**Table 10-1: 2016 CEO Initiative Results Summary**

Program	Annual Gas Savings		Actual NPV Gas Savings (GJ)	Utility Expenditures (\$000s)						Benefit/Cost Ratios				
	(GJ/yr.)			Incentives		Non-Incentives		All Spending		TRC	MTRC	Utility	Participant	RIM
	2014-2018 EEC Plan	2016 Actual		2014-2018 EEC Plan	2016 Actual	2014-2018 EEC Plan	2016 Actual	2014-2018 EEC Plan	2016 Actual					
Non-Program Specific Expenses														
Total	No Direct Savings			0	0	240	101	240	101			No Direct Savings		
Residential Education Program														
Total	No Direct Savings			0	0	990	1,495	990	1,495			No Direct Savings		
Commercial Education Program														
Total	No Direct Savings			0	0	450	277	450	277			No Direct Savings		
School Education Program														
Total	No Direct Savings			0	0	720	541	720	541			No Direct Savings		
ALL PROGRAMS														
Total	No Direct Savings			0	0	2,400	2,415	2,400	2,415			No Direct Savings		

## 10.2 2016 CEO PROGRAMS

Tables 10-2 through 10-4 outline the CEO initiatives undertaken in 2016. This includes program descriptions as well as a breakdown of spending, all of which is classified as “non-incentive spending”.

**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 directly (either face-to-face or through online programs). This audience also included low income and ethnic customers.</p> <p>Promotional activities in 2016 included print and online communications and engagement campaigns as well as educational seminars and participation in home shows and community events. The Program also included the cost of production of materials for events and prizing for audience engagement that are utilized at events targeting Residential customers and children.</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>Furthermore, FEI continued to focus on behavioural change opportunities that resulted in energy savings.</p>																							
Target Market	Residential customers and general public																							
New vs Retrofit	Both																							
Expenditures (\$,000s)	<table><tr><td></td><td></td><td colspan="3">Non-Incentive Expenditures</td><td></td></tr><tr><td>2016</td><td>Incentives</td><td>Admin</td><td>Communication</td><td>Research &amp; Evaluation</td><td>Total</td></tr><tr><td>Total</td><td>0</td><td>1,036</td><td>460</td><td>0</td><td>1,495</td></tr></table>								Non-Incentive Expenditures				2016	Incentives	Admin	Communication	Research & Evaluation	Total	Total	0	1,036	460	0	1,495
		Non-Incentive Expenditures																						
2016	Incentives	Admin	Communication	Research & Evaluation	Total																			
Total	0	1,036	460	0	1,495																			

**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 2016 included print and online communications, event support of industry trade shows, industry association meetings, award events, and development of tools to assist with education and engagement.</p> <p>In addition, the Companies furthered partnerships with organizations such as the Business Improvement Associations of BC (BIABC) and Climate Smart, who all work with 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, as well as with other utilities, were pursued to achieve cost efficiencies in the budget, in particular on advertising and outreach events.</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>2016</td><td>Incentives</td><td>Admin</td><td>Communication</td><td>Research &amp; Evaluation</td><td>Total</td></tr><tr><td>Total</td><td>0</td><td>134</td><td>143</td><td>0</td><td>277</td></tr></table>								Non-Incentive Expenditures				2016	Incentives	Admin	Communication	Research & Evaluation	Total	Total	0	134	143	0	277
		Non-Incentive Expenditures																						
2016	Incentives	Admin	Communication	Research & Evaluation	Total																			
Total	0	134	143	0	277																			

