

Tom A. Loski

Chief Regulatory Officer

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February 12, 2016

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

Dear Ms. Hamilton:

**RE: Project No. 3698781
British Columbia Utilities Commission (BCUC or Commission)
British Columbia Hydro and Power Authority (BC Hydro)
2015 Rate Design Application (2015 RDA)
Compliance with Commission Order No. G-12-16**

BC Hydro writes to provide the following three items in the above noted proceeding:

1. BC Hydro's response to BCUC IR 1.43.1, filed in accordance with Commission Order No. G-12-16.

As noted in the covering letter to BC Hydro's response to Round 1 Information Requests (Exhibit B-5), BC Hydro did not submit a response to BCUC IR 1.43.1 regarding BC Hydro's Residential E-Plus proposal, but instead sent a draft of the response and BC Hydro's proposed Residential E-Plus interruption business practice to the E-Plus Homeowners Group (**EPHG**) for comment. BC Hydro now submits its response to BCUC IR 1.43.1, which includes as attachments a record of the letter communications in which EPHG discussed the issues it has with BC Hydro's proposed business practice, including interruption notification provisions, and BC Hydro's discussion of those issues in reply.

2. Errata No. 3, revision to Exhibit B-1, page 5-56.

EPHG wrote to BC Hydro on December 1, 2015 drawing to BC Hydro's attention an error at Exhibit B-1, page 5-56, lines 1 to 3. BC Hydro acknowledges it erred in conflating the EPHG September 4, 2015 letter and two e-mails of the same date which were not sent by EPHG but rather by a Residential E-Plus customer.

3. Revised British Columbia Old Age Pensioners' Organization *et al* (**BCOAPO**) Demand Side Management (**DSM**) related IRs, filed in accordance with Commission Order No. G-12-16;

February 12, 2016
Ms. Erica Hamilton
Commission Secretary
British Columbia Utilities Commission
2015 Rate Design Application (2015 RDA)
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As directed by the Commission on page 11 of 13 in its Reasons for Decision in relation to Commission Order No. G-12-16, BC Hydro engaged BCOAPO to discuss the revised DSM related IRs. BC Hydro and BCOAPO have agreed that responses will be provided for the following IRs:

BCOAPO IR 1.105.1	BCOAPO IR 1.106.1	BCOAPO IR 1.108.4
BCOAPO IR 1.108.5	BCOAPO IR 1.108.6	BCOAPO IR 1.108.7
BCOAPO IR 1.109.1	BCOAPO IR 1.109.3	BCOAPO IR 1.109.6
BCOAPO IR 1.109.7	BCOAPO IR 1.117.1	

Some of the IR responses (BCOAPO IRs 1.108.4, 1.108.6, 1.109.3, and 1.109.6) require BC Hydro to extract information from multiple sources, which will require additional time beyond the February 12, 2016 date for outstanding IRs as determined by the Commission. BC Hydro has informed BCOAPO that they will be in a position to provide responses to these outstanding IRs by February 29, 2016. BCOAPO has indicated that this timing is acceptable to them. BCOAPO and BC Hydro do not have any IRs that remain in dispute.

BC Hydro notes that it will be providing responses to the unanswered Commercial Energy Consumers Association of British Columbia (**CEC**) IR 1.7 series and CEC IR 1.8.1 in conjunction with the updated Load Resource Balance, as these IRs relate to BC Hydro's expectations concerning potential liquefied natural gas loads.

For further information, please contact Gordon Doyle at 604-623-3815 or by email at bchydroregulatorygroup@bchydro.com.

Yours sincerely,



(for) Tom Loski
Chief Regulatory Officer

gd/ma

Enclosure (1)

Copy to: BCUC Project No. 3698781 (2015 RDA) Registered Intervener Distribution List.

British Columbia Utilities Commission Information Request No. 1.43.1 Dated: November 10, 2015 British Columbia Hydro & Power Authority Response issued February 12, 2016	Page 1 of 2
British Columbia Hydro & Power Authority 2015 Rate Design Application	Exhibit: B-14

43.0 D. CHAPTER 5 – RESIDENTIAL RATE DESIGN

**Reference: Exhibit B-1, Application, Section 5.3 Residential Dual Fuel E-Plus Rate, pp. 5-54 to 5-56
E-Plus customers interruption notice**

BC Hydro favours amending RS 1105 Special Condition 1 to provide a practical interruptible option. As its business practice, one of the ways of notifying E-plus customers for interruption is “up to one week’s notice that an interruption event is likely to occur.”

1.43.1 Please provide an example of an *event* that will allow BC Hydro to provide up to one week’s notice to E-Plus customers regarding interruption.

RESPONSE:

It is envisioned that RS 1105, if the amendments are approved by the Commission, could be used during times of high load such as during cold weather events.

BC Hydro has refined what it means by “up to one week’s notice”:

- 1. BC Hydro is proposing to provide an Annual Reminder Notice each year in September before the October to April period, reminding all E-Plus customers that interruptions are possible in the coming months.**
- 2. BC Hydro is proposing to provide an Interruption Notice giving two calendar days’ notice for E-Plus Residential customers to switch to their alternative back-up systems. Such an ‘Interruption Notice’ will be provided at any time during October through April if BC Hydro decides that an E-Plus service interruption is required in accordance with the proposed terms of RS 1105.**

BC Hydro notes the ability to provide two days’ notice strikes a balance between the ability to forecast the cold weather event in advance and the nature of the Residential E-Plus load. It is expected that two days’ notice could reduce the likelihood of an interruption as compared to providing a longer notice period. That is, BC Hydro would be more certain of the weather and a related need for a service interruption two days in advance rather than calling an interruption on a predicted need further out in time, be it one week or 30 days.

- 3. BC Hydro is proposing to provide an Interruption Closure Notice when the Period of Interruption is over. Subsequent to the issuance of an Interruption Closure Notice no interruption of E-Plus Service will occur until another Interruption Notice is issued.**

British Columbia Utilities Commission Information Request No. 1.43.1 Dated: November 10, 2015 British Columbia Hydro & Power Authority Response issued February 12, 2016	Page 2 of 2
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BC Hydro's proposed Residential E-Plus interruption business practice, which sets out these proposed notification processes, is found at Attachment 1 to this response.

The following describes the most recent engagement with EPHG concerning BC Hydro's Residential E-Plus proposals:

- **EPHG wrote to BC Hydro on September 4, 2015 raising three questions with respect to BC Hydro's Residential E-Plus proposals - refer to Attachment 2 to this response;**
- **BC Hydro wrote to EPHG on December 15, 2015 responding to EPHG's three questions and attaching for EPHG's feedback a draft of this IR response and a draft of its proposed business practice – refer to Attachment 3 to this response. BC Hydro also included a supporting Question and Answer document to the proposed business practice and sample notifications that BC Hydro would send E-Plus customers to explain that service interruption may occur and what E-Plus customers should do in response;**
- **EPHG provided its feedback on BC Hydro's proposed E-Plus interruption business practice in a letter dated January 5, 2016 – refer to Attachment 4 to this response.**
- **BC Hydro responded to the issues raised by EPHG on January 27, 2016, seeking further feedback from EPHG in advance of filing its response to this IR – refer to Attachment 5 to this response.**
- **EPHG replied on February 8, 2016 – refer to Attachment 6 to this response.**

BC Hydro's proposed Residential E-Plus Interruption business practice at Attachment 1 of this response is unchanged from the draft provided to EPHG on December 15, 2015, aside from a minor typo correction.

Proposed Residential E-Plus Interruption Business Practice

Element	Business Practice/Rationale
<p>1. Compensation</p>	<ul style="list-style-type: none"> • Already provided for in current Residential E-Plus energy rate (Rate Schedule (RS) 1105) discount compared to the Residential Inclining Block (RIB) rate • Current RIB Step 1 price is 7.97 cents per kilowatt hour (/kWh) and RIB Step 2 price is 11.95 cents/kWh; RS 1105 energy rate is 5.22 cents/kWh • No business practice required
<p>2. Period of Interruption</p>	<ul style="list-style-type: none"> • Currently, there is no limit on months, days or hours of interruption during the year under RS 1105; “Period of Interruption” is defined as “[a] period during which a Customer is required by BC Hydro to cease the use of Electricity under this Rate Schedule” • Proposal: Confine interruptions to October to April period, to be refined through the Interruption Notice discussed below under Item #3 • Rationale: BC Hydro is a winter peaking utility, with Demand highest during the four months of November through February; there is also increased Demand during the ‘shoulder months’ of October, March and April. BC Hydro will not interrupt Residential E-Plus customers during the other five months of the year. This is also consistent with BC Hydro’s industrial load curtailment pilot launched on 19 August 2015 • BC Hydro foresees that interruption of E-Plus Service may occur in response to system contingencies or conditions (e.g., need for capacity during four winter months of November- February); interruptions may be regional (Vancouver Island) or system-wide
<p>3. Notice</p>	<ul style="list-style-type: none"> • Currently, RS 1105 does not require notice; Special Condition 3 provides that “BC Hydro may interrupt the supply of Electricity by either manual or automatic means <u>or</u> by written notice by registered mail or hand delivery to the Customer to cease the use of Electricity under this Rate Schedule” [emphasis added] • BC Hydro proposes the following sequence of three types of notice, each to be issued via auto-dialer (phone) or email: <ol style="list-style-type: none"> 1. Annual Reminder Notice – provided by BC Hydro each year in September, prior to the October-April period, to all Residential E-Plus Customers reminding Customers that an interruption of E-Plus Service may be applicable in that period. BC Hydro would also use the Annual Reminder Notice to ask Customers to provide their contact information (telephone, e-mail) to ensure BC Hydro’s records are up to date 2. Interruption Notice - provided by BC Hydro that a Period of Interruption of E-Plus Service will start two (2) calendar days from the date of the Interruption Notice (the date of the auto-dialer (phone) and/or e-mail). Customers are obligated within two (2) calendar days

Proposed Residential E-Plus Interruption Business Practice

Element	Business Practice/Rationale
	<p>from the date of the Interruption Notice to switch to their alternative back-up heating systems;</p> <p>3. Interruption Closure Notice – provided by BC Hydro that the Period of Interruption is over and that no interruption of E-Plus Service will occur until another Interruption Notice is issued; upon receipt of the Interruption Closure Notice Customers may switch their heating systems back to BC Hydro-provided Service at any time. BC Hydro will not interrupt E-Plus service as of the date that the Interruption Closure Notice was issued (the date of the auto-dialer (phone) or e-mail)</p> <ul style="list-style-type: none"> • Note that there is no limit to the number of Interruption Notices BC Hydro can issue during the October-April period • The duration of an interruption is the period between two (2) calendar days from the date of the Interruption Notice and the date of the Interruption Closure Notice – the duration could be days or weeks or months • Rationale: Residential E-Plus Customers have asked BC Hydro to clarify how BC Hydro would implement RS 1105 if the changes proposed in the 2015 RDA are set by the Commission, and in particular how much notice would be provided and how long interruptions would last. The above notice provisions strike a balance between the utility needing to derive some value from E-Plus interruptible Service, the realities of notice preparation time (about 1 day for auto-dialer or e-mail) and the need to give Residential Customers reasonable time to switch to their alternative back-up heating systems
<p>4. Interruption Mechanism</p>	<ul style="list-style-type: none"> • Physical interruption of E-Plus Service when required will be implemented through remote disconnection or manual disconnections by BC Hydro • Rationale: This is permitted per existing Special Condition 3 of RS 1105 (remote disconnection is disconnection by ‘automatic means’; Special Condition 3 also permits disconnection by manual means)
<p>5. Non-performance</p>	<ul style="list-style-type: none"> • Where BC Hydro has not physically disconnected an E-Plus customer’s service, customers using Electricity for heating during a Period of Interruption as defined through the Interruption Notice-Interruption Closure Notice period described in Item #3 above will be charged the higher 30.37 cents/kWh energy rate set out in the ‘Rate’ clause of RS 1105 as permitted by existing Special Condition 3 of RS 1105 • The E-Plus customer may be removed from E-Plus service if such usage occurred. • BC Hydro will measure Customers’ consumption during Periods of Interruption for the purpose of ensuring compliance or enforcing non-performance

E-Plus Homeowners Group

Gary McCaig – 9277 Faber Road, Port Alberni B.C. V9Y 9C3 eplusbcgroup@gmail.com

September 4, 2015

Keith Anderson – Vice President Customer Service
BC Hydro
6911 Southpoint Drive
Burnaby, BC V3N 4X8

Dear Mr. Anderson,

Members of our Group have received your letter dated August 26, 2015, regarding BC Hydro's proposal for the E-Plus rate that will be filed with the British Columbia Utilities Commission later this month. We were pleased to read that, after considering feedback from E-Plus customers and others, BC Hydro proposes to maintain the E-Plus rate.

You note that the feedback received from E-Plus customers included the fact that they had made significant financial investments to qualify for the rate and that they would be faced with significant bill increases if the rate is ended. You also noted the fact that as the vast majority of E-Plus customers are seniors the rate will naturally end over time.

I am sure that you also received extensive feedback stating that **BC Hydro should respect the written agreements they have with E-Plus customers.**

Your letter also states that you will apply to have the language that lays out the conditions for interruptions of E- plus supply changed from the current:

“there is a lack of surplus hydro energy and the service cannot be provided economically from other energy sources”

to the following, or similar language:

“BC Hydro may interrupt service under this Rate Schedule in circumstances where BC Hydro does not have energy or capacity”

Although the change appears on the surface to be a minor one, and could be read to only relieve BC Hydro of the need to purchase energy to provide for E-Plus customers, we would like to understand it better.

Can you please explain more clearly why the language is being changed and the expected impact of that change? Specifically, what problem will be remedied by this change or what benefits will accrue to BC Hydro or its customers?

1

We are concerned by your statement that this change will ensure that the “rate was truly interruptible as was intended when the discount was offered”. This, as well as your statement that “the rate has never been interrupted because the Special Conditions attached to interruption are outdated”, could imply that BC Hydro feels that occasional interruptions are a necessary part of the rate structure, and that the proposed change is being made to create new or additional “opportunities” for BC Hydro to interrupt E-Plus. We hope this is not your intent. Interrupting home heating power to vulnerable seniors should not be taken lightly, and must be fully supported by the legitimate reasons on which the program was originally based. While we understand that the overall power supply situation in BC might have changed to the benefit of E-Plus customers since the introduction of the program, that does not justify changing the “rules” in any significant way. We also note that input from E-Plus customers has been neither asked for nor received on the proposed language change. We hope this indicates that the change is a minor one.

Can you assure us that the proposed language change is not a material one, and is not intended to create additional conditions under which BC Hydro can interrupt E-Plus power, beyond those specified and agreed to when the program was introduced?

We also wish to emphasize that beyond the language you have quoted that governs conditions for interruption, E-Plus customers have in the past been given additional assurances; specifically, we have been told:

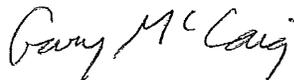
“the export market would be first to be cut off, then large industrial customers, then commercial and finally the homeowners”.

This understanding is important; it is one of the fundamental underpinnings of the E-Plus program, and has been communicated several times since the program was first introduced including at the 2007 BCUC hearings.

Can you assure us that the above priorities for interruptions would still apply?

We would appreciate a prompt reply to our questions as they will inform any submission the E-Plus Homeowners Group makes to the BCUC.

Thank you



R. Gary McCaig – for E-Plus Homeowners Group

c.c. Office of the Seniors Advocate
Office of the Ombudsperson



Keith Anderson
Vice-President, Customer Service
Phone: 604-699-9097
Keith.Anderson@bchydro.com

December 15, 2015

E-Plus Homeowners Group
c/o Gary McCaig
9277 Faber Road
Port Alberni, BC V9& 9C3

Dear Mr. McCaig:

RE: BC Hydro's E-Plus Proposal

Thank you for your two letters: 1) dated September 4, 2015 addressed to myself, raising additional questions about BC Hydro's proposal to amend the terms and conditions of our Residential E-Plus service so that the service could be interrupted in practice when required, and 2) dated December 1, 2015 addressed to Mr. Tom Loski, Chief Regulatory Officer, drawing to BC Hydro's attention an error in the 2015 Rate Design Application (RDA), page 5-56, lines 1-3.

I am writing to you now, and on behalf also of Mr. Loski, for the following reasons:

1. To acknowledge that BC Hydro erred in conflating the EPHG September 4, 2015 letter and two e-mails of the same date which were not sent by EPHG but rather by two Residential E-Plus customers. BC Hydro will file an amendment to page 5-56 of the RDA prior to the RDA Procedural Conference scheduled for January 12, 2016;
2. To respond below to the specific questions you raised in your September 4, 2015 letter, which was your reply to my August 26, 2015 letter advising Residential E-Plus customers at that time of our E-Plus proposal as it was to be included in Chapter 5 of the 2015 RDA (the 2015 RDA was filed with the British Columbia Utilities Commission (**BCUC**) on September 24, 2015);
3. To ask for your feedback on our intended business practices - the internal rules that guide how and under what conditions E-Plus service interruptions would work in practice, and our draft customer notices - that would be provided to Residential E-Plus customers if our proposal was approved by the BCUC; and
4. To ask for your feedback on a draft BC Hydro response to BCUC Information Request (**IR**) 1.43.1, which addresses E-Plus service interruption notice and will include attachments that set out and explain the proposed business practice of E-Plus service interruption (**Attachments 4 and 5**, as listed below). To support providing you an opportunity for feedback, BC Hydro's response to BCUC IR 1.43.1 and the attachments will not be included with BC Hydro's filing of the RDA Round 1

December 15, 2015
E-Plus Homeowners Group
BC Hydro's E-Plus Proposal

IR responses on December 18, 2015, but will be filed at the 2015 RDA Procedural Conference scheduled for January 12, 2016.

Further to this discussion and our request for your feedback, I have attached:

Attachment 1 – your September 4, 2015 letter;

Attachment 2 – your December 1, 2015 letter;

Attachment 3 – draft BC Hydro response to BCUC IR 1.43.1;

Attachment 4 – proposed Residential E-Plus Interruption Business Practice;

Attachment 5 – question and answer document - questions and answers that explain the expected business practice of E-Plus service interruption; and

Attachments 6, 7 and 8, which are sample notifications that BC Hydro would send E-Plus customers to explain that service interruption, may occur, and what E-Plus customers should do in response.

We would appreciate any feedback or comments you have in advance by January 8, 2016.

In answer to the questions you raised in your September 4, 2015 letter:

- 1. Can you please explain more clearly why the language [that lays out the conditions for interruption of E-Plus service] is being changed and the expected impact of that change? Specifically, what problem will be remedied by this change or what benefits will accrue to BC Hydro and its customers?***

Under the current Special Condition 1 of Rate Schedule (RS) 1105, BC Hydro has the right to interrupt E-Plus service whenever there is a lack of “surplus hydro energy” and “the service cannot be provided economically from other energy sources”.

The current E-Plus language differs from the typical interruptible rate provisions, which allow BC Hydro to disconnect when it doesn't have available energy and capacity to provide service. In particular there is no requirement to source energy or capacity from other sources prior to disconnecting.

As a result of Special Condition 1, we have never interrupted E-Plus service. For further discussion, please refer to section 2.3.2 of the RDA Workshop 9a/9b Discussion Guide, attached in Appendix C-3B of the RDA.

In this 2015 RDA, we have proposed that Special Condition 1 of RS 1105 be amended to state that:

BC Hydro will provide electricity under this rate schedule only to the extent that it has energy and capacity to do so. BC Hydro may, at any time and from time to time,

interrupt the supply of electricity under this rate schedule where BC Hydro does not have sufficient energy or capacity.

As discussed in section 5.3.4 of the RDA, these proposed changes will allow for the Residential E-Plus rate to be practically interruptible. This proposal seeks to remedy the issue that E-plus service cannot presently be interrupted under the existing language, even though this is the intent of the E-Plus rate.

The proposed language is consistent with BCUC Order G-37-90, which approved E-Plus service interruption criteria for BC Hydro to interrupt the supply of energy under RS 1105 "... at any time and from time to time." It is also consistent with BC Hydro's other interruptible rates.

2. Can you assure us that the proposed language change is not a material one, and is not intended to create additional conditions under which BC Hydro can interrupt E-Plus power, beyond those specified and agreed to when the program was introduced?

The proposed language change is not a material change in comparison to the language of our other interruptible rates and load curtailment programs.

The proposed language change is material in that E-Plus service would become truly interruptible, whereas the effect of the current language restricts BC Hydro from interrupting E-Plus service in practice.

There are currently no limits on the period of interruption except for Special Condition 1 described above. As set out in Attachment 2, we propose to limit interruption periods to October through April. These are the months of highest customer demand in B.C. - November to February is the winter period, and October, March and April are the 'shoulder period' when customer demand can also be high. Interruptions would not occur in the other five months of the year.

Attachment 2 describes the three notices we would provide customers about interruptions – the Annual Reminder Notice, the Interruption Notice and the Interruption Closure Notice, and samples of each of these notices is also attached.

I draw your attention to the Interruption Notice. Having reviewed a number of notice periods for interruptions, ranging from 24 hours' notice for industrial interruptions under our industrial load curtailment program to up to about five days' notice given by some utilities to customers taking firm service for planned outages and maintenance, we are proposing two (2) calendar days' notice to interrupt Residential E-Plus service.

On receipt of an Interruption Notice, E-Plus customers would have to switch from using their electric heating to their back-up heating system within two (2) calendar days i.e., if the date of an Interruption Notice is November 14, 2016, customers would have to complete the switch before the end of day on November 16, 2016, and the interruption period would start on November 17, 2016.

We welcome your views on this proposed notice period.

December 15, 2015
E-Plus Homeowners Group
BC Hydro's E-Plus Proposal



3. Can you assure us that the above priorities for interruptions [that “the export market would be first to be cut off, then large industrial customers, then commercial customers and finally E-Plus homeowners”] would still apply?

There is no established hierarchy of interruption for non-firm service. BC Hydro considers each situation under which energy or capacity may be limited individually, taking into account factors such as the size and regional extent of the system issue or constraint.

Unfortunately we cannot locate the reference to the quote included in this question, which you've indicated was communicated during the 2007 RDA proceeding. Please provide the reference to the quote.

If you have any further questions about our 2015 RDA, please let me know. And, as I have mentioned above, we would be pleased to receive any comments you have on the attachments to this letter by January 8, 2016.

Yours sincerely,

A handwritten signature in blue ink, appearing to read 'Keith Anderson', is written over a light blue horizontal line.

Keith Anderson
Vice-President, Customer Service

E-Plus Homeowners Group

Gary McCaig – 9277 Faber Road, Port Alberni B.C. V9Y 9C3 eplusbcgroup@gmail.com

September 4, 2015

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BC Hydro
6911 Southpoint Drive
Burnaby, BC V3N 4X8

Dear Mr. Anderson,

Members of our Group have received your letter dated August 26, 2015, regarding BC Hydro's proposal for the E-Plus rate that will be filed with the British Columbia Utilities Commission later this month. We were pleased to read that, after considering feedback from E-Plus customers and others, BC Hydro proposes to maintain the E-Plus rate.

You note that the feedback received from E-Plus customers included the fact that they had made significant financial investments to qualify for the rate and that they would be faced with significant bill increases if the rate is ended. You also noted the fact that as the vast majority of E-Plus customers are seniors the rate will naturally end over time.

I am sure that you also received extensive feedback stating that **BC Hydro should respect the written agreements they have with E-Plus customers.**

Your letter also states that you will apply to have the language that lays out the conditions for interruptions of E- plus supply changed from the current:

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1.

Attachment 1

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“the export market would be first to be cut off, then large industrial customers, then commercial and finally the homeowners”.

This understanding is important; it is one of the fundamental underpinnings of the E-Plus program, and has been communicated several times since the program was first introduced including at the 2007 BCUC hearings.

Can you assure us that the above priorities for interruptions would still apply?

We would appreciate a prompt reply to our questions as they will inform any submission the E-Plus Homeowners Group makes to the BCUC.

Thank you



R. Gary McCaig – for E-Plus Homeowners Group

c.c. Office of the Seniors Advocate
Office of the Ombudsperson

E-Plus Homeowners Group

Gary McCaig – 9277 Faber Road, Port Alberni B.C. V9Y 9C3 eplusbcgroup@gmail.com

December 1, 2015

Via Email – bhydroregulatorygroup@bhydro.com

Mr. Tom A. Loski
Chief Regulatory Officer
Regulatory and Rates Group
British Columbia Hydro and Power Authority
16th Floor – 333 Dunsmuir Street
Vancouver, BC V6B 5R3

Dear Mr. Loski:

Re: 2015 Rate Design Application

I am writing to bring to your attention what appear to be errors in the 2015 RDA filing document, as regards the input of the E-Plus Homeowners Group (EPHG), a registered intervener in the current BCUC proceedings, regarding the so-named “Option 3” for Residential E-Plus customers.

In the RDA filing BC Hydro describes Option 3 as amending the language of RS 1105 Special Condition 1 “*to provide a practical interruptible option*”. Option 3 was first presented to those homeowners affected, including members of EPHG, in a letter dated August 26, 2015.

EPHG responded promptly, with a letter signed by myself and dated September 4, 2015, a copy of which follows. This letter is referred to on page 5-56 of the RDA, which states

“In response, EPHG sent two e-mails on September 4, 2015 and a letter dated September 4, 2015 (copies found at Appendix C-3E) raising two issues with Option 3:”

This statement is incorrect. The letter from EPHG is not to be found in the Appendix named, or elsewhere in the RDA so far as I can determine. The two emails which are copied appear to be from an individual customer who did not identify himself as a member or spokesperson of EPHG and in fact is not known to EPHG.

The RDA goes on to identify two issues (purportedly) raised by EPHG as:

“1. Requesting that BC Hydro include in RS 1105 a statement that BC Hydro will not sell power outside of B.C. for six months prior to interrupting Residential E-Plus customers.”

“2. Asking BC Hydro to confirm the notice period for interruptions.”

Neither of these issues was raised by EPHG in the letter of September 4, 2015, or in other communications from the group; rather, they come from the emails sent by the individual mentioned above. The RDA responds to both these issues at some length, but does not acknowledge, respond to or address the different issues raised or the specific questions asked by EPHG regarding Option 3. In fact no response in any form has yet been received from BC Hydro to the EPHG letter of September 4, 2015.

In view of the very limited opportunities that E-Plus homeowners had to respond or give input on Option 3 prior to the RDA being submitted, we believe that it is both important and reasonable for BC Hydro to correctly acknowledge and address the issues raised by EPHG in regard to this option. We hope BC Hydro will do so in the near future.

Yours truly

Gary McCaig – E-Plus Homeowners Group

cc. - Erica Hamilton, Commission Secretary, British Columbia Utilities Commission

- Office of the Ombudsperson

Attachment - Letter from EPHG regarding "Option 3"

E-Plus Homeowners Group

Gary McCaig – 9277 Faber Road, Port Alberni B.C. V9Y 9C3 eplusbcgroup@gmail.com

September 4, 2015

Keith Anderson – Vice President Customer Service
BC Hydro
6911 Southpoint Drive
Burnaby , BC V3N 4X8

Dear Mr. Anderson,

Members of our Group have received your letter dated August 26, 2015, regarding BC Hydro's proposal for the E-Plus rate that will be filed with the British Columbia Utilities Commission later this month. We were pleased to read that, after considering feedback from E-Plus customers and others, BC Hydro proposes to maintain the E-Plus rate.

You note that the feedback received from E-Plus customers included the fact that they had made significant financial investments to qualify for the rate and that they would be faced with significant bill increases if the rate is ended. You also noted the fact that as the vast majority of E-Plus customers are seniors the rate will naturally end over time.

I am sure that you also received extensive feedback stating that **BC Hydro should respect the written agreements they have with E-Plus customers.**

Your letter also states that you will apply to have the language that lays out the conditions for interruptions of E- plus supply changed from the current:

“there is a lack of surplus hydro energy and the service cannot be provided economically from other energy sources”

to the following, or similar language:

“BC Hydro may interrupt service under this Rate Schedule in circumstances where BC Hydro does not have energy or capacity”

Although the change appears on the surface to be a minor one, and could be read to only relieve BC Hydro of the need to purchase energy to provide for E-Plus customers, we would like to understand it better.

Can you please explain more clearly why the language is being changed and the expected impact of that change? Specifically, what problem will be remedied by this change or what benefits will accrue to BC Hydro or its customers?

We are concerned by your statement that this change will ensure that the “rate was truly interruptible as was intended when the discount was offered”. This, as well as your statement that “the rate has never been interrupted because the Special Conditions attached to interruption are outdated”, could imply that BC Hydro feels that occasional interruptions are a necessary part of the rate structure, and that the proposed change is being made to create new or additional “opportunities” for BC Hydro to interrupt E-Plus. We hope this is not your intent. Interrupting home heating power to vulnerable seniors should not be taken lightly, and must be fully supported by the legitimate reasons on which the program was originally based. While we understand that the overall power supply situation in BC might have changed to the benefit of E-Plus customers since the introduction of the program, that does not justify changing the “rules” in any significant way. We also note that input from E-Plus customers has been neither asked for nor received on the proposed language change. We hope this indicates that the change is a minor one.

Can you assure us that the proposed language change is not a material one, and is not intended to create additional conditions under which BC Hydro can interrupt E-Plus power, beyond those specified and agreed to when the program was introduced?

We also wish to emphasize that beyond the language you have quoted that governs conditions for interruption, E-Plus customers have in the past been given additional assurances; specifically, we have been told:

“the export market would be first to be cut off, then large industrial customers, then commercial and finally the homeowners”.

This understanding is important; it is one of the fundamental underpinnings of the E-Plus program, and has been communicated several times since the program was first introduced including at the 2007 BCUC hearings.

Can you assure us that the above priorities for interruptions would still apply?

We would appreciate a prompt reply to our questions as they will inform any submission the E-Plus Homeowners Group makes to the BCUC.

Thank you

R. Gary McCaig – for E-Plus Homeowners Group

c.c. Office of the Seniors Advocate
Office of the Ombudsperson

British Columbia Utilities Commission Information Request No. 1.43.1 Dated: November 10, 2015 British Columbia Hydro & Power Authority Response issued December 18, 2015	Page 1 of 1
British Columbia Hydro & Power Authority 2015 Rate Design Application	Exhibit:

43.0 D. CHAPTER 5 – RESIDENTIAL RATE DESIGN

**Reference: Exhibit B-1, Application, Section 5.3 Residential Dual Fuel E-Plus Rate, pp. 5-54 to 5-56
E-Plus customers interruption notice**

BC Hydro favours amending RS 1105 Special Condition 1 to provide a practical interruptible option. As its business practice, one of the ways of notifying E-plus customers for interruption is “up to one week’s notice that an interruption event is likely to occur.”

1.43.1 Please provide an example of an *event* that will allow BC Hydro to provide up to one week’s notice to E-Plus customers regarding interruption.

RESPONSE:

It is envisioned that RS 1105, if the amendments are approved by the Commission, could be used during times of high load such as during cold weather events. Note that BC Hydro refined what it means by “up to one week’s notice”; BC Hydro is proposing two calendar days’ notice from the date of the issuance of the notice during a Period of Interruption (three calendar days’ notice including the day the notice issues) for E-Plus Residential customers to switch to their alternative back-up systems. The ability to provide two days’ notice strikes a balance between the ability to forecast the cold weather event in advance and the nature of the Residential E-Plus load.

BC Hydro received two letters from EPHG:

- Letter dated 4 September 2015 asking three questions (refer to Attachment 1 to this response). This IR response, together with the attachments, provides BC Hydro’s response to EPHG. BC Hydro shared a draft of this response with EPHG on 11 December 2015 [**NTD to insert EPHG feedback**];
- Letter dated 1 December 2015 (refer to Attachment 2). In that letter, EHG draws to BC Hydro’s attention an error at Exhibit B-1, page 5-56, lines 1-3. BC Hydro acknowledges it erred in conflating the EPHG 4 September 2015 letter and two e-mails of the same date which were not sent by EPHG but rather by two Residential E-Plus customers. BC Hydro’s amendment to Exhibit B-1, page 5-56 is found at Attachment 3 to this response.

BC Hydro attaches its proposed Residential E-Plus Interruption business practice which sets out the proposed notification process, and a supporting Question and Answer document, to this response as Attachment 4 and Attachment 5 respectively. [**NTD. Attachments not yet included, subject to feedback**]

Element	Business Practice/Rationale
<p>1. Compensation</p>	<ul style="list-style-type: none"> • Already provided for in current Residential E-Plus energy rate (Rate Schedule (RS) 1105) discount compared to the Residential Inclining Block (RIB) rate • Current RIB Step 1 price is 7.97 cents per kilowatt hour (/kWh) and RIB Step 2 price is 11.95 cents/kWh; RS 1105 energy rate is 5.22 cents/kWh • No business practice required
<p>2. Period of Interruption</p>	<ul style="list-style-type: none"> • Currently, there is no limit on months, days or hours of interruption during the year under RS 1105; "Period of Interruption" is defined as "[a] period during which a Customer is required by BC Hydro to cease the use of Electricity under this Rate Schedule" • Proposal: Confine interruptions to October to April period, to be refined through the Interruption Notice discussed below under Item #3 • Rationale: BC Hydro is a winter peaking utility, with Demand highest during the four months of November through February; there is also increased Demand during the 'shoulder months' of October, March and April. BC Hydro will not interrupt Residential E-Plus customers during the other five months of the year. This is also consistent with BC Hydro's industrial load curtailment pilot launched on 19 August 2015 • BC Hydro foresees that interruption of E-Plus Service may occur in response to system contingencies or conditions (e.g., need for capacity during four winter months of November- February); interruptions may be regional (Vancouver Island) or system-wide
<p>3. Notice</p>	<ul style="list-style-type: none"> • Currently, RS 1105 does not require notice; Special Condition 3 provides that "BC Hydro may interrupt the supply of Electricity by either manual or automatic means <u>or</u> by written notice by registered mail or and delivery to the Customer to cease the use of Electricity under this Rate Schedule" [emphasis added] • BC Hydro proposes the following sequence of three types of notice, each to be issued via auto-dialer (phone) or email: <ol style="list-style-type: none"> 1. Annual Reminder Notice – provided by BC Hydro each year in September, prior to the October-April period, to all Residential E-Plus Customers reminding Customers that an interruption of E-Plus Service may be applicable in that period. BC Hydro would also use the Annual Reminder Notice to ask Customers to provide their contact information (telephone, e-mail) to ensure BC Hydro's records are up to date 2. Interruption Notice - provided by BC Hydro that a Period of Interruption of E-Plus Service will start two (2) calendar days from the date of the Interruption Notice (the date of the auto-dialer (phone) and/or e-mail). Customers are obligated within two (2) calendar days

Element	Business Practice/Rationale
	<p>from the date of the Interruption Notice to switch to their alternative back-up heating systems;</p> <p>3. Interruption Closure Notice – provided by BC Hydro that the Period of Interruption is over and that no interruption of E-Plus Service will occur until another Interruption Notice is issued; upon receipt of the Interruption Closure Notice Customers may switch their heating systems back to BC Hydro-provided Service at any time. BC Hydro will not interrupt E-Plus service as of the date that the Interruption Closure Notice was issued (the date of the auto-dialer (phone) or e-mail)</p> <ul style="list-style-type: none"> • Note that there is no limit to the number of Interruption Notices BC Hydro can issue during the October-April period • The duration of an interruption is the period between two (2) calendar days from the date of the Interruption Notice and the date of the Interruption Closure Notice – the duration could be days or weeks or months • Rationale: Residential E-Plus Customers have asked BC Hydro to clarify how BC Hydro would implement RS 1105 if the changes proposed in the 2015 RDA are set by the Commission, and in particular how much notice would be provided and how long interruptions would last. The above notice provisions strike a balance between the utility needing to derive some value from E-Plus interruptible Service, the realities of notice preparation time (about 1 day for auto-dialer or e-mail) and the need to give Residential Customers reasonable time to switch to their alternative back-up heating systems
<p>4. Interruption Mechanism</p>	<ul style="list-style-type: none"> • Physical interruption of E-Plus Service when required will be implemented through remote disconnection or manual disconnections by BC Hydro • Rationale: This is permitted per existing Special Condition 3 of RS 1105 (remote disconnection is disconnection by ‘automatic means’; Special Condition 3 also permits disconnection by manual means)
<p>5. Non-performance</p>	<ul style="list-style-type: none"> • Where BC Hydro has not physically disconnected an E-Plus customer’s service, customers using Electricity for heating during a Period of Interruption as defined through the Interruption Notice-Interruption Closure Notice period described in Item #3 above will be charged the higher 30.37 cents/kWh energy rate set out in the ‘Rate’ clause of RS 1105 as permitted by existing Special Condition 3 of RS 1105 • The E-Plus customer may be removed from E-Plus service if such usage occurred. • BC Hydro will measure Customers’ consumption during Periods of Interruption for the purpose of ensuring compliance or enforcing non-performance

1. Under what conditions could BC Hydro interrupt E-Plus service?

Under BC Hydro's proposed amendments to the Residential E-Plus rate, filed with the British Columbia Utilities Commission as part of the 2015 Rate Design Application, BC Hydro may interrupt E-Plus service if we do not have sufficient energy or capacity to serve the demand of our customers.

'Energy' is the total power we supply over a period of time and 'capacity' (or peak) is the maximum power we provide at a point in time.

