



FOR GENERATIONS

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August 14, 2015

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

Dear Ms. Hamilton:

**RE: British Columbia Utilities Commission (BCUC or Commission)  
British Columbia Hydro and Power Authority (BC Hydro)  
Smart Metering & Infrastructure (SMI) Program -  
Quarterly Update Report No. 21 – April to June 2015 (Report)**

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BC Hydro writes in compliance with Commission Order No. G-67-10, to provide its Report.

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

Yours sincerely,

Original signed

Tom Loski  
Chief Regulatory Officer

st/rh

Enclosure

Copy to: BCUC Project No. 3698622 (Fiscal 2012 to Fiscal 2014 Revenue Requirements Application) Registered Intervener Distribution List.

**Smart Metering & Infrastructure Program**

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**Quarterly Update Report No. 21**

**F2016 First Quarter**

**April 2015 to June 2015**

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## 1 Introduction

This Smart Metering & Infrastructure (**SMI**) Quarterly Report No. 21 covers the First Quarter of Fiscal 2016 (**F2016 Q1**), the period from April 1, 2015 to June 30, 2015 and is submitted in accordance with Directive 6 of Commission Order No. G-67-10. Program expenditures are categorized as identified in Directive 4 of Commission Order No. G-67-10. As set out in BC Hydro's letter to the Commission dated March 18, 2011 regarding SMI Quarterly Report No. 3, [Table 5](#) and [Table 8](#) include estimated total SMI Program expenditures at the completion of the program. In accordance with Directive 5 of Commission Order No. G-115-11, a description and value of contracts and commitments related to the SMI Program undertaken during F2016 Q1 is provided in [Appendix A](#). This report also identifies the number of smart meters in the field and the number of remaining smart meter installs, both as of June 30, 2015. Additional tables which identify total program expenditures to date are also included. This report also identifies the level of participation in the Meter Choices Program as of June 30, 2015. Finally, and pursuant to BC Hydro's letter to the Commission dated March 18, 2011, this report identifies SMI Program benefits achieved during F2015.

BC Hydro's activities with respect to the SMI Program in F2009 and F2010 focused on foundational program elements, such as meter system technologies and information technology requirements. In F2011, BC Hydro's SMI Program activities focused on the design, issuance and completion of procurement processes for four primary work packages, and the award of major contracts that were on the critical path for the deployment of metering infrastructure for the SMI Program. SMI Program procurement activities continued in F2012, and focused on the development of the theft detection solution components including Distribution System Metering Devices (**DSMD**), and the Energy Analytics Solution (**EAS**) theft analytics software. BC Hydro's SMI Program activities in F2013 included the completion of mass deployment of smart meters, the continued installation of

telecommunications infrastructure and implementation of related information systems, procurement processes related to DSMD and the EAS, and the field testing and deployment of DSMD. In F2014, program activities focused on the procurement of DSMD, the development of the EAS, telecommunications network optimization, implementation of the Meter Choices Program, and the installation of smart meters that were not included as part of the mass deployment. In F2015 SMI Program activities focused on completing the network optimization and the installation of telecommunications infrastructure, migrating the meters and the network to a more advanced networking protocol (**IPv6**), expanding on the EAS capabilities, and implementation of the DSMD (transformer and feeder meters) and their associated applications.

In F2016 SMI Program activities are focusing on completing the network optimization and the installation of telecommunications infrastructure, migrating the meters and the network to IPv6, introducing Energy Balancing capabilities across distribution feeders supported by Supervisory Control and Data Acquisition (**SCADA**) devices and Check Meters (distribution equipment) and their associated applications.

## **2 Meter Choices Program**

On July 18, 2013, the Minister of Energy and Mines announced that in response to public concerns, BC Hydro would offer new options for customers who delayed their smart meter installation. On September 25, 2013, the Government of British Columbia issued Direction No. 4 providing direction to the Commission with respect to implementing Government policy. On October 7, 2013 BC Hydro filed its Application for approval of charges related to the Meter Choices Program, offering eligible customers an installation of a standard smart meter at no cost, or an installation of a radio-off meter, or the existing legacy meter at the premises for a fee approved by the Commission. On April 25, 2014, the Commission issued

Order No. G-59-14 and set the charges related to the Meter Choices Program on a permanent basis.

On July 31, 2014, in accordance with the updated tariff approved by the Commission on July 22, 2014, BC Hydro applied the “missed read credit adjustment” including interest to the accounts of Meter Choices Program customers that had estimated scheduled readings from the start of the Meter Choices Program to July 30, 2014.