**Table 10-4: School Education Program**

Program Description	<p>This program responds to section 44.1 (8) (c) of the Utilities Commission Act, R.S.B.C 1996, c.473, s.125.1 (4) (e), where a public utility's plan portfolio is adequate if it includes an education program for students enrolled in [K-12] schools and post-secondary schools in the Company's service area.</p> <p>The program area now has an online resource for teachers directly linking to the K-9 curriculum.</p> <p>Other activities included building partnerships and funding support for a variety of in-class and online programs related to conserving energy for K-12 students, delivered both internally and externally by third parties such as non-profit organizations or local sports teams.</p> <p>Some of the activities included were: Energy is Awesome, Green Bricks, Energy Champion assembly presentations and Beyond Recycling. Some of these activities also included distribution or education of energy-efficient fixtures, colouring books, mood pencils, and educational playing cards as part of the program. Partnerships and funding support for post-secondary activities included in-residence and on-campus education campaigns.</p>																										
Target Market	<p>This program responds to section 44.1 (8) (c) of the Utilities Commission Act, R.S.B.C 1996, c.473, s.125.1 (4) (e), where a public utility's plan portfolio is adequate if it includes an education program for students enrolled in [K-12] schools and post-secondary schools in the Company's service area.</p>																										
New vs Retrofit	Retrofit																										
Expenditures (\$,000s)	<table><tr><td></td><td></td><td></td><td colspan="3">Non-Incentive Expenditures</td><td></td></tr><tr><td>2016</td><td>Incentives</td><td></td><td>Admin</td><td>Communication</td><td>Research &amp; Evaluation</td><td>Total</td></tr><tr><td>Total</td><td>0</td><td></td><td>141</td><td>70</td><td>330</td><td>541</td></tr></table>									Non-Incentive Expenditures				2016	Incentives		Admin	Communication	Research & Evaluation	Total	Total	0		141	70	330	541
			Non-Incentive Expenditures																								
2016	Incentives		Admin	Communication	Research & Evaluation	Total																					
Total	0		141	70	330	541																					

### 10.3 SUMMARY

All of the initiatives described in CEO outreach are designed to foster a culture of energy conservation in B.C. This portfolio is immensely important to the overall C&EM message and helps to keep the program information and energy conservation message top-of-mind with all customers. By changing attitudes and behaviours, the Company will help communities reach their goals, help customers save energy and money, increase participation in DSM programs and ultimately support the shared goals of FEI and the Provincial Government. This portfolio will continue to explore new ways and seek out new opportunities and channels to connect with customers and grow the culture of energy conservation.

## 11. ENABLING ACTIVITIES

### 11.1 OVERVIEW

In 2016, 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 on the Company's DSM program tracking system;
- work on a new Conservation Potential Review; and
- continued funding to support post-secondary energy management programs.

While these activities play a very important role in FEI's portfolio of DSM activities by advancing the delivery of all program areas, the Company has not claimed any energy savings in 2016 for work completed in this area.

FEI has developed an acceptable method for measuring and attributing energy efficiency savings from Codes and Standards work for the 2014 Residential New Home program (see Table 5-8, page 32 of the 2014 Annual Report). FEI used the same method to examine potential for attributing efficiency standards advancement in the Residential Fireplace Program (See Notes to Table 5-4) and will continue to examine and, where appropriate, claim energy savings from Codes and Standards advancement.

Table 11-1 summarizes the projected and actual expenditures for the Enabling Activities in 2016.

**Table 11-1: 2016 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 EEC Plan	2016 Actual		2014-2018 EEC Plan	2016 Actual	2014-2018 EEC Plan	2016 Actual	2014-2018 EEC Plan	2016 Actual					
Trade Ally Network														
Total	No Direct Savings			n/a	n/a	500	723	500	723			No Direct Savings		
Codes and Standards														
Total	No Direct Savings			n/a	n/a	35	96	35	96			No Direct Savings		
TrakSmart Maintenance														
Total	No Direct Savings			n/a	n/a	80	111	80	111			No Direct Savings		
Conservation Potential Review														
Total	No Direct Savings			n/a	n/a	n/a	345	n/a	345			No Direct Savings		
Energy Management Education Funding														
Total	No Direct Savings			n/a	n/a	150	102	150	102			No Direct Savings		
ALL PROGRAMS														
Total	No Direct Savings			n/a	n/a	765	1,378	765	1,378			No Direct Savings		

Note:

- The 2014-2018 DSM Plan had budgeted a one-time cost of \$500,000 for the CPR and anticipated that this would take place in the year 2015. The CPR was started in 2015 but the majority of the expenditures for the project were incurred in 2016.