The availability of capacity to serve all our customers may be limited during periods when it is very cold and customer demand is therefore very high.

2. Over what period of time could BC Hydro interrupt E-Plus service?

BC Hydro's intention is to limit any interruption of E-Plus service to occur during the consecutive seven (7) months of October through April.

Customer demand for electricity is highest during the four (4) months of November through February. We also experience increased customer demand during the 'shoulder months' of October, March and April.

BC Hydro will not interrupt Residential E-Plus customers during the other five (5) months of the year.

3. How will E-Plus customers be notified that their service will be interrupted?

We will notify E-Plus customers that a period of interruption is commencing by contacting customers by phone (automated messaging) and/or by email.

It is therefore very important for E-Plus customers to ensure that we have their up-to-date contact information.

Customers who do not provide appropriate contact information may be subject to service interruption without notification.

Please contact us at 1 800 BCHYDRO (1 800 224 9376) to provide us any updates to your contact information.

4. What is the form of notification of an E-Plus service interruption?

There will be three types of notification:

First, an Annual Reminder Notice will be provided each year, likely sometime in September before the October to April period, reminding all E-Plus customers that interruptions are possible in the coming months. An Annual Reminder Notice is a courtesy notification and will not trigger a Period of Interruption. Failure by BC Hydro to deliver an Annual Reminder Notice will not affect its ability to interrupt service.

Second, an Interruption Notice will be provided at any time during October through April if we decide that an E-Plus service interruption is required (due to an impending cold weather snap, for example). Each Interruption Notice will relate to a specific Period of Interruption and give notice of the start of the Period of Interruption.

Third, an Interruption Closure Notice will be provided as necessary when we determine that an interruption of E-Plus service is no longer required. The Interruption Closure Notice will be issued to all E-Plus customers who received the Interruption Notice and will confirm the [date/time] of termination of the Period of Interruption.

5. What should E-Plus customers do in response to an Annual Reminder Notice?

E-Plus customers should ensure that their back-up heating systems are in proper working order with an adequate supply of fuel.

E-Plus customers should also check that their contact details (phone, address and email, if applicable) are up to date with BC Hydro to ensure they will receive interruption-related notices.

6. What should E-Plus customers do in response to an Interruption Notice?

E-Plus customers must switch from using their electric heating to their back-up heating system within two (2) calendar days from the date of the Interruption Notice.

For example, if the date of the Interruption notice is November 14, 2016, E-Plus customers must switch from using their electric heating to their back-up heating system before the end of the day on November 16, 2016. The Period of Interruption would start on November 17, 2016.

Advance notice of a Period of Interruption period is intended to allow sufficient time for E-Plus customers to switch from electric heating to their back-up heating systems.

7. What should E-Plus customers do in response to an Interruption Closure Notice?

E-Plus customers may switch from using their back-up heating systems to electric heating upon receipt of an Interruption Closure Notice.

8. How long will a Period of Interruption last?

The duration of a Period of Interruption will depend on need – it could be days, weeks or months.

A Period of Interruption begins two (2) calendar days from the date of an Interruption Notice and ends on the date of the Interruption Closure Notice.

We will not interrupt E-Plus service after the date of the Interruption Closure Notice without issuing another Interruption Notice.

9. How will BC Hydro actually interrupt E-Plus service?

If necessary, we can interrupt the E-Plus service by remote or manual disconnection of customers' meters.

An actual physical disconnection of service may not be necessary following an Interruption Notice because customers will have switched from their electric heating to their back-up heating system. In other words, once customers have made the switch to their back-up heating systems, the electricity supply provided by BC Hydro is in effect already interrupted for BC Hydro's use to serve other customer demand as needed. If a customer fails to switch to their back-up heating system when notified they will be subject to the E-Plus exception rate (currently 30.37 cents per kilowatt hour) for any consumption during the Period of Interruption.

10. What would happen if an E-Plus customer did not switch to his or her back-up heating system upon receiving an Interruption Notice?

If we don't physically disconnect an E-Plus customer's service and that customer continues to use electric heating 2 calendar days from the date of the Interruption Notice, we will charge that electric usage during the interruption at the E-Plus exception rate, which is currently 30.37 cents per kilowatt-hour.

The E-Plus customer may be removed from E-Plus service if such usage occurred.

11. At any time can an E-Plus customer decide to move off of E-Plus service and have their heating service billed at standard rates, rather than respond to an Interruption Notice as required?

Yes. E-Plus customers may decide to move off E-Plus service and have their heating service billed on the applicable residential rate which in most cases will be the Residential Inclining Block rate. This would be a permanent move and the E-Plus rate would no longer be available going forward.

12. Will all other Residential electric service continue as normal in the event of an E-Plus interruption?

Yes. The electricity for your heating under the E-Plus service is available to be interrupted. All other use of BC Hydro electricity will continue to be supplied by BC Hydro and billed at standard rates during a Period of Interruption.

**[Sample Annual E-Plus Reminder]**

JOHN DOE
1234 ANYNAME ST
ANYTOWN BC V6B 5A1

September 13, 2016

Account Number: 1234 567
Service Address: 1234 ANYNAME ST, ANYTOWN BC V6N5A1

Dear Customer,

Winter is approaching, and between October 1, 2016 and April 30, 2017 we may need to interrupt your E-Plus service. Please check that your back-up heating system is working, and that you have an adequate supply of fuel.

You'll be notified before an interruption

The E-Plus rate is lower than the standard residential rate because it is interruptible if we don't have enough energy or can't meet capacity. 'Energy' is the total power we supply over a period of time and 'capacity' (or peak) is the maximum power we provide at a point in time.

If this situation occurs this winter, you'll receive a phone call and/or email two (2) calendar days before we begin the E-Plus interruption period. Make sure you're ready to turn off your electric heating system and switch to your back-up heating system.

We may not disconnect your E-Plus service during the interruption period, but to avoid being charged the E-Plus exception rate, currently 30.37 cents per kilowatt hour, make sure you don't use your electric heating system during that period.

We'll notify you when the interruption period ends and you can start using your E-Plus service again.

Make sure your back-up heating system is ready

To remain eligible for the E-Plus rate you have to maintain a back-up heating system that will replace your electric heating system during an interruption period.

You can switch to a standard residential rate, which is not interruptible, at any time.

Do we have your contact information correct?

Please check that we have your correct contact information. If the information below is incomplete or incorrect, contact us immediately.

Phone: 1 250 123 1234 and 1 250 111 2222
Email: johndoe@email.com

Where can you get more information?

If you need to update your contact information, have questions about your E-Plus service, or want to switch to a standard residential rate, call us at 1 800 BCHYDRO (1 800 224 9376).

Sincerely,

BC Hydro Customer Service

bchydro.com



[Sample Interruption Notice]

October 23, 2016

Dear Customer,

Your E-Plus service interruption period starts on October 26, 2016

From 12:00 a.m. on October 26, 2016 your E-Plus service will be interrupted. Please make sure you switch over to your back-up heating system before then.

Make sure you're ready

Please take a few moments now to ensure that your back-up heating system is working and that you have a good supply of fuel.

Before October 26 you'll need to turn off your electric heating system and switch on your back-up heating system.

What can you expect during the interruption period?

Your E-Plus service may be disconnected any time from October 26 until you receive notice that the interruption period is over.

Although your service may not be disconnected, you should make sure you're not using your electric heating system during the interruption period to avoid being charged the E-Plus exception rate, currently 30.37 cents per kilowatt hour.

You'll be notified when the interruption period ends

We'll contact you again once the interruption period ends and you can resume using your E-Plus service.

Thank you for your cooperation during the interruption period. If you have any questions, please call us at 1 800 BCHYDRO (1 800 224 9376).

Sincerely,

BC Hydro Customer Service



[Sample Interruption Closure Notice]

November 9, 2016

Dear Customer,

The E-Plus service interruption period has ended and you can now switch on your E-Plus electric heating system. Thank you for your cooperation during this interruption period.

If we need to begin another interruption period before April 30, 2017, you'll receive a phone call and/or email two (2) calendar days before the interruption period begins.

Please continue to make sure your back-up heating system is working, and has an adequate supply of fuel.

If you have any questions about your E-Plus service or other BC Hydro services, call us at 1 800 BCHYDRO (1 800 224 9376).

Sincerely,

BC Hydro Customer Service

SAMPLE

E-Plus Homeowners Group

Gary McCaig – 9277 Faber Road, Port Alberni B.C. V9Y 9C3

eplusbcgroup@gmail.com

January 5, 2016

Via Email – bhydroregulatorygroup@bhydro.com

Mr. Keith Anderson
Vice President, Customer Service
British Columbia Hydro and Power Authority
16th Floor – 333 Dunsmuir Street
Vancouver, BC V6B 5R3

Dear Mr. Anderson:

Re: BC Hydro’s E-Plus Proposal, 2015 Rate Design Application

Thank you for your letter of December 15, 2015, offering the E-Plus Homeowners Group (EPHG) the opportunity to provide input on the “Business Practice” that would govern how Residential E-Plus interruptions would work in practice, including the form and timing of notices of interruptions, as well as on your draft Question and Answer (Q & A) document which provides additional details on this matter.

EPHG opposes BC Hydro’s proposal to change the wording of the “Special Conditions” of Rate Schedule 1105. It is clear from your letter that this change is intended to expand the parameters under which Hydro may interrupt Residential E-Plus service beyond those stated and understood when the E-Plus program was introduced. Our position continues to be that so long as E-Plus customers fulfill their responsibilities under the E-Plus agreements then BC Hydro should supply them with power according to its original agreements and previously stated commitments.

Our following input on the issues raised in your letter is made without prejudice to that position.

EPHG Input on Proposed Residential E-Plus Interruption Business Practice

The views of our members on “Business Practice” and other aspects of the E-Plus program, are based primarily on specific assurances and commitments made to customers in writing at the time the program was introduced and upon which they based their decision to join the program. In this letter I make reference to some of those and have attached the supporting documents

where they may not be readily available to BC Hydro. The draft Business Practice and Q & A documents appear to ignore several of the original terms of the E-Plus program.

The following is the EPHG input relating to each of the “Elements” of the proposed Business Practice; this will also apply to the related parts of the Question and Answer document.

Element 1. Compensation

We note that current E-Plus rates as stated are in accordance with past commitments that they would never exceed two thirds of the “regular” price of electricity.

Element 2. Period of Interruption

Summary of EPHG Input

- provide a clear statement that interruptions will occur only during the specific periods, and in those service areas, where the need can be demonstrated
- provide a clear statement that residential E-Plus customers have priority over other non-firm (surplus) customers and that this will be reflected in forward planning

Rationale

The proposed Business Practice and Q&A document should be revised and expanded to better reflect the specific conditions that determine when residential E-Plus power may be interrupted.

Obviously interruptions will be closely examined by those affected as well as by third party observers, and will potentially be contentious. If done improperly or unnecessarily there could be serious human, social, environmental and political repercussions, and clearly these would increase exponentially with the length of time of the interruption.

At the time the E-Plus program was introduced two types of potential interruptions were recognized. The BC Hydro publication titled “Electric Plus Heating Program – October 1987” (Attachment 1), which is typical of the material provided those who joined the program, referred to the possibility of long-term interruptions, “*when reservoir levels are low*”, and brief interruptions for a, “*few hours during peak daily use periods*”. The written agreements made with individual homeowners also made the distinction between “*infrequent interruptions of long duration*” and “*interruptions of short duration (usually only hours)*”.

The most critical elements that EPHG expects to see included in any statement or explanation of the Business Practice regarding interruptions are:

- that there is a clear and demonstrable lack of surplus power (energy or capacity), that is, power beyond that needed to service firm power customers, during the full period of the interruption and for the specific service area to be affected, and

- that BC Hydro respect their commitment that Residential E-Plus customers will have a priority position among non-firm customers.

There is no reference to either of these in the Proposed Business Practice or Q & A documents.

The “priority” position of residential E-Plus has been a key element of the E-Plus program from its beginning. Attachment 1 includes the statement “***Residential customers will be given priority over other surplus energy customers and will not be interrupted to export surplus interruptible energy***”. (Note – EPHG understand the word “export”, in this context, to mean sales outside of BC Hydro’s normal service area in British Columbia). An even more specific statement regarding priority was given by the Honourable Jack Davis, Minister of Energy, Mines and Petroleum Resources, to the Provincial Legislature on May 25, 1987 (Attachment 2 – excerpt from Hansard) who in regard to potential interruptions of E-Plus service stated: “***Obviously, the export market will be the first to be cut off, then large industrial customers here, then commercial and finally the homeowner, if there is indeed a shortage of energy.***” Minister Davis’s words clearly defined the commitments made at the time of the introduction of the E-Plus program and the understanding of those who joined it and those who approved it.

Additionally, when I testified before the BCUC, on behalf of the EPHG, at the time of the 2007 RDA I spoke of this order of priority, and there were no questions or challenges raised by the BCUC panel members, by BC Hydro or their counsel, or by any of the other parties present, to that part of my testimony.

Priority can only be assured if BC Hydro makes a reasonable attempt to manage export/surplus sales with a view to what effect these will have on power availability in the foreseeable future. For example, it would not be acceptable to knowingly allow reservoir levels to be depleted by such sales when this could reasonably be foreseen to result in future shortages leading to interruptions of residential E-Plus.

Giving priority to residential E-Plus customers, in addition to being a commitment by BC Hydro and the Government of British Columbia, makes practical sense for a number of reasons, including:

- the total amount of power consumed under the residential E-Plus program is very small compared to other customer segments, and continually getting smaller, and only in the most extreme cases could it be demonstrated that there was a need to curtail this because of insufficient energy or capacity
- residential E- Plus customers are the most unsophisticated and vulnerable of non-firm power customers and do not have the technical, legal or business expertise to monitor interruptions, export sales, the conditions that led up to a lack of surplus or to otherwise ensure that agreed upon practices are being followed

- giving proper notice of interruption to 8000 individual residential customers will be problematic
- there could be serious, unintended social and human cost attached to interruptions; as an example, it would be socially and politically unacceptable for senior citizens, in Northern communities to be chopping wood in the snow to feed backup heating systems, or sitting in the cold because of unexpected problems with their backup systems, while non-firm power was being exported or supplied to industrial or commercial customers
- there will be an environmental impact from residential interruptions as these will result in greater use of fossil fuel, and in some communities air quality may become a contentious issue due to increased wood burning

Element 3. Notice, and Element 4. Mechanism of Interruptions

Summary of EPHG input

- 30 days notice should be given of any interruption longer than 3 hours.
- individual customers should be asked to specify their preferred means of communication for notice of interruption which can be registered mail, telephone or email.
- BC Hydro should engage E-Plus customers in an open and constructive dialogue to develop an effective way for them to participate in necessary demand management through short term interruptions of 3 hours or less.

Rationale

The suggestion that two days is an adequate notice period for long term interruptions is unreasonable and unacceptable. The BC Hydro publication identified as Attachment 1 stated that notices would be “**well in advance**”. Another BC Hydro publication “Electric Plus – Question and Answer Guide – September 1989” (Attachment 3) which was submitted by BC Hydro as evidence in the 2007 RDA was more specific, stating “**A minimum of 30 days notice will be given for long-term interruptions.**” This was confirmed in a letter from John Sheehan, Vice President Customer Service of BC Hydro dated October 17, 1990, which stated “**You will be given at least 30 days notice of any interruption.**” A 30 day period of notice is therefore well established and additionally is fully justified for a number of reasons, including:

- E-Plus customers might be travelling, hospitalized, working away from home or otherwise be unavailable to receive and promptly react to a shorter notice period
- BC Hydro has established harsh consequence for those who do not properly react, charging the punitive rate of 30.37 cents/kW hour for power used during interruptions and/or permanently removing the customer from E-Plus service

- if extended curtailments were initiated automatically or manually by Hydro, and a customer not properly informed, there would be risk of substantial property damage or in the worst case health consequences for the homeowner, due to unavailability of heat

Any suggestion that BC Hydro can avoid the specified 30 day notice period by giving a form of “reminder notice” at the beginning of the heating season followed by an interruption notice only two days in advance is unacceptable being nothing more than an “end run” on previous commitments.

For short term interruptions of a few hours made necessary by high demand, EPHG recognize that a 30 day notice is neither practical nor appropriate. The publication provided as Attachment 1 states “*Brief interruptions for a few hours during peak daily use periods may sometimes occur without notice in some areas if required to maintain the supply of firm electricity*”. EPHG suggest a reasonable definition of “short term interruptions” would be those of 3 hours or less. E-Plus homeowners are well positioned to manage such short interruptions of their E-Plus service and potentially these might be done remotely by BC Hydro or in the home through the use of e.g. programmable thermostats. Focusing constructively on this aspect of the E-Plus program might be the best opportunity for BC Hydro to realize benefits from the program while respecting their commitments to E-Plus customers.

Element 5. Non Performance

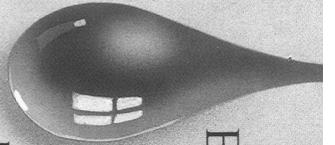
No comments

In conclusion, as a Crown Corporation there is a particular obligation on BC Hydro to act in good faith in its dealing with its customers and the citizens of British Columbia. This obligation requires honouring its agreements with E-Plus customers and keeping the commitments made to those customers at the time they were making their decision to invest in the program. In 1987 Minister Davis gave assurances to British Columbians in regard to the E-Plus program, as follows: “*British Columbia Hydro has devoted some nine months to the establishment of this rate, ----- our public power company knows what it is doing.*” (Attachment 2). It would be unconscionable for BC Hydro to now ask the British Columbia Utilities Commission to facilitate their abandoning their obligations to residential E-Plus customers.

Yours truly,

R. Gary McCaig – for E-Plus Homeowners Group

cc. Erica Hamilton – Secretary, British Columbia Utilities Commission



Electric Plus is Surplus Energy

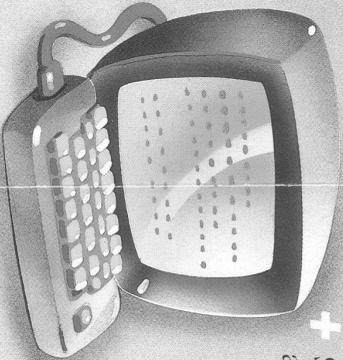
Electric Plus costs less because it is surplus energy, available when there is more than enough water in our reservoirs to provide electricity for the basic needs of British Columbia homes and industry. It is secondary energy, a byproduct of firm hydroelectric generation, and can be supplied without more dams being built.

Surplus secondary energy formerly could only be exported, or else the extra water had to be spilled if there was no market for the energy. Electric Plus now lets B.C. residents and businesses share directly in the benefits of this low-cost energy while developing a stable market for it.

Residential customers will be given priority over other surplus electricity customers and will not be interrupted to export surplus interruptible energy.

Electric Plus is a permanent program, but the number of customers on the special rate will be limited to match the amount of surplus available. This will ensure that each Electric Plus customer gets enough low-cost energy to repay conversion costs and keep saving year after year.

Electric Plus is not available in areas served by local fuel-fired generating plants, nor to customers who now heat with natural gas.



Start Saving Now with

Electric Plus

Your local Hydro office and electrical and heating contractors can help you start saving money with Electric Plus.

The people at your Hydro office can:

- + Give you a computerized analysis of your possible savings.
- + Provide additional literature and technical advice.
- + Sign you up for the Electric Plus service and rate.

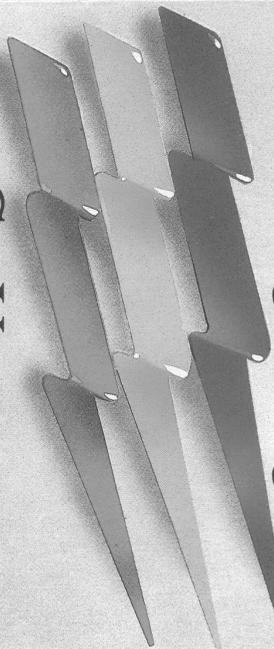
Your local contractor can:

- + Recommend the best type of heating system for your home or business.
- + Give an estimate of conversion installation costs. We suggest getting at least two estimates before deciding on a contractor.
- + Sign you up for low-interest B.C. Hydro financing.



8710-50M

Electric Plus Heating Program



Cut Your Heating Costs up to

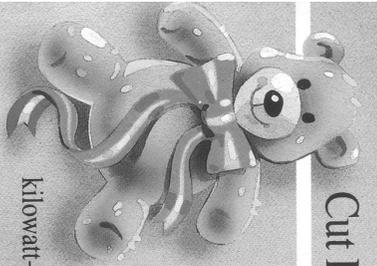
12

if you now use oil or propane



October 1987

Cut Heating Costs up to 50%



Our Electric Plus program can cut your fuel bills as much as 50% if you now heat with oil or propane.

Add electric heating, with your fuel-fired system as a back-up, and you can qualify for the low Electric Plus rate of 2.5¢ per kilowatt-hour (kW.h).

Since the surplus energy that makes Electric Plus possible is not always available, you'll need to keep your present heating system in good working order to take over when necessary. Back-up systems must use fuels stored on your property. Many can be designed to take over automatically when Electric Plus is interrupted.

You'll save an estimated \$200 to \$450 a year over oil or propane on space heating, and another \$110 to \$130 in water heating if you add Electric Plus there too.

We will finance up to \$2,500, at the special interest rate of 8½%, on approved credit. This will more than cover the entire cost of converting to dual-fuel Electric Plus, in most cases. And it's conveniently repayable on your Hydro bill.

Businesses can save, too. The same rate of 2.5¢ a kW.h applies to the first 8,000 kW.h a month, reducing to 1.8¢ for any additional consumption. Our special financing is also available, with maximum commercial loans based on estimated revenue.

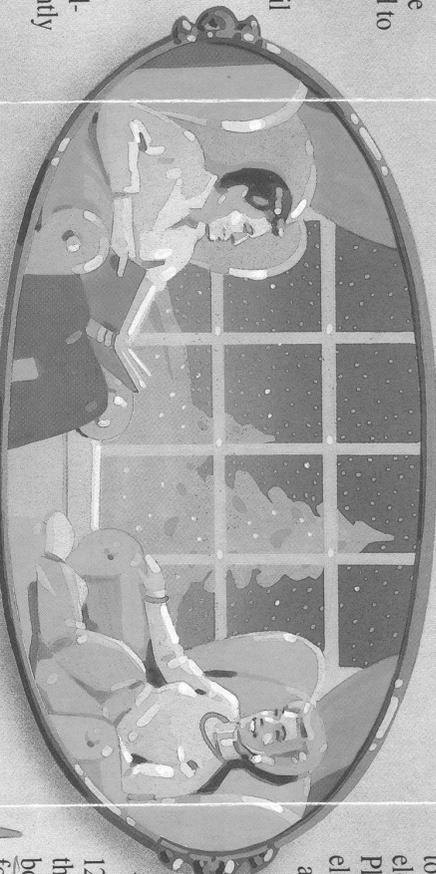
If you already have dual-fuel electric heat, or now heat with wood or coal, you may also be eligible for the Electric Plus program. If you now heat with electricity only, you may find it worthwhile to install a fuel-fired back-up system under certain conditions. Heating contractors can offer guidance and an appraisal of the cost and savings.

Special Low Rate

Cut your fuel bills by up to 50% with the dual-fuel rate of 2.5¢ a kW.h

Modern Electric Heat

Enjoy clean, quiet, 100% efficient electric heat, with zone control options



How Electric Plus Works

When you convert to dual-fuel Electric Plus, the electricity you use for heating will be metered separately from other electricity use, so it can be billed at the special rate, which we expect will remain fixed until at least March 31, 1991. Even after that, Electric Plus will cost substantially less than your other electricity.

The cost of converting will usually range from \$1,300 to \$2,800. Select from several ways to heat electrically, as described in our pamphlet "Electric Plus Heating Systems." If you already have dual-fuel electric heat, you can install Electric Plus for as little as \$500 to \$1,000.

Your back-up system can be oil, propane, butane, wood or coal, but it must be able to take over heating of the entire area served by Electric Plus when it's necessary to interrupt the latter.

We intend to limit interruptions to no more than 120 days in total prior to March 31, 1991. After that they will still be kept to a minimum, because it's in both your interest and ours to have Electric Plus used for heating whenever there is surplus energy.

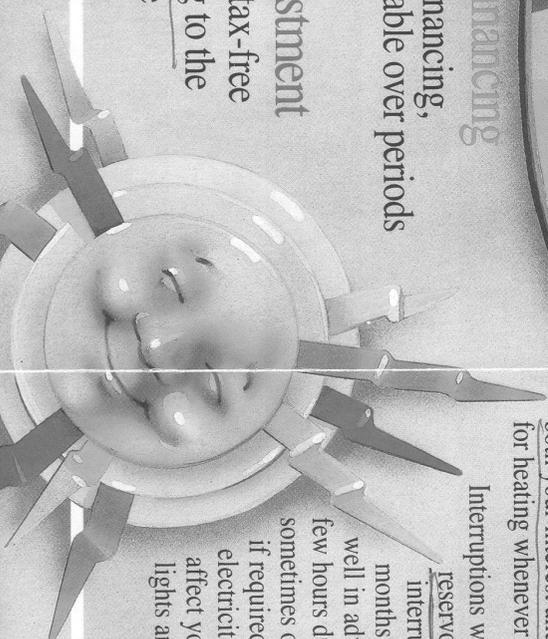
Interruptions will sometimes be necessary when reservoir levels are low. These interruptions may last for several months or more, but you'll be notified well in advance. Brief interruptions for a few hours during peak daily use periods may sometimes occur without notice in some areas if required to maintain the supply of firm electricity. Neither type of interruption will affect your other electricity use, such as lights and appliances.

Low-interest Financing

Use 8½% Hydro financing, conveniently repayable over periods up to 4 years

Return on Investment

Earn an attractive, tax-free return while adding to the value of your home



Hansard: Monday May 25, 1987 Afternoon sitting

INTERRUPTIBLE POWER TO VANCOUVER ISLAND

MR. G. HANSON: My question is to the Minister of Energy, Mines and Petroleum Resources. As all members of the House know, in every provincial election since about 1960, the people of Vancouver Island have been promised cheaper energy in the form of natural gas through a pipeline. The present minister was a rational voice, in the sense that he always stated that the Cheekye-Dunsmuir had capacity to bring space-heating over to Vancouver Island and put us in the same status as our friends on the mainland who are on the natural gas pipeline. On Friday the minister announced that there would be power coming to Vancouver Island at discount rates, but the switch is going to flick off and on. Why are we getting interruptible power?

HON. MR. DAVIS: The policy announced on Friday had previously been cleared by the B.C. Utilities Commission for fairness across the province and cost recovery. There is energy currently available; surplus, in other words, which won't be available indefinitely. This surplus energy is being made available province wide, on the same basis on the Island, for example, as on the mainland. From time to time there will be surplus energy. This energy is priced lower than firm energy. It's half-price energy, but it can't be guaranteed all the time. Hence the interruptible nature of the service and the lower price.

MR. G. HANSON: Mr. Speaker, the minister talks about fair application across the province. Hydro officials tell us that once the program reaches 60,000 household subscribers, it'll be cut off. There are approximately 200,000 households that would want to participate on Vancouver Island alone, Mr. Minister.

My question relates to the fact that as the price for our export sale of surplus power increases as the spot market goes up, our industrial customers here in the province of British Columbia can be cut off. Why would you want to afford that opportunity for industrial customers across the line to get an advantage of surplus power and cut off our own Canadian industrial and commercial customers?

HON. MR. DAVIS: Mr. Speaker, that's a strange interpretation. **Obviously the export market will be the first to be cut off, then large industrial customers here, then commercial and finally the homeowner, if there is indeed a shortage of energy. But the priorities are well established,** and they're the reverse of those suggested by the hon. member.

MR. G. HANSON: The point is that the people of Vancouver Island and everywhere in this province who are not on natural gas want firm juice; they want firm power, Mr. Speaker. The conditions that have been put on this program, in terms of providing a backup heating source.... For example, if you have an electrical furnace or heat system in your house, you have to install an oil system to take advantage of it. Our numbers are that the amortization or payback period for a subscriber.... It would take an average of

eight years before you'd start to make that up. Why don't you go on to firm juice for the people of this province?

HON. MR. DAVIS: Customers who have a firm supply have to pay for a firm supply, which is a higher price than the interruptible service. Everyone has the opportunity to put in an alternative system. It may be expensive in some cases and very low-cost in others. The low-cost alternatives, particularly in the outlying areas of the province, are the most attractive economically, and they'll be served first.

There may well be as many as 100,000 customers taking advantage of these rates within three or four years' time; I think that Hydro will find it has other surpluses, and the number may be 200,000 within the decade.

MR. G. HANSON: Supplementary, Mr. Speaker. With the amount of surplus electric power available within British Columbia that could be given to Vancouver Island on a firm basis, the pipeline on the lower mainland and so on — that's not on an interruptible basis; that's firm — will you not give the people of Vancouver Island and the other unserved areas firm power on the same basis that they get firm natural gas?

MR. STUPICH: Supplementary question to the same minister, Mr. Speaker. With one set of transmission lines, how do you interrupt the power to one of two meters?

HON. MR. DAVIS: B.C. Hydro has devoted some nine months to the establishment of this rate, the manner in which interruptions will take place, the two to three months' advance notice for disconnection and so on. The hon. member can rest assured that our public power company knows what it's doing.

Note – Highlighting added by EPHG

BC hydro
Electric
Plus

**Question
and
Answer
Guide**

BC hydro



proud of our Service

Page 1 of 6

September 1989

29. Q. When will service interruptions occur?

A. Minimal interruptions (maximum of 120 days) will occur before March 31, 1991. Interruptions will occur when there is not enough water in our reservoirs to meet B.C.Hydro's basic electricity commitments. A minimum of 30 days' notice will be given for long-term interruptions.

30. Q. How are customers interrupted?

A. During the initial period, B.C.Hydro will be interrupting residential customers by manually operating a switch located on the outside of the house. However, B.C.Hydro reserves the right to interrupt by serving notice to the customer that an interruption is scheduled and asking the customer to operate the disconnect switch himself. This is the same method used for commercial and industrial customers.

31. Q. During an interruption, what stops a customer from switching to firm electricity?

A. The customer signs a Service Agreement assuring B.C.Hydro that he will not switch the load from the Electric Plus program to a firm load during interruptions. B.C.Hydro will be able to detect such a change by noting the significant increase in the firm load of the residence following an interruption. Should a customer try to attempt what is contravention of the terms of the Agreement, B.C.Hydro will discontinue the supply of electricity under the reduced rate schedule and bill the estimated unauthorized consumption at the rate specified during a period of interruption (15¢/kW.h). B.C.Hydro has the right to inspect premises to ensure that only authorized loads are connected to Electric Plus and that they are not switched to firm during an interruption.

1. Q. What is meant by *dual fuel*?

A. A dual fuel heating system consists of an electric heating system with an oil, propane, butane or solid fuel back-up system, which takes over the heating function when the supply of electricity is interrupted.

2. Q. What is meant by *interruptible electricity*?

A. It is surplus secondary electricity offered to customers at a reduced rate, the supply of which can be interrupted during periods when no surplus secondary energy is available. B.C.Hydro will not build new dams to supply this interruptible energy.

3. Q. What is *firm electricity*?

A. This is your normal electricity supply from B.C.Hydro. It is always available except during a system failure or planned short-term outages, sometimes required to facilitate system modifications.

4. Q. What are the typical costs and benefits?

A. The benefits depend directly on the amount of fuel displaced by the low-cost electricity. If the customer can provide his current oil consumption, B.C.Hydro can estimate the benefits he will receive. The cost of the installation depends very much on the present wiring in the customer's home and the type of system he chooses to add. B.C.Hydro's recommendation is that two or three quotes be obtained from different contractors who can advise on the most suitable type of equipment needed for conversion to Electric Plus. Most customers should be able to convert to Electric Plus for less than \$2,500 and will be able to save \$200 to \$400 annually. Savings will be even greater in the colder regions.



Keith Anderson
Vice-President, Customer Service
Phone: 604-699-9097
Keith.Anderson@bchydro.com

January 27, 2016

E-Plus Homeowners Group (EPHG)
c/o Gary McCaig
9277 Faber Road
Port Alberni, BC V9Y 9C3

Dear Mr. McCaig

Re: BC Hydro's E-Plus Proposal – 2015 Rate Design Application (RDA)

Thank you for your letter of January 5, 2016 offering input on our proposed E-Plus Interruption Business Practice, for which I requested your feedback in my letter dated December 15, 2015. I'm writing to you to discuss the issues you raised.

I understand that the EPHG and many E-Plus customers maintain the perspective that the E-Plus rate is a contract between BC Hydro and customers and that BC Hydro's business practices are bound by prior discussions on the notice period and the priority of interruptions.

As you are aware, this issue was reviewed fully by the British Columbia Utilities Commission (BCUC) in the 2007 RDA proceeding. In its 2007 RDA Decision, page 133, the BCUC determined that it was "not persuaded by the E-Plus Group's argument that its members have "contracts" with BC Hydro that the Commission has limited jurisdiction to abrogate, or that those contracts are everlasting in nature with a guaranteed price cap. ... The Commission Panel is of the opinion that it had the jurisdiction to find Rate Schedules 1105 and 1205 to be in the public interest in 1987, to amend them in the public interest in 1992 and that that jurisdiction remains."

BC Hydro agrees with this determination and, by extension, also believes the internal rules how and under what conditions E-Plus service interruptions would work can change to reflect current needs and capabilities.

It's on this basis that BC Hydro reviewed the Residential E-Plus rate in the 2015 RDA stakeholder engagement process. Accordingly, the proposed E-Plus rate and the Interruption Business Practice align the discounted rate with a service that provides a flexible option to respond to system or localized constraints when circumstances require.

Overall, BC Hydro believes your suggestions would limit the flexibility of BC Hydro to interrupt E-Plus service in much the same way as the current Rate Schedule (RS) 1105 does, to the extent that it would remain impractical to ever interrupt E-Plus service. I ask for your further consideration and feedback on these issues as addressed individually below.



1. Compensation

EPHG notes “that current E-Plus rates as stated are in accordance with past commitments that they never exceed two-thirds of the “regular” price of electricity.”

BC Hydro’s proposed pricing principles for F2017 to F2019 are to apply rate increase percentages equally to all Residential rate components (e.g. Step 1 and Step 2 of the RIB rate), as well as to the Residential exempt flat rate and the E-Plus rate. Under these principles the current E-Plus rate of 5.22 cents/kWh:

- Would continue to be less than two-thirds of the Step 2 rate (7.97 cents/kWh in F2016); and
- Would be less than an equivalent residential flat rate (Rate Schedule 1151) for the F2017 to F2019 period (6.37 cents/kWh).

BC Hydro cannot commit or guarantee that the E-Plus rates will never exceed two-thirds of the “regular” price of electricity. As noted above, the BCUC has determined it has the jurisdiction to amend Rate Schedules 1105 and 1205. Therefore, the E-Plus rate could exceed two-thirds of the “regular” price of electricity if the BCUC determines that changes are appropriate.

2. Period (and Priority) of Interruption

EPHG states that the business practice should include a statement or explanation that “there is a clear and demonstrable lack of surplus power (energy or capacity), that is, power beyond that needed to service firm power during the full period of the interruption and for the specific area to be affected”. EPHG also states “that BC Hydro should respect their commitment that Residential E-Plus customers will have a priority position among non-firm customers”, noting that this has been a key element and commitment of the E-Plus program from its inception. BC Hydro believes that the suggestion above would limit the flexibility to interrupt E-Plus service in much the same way as the current rate schedule does.

Currently, under Special Condition 1 of RS 1105, BC Hydro has the right to interrupt the supply of electricity whenever there is a lack of “surplus hydro energy” and “the service cannot be provided economically from other energy sources”. This is different language than typical interruptible rate provisions that require BC Hydro to provide service only when it has available energy and capacity to do so. As a result of Special Condition 1 BC Hydro has never interrupted E-Plus load.

As noted in my letter of December 15, 2015, there currently isn’t an established hierarchy of interruption for non-firm service, and BC Hydro does not agree one should exist. BC Hydro separately assesses each situation under which electricity, be it energy or capacity, may be limited, taking into account factors such as the size and regional extent of the system issue or constraint. For example, it would be impractical and therefore unlikely to interrupt E-Plus for periods of very short duration, such as a few hours, as may be required in response to a generation unit forced outage. However, interruption of E-Plus could be practical and useful in response to a system or regional constraint of a two-week duration, as may be associated with an increase in load during a period of cold weather, for example. BC Hydro’s development of its E-Plus business practice reflects a balanced consideration of the nature of the Residential E-Plus load and the purpose to allow the rate to be a useful and valuable resource to BC Hydro and its ratepayers when required.



3. Notice of Interruption

EPHG suggests that a 30 day notice period be given for any interruption longer than three hours, commenting that a two day notice period would be unreasonable and unacceptable for longer term interruptions.

BC Hydro is opposed to a 30-day notice period because it would provide no value to BC Hydro and its ratepayers. A service interruption would not be called under any of the non-firm programs if a 30 day advance notice of a possible interruption was required. BC Hydro notes that its interruption of firm service does not require a period of notification. In addition, BC Hydro is not aware of any program in other jurisdictions with a notice provision of such length.