The composition of Meter Choices Program participants as of June 30, 2015 is identified in [Table 1](#).

**Table 1 Meter Choices Program Participation Breakdown – As of June 30, 2015**

Option	Number of Accounts
Legacy Meter	13,684
Selected Radio-off	559
<b>Total</b>	<b>14,243</b>

All BC Hydro electricity meters are required to have a valid Measurement Canada accuracy seal. In 2014, BC Hydro was required, under Measurement Canada Regulations, to exchange 10,700 Meter Choices customers’ legacy meters because the accuracy seal had expired. These meters must be replaced by a meter with a valid Measurement Canada seal. BC Hydro sent letters to customers explaining why the BC Hydro legacy meter at their premises was being replaced with another legacy meter. Of these customers, approximately 2,600 refused to permit BC Hydro to exchange the time expired meter at their premises.

BC Hydro is continuing to work with these customers and as of June 30, 2015, of the approximately 2,600 customers who refused access, 815 customers have had their meter replaced. Out of the remaining 1,785 customers, 820 have consented to replacement of the legacy meter with another legacy meter, and 965 customers still require a resolution.

In late March 2015, an additional 1,320 letters were sent to customers informing them that the Measurement Canada accuracy seal on the legacy meters at their premises would expire in 2015 and require meter exchange. Of these, 165 customers were informed that because the stock of legacy meters for their service type has been exhausted, a radio-off smart meter will need to be installed. As of June 30, 2015, work orders were raised for the 1,320 customers to whom letters were sent. Of these, 153 customers have had the meter on their premises exchanged, 165 work orders have been issued to replace legacy meters with radio off meters, and 1,002 legacy meters still require meter exchange.

The Measurement Canada accuracy seals of all legacy meters remaining in service will expire in subsequent years through 2022, at which point all legacy meters will have expired seals and require replacement by a radio-off smart meter.

### **3 Project Status**

During F2016 Q1, BC Hydro took the following steps to advance and implement the SMI Program:

- Continued deployment of customer meters and telecom equipment;
- Continued transition of customers to automated billing;
- Continued telecom network optimization;
- Continued work related to the Meter Choices Program including exchanges of legacy meters with expired seals;
- Continued development of the meter configuration management tool;
- Continued implementation of IPv6 network protocol;
- Continued development of the EAS including build out of Data Lake (data storage and processing) infrastructure;

- Continued integration activities of SCADA capable devices and check-meters; and
- Continued development of Disaster Recovery Capability.

## 4 Project Schedule

[Table 2](#) shows the status of the major activities in F2016 Q1 as reported in F2015 Q4 Quarterly Report No. 20.

**Table 2 Project Schedule F2016 Q1**

Date	Activity	
April 2015	In Field/Over the Air Meter Mitigation – Network Stability	Ongoing
	Continue Network Stabilization and Optimization	Ongoing
	Operational Insights Requirements and Design	Started
	Meter Choices Program: Install Radio Off & Smart Meters	Ongoing
	SCADA Recloser Reconfiguration	Ongoing
	SCADA Information Technology Modifications	Ongoing
	Validate SCADA Data Measures (Relays)	Started
	Planning SCADA Infrastructure and Reclosers Field Upgrades	Started
	Design and Build Check Meter Information Technology Systems	Ongoing
	Check Meter Device Testing	Ongoing
	Build EAS 2b (SCADA and Check Meters)	Started
	Data Lake Build and Testing Automated Data Collection System (ADCS)	Ongoing
	Data Lake Build and Testing Meter Data Management System (MDMS)	Ongoing
	Data Lake Build and Testing SCADA and Check Meters	Started
	Disaster Recovery Capability Failover Design	Ongoing
Advanced Telecom: WiMAX	Ongoing	
May 2015	In Field/Over the Air Meter Mitigation – Network Stability	Ongoing
	Continue Network Stabilization and Optimization	Ongoing
	Operational Insights Requirements and Design	Ongoing
	Meter Choices Program: Install Radio Off & Smart Meters	Ongoing
	SCADA Recloser Reconfiguration	Ongoing
	SCADA Information Technology Modifications	Ongoing
	Validate SCADA Data Measures (Relays)	Complete