## 11.2 2016 ENABLING ACTIVITIES BY PROGRAM

The following tables outline the specific Enabling Activities undertaken in 2016 by activity, including activity descriptions along with a breakdown of spending. Note that all spending under Enabling Activities is considered non-incentive spending.

**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)	2016	Admin	Communication	Research & Evaluation	Total
	Total	263	461	0	723

**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 the Home Owner Protection Office (HPO) for the development of industry training and guidelines on implementation of new energy efficiency measures. Participation with the BC Safety Authority Gas Technology Committee industry stakeholder group.				
Involvement with supporting projects	Active participation for supporting projects like: the Natural Resources Canada new EnerGuide rating system and 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 the Canadian Gas Association (CGA), 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.				
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. Participation in the Standards Council of Canada, committee on Domestic gas cooking appliances ISO/TC 291.				
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 standards for reference.				
Expenditures (\$,000s)	2016	Admin	Communication	Research & Evaluation	Total
	Total	95	1	0	96



**Table 11-4: TrakSmart Maintenance**

Program Description	Ongoing IT license and maintenance costs related to the portfolio DSM tracking system.				
Expenditures (\$,000s)	2016	Admin	Communication	Research & Evaluation	Total
	Total	111	0	0	111

**Table 11-5: Conservation Potential Review**

Program Description	FEI considers the CPR to be an important tool for use in developing, supporting, and assessing current and future DSM expenditure applications, as well as for directional input into program development. The purpose of a CPR study is to examine available technologies and determine their conservation potential, which includes the amount of energy savings that can be achieved through energy-efficiency and conservation programs over the study period. This project is being worked on in collaboration with BC Hydro, Pacific Northern Gas and FortisBC Electric. Core work on the CPR began in 2015. As of end-2016 the CPR project was close to being completed.				
Expenditures (\$,000s)	2016	Admin	Communication	Research & Evaluation	Total
	Total	345	0	0	345

**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)	2016	Admin	Communication	Research & Evaluation	Total
	Total	102	0	0	102

## 11.3 2016 ENABLING ACTIVITIES PLANNED BUT NOT LAUNCHED

### 11.3.1 Home Energy Efficiency Web Portal

Funds allocated to the Home Energy Efficiency Web Portal were not accessed in 2016 as the main focus of the Home Renovation Rebate Program (formerly known as Home Energy Rebate Offer) was customer experience, contractor engagement, and municipal home energy coaching

1 pilots. In 2017, utility partners will continue to assess options for online resources and tools to  
2 support enhanced customer, contractor and administrative services.

### 3 **11.3.2 Residential End Use Study (REUS)**

4 The REUS provides a snapshot of the FEI Residential customer base. It provides information  
5 about the building characteristics, the fuel choice for heating, cooling and cooking, the types and  
6 ages of appliances installed, energy-use behaviours, and customer attitudes towards energy  
7 issues. The REUS also includes a billing analysis to determine natural gas consumption by  
8 appliance type. This study is shared with other FEI departments. Initial scoping for the study  
9 was started in 2016 but no expenditures will be incurred until 2017.

## 10 **11.4 SUMMARY**

11 Enabling Activities are critical initiatives that support and supplement DSM program  
12 development and delivery. The success of the Residential Furnace and Boiler Replacement  
13 Program (see Section 5.3, Table 5-3), which was promoted through the contractor network,  
14 demonstrates the value of the Trade Ally Network program. Communications were immediate  
15 and responsive through the network and at the end of the program, 71 per cent of the program's  
16 participants used contractors who were members of the Trade Ally Network.

17 FEI's involvement in codes and standards work in 2016 continued to encompass varying  
18 degrees of activities including monitoring, reviewing and responding to existing and proposed  
19 regulatory changes and direct participation in various working groups that explore the  
20 development of future targets, codes and standards. Work also continued on the Conservation  
21 Potential Review study which is a collaboration between BC Hydro, Pacific Northern Gas and  
22 both FEI and FBC. The Technical and Economic Potential portions of the Conservation  
23 Potential Review project were nearing conclusion.