BC Hydro's proposed business practice would be to provide an *Annual Reminder Notice* each September to all Residential E-Plus customers to remind them each year and well in advance of the potential for an interruption of E-Plus Service in the October-April (7-month) period. The notice is intended to remind E-Plus customers that an interruption of E-Plus Service may be applicable in that period, to ensure that their back-up heating systems are in proper working order with an adequate supply of fuel, and that their contact details are up to date.

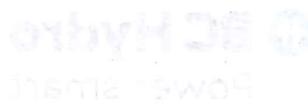
BC Hydro would provide an *Interruption Notice* two calendar days in advance only to potentially interrupted customers as may be required to respond to system or localized constraints. This notice period provides a reasonable timeframe for E-Plus customers to switch to their back-up heating systems while allowing some flexibility to BC Hydro to interrupt service in response to system or localized constraints, recognizing the nature of E-Plus Residential customer load.

4. Interruption Mechanism

EPHG suggests that individual customers should be asked to specify their preferred means of communication for notice of interruption; registered mail, telephone or email.

Special Condition 3 provides that "BC Hydro may interrupt the supply of Electricity by either manual or automatic means or by written notice by registered mail or hand delivery to the Customer to cease the use of Electricity under this Rate Schedule" [emphasis added]. BC Hydro agrees that E-Plus customers should provide their preferred means of communication but notes that the use of registered mail or hand delivery is not a practical means and accordingly has proposed that Special Condition 3 of RS 1105 be amended to remove this qualification. Notifying customers by registered mail or by hand delivery is not practical as it would diminish the flexibility and value in any possible E-Plus interruption by delaying BC Hydro's response to system conditions that would warrant a service interruption. It also does not reflect changes in communications capabilities since the rate was initially created. Thus, BC Hydro's proposed Business Practice proposes to issue notices via auto-dialer (phone) or email only.

BC Hydro will contact you by the end of next week to seek your further feedback in advance of its filing of the final response to BCUC IR 1.43.1, which provides BC Hydro's business practice document, expected on or before February 12, 2016.



Yours sincerely,

Keith Anderson
Vice President, Customer Service

E-Plus Homeowners Group

Gary McCaig – 9277 Faber Road, Port Alberni B.C. V9Y 9C3
eplusbcgroup@gmail.com

February 8, 2016

Via Email – Keith.Anderson@bchydro.com

Mr. Keith Anderson
Vice President, Customer Service
British Columbia Hydro and Power Authority
16th Floor – 333 Dunsmuir Street
Vancouver, BC V6B 5R3

Dear Mr. Anderson:

Re: BC Hydro's E-Plus Proposal, 2015 Rate Design Application

This letter will acknowledge yours of January 27, 2016. In that letter you discussed the issues raised in mine of January 5, 2016 and asked the E-Plus Homeowners Group (EPHG) for further feedback on your proposed Business Practice document relating to interruptions of residential E-Plus power.

Our position on your RDA application and your proposed Business Practice remains as stated in my previous letter. We note that you have rejected or ignored every element of our input. You state that our “suggestions would limit the flexibility of BC Hydro to interrupt E-Plus service – to the extent that it would remain impractical to ever interrupt”. I must correct you on this point. What you characterize as our “suggestions” are in fact the considered commitments that were made to E-Plus customers at the time they joined the program and on which basis the BCUC and the Government of British Columbia approved the E-Plus rate.

We are shocked and disappointed in your stated position that BC Hydro has no need to recognize, and no intention to honour any previous written commitments made to E-Plus customers (you characterize these as mere “discussions”), but instead are free to create whatever “rules” and business practices best suit your current needs. To support your position you refer to the decision of the BCUC in the 2007 RDA (page 133).

By our reading, that part of the BCUC decision you refer to was aimed specifically at asserting their jurisdiction over rates. We do not believe it was the intention of the BCUC “by extension” (as you suggest) to give carte blanche to BC Hydro to ignore previous written understandings, including those relating to your proposed Business Practice This would be neither fair to customers nor reasonable

Such an approach would never be considered as acceptable, and would likely be the basis of legal action, if part of a normal commercial transaction or if enacted as the policy of a public or private corporation. As a Crown Corporation, BC Hydro is not exempt from this standard. The potential overlap of BCUC

jurisdiction and contract law, and the possibility of civil action, was recognized on page 134 of the 2007 RDA decision where in reference to rates the BCUC stated, “if it remains an issue, it is a commercial issue between BC Hydro and its E-Plus customers which is more appropriate for determination by the Courts, if necessary”.

Regardless, we hope that the question of honouring commitments will not come down to legal or jurisdictional arguments. Surely there is an onus and a public expectation for a Crown Corporation such as BC Hydro to treat its customers with the highest standards of integrity and fairness. For BC Hydro to openly take the position you have outlined in regard to prior commitments, and to ask the BCUC to approve that position, challenges the integrity of the sale and regulation of electrical power in BC as well as the public’s confidence in the fairness of this process.

In addition to categorically dismissing that part of our input stemming from previous commitments, you have ignored our other strong arguments, based on fairness and practicality, that we believe provided a sound basis for those commitments. In doing so we believe you have shown a lack of understanding and respect of E-Plus customers’ needs. For example, your position that you intend to cut off heating power to residential customers with only two days notice, and without any assurance that notice was received, ignores the serious impact that will have on customers’ lives, as discussed in my earlier letter. Similarly, we find it unreasonable that you intend to ignore the promised priority of highly vulnerable residential customers over large and sophisticated commercial, industrial and export customers.

These elements of your proposed Business Practice stoke the fears of E-Plus customers that interruptions will be applied in a punitive way that is designed to drive them off the rate.

When BC Hydro began their review of the E-Plus rate, at workshops held in early 2014, they proposed to “maintain attrition approach” for the residential E-Plus program. This was an entirely reasonable proposal that respected both earlier commitments that E-Plus was a permanent program, as well as the outcome of the 2007 RDA that “transferability” of the rate to new homeowners would no longer be allowed, ensuring that the residential E-Plus rate would disappear through natural attrition.

EPHG cannot understand why BC Hydro has moved from that position. BC Hydro has acknowledged (2015 RDA - Q & A March 23, 2015) that with so few customers remaining on the E-Plus rate, and with that number dropping each year “there will be no significant cost saving to BC Hydro from ending the E-Plus rate”. The impact of imposing occasional interruptions in the winter months would likely be far less. In short there will be minimal if any benefit to BC Hydro, their customers, or the public by imposing the approach you suggest, but as EPHG have endeavoured to convey there will be a significant and disproportionate adverse impact on E-Plus Homeowners.

We look forward to receiving a copy of your revised Business Practice governing interruptions and hope it will reflect a more respectful, fair and appropriate approach to customers than does your current draft.

Finally, EPHG have a further question which we hope you will be able to answer in a timely matter:

- As the stated purpose for the E-plus rate at the time it was introduced, as per the RDA, was “to market surplus energy ---- because at the time consistent access to the spot market was not available”, can you tell us what the dollar value of sales to residential E-Plus accounts has been,

and what financial benefit that has provided to BC Hydro, for each year since the rate was introduced.

Thank you.

Yours truly

Gary McCaig – for E-Plus Homeowners Group

1 Appendix C-3E. ~~In response, EPHG~~An E-Plus customer sent two e-mails on
2 September 4, 2015 ~~and a letter dated September 4, 2015~~ (copies found at
3 Appendix C-3E) raising two issues with Option 3:

- 4 1. Requesting that BC Hydro include in RS 1105 a statement that BC Hydro will
5 not sell power outside of B.C. for six months prior to interrupting Residential
6 E-Plus customers. BC Hydro rejects this potential condition given that it would
7 mean BC Hydro would never be able to interrupt Residential E-Plus customers
8 as BC Hydro buys and sells electricity every day through trade; and
- 9 2. Asking BC Hydro to confirm the notice period for interruptions. Since its
10 inception, RS 1105 has not contained a notice period provision. As part of
11 developing its response, BC Hydro reviewed its other interruptible rates. There
12 is no notice provision in RS 1280 (the Distribution Service Shore Power Rate)
13 or RS 1891 (the Transmission Service Shore Power Rate). There is a
14 requirement in RS 1880 for customers to give 30 minutes' notice prior to taking
15 energy under RS 1880 but this is not analogous to the Residential E-Plus
16 situation. BC Hydro concluded that RS 1852 (Modified Demand) is the most
17 relevant of its existing interruptible rates. There is no notice provision in
18 RS 1852 itself. However, section 5.1 of the accompanying TS 54 provides that
19 "BC Hydro will make reasonable efforts to alert the Customer by telephone of
20 the potential of making an Offer for Demand Reduction in the days or hours
21 ahead" (refer to section 7.3.2 of the Application for additional detail). BC Hydro
22 proposes the following as business practices: (i) the issuance of a 'seasonal
23 notice' each year prior to the November-February winter months reminding
24 Residential E-Plus customers that they are served on an interruptible rate. This
25 seasonal notice would be given to all Residential E-Plus customers through
26 auto-dialer, e-mail or letter; (ii) up to one week's notice that an interruption
27 event is likely to occur. This notice would happen through auto-dialer, e-mail or
28 letter. The interruption itself would occur by manual or automatic means or by
29 written notice as set in Special Condition 3 of RS 1105.

British Columbia Old Age Pensioners' Organization Information Request No. 1.105.1 Dated: November 17, 2015 British Columbia Hydro & Power Authority REVISED Response issued February 12, 2016	Page 1 of 1
British Columbia Hydro & Power Authority 2015 Rate Design Application	Exhibit: B-14

105.0 CHAPTER 5 RESIDENTIAL RATE DESIGN

**Reference: Exhibit B-1, Section 5.6.2
Low income energy efficiency**

- 1.105.1 Please provide a copy of all Demand Side Management (“DSM”):
- (a) Program planning documents prepared by or for BC Hydro since January 1, 2010 for any BC Hydro low income DSM programs; and
 - (b) Program evaluations prepared by or for BC Hydro since January 1, 2010 for any BC Hydro low income DSM programs.

ORIGINAL RESPONSE:

The IR is asked in the context of the Minister RIB Report Letter (section 5.6 of Exhibit B-1). BC Hydro respectfully submits that the information sought in this IR, which is more relevant to a DSM expenditure schedule determination filed with the Commission under subsection 44.2(1)(a) of the *UCA* and is broad in scope, is of no relevance to the review of 2015 RDA Module 1 or the orders sought with respect to it, and of questionable relevance for purposes of the Minister RIB Report Letter. As noted in BC Hydro’s response to BCOAPO IR 1.102.1, it has not been established that the RIB rate results in bill impacts of 10 per cent or greater for BC Hydro’s low income customers. It is therefore premature to engage in review of BC Hydro’s low income DSM programs as part of the RIB Report process.

Nevertheless, to be responsive for purposes of the RIB Report, BC Hydro attaches executive summaries of the following to this IR response:

- Executive Summary, “Low Income Households Program – Energy Savings Kits: Impact Evaluation for F2009 and F2010”, September 29, 2010 (Attachment 1); and
- Executive Summary, “Power Smart for Low-Income Housing: the Energy Conservation Assistance Program (ECAP): Program Evaluation F2010 and F2011”, February 28, 2012 (Attachment 2).

REVISED RESPONSE

Further to BC Hydro’s original response to BCOAPO IR 1.105.1, attached are the reports of the following evaluations:

- “Low Income Households Program – Energy Savings Kits: Impact Evaluation for F2009 and F2010”, September 29, 2010 (Attachment 1); and
- “Power Smart for Low-Income Housing: the Energy Conservation Assistance Program (ECAP): Program Evaluation F2010 and F2011”, February 28, 2012 (Attachment 2).



Low Income Households Program

Energy Saving Kits

Impact Evaluation for F2009 and F2010
Final

September 29, 2010

Prepared by:
Mark Rebman
Power Smart Evaluation & Research

ABSTRACT

The Low Income Households Program (LIHP) is a BC Hydro energy acquisition initiative to help low income residential customers reduce their energy bills. This report provides a process, market and impact evaluation of the program for Fiscal Years 2009 and 2010. Net annual acquired energy savings were 0.9 GWh and 0.4 MW (peak) in 2009 and 1.4 GWh and 0.5 MW in 2010. This translates to evaluated, cumulative net results of 4.6 GWh (energy) and 1.9 MW (peak) for the two years combined – assuming that all elements of the kit remain in use from 2009. A total of 20,887 kits were distributed over the two years.

Net annual *run-rate* energy savings were 2.3 GWh and 0.9 MW (peak) in 2009 and 2.6 GWh and 1.1 MW in 2010.

ACKNOWLEDGEMENTS

The writer thanks everyone involved for their careful reviews and suggestions. Special thanks go out to Program Manager Margo Longland who provided continuous support throughout the writing of this report and Ophelia Chow for her work supplying the data needed for impact analysis.

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GLOSSARY

Acquired Rate Savings – Run-rate savings per participant adjusted for actual program start date.

Demand – The amount of electricity that is consumed at any instant in time, measured in multiples of watts. Demand savings are the reduction in amount of electricity that is consumed at system peak demand, which for BC Hydro occurs on a winter weekday between 4 p.m. and 9 p.m.

Energy – Energy refers to the amount of electricity consumed over a certain time period, measured in multiples of watt-hours. Energy savings are the reduction in the amount of electricity consumed over a certain time period.

Free Riders – Free riders are persons who would have purchased a product in the absence of a program but accepted program incentives.

Participant Free Rider Rate – The free rider *rate* is the percentage of program participants who would have purchased a product in the absence of incentives. Percentage estimates are usually derived from survey questions that ask participants whether or not an incentive influenced their buying decision.

Participant Spill-over – Spill-over is the percentage of program participants who purchased another related product as a result of program influence. Estimates are usually derived from survey questions that ask participants whether or not an incentive influenced them to buy additional or similar products.

Run-Rate Savings – Program savings per participant realised over a 365 day period.

EXECUTIVE SUMMARY

Introduction

In 2007, the BC Provincial Government set out a plan to meet 50 percent of future resource needs through energy conservation by 2020. In partial support of this initiative, BC Hydro designed an energy acquisition program for low income residential customers in line with these long-range goals. Similar programs are widely available in many jurisdictions in North America and have been in place for three decades or more.

Reaching low income customers is important because of:

- (a) **The number of households.** Between 15 and 20 percent of BC Hydro residential customers are designated low-income. This translates to a population of approximately 260,000 low income households depending on prevailing socio-economic conditions.
- (b) **Special marketing considerations.** Low income customers face significant barriers to participation in conventional Demand Side Management (DSM) programs. Factors affecting participation include low disposable income and sub-optimal access to program information and financing (social marginalisation).

The Low Income Households Program offer includes Energy Saving Kits, Basic Retrofits and Advanced Retrofits with varying eligibility requirements for each of the three program components.¹ This evaluation focuses on the Energy Saving Kit (ESK) which is a package of basic, low-cost energy savings measures believed to be easily installed by any homeowner or tenant. The kit includes Compact Florescent Lights (CFL), faucet aerators, low flow shower heads, pipe wrap, caulking and draft proofing materials, outlet gaskets, window film and a number of smaller products and information on how to save energy in the home. The purpose of this document is to present an evaluation of the Energy Saving Kit component of the Power Smart for Low Income Households Program.

Program Rationale

As of March 31 2010, the LIHP has provided approximately 21,000 low income residential customers with greater awareness of inexpensive high-efficiency products and improved their access to information on how to save energy in their homes. The program rationale was examined using a program logic model, examining the linkages among inputs, outputs, purpose and goal for each activity. The logic model is consistent and reflects a strong program rationale.

Customer Survey

A detailed survey was conducted with 400 program participants covering a wide range of program attributes. When customers were asked how they became aware of the ESK offering the most important sources of customer awareness were BC Hydro billing statements (44%), friends and relatives (14%) and magazines and newspapers (12%). Customer satisfaction with various program components was particularly high with 89% of participants reporting either satisfaction or great satisfaction with the kits.

¹ The Energy Conservation Assistance Program (ECAP) provides free Basic and Advanced retrofits to customers with high electricity consumption. Services are provided through BC Hydro program contractors.

Energy and Peak Impacts

Gross and net energy savings were based on program activity in two fiscal years – one for the period April 1, 2008 through March 31, 2009 (F2009) and another for the period April 1, 2009 through March 31, 2010 (F2010) as shown in Tables 3.10 and 3.11 The evaluation estimated program impact in the following stages:

- (a) **Gross savings.** A pre and post experimental design with participant and non-participant groups (N=507) was used to compare pre-program and post-program measurements. Calculation of gross savings is then based on consumption comparisons between the participant and non-participant groups.
- (b) **Net savings (annual acquired rate).** Net (evaluated) savings were estimated by modifying gross savings with free rider and participant spill over rates, calculated from survey response data. For F2009, evaluated energy savings are 0.9 GWh compared to gross savings of 1.2 GWh; evaluated peak savings are 0.4 MW compared to peak savings based on the program gross peak savings of 0.5 MW. For F2010, evaluated energy savings from new applicants are 1.4 GWh compared to gross savings of 1.9 GWh; evaluated peak savings were 0.6 MW compared to peak savings based on the program gross peak savings of 0.8 MW. The gross and net *cumulative* energy savings totals to F2010 are 6.2 GWh and 4.6 GWh respectively².
- (c) **Net savings (annual run-rate).** Net (evaluated) savings were estimated by modifying gross savings with free rider and participant spill over rates, calculated from survey response data. For F2009, evaluated energy savings are 2.3 GWh compared to gross savings of 3.1 GWh; evaluated peak savings are 0.9 MW compared to peak savings based on the program gross peak savings of 1.3 MW. For F2010, evaluated energy savings from new applicants are 2.6 GWh compared to gross savings of 3.6 GWh; evaluated peak savings were 1.1 MW compared to peak savings based on the program gross peak savings of 1.5 MW.

² It is assumed that savings from F2009 will persist for up to 10 years at the full discounted rate in kilowatt-hours per year per participating customer (in F2009, the acquired saving for participants entering the program are lower due to adjustments for the date kits were actually installed). For customers who received their kits during F2009, evaluated energy savings in F2010 are 2.3 GWh = 241 kWh x 9,364 compared with gross savings of 3.1 GWh = 329 kWh x 9,364. These amounts are added to the savings attributed to the program by participants entering the program during F2010 for net and gross calculations respectively. The cumulative totals are: 1.2+1.9+3.1=6.2 GWh (gross) and 0.9+1.4+2.3 = 4.6 GWh (net)).

1.0 INTRODUCTION

1.1. *Background*

In April 2008, the Low Income Households Program began offering free Energy Savings Kits (ESK) to residential customers falling below Statistics Canada designated Low Income Cut-Off (LICO) points. These are designed to encourage customers to install 8 simple, low-tech energy-saving retrofits and improvements in their homes free of cost. Kits include Compact Florescent Lights (CFL), faucet aerators, low flow shower heads, hot water pipe wrap, caulking and draft proofing materials, outlet gaskets, window film and a number of smaller products and information on how to save energy in the home.

The program is administered through a phone-in registration system. Agents of BC Hydro record information affecting eligibility such as total annual household income, the number of persons per household, account information and household location. In addition, the program also offers a bulk distribution and direct install offer (vendor assisted install) for non-profit housing providers and Aboriginal communities who distribute the kits in bulk to low-income tenants and community members.

Program goals include:

- Generating electricity savings by replacing inefficient with efficient technologies;
- Increasing energy efficiency awareness by actively communicating with customers;
- Informing customers of the general benefits of energy efficient products;
- Helping transform the market for specific technologies;
- Better meeting the needs of chronically underserved low income customers and
- Increasing customer satisfaction.

This purpose of this report is to provide a process, market and impact evaluation of the LIHP as it pertains to the distribution of the ESK. The remainder of the current section reviews previous research on similar programs while section 2 summarizes the evaluation issues and methods of the LIHP (ESK). Section 3 provides the results of data collection and analysis and section 4 presents conclusions and recommendations. Finally, section 5 lists all relevant references.

1.2. Previous Research

To understand the nature and impact of low income programs in other jurisdictions, a review was conducted to identify those most comparable to the LIHP (ESK) in scope. This review occurred in late 2009 and applies to both the 2009 and 2010 fiscal year evaluations. References include State of Wisconsin Department of Administration Division of Energy (2004), Hungerford et al. (2002), Hall and Riggert (2001), Nevius (2001) and Tannenbaum et al. (2000). The focus was on general approaches to conservation activity among low income households.

Low income energy conservation programs for residential customers often share the following key elements: (1) educational packages consisting of written information and community energy workshops; (2) free kits containing easy-to-install energy-efficient devices such as low-flow shower heads, faucet aerators and insulation material and (3) home energy audits. Content varies considerably by program.

Table 1.1 compares the LIHP to 6 other typical low income programs offered in other jurisdictions – 3 in Canada and 3 in the United States. The programs are offered by the Ontario Power Authority (OPA), Hydro Québec, Conserve Nova Scotia, Pacific Gas & Electric, Southern California Edison and Efficiency Vermont. A brief description of each program is provided.

Table 1.1 Comparable Low Income Energy Efficiency Program Descriptions

Utility	Program	Description
BC Hydro	Low Income Program for Householders (Energy Saving Kits)	Provides eligible (LICO) residential customers with a free package of low cost, easy-to-install energy efficient devices and retrofits
Ontario Power Authority	Energy Efficiency Assistance Program for Houses	Similar to BC Hydro program with energy saving kits provided to eligible (LICO) customers
Hydro Québec	Energy Efficiency Retrofit Program for Low Income Households	Light weatherization and draft proofing; programmable thermostats and lighting retrofits
Conserve Nova Scotia	Lower Income Energy Saving Kits	Contents are similar to those provided by the BC Hydro program.
Efficiency Vermont (Vermont Public Service Board)	Low Income Single Family Service	A component of the program includes items similar to the BC Hydro Energy Saving Kit (CFL, low-flow showerhead)
Southern California Edison	Energy Management Assistance Program	A component of the program includes items similar to the BC Hydro Energy Saving Kit (CFL, low-flow showerhead, draft-proofing)
Pacific Gas & Electric	Energy Partners	A component of the program includes items similar to the BC Hydro Energy Saving Kit (CFL retrofit, low-flow showerhead, draft-proofing)

2.0 EVALUATION ISSUES AND METHOD

2.1. *Research Design and Issues*

The evaluation issues examined in this study were determined by consulting internal BC Hydro stakeholders. The 5 main evaluation issues are:

- **Program Review.** Describe the program component and provide an analysis of program logic.
- **Consumption Change.** Characterize consumption change by item provided in the Energy Saving Kit.
- **Customer Survey.** Assess customer participation and satisfaction with the program; tabulate the number of products installed and calculate free-ridership and spill-over rates.
- **Energy and Peak Savings.** Evaluate energy and peak savings attributed to the program in Fiscal Years 2009 and 2010.
- **Cost Effectiveness.** Estimate the cost of conserved energy for some of the main products provided through the Energy Saving Kit.

The evaluation issues, data sources and methods used in the study to examine the evaluation issues are listed in Table 2.1.

Table 2.1 Evaluation Issues, Data Sources and Methods

Issues	Main data sources	Method
Program review	Discussions with Program Managers and Administrators	Logic Model
End use consumption by kit component	Initial Technical Analysis by Item; Billing data	Engineering algorithms informed and affirmed by billing analysis
Participation, satisfaction, product installation, free riders, participant spill-over	Customer survey (n = 400)	Cross tabulations
Energy and Peak savings	Bi-monthly Billings, Low Income Household Applications and REUS 2008	Pre and Post Test (double-differenced), group means t-test
Cost effectiveness	Estimated energy savings Installed cost estimates by kit item	Engineering algorithms

2.2. *Data and Method*

Information on all program applicants receiving Energy Saving Kits during fiscal years 2009 and 2010 was obtained in April 2010. In addition to application dates, information was available on program application status, fuel type, household income, location and demographic detail – all of which help to provide an in-depth profile of program activity.

Customer awareness, satisfaction, program experience, respondent free rider and participant spill-over questions were addressed in a telephone survey of 400 program participants conducted during January of 2010. Respondents were recruited from a list of program applications for the relevant fiscal year and did not include concurrent Power Smart program participants.

Gross and net energy savings were estimated for program activity completed during fiscal years 2009 and 2010. Since gross savings do not account for factors external to the program that might affect savings calculations, net savings were calculated to adjust initial savings estimates for the influence of non-program related factors. These include the effects of free-ridership, participant spill-over (naturally occurring conservation is already accounted for in the gross savings calculations). Initial (gross) savings estimates for LIHP (ESK) are calculated using a Pre and Post experimental design which uses a program group and a comparison group – each with pre-program and post-program measurements. The assumption is that, if the program and comparison groups are sufficiently comparable any difference in outcome between the two groups may be plausibly attributed to the program. The program and comparison groups were analysed across various indicators such as geographic location, dwelling type and primary heating fuel.

Equation (1) shows how average gross energy savings are estimated. The average savings per participant were measured as the difference between average participant and non-participant changes in energy consumption for the sample. Both *acquired* and *run-rate* savings are calculated. In the special case of acquired savings, Δ kWh is adjusted for the date each participating customer acquired the kit³. Some adjustment was also made to account for known differences in annual savings rates between those participants installing the kits themselves and those receiving assistance from vendors⁴. Equation (2) shows how total gross savings are estimated while Equation (3) shows how the total gross savings were adjusted to calculate total net savings using an attribution rate.

$$\begin{aligned}
 (1) \Delta \text{ kWh} &= (\text{BasekWh} - \text{PostkWh})_{\text{participants}} - (\text{BasekWh} - \text{PostkWh})_{\text{non-participants}} \\
 (2) \Delta \text{ GWh (Gross)} &= N_{\text{PP}}^5 * \Delta \text{ kWh} / 1,000,000 \\
 (3) \Delta \text{ GWh (Net)} &= N_{\text{PP}} * \Delta \text{ kWh} * \text{Attribution} / 1,000,000
 \end{aligned}$$

Attribution is calculated using *free-rider* and participant *spill-over* rates. As these rates are proportions, the attribution rate is calculated by subtracting the free rider rate from one and adding the spill-over rate⁶. The free-rider rate is added to account for customers who would have purchased the new technology on their own while the participant spill-over rate is included to account for additional energy efficient purchases collateral to (but influenced by) the program.

Peak savings were estimated by applying load factors based on hourly consumption data to Equation (2). Net peak demand is estimated by applying the same attribution rate in Equation (3) to gross peak demand.

³ For example, if a customer acquired her kit 6 months into the fiscal year, acquired savings would be reduced by approximately half; run-rate savings calculations require no such adjustment.

⁴ This step ensures that the total number of kit recipients is correct and represents the actual break-out of participants into either (a) those who self-install or (b) those who receive assistance from vendors.

⁵ **N_{PP}** is the total number of official program participants in a given fiscal year.

⁶ Therefore, the equation is: **Attribution = 1 – Free Rider Rate + Spillover Rate.**

3.0 RESULTS

3.1. Program Review

The Low Income Households Program (Energy Saving Kits Component) was initiated in partial response to a Provincial Ministerial Order to help the lowest income households to reduce their energy consumption. All participants are residential BC Hydro customers who meet the eligibility requirements determined by the Low Income Cut-Off points for households of varying size (number of members).

The savings estimates for each item in the Energy Saving Kit are initially reported according to formulas and parameters approved by Power Smart Engineering with pre-calculated savings per item adjusted according to presumed per item installation rates⁷. The individual savings per item are then summed to produce an overall estimate of savings per household per kit.

In order to receive a kit customers go through the following steps:

1. **General and Bulk Recruitment.** Customers respond to program brochures, community advertisements, bill inserts and initiatives by non-profit organisations and social housing providers.
2. **Apply (Register) for Energy Saving Kit.** The customer calls a telephone agent toll free and provides account number, total annual household income before taxes, the number of persons in the household and address.
3. **Eligibility Assessment.** Information provided during the telephone application is used to determine program eligibility.
4. **Delivery and Receipt of Energy Saving Kit.** The kit is mailed to all customers deemed eligible for the program in (3).
5. **Installation of Energy Saving Kit Items.** Contents of the kit are installed as feasible and at the convenience of household occupants. The rate of installation is estimated using quota samples⁸ of customers residing in each region.

Table 3.1 provides a program logic model developed from interviews with the program manager, a review of relevant program documents and a literature search based on experiences in other jurisdictions. The model summarizes program inputs, outputs, purpose, goal and assumptions. The review of the logic model supports a claim of program validity for the following reasons: (1) program linkages have face validity and are plausible; (2) key outputs are based on reasonable assumptions and therefore likely to be met; and (3) key model components have performance indicators that can be measured against objectives.

⁷ Some households may not require all kit contents. For example, if there is no separate hot water tank in the household, pipe insulation cannot be installed.

⁸ Within each region, respondents were randomly drawn from the total population of eligible applicants.

Table 3.1 Low Income Households Program Model

	Marketing	Delivery	Inspections	Assumptions
Inputs	Advertising and promotional activities	Power Smart arranges delivery of the ESK to eligible customers	Customer applies via telephone to determine eligibility to receive an ESK	Consumers are able to practice desired energy conservation behaviours
Outputs	Customers are aware of the program and easy-to-install energy-efficient technologies	Energy-efficient items and suggestions are delivered and installed	Application is checked, verified and processed; ESK is delivered	The program attribution rate (free rider rate net of participant spill-over) does not jeopardize program savings
Purpose	Customers are willing participants in the program	Energy-efficient items in the kit work as designed	Low income residential customers receive kits	Take back and rebound are insignificant ⁹
Goal	Reduce energy consumption and peak demand in the residential sector by targeting low income households.			

3.2. Consumption Saving by Kit Item

Table 3.2 presents a summary of technically estimated savings per ESK item and was used in the business case to estimate potential and actual savings per program participant¹⁰. This information provides an annual estimate of maximal savings assuming 100% installation in a typical low income household (row 1) and a second line of data (row 2) showing the cumulative effect of various adjustments such as installation rate and cross-over effects based on engineering algorithms.

Note that Row 2 is the reported average saving per kit and represents reported savings for *self-installed kits*. Some kits were installed with the professional assistance of vendors – particularly in low income housing complexes and other similar settings. The total (gross) estimated savings for vendor-assisted installations was approximately 359 kWh/year compared to 203 kWh/yr for self-installed kits. These values represent the run-rate for a full fiscal year whereas actual program savings in any given period will depend on the proximate date each participating customer acquires a kit.

⁹ Expected overall savings per household from this component of the program represent only 2.7% of total energy usage per low income account. As such, the electricity saving (less than 14 dollars per customer) is unlikely to cause any measurable rebound or take-back.

¹⁰ See *Appendix J* of the 2008 BC Hydro *Low Income Households Program Business Case*.

Table 3.2 Consumption Savings per Kit Item from the Business Case (kWh/yr)

Row Number	Adjustments	CFL Interior (Higher Use)	CFL Interior (Lower Use)	CFL Exterior	Faucet Aerators (2)	Low-flow Showerhead	Pipe Wrap	Rope Caulking	Draft-proofing	Electric Outlet Gaskets	Window Insulating Film	LED Nightlight	Total
1	No Adjustment	68	50	132	70	225	45	15	20	20	45	54	744
2	Install Rate	48	34	36	7	33	9	4	5	3	8	10	203

Table 3.3 presents the results of the pre and post test of annual consumption using the method presented in Equation (1) of Section 2.2 above. The differences between the average participant and non-participant savings per kit are statistically significant at the 0.05 level¹¹ with the final sample consisting of 232 non-participants and 275 participants.

These two results are used to determine *evaluated gross and net* savings. The mean saving per program participant is also adjusted to reflect (a) actual regional population distributions as opposed those sampled and (b) the proportion of kit installations performed by vendors as opposed to those performed entirely by the customers themselves¹².

Table 3.3 Evaluated Consumption Savings Rate per Kit (kWh)

Adjustments	Self-Installed Rate	Vendor-Installed Rate	Weighted Rate FY2009	Weighted Rate FY2010 ¹³
None	273	474	329	312
Net ¹⁴	200	347	241	229

¹¹ The calculation of the weighted difference is based on 10 months of data from 2007 (Base Year) and 2009 (Test Year). This result was found to be significant using a group means t-test outlined in the table below:

$D_{weighted}$	σ	t-value	2-Tailed P-Value	$H_0: D_{weighted} = 0$
-234.5	113.3	-2.07	0.04	Reject

The weighted difference was subsequently prorated to a 12 month period resulting in a final figure of 298.4 kWh per year. This number was then subject to a correction based on a more up-to-date mix of self-installed and vendor installed kits – each with different savings rates. The figures actually used for savings estimates are 328.6 (FY2009) and 312.4 (FY2010).

¹² Kits installed by vendors show higher average savings per household. The proportion of vendor-assisted installations in FY2009 (28%) is reflected in the savings per kit reported in Table 3.3.

¹³ The weighted savings rate for FY2010 differs from that for the previous year due to a change in the reported mix of self-installed to vendor-installed kits. The percentage of vendor installed kits is less in FY2010 than in FY2009.

¹⁴ C. f. footnote 4 above. Note that these net values are very similar to those reported in the original business case.

In summary, the unadjusted self-installed and vendor-installed rates (first row of Table 3.3) are derived from the following information:

- (a) known proportions of vendor and self-installed kits from the program application system for each fiscal year of interest;
- (b) known proportion of vendor and self-installed kits from the participant sample used to calculate the raw savings rate per program participant;
- (c) raw savings rate calculated from the pre and post test with known proportions of vendor and self installed kits in the mix; and
- (d) estimated savings rates for vendor and self-installed kits from the original program business case.

The above information is sufficient to solve for the statistically determined self and vendor installed rates shown in the first two columns of Row 1 in Table 3.3¹⁵. The overall weighted rate for each fiscal year is then calculated by multiplying the proportion of kits installed using each method of installation by their respective savings rates.

3.3. Customer Participation, Customer Satisfaction and Product Installation

The 5 tables in this next section contain results from a telephone survey of 400 program participants conducted in January of 2010.

Table 3.4 shows the main reported sources of program awareness for the program. The most important sources of customer awareness of the LIHP (ESK) were BC Hydro bills (44%), family members or friends (14%), newspapers and magazines (11%) and the BC Hydro website (8%).

Table 3.4 Primary Source of Program Participant Awareness

Source	Share
My BC Hydro Bill	44%
Family Members or Friends	14%
Newspapers or Magazines	11%
The BC Hydro Website	8%
First Nations Band Office	4%
BC Ministry of Housing and Social Development	3%
Television	3%
Food Bank	3%
BC Hydro Representatives	3%
Other	7%
Total Sample	100%

¹⁵ Since we know the ratio of savings from the two installation methods (from the business case) and we know the proportion of each in the sample used to determine the adjusted savings rate, a simple simultaneous equation in two variables may be constructed. Solving this system of 2 equations results in the values reported in the first two columns of Row 1 in Table 3.3.

Table 3.5 provides participant responses to their degree of satisfaction with the program as a whole. The response categories are (1) not at all important, (2) not very important, (3) neutral, (4) somewhat important, (5) very important and (6) don't know or not applicable. The combined top box score¹⁶ was 89%.

Table 3.5 Customer Satisfaction

1	2	3	4	5	Don't Know	Refused	Total	Mean
4	6	32	62	268	1	4	377	4.6

A series of questions were asked that relate to (1) the relative difficulty of installing kit items and (2) their relative usefulness. Table 3.6 provides participant responses to questions about the utility (usefulness) of installed equipment. As in the previous table, the response categories are: (1) not at all important; (2) not very important; (3) neutral; (4) somewhat important; (5) very important and (6) don't know or not applicable.

Table 3.6 Reported Utility of Installed Kit Items

Product type	1	2	3	4	5	Don't Know	Refused	Total	Mean
Compact Fluorescent Lights	11	5	18	37	284	0	0	355	4.6
Weather Stripping	8	5	17	28	150	3	0	211	4.5
Window Insulator Film	4	6	10	18	96	2	0	136	4.5
Electric Outlet and Switch Plugs	10	19	32	28	93	7	1	190	4.0
Fridge & Freezer Thermometers	22	18	34	43	117	3	1	238	3.9
Low-flow Showerhead	11	6	14	32	152	1	0	216	4.4
Faucet Aerators	12	14	30	45	143	3	0	247	4.2
LED Night Light	16	18	31	37	182	1	0	285	4.2
Hot Water Pipe Wrap	2	8	20	20	118	3	0	171	4.5
Electric Outlet & Switch Sealer	8	13	39	35	100	8	1	204	4.1
Water-flow Measuring Bag	80	50	55	33	65	85	9	377	2.8
Hot Water Gauge	69	28	57	41	94	78	10	377	3.2
ESK Grand Mean	-	-	-	-	-	-	-	-	4.1

¹⁶ Top box scores include categories 4 and 5.

Based on the data from Table 3.6, Figure 3.1 graphically illustrates the relative usefulness of each item as ranked by respondents.