Date	Activity	
	SCADA Infrastructure and Reclosers Field Upgrades	Ongoing
	Design and Build Check Meter Information Technology Systems	Ongoing
	Check Meter Device Testing	Ongoing
	Build EAS 2b (SCADA and Check Meters)	Complete
	Data Lake Build and Testing ADCS	Complete
	Data Lake Build and Testing MDMS	Ongoing
	Data Lake Build and Testing SCADA and Check Meters	Ongoing
	Disaster Recovery Capability Failover Design	Ongoing
	Advanced Telecom: WiMAX	Ongoing
June 2015	In Field/Over the Air Meter Mitigation – Network Stability	Ongoing
	Continue Network Stabilization and Optimization	Ongoing
	Operational Insights Requirements and Design	Ongoing
	Meter Choices Program: Install Radio Off & Smart Meters	Ongoing
	SCADA Recloser Reconfiguration	Ongoing
	SCADA Information Technology Modifications	Complete
	SCADA Infrastructure and Reclosers Field Upgrades	Ongoing
	Design and Build Check Meter Information Technology Systems	Ongoing
	Check Meter Device Testing	Ongoing
	Test EAS 2b (SCADA and Check Meters)	Started
	Data Lake Build and Testing SCADA and Check Meters	Ongoing
	Disaster Recovery Capability Failover Design	Ongoing
	Advanced Telecom: WiMAX	Ongoing

[Table 3](#) shows the major activities included in the project schedule for the second quarter of F2016.

**Table 3 Project Schedule F2016 Q2**

Date	Activity
July 2015	In Field/Over the Air Meter Mitigation – Network Stability
	Continue Network Stabilization and Optimization
	Upgrade of ADCS, MDMS and Network Management System ( <b>NMS</b> ) to new software versions
	Operational Insights Requirements and Design
	Meter Choices Program: Install Radio Off & Smart Meters
	SCADA Recloser Reconfiguration
	SCADA Infrastructure and Reclosers Field Upgrades
	SCADA Relay Resolution Reconfiguration

Date	Activity
	Design Check Meter Information Technology Systems
	Build Check Meter Information Technology Systems
	Check Meter Device Testing
	Test EAS 2b (SCADA and Check Meters)
	Data Lake Build and Testing SCADA, Check Meters and MDMS
	Disaster Recovery Capability Network Failover Design
	Advanced Telecom: WiMAX
August 2015	In Field/Over the Air Meter Mitigation – Network Stability
	Continue Network Stabilization and Optimization
	Upgrade of ADCS, MDMS and NMS to new software versions
	Operational Insights Build
	Meter Choices Program: Install Radio Off & Smart Meters
	SCADA Recloser Reconfiguration
	SCADA Infrastructure and Reclosers Field Upgrades
	SCADA Relay Resolution Reconfiguration
	Build Check Meter Information Technology Systems
	Test Check Meter Information Technology Systems
	Check Meter Device Testing
	Test EAS 2b (SCADA and Check Meters)
	Data Lake Deployment
	Disaster Recovery Capability Failover Network Testing
	Advanced Telecom: WiMAX
September 2015	In Field/Over the Air Meter Mitigation – Network Stability
	Continue Network Stabilization and Optimization
	Upgrade of ADCS, MDMS and NMS to new software versions
	Operational Insights Build
	Meter Choices Program: Install Radio Off & Smart Meters
	SCADA Recloser Reconfiguration
	SCADA Infrastructure and Reclosers Field Upgrades
	SCADA Relay Resolution Reconfiguration
	Test Check Meter Information Technology Systems
	Deploy Check Meter Information Technology Systems
	Check Meter Device Testing and Soft Deployment
	EAS 2b (SCADA and Check Meters) deployment
	Disaster Recovery Capability Failover Network Testing
	Advanced Telecom: WiMAX

Meter deployment continued throughout F2016 Q1, increasing the total number of smart meters installed by 6,751 during the quarter, none of which were installed by Corix, as shown in [Table 4](#). On June 30, 2015, there were 1,920,655 smart meters in the field, and 4,180 conventional meters remaining in the field (excluding 13,684 legacy meters remaining under the Meter Choices Program).

During the first quarter of F2016, eight Field Area Network (**FAN**) collectors (Cisco Connected Grid Routers) were removed (after review of meter performance and business criteria), bringing the total number installed to 1,855 by the end of F2016 Q1. Six Range Extenders were installed during the quarter, bringing the total number in the field at the end of the quarter to 5,242. Small numbers of FAN collectors and range extenders will be installed as part of the optimization of the telecom network which is currently underway and is expected to continue through F2016.