## 12. EVALUATION

FEI continued to advance their evaluation activities in 2016 by conducting evaluation studies<sup>16</sup> on a program by program basis. In alignment with the Company's Evaluation Measurement & Verification (EM&V) Framework and industry standard practice, program evaluation activities are assessed at different stages of each program's lifecycle. Based on this ongoing assessment, all programs are evaluated when appropriate. The 2016 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. The evaluation activities conducted in 2016 are in accordance with the evaluation principles presented in the Company's EM&V Framework.

### 12.1 2016 PROGRAM EVALUATION AND EVALUATION RESEARCH ACTIVITIES

In 2016, 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 FEI DSM outreach activities, and conducting industry research. Measurement and Verification (M&V) activities were 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 presents an inventory of all program evaluation and evaluation research related activities undertaken in 2016. Expenditures for these activities have been accounted for within the applicable program or Program Area as part of the non-incentive costs, but 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 2016 evaluation activities; the Program Area each activity occurred in; the general type of evaluation activity undertaken; the Company's actual 2016 evaluation expenditures; and, a status update on each activity. The total expenditure for program evaluation and research activities in 2016 is \$518,000 which is an increase from 2015.

<sup>16</sup> Types of evaluation activities include: Communications evaluations, which focus on advertising and media outreach; Evaluation studies, where quality assurance or inspection is conducted to gain more insight on the incented measure; 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 2016<sup>17</sup>**

Evaluation Name	Program Area	Type of Evaluation	Years the program has been running <sup>18</sup>	Evaluation Partnership	Actual Evaluation Expenditure (000's)	Evaluation Status <sup>19</sup>
FortisBC Communications Tracking: Energy Efficiency and Conservation	C&EM Portfolio	Communication	ongoing	none	\$13	Customer engagement and awareness of C&EM activities. <b>Completed November 2016 by TNS</b>
C&EM Rebates UX Testing - Phase I and II	C&EM Portfolio	Communication	ongoing	none	\$2	Usability testing of the rebates section of FortisBC.com website. <b>Completed July and December 2016 by Participant Research</b>
Home Energy Rebate Offer (HERO) - Participant Survey	Residential	Process	2	FortisBC Inc. and BC Hydro	-\$2	Customer survey conducted for the program evaluation. Partnership funding received in 2016 which resulted in a negative expenditure for 2016. <b>Completed April 2016 by Sentis Research</b>
Home Energy Rebate Offer (HERO) - Quality Study of Insulation	Residential	Evaluation Study	2	FortisBC Inc. and BC Hydro	\$15	On-site visit of homes with insulation and draft proofing measures <b>Completed May 2016 by RDH Building Science Inc.</b>
Home Energy Rebate Offer (HERO) - Quantitative Analysis	Residential	Evaluation Study	2	FortisBC Inc. and BC Hydro	\$6	HERO participant analysis to determine inputs for cost effectiveness tests and feedback on 2016 program design.
Home Energy Rebate Offer (HERO) - Insulation Home Visit	Residential	Evaluation Study	2	FortisBC Inc.	\$9	On-site visit of homes with insulation and draft proofing measures. <b>Expected completion by Q2 2017.</b>
BC Fenestration Market Study	Residential	Market Analysis	2	FortisBC Inc., FortisBC Energy Inc., BC Hydro and MEM	\$10	Study to characterize market conditions for fenestration products manufactured, sold, and/or installed in British Columbia . <b>Completed October 2016 by RDH Building Science Inc.</b>
Evaluation & Contractor Outreach	Residential	Evaluation Study	ongoing	none	\$9	Ongoing studies and workshops to gather contractor feedback and awareness.
Rental Apartment Efficiency Program (RAP)	Residential / Commercial	Evaluation Study	1	none	\$3	Ongoing performance testing for RAP participants.
Rental Apartment Efficiency Program (RAP)	Residential / Commercial	Process	1	none	\$11	Building owner and Tenant survey for program evaluation. <b>Completed December 2016 by Cohesium Research</b>
Energy Conservation Assistance Program (ECAP)	Low Income	Evaluation Study	5	BC Hydro	\$82	Ongoing Quality Assurance to ensure all products are installed according to program installation policies and procedures.