Figure 3.1 Percentage of Respondents Reporting Installed Kit Items as Useful¹⁷

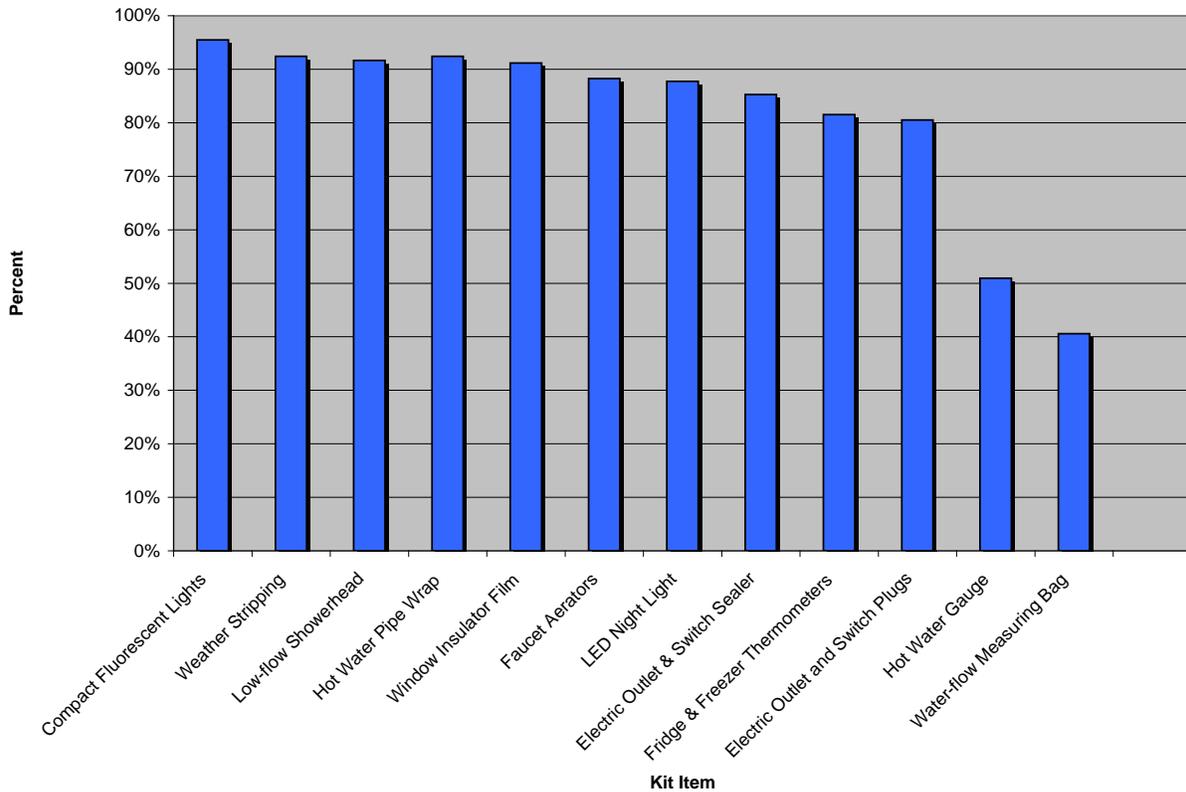


Table 3.7 provides participant responses to questions about the relative difficulty of installing kit items. This question also helps identify the appropriateness of kit content. As in the previous table, the response categories are: (1) not at all important, (2) not very important, (3) neutral, (4) somewhat important, (5) very important and (6) don't know or not applicable.

In general, participants in the program found no little or no difficulty installing or using the items provided in the kit. However, it is worth noting that the high number of “Don't Know” responses for the water-flow measuring bag and hot water gauges confirms the low usage values for these items in Table 3.5.

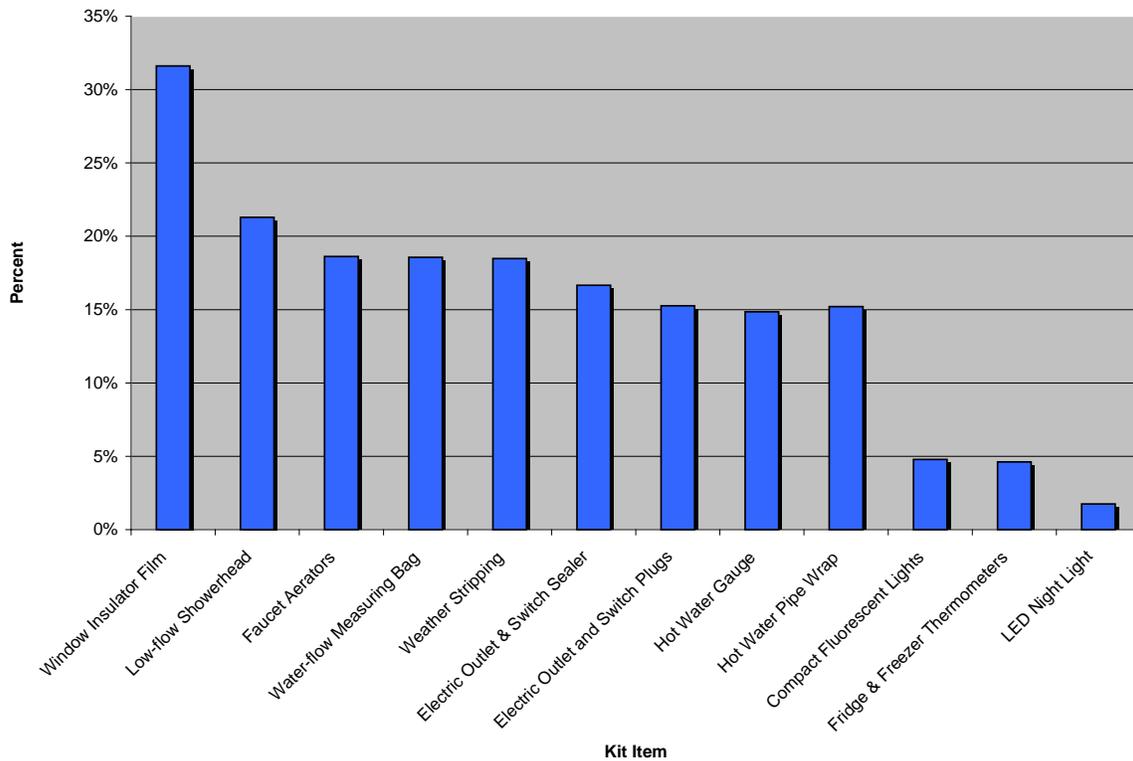
¹⁷ Here, “useful to the respondent” is defined as a score of 3 or higher on a scale of 1 to 5.

Table 3.7 Reported Difficulty of Installing Kit Items

Product type	1	2	3	4	5	Don't Know	Refused	Total	Mean
Compact Fluorescent Lights	323	11	6	4	7	4	0	355	1.2
Weather Stripping	140	28	23	5	11	4	0	211	1.6
Window Insulator Film	65	24	25	10	8	3	1	136	2.0
Electric Outlet and Switch Plugs	127	27	21	4	4	7	0	190	2.1
Fridge & Freezer Thermometers	214	13	3	5	3	3	0	238	1.2
Low-flow Showerhead	131	34	27	5	14	5	0	216	1.8
Faucet Aerators	160	33	31	6	9	7	1	247	1.6
LED Night Light	267	7	2	0	3	6	0	285	1.2
Hot Water Pipe Wrap	118	23	18	3	5	4	0	171	1.5
Electric Outlet & Switch Sealer	119	40	23	5	6	11	0	204	1.6
Water-flow Measuring Bag	141	37	31	10	29	124	5	377	2.0
Hot Water Gauge	157	34	23	9	24	120	10	377	1.8
ESK Grand Mean	-	-	-	-	-	-	-	-	1.6

Figure 3.2 is based on Table 3.7 and illustrates the reported difficulty of installing kit items.

Figure 3.2 Percentages of Respondents Reporting Difficulty in Installing Kit Items¹⁸



Of the twelve kit items shown in Figure 3.1, only the Hot Water Gauge and Water-flow Measuring Bag show relatively low utility scores. Combined with results in Table 3.7 and Figure 3.2, this suggests that more assistance with installation might be beneficial in such cases. For example, there is a high recognition of the usefulness of Window Insulator Film in Figure 3.1, but this fact is partially negated by the large difficulty score in Figure 3.2. By providing assistance to customers with items they find difficult to install, the annual savings rate per kit per customer might be increased.

Free Rider Rate

Free rider estimates are based on the relative importance customers place on program participation when deciding to install energy efficient products. The rate is based on how respondents rank this importance on interview items. They were subsequently asked whether they would have purchased and installed any of the items found in the ESK had they not received the kit for free with each item treated individually. Those responding in the affirmative were treated as free riders.

Participant Spill Over Rate

Participant spill-over estimates are based on the percentage of program participants who purchased additional energy-efficient products as a result of program influence and are derived from survey questions. Participants are asked whether they installed additional energy efficient equipment outside the program as well as the type installed. They were then asked whether they purchased additional items found in the ESK as a result of their having received the kit. This is an indication of how important participation in the program was in the decision to install

¹⁸ Here, “Reported Difficulty” represents the percentage of respondents providing scores of either 4 or 5 on a scale of 1 to 5.

additional energy-efficient product(s). Affirmative responses were treated as spill over. The *net-to-gross ratio* was then defined as $1 - FR + SO$.

Table 3.8 provides a *free rider rate* (FR) and the *spill-over rate* (SO) for the Energy Saving Kit as a whole. These are based on the program participant survey conducted in January of 2010.

Table 3.8 Estimated Market Effects

Source	Free Rider Rate	Spill Over Rate (SO)	1 – FR + SO
Participant Survey	0.44	0.17	0.73
Business Case	0.11	0.00	0.89

Although some low income programs assume zero free-ridership and spill-over rates (or an attribution rate of 1.0)¹⁹, it is not clear whether the low income cut-off used to establish eligibility for the program at hand is sufficiently low to discount free-riding and spill-over altogether. For programs where the income of an eligible household consists wholly of state support, the assumption of zero free-ridership may be valid. In programs like the one under discussion here, the income levels vary considerably from household to household. In such a case, it may be wise to obtain a measure of both free-rider and spill-over rates.

After looking at various combinations of kit components and their associated free rider and spill over rates, the attribution rate remained stable at 0.70 to 0.75 compared to the fully averaged value reported in Table 3.8²⁰. The unexpectedly high free rider rate may be due to one or more of the following factors:

- (a) Low cost of kit items;
- (b) Low ratio of kit cost to income;
- (c) Familiarity with certain kit items and their energy efficiency; and
- (d) A desire by the respondent to be seen as socially responsible by the interviewer (reporting bias)²¹.

One policy consideration in favour of high program attribution rates is the issue of equity. In general, behaviours consistent with current social and environmental policies should be rewarded since in a broader policy context, free riders still benefit from low income programs by engaging in socially desirable energy efficiency behaviours. If social equity is a consideration, then an attribution rate of 1.0 might be assumed.

¹⁹ This is supported by comments made during the April 21, 2010 BC Hydro Evaluation Oversight Committee (EOC) Meeting. David Sumi, formerly of PA Consulting and a senior advisor to the Committee is a known expert in evaluation methodology. He stated that gross savings are not normally adjusted in the case of low income programs. Both free-rider and spill-over rates are usually considered to cancel each other out and produce an attribution rate of zero.

²⁰ Excluding kit items not available for sale in the retail market does not affect the attribution rates to any appreciable degree. Detailed information on this issue is available from the writer.

²¹ Participants may seek to enhance their image by responding to questions according to how they are expected to behave rather than how they actually behave. For example, participants said that they would have installed most kit components even in the absence of the program.

3.4. Market Analysis

Table 3.9 provides information on the installation rate of each ESK item. The total number of kits delivered in fiscal year 2009 is estimated at 9,364 and 11,523 in fiscal year 2010. Overall utilisation of kit items was approximately 54%. The estimated number of installations by kit item in each fiscal year is net figure adjusted for the installation rate shown in column two of Table 3.9.

Table 3.9 ESK Installations by Item (by March 31 2010)

Kit Item	Installation Rate	Estimated Installations (FY2009)	Estimated Installations (FY2010)
Compact Fluorescent Lights	94%	26,453	32,552
Weather Stripping	56%	5,241	6,449
Window Insulator Film	36%	6,756	8,314
Electric Outlet and Switch Plugs	54%	60,804	74,823
Fridge & Freezer Thermometers	63%	5,911	7,274
Low-flow Showerhead	57%	5,365	6,602
Faucet Aerators	65%	12,270	15,099
LED Night Light	76%	7,079	8,711
Hot Water Pipe Wrap	45%	4,247	5,227
Electric Outlet & Switch Sealer	42%	47,313	58,221
Water-flow Measuring Bag	-	-	-
Hot Water Gauge	-	-	-
ESK Grand Mean (all items)	54%	181,439	223,272
Number of Kits Distributed (N_{pp})	-	9,364	11,523

Table 3.10 summarizes findings on questions concerning stated customer need for certain select kit items. This question was asked to determine if the number of certain products might be worth increasing.

Table 3.10 Select ESK Item Shortfalls in Low Income Households

Kit Item	Number Supplied	Average Number Installed	Average Number Required	Shortfall (-)
Compact Fluorescent Lights	3	2.5	8.5	-6
Weather Stripping	2	2.3	7.1	-5
Electric Switch & Outlet Insulators	12	6.0	15.8	-3
Faucet Aerators	2	1.4	2.0	-

3.5. Energy and Peak Impacts

Gross and net *acquired* energy savings were estimated for program activity for the period April 1, 2008 through March 31, 2010 (two fiscal years) as shown in Table 3.10. This evaluation addressed gross program savings as follows: (1) the gross savings algorithms and parameter assumptions used in the calculation of program deemed savings were reviewed and modified using BC Hydro billing data; and (2) net savings were based on gross savings modified by survey based free rider and participant spill over rates. Numbers presented below are approximate only with mean kilowatt-hours saved per participating customer taking into account the point in the year at which each kit was acquired.

Table 3.10 Estimated Acquired Energy Impacts of Applications by Year

Fiscal Year	New Participants by Fiscal Year	Gross Mean kWh Saved per Customer	Gross savings (GWh)	1 – FR + SO	Net savings
2009	9,364	132	1.2	0.733	0.9
2010	11,523	169	1.9	0.733	1.4

Gross and net *run-rate* energy savings were estimated for program activity for the period April 1, 2008 through March 31, 2010 (two fiscal years) as shown in Table 3.11. This evaluation addressed gross program savings as follows: (1) the gross savings algorithms and parameter assumptions used in the calculation of program deemed savings are based on the statistically estimated run-rate; and (2) net savings were based on gross savings modified by survey based free rider and participant spill over rates. Numbers presented below are approximate only with mean kilowatt-hours saved per participating customer taking into account the point in the year at which each kit was acquired.

Table 3.11 Estimated Run-Rate Energy Impacts of Applications by Year

Fiscal Year	New Participants by Fiscal Year	Gross Mean kWh Saved per Customer	Gross savings (GWh)	1 – FR + SO	Net savings
2009	9,364	329	3.1	0.733	2.3
2010	11,523	312	3.6	0.733	2.6

Table 3.12 summarizes evaluated *acquired* energy savings and peak savings for the Low Income Households Program (ESK Component) for F2009 and F2010. Evaluated energy savings are 0.9 GWh compared to program gross energy savings of 1.2 GWh for F2009 and 1.4 GWh compared to program gross energy savings of 1.9 GWh in F2010. Evaluated peak savings are 0.4 MW in F2009 compared to peak savings based on the program reported energy savings of 0.5 MW and 0.6 MW in F2010 compared to peak savings of 0.8 MW based on the gross program energy savings.

Table 3.12 Program Net Acquired Energy and Peak Savings

Period	Energy (GWh)		Peak (MW)	
	Gross	Net	Gross	Net
F2009	1.2	0.9	0.5	0.4
F2010	1.9	1.4	0.8	0.6
F2010 (Cumulative) ²²	3.1	2.3	0.8	0.4
Total (Cumulative)	6.2	4.6	2.5	1.9

The cumulative total assumes that all F2009 participants continue to use the kit throughout F2010 and accumulate savings for the whole year as a result – having installed the previous year²³.

Table 3.13 summarizes evaluated *run-rate* energy savings and peak savings for the Low Income Households Program (ESK Component) for F2009 and F2010. Evaluated energy savings are 2.3 GWh compared to program gross energy savings of 3.1 GWh for F2009 and 2.6 GWh compared to program gross energy savings of 3.6 GWh in F2010. Evaluated peak savings are 0.9 MW in F2009 compared to peak savings of 1.3 MW based on the gross program energy savings and 1.1 MW in F2010 compared to peak savings of 1.5 MW based on the gross program energy savings.

Table 3.13 Program Net Run-Rate Energy and Peak Savings

Period	Energy (GWh)		Peak (MW)	
	Gross	Net	Gross	Net
F2009	3.1	2.3	1.3	0.9
F2010	3.6	2.6	1.5	1.1
Total	6.7	4.9	2.8	2.0

²² This row contains the savings attributed to kits acquired in 2009 but now assumed in use for the entire 2010 fiscal year (savings attributed to this group of participants in fiscal year 2009 depend on the dates kits were acquired by each individual customer).

²³ It is assumed that savings from F2009 will persist into F2010 and up to 8 more subsequent years at the full discounted rate in kilowatt-hours per year per participating customer (in F2009, the acquired saving for participants entering the program are lower due to adjustments for the date kits were actually installed). For customers who received their kits during F2009, evaluated energy savings in F2010 are therefore actually 2.3 GWh = 241 kWh x 9,364 compared with gross savings of 3.1 GWh = 329 kWh x 9,364. These amounts are added to the savings attributed to the program by participants entering the program during F2010. The cumulative totals for both fiscal years are therefore 1.2+1.9+3.1=6.2 GWh (gross) and 0.9+1.4+2.3=4.6 GWh (net).

4.0 CONCLUSIONS

Program Rationale

The LIHP (ESK) is meeting its stated objective of increasing the penetration of simple, easy-to-install energy-efficient behaviours and technologies into the low income residential market. Most low income households appear to have more difficulty implementing simple energy efficiency behaviours than those in the general population. Social marginalization due to literacy issues, a disproportionate number of elderly customers and access to information are major barriers to program participation²⁴. As a result, low income households are somewhat underserved by regular Power Smart programs for residential customers. This supports the overall program rationale of providing special, low-cost assistance to low income residential customers.

Customer Survey

A detailed survey covering a wide range of program aspects was conducted with 400 program participants. When customers were asked how they became aware of LIHP (ESK), the most important sources of customer awareness were from BC Hydro bill inserts and other promotional literature (44%), family and friends (14%), newspapers and magazines (11%) and the BC Hydro website (8%). Overall customer satisfaction with the program as a whole was very high. Using the response categories (1) not at all important, (2) not very important, (3) neutral, (4) somewhat important, (5) very important and (6) don't know or not applicable. The combined top box score²⁵ was 89%.

Market Analysis

To understand market impacts, we examined the distribution of applications by product type and by facility type. Product installations under LIHP (ESK) for F2009 were approximately 181,400 units in total and consisted of 26,500 Compact Fluorescent Lights, 5,200 packages of Weather Stripping, 6,800 sets of Window Insulator Film, 60,800 Electric Outlet and Switch Covers, 5,900 Fridge Thermometers, 5,400 Low-flow Showerheads, 12,300 Faucet Aerators, 7,100 LED Night Lights, 4,200 Hot Water Pipe Wraps and 47,300 Electric Outlet and Switch Sealers.

For F2010, the corresponding overall figure for installations was approximately 223,270 units consisting of 32,550 Compact Fluorescent Lights, 6,450 packages of Weather Stripping, 8,310 sets of Window Insulator Film, 74,820 Electric Outlet and Switch Covers, 7,270 Fridge Thermometers, 6,600 Low-flow Showerheads, 15,100 Faucet Aerators, 8,710 LED Night Lights, 5,230 Hot Water Pipe Wraps and 58,220 Electric Outlet and Switch Sealers.

Energy and Peak Impacts

Gross and net energy savings were estimated for program activity in the period April 1 2008 through March 31 2009 and April 1 2009 through March 31 2010.

Evaluated *acquired* energy savings are 0.9 GWh compared to program gross energy savings of 1.2 GWh for F2009 and 1.4 GWh compared to program gross energy savings of 1.9 GWh in F2010. Net evaluated peak savings are 0.4 MW in F2009 compared to gross peak savings of 0.5 MW and 0.8 MW in F2010 compared to peak savings of 0.6 MW using load factors derived

²⁴ The 2009 CFL Impact Evaluation (Min Yu, BC Hydro Power Smart: 2009) showed a positive relationship between income and the number of CFL bulbs purchased per household. This is further evidence that low income customers require a different and more aggressive form of program intervention.

²⁵ Top box scores include categories 4 and 5.

from hourly consumption data²⁶. The cumulative savings totals for both fiscal years combined are 6.2 GWh and 4.6 GWh for the respective gross and net calculations.

Evaluated *run-rate* energy savings are 2.3 GWh compared to program gross energy savings of 3.1 GWh for F2009 and 2.6 GWh compared to program gross energy savings of 3.6 GWh in F2010. Net evaluated peak savings are 0.9 MW in F2009 compared to gross peak savings of 1.3 MW and 1.1 MW in F2010 compared to peak savings of 1.5 MW.

Recommendations

While the Energy Saving Kit is well-received and perceived as useful in assisting customers to reduce energy consumption, it is recommended that items recognized as useful in lowering household consumption yet difficult to install or use be considered for vendor assisted installation. Some kit items which customers do not appear to use (such as water measuring bags) might be excluded from the kits altogether.

It is further recommended that both net and gross calculations be accepted as representing the best estimate of savings due to Energy Saving Kits.

²⁶ It is assumed that savings from F2009 persist into F2010 at the full discounted rate in kilowatt-hours per year per participating customer (in F2009, the saving for participants entering the program are lower due to adjustments for the date kits were actually installed). For customers who received their kits during *F2009*, evaluated energy savings in F2010 are therefore actually 2.3 GWh = 241 kWh x 9,364 compared with gross savings of 3.1 GWh = 329 kWh x 9,364. These amounts are added to the savings attributed to the program by participants entering the program during F2010. The cumulative totals for both fiscal years are therefore 1.2+1.9+3.1=6.2 GWh (gross) and 0.9+1.4+2.3=4.6 GWh (net).

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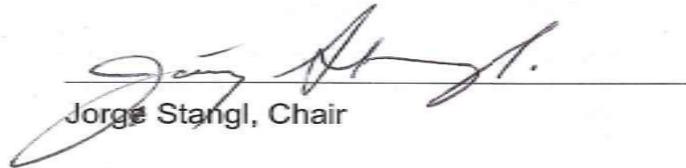
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EVALUATION OVERSIGHT COMMITTEE SIGN-OFF

This evaluation was prepared for Program Management and the BC Hydro Evaluation Oversight Committee. The Evaluation Oversight Committee was established to represent various stakeholders in BC Hydro to ensure that evaluation findings are of value to the corporation.

The Low Income Households Program Impact Evaluation for F2009 has met the criteria for sign-off by the BC Hydro Evaluation Oversight Committee, as outlined below:

1. The evaluation complied with the defined scope.
2. The methodology used for both evaluation of results and analysis are appropriate given the available resources at the time of the evaluation.
3. The results are reasonable given the data and resources available at the time of the evaluation.
4. The recommendations are acceptable.



Jorge Stangl, Chair



**Power Smart for Low-Income
Housing: the Energy Conservation
Assistance Program (ECAP)**

Program Evaluation F2010 and F2011

Final Report

February 28, 2012

Prepared by:

**Mark Rebman and Michael Li
Power Smart Evaluation**

Internal Use Only

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GLOSSARY

Bootstrapping - A method of assigning measures of accuracy to sample estimates. Bootstrapping estimates the sample distribution of the mean and variance by re-sampling an empirical distribution with replacement until results are consistent and stable. The procedure works well if the set of observations can be assumed to be drawn from an independent and identically distributed population. No additional information about the underlying distribution of the population is required. For more technical detail on this subject, consult a senior text on sampling theory or early monographs on the subject such as Efron (1979).

Electrical Demand – The amount of electricity consumed at any instant in time, measured in watts. Demand savings are the reduction in amount of electricity consumed at system peak demand, which for BC Hydro occurs on a winter weekday between 4 p.m. and 9 p.m.

Double-Difference Test – In the double-difference test (also known as the difference of differences test), the t-test is used to compare the sample means of an experimental group receiving an intervention at two points in time – one in the presence of the intervention and the other not – with the sample means of a control group at the same two points in time (t1 and t2). In the context of program evaluation, the experimental group consists of program participants while the control group is comprised of non-participants with similar characteristics along key dimensions. The null hypothesis that the program has no effect (zero savings per unit of analysis) is:

$$H_0: (\bar{X}_{\text{participants,t1}} - \bar{X}_{\text{participants,t2}}) - (\bar{X}_{\text{non-participants,t1}} - \bar{X}_{\text{non-participants,t2}}) = 0$$

Energy – Energy refers to the amount of electricity consumed over a certain time period, measured in multiples of watt-hours. Energy savings are the reduction in the amount of electricity consumed over a certain time period.

Free Riders – Free riders are program participants who would have purchased a product in the absence of a program but accepted program incentives.

Low Income Household – A residential household defined by a Statistics Canada Low-Income Cut-off (LICO) value. Values are determined by the percentage of households falling below an income threshold where the share of total income spent on necessities like food, shelter and clothing significantly exceeds the average. The threshold is currently set where households must spend 20 percent more of their income on these necessities than the average household. Statistics Canada currently publishes a set of two LICO tables every year with 35 pre-tax income and 35 after-tax thresholds.

Participant Free Rider Rate – The free rider rate is the percentage of program participants who would have purchased a product in the absence of incentives. Percentage estimates are usually derived from survey questions that ask participants whether or not an incentive influenced their buying decision.

Participant Spillover – Spillover is the percentage of program participants who purchased another related product as a result of program influence. Estimates are usually derived from survey questions that ask participants whether or not an incentive influenced them to buy additional or similar products.

Run-Rate Savings – Run rate savings is the rate at which the Power Smart programs or projects are saving electricity at a given point in time. This is usually expressed as GWh/yr at the end of the month or year being reported.

EXECUTIVE SUMMARY

Introduction

In 2007, the BC Provincial Government set out a plan to meet 50 percent of future resource needs through energy conservation by 2020¹. In partial support of this initiative, BC Hydro designed an energy savings acquisition program for low-income residential customers identified under the Statistics Canada Low-Income Cut-off (LICO). Low-income customers face significant barriers to participation in conventional Demand Side Management (DSM) programs. Factors affecting participation include low disposable income and sub-optimal access to program information and financing (social marginalization). Similarly defined programs are available in other North American jurisdictions such as California, Wisconsin, New York State and Québec.

The BC Hydro Power Smart Residential Low-Income Housing Program (PSLIHP) is intended to generate significant energy savings, contribute to BC Hydro energy savings goals and support the conservation targets of the provincial government's Energy Plan. In summary, the primary objectives of the program are to:

1. Make energy efficiency more accessible to low-income customers;
2. Provide energy savings for BC Hydro;
3. Provide low-income customers with energy-efficient technologies that reduce energy consumption and lower utility bills; and
4. Increase knowledge and awareness of energy efficiency among low-income customers.

The PSLIHP provides some low-cost energy savings measures that are easy to install by a homeowner or tenant. These are packaged into an Energy Saving Kit (ESK) which includes CFL lamps, faucet aerators, low-flow shower heads, pipe wrap, caulking and draft proofing materials, outlet gaskets, window film and a number of additional measures as well as tips on saving energy in the home.

Further offerings are delivered through the Energy Conservation Assistance Program (ECAP). The ECAP provides qualified low-income BC Hydro residential account holders with a home energy evaluation, the installation of additional energy saving products such as energy-efficient refrigerators and personalized energy efficiency advice. All services and equipment are supplied free of charge to the participant. Of eligible low-income customers, approximately 47% own and inhabit electrically heated single-family dwellings eligible for further retrofits under the basic or advanced stream of the ECAP². The advanced stream includes basic offerings but adds a comprehensive home insulation program. Other low-income customers such as renters or those living in natural gas heated dwellings remain eligible for the basic program stream.

In fiscal year 2010, the program commenced in May 2009 and totalled 607 ECAP participants of whom 534 (87.9%) received basic stream deliverables and 73 (12.1%) received the advanced. Fiscal year 2011 ran for a full 12 months and counted 1,719 participants consisting of 1,659 basic (96.5%) and 60 advanced (3.5%) program deliveries. The two-year total for fiscal years 2010 and 2011 was 607 (26%) and 1,719 (74%) respectively for 2,326 program completions in all.

¹ This plan was updated in the Fiscal 2011-2014 BC Hydro Service Plan to provide for 66% of future resource needs.

² BC Hydro Residential End-use Survey (2010)

The purpose of this document is to present an evaluation of ECAP for the fiscal years 2010 and 2011.

Program Rationale

As of March 31 2011, ECAP installed energy-efficient products in the homes of approximately 2,300 low-income residential customers and provided them with personalized energy efficiency advice. The program rationale is expressed through a program logic model which describes the linkages between inputs, outputs, purpose and goal for each activity (§3.1). The model is consistent and provides a sound program rationale.

Customer Survey

A detailed telephone survey of program participants conducted in June 2011 resulted in 300 interview completions. The response rate was an acceptable 15% of 2,000 participants polled and proportional representation by region and dwelling type was very good³. When customers were asked how they first became aware of the ECAP offering the most prevalent sources of customer awareness were building managers (25%), BC Hydro billing statements (25%), friends and relatives (10%) and the BC Hydro Website (9%). Ratings of the various program components were particularly high with 92 percent of respondents rating the overall quality of the work done by the contractor as either “excellent” or “good”.

Methodology

Energy savings have been estimated for program activity in fiscal years 2010 and 2011. Any naturally occurring conservation was accounted for in the gross savings calculations through the employment of participant and control groups. Initial gross savings estimates were calculated using a pre and post experimental design. The assumption is that, if the program and comparison groups are sufficiently comparable, any difference in outcome between the two groups may be attributed to the program. The program and comparison groups were compared across selected strata such as geographic location, program stream and dwelling type. A total of 448 participating households and 119 non-participating households were used to generate the final samples. Average pre-program consumption for program participants and non-participants was comparable at 15,142 kWh and 15,011 kWh per year respectively. The difference between these values is not statistically significant⁴, and consumption for both groups follows similar exponential distributions.

Re-sampling with replacement and bootstrapping techniques were applied to achieve sample equivalency with population strata.

³ See § 2.2 for more details regarding survey demographics.

⁴ This is established by the fact that the 95 percent confidence interval for mean participant consumption (15594, 14690) includes the consumption value for non-participants (15,011).

Energy Impacts

Gross and net energy savings were based on program activity in two fiscal years – one for the period April 1, 2009 through March 31, 2010 (F2010) and another for the period April 1, 2010 through March 31, 2011 (F2011) as shown in Table 3.7. The evaluation estimated program impact in the following stages:

1. **Gross savings.** A pre and post experimental design with participant and non-participant groups was used to compare pre-program and post-program metrics including electricity use. The gross savings were approximately 0.5 GWh for F2010 and 1.5 for F2011.
2. **Net savings (annual run-rate).** Since both free rider and spillover rates were assumed to be zero, gross and net savings are identical. Evaluated net energy savings for F2010 are therefore 0.5 GWh compared to reported gross savings of 0.4 GWh and 1.5 GWh compared to 1.4 GWh for F2011.

Conclusions

Although average savings per household were validated, program participation was significantly below expectation for both fiscal years examined in this report. Approximately 3,750 basic and 1,500 advanced program deliveries (5,250 in total) were anticipated by the end of fiscal year 2011⁵. These business case projections were based on results from programs with some market history such as the California Low Income Energy-Efficiency Program. Actual participation was much lower with only 2,193 basic and 133 advanced program completions (2,326 in total).

Better penetration and understanding of the target market would result in a higher program participation rate and savings value. A possible barrier to higher penetration levels in British Columbia may be the difficulty in identifying low income customers in electrically heated homes who require significant insulation upgrades. As this may be the result of insufficient outreach methods, a rigorous process review might identify important areas for improvement. Finding the detail for such a review requires more program experience.

This process review should precede any further impact assessment of ECAP by program stream.

⁵ Longland (2008) p 33

1.0 Introduction

1.1 Background

In 2008, BC Hydro approved a three-year business case for the Power Smart Low-Income Households Program (PSLIHP Phase II). The program is administered through a phone-in registration system with agents of BC Hydro recording information affecting eligibility such as total annual household income, the number of persons per household, account information and household location. BC Hydro low-income customers are defined by Statistics Canada Low-Income Cut-off (LICO) specifications. Similarly defined programs are available in other jurisdictions in North America such as California, Wisconsin, New York State and Québec. In each case, the improvement of social welfare was the single most important element of program design and implementation.

The PSLIHP provides free energy-efficient retrofits and assessments to customers who can least afford them. Program goals for low-income customers include:

1. *Addressing key barriers* to energy efficiency of affordability, availability and awareness;
2. *Presenting opportunities* to reduce energy consumption through energy efficiency; and
3. *Increasing knowledge* about energy conservation.

All three offers are fully funded by BC Hydro at no cost to participating customers.

The PSLIHP also provides program breadth and depth with the following two main components:

1. **Energy Saving Kits.** These are delivered to a large number of qualified participants upon request. Excepting some cases of vendor-assistance, kit components are generally selected and installed by participants themselves. In April 2008, the Low-Income Households Program began offering free Energy Savings Kits to residential customers falling below Statistics Canada designated Low-Income Cut-Off (LICO) points. These are designed to encourage customers to install 8 simple, low-tech energy-saving retrofits and improvements in their homes free of cost. Kits include Compact Florescent Lights (CFL), faucet aerators, low-flow shower heads, hot water pipe wrap, caulking, draft proofing materials, outlet gaskets, window film and a number of smaller products, and information on how to save energy in the home. Energy savings depend on choices made by the individual customer who may or may not install kit components. In addition, the program also offers a bulk distribution and direct install offer for non-profit housing providers and Aboriginal communities who distribute the kits in bulk to low-income tenants and community members.
2. **Energy Conservation Assistance Program (ECAP).** This is delivered by contractors and consists of a selection of products installed on the basis of assessed need. As it is known which products are actually installed, savings per participant are generally higher and more predictable. The program was launched in May 2009 and consists of *basic* and *advanced* streams. The *basic* stream includes a free basic home assessment to identify energy saving opportunities, the direct installation of select energy conservation measures plus 30 minutes of personalized energy efficiency consultation. There were 534 and 1,659 basic stream completions during fiscal years 2010 and 2011, respectively. The *advanced* stream includes the basic stream, an ecoENERGY assessment by a federally certified energy advisor plus additional energy conservation measures such as advanced weatherization. There were 73 and 60 advanced stream completions during fiscal years 2010 and 2011 respectively.

The purpose of this report is to provide a process and impact evaluation of ECAP.

The remainder of the current section reviews research on similar programs, while Section 2 summarizes the evaluation issues and methods of ECAP. Section 3 provides the results of data collection and analysis, Section 4 the conclusions, and Section 5 a select bibliography.

1.2 Literature Review

To understand the nature and impact of similar programs in other jurisdictions, a review was conducted in late 2011 to identify those most comparable to the PSLIHP in scope. Evaluation of low-income energy efficiency programs began during the 1990s and has since produced a modest body of literature. Research efforts included both traditional program evaluations and social welfare analyses.

Heffner and Campbell (2011) and Thompson (2006) discussed the salient energy-efficiency evaluation approaches.

Free ridership has been a focus of low-income program evaluation research. Berger (2011) concluded that free ridership is less an issue in low-income home audit programs as these provide both energy conservation and social welfare benefits to most program recipients. One such benefit was the overall improvement of living standards and affordability in the social housing market as discussed by Summerfor (2007). In most cases, low-income programs are designed to supply energy-efficient technologies to households without the information and financial resources to choose and purchase freely in the market. This entails an assumption of zero (or near zero) free ridership. State programs in California, Wisconsin and Oregon operate on this assumption.

The uncertain energy conservation outcome of weatherization measures was another focus of low-income program evaluation research. Roth et al. (2009) showed that the benefit and cost comparison of blower door tests for obtaining additional energy savings was not conclusive. Korane (2010) proposed incorporating comprehensive program audits into evaluation and linking measurement and verification efforts to program implementation to improve accuracy.

According to the literature, low-income energy conservation programs for residential customers often share the following key elements: (1) educational packages consisting of written information and community energy workshops; (2) free kits containing easy-to-install energy-efficient devices such as low-flow showerheads, faucet aerators and insulation material; and (3) home energy audits. Content varies considerably by program.

Table 1.1 contains an annotated selection of recent literature on low-income programs.