**Table 4 Customer Mass Meter Deployment – June 2011 Schedule and Actuals**

Region	Total Meters	Fiscal 2012			Fiscal 2013				Fiscal 2014				Fiscal 2015				Fiscal 2016	Total
		Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	
<b>Corix Installations (June 2011 Plan)</b>																		
Lower Mainland South	444,215	51,542	127,290	127,050	113,613	24,720	-											444,215
North Interior	104,367	16,163	22,411	24,292	23,522	17,979	-											104,367
North Coast	42,432	3,265	21,205	15,711	1,635	616	-											42,432
Vancouver Island	387,895	26,765	76,129	80,599	81,660	77,628	45,114											387,895
Lower Mainland North (Metro)	623,611	14,875	135,681	152,653	154,563	134,737	31,102											623,611
	368,311	14,875	95,282	107,867	68,404	71,315	10,568											368,311
	38,206	-	10,000	28,206	-	-	-											38,206
	83,534	-	-	-	-	63,000	20,534											83,534
	78,911	-	-	16,580	62,331	-	-											78,911
	24,250	-	-	-	23,828	422	-											24,250
	18,975	-	18,975	-	-	-	-											18,975
	11,424	-	11,424	-	-	-	-											11,424
South Interior	191,966	-	30,244	32,281	38,871	66,637	23,933											191,966
Kootenay	54,438	-	-	-	15,803	32,324	6,311											54,438
<b>Planned Corix Installations (June 2011 Plan)</b>	<b>1,848,924</b>	<b>112,610</b>	<b>412,960</b>	<b>432,586</b>	<b>429,667</b>	<b>354,641</b>	<b>106,460</b>											<b>1,848,924</b>
<b>To End of Q1 F2016</b>																		
Actual Corix Installations	1,769,629	116,583	422,563	451,796	385,314	261,527	70,307	16,291	3,148	216	14,514	20,207	6,254	909	-	-	-	1,769,629
Actual BC Hydro Installations	151,026																	
Total Smart Meter Installations	1,920,655																	
Conventional Meters Remaining in Field (Excl. Meter Choices Program)	4,180																	

\* Revised figure.

\*\* Includes smart meters installed due to growth in the number of customer accounts during the deployment.

## 5 Project Costs: F2016 Q1 and Program to Date

Excluding contingency, which has been allocated to planned expenditures for F2016 Q1, actual operating expenditures were \$0.1 million less than planned during F2016 Q1. Similarly, actual capital expenditures during F2016 Q1 are less than plan by \$1.2 million primarily due to delays in implementation activities to later in F2016. Forecast operating and capital expenditures at the completion of the program remain unchanged at \$860.6 million.

Operating and capital expenditures related to the SMI Program incurred by BC Hydro in F2016 Q1 and for the SMI Program to date are shown in [Table 5](#) and [Table 6](#), respectively.

**Table 5 SMI Program Operating and Capital Expenditures – F2016 Q1 and Forecast at Completion**

(\$ million)	Operating Expenditures			Capital Expenditures			Forecast at Completion (\$)	
	Actual	Plan	Variance	Actual	Plan	Variance	Operating	Capital
Labour	0.1	0.1	0.0	0.9	0.7	(0.2)	28.6	52.4
Consultants and Contractors	0.2	0.3	0.1	5.0	10.6	5.6	41.6	363.9
Materials/Other	0.0	0.0	0.0	1.9	(2.4)	(4.3)	(5.8)	367.9
Interest	n/a	n/a	n/a	0.3	0.4	0.1	n/a	12.0
<b>Sub-total SMI Program</b>	<b>0.3</b>	<b>0.4</b>	<b>0.1</b>	<b>8.1</b>	<b>9.3</b>	<b>1.2</b>	<b>64.4</b>	<b>796.2</b>
Interest on Deferral	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
<b>Total</b>	<b>0.3</b>	<b>0.4</b>	<b>0.1</b>	<b>8.1</b>	<b>9.3</b>	<b>1.2</b>	<b>860.6</b>	

**Table 6 SMI Program Operating and Capital Expenditures – SMI Program to Date**

(\$ million)	Operating Expenditures	Capital Expenditures	Total Expenditures
Labour	27.7	51.1	78.8
Consultants and Contractors	40.9	328.9	369.8
Materials/Other	(8.3)	285.2	276.9
Interest	n/a	11.1	11.1
<b>Sub-total SMI Program</b>	<b>60.3</b>	<b>676.3</b>	<b>736.6</b>
Interest on Deferral	7.5	n/a	7.5
<b>Total</b>	<b>67.8</b>	<b>676.3</b>	<b>744.1</b>

Operating and capital expenditures by program component<sup>1</sup> for F2016 Q1, and SMI Program to date are presented in [Table 7](#) and [Table 8](#) respectively.

<sup>1</sup> In Directive No. 4 of Commission Order No. G-67-10, BC Hydro was directed to report SMI Program costs broken down by the components specified therein.