2

3

<sup>17</sup> Table 12.1 does not include Prefeasibility Studies. Please refer to the Innovative Technologies section (Section 8) for details.

<sup>18</sup> 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](http://www.evo-world.org). January 2012.

<sup>19</sup> M&V completion refers to the time period where the actual monitoring and data collection ends. Analysis and reporting will require additional time

1

**Table 12-1: Inventory of DSM Program Evaluation and Evaluation Research Activities Conducted in 2016<sup>17</sup> (continued)**

Evaluation Name	Program Area	Type of Evaluation	Years the program has been running <sup>18</sup>	Evaluation Partnership	Actual Evaluation Expenditure (000's)	Evaluation Status <sup>19</sup>
Energy Specialist Program Energy Savings Audit (Update for 2016)	Commercial	Impact	7	none	\$25	The study is an update to the Energy Savings Audit to verify energy savings for projects completed in 2015. <b>Completed May 2016 by Prism Engineering. Preliminary results reported in 2015 Annual Report.</b>
EnerTracker Pilot Program - Impact Evaluation	Commercial	Impact	4	none	\$5	Billing analysis of the program participants' energy usage. <b>Completed April 2016 by Prism Engineering</b>
Commercial Water Heating Program	Commercial	Process/Impact	6	none	\$52	Customer survey and billing analysis conducted for program evaluation. <b>Completed October 2016 by Prism Engineering</b>
Commercial Food Service Incentive Program	Commercial	Process & Impact	5	none	\$10	Participant Survey and billing analysis conducted for program evaluation. <b>Expected completion by Q3 2017</b>
Apartment Fireplace Efficiency Pilot (AFER)	Innovative Technologies	Measurement & Verification	2	none	\$119	High efficiency gas fireplace M&V study. <b>Completed M&amp;V October 2016 by Building Energy Solutions Ltd</b>
Combination Space/Water Heating Units Pilot	Innovative Technologies	Process Evaluation	2	none	\$11	Results from the completed participant survey will be incorporated in the 2017 billing analysis summary report. <b>Expected completion by Q3 2017</b>
Combination Space/Water Heating Units Pilot	Innovative Technologies	Measurement & Verification	2	none	\$71	Boiler testing to assess the DHW energy factor. <b>Completed M&amp;V July 2016 by Natural Gas Technologies Centre (NGTC)</b>
Heat Reflector Pilot (HRP)	Innovative Technologies	Evaluation Study & Measurement & Verification	1	none	\$6	Thermal Imaging completed through RDH in 2016. <b>Expected completion of Final Report by Q1 2018</b>
Industrial Optimization Program	Industrial	Measurement & Verification	5	none	\$59	M&V was conducted on 15 projects in 2016 of which one 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.

2

- 1 Table 12-2 contains a summary of all program evaluation studies and pilot program reports completed in 2016 and includes a brief  
 2 description of the methodologies and key findings.

3 **Table 12-2: Summary of Key Findings and Methodology for 2016 Completed DSM Program Evaluation Studies and Pilot Program**  
 4 **Reports**