Table 1.1 A Selection of Key Findings in the Literature

Paper	Author and Date	Key Findings
<i>Strategies and Challenges in Measuring Non-Energy Benefits from a Low-Income Weatherization Program</i>	Allen & Gaffney (June 2010)	This paper presents the approach and non-energy benefits realized by the Econologis Program – a low-cost weatherization program administered by the Quebecois Agence d'Efficacite Energetique (AEE).
<i>The Need for Better Evaluation Methods for Home Energy Audit Programs</i>	Amanda C. Korane (2010)	Home energy audit programs are assessed. The article provides evidence that the presence of measurement and verification services in energy audits is a strong predictor of program success.
<i>Evaluating Low-Income Energy Efficiency Programs</i>	Berge (August 2011)	This paper is one which did not consider free-ridership an important consideration in the evaluation of low-income efficiency programs. The author found that, participants in such programs rarely undertake energy efficiency upgrades in the absence of financial support.
<i>The 2009 Impact Evaluation of California Low Income Energy Efficiency Program</i>	ECONorthwest (2010)	This evaluation found that the 2009 program generated lower energy savings than in prior years. The reduction was due to weather dependent energy saving measures such as the repair or replacement of home heating systems or hot water heaters. The program enabled increased use of these measures because the equipment was often idle or infrequently used prior to repair or replacement. The 2009 participants were also located in milder climate zones than were participants from prior years. Altogether, this resulted in lower overall energy consumption and associated savings.
<i>Evaluating the Co-benefits of Low-income Energy-efficiency Programmes</i>	Heffner & Campbell (June 2011)	A number of evaluation methods are presented which assess energy conservation effects and economic co-benefits associated with programs for low-income households. These include (a) Engineering Estimation; (b) Incremental impact Analysis; (c) Model-based Estimation and (d) Revealed Preference based on surveys.
<i>New York Energy Smart Low-income Energy Affordability Program Evaluation and Status Report</i>	New York State Energy Research and Development Authority (September 2002)	The authors found that energy efficiency programs for low-income customers in New York State achieved the twin goals of improving energy use efficiency and reducing energy consumption. The direct install program assisted over 10,200 low-income households between October 1998 and April 2002 and realized 11.4 GWh of electricity savings per annum. Interestingly, free rider and spillover rates were neither measured nor assumed and savings persistence was estimated at 12 years.
<i>Evaluating Low Income Energy Efficiency Programs: Getting Results in California</i>	O'Drain & Edwards (June 2010)	Some preliminary findings and results of five joint evaluation studies within California low income programs are discussed. Also included in the report are details on the collaborative utility-regulatory agency project management process, the evaluation approaches used and lessons learned.

Paper	Author and Date	Key Findings
<i>Wisconsin Low-income Weatherization Assistance Program Evaluation—Economic Development Benefits</i>	Petraglia & Weisbrod (February 2007)	This report evaluates the energy saving attributed to the first five years of the Wisconsin program at 22.6 GWh - or \$7.3 million in energy costs to customers and \$4.5 million in non-energy benefits. Non-energy benefits included some impacts on other streams of economic activities and development within Wisconsin.
<i>Assessing and Comparing the Results of a Meter Analysis and Blower Door Test of Weatherization Programs: Is the Expense of the Blower Door Test Worth It?</i>	Roth, McCormack, Jacobs & Hall (2009)	The authors examine the energy reduction impacts of 280 homes weatherized through the US Department of Energy Low-Income Weatherization Program. The study concluded that adding blower door tests to a standard home audit shows little evidence of cost effectiveness.
<i>Energy Efficiency-Based Utility Allowance—Increasing the Affordability of Affordable House</i>	Summerfor (May 2007)	Summerfor outlines some barriers to energy efficiency specific to social housing markets and presents some strategies to address them. Overall, the author finds that the impact of energy efficiency measures on housing affordability for low-income households is significant.
<i>NW Natural Oregon Low Income Energy Efficiency Program Impact Evaluation 2004-05 Program Year</i>	Thompson (December 2006)	This evaluation employs a quasi-experimental design to evaluate gas and electricity savings by comparing the change in consumption between program participants and non-participants. Savings by efficiency measure are based on statistical stock modeling and participant consumption but only four of nine direct install measures are estimated. Results were therefore not statistically certain for the remaining five. Average energy saving per customer was about 3,372 kWh per year for a 77 percent realization rate. Free riders were not measured or accounted for in this calculation.

2.0 Evaluation Issues and Methods

2.1 Research Design and Issues

The evaluation issues examined in this study were addressed by analysing program-related data and consulting both customers and internal BC Hydro stakeholders such as program administrators. The four main evaluation issues were:

- **Program Review.** Program components are described and an analysis of program logic is provided.
- **Consumption Analysis.** Consumption changes due to the ECAP program are analysed.
- **Customer Survey.** The survey assesses customer participation and attitudes towards the program, tabulates the number of products installed and discusses free ridership and spillover.
- **Energy Savings.** This section presents the energy savings attributed to the program in Fiscal Years 2010 and 2011.

The evaluation issues, data sources and methods used in the study to examine the evaluation issues are listed in Table 2.1.

Table 2.1 Evaluation Issues, Data Sources and Methods

Issues	Main data sources	Method
Program review	Discussions with Program Managers and Administrators	Update Logic Model
End use consumption	Initial technical analysis by retrofit item; billing data	Engineering algorithms informed and affirmed by billing analysis
Participation, satisfaction, product installation, free riders, participant spillover	Customer telephone survey (n = 300 of 2,000 polled)	Cross tabulations
Energy savings	Monthly billings, program recipient data and REUS 2010	A pre and post test with participant and non-participant groups

2.2 Data and Method

Information on all program applicants receiving ECAP deliverables during fiscal years 2010 and 2011 was obtained in November 2011. In addition to retrofit completion dates, there was sufficient information available on fuel type, location and demographic detail to provide a profile of program activity.

Customer awareness, satisfaction, program experience, respondent free rider and participant spillover questions were addressed in a telephone survey of 300 program participants conducted during June of 2011. Respondents were recruited from a list of 2,524 program completions from the relevant fiscal years and through to May 2011. The response rate was an acceptable 15% of 2,000 households polled and proportional representation by region and dwelling type was very good. The breakout by region (population versus sample) was: (a) Lower Mainland (59% to 54%); (b) Vancouver Island (38% to 42%) and (c) Interior⁶ (3% to 4%). The match by dwelling type was similarly close: (d) Single Family Dwellings⁷ (87% to 84%); (e) Apartments (6% to 8%) and (f) Mobile Homes (7% to 8%).

Gross and net energy savings were estimated for program activity completed during fiscal years 2010 and 2011. Since gross savings do not usually account for factors external to the program that might affect savings calculations, net savings are normally calculated to potentially adjust initial savings estimates for the influence of non-program related factors. These include the effects of free ridership and participant spillover. In this report, free rider and spillover rates are assumed to be zero. See §3.4 for a detailed discussion of this assumption.

Initial gross savings estimates were calculated using a pre and post experimental design that includes program and comparison groups – each with associated baseline and post-program measurements. The assumption is that, if the program and comparison groups are sufficiently comparable, any difference in outcome between the two groups may be plausibly attributed to the program. The difference of differences method applied here also accounts for naturally occurring conservation in the gross savings calculations.

A summary of program participation for fiscal years 2010 and 2011 by service region and program stream is shown in Table 2.2 below. Values in brackets indicate actual counts of participants obtained from program data used in the analysis.

Table 2.2 Participant Population by Region and Program Stream

<i>Geographic Region</i>	<i>Program Stream</i>		
	<i>Advanced</i>	<i>Basic</i>	<i>Total</i>
Lower Mainland	1.9% (44)	57.1% (1,328)	59.0% (1,372)
Vancouver Island	3.8% (89)	33.3% (774)	37.1% (873)
North and Southern Interior	0.0% (0)	3.9% (91)	3.9% (91)
Total	5.7% (133)	94.3% (2,193)	100% (2,326)

⁶ Interior includes both the North and Southern Interior.

⁷ This category collapses detached multiplex (duplex, triplex) and semi-detached townhouses with fully detached single family homes.

Program and comparison groups were analysed for comparability across geographic location, program stream and dwelling type. Re-sampling with replacement and bootstrapping were applied to correct for any sample imbalances. Table 2.3 shows an expanded disposition of the participant population and sample plus the original and bootstrapped sample of program non-participants. The non-participant sample was adjusted to ensure comparability with the participant sample (the appropriate columns are highlighted). Note in Table 2.2 that participation in the North and the Southern Interior was negligible (less than 4% of the total) and was excluded from this analysis. Exclusion of these participants was unavoidable as corresponding records were incomplete, suspect or too few in numbers to permit analysis of savings in the fiscal years of interest. This exclusion introduces a degree of unknown bias into results but the effect is assumed to be small for the years in question.

Overall consumption comparability between the participant and non-participant sample was very good. Mean annual pre-program consumption for sampled program participants and non-participants was 15,142 kWh and 15,011 kWh per year respectively. The difference between these values is not statistically significant, and consumption for both groups follows similar exponential distributions⁸.

Table 2.3 Participant Population and Sample Dispositions by Region

	<i>Lower Mainland</i>			
<i>Housing Type</i>	<i>Non-Participants (Original Sample)</i>	<i>Non-Participants (Bootstrapped Sample)</i>	<i>Participants⁹ (Population)</i>	<i>Participants (Sample)</i>
Single-Family Detached/ Townhouse/Duplex	81.4% (35)	91.4% (244)	91.9% (1,261)	91.4% (244)
Apartment	13.9% (6)	4.6% (12)	5.1% (70)	4.6% (12)
Mobile Home/Other	4.7% (2)	4.0% (11)	3.0% (41)	4.0% (11)
Total	100% (43)	100% (267)	100% (1,372)	100% (267)

	<i>Vancouver Island</i>			
<i>Housing Type</i>	<i>Non-Participants (Original Sample)</i>	<i>Non-Participants (Bootstrapped Sample)</i>	<i>Participants (Population)</i>	<i>Participants (Sample)</i>
Single-Family Detached/ Townhouse/Duplex	71.1% (54)	81.8% (148)	82.4% (719)	81.8% (148)
Apartment	9.2% (7)	3.9% (7)	3.3% (29)	3.9% (7)
Mobile Home/Other	19.7% (15)	14.3% (26)	14.3% (125)	14.3% (26)
Total	100% (76)	100% (181)	100% (873)	100% (181)

⁸ This is established by the fact that the 95 percent confidence interval for mean participant consumption (15,594, 14,590) includes the consumption value for non-participants (15,011). Note that the high consumption averages reported here are the result of the program bias toward electrically heated homes

⁹ The population total of 2,235 excludes participants from the interior regions as well as a few participants added to the official tally after sampling had already been completed. This partially accounts for the difference between the official participant total (2,326) and the number reported here.

In addition to the categories shown in Table 2.3, the Vancouver Island and Lower Mainland samples also reflect their respective shares of participant population by program stream. Although not shown here, this information is available in Table 2.2¹⁰.

Equation (1) shows how average gross energy savings were estimated. The average savings per participant were measured as the difference between average participant and non-participant changes in energy consumption for the sample. Equation (2) shows how total gross savings were estimated, while Equation (3) shows how the total gross savings are normally adjusted to calculate total net savings using an attribution rate.

N_{PP} in Equations (1) and (2) represents the total number of official program participants in a given fiscal year; $Base$ and $Post$ in Equation (1) are the respective consumption values in a baseline year without the program and those realised during a program year. The ΔkWh term in Equations (1), (2) and (3) represents the mean number of kilowatt-hours saved in one year as a result of the program.

$$(1) \Delta kWh = (Base_{kWh} - Post_{kWh})_{participants} - (Base_{kWh} - Post_{kWh})_{non-participants}$$

$$(2) \Delta GWh (Gross) = N_{PP} * \Delta kWh / 1,000,000$$

$$(3) \Delta GWh (Net) = N_{PP} * \Delta kWh * Attribution / 1,000,000$$

Attribution is normally calculated using free rider and participant spillover rates. As these rates are proportions, the attribution rate is calculated by subtracting the free rider rate from one and adding the spillover rate. The corresponding equation for attribution is $1 - \text{Free Rider Rate} + \text{Spillover Rate}$. The free rider rate accounts for customers who would have purchased the new technology on their own, while the participant spillover rate accounts for additional energy-efficient purchases not incented (but influenced by) the program. As the free rider and spillover rates are assumed to be zero, attribution has no effect on calculations in this report. See §3.4 for a detailed discussion of this assumption.

Given the extremely small scale of run-rate savings for this program and the absence of up-to-date load-shape data, peak savings were not calculated.

¹⁰ The percentage share by program stream translates to 25 advanced stream participants in the sample of which 5 are in the Lower Mainland region and the remaining 20 situated on Vancouver Island.

3.0 Results

3.1 Program Review

Table 3.1 provides a program logic model developed from interviews with the program manager, a review of relevant program information and a literature search based on select experience in other jurisdictions. The model summarizes program inputs, outputs, purpose, goal and assumptions. The review of the logic model supports a claim of program validity for the following reasons: (1) program linkages had face validity and were plausible; (2) key outputs were based on reasonable assumptions and, therefore, were likely to be met; and (3) key model components had performance indicators that could be measured against objectives

Table 3.1 Low-Income Households Program Logic Model

	Marketing	Inspections	Delivery	Assumptions
Inputs	Advertising and promotional activities	Customer applies to determine eligibility	Power Smart arranges delivery of ECAP to eligible customers	Consumers are able to practice desired energy conservation behaviours
Outputs	Customers are aware of the program and energy-efficient retrofit technologies	Application is processed and assigned to a certified contractor	Energy-efficiency suggestions are communicated and appropriate retrofits delivered and installed	The program attribution rate does not jeopardize program savings
Purpose	Customers participate in the program	Low-income residential customers receive appropriate retrofits	Energy-efficient retrofits function to specification	Take back and rebound are insignificant ¹¹
Goal	Reduce energy consumption in the residential sector by targeting low-income households.			

¹¹ Expected overall savings per household from ECAP represent about 5.8% of total energy usage per participant. This translates into an average saving of around \$84 per customer at Step 2 of the 2010 Residential Inclinig Block Rate. At lower income levels, it seems realistic to assume that dollar savings will go to necessities such as food, medical services, clothes and other pressing requirements. As a result, little measurable re-bounce or take-back should occur.

3.2 Savings Calculations

Program savings were calculated by observing the difference between the weather-normalized, mean annual consumption of a suitable baseline period and a program-affected period of equal duration for each participating (treatment) and non-participating (control) customer. In general, this was achieved by (1) selecting a representative sample from each group of customers and using a bootstrapping technique to re-sample until each comparison group was of equal size and distribution; and (2) separately calculating the difference in means between baseline and program intervention periods for treatment and control groups.

The original distribution of the participant set was used to generate the final non-participant sample using a technique known as *bootstrapping*. This approach uses random sampling with replacement to bring the non-participant sample in line with the original size and distribution of key traits shown by the participant sample¹². This activity entailed the expansion of the raw non-participant set from the original 119 cases to 448 and an adjustment to ensure that the distribution of cases were rendered as similar as possible on the chosen attributes of region, dwelling type and program stream for both the participant and non-participant groups.

Recall from §2.2 that less than 4% of participants were from regions other than Vancouver Island or the Lower Mainland. As representation from the North or the Southern Interior is inadequate for sampling purposes, this analysis is restricted to the Vancouver Island and Lower Mainland regions. While this undesirable restriction introduces a potential for bias resulting from regional differences in culture, socio-economic conditions and weather, the program is focussed heavily on electrically heated homes. However, for historical and geographical reasons, these homes are more common in the Lower Mainland and Vancouver Island regions. As a result, bias due to sampling restriction should be small.

Annual electricity savings results are shown in Table 3.2.

Table 3.2 Annual Electricity Savings

Statistic	Non-Participants (X_{np})	Participants (X_p)	$D = (X_p - X_{np})$	95% Confidence Interval (D)
Mean Savings (kWh)	242	-632	-874	(-895, -852)
Standard Error of Savings (kWh)	2.2	10.9	11.1 ¹³	-
Observations	448	448	-	-
Test Difference	0	-	-	-
t - statistic	79	-	-	-

The mean difference **D** of 874 kilowatt-hours per annum implies an average energy saving of approximately 5.8% on average annual baseline consumption of 15,142 kWh for program participants.

¹²A more detailed description of this technique may be found in the glossary of this report. A reference text is also cited.

¹³For this calculation a pooled variance is used.

3.3 Consumption Savings by Program Stream

Table 3.3 compares reported and evaluated savings for the ECAP program as a whole. Technical estimates were applied in the business case to approximate potential and actual savings per program participant. This information provides an annual estimate of maximal savings in a typical participating household and represents the cumulative effect of various adjustments for installation rate, usage rate and cross-over effects based on engineering algorithms. The mean savings per program participant reflects the actual regional population distributions as opposed to those sampled as well as the population proportion of participants by program stream.

Table 3.3 Consumption Savings per Household (kWh/yr)

Estimate Source	Mean Savings
Reported ¹⁴	778
Evaluated	874

The evaluated result in Table 3.3 is based on results from the pre and post test of annual consumption using the method presented in Equation (1) of Section 2.2 above; the corresponding reported figure is pro-rated from known counts of participants and reported savings in Gigawatt-hours per annum. The data was not sufficient to determine the annual savings per household by program streams; only overall program mean savings values (last column) may be reasonably compared.

¹⁴ This number is calculated by dividing the total reported savings from both program streams for both fiscal years (1.81 GWh) by the total number of participants (2,326). The resulting savings rate per participant is a weighted average of both program years.

3.4 Customer Participation, Customer Satisfaction and Installations

The tables in this section contain results from a telephone survey of program participants conducted in June of 2011. Approximately 300 survey completions were achieved from the 2,000 participants polled – a very acceptable 15% completion rate. Table 3.4 details the main reported sources of awareness of the program. The most frequent sources of customer awareness of ECAP are building managers (25%), BC Hydro bill inserts (25%), family members or friends (10%) and the BC Hydro website (9%). These categories reflect the most common means of customer contact in recent years and by no means reflect an exhaustive list.

Table 3.4 Primary Source of Program Participant Awareness

Source	Share
Building Manager	25%
BC Hydro Bill Inserts	25%
Family Members or Friends	10%
The BC Hydro Website	9%
BC Housing	4%
Mail (general)	4%
First Nations Band Office	3%
Local Community Service Organization	2%
Television	2%
Radio	2%
BC Hydro Call Centre	2%
Other	12%
Total Sample	100%

Table 3.5 details participant performance ratings of contractor performance in four categories: (1) the courtesy and professionalism of the contractor; (2) the ease of scheduling the energy audit and retrofit installation with the contractor; (3) the punctuality of the contractor in arriving at the residence to conduct the work; and (4) the overall quality of the work done by the contractor.

Top-two box ratings (excellent plus good) measure well into the 90th percentile for each of the metrics, including 92 percent for the overall quality of the work done by the contractor. This confirms that the program is being implemented to the satisfaction of most program participants.

Table 3.5 Participant Assessment of ECAP Contractor Performance

Contractor Behaviour¹⁵	Excellent	Good	Fair	Poor	Very Poor
Courtesy and professionalism of the contractor	68%	27%	4%	1%	-
Scheduling the energy audit and retrofit installation	56%	40%	2%	1%	1%
Punctuality of the contractor in arriving at your residence	70%	27%	2%	1%	-
Overall quality of the work done by the contractor	53%	39%	6%	1%	1%

Free Rider Rate

An original objective of this evaluation was to base free rider estimates on the relative importance customers placed on program participation when deciding to install energy-efficient products. The rate was to be based on how survey respondents ranked this importance on installed items. They were to be asked whether they would have purchased and installed any of the ECAP retrofits had they not received the service and installed products for free. Those responding in the affirmative were to be treated as free riders.

The free rider rate was designed as a weighted mix of program deliverables which assumes that each customer independently assesses the relative merits of each product or service. While this approach carries logical appeal, customers actually receive their program deliverables all at once. This suggests that the free rider rate could be much lower than a weighted average of products and services since low-income customers would resist paying for an entire suite of goods at one time, but might do so in stages over a longer period of time. Although the updated low-income participant survey is not currently designed to deal with this issue, changes to program attribution survey items are now likely.

Given this argument and further support from the literature, the free rider rate for this program was set to zero.

¹⁵ Behaviour is measured on the following 5-point labelled scale: Excellent, Good, Fair, Poor, Very Poor. "Don't know" responses have been removed from the denominator for the purposes of the percentage calculations.

Participant Spillover Rate

Participant spillover estimates were to be based on the percentage of program participants who purchased additional energy-efficient products as a result of program influence. Participants were to be asked whether they had installed additional energy-efficient equipment outside the program as well as the type installed. They were then to be asked whether they had purchased additional items supplied by ECAP as a result of their having participated in the program. This was to provide an indication of how important participation in the program was in the decision to install additional energy-efficient product(s). Affirmative responses were then to be treated as spillover.

This planned spillover rate was to be based on a weighted mix of program deliverables which assumes that the customer separately assesses the relative merits of each product or service. Like the initially planned free-rider rate, this measure assumed that the customer independently assessed each product or service. While this approach carries a certain logical appeal, ECAP participants actually receive their program deliverables as a package in a relatively short time frame. This suggests that the spillover rate could differ from a weighted average of intentions to purchase additional energy-efficient products and services. A proper assessment might proceed in stages over a longer period of time since some passage of time is required for spillover to occur. As the installation of retrofits was very recent, it was felt that asking questions about their effect on current purchases of similar products was too premature. Although the updated low-income participant survey is not currently designed to deal with this issue, changes to program attribution survey items are anticipated.

Following this argument, the spillover rate for this program was set to zero.

Program Attribution

Free rider (FR) and spillover rate (SO) calculations were planned for ECAP as a whole. These were to be based on the program participant survey conducted in June of 2011 and weighted according to the proportionate contribution of each retrofit to the overall free rider and spillover estimates. The net-to-gross ratio would continue to be defined as $1 - FR + SO$.

An original motivation for these calculations was to *verify* the common assumption of zero (or near zero) free ridership and negligible spillover rates (or an attribution rate of 1.0)¹⁶ as it was unclear whether the low-income cut-off used to establish ECAP eligibility was sufficiently low to discount free ridership and spillover altogether. For programs where the income of an eligible household consists *wholly* of state support, the assumption of zero free ridership seemed valid but it was felt that this assumption should be tested on the *mix* of working poor and welfare recipients who constitute the population of BC Hydro low-income customers.

Since it is believed that the calculation of free rider rates using a weighted average may artificially reduce the already small estimate of program attribution, an attribution rate of 1.0 was assumed for this evaluation. An attribution rate of 1.0 has no effect on gross savings calculations.

¹⁶ This is supported by comments made during the April 21, 2010 BC Hydro Evaluation Oversight Committee (EOC) Meeting. David Sumi, formerly of PA Consulting and formerly a senior advisor to the Committee, is a known expert in evaluation methodology. He stated that gross savings are not normally adjusted in the case of low-income programs. Both free rider and spillover rates are usually considered to cancel each other out and produce an attribution rate of zero. Existing low income programs in the states of Wisconsin, Oregon and California also assume zero free rider rates.

3.5 Installation by Retrofit Item

Table 3.6 provides information on the installation rate of each ECAP retrofit technology. The total number of retrofits and service delivered was approximately 25,000 units in fiscal years 2010 and 2011. These units included approximately 14,200 Compact Fluorescent Lights, 1,800 Draft-proofing actions, 700 Refrigerator replacements, 2,100 Faucet Aerators, 1,000 Low-flow Showerheads, 800 LED Night Lights, 1,000 Hot Water Pipe Wraps, 2,000 Fridge Thermometers and 1,300 sets of Window Insulator Film.

The estimated number of installations by item for both 2010 and 2011 fiscal years is the net figure adjusted for the installation rate shown in column two of Table 3.6. The table may help program administrators focus on those retrofit technologies that attain a threshold installation rate high enough to warrant some measure of cost-effectiveness.

Table 3.6 ECAP Installations by Item (by March 31 2011)

<i>Retrofit</i>	<i>Installation Rate</i>	<i>Estimated Deliveries</i>
CFL	0.759	14,183
Draft-proofing (any)	0.782	1,820
Fridge	0.316	735
Insulation (any)	0.056	130
LF Aerator	0.884	2,055
LF Showerhead	0.432	1,004
Night Light	0.361	840
Pipe Wrap	0.415	965
Thermo-card	0.879	2,045
Water Heater Blanket	0.014	33
Window Insulating Film	0.574	1,334
Total	N/A	25,145

3.6 Energy and Impacts

Energy savings were estimated for program activity for the period May 2009 through March 31, 2011 (approximately two full fiscal years) as shown in Table 3.7. This evaluation addresses gross program savings as follows: (1) the gross savings algorithms and parameter assumptions used in the calculation of program deemed savings were based on the statistically estimated run-rate; and (2) net savings were equated with gross (evaluated) savings as zero free rider and spillover rates are assumed.

For comparison purposes, total reported gross savings were estimated at 0.4 GWh for F2010 and 1.4 GWh for F2011 for 1.8 GWh in total. Evaluated savings are slightly higher (0.2 GWh) than reported savings.

Table 3.7 Estimated Run-Rate Gross Energy Impacts of Applications by Year

Fiscal Year	Participants by Fiscal Year	Gross Mean Saving per Participant (kWh)	Gross Savings (GWh)	1 – FR + SO	Net Savings (GWh)
2010	607	874	0.5	1.00	0.5
2011	1,719	874	1.5	1.00	1.5
Total	2,326	874	2.0	1.00	2.0

4.0 Conclusions

Program Rationale

ECAP is meeting some of its stated objective of increasing the penetration of a broader range of energy-efficient behaviours and technologies into the low-income residential market. According to cross-jurisdictional experience, most low-income households *do* appear to have more difficulty implementing simple energy efficiency behaviours than those in the general population. Social marginalization due to literacy issues, a disproportionate number of elderly customers and access to information appear to be the major barriers to program participation. As a result, low-income households in British Columbia are somewhat underserved by regular Power Smart programs for residential customers. Findings from ECAP do not, therefore, contradict the overall low-income program rationale of providing special, low-cost assistance to low-income residential customers. This statement is supported by the fact that, participation in other Power Smart programs is low for this group compared to other socio-economic groups¹⁷.

Nevertheless, although savings per household were validated, participation was significantly below expectation in both fiscal years examined in this report. Approximately 3,750 basic and 1,500 advanced program deliveries were anticipated by the end of fiscal year 2011¹⁸. Participation projections presented in the business case were based on results from programs with market history such as the California Low Income Energy-Efficiency Program. Better penetration and understanding of the target market would likely result in higher program participation and savings rates.

One barrier to higher market penetration in British Columbia may be the apparent difficulty in identifying those low income customers in electrically heated homes who require the more significant insulation upgrades. As this is most likely the result of insufficient outreach methods, a rigorous process review might identify important areas for improvement. Such a review should likely precede any further impact assessment of ECAP by program stream.

Customer Survey

A detailed survey covering a wide range of program aspects was conducted with 300 program participants. The response rate of 15% on 2,000 customers polled was good for a telephone survey. When customers were asked how they first became aware of the ECAP offering the most frequent sources of customer awareness were building managers (25%), BC Hydro billing statements (25%), friends and relatives (10%) and the BC Hydro Website (9%). Overall customer assessment of the contractors' performance in the program as a whole was very high: a total of 92 percent of customers rated the overall quality of the work done by their contractor as either "excellent" or "good".

¹⁷ For example, 24% of all residential customers report participation in the Power Smart Refrigerator Buy-Back Program (2012 Power Smart Residential Rate Survey). The corresponding figure for low-income customers is only 11% (2011 Survey of Low-income Program Participants). This pattern is similar with other residential programs.

¹⁸ Longland (2008) p 33

Retrofit Installations

To understand program impacts in greater detail, the distribution of individual energy efficient retrofit products was examined by retrofit type. The 2,326 program completions for ECAP in F2010 and F2011 consisted of approximately 25,000 individual retrofits in total. These units included approximately 14,200 Compact Fluorescent Lights, 1,800 Draft-proofing actions, 700 Refrigerator replacements, 2,100 Faucet Aerators, 1,000 Low-flow Showerheads, 800 LED Night Lights, 1,000 Hot Water Pipe Wraps, 2,000 Fridge Thermometers and 1,300 sets of Window Insulator Film.

An analysis of these installations and their rate per household should be reviewed by program management to determine whether some items might be dropped or efforts redoubled on others to obtain optimal results.

Energy Impacts

Energy savings for program activity covered the period April 1 2009 through March 31 2011.

Evaluated energy savings were 0.5 GWh compared to (reported) program gross energy savings of 0.4 GWh for F2010 and 1.5 GWh compared to (reported) program gross energy savings of 1.4 GWh in F2011. The cumulative savings totals for both fiscal years combined are 1.8 GWh and 2.0 GWh for the respective reported and evaluated calculations. This finding validates the mean saving assumptions per household assumed by ECAP.

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EVALUATION OVERSIGHT COMMITTEE SIGN-OFF

This evaluation was prepared for Program Management and the BC Hydro Evaluation Oversight Committee. The Evaluation Oversight Committee was established to represent various stakeholders in BC Hydro to ensure that evaluation findings are of value to the corporation.

The Low-Income Households Program Impact Evaluation for F2010 – F2011 has met the criteria for sign-off by the BC Hydro Evaluation Oversight Committee, as outlined below:

1. The evaluation complied with the defined scope.
2. The methodology used for both evaluation of results and analysis are appropriate given the available resources at the time of the evaluation.
3. The results are reasonable given the data and resources available at the time of the evaluation.



David Ince, Chair, Load and Marketing Forecast Manager

British Columbia Old Age Pensioners' Organization Information Request No. 1.106.1 Dated: November 17, 2015 British Columbia Hydro & Power Authority REVISED Response issued February 12, 2016	Page 1 of 2
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106.0 CHAPTER 5 RESIDENTIAL RATE DESIGN

**Reference: Exhibit B-1, Section 5.6.2
 Low income energy efficiency**

1.106.1 Please provide all studies, reports, evaluations or other written documents of any nature within the custody or control of BC Hydro, prepared since January 2005 regarding the extent of the following DSM market conditions experienced by low income households in British Columbia:

- (a) High initial capital costs of energy efficiency investments;
- (b) Lack of access to capital for energy efficiency investments;
- (c) High implicit discount rates/payback periods for energy efficiency investments;
- (d) High proportion of low income renters;
- (e) Split incentives between landlord and tenants relative to energy efficiency investments; and
- (f) High mobility rate of low income renters.

ORIGINAL RESPONSE:

BC Hydro respectfully declines to respond to this IR on the basis that the information sought is not relevant to and cannot aid in the review of the 2015 RDA or the orders sought in respect of it, or for purposes of the Minister RIB Report Letter.

The requested information is broad in scope temporally and geographically- "all studies, reports, evaluations or other written documents of any nature within the custody or control of BC Hydro" over the last decade, regarding "DSM market conditions experienced by low income households in British Columbia", thus including portions of the Province outside of BC Hydro's service area. An inquiry into "DSM market conditions experienced by low income households in British Columbia" amounts to a virtually unconditional examination of the establishment of BC Hydro's low income DSM programs. Even a generous reading of Minister RIB Report Letter Questions 4 and 5 cannot support such an inquiry.

REVISED RESPONSE:

BCOAPO and BC Hydro agreed that for the purpose of answering this IR, BC Hydro would take reasonable efforts to search for readily available documents. BC Hydro does not have specific research on all the items listed above; however, the following reports may provide some insight into the DSM market conditions experienced by low income households in British Columbia.

British Columbia Old Age Pensioners' Organization Information Request No. 1.106.1 Dated: November 17, 2015 British Columbia Hydro & Power Authority REVISED Response issued February 12, 2016	Page 2 of 2
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- **“Characteristics of BC Hydro’s Low Income Households”, Analysis from 2012 Residential End Use Survey (Attachment 1);**
- **“Threshold Setting for Low Income Energy Conservation Programs”, 2012 (Attachment 2);**
- **“Opportunity Assessment of Power Smart Programs in Residential Rental Market”, 2012 (Attachment 3); and**
- **“Addressing the Split Incentives Issue in British Columbia”, 2009 (Attachment 4).**

Characteristics of BC Hydro’s Low-income Customers

Analysis completed by the Power Smart Evaluation and Research department using the 2012 Residential End Use Survey (**REUS**) finds the following characteristics for BC Hydro low-income customers.

General:

As of 2012, BC Hydro has approximately 1.6 million residential accounts (representing households) of which 11 per cent fall into the low-income category as defined by Statistics Canada Low Income Cut-off (**LICO**) tables for 2012.

Statistics Canada LICO Table 2012

Community Size (Population)			
Household Size	Rural < 30,000	CA 30,000-499,999	CMA > 500,000
1 person	\$18,520	\$20,366	\$23,647
2 persons	\$23,055	\$25,353	\$29,440
3 persons	\$28,434	\$31,168	\$36,193
4 persons	\$34,414	\$37,843	\$43,942
5 persons	\$39,031	\$42,920	\$49,839
6 persons	\$44,021	\$48,408	\$56,209
7 or more persons	\$49,010	\$53,894	\$62,581

* 2012 LICO Scale (before tax household income). Source: Statistics Canada.

Region

Compared to the general population, low-income households in B.C. are more likely to be found in the Lower Mainland than in other three regions of the province.

Table 1 Regional Distribution of Low-income Households in B.C.

Regional Distribution of Households	All BC Hydro Residential Customers	Non-LICO Sub-population	Low-income (LICO) Sub-population
Total Number of Accounts	1,637,000	1,455,000	182,000
Lower Mainland (%)	58	57	68
Vancouver Island (%)	22	22	17
Southern Interior (%)	12	12	8
North (%)	9	9	7

Home Ownership

Low-income account holders are less likely to be homeowners than the average BC Hydro customer (57 per cent vs. 81 per cent). Electrically heated low-income customers are significantly more likely to live in rental or subsidized housing compared to non-electrically heated low-income customers.

Table 2 Status of Home Ownership in BC’s Low-income Population

Home Ownership	All BC Hydro Customers	Low-income (LICO) Sub-population	Low-income (Elect Heat)	Low-income (non- EH)
Total Households (N)	1,637,000	182,000	79,000	103,000
Owned (%)	81	57	51	63
Rented (%)	18	41	47	36
Co-op (%)	1	2	2	1

Dwelling Type

Low-income households are less likely to live in single family detached homes compared to the general population (36 per cent vs. 56 per cent). Conversely, low-income households are more likely to live in apartments (42 per cent) than the general population (26 per cent). Low-income customers who heat their homes with electricity are more likely to live in apartments than in single family detached, townhouses and mobile homes.

Table 3 Dwelling Types by Customer Segment

Dwelling Type (% of Population)	All BC Hydro Customers	Low-income (All)	Low-income (Elect Heat)	Low-income (non-EH)
Total (N)	1,637,000	182,000	79,000	103,000
Single Family Detached (%)	56	36	21	48
Duplex/Row/Townhouse (%)	13	17	21	14
Apartment/Condo (%)	27	42	55	32
Mobile/other (%)	5	6	4	7

Dwelling Size

Compared to the general customer population, low-income customers live in smaller homes (regardless of dwelling type).

Table 8 Dwelling Sizes by Dwelling Type and Customer Segment

Dwelling Size (square feet) ft²	All BC Hydro Customers	Low-income (LICO) Sub-population
Total (N)	1,637,000	182,000
Single Family Detached	2326	2161
Duplex/Row/Townhouse	1590	1436
Apartment or Condo	903	758
Mobile/Other	1063	983

Household composition

Low-income households in B.C. are more likely to be composed of single individuals or of four or more people living together (fewer couple households). In addition, low-income households are more likely to contain children and young adults.

Table 4 Household Composition of B.C.’s Low-income Population

Number of Household Occupants and Presence of Children and Young Adults	All BC Hydro Customers	Low-income (LICO) Sub-population
Total (N) – Number of Occupants	1,637,000	182,000
1 (%)	25	32
2 (%)	42	27
3 (%)	13	10
4+ (%)	21	31
Household with children under 12 (%)	17	27
Household with young adults (13-24) (%)	20	27
Total (%)	100	100

Households headed by seniors, young adults and women

The primary bill payer in a low-income household is more likely to be female (57 per cent in the low-income population vs. 47 per cent in the general population). Few households are headed by young adults; however this scenario is more likely to occur in the low-income population. Seniors are the primary bill payer in nearly one-third of all BC Hydro’s customers, regardless of income level.

Table 5 Age and Sex of Low-income Primary Household Bill Payers

Primary Household Bill Payers	All BC Hydro Customers	Low-income (LICO) Sub-population
Total (N)	1,637,000	182,000
Female (%)	47	57
Male (%)	53	43
Young Adult (18-24) (%)	1	3
Senior (65+) (%)	31	33

Education

Low-income customers are more likely to have less than a grade 12 education than the general population in B.C (17 per cent vs. 8 per cent). And although fewer customers in the low-income population are college, vocational or technical school graduates, there is little difference between high school and university graduates compared with the general population in B.C.

Table 7 Education Level of B.C.'s Low-Income Sub-population

Level of Education Reached (% of Population)	All BC Hydro Customers	Low-income (LICO) Sub-population
Total (N)	1,637,000	182,000
Less than grade 12 (%)	9	17
High School Diploma (%)	15	15
Some college, vocational or technical school (%)	19	20
College, vocational or technical school (%)	20	12
Some university (%)	7	8
University/Graduate degree (%)	31	28

Language spoken at home -

The primary language spoken at home in low-income households is less likely to be English (72 per cent in the low-income population vs. 90 per cent in the general population). Cantonese, Mandarin, and Punjabi are recognized as major non-official language groups in B.C. (languages other than English or French). In general, these three non-official languages are spoken more often at home in the low-income population than in the general population and low-income households are more likely than the general population to speak another non-official language other than Cantonese, Mandarin, or Punjabi.

Table 9 Language Spoken at Home in B.C. Households

Language Spoken at Home (Home Language of Primary Household Maintainer)	All BC Households	Low-income (LICO) Sub-population
Total (N)	1,637,000	182,000
English (%)	90	72
French (%)	0.5	1.4
Cantonese (%)	3	8
Mandarin (%)	2	6
Punjabi (%)	0.3	1.4
Other language (%)	4.4	11

Average Annual Consumption for Fiscal Year 2012 by Dwelling Type and Heating Type

In general, low-income customers consume less electricity than the average customer, with the exception of those living in electrically- heated single family dwellings. However, this result is probably significantly due to the fact that low-income customers are more likely to live in apartments and smaller dwellings (ft²) overall.