**Table 7**      **SMI Program Operating and Capital Expenditures by SMI Program Component – F2016 Q1**

(\$ million)	Operating Expenditures			Capital Expenditures		
	Actual	Plan	Variance	Actual	Plan	Variance
Smart Meters	(0.5)	(0.5)	0.0	0.4	0.6	0.2
Telecommunications Systems	0.0	0.0	0.0	0.0	0.0	0.0
Meter Data Management System	0.0	0.0	0.0	0.0	0.0	0.0
Solution Integration	0.0	0.0	0.0	0.7	0.5	(0.2)
In-Home Display/In-Home Feedback	0.0	0.1	0.1	0.0	0.0	0.0
Conservation Based Rates	0.0	0.0	0.0	0.0	0.0	0.0
Smart Grid <sup>1</sup>	0.7	0.7	(0.0)	6.6	7.0	0.4
Other						
Procurement	0.0	0.0	0.0	0.0	0.0	0.0
Program Management	0.0	0.0	0.0	(0.1)	0.5	0.6
Facilities	0.0	0.0	0.0	0.1	0.0	(0.1)
Finance	0.0	0.0	0.0	0.2	0.5	0.3
Human Resources	0.0	0.0	0.0	0.0	0.0	0.0
Contract Management	0.0	0.0	0.0	0.2	0.2	0.0
IT Infrastructure	0.0	0.0	0.0	0.0	0.0	0.0
Security	0.0	0.0	0.0	0.0	0.0	0.0
Communications & Stakeholder Engagement	0.0	0.1	0.1	0.0	0.0	0.0
Regulatory	0.0	0.0	0.0	0.0	0.0	0.0
Transition to Operations	0.1	0.0	(0.1)	0.0	0.0	0.0
Interest During Construction <sup>2</sup>	0.0	0.0	0.0	0.0	0.0	0.0
Total Other	0.1	0.1	0.0	0.4	1.2	0.8
Contingency	0.0	0.0	0.0	0.0	0.0	0.0
<b>Total</b>	<b>0.3</b>	<b>0.4</b>	<b>0.1</b>	<b>8.1</b>	<b>9.3</b>	<b>1.2</b>

<sup>1</sup> Smart Grid includes theft detection and other advanced telecom infrastructure related expenditures.

<sup>2</sup> Interest during construction is included in actual expenditures for each expenditure category, but not included in planned expenditures by category. Therefore, a separate line item is included in "Other."

Most of the variance in capital expenditures for F2016 Q1 in [Table 7](#) relates to the postponement of the implementation activities to later in F2016.

**Table 8 SMI Program Operating and Capital Expenditures by SMI Program Component – SMI Program to Date and Forecast at Completion of Program**

(\$ million)	Actual Expenditures – Program to Date			Forecast Expenditures - Completion of Program	
	Operating Expenditures	Capital Expenditures	Total Expenditures	Operating	Capital
Smart Meters	11.0	358.2	369.2	11.1	359.5
Telecommunications Systems	0.4	41.4	41.8	0.4	41.4
Meter Data Management System	0.2	8.1	8.3	0.2	8.1
Solution Integration	0.0	51.9	51.9	0.0	53.0
In-Home Display/In-Home Feedback	7.4	19.1	26.5	7.5	19.3
Conservation Based Rates	0.0	4.0	4.0	0.0	3.9
Smart Grid <sup>1</sup>	11.1	122.7	133.8	12.7	167.2
Other					
Program Management	4.6	20.2	24.8	4.6	20.9
Facilities	2.1	4.3	6.4	2.1	4.7
Finance	2.7	4.5	7.2	2.7	4.8
Regulatory	(8.7)	0.0	(8.7)	(8.7)	0.0
Procurement	0.1	20.3	20.4	0.1	20.4
Contract Management	0.0	1.9	1.9	0.0	2.2
Customer	2.6	0.0	2.6	2.6	0.0
Business Transformation	2.0	0.0	2.0	2.0	0.0
Engineering, IT, Telecom, Security & Field Trials	3.4	0.0	3.4	3.4	0.0
Utility Operations	1.4	0.0	1.4	1.4	0.0
Human Resources	0.9	0.5	1.4	1.6	0.5
Communication & Stakeholder Engagement	11.2	0.0	11.2	11.3	0.0



	Actual Expenditures – Program to Date			Forecast Expenditures - Completion of Program	
Transition to Operations	0.6	0.0	0.6	0.6	0.0
Leasehold Improvements	0.0	0.4	0.4	0.0	0.4
Field Trial Equipment	0.0	0.0	0.0	0.0	0.0
Security	0.0	1.9	1.9	0.0	2.0
Infrastructure (IT)	0.0	16.9	16.9	0.0	17.1
Program Development <sup>2</sup>	7.3	0.0	7.3	7.3	0.0
Interest During Construction <sup>3</sup>	0.0	0.0	0.0	0.0	0.8
Total Other	30.2	70.9	101.1	31.0	73.8
Contingency	0.0	0.0	0.0	1.5	70.0
<b>Total</b>	<b>60.3</b>	<b>676.3</b>	<b>736.6</b>	<b>64.4</b>	<b>796.2</b>
				<b>860.6</b>	

<sup>1</sup> Smart Grid includes theft detection and other advanced telecom infrastructure related expenditures.