	Program Area	Type of Evaluation	Methodology	Outcome from Key Findings
FortisBC Communications Tracking: Energy Efficiency and Conservation	C&EM Portfolio	Communication	Online interviews conducted over three waves with 2,400 (800 per wave) British Columbia adults living within the FortisBC service territory.	<p><b>Results:</b> The percentage of participants had aided awareness of at least one of the three main energy efficiency activities undertaken by FortisBC trended upward from 64% in 2015 to an average over the 3 waves of 66% in 2016.</p> <p>Overall, half of the participants surveyed were classified as being at least somewhat engaged with energy efficiency.</p> <p><b>Outcome of Key Findings:</b> Continue to emphasize the overarching energy efficiency activities rather than individual programs to build awareness.</p>
C&EM Rebates UX Testing - Phase I and II	C&EM Portfolio	Communication	One-on-one user testing sessions	<p><b>Results:</b> Improvements identified in both Phase I and II for the rebates web page.</p> <p><b>Outcome of Key Findings:</b> As a result of the study, improvements were made to the rebates section of corporate website.</p>
Home Energy Rebate Offer (HERO) - Participant Survey	Residential	Process	Online survey completed for 435 program participants between March 3 to March 18, 2016.	<p><b>Results:</b> 87% of participants were satisfied with the overall program and 94% were satisfied with the home upgrades.</p> <p>The factor most likely to have motivated participants to sign up for the program is reduced energy bills, with 78% of participants indicating that 'saving money on energy bills' is their main reason for undertaking the home upgrades.</p> <p><b>Outcome of Key Findings:</b> Feedback from customers was taken into account as new program offer, application form and messaging was introduced September 1.</p>

**Table 12-2: Summary of Key Findings and Methodology for 2016 Completed DSM Program Evaluation Studies and Pilot Program Reports (continued)**

	Program Area	Type of Evaluation	Methodology	Outcome from Key Findings
Home Energy Rebate Offer (HERO) - Quality Study of Insulation	Residential	Evaluation Study	Site visits for 42 houses with HERO improvements were completed in February and March of 2016 to identify compliant installation practices in the installed upgrades.	<p><b>Results:</b> The results of the site visits revealed good installation practices such as including insulation baffles for soffit vents, insulating and air-sealing attic hatches in many houses, and two-thirds of installs providing sufficient insulation in a uniform and consistent manner, aligned with the rebate applications.</p> <p><b>Outcome of Key Findings:</b> The study suggested that overall insulation and air sealing met minimum standards although variability across contractors suggested that there was need for contractor education about best practices. Also noted some non-compliance that was further addressed through contractor education and face to face meetings.</p>
BC Fenestration Market Study	Residential	Market Analysis	Market surveys (interviews) were conducted with industry entities, including fenestration manufacturers and their suppliers, and builders. Analysis and review of public data sources and literature, and government and utility data from related programs.	<p><b>Results:</b> The report summarizes three key findings pertaining to three research questions.</p> <p>1) U-value ranges for new and replacement windows. -New construction and replacement (U-values that comply with or exceed the USI-1.80 BCBC.</p> <p>2) Expected energy savings if U-values are lowered below current regulated levels. - Natural gas heated home in Vancouver can range from 2.0GJ for USI-1.8 windows to 9.8 GJ for USI-1.0 windows</p> <p>3) Market readiness for manufactures with the introduction of higher-performance, lower U-value products requires a shift away from double-pane windows frames.</p> <p><b>Outcome of Key Findings:</b> Update on current market conditions to inform policy and program development.</p>
Rental Apartment Efficiency Program (RAP)	Residential / Commercial	Process	Two separate surveys were conducted; a building owners survey and tenant survey. A telephone survey was completed for 56 owners/managers and 2 onsite contractors and an online survey was completed for 193 tenants.	<p><b>Results:</b> 91% of the building owners and 71% of the tenants surveyed were "very" or "somewhat satisfied" with the overall program. Assessment of the program communications were positive, with approximately 9 in 10 owners/managers "very" or "somewhat satisfied" with the accessibility of the program information, the ease of understanding the information and knowing how/who to contact regarding the program.</p> <p><b>Outcome of Key Findings:</b> Continue to conduct ongoing tenant and building owner surveys to provide feedback to program design.</p>

**Table 12-2: Summary of Key Findings and Methodology for 2016 Completed DSM Program Evaluation Studies and Pilot Program Reports (continued)**