Table 10 Annual Consumption by Dwelling Type and Customer Segment

Average Annual Consumption (kWh) by Dwelling Type	All BC Hydro Customers	Low-income (all)	Low-income (Elect Heat)	Low-income (non-EH)
Total (N)	1,637,000	182,000	79,000	103,000
All Types	10,155	7,959	8,962	7,115
Single Family Detached	12,757	11,920	18,586	9,629
Duplex/Row/Townhouse	9,363	8,345	8,791	7,700
Apartment or Condo	5,056	4,358	5,344	2,971
Mobile/Other	10,407	9,267	11,236	8,095

SAMPSON RESEARCH

Consulting Project

THRESHOLD SETTING FOR LOW INCOME ENERGY CONSERVATION PROGRAMS

Prepared for:

BC Hydro Power Smart

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Disclaimer

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

Currency Units

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

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EXECUTIVE SUMMARY

THRESHOLD SETTING FOR LOW INCOME ENERGY CONSERVATION PROGRAMS

This report summarizes a review of measures, methods, and rationale used to determine eligibility for energy conservation programs directed at low income households. The research included an industry scan of the methods and procedures used to qualify participants in low income energy conservation programs, the determination of an industry standard, if any, for qualifying low income applicants, and an investigation into the application and rationale for use of scale or mark-up factors applied to low income thresholds. The latter is extended to recommendations for whether a scale factor is needed for BC Hydro's low income DSM program. Additionally, the industry scan increased understanding of the treatment of co-operative housing in low income conservation programs.

E.1 Research Findings

Highlights from the industry scan include:

- Determining what proportion of households under financial stress is highly subjective regardless of the criteria or measure used. This subjectivity applies to many of the underlying assumptions, measurement criteria, and, in some cases, the concepts themselves.
- There are four published statistical options used in Canada to determine the incidence of low income individuals and households – Low Income Measure (LIM), Market Basket Measure (MBM), Housing Income Limits (HILs), and Low Income Cut-Offs (LICO). Of these, LICO represents the oldest and most commonly used measure of low income status to define eligible participants for a low income program.
- Benefits to using LICO include the differentiation of thresholds by family and community size, annual government updates to the income thresholds, administrative efficiency (i.e., can be used either with before or after tax household income), and its general acceptance as a reasonable attempt to define households in financial stress.
- Drawbacks (weaknesses) to using LICO include its lack of regional- or community-specific thresholds, a general lack of transparency to users, and an empirical foundation based on spending and income patterns now 20 years old.

Highlights from the determination of an industry standard for low income in Canada, and the need for a mark-up factor for British Columbia include:

- LICO is the most common measure used to qualify participants in low income conservation programs in Canada.
- There is precedence for marking-up the LICO thresholds, as confirmed by several of the Canadian utilities contacted as part of industry scan. Scale factors of between 115% and 135% to the LICO income thresholds were noted.

EXECUTIVE SUMMARY

- Despite their use, rationales for using mark-ups are not well understood. Methods and assumptions used to determine the size of the mark-up appear to be lacking.
- An investigation into differences in the cost of living between British Columbia and the national average using published statistics on household expenditures yielded sufficient evidence to suggest that (1) household operating costs in British Columbia, particularly that of shelter costs, were significantly higher than the national average when LICO thresholds were last determined (1992); and (2) while the size of the discrepancy appears to have diminished in the subsequent passage of time, updates to the LICO thresholds using the national consumer price index (CPI) have failed to fully compensate for the cost differential.
- The higher cost of living in British Columbia has not been offset by relatively higher household incomes. Median household incomes are equivalent to the national average.

E.2 Summary and Conclusions

The question of who should qualify for a low income program offered by BC Hydro should be viewed from the perspective of identifying who is not participating in the utility's existing DSM initiatives because of limited financial resources. In particular, the initial financial outlay or "first cost" associated with adopting energy efficient measures can be a legitimate barrier for those with limited financial means to participate in a DSM initiative that requires an out-of-pocket financial contribution by the participant. Awareness that the long-term energy savings from adopting the measures will more than offset their initial financial outlay is important for those with financial means, but it is a moot point for those who struggle to provide the basic necessities of food, clothing and shelter. It is this latter group that should be the primary candidate for a low income energy efficiency initiative.

Based on the results of the industry scan, and analysis of applicability of low income measures to British Columbia, there appears sufficient evidence to support the:

- continued use of LICO as the primary vehicle for qualifying eligible participants for BC Hydro's low income DSM program, and
- application of a scale factor to the LICO thresholds to compensate for British Columbia's relatively higher cost of housing for both renters and owners.

E.3 Recommendations

- BC Hydro should continue to use LICO thresholds to qualify applicants for their low income DSM program. The concept's basis of relating financial means to spending on the basic necessities of food, clothing, and shelter is intellectually intuitive but also administratively efficient.
- BC Hydro should consider raising the LICO thresholds to accommodate the higher cost of living in British Columbia particularly for the large urban centres. Based on the analysis presented in this report, a conservative scale factor of 115% and 125% is justifiable.

- BC Hydro should develop a better understanding of the characteristics of the residential customers that are not participating in DSM initiatives due to limited financial means to qualify and support an appropriately sized scale factor.

* * * * *

1 INTRODUCTION

1.1 Introduction

This report summarizes research and offers conclusions derived from a review of industry measures used to determine eligibility for energy conservation programs directed at low income households. The report summarizes the research objectives, methodology, research findings, conclusions, and recommendations.

1.2 Research Objectives

The primary objective of the research was to understand the methods, measures, and rationale(s) used by electric and gas utilities to qualify households for participation in low income energy conservation programs, and to determine whether these criteria are suitable and appropriate for application to BC Hydro's residential low income DSM program. These objectives were satisfied by undertaking the following tasks:

- Conducting an industry scan of the low income measures and thresholds used by Canadian and US utilities that operate low income energy conservation programs, and assessing the incidence and rationale used to support mark-ups or escalators applied to industry measures.
- Determining the industry standard measure used by Canadian utilities to qualify applicants for low income conservation programs.
- Assessing the appropriateness of applying the industry standard to British Columbia.
- Assess the need for a scale factor applied to the industry standard, and if needed, presenting recommendations for an appropriate scale factor for British Columbia.

1.3 Methodology

The industry scan was conducted in two phases. The first phase included a scan of published literature for North American low income conservation programs, with emphasis on identifying program-specific income thresholds and the adjustment mechanisms used. Associated rationales for these measures were investigated via informal telephone or email exchanges. The second phase of the industry scan focused on developing a greater understanding of the methods and rationales used by Canadian utilities to qualify eligible participants for their low income programs.

The results of the industry scan confirmed that while the use of LICO to qualify applicants to low income programs, particularly energy conservation programs, was not exclusive to every province and organization, there was sufficient evidence to suggest its application in British Columbia should be explored in greater detail. The representativeness of LICO to British Columbia was explored primarily via the use of various published statistics of household expenditures, income, and dependency. The need for a scale factor was explored via a review of third party analyses of LICO methods, and comparisons of published statistics on household incomes and relative costs of living in British Columbia with those of the national average.

INTRODUCTION

Additional detail on the methods and data used for all phases of the research are provided in the relevant sections of this report.

1.4 Report Organization

This report is organized as follows:

- Section 1 – Introduction
- Section 2 – Background
- Section 3 – Industry Scan
- Section 4 – Assessment
- Section 5 – Summary & Recommendations
- Section 6 – Bibliography

2 BACKGROUND

2.1 Overview of Canadian Measures of Low Income

At present, there are four measures used to define low income households in Canada: Low Income Cut-Off (LICO); Market Basket Measure (MBM); Household Income Limit (HIL); and Low Income Measure (LIM). None are specifically designed to measure poverty, although there has been a tendency for users to treat the measures as such. Unlike the United States, Canada does not produce or publish an official measure of poverty.

A brief description of each measure is provided. Additional detail on the characteristics of the four measures is provided in Table 1 on page 5.

2.1.1 Low Income Cut-Offs (LICOs)

Low Income Cut-Offs (LICOs) are a relative measure of hardship based on the percentage of household income required to satisfy the basic needs of food, shelter and clothing. The first LICO thresholds were published in 1967. LICO uses survey data on household spending and incomes to calculate the average percent of household income spent on the basic necessities of food, shelter, and clothing. An additional 20 percentage points is added to this average percentage to define households in “straitened” circumstances (Zhang 2010). The 20 percentage point mark-up over the Canadian average is arbitrary; its first use was in the 1960s and it has been retained ever since. The last update to LICOs using survey-based household expenditure and income data was 1992. Since then, LICO income thresholds have been updated using the national consumer price index (CPI).

Acknowledging that the costs of living can vary depending upon the size of the community, Statistics Canada produces LICO thresholds for five different rural and urban communities. In addition, individual LICO estimates are published for individuals, and for families of six different sizes (1 to 7+ persons). The most recent LICO thresholds are based on expenditure data collected from the 1992 Family Expenditure Survey (FAMEX). Statistics Canada has since replaced FAMEX with the annual Survey of Household Spending (SHS). Despite annual updating of expenditure data at both the national and regional / sub-regional levels via SHS, LICO thresholds remain based on the 1992 expenditure and income datasets, with the income thresholds adjusted annually for inflation using the national consumer price index (CPI). There are no LICO thresholds derived using expenditure and income data exclusively from British Columbia households; only nationally derived estimates that are subsequently applied to the province.

2.1.2 Low Income Measure (LIM)

Low Income Measure (LIM) represents a fixed percentage (50%) of median household income adjusted by household needs, as determined by the number of members in the household. This adjustment is rooted in the fact that the needs (e.g., for food, clothing, utilities, etc.) increase in a household as the

INDUSTRY SCAN

number of people in the home increases. They are calculated using data from the annual Survey of Labour Income and Dynamics (SLID).¹

LIMs are calculated by first dividing household income by the “adjusted size” of the home, calculated as the square root of the number of persons in the home. This determines the “equivalent household income”. This per-individual income figure is applied to all individuals in the population, and a median value is determined. Taking the example of a one person household, the LIM for this household would be 50% of the median “equivalent household income”. LIMs for other household sizes are calculated by taking this value and multiplying it by the “equivalent household size”.

2.1.3 Market Basket Measure (MBM)

The Market Basket Measure of low income (MBM) is a relatively new measure used to define low income households, designed by a working group of federal, provincial and territorial officials between 1997 and 1999. MBM differentiates itself from LICO and LIM by determining the income needed to purchase a representative basket of goods and services required to meet a “modest, basic standard of living”. This basket includes food, shelter, clothing, footwear, transportation and other common expenses such as personal care, household needs, furniture, basic telephone service, school supplies and modest levels of reading material, recreation and entertainment. MBM assesses the cost of this basket for a reference family of two adults and two children with provincial and sub-provincial differentiation. Because of its geographic detail, MBM is more sensitive to regional differences in living costs, particularly for shelter and transportation, than the LICOs and the LIM (Hatfield, Pyper, & Gustajtis, 2010).

The federal department of Human Resources Development Canada (HRSDC) is responsible for defining the components of the basket and the related concepts. Statistics Canada is responsible for the costing of the components and producing low income statistics.²

2.1.4 Household Income Limits (HILs)

Household Income Limits (HILs) represents the minimum income needed by a household if it is to spend no more than 30% of its income on the median rent for an appropriately sized private sector unit (bachelor, 1 bedroom, 2 bedroom, etc.) within a specific geographic market. Data on apartment rents come from Canada Mortgage and Housing Corporation’s (CMHC) bi-annual *Rental Market Survey*. The size of unit required by a household is governed by federal/provincial occupancy standards. Given its particular emphasis on housing costs, HILs are often used to define eligibility for subsidized housing programs.

Table 1 (next page) summarizes the characteristics of the four measures of low income used in Canada.

¹ <http://www.statcan.gc.ca/pub/75f0002m/2011002/lim-mfr-eng.htm>

² <http://www.statcan.gc.ca/pub/75f0002m/2011002/intro-eng.htm>

Table 1: Overview of Low Income Measures in Canada

	LICO	LIM	MBM	HIL
Type of measure				
Relative	✓	✓		
Absolute			✓	✓
Includes expenditures on		¹		
Shelter	✓	✓	✓	✓
Clothing	✓	✓	✓	
Food	✓	✓	✓	
Transportation		✓	✓	
Basic Health Care ²		✓	✓	
Basic Education ³		✓	✓	
Childcare		✓	✓	
Other ⁴		✓	✓	
Income			⁵	
After income tax	✓	✓	✓	
Before income tax ⁶	✓	✓		✓
Sensitivity				⁷
Household size	✓	✓	✓	
Household Composition		✓	✓	
Community Size	✓		✓	
Scope of Geographical Representation				
Provincial			✓	
Rural/Urban	✓		✓	
Community-Specific			✓	✓
Adjustment for inflation	✓	N/A ⁸	✓	N/A ⁹
Last adjusted for changes in spending patterns (i.e. base year)	1992	2010 ¹⁰	2010	2012
Annual Availability	✓	✓	✓	✓
Temporal analysis possible (inter-annual)	✓	✓	✓	✓

Table Footnotes

¹ LIM does not explicitly list expenditure inclusions but, rather adjusts for all necessary expenditures weighted by family composition/size.

² Includes non-insured but medically-prescribed health-related expenses such as medicines, personal care, and pharmaceutical items. See: http://www.hrsdc.gc.ca/eng/publications_resources/research/categories/inclusion/2009/sp-909-07-09/page05.shtml.

³ Includes basic supply costs associated with attending school.

⁴ Includes expenses on items related to home entertainment, sports and recreation, household supplies, telephone and Internet.

⁵ MBM uses a disposable income measure which includes income tax and all other transfers including CPP/QPP contributions, Employment Insurance (EI), Registered Pension Plan (RPP), union and professional dues, child/spousal support payments, work-related child care expenses, medical expenses, public health insurance.

⁶ The before income tax measure includes government transfers.

⁷ The household composition and size are not explicitly accounted for in the HILs but the occupancy standards do implicitly adjust for these factors.

⁸ LIMs do not require annual CPI updates because they are derived from an annual income survey.

⁹ HILs do not require annual CPI updates because they reflect current prices as collected by the annual CMHC Rental Market Survey.

¹⁰ Availability of LIM statistics is dependent on the release dates of the Survey of Labour and Income Dynamics (SLID).

3 INDUSTRY SCAN

This section summarizes the findings from an industry scan of eligibility criteria and measures used by low income energy conservation programs in the United States and Canada. The scan was undertaken to understand how the low income criteria are used by organizations delivering or otherwise administering energy conservation programs directed at low income households, the reasons behind their choice of criteria and, finally, the presence and rationale for any mark-ups applied to the low income measure.

3.1 Methodology & Data Sources

The industry scan was conducted in two phases. The first phase, conducted in November and December of 2011, consisted primarily of a scan of published literature for North American low income conservation programs, with emphasis on identifying program-specific income thresholds and the adjustment mechanisms used. Where relevant, the associated rationales for these measures were investigated via informal telephone or email exchanges. Sources for the literature review included California Measurement Advisory Council (CALMAC), Consortium for Energy Efficiency (CEE) Clearinghouse, American Council for an Energy-Efficient Economy (ACEEE), Association of Energy Services Professional (AESP), legal documents, governmental and private sector reports, grey literature available on the internet, and peer-reviewed journal articles. If a document was found particularly interesting or useful, the author and associated experts were contacted to detail their contributions. The findings from this first phase of research were submitted to BC Hydro in December 2011, but are reproduced in this report with updated information found via the second phase of research.

The second phase of the industry scan primarily focused on developing a greater understanding of the methods and rationales used to qualify eligible participants for low income programs operated or otherwise administered by Canadian utilities and organizations. In addition, the interviews explored how co-operative housing is treated under these programs. The list of relevant contacts included all energy utility companies in Canada (electric or gas). In provinces where low income energy assistance is largely facilitated by provincial authorities, (e.g. Nova Scotia, Newfoundland, New Brunswick and Ontario), those bodies were added to the contact list accordingly. Advocacy groups are particularly active with policy design and analysis in Ontario, working with the utility companies, the Ontario Energy Board (OEB), and Ontario Provincial Authority (OPA). Commensurately, these organisations were added to the contact list.

3.2 Key Findings – Industry & Literature Scan

3.2.1 Phase I – Overview of Canadian and American Programs

American and Canadian systems offering low income energy assistance programs differ in a number of ways. Firstly, the Americans have a federally administered program called Low Income Home Energy Assistance Program (LIHEAP). LIHEAP uses a series of formulas in determining the amount of funding each state will receive to administer its own low income energy programs. These formulas have been updated a number of times since their inception in the 1970s and currently account for the following:

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heating and cooling needs of the states, the types of energy used, energy prices, and the low income population and their heating and cooling methods (Perl 2010). At both the federal and state levels, the low income population is determined by the Federal Poverty Guideline (FPG) measure which is a simplified version of the Census Bureau's Federal Poverty Thresholds (FPT).³ Developed by the Department of Health and Human Services (HHS), LIHEAP uses the FPG and applies a maximum multiplier of 150%, or if greater, up to 60% of state median income (HHS 2011). If a state's FPG is less than its median income, it is free to decide the appropriate mark-up to a maximum of 150% but no household with less than 110% FPG is ineligible for assistance (HSS 2011).

For those Canadian utilities offering low income assistance programs, the Low Income Cut Off (LICO) measure is usually the measure used to determine the eligible population. Some Canadian provinces/utilities choose to mark up the LICO threshold by anywhere from 115% (e.g. Ontario Energy Board) to 135% (e.g. Union Gas); however, not all utilities/programs use a multiplier (e.g. FortisBC / BC Hydro Energy Savings Kit Program).

Canada's LICO and America's FPG are both developed through the collection of data on individual/household income in national census instruments and complementing surveys (e.g. Canada's Survey of Labour and Income Dynamics (SLID) and America's Current Population Survey (CPS) Annual Social and Economic Supplement (ASEC)).⁴ Both estimates are weighted according to household composition and annually updated to account for inflation using the Consumer Price Index (CPI). However, geographical differences are weakly represented in both measures; LICO is scaled according to five different community sizes rather than specific regions, while the FPG applies to all contiguous states equally (Federal Register 2011; Norman 2000).

3.2.2 Factors Considered When Choosing a Low Income Threshold Measure

Understanding the characteristics and properties of the low income measures is important. Recent evidence from Canada shows that the LICO, LIM and MBM metrics tend to behave similarly in the long run in terms of low income rates, gaps and severity, but they can differ in direction and magnitude in the short run; therefore choosing a particular threshold measure may cause assistance programs to be offered on misleading premises (Zhang 2010). Secondly, utility companies must be aware of absolute and relative income measurements when designing eligibility requirements. While absolute measures are decreasing over time, relative discrepancies are increasing, the difference affects assistance budgets and the customer-base accordingly (Michaud and Poon 2006). Thirdly, each threshold measure has a unique set of implicit and explicit assumptions (e.g. household composition, budget shares, sources of income, and employment status), criteria (e.g. pre- or post-tax), and purposes (e.g. quantifying household sufficiency, measuring household purchasing power, or determining income inequality) (Zhang 2010); awareness of these elements and their implications will help policy makers choose an

³ Differences in the FPT and FPG are documented by the US Department of Health and Human Services and can be read at: <http://aspe.hhs.gov/poverty/faq.shtml#differences>

⁴ It is noteworthy that Statistics Canada does not endorse the LICO statistic as a measure of poverty; rather, it is a calculation of relative income levels within the country. Alternatively, the US Census Bureau maintains that the FPT is a good measure of national poverty.

appropriate threshold and multiplier if necessary. A summary of the strengths and limitations of these low income measures within energy assistance programs are summarized in Appendix A.

3.2.3 Choice of Income Threshold Measure

Despite the variety of statistical thresholds as just described, there is considerable national uniformity in which ones are actually used. For the US, this choice is federally mandated by the Department of Health and Human Services (HHS), making the nation-wide use of FPG unsurprising. In Canada, the majority of utilities voluntarily choose LICO as a baseline. The consistency in Canada, and legislated standard in the US, is found to be primarily driven by methodological concerns. In Saskatchewan, the natural gas utility, SaskEnergy, partners with Habitat for Humanity to provide an alternate model for low income energy assistance. While they are run as a public relations campaign, the utility representative highlighted the symbiotic value of the partnership which provides insight to programs currently run as DSM initiatives. For instance, SaskEnergy provides technical expertise and funding while Habitat for Humanity provides locally relevant capacity in terms of volunteers, knowledge of the area and most deserving households, and program administration.

Some utilities have chosen their income thresholds based on the relative merits as compared to alternative measures. It has also been argued by industry practitioners that streamlining income eligibility requirements among assistance programs, justifies the choice in income thresholds by reducing administrative burdens and facilitating program participation (Prociw November 15, 2011; Stewart 2011; Stewart and Fry 2006). More simply, customers of low income programs using the same income threshold requirements as energy assistance programs, would automatically pre-qualify for low income energy assistance; indeed, this is the case with LIHEAP in the US (HSS 2011) and some Canadian programs (e.g. Ontario Enbridge Gas Weatherization Program (Green Venture 2007). Finally, given the political sensitivity of income assistance, it can be inferred that economic and political incentives exist for stakeholders and policy makers to streamline eligibility requirements. These incentives include, but are not limited to, maintaining national uniformity through policy consistency, limiting discrimination, and fostering utility competition where applicable.

While the abovementioned rationales are used to justify the choice of statistical threshold employed, it has also been argued that the institutional standards were customarily set so long ago that the assumptions on which the decisions were made, are no longer relevant (Mukhopadhyay, Shingler et al. 2011; Willis 2011).

3.2.4 Phase II - Additional Detail on the Canadian Experience

Different models for low income energy assistance provision exist in Canada. The most common model involves provincial oversight on utility managed programs. The nature of government involvement in this model can be directive, financial, regulatory, or a mixture of responsibilities. The strongest involvement of provincial authorities is seen in Newfoundland, where low income energy efficiency programs are directly operated by the provincial department, Newfoundland Housing. In Saskatchewan, SaskEnergy has taken a different approach by partnering with Habitat for Humanity as previously mentioned.

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The type of program delivery model used influences how income eligibility thresholds are determined and applied. The government-utility model tends to use Statistics Canada's LICO measure. Where this doesn't apply is in Nova Scotia and New Brunswick where Canada Mortgage Housing Corporation's (CMHC) Housing Income Limits (HILs) are used. Newfoundland Housing also uses the HILs. In the case of SaskEnergy, low income eligibility requirements are set by Habitat for Humanity through their program partnership arrangement. On account of these differences, feedback from interviews reviewed in this section provides both general and program-specific insights to the above mentioned objectives.

3.2.5 Summary of Major Findings – Industry Scan

Five utility companies, five provincial authorities, and two advocacy groups were contacted as part of the Phase II industry scan. Four provincial bodies and one energy utility were unresponsive. Major findings from the literature search and industry scan includes:

Finding 1: Five criteria have guided the choice of low income measure among the agencies and utilities we spoke with and as suggested in the literature. These criteria are:

- Reliability: the measure is produced by credible institutions on a regular basis, with periodic updating;
- Availability: access to the measure is readily available, with updates to accommodate changes in costs and incomes over time;
- Sensitivity: the measure is sensitive to key factors influencing household spending, including household size, community size, and geographic location;
- Administrative efficiency: the measure is easy to use and/or consistent with other social program requirements;
- Ease of reporting: The measure defines its thresholds using information that can easily be met by potential applicants and validated by the utility (e.g., pre-tax or after-tax household incomes).

Finding 2: Of the five criteria, the dominating concern driving the choice of an income threshold is the need for streamlined, simple, and administratively efficient programs. This is true for programs using the LICO or HIL and has become somewhat of a standard industry practice. While there is value to this approach in setting eligibility requirements, it can be problematic because not all utilities and provincial authorities, who intend to streamline their requirements, are using the same and/or most up-to-date versions of the same income thresholds. This may be due to a lack of awareness by some program providers regarding the annually up-dated LICOs or the untimely release of the updated LICOs (mid-year), adding an administrative burden. This situation was noted in Ontario. The issue was acknowledged and corrective efforts are underway.

Finding 3: Generally speaking, utilities were less certain than advocacy groups when queried about the respective weaknesses of eligibility threshold they use. This may reflect a lack of critical review by the assistance providers themselves. However, some concerns with eligibility measures highlighted in the interviews include:

- Arbitrariness – what comprises an adequate standard of living is highly subjective;
- Lack of geographic sensitivity – the inability to adequately measure low-income in different environments and geographic regions of Canada (a particular issue for LICO);
- Lack of sensitivity to vulnerable populations – some measures do not account well for elderly, children, and single-parent households;
- Lack of sensitivity to precarious unemployment – all measures do not account for temporary or chronic job insecurity;
- Non-comprehensive – this issue particularly affect the HILs measure as it is solely based on the housing market.

Finding 4: Utilities and regulatory boards sometimes add multipliers to the relevant threshold to account for some of the statistical or methodological weaknesses in measures of low income. Mark-ups are currently not used in conjunction with HILs as HILs themselves are believed to be effective in capturing a sufficient number of program applicants by those who currently employ this measure. One respondent acknowledged that the HILs alone do not perform as well in terms of capturing a relevant low income population base in highly economically unequal communities and prospective changes are under review.

Finding 5: There is greater consensus regarding the benefits and disadvantages of the LICO itself than there is on how best to correct it in low income energy assistance programs. For example, mark-ups are usually applied to LICO; however, no interview respondents were aware of a quantitative justification used in determining an appropriate multiplier. Rationales provided by respondents for the application and size of mark-ups are largely subjective and include:

- The LICO alone is too exclusive. Eligibility for conservation programs should be broader than for other financial assistance services and should not be the sole determinant of eligibility for conservation programs directed at low income households.
- The extent of program inclusivity (size of mark-up) is often restricted by utility capacity (i.e., expanding the market eligible for a low income program via adding a scale factor to LICO may strain the resources of the program).
- Low income assistance programs need to adjust for the population of potential applicants who will not apply due to the stigma of being considered low income.

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3.3 Summary Comments - Rationales for Determining Program-Specific Mark-Ups

It appears many low income energy assistance programs in North America apply a multiplier to the chosen income threshold measurement. The federally mandated range of mark-ups in the United States falls between 110% and 150% FPG. In Canada, the comparable range in mark-ups is between 0% LICO (e.g. programs provided by BC Hydro, Fortis BC, Hydro-Québec) and 135% LICO (e.g. programs provided by Ontario Power Authority and Union Gas). Justifications for the application and extent of these multipliers are not explicit in the literature. When asked, the typical response from industry practitioners was either “I don’t know” and/or “because that’s what everyone else does”. Similarly, when reflecting on the American case, Gordon Fisher, who has written extensively on poverty measures in the United States, said in an email communication:

“There is no general or overall rationale for how various percentage multiples of the guidelines were assigned to specific programs. Instead, the various percentage multiples used are a result of individual ad hoc decisions made at different times by different people.” (Fisher 2011)

In conclusion, the industry scan found that, with the exceptions noted, LICO is the most common measure used to qualify participants in low income conservation programs in Canada. As well, precedence for marking-up the LICO thresholds exists, as confirmed by several of the utilities contacted as part of industry scan. Despite the considerable effort expended, rationales justifying the mark-ups and methods used to determine the size of the mark-up remain a mystery.

3.4 Co-operative Housing

Discussions with utility companies were also used to investigate the treatment of co-operative housing in low income energy assistance programs. Co-op housing is distinct from social or private non-profit housing as it is communally owned and operated. Information discussed and reviewed in this section pertains strictly to co-ops.

Two topics were of specific interest in these interviews. Firstly, if an assistance program services co-op housing, what proportion of a building’s tenants are required to be classified as low income in order for the entire building to be eligible for assistance? Secondly, what share of the program costs are paid by the utility and the co-op?

The majority of utilities do not offer low income energy efficiency assistance particularly to co-operative housing. The representative of Newfoundland Housing reported that there were not enough co-op units within the province to make a program worthwhile. For SaskEnergy, servicing co-op housing is not a part of its current partnership with Habitat for Humanity as they focus on individual households. The most significant energy efficiency assistance for co-ops revealed in these discussions is offered by Hydro Québec and is called ENERGY EFFICIENCY RETROFIT PROGRAM FOR LOW-INCOME HOUSEHOLDS – CO-OP COMPONENT.

Hydro Québec estimates that 40% of people living in Québec co-op housing can be classified as low income. They use the after-tax LICO to determine this. All co-ops listed in Québec Enterprise Register “as lessors of social housing complexes that manage rental housing” qualify for the Retrofit Program regardless of how many low income tenants reside within the building; no proof of income eligibility is required.⁵ Reasons for this are:

- to be discreet and respectful of low income households by not distinguishing them from their neighbours;
- to permit whole-building upgrades (e.g. to the construction envelope), the benefits of which cannot be subdivided by household;
- to maximize installation efficiency in terms of logistics: for unit-specific upgrades, it is more cost- and energy-effective to treat all units as opposed to a selection.

Energy efficiency assistance for co-ops in this program is offered through a renovation rebate process as outlined in the Energy Efficient Retrofit Measures Guides. The co-operatives pay for the upgrades to be installed and Hydro Quebec will reimburse the organisation in full, for program qualifying measures, if the process is completed according to their regulations.

The Ontario Power Authority also offers energy assistance to low income co-operative housing as part of its multi-family residential buildings initiative. Driven by the Low-Income and Social Housing Directive issued in December 2006 by the Ontario Minister of Energy, various programs in this regard have since been offered. Most recently, the OPA partners with local electric utilities in providing three tracks of financial incentives for individual and commercially-run housing co-operatives: the prescriptive track reimburses the dollar-cost purchases of energy efficient items, and the engineered and custom tracks incentivise actual energy savings resulting from installation of a particular measure.^{6 7}

Program criteria for the OPA low income co-op assistance programs are stricter than those required by Hydro Québec. Under the HOME ASSISTANCE program, eligible co-operatives must be (1) developed or acquired and operated under the *Co-operative Corporations Act*; (2) not more than three stories high or 600 meters squared; and, (3) *all* tenants must be of low income status. Low income status can be determined by one of three ways: (1) using before-tax LICO; (2) if they have received utility LEAP grant (Low Income Energy Assistance Program) in the past 12 months; or (3) if they are a recent recipient of an Ontario social assistance benefit in the past 12 months.⁸ Co-operative housing that is larger than 600 meters squared is eligible for assistance under the BUSINESS RETROFIT program.

⁵ See <http://www.hydroquebec.com/org-comm/en/index.html>

⁶ For more information on all Social and Assisted Housing energy efficiency programs by the OPA see <https://saveonenergy.ca/Business/Program-Overviews/Social-Housing.aspx>.

⁷ For an example of these programs see <http://www.wellandhydro.com/news/energy-efficiency-top-priority-woodrose-co-operative-homes>.

⁸ For all eligibility requirements including a list of social assistance benefits which will pre-qualify tenants for OPA Co-operative housing energy assistance see <https://saveonenergy.ca/Consumer/Home-Assistance/Housing-Provider.aspx>.

4 THRESHOLD ANALYSIS

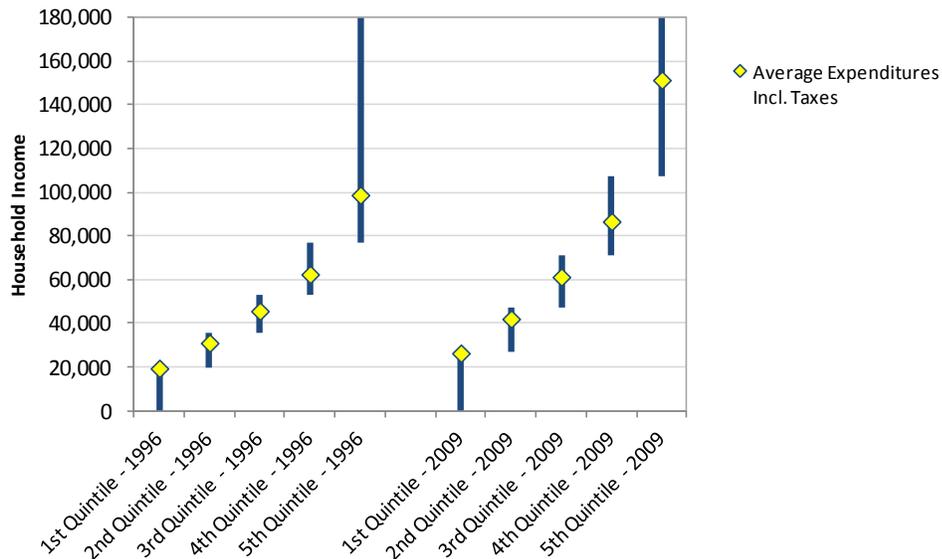
The purpose of this section is to assess the relevance and applicability of the LICO criteria used to qualify applicants for BC Hydro’s low income DSM program. The need for a scale factor is explored, and recommendations provided.

4.1 Approximations to the Size of the Low Income Population in British Columbia

Data from Statistics Canada’s Survey of Household Spending (SHS) for 1996 and 2009 shed light on the relative size of the low income population in British Columbia, and how these relative measures have changed over time.⁹ These data provide direction as to the proportion of households that could benefit from a low-income DSM program.

Figure 1 summarizes average household expenditures, including taxes, by income quintile for British Columbia households in 1997 and 2009. Each income quintile represents 20% of BC households. The average expenditure on goods, services and taxes for each income quintile is illustrated by the yellow diamond which, in turn, is plotted on the line representing the range of household incomes for the quintile. The upper bound for the 5th income quintile has been capped at \$180,000 in the figure for illustration purposes, but the upper bound of the quintile will be considerably higher.¹⁰ Income and average expenditures for 2009 are generally higher across the quintiles, reflecting both the effects of inflation and relative changes in household spending and income over the 13 year period.

Figure 1: Household Spending by Income Quintile – British Columbia 1996 vs 2009



⁹ Comparable data for 1992 (i.e., same as the base year for LICO) were not available to the researchers at the time of this analysis. These data would come from the now discontinued Survey of Family Expenditures (FAMEX).

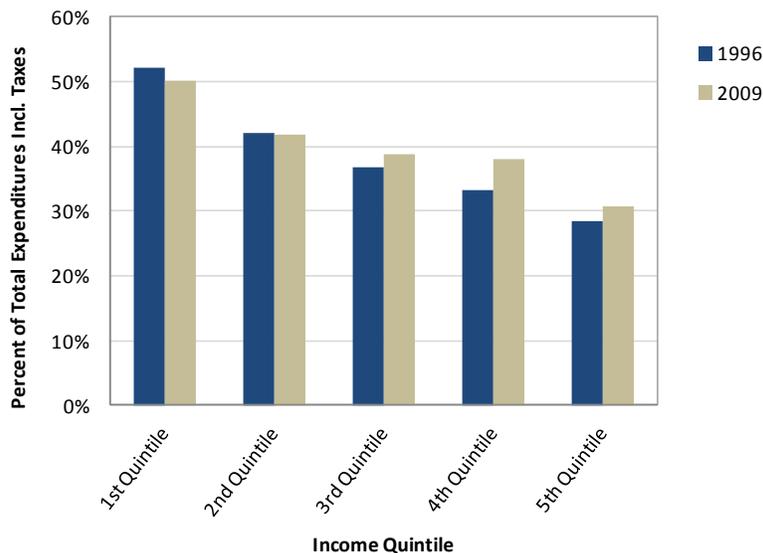
¹⁰ For reasons of confidentiality, Statistics Canada does not publish the upper bound.

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The data for the two time periods show household expenditures for the bottom 20% of British Columbia households at or near the top end of the income range for the quintile, suggesting that all or nearly all of the income for the majority of these households is effectively spent, leaving little money left over for savings or discretionary purchases.¹¹ Average spending for the next highest quartile is towards the upper end of the quintile range, suggesting that a significant proportion of this group also spends the majority of their income. In contrast, average household expenditures for households in the third through fifth quintiles is clearly lower relative to the income range represented by the quintile, inferring these households are more likely than the other quintiles to have discretionary income left over after covering the basics of maintaining their household. Not surprising, average expenditures also rise as incomes increase, consistent with the spending freedom that comes when financial pressures are reduced. That said, since households included in each quintile range in size from single person households to those with large families, it is likely that some families in the second and third quintiles also spend most or all of their income on necessities.

Figure 2 expands on expenditures by BC households in the five household income quintiles by exploring the proportion of total household expenditures, including taxes, that go to the basic necessities of food, shelter and clothing. These necessities represented slightly more than half of total household expenditures for the lowest income quintile in 1996, falling only slightly by 2009. As expected, the share of total expenditures represented by these three items decreases as income increases. Higher shares in 2009 compared to 1996 for the higher quintile groups are primarily attributable to an increase in relative expenditures for shelter, consistent with the rise in housing prices since 1996.

Figure 2: Food, Clothing and Shelter Expenditure Shares – British Columbia 1996 vs 2009



¹¹ It is acknowledged that as incomes rise, households will gradually switch their purchases to include higher value / higher quality goods, as well as expanding their spending to include discretionary purchases. These effects aside, the higher the income quintile, the more likely households will have income left over after covering their household expenditures, allowing them to save or invest for future consumption.

4.2 Assessment of LICO

The industry scan confirmed that LICO is used by other utilities in Canada, with several using mark-ups to adjust LICO's thresholds. Assessing the suitability of LICO to British Columbia in the context of a low income DSM program begins with first understanding the relative strengths and limitations of its design and sources of data.