<sup>2</sup> Program Initiation and Identification includes expenditures of \$7.3 million incurred during F2006 and F2008 (inclusive). These amounts were expensed in the year in which they were incurred, although only \$0.6 million was recovered in rates (i.e., \$6.7 million was incurred ex-plan).

<sup>3</sup> Interest during construction is included in actual expenditures for each expenditure category, but not included in planned expenditures by category. Therefore, a separate line item is included in "Other".

## 6 SMI Program Benefits and Related Costs – F2015

The SMI Program continued in the implementation phase throughout F2015, and additional program benefits were realized during the period. [Table 9](#) identifies these benefits, and compares them to plan estimates included in the Amended F2012 to F2014 Revenue Requirements Application (RRA) (Amended Tables 7-4 and 7-5). [Table 9](#) also identifies and updates the SMI Program benefits realized in F2012, F2013 and F2014 reported in SMI Quarterly Report Nos. 9, 13 and 17 respectively.

The volume of calls to the call centre resulting from the implementation of SMI began increasing in May 2012, and the volume of calls experienced resulted in an unfavourable variance of \$2.0 million for F2013. In F2014, the costs for incremental calls were \$0.4 million, or \$0.1 million lower than the plan value of \$0.5 million. In F2015 there were no net call centre costs or savings. On a cumulative basis for the

period F2012 through F2015, call centre costs have been close to plan, with a \$0.2 million unfavourable variance.

Diversion reduction costs, which includes costs associated with investigation, security, and collections, have been less than planned in each of the years from F2012 through F2015, resulting in a cumulative favourable variance of \$14.4 million.

Incremental charges for manual meter reading commenced in F2014. In F2015 there was an unfavourable variance of \$1.6 million due to a higher number of smart meters requiring manual meter reading services compared to plan. The cumulative unfavourable variance through F2015 is \$6.6 million. Meter reading savings in F2015 were the same as plan at \$20.4 million.

The deployment of smart meters has resulted in the suspension of the meter sampling program since smart meters have a 10-year initial seal period. This has resulted in a cumulative \$21.3 million operating cost savings and a cumulative \$9.0 million capital savings. Most of these savings (i.e., \$18.8 million) has already been included in the F2012 to F2015 RRA, and the residual operating cost savings of \$2.5 million has been applied to the SMI Regulatory Account. The \$9.0 million capital savings is based on the estimated cost of replacement meters from failed sample groups.

Remote disconnect/reconnect technology and processes were implemented in late F2013. In F2015 BC Hydro conducted approximately 34,000 remote reconnections and benefits of \$1.1 million were realized, compared to plan of \$1.4 million.

Planned energy savings in F2013, F2014 and F2015 were largely comprised of savings resulting from the implementation of the In-Home Device (**IHD**) Rebate Program, the Voltage Optimization Program, and the Energy Visualization Web Portal. In F2015 the Voltage Optimization Program realized 7.0 Gigawatt Hours (**GWh**) of energy savings. The IHD Rebate Program was significantly reduced in scope compared to the SMI Business Case and was implemented in late F2015.

Measurement of the energy savings resulting from the Energy Visualization Web Portal have been estimated at 12.4 GWh for F2015. Analysis in F2015 has indicated that significant energy savings have resulted from the Diversion Detection Program and are estimated at 300 GWh for F2015, and a cumulative 600 GWh favourable variance.

Revenue Assurance investigation results show that of the grow-ops that were identified in the field each year, the proportion with electricity theft present increased from 41 per cent in F2006 to 62 per cent in F2011 which was the last fiscal year prior to the commencement of smart meter deployment. In F2013, the proportion of identified grow-ops with theft present declined to 22 per cent, with a further reduction in F2014 to 7 per cent and 3 per cent in F2015. This suggests that a significant proportion of energy diversions have already switched to being paid customers or left the grid due to a combination of media coverage of the SMI Program, proactive communications around the meter change out process, and BC Hydro's visible expanded revenue assurance field inspection program leveraging interim technology solutions. Since grow-ops are an illegal activity, it is difficult to estimate the amount of electricity consumed by this segment with the same degree of accuracy as for traditional residential and commercial uses. The revenue from individual grow-ops is not tracked due to security and privacy concerns.