	Program Area	Type of Evaluation	Methodology	Outcome from Key Findings
EnerTracker Pilot Program - Impact Evaluation	Commercial	Impact	The evaluation was carried out for 145 sites which had a minimum of 12 months post implementation data available. In addition to analyzing the consumption data, interviews with program participants were conducted to gain a better understanding of site specific behaviors and to determine if gas savings actions were triggered as a result of utilizing the EnerTracker sponsored EMIS software.	<p><b>Results:</b> The evaluation revealed that although some participants utilized the EMIS tool consistently, a significant portion of participants (25%) had not logged into the provided software since starting the program. Moreover, program participants who actively used the provided EMIS tool were found to have reduced natural gas consumption by no more than those participants who did not use the provided EMIS or indeed any energy management software.</p> <p><b>Outcome of Key Findings:</b> Net-to-Gross values were updated for 2016 and the pilot program period ended in 2016.</p>
Commercial Water Heating Program	Commercial	Process/Impact	Online survey for 115 program participants was conducted between May 2 to May 16. 240 participant sites were included in the energy savings analysis which included 12 months post consumption usage.	<p><b>Results:</b> 84% of participants were satisfied with the program and 73% were satisfied with the equipment selection. 23% of participants were not satisfied with the process of completing the application forms or with the program requirements. The overall program average savings is 0.23 GJ/yr/MBH for On-Demand, Boilers and Storage heater types.</p> <p><b>Outcome of Key Finding:</b> Net-to-Gross values updated for 2016 program. Deemed savings for water heaters will be developed in 2018 based in large part on the findings of the Evaluation Study.</p>
Apartment Fireplace Efficiency Pilot (AFER)	Innovative Technologies	Measurement & Verification	<p><b>M&amp;V Plan:</b> Complies with the International Performance Measurement &amp; Verification Protocol. The selected IPMVP option and measurement boundary was Option A<sup>20</sup></p> <p><b>M&amp;V:</b> M&amp;V was conducted on 4 Multi Unit Residential Buildings in the Lower Mainland area representing 27 participants across the four sites. Baseline data was collected and measured for 3 months (Jan to Mar) and 2 months post retrofit of the direct-vent fireplace.</p>	<p><b>Results:</b> The M&amp;V results indicated an overall change in energy use across all Baseline fireplace types over a normalized Winter Heating Season; average natural gas consumption reduction per hour of runtime of 49 - 52% where high BTU/h units were replaced and a reduction of 25 - 27% where low BTU/h units were replaced.</p> <p><b>Outcome of Key Findings:</b> Results presented to the Residential Program Team. Data to be used to inform program decisions.</p>

<sup>20</sup> IPMVP Option A - Measurement of key parameters governing energy use to assess consumption. [www.evo-world.org](http://www.evo-world.org)



**Table 12-2: Summary of Key Findings and Methodology for 2016 Completed DSM Program Evaluation Studies and Pilot Program Reports (continued)**

	Program Area	Type of Evaluation	Methodology	Outcome from Key Findings
Combination Space/Water Heating Units Pilot	Innovative Technologies	Measurement & Verification	Three models of combi-boilers (CB) and three models of boilers with indirect tanks (IT) were tested to determine the DHW energy factor (EF). The energy factor testing used was the CAN/CSA P.7 testing method which targets residential instantaneous natural gas water heaters .	<p><b>Results:</b> The test results indicated in general, the energy factors for combi-boilers were roughly equal to the recovery efficiency of the corresponding boiler. Average EF varied between 0.80 and 0.84 depending on the model. For the indirect tanks, the energy factors were much lower than the recovery efficiencies. Average EF varied between 0.63 and 0.67.</p> <p><b>Outcome of Key Findings:</b> Continue to gather information from participant survey and energy savings analysis.</p>
Industrial Optimization Program	Industrial	Measurement & Verification	<p><b>M&amp;V Plan:</b> Complies with the International Performance Measurement &amp; Verification Protocol. The selected IPMVP option and measurement boundary was Option B<sup>21</sup></p> <p><b>M&amp;V:</b> M&amp;V was conducted on (Project reference ITRP003) for a lime kiln upgrade project in a pulp and paper mill.</p>	<p><b>Results:</b> Three year M&amp;V completed with a total verified natural gas savings of 132,000 GJ. The mill reduced their natural gas consumption by 132,000 GJ by upgrading a key mechanical component of their lime kiln. The achieved savings were well above the minimum savings to achieve cost effectiveness of the project and provided the plant valuable feedback on the performance of the energy efficiency upgrade.</p> <p><b>Outcome of Key Findings:</b> M&amp;V project completed with the full incentive payment issued to the participant as the natural gas savings exceeded pre-installation estimates.</p>