4.2.1 LICO's Strengths

LICO generally scores well on several criteria, including applicability, accessibility, acceptance and administrative efficiency.

Applicability – The LICO concept of relating household spending on necessities to income is intuitive. For BC Hydro's purposes, it generally defines a group of households that, for reasons of limited financial resources, are unlikely to participate in traditional DSM programs that place the onus on participants to finance the energy saving measure or upgrade.

Accessibility - It is published annually by Statistics Canada, with LICO thresholds and shares reported for British Columbia and all other Canadian provinces, allowing easy comparisons. However, as noted, the LICOs reported for British Columbia are based on national average data, not household expenditure and income data exclusively to British Columbia households.

Acceptance -Due to its longevity and the intuitiveness of concept, LICO is acknowledged by many to be a legitimate attempt to identify low income households in Canada. It is not without its detractors, and alternative measures have been developed (e.g., MBM and LIM). The longevity of LICO's definition of what constitutes hardship for households, namely the arbitrary 20 percentage point mark-up over the average proportion of income spent on food, clothing, and shelter, appears to have gone on largely unchallenged.

Administrative efficiency – LICO is generally easy to use as a qualifying criterion for low income programs. Income thresholds are defined by size of household and community, and are published annually for British Columbia in both pre- and post-tax household income amounts. Applicants to the program require a relatively modest amount of verifiable information (income tax receipts).

4.2.2 LICO's Weaknesses

While the concepts behind LICO are generally intuitive, the measure itself suffers from poor transparency. In particular, the ability for third parties (i.e., anyone other than Statistics Canada) to recalculate LICOs to accommodate provincial or sub-provincial expenditure or income variations without a significant outlay of resources both in research and analysis time, and data acquisition, is limited. With the significant passage of time since the last expenditure rebasing (1992), the transparency has further diminished.

Applying a national average to regions whose economic circumstances have, in some cases, significantly changed (for better or worse) over the last twenty years, makes interpreting the legitimacy of LICO even more challenging.

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Since 1992, Statistics Canada has updated the income thresholds using the national consumer price index (CPI), a measure of consumer price inflation. The updated thresholds are then used at the provincial level to determine the proportion of households falling below the thresholds. Despite the use of the CPI to update the LICO thresholds, the fact remains that the statistical and econometric foundation for LICO in Canada is based on 20 year-old geographically-insensitive household expenditure and income data. It has been argued that updating spending patterns and household incomes from 20 years ago to present day using the CPI has effectively turned LICO into an absolute measure of low income, not a relative one (Michaud 2006).

The design of LICO and the method used to update its thresholds raises two issues that affect its applicability to British Columbia:

- whether national expenditures and incomes used to determine the thresholds in 1992 adequately represented the cost of living in British Columbia at that time; and
- whether use of a national CPI to update the thresholds has adequately represented the increase in the costs of food, clothing, and housing in British Columbia over the past twenty years.

The latter issue is of particular importance if differences in the cost of living and/or incomes for households between British Columbia and the national average existed in 1992. The presence of a gap, its direction (positive or negative) and size, raises the prospect that LICO thresholds may not be representative of British Columbia's circumstances. The question then becomes whether use of the CPI has preserved, increased, or reduced this gap. These issues are explored further in the next two sections.

4.3 Differences in Cost of Living

A number of data sources were reviewed to assess how the cost of living for British Columbians in 1992 compared with that of the national average and how it compares today (20 years later). This exercise is considerably more difficult than it sounds, as there is no single source of published data or analysis that reliably and comprehensively compares the cost of living in British Columbia with that of the national average. Additional issues hindering this analysis included:

- the infrequency of updates to key surveys (e.g., Statistics Canada's Census is conducted only once every five years);
- the age of some data (e.g., the most recent data on household incomes and spending from the Census are 2006); and,
- changes in survey coverage or methodology which introduced a degree of incompatibility between survey releases for key household expenditure data (e.g., the Survey of Family Expenditures in 1992 broke out mortgage expenditures into principal versus interest payments whereas its successor survey, the Survey of Household Spending, does not).

In the end, no single source of data adequately addresses the possibility of a gap in the cost of living between British Columbia and the national average in 1992, and whether this gap continues today. For this reason, what follows is based on a variety of data sources.

4.3.1 Statistics Canada Census Data

Data from the 1991 and 2006 Census were used to compare relative costs of shelter for renters and homeowners in British Columbia with national averages. These data do not differentiate by type or size of dwelling or by family income. Rental and housing costs will vary depending on the size, type, and general level of upkeep of the dwelling unit, however, it is assumed that their costs will generally trend together within geographic areas over time.¹² Comparable data from the 2011 Census was not yet published by Statistics Canada at the time of this report's preparation.

Table 2 compares gross rents for tenants of one family households in British Columbia with that of the national average in 1991 (the closest year to the release date for 1992 LICO) and 2006 (the year of the most recent Census). Gross rents from the 1991 Census show British Columbia renters paying an average of \$658 per month, equivalent to 113% of the national average of \$580 per month. By 2006, the average rent in British Columbia increased to \$907 per month, equal to 116% of the national average of \$785 per month. Costs are reported in current dollars to eliminate possible temporal bias introduced by adjustments for general consumer price inflation using the consumer price index (CPI).

Table 2: Monthly Gross Rents – British Columbia vs Canada
Current Dollars

	BC	Canada	Difference	BC/Canada
1991 Census	\$658	\$580	\$78	113%
2006 Census	\$907	\$785	\$122	116%
Increase 2006-1991 (\$)	\$249	\$205	--	--
Increase 2006-1991 (% Chg)	38%	35%	--	--

Tenants, one family households without additional persons, non-farm, non-reserves
Data source: Statistics Canada 1991 & 2006 Census

Data for Vancouver CMA show that rental costs in the Greater Vancouver area in 1991 were equivalent to 128% of the national average. By 2006, the gap narrowed only slightly to 125% (Table 3).

Table 3: Monthly Gross Rents – Vancouver CMA vs Canada
Current Dollars

	Vancouver CMA	Canada	Difference	Vancouver CMA/Canada
1991 Census	\$741	\$580	\$161	128%
2006 Census	\$982	\$785	\$197	125%
Increase 2006-1991 (\$)	\$241	\$205	--	--
Increase 2006-1991 (% Chg)	33%	35%	--	--

¹² The phrase “a high tide floats all boats” is a colloquial way of referring to the tendency for the supply and demand conditions within geographic regions to broadly influence shelter costs for a wide variety of housing types.

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Tenants, one family households without additional persons, non-farm, non-reserves
 Data source: Statistics Canada 2006 Census

Alternative Data for Rental Costs : CMHC Data

The twice annual Rental Market Survey (RMS) conducted by the Central Housing and Mortgage Corporation (CMHC) for major metropolitan areas provides an alternate source of rental cost increases over the past two decades. The survey found that rents for a one bedroom apartment in a row or apartment complex in the Vancouver CMA area rose by 37% over the 1992-2006 period (approximately the same period as the 1991 and 2006 Census) and then an additional 18% over the 2007-2011 period. For two bedroom units, rents increased by 36% from 1992-2006, and an additional 19% to 2011. While definitional differences make direct comparisons with the Census and other data challenging, the increases for the Vancouver area up to 2006 are comparable to those of the Census. A review of CHMC rental data for Victoria, Vancouver and Kelowna suggest that rents have increased anywhere from 11% to 20% since the 2006 Census data was collected.

Source: Canada Mortgage and Housing Corporation (CMHC)

Table 4 provides data on shelter payments for one family households who own their home, with or without a mortgage. British Columbia homeowners in 1991 paid slightly less in principal and interest than the national average (slightly below the national average at \$666 per month versus \$708 per month, or a difference of \$42 per month or \$504 per year). This difference more than reversed itself by 2006, where gross payments for British Columbia homeowners rose to \$1,119 per month compared to \$1,038 per month national average; equivalent to 116% that of the national average. Gross payments for British Columbia homeowners increased by 68% over the 1991-2006 period compared to 47% for the national average.

**Table 4: Monthly Gross Homeowner Payments – British Columbia vs Canada
 Current Dollars**

	British Columbia	Canada	Difference	BC/Canada
1991 Census	\$666	\$708	-\$42	94%
2006 Census	\$1,119	\$1,038	\$81	108%
2006-1991 (\$)	\$453	\$330	--	--
2006-1991 (% Chg)	68%	47%	--	--

Owners, one family households without additional persons, non-farm, non-reserves – with and without mortgages
 Data source: Statistics Canada 1991 & 2006 Census

Data comparing gross payments for homeowners in the Vancouver CMA with the national average show similar differences between the British Columbia average and the metropolitan Vancouver area; namely homeowners in the Vancouver CMA area paid 112% of the national average in 1991, and this difference increased to 126% by 2006.

**Table 5: Monthly Gross Homeowner Payments – Vancouver CMA vs Canada
Current Dollars**

	Vancouver CMA	Canada	Difference	Vancouver CMA/Canada
1991 Census	\$794	\$708	\$86	112%
2006 Census	\$1,310	\$1,038	\$272	126%
2006-1991 (\$)	\$516	\$330	--	--
2006-1991 (% Chg)	65%	47%	--	--

Owners, one family households without additional persons, non-farm, non-reserves – with and without mortgages
Data source: Statistics Canada 1991 & 2006 Census

These data suggest that a notable gap existed between British Columbia and the national level for renters when the national LICO thresholds were last calculated. For homeowners, the gap was initially in British Columbia's favour but that has since reversed. The differences between the national level data and those of renters and owners in the higher cost Vancouver CMA are notable.

4.3.2 Statistics Canada's Survey of Household Spending

Statistics Canada's Survey of Household Spending (SHS) is the successor survey to the Survey of Family Expenditures (FAMEX), which was the survey vehicle which provided expenditure data for the 1992 derivation of the LICO income thresholds. The SHS survey provides rich information on household expenditures for the 1997-2009 period. Data from the 1992 survey were unavailable to the report's authors at the time of this report's preparation.¹³

The SHS survey was used to compare median household expenditures for British Columbia households in 1997 and 2009 for the three key components of the LICO measure – food, clothing and shelter. These data were further compared with national averages for the same two years to assess whether differences observed in the census are also borne out with the SHS data, and the relative size of these differences between British Columbia and the national average. These data are summarized in Table 6.

Median expenditures for food and clothing in British Columbia in 1997 were somewhat lower than the national average (99% and 92% of the national average respectively). By 2009, median food expenditures by British Columbia households had increased to 103% of the national average, while median spending on clothing increased to 94%. Costs for shelter are broken down to those for renters versus owners. Median annual expenditures on rented living quarters (rent, renter maintenance, repairs and alterations, and insurance) for British Columbia renters in 1992 were \$6,600, or 119% of the national average. By 2009, median annual rental expenditures for British Columbia renters rose to \$8,625 or 111% of the national average.

For British Columbia homeowners (with and without a mortgage), median expenditures on housing (mortgage payments, repairs and maintenance, condo fees, property taxes, etc.) were \$7,420 or 142%

¹³ Methodological differences exist in the treatment of shelter costs between the 1992 Survey of Family Expenditures (FAMEX) and its successor, the Survey of Household Spending (SHS). The former separated principal payments from interest expense, while the latter groups the two together. Attempts to reconcile the two survey sources for shelter costs have met with limited success. Source: www.ic.gc.ca/eic/site/oca-bc.nsf/eng/ca02121.html.

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of the national average in 1997. By 2009, median expenditures rose to \$10,090 or 130% of the national average, suggesting that prices did not rise as rapidly at the national level during this time.

**Table 6: Median Annual Household Expenditures
Survey of Household Spending 1997 vs 2009
Current Dollars**

Median expenditures	British Columbia		Canada		British Columbia as a % of Canada	
	1997	2009	1997	2009	1997	2009
Food	\$5,082	\$6,540	\$5,111	\$6,350	99%	103%
Clothing	\$1,431	\$1,800	\$1,550	\$1,910	92%	94%
Shelter	\$8,706	\$11,343	\$7,651	\$11,211	114%	101%
Rented living quarters	\$6,600	\$8,625	\$5,535	\$7,800	119%	111%
Owned living quarters	\$7,420	\$10,090	\$5,208	\$7,770	142%	130%
Total Expenditures	\$43,847	\$60,559	\$41,709	\$58,324	105%	104%

Source: Survey of Household Spending, Statistics Canada, 62-202-XWE, Various Years

4.3.3 Comparisons of Median Household Income

Data from Statistics Canada's Census and the Survey of Household Spending indicate that British Columbia residents typically paid more for shelter than the national average over the past two decades. This relative difference needs to be placed in the context of the ability to pay. That is, higher costs of living, including higher costs of shelter, may have been offset by relatively higher incomes in British Columbia if they existed. To explore this issue further, data on median household incomes for British Columbia households were compared with national averages for 1991 and 2006 using the census.

The data in Table 7 summarize median incomes for private households¹⁴ in British Columbia in 1991 and 2006, with comparisons to the national average. The data show that median household incomes in British Columbia differed only marginally from the national average in 1991 (\$39,958 or 102% the national average). By 2006, British Columbia's median income had risen 65% to \$65,787 but fell below parity with the national average (99%). These data confirm that, from the perspective of household incomes, British Columbia was only slightly above the national average at the time LICOs were last estimated (1992) and experienced a slight deterioration by 2006.

**Table 7: Median Household Incomes for Private Households – British Columbia vs Canada
Current Dollars**

	British Columbia		Canada		British Columbia as a % of Canada	
	1991	2006	1991	2006	1991	2006
Median Household Income	\$39,958	\$65,787	\$39,013	\$66,343	102%	99%

¹⁴ A private household is defined by Statistics Canada as persons or groups of persons (other than foreign residents) who occupy a private dwelling and do not have a usual place of residence somewhere elsewhere in Canada.

4.3.4 Updating LICOs using the Consumer Price Index

As mentioned earlier, the national LICO income thresholds determined in 1992 are adjusted annually to reflect the general increase in the costs of consumer goods and services by applying the national consumer price index (CPI). The CPI measures the change in prices for a standardized basket of goods and services purchased by households, and is produced at the national level, and also by province and for some major cities. The use of the CPI is required as the data and analysis used to derive the LICO thresholds have not been updated since 1992. That is, the thresholds reflect both the household incomes and the prices of goods and services that existed in 1992, but also a variety of other factors including the relative proportion of the population living in urban versus rural areas (and associated differences in the cost of living between various sized population centres), and the composition of goods and services comprising household spending.

An analysis conducted by Statistics Canada as part of a broad based review of LICOs in the late 1990s explored the impact of using the CPI to update the 1992 LICO thresholds rather than re-estimating the thresholds using more recent household expenditure and income data. The results of this analysis highlight some of the drawbacks of using the CPI to update the thresholds rather than periodically re-estimating the thresholds using updated information. (Cotton, Webber, & Saint-Pierre, Should the Low Income Cutoffs be Updated? A Discussion Paper, 1999) (Cotton, Recent Developments in the Low Income Cutoffs, 2001).

The 2001 analysis updated the LICO thresholds using the 1997 Survey of Household Spending (SHS), the successor survey to the 1992 Family Expenditure Survey (FAMEX), whose data was used to determine the 1992 LICO thresholds. The report authors acknowledged updating LICO using SHS survey is imperfect as the latter survey no longer separates shelter costs of home owners into principal and interest payments as did the FAMEX survey. This is relevant because the 1992 LICO thresholds were calculated excluding mortgage principal payments because they are considered a form of savings.¹⁵

Despite these limitations, the results showed that updating the 1992 LICO base for a family of four living in a medium sized city to 1997 levels using the CPI raised the LICO after-tax income threshold from \$21,300 to about \$22,900. Recalculating the base using 1997 expenditure and income data from the 1997 SHS, raises the after-tax threshold to \$24,300, 6.1% higher than the comparable CPI-adjusted estimate. The analysis was repeated using the 1997 SHS data and CPI and found a similar sized difference; \$24,700 versus \$23,100, or 6.9% difference. When broken down by the different demographic groups, the rebasing exercise found the demographic groups most affected included lone parent families and two parent families with a sole income earner (Cotton, Webber, & Saint-Pierre, Should the Low Income Cutoffs be Updated? A Discussion Paper, 1999).

¹⁵ The analysis explored the impact of including principal payments on the 1992 thresholds. It found that including both mortgage principal and interest costs raised the after-tax base for a family of four living in a medium city from \$21,300 to \$21,900.

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The limitations of using national estimates of LICO at the provincial or sub-provincial level were also explored in the 2001 Statistics Canada research. Specifically, the research explored the impact of increased urbanization and decreasing family size that occurred since the original 35 community and family size combinations were first established. Data from the Census for British Columbia for 1991 through 2006 confirms that urbanization has increased since the LICO thresholds were last set in 1992 with the proportion of British Columbia residents living in urban areas rising from 80% in 1991 to 85% by 2006.

The impact of urbanization was explored by using city-specific shelter costs to calculate 1992 LICOs for Montreal, Toronto, and Vancouver. The city LICOs were then updated to 1998 levels using the consumer price index. The research found that after-tax thresholds for Vancouver rose by \$3,280 for a family of four. Additionally, when the city-specific estimates were incorporated into the overall national LICO it raised the overall national LICO threshold by 1.1 percentage points. For British Columbia, incorporating Vancouver-specific costs raised the overall proportion of persons falling below the provincial after-tax LICO threshold from 11.1% to 12.2%, a difference of 1.1 percentage points.

4.3.5 National and British Columbia CPI Trends

While there is general acceptance of CPI as a measure of the underlying increase in prices for consumer goods and services, it cannot be used to compare the cost of living in one jurisdiction to another, only the degree to which consumer prices in those jurisdictions change relative to one another compared to a common base year (currently 2002). Differences in the cost of living between two jurisdictions may exist at the time the base for the CPI is set and these differences may or may not change over time depending upon the relative increase or decrease in prices between the two jurisdictions (as measured by the CPI).¹⁶ In the case of British Columbia, there is evidence to suggest that differences in the cost of living between the province and the national average existed at the time the LICO thresholds were last set.

The application of a national CPI figure to adjust income thresholds applied at the provincial level raises two possible issues in the application of LICO to British Columbia: (i) how relative differences in the cost of living during the base year might affect the representativeness of this method of updating; and (ii) whether changes in the relative cost of living between CPI sub-components at the provincial and national levels have changed over time. A third issue is one of inconsistency between the goods and services represented under the CPI and those included in the LICO determination.¹⁷ The first issue was explored by examining data on household expenditures on food, clothing and shelter in British Columbia versus the national average for the base year (1992). The second issue was explored by examining whether relative expenditures between British Columbia and the national average spending by households changed over time.

¹⁶ As an example, if the annual cost of living in jurisdiction A was 10% higher than jurisdiction B at the time the base year of the index, a 10% rise in the CPI for the two jurisdictions over the next five years would effectively maintain the 10% difference in the cost of living.

¹⁷ Source: <http://www.ic.gc.ca/eic/site/oca-bc.nsf/eng/ca02121.html>

Table 8 summarizes the percent increase in the overall CPI for British Columbia and Canada , with detail on individual sub-indices including food, clothing, and shelter. The data show that since 1992, the national CPI increased by 43% compared to 37% for British Columbia. Of the three subcomponents, food prices increased the most (54% nationally and 50% for British Columbia). Shelter costs increased 43% for Canada versus 16% for British Columbia. Shelter costs in the CPI include rent and imputed rent for homeowners. Finally, clothing and footwear prices increased by 16% in British Columbia over the 1992 period while declining 3% over the same period at the national level.

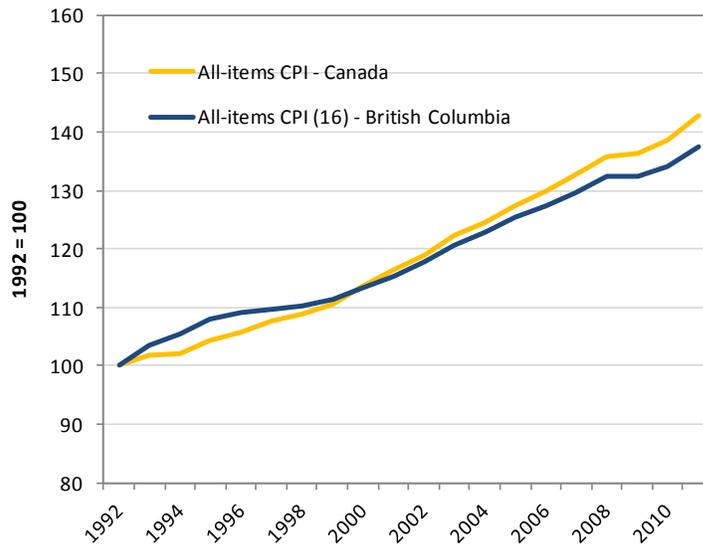
**Table 8: National Consumer Price Trends – CPI & Components
1992 - 2011**

CPI & Components	British Columbia	Canada
Food	50%	54%
Clothing and footwear	10%	-3%
Shelter	16%	43%
All Items	37%	43%

Source: Statistics Canada, Consumer Price Index, 62-001-XWE

Finally, the trend in the CPI for British Columbia and Canada over the 1992 to 2011 period using the 1992 base is shown in Figure 3. The data indicate that British Columbia’s annual price inflation slightly exceeded the national average prior to 2000, and then began to fall slightly below the increases at the national level for the remainder of the decade. By 2011, the British Columbia consumer price index was 97% that of the national average.

Figure 3: Consumer Price Index – British Columbia versus Canada



4.4 Summary

THRESHOLD ANALYSIS

This section explored the relationship between the costs of shelter, clothing and food between British Columbia and the national average. While data on food and clothing is inconclusive, the research confirms British Columbia had higher shelter costs relative to the national average for renters, and this gap has expanded over time. British Columbia homeowner costs were somewhat below the national average in 1992, but have since risen above the national average. Finally, research by Statistics Canada confirms that two issues produce lower after-tax LICO thresholds: (1) the application of national LICOs regardless of regional or sub-regional differences; and (2) the use of the (national) CPI to update the thresholds rather than using updated data on household spending and incomes.

5 SUMMARY & RECOMMENDATIONS

This report summarizes the review of measures, methods, and rationale used to determine eligibility for energy conservation programs directed at low income households. The research included an industry scan of the methods and procedures used to qualify participants in low income energy conservation programs, the determination of an industry standard, if any, for qualifying low income applicants, and an investigation into the application and rationale for use of scale or mark-up factors applied to low income thresholds. The latter is extended to recommendations for whether a scale factor is needed for BC Hydro's low income DSM program. Additionally, the industry scan increased understanding of the treatment of co-operative housing in low income conservation programs.

5.1 Summary and Conclusions

Major findings from the research into low income measures and scale factors include:

- Determining what proportion of households under financial stress is highly subjective regardless of the criteria or measure used. This subjectivity applies to many of the assumptions (and concepts in some cases).
- There are four published statistical options used in Canada to determine the incidence of low income individuals and households – LIM, MBM, HILs, and LICO. Of these, LICO represents the oldest but most commonly used measure of low income status to define eligible participants for a low income program.
- Benefits to using LICO include differentiation of thresholds by family and community size, annual government updates to the income thresholds, administrative efficiency (i.e., can be used either with before or after tax household income), and its general acceptance as a reasonable attempt to define households in financial stress.
- Drawbacks (weaknesses) to using LICO include its lack of regional-specific thresholds, a general lack of transparency to users, and an empirical foundation based on spending and income patterns now 20 years old.
- Other utilities and jurisdictions apply scale factors of between 115% and 135% to the LICO income thresholds to increase the overall size of eligible markets for low income programming. Despite their use, there appeared to be no clear understanding of why the scale factors are used, nor is there documentation of the methods or data used to determine the size of the scale factor.

In summary, the question of who should qualify for a low income program offered by BC Hydro should be viewed from the perspective of identifying who is not participating in the utility's existing DSM initiatives because of limited financial resources. While they vary by program and utility, traditional reasons for non-participation in DSM programs generally overlap with reasons why households, in general, fail to adopt energy efficient measures or change their energy-using behaviours. These include:

- Lack of knowledge about ways to save energy

SUMMARY & RECOMMENDATIONS

- Disconnect between costs and benefits (e.g., renters who do not directly realize the benefits of adopting energy efficient measures)
- Dislike of the characteristics of energy efficient alternatives (e.g., dislike of the CFLs that are slow to reach full brightness)
- Lack of time or interest

Beyond these issues, the initial financial outlay or “first cost” associated with adopting energy efficient measures can be a legitimate barrier for those with limited financial means to participate in a DSM initiative that requires an out-of-pocket financial contribution by the participant. Awareness that the long-term energy savings from adopting the measures will more than offset their initial financial outlay is important for those with financial means, but it is a moot point for those who struggle to provide the basic necessities of food, clothing and shelter. It is this latter group that should be the primary candidate for a low income energy efficiency initiative. Participants in a low income program benefit from reduced energy costs for those cases where the savings directly accrue to the occupant. They may also benefit from non-energy benefits such as improved comfort (e.g., from draft-proofing or furnace tune-ups). The sponsoring utility benefits from having these homes reduce their energy use.

With the above in mind, the principle for setting income thresholds for a low income conservation program should be to set it low enough that it is inclusive of households that do not have the financial resources or means to participate, while ensuring the threshold is not too high so as to allow those households with the financial means to undermine the cost effectiveness of the program.

Based on a review of various published statistics on household incomes and expenditures in British Columbia versus that of the national average, there appears sufficient evidence to suggest that (1) household operating costs in British Columbia, particularly that of shelter costs, were significantly higher than the national average when LICO thresholds were last determined (1992); and (2) while the size of the discrepancy appears to have diminished in the subsequent passage of time, updates using the national consumer price index have failed to fully compensate for the cost differential.

5.2 Recommendations

The following recommendations are based on the research findings presented in this report:

- BC Hydro should continue to use LICO thresholds to qualify applicants for their low income DSM program. The concept’s basis of relating financial means to spending on the basic necessities of food, clothing, and shelter is intellectually intuitive but also administratively efficient.
- BC Hydro should consider raising the LICO thresholds to accommodate the higher cost of living in British Columbia particularly for the large urban centres. Based on the analysis presented in this report, a conservative scale factor of 115% and 125% is justifiable.
- BC Hydro should develop a better understanding of the characteristics of the residential customers that are not participating in DSM initiatives due to limited financial means to qualify and support an appropriately sized scale factor.

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Appendix A

Summary and Assessment of Low Income Measures used in DSM Programs

Table 9: Summary and Assessment of Low Income Measures used in DSM Programs

Country	Low Income Measure	Source	History and Development	Definition/measurement	Strengths	Limitations
Canada	Low Income Cut Off (LICO)	Statistics Canada	<ul style="list-style-type: none"> 1960s Jenny Podoluk developed LICOs as part of Census monograph series 	<ul style="list-style-type: none"> Households which spend 20 percent more of their income on food, shelter, and clothing than the average Canadian household Separate cut-offs for 7 sizes of families and 5 sizes of communities Measures relative and absolute aspects of income levels 	<ul style="list-style-type: none"> Sensitive to family and community size Annually adjusted for inflation using CPI (Zhang 2010) Long history allowing for temporal analysis (Michaud and Poon 2006) Low cost of production (Zhang 2010) 	<ul style="list-style-type: none"> Weak geographical representation; does not permit inter-provincial comparisons or reflect differences in cost of living well (Michaud Unknown; Michaud and Poon 2006; Norman 2000) Contested ability to accurately measure low income population (Norman 2000) Ambiguity in 20% benchmark (Norman 2000) Often misinterpreted as a measure of poverty (Norman 2000) Low conceptual transparency (Zhang 2010) No international comparability (Zhang 2010)
	Low Income Measure (LIM)	Statistics Canada	<ul style="list-style-type: none"> 1990s 	<ul style="list-style-type: none"> 50 % of median adjusted family income Measures relative income levels 	<ul style="list-style-type: none"> Accounts for different needs of families of different sizes and composition (Zhang 2010) Annually updated with data from Survey of Labour and Income Dynamics (SLID) Limits the impact of high income outliers (Norman 2000) High conceptual transparency (Zhang 2010) International comparability (Zhang 2010) Low costs of production (Zhang 2010) 	<ul style="list-style-type: none"> Does not account for regional variations in costs of living (Zhang 2010)
	Market Based Measure (MBM)	Human Resources and Skill Development Canada	<ul style="list-style-type: none"> Development began in 1990s and first set of thresholds released in 2003 for year 2000 Began as an assessment tool for a Child Tax Benefit program 	<ul style="list-style-type: none"> Cost of a basket of goods defined as necessities compared to disposable household income Based on a family of 4 including 2 children Includes a total of 48 thresholds reflecting community and community size Basket of goods includes: a nutritious diet, clothing and footwear, shelter, transportation, and other necessary goods and services (such as personal care items or household supplies) Disposable income is the remaining money after tax, payroll deductions, child care, child support and alimony payments Measures absolute poverty 	<ul style="list-style-type: none"> Reflects the differences in living costs within Canada (Zhang 2010) Sensitive to family composition and community size Captures a more inclusive population (Zhang 2010) Considers transportation costs High conceptual transparency (Zhang 2010) 	<ul style="list-style-type: none"> Assumptions for what is considered a necessity will likely change over time (Norman 2000) International comparability not easy (Zhang 2010) High costs of production (Zhang 2010)
	Household Income Limits (HIL)	Canadian Mortgage and Housing Corporation (CMHA)		<ul style="list-style-type: none"> The minimum income a household needs if it is to spend no more than 30% of its income on the median rent in a market area Set using CMHC's rental-market surveys 	<ul style="list-style-type: none"> Location-specific Based on occupancy requirements of families 	<ul style="list-style-type: none"> Updated generally every 3 years Fairly rigid occupancy standards regarding sharing of rooms Based on housing market only; not comprehensive measurement of low income

Country	Low Income Measure	Source	History and Development	Definition/measurement	Strengths	Limitations
USA	Federal Poverty Guidelines (FPG)	US Dept. of Health and Human Services (HSS)	<ul style="list-style-type: none"> Concept developed by Mollie Orshansky of the Social Security Administration , 1963-65 (Fisher Winter 1992; Hanson 2008) 	<ul style="list-style-type: none"> A statistical simplification of the Federal Poverty Thresholds (FPT) (Federal Register 2011; Fisher Winter 1992; Mukhopadhyay, Shingler et al. 2011) Measures pre-tax income (Besharov and Germanis 2004) 	<ul style="list-style-type: none"> Annually adjusted for inflation using CPI Historically well established allowing for temporal trend analysis 	<ul style="list-style-type: none"> Does not include some low-income sources of income (i.e. food stamps, publicly provided health insurance benefits, and cash welfare payments) (Besharov and Germanis 2004; Willis 2011) Weak geographical representation of differences in cost of living (Besharov and Germanis 2004) Does not include some assets available to low-income households (Besharov and Germanis 2004) Based on outdated assumptions (i.e. excludes and/or underestimates household budget elements now considered essential such as child care, transportation, and utility costs; does not account for changes in standard household family structure; does not account for modern work related expenses) (Besharov and Germanis 2004; Pearce 2001; Ruggles 1990; Willis 2011) Does not vary by age of children (Center for Women's Welfare 2011) Does not account for net effect of taxes (Besharov and Germanis 2004; Center for Women's Welfare 2011) Theoretically updated in 2000 by Orshansky herself to 170% its original level but this has not formally been reflected in FPGs since (Schwartz 2005)
	Self Sufficiency Standard (SSS)	No formal distributor yet; considered a strong alternative to FPG	<ul style="list-style-type: none"> Developed in 1996 by Dr. Diana Pearce, then Director of the Women and Poverty Project at Wider Opportunities for Women 	<ul style="list-style-type: none"> A measure of income adequacy that calculates the amount of money working adults need to meet their family's basic needs without public or private subsidies (Pearce 2001) Market based approach to annual costs of living (Mukhopadhyay, Shingler et al. 2011) Adjusted for household size, ages, and geographic location Measures resources after taxes 	<ul style="list-style-type: none"> Sensitive to household composition (ages) and geographical context Comprehensively accounts for modern necessities such as housing prices, child care, transportation, medical care, in-kind benefits and food costs (Mukhopadhyay, Shingler et al. 2011) Reduces social stigma associated with traditional low income measures 	<ul style="list-style-type: none"> Does not account for long term expenses (e.g. savings for education or retirement) (Mukhopadhyay, Shingler et al. 2011) Neglects child support payments by non-custodial parent families (Mukhopadhyay, Shingler et al. 2011) Does not adjust for unemployment/underemployment; assumes full employment (Mukhopadhyay, Shingler et al. 2011)

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OPPORTUNITY ASSESSMENT OF POWER SMART PROGRAMS IN RESIDENTIAL RENTAL MARKET

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1. Executive Summary

While rental housing constitutes approximately 30% of the BC housing stock, it only represents approximately 16% of BC Hydro's customers because of secondary suites, which do not have individual electricity meters, and apartment buildings with one master electric meter. Energy efficiency in the rental market faces more barriers than in owner occupied housing units.

While BC Hydro Power Smart currently has several program offers for the residential market, it does not currently have a specific program targeted specifically at the needs and unique barriers of the rental market. As a result, BC Hydro wishes to assess energy savings opportunities in the residential rental market and assess the viability of extending its existing Energy Savings Kit (ESK) offer for low income residential customers to all the residential rental market.

The residential rental market consists of various types of dwellings. Secondary suites represent approximately 4% of all dwellings and approximately 13% of rental dwellings. Apartment units represent approximately 72% of rental dwellings that are BC Hydro customers

Over the past few years the number of low-income households in rental dwellings has increased. As a result, more renters tend to be low-income households than in the past. Households in the bottom 20% of the income distribution are the fastest-growing segment of the residential rental market. The adjusted 2011 median income of rental households of \$37,075 is approximately 57% of the adjusted 2011 median income of \$65,358 for all BC household.

Approximately 37% of rental households are eligible for BC Hydro's low-income programs.

The residential rental market uses approximately 1,660 GWh per year, which represents approximately 9% of residential electricity sales. After accounting for free riders, the residential rental market has the potential for approximately 125 GWh per year of electricity savings, if all energy efficiency measures currently available through BC Hydro's residential programs were implemented. This includes approximately 26 GWh per year from ENERGY STAR appliances, 78 GWh per year from replacing all incandescent bulbs with efficient lighting, 8 GWh per year from water heating upgrades, and 14 GWh per year from space heating upgrades. Extending ESK to all approximately 256,000 rental households has the potential to result in annual electricity savings of approximately 51 GWh for customer installed ESKs at a variable measure cost of approximately \$0.028 per kWh over the 9 year life of the measure and annual electricity savings of approximately 89 GWh for direct installed ESKs at a variable measure cost of approximately \$0.0257 per kWh over the 9 year life of the measure. These measure costs exclude free riders (estimated at over 37%) and fixed program costs. Furthermore, participation rates for energy efficiency programs in the rental market can be expected to be lower than owner occupied dwellings. Including free riders, fixed program costs, and the lower participation rates will impact the cost effectiveness of ESK for the rental market significantly.



With the exception of BC Hydro's low income programs, other programs are available to all rental dwellings. However, BC Hydro does not specifically target rental households and landlords to take part in its Power Smart programs. BC Hydro should consider using energy efficiency and program content from its existing programs and present the content in such a way that it is specifically targeted at landlords and tenants.

Any programs for rental market should focus on lighting as lighting represents the greatest potential for energy savings.

Tenants have not demonstrated a willingness to pay more for energy efficient homes and are less likely to invest in energy efficiency because they do not believe they can recover their investment during the term of their leases. Landlords are less likely to invest in energy efficiency because they do not benefit from the lower energy costs. BC Hydro should consider working with various levels of government to introduce a home labelling to increase consumer awareness of energy efficient homes.

Transaction costs for all BC Hydro programs are similar for rental and owner occupied households with the exception of the appliance rebate program, which has significantly higher transaction costs for rental units. As result, BC Hydro should investigate implementing an upstream incentive for major appliances similar to the lighting and home electronics incentives.

2. Introduction

While rental housing constitutes approximately 30% of the BC housing stock, it only represents approximately 16% of BC Hydro's customers because of secondary suites, which do not have individual electricity meters, and apartment buildings with one master electric meter. Energy efficiency in the rental market faces more barriers than in owner occupied housing units, primarily due to the split incentive issue, where the landlord is often responsible for improvements to the rental dwelling and the tenant is responsible for the energy bills and would benefit from any energy savings that result from energy efficiency upgrades by the landlord. Furthermore, tenants are often reluctant to invest in energy efficiency because they don't believe that they will recover their investment over the term of their tenancy.

While BC Hydro Power Smart currently has several program offers for the residential market, it does not currently have a specific program targeted specifically at the needs and unique barriers of the rental market.

BC Hydro wishes to assess energy savings opportunities in the residential rental market, and prepare a high level strategy for addressing the barriers to energy efficiency in this market. Furthermore, BC Hydro wishes to assess the viability of extending its existing Energy Savings Kit (ESK) offer for low income residential customers to all the residential rental market and assess the free ridership and cost effectiveness of extending its ESK the residential rental market.



3. Residential Rental Market Assessment

This section provides an overview of the residential rental market. It includes a description of the various dwelling types, an assessment of the household income of rental households, a description of some characteristics of rental households, and the number of rental households.