Based on a review of F2015 investigation data, which demonstrates a reduced incidence of theft from grow-ops in the field, it is clear that further reductions in diversions have been realized. It is estimated that by F2015 reduced incidence of diversion resulted in increased revenue of approximately 300 GWh per year and reduced load of approximately 300 GWh per year from grow-ops relative to 2010. While the volume of theft reduction exceeded the business case targets, approximately 100 GWh of the incremental revenue is estimated to have been realized at commercial rates which are lower than the residential rates assumed in the business case.

**Table 9 SMI Program Operating and Capital Expenditures by SMI Program, with Energy Related Benefits (GWh) and Revenues**

	F2012			F2013			F2014			F2015			Cumulative (F2012 to F2015)		
	Actual	Plan	Variance	Actual	Plan	Variance	Actual	Plan	Variance	Actual	Plan	Variance	Actual	Plan	Variance
<b>A. SMI Operating Costs (\$ millions)</b>															
KBU Operating Costs - SMI Implementation															
Call Centre	0.0	1.7	1.7	4.5	2.5	(2.0)	0.4	0.5	0.1	0.0	0.0	0.0	4.9	4.7	(0.2)
Diversion Reduction	2.6	6.9	4.3	6.0	9.3	3.3	6.0	10.5	4.5	4.8	7.1	2.3	19.4	33.8	14.4
Meter reading - Manual reads	0.0	0.0	0.0	0.0	1.9	1.9	10.3	3.4	(6.9)	7.6	6.0	(1.6)	17.9	11.3	(6.6)
Other	0.0	0.0	0.0	0.0	3.0	3.0	0.0	3.6	3.6	0.0	0.0	0.0	0.0	6.6	6.6
<b>Total - KBU Operating Costs - SMI Implementation</b>	<b>2.6</b>	<b>8.6</b>	<b>6.0</b>	<b>10.5</b>	<b>16.7</b>	<b>6.2</b>	<b>16.7</b>	<b>18.0</b>	<b>1.3</b>	<b>12.4</b>	<b>13.1</b>	<b>0.7</b>	<b>42.2</b>	<b>56.4</b>	<b>14.2</b>
KBU Operating Costs - SMI Benefit Related															
Reduction in Meter Sampling Costs Realized	(4.9)	(4.1)	0.8	(4.9)	(4.9)	0.0	(6.0)	(6.0)	0.0	(5.5)	(5.5)	0.0	(21.3)	(20.5)	0.8
Less: Meter Sampling Benefit Included	(4.1)	(4.1)	0.0	(3.2)	(4.9)	(1.7)	(6.0)	(6.0)	0.0	(5.5)	(5.5)	0.0	(18.8)	(20.5)	(1.7)
<b>Net Meter Sampling Benefit</b>	<b>(0.8)</b>	<b>0.0</b>	<b>0.8</b>	<b>(1.7)</b>	<b>0.0</b>	<b>1.7</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>(2.5)</b>	<b>0.0</b>	<b>2.5</b>
Meter Reading	0.0	(0.2)	(0.2)	0.0	(14.4)	(14.4)	(22.3)	(26.4)	(4.1)	(20.4)	(20.4)	0.0	(42.7)	(61.4)	(18.7)
Remote Disconnect / Reconnect	0.0	0.0	0.0	0.0	(1.9)	(1.9)	(2.2)	(4.5)	(2.3)	(1.1)	(1.4)	(0.3)	(3.3)	(7.8)	(4.5)
Other	0.0	0.0	0.0	0.0	(1.5)	(1.5)	0.0	(1.8)	(1.8)	(0.3)	(0.4)	(0.1)	(0.3)	(3.7)	(3.4)
<b>Net Benefit</b>	<b>(0.8)</b>	<b>(0.2)</b>	<b>0.6</b>	<b>(1.7)</b>	<b>(17.8)</b>	<b>(16.1)</b>	<b>(24.5)</b>	<b>(32.7)</b>	<b>(8.2)</b>	<b>(21.8)</b>	<b>(22.2)</b>	<b>(0.4)</b>	<b>(48.8)</b>	<b>(72.9)</b>	<b>(24.1)</b>
<b>B. SMI Energy Related Benefits (GWh)</b>															
Energy Savings															
DSM Conservation *	0.0	0.9	(0.9)	0.0	198.0	(198.0)	10.3	249.6	(239.3)	12.4	7.8	4.6	22.7	456.3	(433.6)
Diversion Program Conservation **	50.0	4.0	46.0	100.0	6.0	94.0	161.0	1.0	160.0	300.0	0.0	300.0	611.0	11.0	600.0
Voltage Optimization	0.0	25.5	(25.5)	0.0	34.0	(34.0)	0.2	47.0	(46.8)	7.0	6.1	0.9	7.2	112.6	(105.4)
<b>Total Energy Savings</b>	<b>50.0</b>	<b>30.4</b>	<b>19.6</b>	<b>100.0</b>	<b>238.0</b>	<b>(138.0)</b>	<b>171.5</b>	<b>297.6</b>	<b>(126.1)</b>	<b>319.4</b>	<b>13.9</b>	<b>305.5</b>	<b>640.9</b>	<b>579.9</b>	<b>61.0</b>
<b>Theft Reduction - Increased Energy Sales**</b>	<b>200.0</b>	<b>1.0</b>	<b>199.0</b>	<b>300.0</b>	<b>51.0</b>	<b>249.0</b>	<b>339.0</b>	<b>287.0</b>	<b>52.0</b>	<b>300.0</b>	<b>510.0</b>	<b>(210.0)</b>	<b>1139.0</b>	<b>849.0</b>	<b>290.0</b>
<b>C. SMI Impact on Capital Costs (\$ millions)</b>															
Meter Sampling - Failed Meter Samples	(3.5)	(0.4)	3.1	(1.7)	(1.7)	0.0	(2.4)	(2.4)	0.0	(1.4)	(1.4)	0.0	(9.0)	(5.9)	3.1
Load Research - Avoided capital replacement	0.0	0.0	0.0	0.0	0.0	0.0	(1.4)	(2.2)	(0.8)	(0.4)	0.0	0.4	(1.8)	(2.2)	(0.4)
<b>Net Benefit</b>	<b>(3.5)</b>	<b>(0.4)</b>	<b>3.1</b>	<b>(1.7)</b>	<b>(1.7)</b>	<b>0.0</b>	<b>(3.8)</b>	<b>(4.6)</b>	<b>(0.8)</b>	<b>(1.8)</b>	<b>(1.4)</b>	<b>0.4</b>	<b>(10.8)</b>	<b>(8.1)</b>	<b>2.7</b>