## 12.2 EVALUATION COLLABORATION

FEI has continued to seek opportunities to increase collaborative activities with FBC, BC Hydro, and other entities to conduct program evaluation for DSM programs. The number of collaborative activities depends on the timing of the activity, program participants, legal and privacy concerns, and available budget to conduct the study. Tables 12-1 and 12-2 provide information on program evaluation activities conducted in partnership with other organizations. One jointly funded evaluation project was initiated in 2016 as a result of the collaboration efforts between FEI, BC Hydro and the BC Ministry of Energy and Mines; Home Energy Rebate Offer (HERO) – Fenestration Market Study. In addition, BC Hydro and FEI continue to collaborate in the evaluation projects for HERO – Participant Survey, HERO – Quality Study of Insulation, and the Energy Conservation Assistance Program (ECAP).

Collaboration efforts on evaluation have been further enhanced by the MOU on collaboration discussed in Section 2.5. The BC Utilities evaluation staff held update meetings to review the evaluation plans and discuss future evaluation activities. Evaluation staff from the BC Utilities 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 demonstrates that FEI has business practices in place to ensure DSM activities and associated spending are in compliance with Commission Orders and the Company's internal control processes. In its 2009 Decision<sup>21</sup>, the Commission directed the Company to include a discussion in the DSM Annual Report of the Company's internal data gathering, monitoring and reporting control practices. FEI continues to provide this information.

### 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 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 increases 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 consultants<sup>22</sup> 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 British Columbia 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.

In addition to the internal business case process, the Commission, in its 2014-2018 PBR Application Decision, directed FEI to submit a written request and business plan for any new

<sup>21</sup> BCUC Order G-36-09 dated April 16, 2009

<sup>22</sup> Willis Energy Services Ltd. and The Cadmus Group Inc. provided input into this in-house cost-benefit modelling.

programs they want to implement that have not previously been identified within the approved DSM Plan. Such requests must demonstrate the new program results in a net improvement to the Portfolio effectiveness or is needed to ensure balanced access to DSM programming among different customer groups. Four such business cases were submitted to, reviewed and accepted by the BCUC in 2016. Three of these were in the Low Income Programs: Space Heat Top up, Water Heating Top Up and the Non-Profit Custom Program. Each of these programs is described in Section 6.2. The fourth business case was for the Specialized Industrial Process Technology Program described in Section 9.2.

### **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 application and supporting documents are filed and stored for seven years in case of an audit.

### **13.5 INTERNAL AUDIT SERVICES**

FEI regularly engages the Company's own Internal Audit Services (IAS) group to review the internal controls associated with DSM activities. The IAS utilizes the most recently completed year of operation on which to conduct their audit (in this case, the 2017 Audit will cover the 2016 DSM operations consistent with past reports). At the time of writing this report, the 2017 Audit of 2016 activity has been initiated but not yet completed. FEI will therefore make the results available in the next annual report or upon request from the Commission, once complete.

### **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.

## 14. 2016 DSM PROGRAMS ANNUAL REPORT SUMMARY

In 2016, FEI's DSM portfolio expenditures reached 90 percent of Plan with 65 percent of actual DSM program spending going toward customer incentives. With almost 438,000 GJ of annual savings, DSM programming continued to contribute valuable options for customers to reduce their energy use. FEI cost effectively delivered these programs within the spending limits approved by the Commission, and in accordance with the B.C. DSM Regulation. FEI works to ensure DSM programs are operating in compliance with the Company's DSM Guiding Principles and are meeting Provincial requirements for adequacy. FEI also continues to implement good internal data gathering, monitoring and reporting control practices.