\* DSM Conservation F2015 target based on Energy Visualization Portal Benefit only

\*\* Theft Reduction - Increased Energy Sales and Diversion Program Conservation estimated based on analyses performed in F2015

**Smart Metering & Infrastructure Program**

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**Appendix A**

**SMI Program Contracts and Commitments –  
Executed in F2016 Q1**

Supplier/Vendor	Contract Value (\$)	Description
Aerotek ULC	52,000	System Device Engineering Services
Annex Consulting Group Inc	555,512	IT Resources
Awesense Wireless Inc	493,080	Check Meter Software and Services
Bit Stew Systems Inc	27,000	Operational Insights Services
Black & Veatch Canada Company	20,670	Advanced Telecom Engineering Services
Blackcomb Helicopters LP	20,000	Helicopter Use for Advanced Telecom Network Enhancement
Borden Ladner Gervais LLP	100,000	Legal Services
EMC Corporation Of Canada	4,582,480	Energy Analytics Solution Services
Erbridge Inc	195,650	Smart Meter Deployment Consultant
Howe Sound Consulting Inc	86,400	DSMD Resource
J. Wilkins Consulting Ltd.	77,500	Network Infrastructure Design Resource
JTS Consulting Inc	447,520	IT Resources
Long View Systems Corporation	17,855	Network Infrastructure Design Services
Nextgen Technologies Ltd	10,085	SCADA Upgrade Services
OSIsoft LLC	344,479	Technology Servers and Licences
Procom Consultants Group Ltd	121,928	Advanced Telecom Engineering Resources
Randstad Interim Inc	2,580	Advanced Telecom Technician
Robert Half Canada Inc	61,681	Project Accountant
Rogers Wireless Inc	149,000	Telecom Infrastructure Services
Teema Solutions Group Inc	33,440	IT Resource
Teksystems Canada Inc.	553,932	IT Resources
Telus Communications Company	364,115	Telecom Infrastructure Services
Vertec Communications Inc	59,772	Advanced Telecom Network Enhancement Services
West Pacific Consulting Group	275,000	IT Resources
Yiutech Solutions Ltd	55,900	IT Resources
<b>TOTAL</b>	<b>8,707,579</b>	