3.1. Dwelling Types

The residential rental market consists of various types of dwellings. These include:

- Single family dwellings
- Semi detached (duplexes)
- Row houses and townhomes
- Apartment units
- Apartment in a detached duplex (this can include secondary suites)
- Rental apartment buildings

A single family dwelling is defined as a dwelling that is not attached to any other dwelling or structure, except its own garage or shed. It has open space on all sides and has no dwelling either above or below it.

A semi-detached house (Duplex) is defined as one of two dwellings that are attached side by side (or back to back) to each other, but not to any other dwelling or structure, except its own garage or shed. It has no dwellings either above or below it and the two units together have open space on all sides.

A row house is defined as one of three or more dwellings joined side by side or side to back, such as a town house or garden home, but not having any other dwellings either above or below.

An apartment in detached duplex is defined as one of two dwellings, located one above the other, but not attached to any other dwelling or structure, except its own garage or shed. The two units together have no other dwelling attached to the back, front, or sides, and have open space on all sides. These can include secondary suites in single family dwellings.

An apartment in a building that has five or more storeys is defined as a dwelling unit in a high rise apartment building which has five or more storeys.

An apartment in a building that has less than five storeys is defined as a dwelling unit in a low rise apartment building which has less than five storeys.

Tenants in single family dwellings, duplexes, row houses, and individual apartment units often have their own individual electric meter and are responsible for their own electricity costs. Landlords of these dwellings are responsible for major building improvements and appliances. The electricity bill for tenants



of secondary suites is typically included in the rent as the secondary suites do not typically have their own electricity meter. Apartment buildings where all the apartment units are rented may have one electricity meter for the building or individual electric meters for each apartment unit. In apartment buildings with one meter the rent includes electricity, while in apartment buildings with individual metering for the apartment units the tenants are responsible for their own electricity bills.

In all cases, the landlord is responsible for building upgrades and replacing major appliances such as heating system, refrigerator, dishwasher, clothes washer, and clothes dryer.

Lighting inside the residential units can consist of lighting fixtures that are attached to the building (such as ceiling fixtures and pot lights) and fixtures that are not attached to the building (such as floor and table lamps). Fixtures that are connected to the building are typically owned by the landlord, while fixtures that are not attached to the building are typically owned by the tenant. In either case, the tenants typically change the lamps when the lamps fail.

3.2. Characteristics of Rental Households

Data from Statistics Canada – 2006 Census indicates that over 73% of the BC population live in urban areas with a population of over 100,000 and that BC had a population of 4,113,490 living in 1,643,150 dwellings with an average of 2.5 people per household¹. Table 1 summarizes the number of households in BC. The data indicates that 55% of all BC households (both rental and owner occupied) have one or two occupants.

Table 1. Number of Households in BC²

Type of Household	Number of Households	% of Total Households
Single Person Households	460,580	28%
Couples without Children	443,565	27%
Couples with Children	474,895	29%
Other	264,110	16%
Total Households	1,643,150	100%

Many Canadian households have moved from renting to home ownership during the past two decades. A study published in the 25 May 2007 issue of the *Services Industries Newsletter*³, found that even though

¹ <http://www12.statcan.gc.ca/census-recensement/2006/dp-pd/tbt/Rp-eng.cfm?TABID=1&LANG=E&APATH=3&DETAIL=0&DIM=0&FL=A&FREE=0&GC=01&GK=1&GRP=1&PID=89076&PRID=0&PTYPE=88971,97154&S=0&SHOWALL=0&SUB=0&Temporal=2006&THEME=69&VID=0&VNAMEE=&VNAMEF=>

² <http://www12.statcan.gc.ca/census-recensement/2006/dp-pd/hlt/97-553/pages/page.cfm?Lang=E&Geo=CSD&Code=59&Table=2&Data=Count&Age=1&StartRec=1&Sort=2&Display=Page&CSDFilter=5000>



prices for homes have risen more rapidly than rents, more households have opted for home ownership. The study found that households that turned to home ownership from renting tend to have higher incomes than renters. **As a result, more renters tend to be low-income households than in the past.**

Households in the bottom 20% of the income distribution are the fastest-growing segment of the residential rental market. In 2005, these households represented nearly 30% of all rent payments, while they represented 24% of all rent payments in 1986.

City-dwellers are also more likely to rent. In 2005, 37% of households living in Canada's 14 largest cities rented their dwellings, compared to only 28% of households elsewhere.

Almost 50% of all rental dwelling have a single occupant even though they represent only 25% of all households. Couples (married and common-law) are under-represented among renters. In 2005, couples comprised 63% of Canada's households but represented only 43% of Canada's rental spending. With 50% of rental dwellings being occupied by a single occupant and 43% of rental spending by couples, this suggests that approximately between 50% and 93%⁴ of rental dwellings are occupied by one or two people. Since it is common for couples with children to own their home, this study assumes that 65% of couples without children rent their residence, while 35% own their home. Therefore, the percentage of couples without children who rent their residence is estimated by multiplying 43% (representing percentage of couples in rental dwellings) by 65% (representing percentage of couples without children). This equates to approximately 28% of the rental market being occupied by two people. The percentage of rental market being occupied by two people (28%) is added to the percentage of the rental market being occupied by one person (50%) to determine the percentage of the rental market being occupied by one or two people at 78% of rental market.

BC Hydro's 2006 End Use Survey indicates that 54% of single family dwellings, 67% of row houses, 89% of apartments, and 81% of other dwellings are occupied by one or two persons. This data is summarized in Table 2 which shows household size by dwelling type for both owner occupied and rental properties.

Table 2. Household Size by Dwelling Type⁵

Household Size	Single Family Dwellings	Row Houses	Apartment	Other
1	12%	27%	54%	34%
2	42%	40%	35%	47%
3 or more	46%	33%	12%	19%

³ <http://www.statcan.gc.ca/daily-quotidien/070525/dq070525b-eng.htm>

⁴ Sum of 50% occupied by single occupants and 43% occupied by couples.

⁵ BC Hydro Residential End Use Survey - 2006



Table 3 summarizes the number BC Hydro customers by dwelling type separated into rental units and owner occupied units.

Table 3. Number of Residential Rental Units by Dwelling Type – BC Hydro Customers

	Owner Occupied Units	Rental Units	Total Units	Rental Units as % of Dwelling Type	Rental Unit as % of Total Dwelling	Rental Units as % of Total Rental Units
Single Family Dwelling	848,821	37,706	886,527	4%	2%	15%
Duplex / Row / Town	153,117	27,270	180,387	15%	2%	11%
Apt, bldg	231,517	185,376	416,893	45%	12%	72%
Mobile / Other Home	74,810	5,634	80,444	7%	0.4%	2%
TOTAL	1,308,265	255,986	1,564,251	16%	16%	100%

The data from Table 2 and Table 3 was used to estimate the number of rental dwellings based on the size of the household. The percentages from Table 2 were applied to the number of rental units from Table 3 for each dwelling type to determine the number of rental dwellings based on the size of the household. The results are summarized Table 4. The results indicate that approximately 80% of rental units are occupied by one or two people, which is consistent with previous estimate of approximately 78%. **As a result, it is estimated that 80% of rental dwelling are occupied by one or two people.**

Table 4. Size of Rental Households by Dwelling Type – BC Hydro Customers

Household Size	Single Family Dwellings	Row Houses	Apartment	Other	TOTAL	Percent of Rental Units
1	4,525	7,363	99,176	1,916	112,980	44%
2	15,837	10,908	63,955	2,648	93,349	36%
3 or more	17,345	8,999	22,245	1,070	49,659	19%
TOTAL	37,706	27,270	185,376	5,634	255,986	100%

3.3. Household Income

Table 5 summarizes Statistics Canada's 2006 Census data on the household income of rental households in BC.

**Table 5. 2006 Rental Household Income⁶**

Household income groups	Number of Households	% of Total Rental Households
Under \$10,000	49,770	10%
\$10,000 to \$19,999	93,050	19%
\$20,000 to \$29,999	73,105	15%
\$30,000 to \$39,999	67,640	14%
\$40,000 to \$49,999	53,805	11%
\$50,000 to \$59,999	40,035	8%
\$60,000 to \$69,999	31,420	6%
\$70,000 to \$79,999	22,555	5%
\$80,000 to \$89,999	15,040	3%
\$90,000 to \$99,999	10,745	2%
\$100,000 and over	28,130	6%
Total	485,295	100%
Average household income \$	\$ 42,656	
Median household income \$	\$ 33,722	

Since number of rental units by income group was not available for 2011, the 2006 income groups were adjusted for inflation from 2006 to 2011 based on Consumer Price Index (CPI) published by the Bank of Canada. With 2006 as the base year and a value of 100, the 2011 value was calculated to be 110, representing a 10% increase in prices and income from 2006 to 2011. Table 6 summarizes the number of rental households from Table 5 after adjusting the income groups for inflation from 2006 to 2011.

Table 6. 2011 Rental Household Income

Household income groups	Number of Households	% of Total Rental Households
Under \$10,994	49,770	10%
\$10,994 to \$21,987	93,050	19%
\$21,988 to \$32,982	73,105	15%
\$32,983 to \$43,976	67,640	14%
\$43,977 to \$54,970	53,805	11%
\$54,971 to \$65,964	40,035	8%
\$65,965 to \$76,959	31,420	6%
\$76,960 to \$87,953	22,555	5%
\$87,954 to \$98,947	15,040	3%
\$98,948 to \$109,942	10,745	2%
\$109,943 and over	28,130	6%
Total	485,295	100%
Average household income \$	\$ 46,897	
Median household income \$	\$ 37,075	

⁶ Statistics Canada - 2006 Census Data



The adjusted 2011 median income of rental households of \$37,075 is approximately 57% of the adjusted 2011 median income of \$65,358 for all BC household. This indicates renters are generally in the lower income groups.

BC Hydro currently uses the 2009 Low Income Cut Offs (LICO) from Statistics Canada to qualify eligible participants for Power Smart Energy Conservation Assistance Program targeted at low income households. The LICO household income thresholds are shown in Table 7.

Table 7. 2009 Low Income Cut Offs Thresholds

House Hold Income Thresholds					
Household Size (Economic Family)	Community Size				
	Rural Areas	Urban Areas Less Than 30,000	Urban Areas 30,000 to 99,999	Urban Areas 100,000 to 499,999	Urban Areas 500,000 and over
1 Person	\$15,302	\$17,409	\$19,026	\$19,144	\$22,229
2 Persons	\$19,050	\$21,672	\$23,685	\$23,832	\$27,674
3 Persons	\$23,419	\$26,643	\$29,118	\$29,299	\$34,022
4 Persons	\$28,435	\$32,349	\$35,354	\$35,573	\$41,307
5 Persons	\$32,250	\$36,690	\$40,097	\$40,345	\$46,850
6 Persons	\$36,374	\$41,380	\$45,223	\$45,504	\$52,838
7 or more Persons	\$40,496	\$46,071	\$50,350	\$50,661	\$58,827

Since the number of rental units in different size communities could not be separated for different household incomes and household sizes, this report assumes that the majority of rental units are in urban areas and approximately 80% of rental dwellings are occupied by one or two people (please see section 3.2). The number of rental households in different income groups shown in Table 6 indicates that approximately 29% of rental households have a household income of less than \$21,987 and 45% of rental households have a household income of less than \$32,982 per year. With 80% of rental dwellings being occupied by one or two people in urban areas, this report assumes that the LICO thresholds for households of one and two persons in urban areas over 500,000, shown in Table 7, would include most rental households. With a LICO threshold of \$22,229 for a household of one person in urban areas over 500,000 and 29% of rental households making less than \$21,987, it can be expected that at least 29% of rental households would be eligible for BC Hydro's low income programs. Furthermore, with a LICO threshold of \$27,674 for a household of two people in urban areas over 500,000 and 15% of rental households making between \$21,988 and \$32,982, it can be expected that another 8% of rental households would be eligible for BC Hydro's low income programs. **Therefore, it is estimated that approximately 37% of rental households are eligible for BC Hydro's low-income programs.**



3.4. Size of the Residential Rental Market

Table 8 summarizes Statistics Canada's 2006 Census data on the number of rental units in BC by dwelling type. The data indicates BC has approximately 488,710 rental units, which represents approximately 30% of the total residential units. It also indicates that apartment units (both low rise and high rise) represent the largest number of the rental units, at 282,695. This represents approximately 58% of the total number of rental units in BC. There are approximately 82,615 rental single family dwellings, representing 17% of the total residential units. There are approximately 63,740 rental apartment duplex units, which likely represents secondary suites, representing approximately 13% of the total residential rental units.

Table 8. Number of Residential Rental Units by Dwelling Type⁷

Dwelling Type	Owner Occupied Units	Rental Units	Total Units	Rental Units as % of Dwelling Type	Rental Unit as % of Total Dwelling	Rental Units as % of Total Rental Units
Single Family Dwelling	698,410	82,615	781,025	11%	5%	17%
Semi-detached (Duplex)	33,745	16,335	50,080	33%	1%	3%
Other single detached house	1,570	1,765	3,335	53%	0.1%	0%
Apt Duplex (secondary suites)	99,495	63,740	163,235	39%	4%	13%
Row house	76,540	35,355	111,895	32%	2%	7%
Apt, bldg with 5 or more flrs	48,815	67,455	116,270	58%	4%	14%
Apt, bldg with less than 5 storeys	128,140	215,240	343,380	63%	13%	44%
Movable dwelling (Mobile Home)	31,440	6,205	37,645	16%	0.4%	1%
Total	1,118,155	488,710	1,606,865	30%	30%	100%

Table 9 summarizes the number of BC Hydro customers by dwelling type separated into rental units and owner occupied units.

Table 9. Number of Residential Rental Units by Dwelling Type – BC Hydro Customers

	Owner Occupied Units	Rental Units	Total Units	Rental Units as % of Dwelling Type	Rental Unit as % of Total Dwelling	Rental Units as % of Total Rental Units
Single Family Dwelling	848,821	37,706	886,527	4%	2%	15%
Duplex / Row / Town	153,117	27,270	180,387	15%	2%	11%
Apt, bldg	231,517	185,376	416,893	45%	12%	72%
Mobile / Other Home	74,810	5,634	80,444	7%	0.4%	2%
TOTAL	1,308,265	255,986	1,564,251	16%	16%	100%

⁷ Statistics Canada - 2006 Census Data



The differences in the number of dwellings in Table 8 and Table 9 is due to the fact that electricity service for the City of New Westminster is provided by the City of New Westminster, and electricity service for Kelowna, Osoyoos, Trail, Castlegar, Princeton, Rossland, Summerland, Penticton, Grandforks, and Nelson is provided by FortisBC. Furthermore, the number of BC Hydro accounts is based on 2011 data while the number of dwellings in Table 8 is based on the 2006 Census.

The data indicates that 30% of BC households are rental dwellings, while only 16% of BC Hydro customers live in rental dwellings. This difference can be attributed to two major factors:

- Secondary suites, which represent 4% of all dwellings. These dwellings generally do not have their own electric meter.
- Apartment buildings with one master electric meter instead of individual electric meters for each suite. This is illustrated by the fact that rental apartment units represent 17% of the all dwellings and only 12% of the BC Hydro accounts.

These two factors account for 900 basis points of the difference between the 1400 basis points difference between rental households in BC vs. BC Hydro rental accounts.

2007 CPR data indicates that 25% of single family & duplexes, 64% of row houses, 51% of apartments, and 37% of mobile homes are electrically heated. By applying these percentages to the number of rental dwellings from Table 9, the number of rental dwellings by dwelling type and primary source of heat were determined. This data is shown in Table 10.

Table 10. Residential Rental Units by Dwelling Type & Primary Heat Source - BCH Customers

Dwelling Type	Number of BCH Customers
SFD/Duplex, electric heating	9,483
SFD/Duplex, non-electric heating	28,223
Row house, electric heat	17,479
Row house, non-electric heat	9,791
Apartment suite, electric heat	93,794
Apartment suite, non-electric heat	91,582
Mobile, electric heat	2,104
Mobile, non-electric heat	3,530
TOTAL	255,986

3.5. Energy Use in Rental Dwellings

Average electricity consumption by dwelling type from BC Hydro's most recent CPR (2007) was used to determine the average electricity use for different dwelling types. Table 11 summarizes the average



electricity consumption per dwelling, number of rental accounts, and annual electricity consumption by rental dwelling by dwelling type.

Table 11. Electricity Consumption by Dwelling Type⁸

Dwelling Type	Average Annual Electricity Consumption per Account (kWh / yr)	Number of Rental Accounts	Annual Electricity Consumption (GWh / yr)
SFD/Duplex, electric heating	20,593	9,483	195
SFD/Duplex, non-electric heating	10,124	28,223	286
Row house, electric heat	11,554	17,479	202
Row house, non-electric heat	8,063	9,791	79
Apartment suite, electric heat	5,292	93,794	496
Apartment suite, non-electric heat	3,743	91,582	343
Mobile, electric heat	12,814	2,104	27
Mobile, non-electric heat	9,024	3,503	32
TOTAL	10,235	255,959	1,660

3.6. Appliance & Lighting Penetration in Rental Dwellings

Appliance penetrations rates by dwelling type for the four BC Hydro regions from BC Hydro's 2007 CPR were used to determine the weighted average penetration rate of major appliances by dwelling type for BC Hydro. This data is summarized in Table 12.

Table 12. Weighted Average Number of Appliances Per Dwelling⁹

Dwelling Type	Refrigerator	Clothes Washer	Dryer	Dishwasher	Freezer
Single Family Dwelling	1.4308	0.9924	0.9539	0.7802	0.8646
Duplex / Row / Town	1.1539	0.9338	0.8764	0.7735	0.5290
Apt, bldg	1.0380	0.2526	0.2482	0.5757	0.2481
Mobile / Other Home	1.1179	0.9454	0.9369	0.5723	0.8031

This report assumes that the weighted average number of clothes washers, clothes dryers, and dishwashers is the same for owner occupied and rental dwellings. However, this report assumes that the average number of refrigerators for rental dwellings is one and the average number of freezers in for rental dwellings is zero, as landlords generally only provide one refrigerator and do not provide a freezer. The weighted average number of appliances per dwelling in rental dwellings is summarized in Table 13.

⁸ BC Hydro Power Smart Conservation Potential Review, Residential Sector, 2007

⁹ BC Hydro Power Smart Conservation Potential Review, Residential Sector, 2007

**Table 13. Weighted Average Number of Appliances Per Rental Dwelling**

Dwelling Type	Refrigerator	Clothes Washer	Dryer	Dishwasher	Freezer
Single Family Dwelling	1	0.9924	0.9539	0.7802	0
Duplex / Row / Town	1	0.9338	0.8764	0.7735	0
Apt, bldg	1	0.2526	0.2482	0.5757	0
Mobile / Other Home	1	0.9454	0.9369	0.5723	0

The total number of major appliances in all rental dwellings is estimated by multiplying the number of rental dwellings that are BC Hydro customers from Table 9 by the weighted average number of appliances per rental dwelling in Table 13. The results are summarized in Table 14.

Table 14. Total Number of Major Appliances in Rental Dwellings – BC Hydro Customers

Dwelling Type	Refrigerator	Clothes Washer	Dryer	Dishwasher
Single Family Dwelling - Electric Space & Water Heat	9,483	9,410	9,046	7,398
Single Family Dwelling - Non-Electric Space & Water Heat	28,223	28,008	26,923	22,019
Duplex / Row / Town - Electric Space & Water Heat	17,479	6,404	15,319	13,520
Duplex / Row / Town - Non-Electric Space & Water Heat	9,791	19,060	8,581	7,574
Apt, bldg	185,376	46,821	46,019	106,719
Mobile / Other Home	5,634	5,327	5,278	3,224
TOTAL	255,986	115,030	111,165	160,454

Lighting penetrations rates by dwelling type were obtained from the 2010 Residential End Use Survey. This data is summarized in Table 15.

Table 15. Number of Lights per Rental Dwelling Type¹⁰

Dwelling Type	Incandescent Bulbs	Fluorescent Bulbs	Halogen Bulbs	LED Bulbs	Other Bulbs	All Bulbs
Single Family Dwelling	14.6425	3.1996	1.9088	0.2649	1.7356	31.5169
Duplex / Row / Town	10.9933	0.9815	1.4708	0.1941	1.4107	20.8932
Apt, bldg	8.5322	0.7399	1.6193	0.1215	0.8192	15.5355
Mobile / Other Home	10.2458	1.4736	0.6984	0.2142	1.0680	20.0986
Total	9.7539	1.1484	1.6236	0.1531	1.0273	18.5581

The total number of various types of light bulbs in all rental dwellings is estimated by multiplying the number of rental dwellings that are BC Hydro customers from Table 9 by the number of light bulbs per rental dwelling in Table 15. The results are summarized in Table 16.

¹⁰ BC Hydro 2010 Residential End Use Survey

**Table 16. Total Number of Light Bulbs in Rental Dwellings – BC Hydro Customers**

Dwelling Type	Incandescent Bulbs	Fluorescent Bulbs	Halogen Bulbs	LED Bulbs	Other Bulbs	All Bulbs
Single Family Dwelling	552,110	120,644	71,973	9,988	65,443	1,188,376
Duplex / Row / Town	299,787	26,766	40,109	5,293	38,470	569,758
Apt, bldg	1,581,665	137,160	300,179	22,523	151,860	2,879,909
Mobile / Other Home	57,725	8,302	3,935	1,207	6,017	113,236
Total	2,496,862	293,974	415,619	39,191	262,974	4,750,614

4. Energy Saving Opportunities

This section provides an estimate of the potential energy savings opportunity from more energy efficient lighting and major appliances as well as upgrades to water heating system and upgrades that reduce energy used for space heating.

After accounting for free riders, the residential rental market has the potential for approximately 125 GWh per year of electricity savings, if all energy efficiency measures currently available through BC Hydro's residential programs were implemented. However, because of several market barriers, this potential may not be easily realized. Table 17 summarizes the potential electricity savings in rental dwellings by end use and dwelling type without accounting for free ridership.

Table 17. Potential Electricity Savings in Rental Dwellings (GWh/yr)– Unadjusted for Free Riders

	Appliances	Lighting	Water Heating	Space Heating	Total
Single Family Dwelling - Electric Space & Water Heat	2.5	23.7	4.3	7.7	43
Single Family Dwelling - Non-Electric Space & Water Heat	5.2		0	0	
Duplex / Row / Town - Electric Space & Water Heat	2.6	12.9	7.9	14.2	40
Duplex / Row / Town - Non-Electric Space & Water Heat	2.8		0	0	
Apt, bldg	18.1	68.0	0	0	86
Mobile / Other Home	1.0	2.5	0	0	4
TOTAL	32	107	12	22	173

Table 18 summarizes the free ridership rates used by BC Hydro for various energy efficiency measures.

Table 18. Free Ridership¹¹

Energy Efficiency Measure	Free Ridership
Energy Efficient Lighting	27%
Appliance Rebate Program	20%
ESK	37% ¹²

¹¹ BC Hydro Residential Marketing



Table 19 summarizes the potential electricity savings in rental dwellings by end use and dwelling type after adjusting for free ridership.

Table 19. Potential Electricity Savings in Rental Dwellings (GWh/yr) – Adjusted for Free Riders

	Appliances	Lighting	Water Heating	Space Heating	Total
Single Family Dwelling - Electric Space & Water Heat	2.0	17.3	2.7	4.8	31
Single Family Dwelling - Non-Electric Space & Water Heat	4.2		0	0	
Duplex / Row / Town - Electric Space & Water Heat	2.1	9.4	5.0	8.9	28
Duplex / Row / Town - Non-Electric Space & Water Heat	2.2		0	0	
Apt, bldg	14.5	49.6	0	0	64
Mobile / Other Home	0.8	1.8	0	0	3
TOTAL	26	78	8	14	126

4.1. Energy Saving Opportunity with Major Appliances

The estimated electricity savings of better than ENERGY STAR appliances, based the Appliance Rebate Program, over standard appliances in replacement applications is shown Table 20.

Table 20. Electricity Savings of Better than ENERGY STAR Appliances over New Standard Appliances¹³

Appliance	Annual Electricity Savings (kWh per year)
Clothes Washer Electric Water Heating	189
Clothes Washer Gas Water Heating	104
Refrigerator	45
Dishwasher	45
Freezer	82

This report assumes that major appliances in rental dwellings are non ENERGY STAR. The potential energy savings from major appliances by replacing all major appliances in rental dwellings with better than ENERGY STAR appliances¹⁴ is estimated by multiplying the average annual electricity savings for better than ENERGY STAR appliances from Table 20 by the number of appliances from Table 14. The results are summarized in Table 21.

¹² As per section 0, 37% of the residential rental market are eligible for BC Hydro's low-income programs.

¹³ Based on BC Hydro's current Appliance Rebate Program . BC Hydro Residential Marketing

¹⁴ Based on BC Hydro's current Appliance Rebate Program



Table 21. Potential Energy Savings From ENERGY STAR Appliances in All Rental Units – BC Hydro Customers (GWh per year)

	Refrigerator	Clothes Washer	Dishwasher	Total
Single Family Dwelling - Electric Space & Water Heat	0.4	1.8	0.3	2.5
Single Family Dwelling - Non-Electric Space & Water Heat	1.3	2.9	1.0	5.2
Duplex / Row / Town - Electric Space & Water Heat	0.8	1.2	0.6	2.6
Duplex / Row / Town - Non-Electric Space & Water Heat	0.4	2.0	0.3	2.8
Apt, bldg	8.3	4.9	4.9	18.1
Mobile / Other Home	0.3	0.6	0.1	1.0
TOTAL	12	13	15	32

4.2. Energy Saving Opportunity for Lighting

The estimated electricity savings of lighting upgrades based on BC Hydro's low income program is summarized in Table 22.

Table 22. Electricity Savings of Lighting Upgrades per Measure (kWh per year)

Measure Types	Average Savings per Unit after Cross Effects
LED nightlight	46.2
CFLs 13 Watt (average use)	43.0
CFLs 20 Watt	131.4

Since effective January 1, 2011, retailers can no longer sell 75 Watt and 100 Watt incandescent light bulbs in BC, the potential energy savings from replacing incandescent light bulbs is based on the average savings of replacing incandescent light bulbs with 13 CFLs. Therefore, the potential energy savings from replacing incandescent light bulbs in rental dwellings is estimated by multiplying the average annual electricity savings for 13 Watt CFLs for interior lighting from Table 22 by the number of incandescent light bulbs from Table 16. The results are summarized in Table 23.

Table 23. Potential Energy Savings From Indoor CFL Lights in All Rental Units – BC Hydro Customers (MWh per year)

Dwelling Type	Incandescent Bulbs
Single Family Dwelling	23,741
Duplex / Row / Town	12,891
Apt, bldg	68,012
Mobile / Other Home	2,482
Total	107,125



4.3. Energy Saving Opportunity with Water Heating Upgrades

The estimated electricity savings of upgrades to the water heating system based on BC Hydro's low income program is summarized in Table 24.

Table 24. Electricity Savings for ESK Water Heating Upgrades per Measure (kWh per year)

Measure Types	Average Savings per Unit after Cross Effects
	(for the average home in BC)
Faucet aerators (2 G.P.M. max)	33.0
Low Flow Showerhead (2 G.P.M. max)	211.8
Water Heater Blanket (standard size)	164.8
Water Heater Pipe Wrap (8 ft)	42.4

The potential energy savings from ESK water heating upgrades in rental dwellings is estimated by multiplying the average annual electricity savings for each water heating upgrade from Table 24 by the number of dwellings with electric water heating from Table 10. This study assumes that electrically heated single family dwellings, row houses, and duplexes also have electric water heating, while electrically heated apartments have a central gas fired water heating system, which is common practice. The results are summarized in Table 25.

Table 25. Potential Energy Savings from ESK Water Heating Upgrades in All Rental Units – BC Hydro Customers (MWh per year)

Dwelling Type	Faucet aerators (2 G.P.M. max)	Low Flow Showerhead (2 G.P.M. max)	Water Heater Blanket (standard size)	Water Heater Pipe Wrap (8 ft)	TOTAL
Single Family Dwelling	313	2,008	1,563	402	4,286
Duplex / Row / Town	577	3,702	2,881	741	7,900
Total	890	5,710	4,443	9,178	12,187

4.4. Energy Saving Opportunity with Space Heating Upgrades

The estimated electricity savings of upgrades that impact space heating based on BC Hydro's low income program is summarized in Table 26.

Table 26. Electricity Savings for ESK Space Heating Upgrades per Measure (kWh per year)

Measure Types	Average Savings per Unit after Cross Effects
	(for the average home in BC)
Outlet Gaskets (package for 4 light switches or outlets)	20.0
Window Film (package to cover 2 standard windows)	45.0
Basic Home Comfort Draftproofing (prescriptive sites, set time)	225.0



The potential energy savings from ESK space heating measure in rental dwellings is estimated by multiplying the average annual electricity savings each space heating upgrade from Table 26 by the number of dwellings with electric space heating from Table 10. This study assumes that these space heating upgrades are applicable to single family dwellings, row houses, and duplexes. The results are summarized in Table 27.

Table 27. Potential Energy Savings from ESK Space Heating Upgrades in All Rental Units – BC Hydro Customers (MWh per year)

Measure Types	Outlet Gaskets (package for 4 light switches or outlets)	Window Film (package to cover 2 standard windows)	Basic Home Comfort Draft proofing (prescriptive sites, set time)	TOTAL
Single Family Dwelling	190	427	2,134	7,679
Duplex / Row / Town	350	787	3,933	14,154
Total	539	1,213	6,066	21,833

5. Programs for Rental Market in Other Jurisdictions

Program offerings of utilities in other jurisdictions targeted at the residential rental market were investigated. This section summarizes the programs targeted at the rental market in other jurisdictions. Most jurisdictions offered low-income programs that were available to both low-income tenants and homeowners. Low-income programs that are available to both tenants and homeowners are summarized in Appendix A. Some jurisdictions also offered programs targeted at the property owners and managers of multifamily residential buildings.

5.1. Efficiency Vermont

Efficiency Vermont has a program specifically targeted at rental properties. Under the Residential Rental Property Rebates¹⁵ Efficiency Vermont provides free compact fluorescent light bulbs (CFLs), low-flow shower heads, faucet aerators, and rebates for energy-efficient refrigerators and ventilation fans to the landlords, for use in residential rental properties.

Efficiency Vermont ships the products directly to the landlord and the landlord must install the products in the tenant's premises. The products cannot be installed in common areas or owner occupied units.

¹⁵ http://www.encyvermont.com/for_my_business/ways-to-save-and-rebates/rental_property_rebates/general_info/overview.aspx



5.2. Pacific Coast Gas & Electric (PG&E)¹⁶

PG&E offers energy efficiency programs targeted at tenants, landlords, and low-income households. Its low-income programs are available to both tenants and homeowners.

5.2.1. Multifamily Properties Program¹⁷

The Multifamily Properties Program is targeted at property owners and managers of multifamily dwellings with two or more units. The program encourages owners of existing properties to upgrade to eligible energy efficient products in tenant premises and the common areas of residential apartment buildings, mobile home parks and condominium complexes.

The program offers incentives to landlords for energy efficiency measures including, high efficiency clothes washers for tenant's dwelling, high efficiency common area clothes washers, high efficiency dishwashers, attic and wall insulation, high performance dual pane windows, central and individual boilers and water heaters, low flow showerheads, HVAC, ENERGY STAR hard-wired fluorescent light fixtures, screw-in CFLs, de-lamping, high performance T8 and T5 fluorescent lamps with electronic ballasts, LED exit signs, time clocks on lighting equipment, occupancy sensors, exterior photocells on outdoor lighting, and VFDs on pool pumps.

The rebates under this program are similar to PG&E's other rebates for similar measures.

5.2.2. SmartACTM

PG&E offers its SmartACTM demand response program, which cycles on and off air conditioning units to both tenants and homeowners.

5.3. Southern California Edison

Southern California Edison has a program for property owners and managers of multifamily buildings and a program for low-income households, which is available to both tenants and homeowners.

5.3.1. Multifamily Energy Efficiency Rebate Program¹⁸

The Residential Multifamily Energy Efficiency Rebate Program offers property owners and managers incentives on several energy efficiency improvements including lighting, HVAC, insulation and window categories. Existing multifamily properties with two or more units are eligible for these incentives.

The program offers select energy-efficient lighting products at no cost. The no cost products include ENERGY STAR screw-in compact fluorescent reflector bulbs, ENERGY STAR interior and exterior

¹⁶ <http://www.pge.com/myhome/saveenergymoney/energysavingprograms/smartac/renters/>

¹⁷ <http://www.pge.com/myhome/saveenergymoney/rebates/property/>

¹⁸ <http://www.sce.com/residential/rebates-savings/multifamily/multifamily-energy-efficiency.htm>



hardwired fluorescent fixtures, T8 linear fluorescent lamps with electronic ballasts, high efficiency LED exit signs, and occupancy sensors. Other incentives include high performance dual pane windows, ENERGY STAR ceiling fans with ENERGY STAR CFL, attic and wall insulation, energy efficient electric storage water heaters, photocells, energy efficient packaged terminal air conditioners and heat pumps, ENERGY STAR room air conditioners, and ENERGY STAR refrigerators.

5.4. San Diego Gas & Electric (SDGE)

San Diego Gas and Electric has a program for property owners and managers of multifamily buildings and a program for low-income households, which is available to both tenants and homeowners.

5.4.1. Multifamily Energy Efficiency Rebates¹⁹

The Multifamily Energy Efficiency Rebate Program offers cash rebates to property owners and property managers for energy-saving improvements to existing multi-family residential properties of two or more units. The energy efficiency measures include attic and wall insulation, faucet aerators, clothes washers, natural gas furnaces, natural gas boilers, boiler controllers, water heaters, and lighting fixtures.

5.5. Manitoba Hydro

Manitoba Hydro offers tenants, homeowner, and property owners and managers of multifamily residential properties a free water and energy savings kit. It also has a low income energy efficiency program.

5.5.1. Water & Energy Savings²⁰

Manitoba Hydro offers a free Power Smart Water and Energy Saver Kit to residential customers who own or rent their home and property managers or landlords who manage or own a multi-unit residential property. The kit includes one to two low-flow showerheads, two low-flow faucet aerators, three metres of water heater pipe wrap, Teflon tape, water heater temperature gauge, and refrigerator/freezer thermometer.

5.6. Puget Sound Energy (PSE)

PSE has a program for property owners and managers of multifamily buildings and a program for low-income households, which is available to both tenants and homeowners.

¹⁹ <http://sdge.com/residential/multiFamilyRebate.shtml>

²⁰ http://www.hydro.mb.ca/your_home/water_energy_saver/index.shtml



5.6.1. Re-Energize Your Multifamily Property²¹

Puget Sound Energy offers incentives to help offset the cost of energy efficiency measures in multifamily properties. The program offers free and direct installation of in-suite low-flow showerheads, water heater pipe wrap, tenant controlled ENERGY STAR CFLs. It also offers rebates for the installation of tenant-controlled ENERGY STAR CFL fixtures, energy efficient windows and sliding glass doors, attic, floor, and insulation, in-suite ENERGY STAR clothes washer, energy efficient in-suite water heater, energy efficient common area lighting, and solar pool heating.

5.7. Energy Trust of Oregon

The Energy Trust of Oregon has a program for low-income tenants and homeowners and a program for multifamily properties.

5.7.1. Multifamily Properties²²

Owners of a condominium unit are eligible for Energy Trust incentives in two ways.

Owners of an individual condominium unit may qualify for cash incentives for appliances, including water heaters and freezer and refrigerator recycling.

Incentives for improvements that affect the entire building, such as windows, insulation, common-area lighting and central heating and cooling systems, the strata corporation must apply for the incentives.

Energy Trust offers cash incentives for upgrades to windows, appliances, water heaters, building envelope, heating and cooling, and energy efficient lighting as well as solar water heating and pool heating.

The Energy Trust also offers a free walk through assessment.

Tenants and homeowners are also eligible for free installation of CFLs, faucet aerators and high-performance showerheads in each apartment unit.

5.7.2. Energy-Saving Help for Renters²³

Oregon Energy Trust also provides information on energy saving measures targeted at tenants.

²¹ http://pse.com/savingsandenergycenter/ForCondosApartments/Documents/4111_MFRetrofitElectricExecutiveSummary.pdf

²² <http://energytrust.org/business/incentives/multifamily-properties/equipment-upgrades/>

²³ <http://energytrust.org/residential/rental-properties/ForRenters.aspx>



6. Existing Power Smart Offers

Power Smart offers a number of different programs for the residential market. These programs include:

- Fridge buy-back program
- Live Smart BC
- Appliance Rebate
- Lighting Offers
- Home Electronics
- Energy Conservation Assistance Program (ECAP) for Low-income Households
- Energy Saving Kit (ESK) for Low-income Households

This section provides an overview of the Power Smart programs and their availability to landlords and tenants. Table 28 summarizes the availability of the Power Smart programs to tenants and landlords.

Table 28. Availability of Power Smart Programs to Tenants and Landlords

Program Name	Availability		Comments
	Tenant	Landlord	
Fridge buy-back	No	Yes	--
Live Smart BC	No	Yes	Only property owners are eligible but the program is available to both owner occupied and rental properties
Appliance Rebate	Yes	Yes	Landlord may have to contact BC Hydro
Lighting Offers	Yes	Yes	Point of purchase incentive
Home Electronics	Yes	Yes	Point of purchase incentive
ECAP for Low-income	Yes	Yes	Requires landlord consent and available to housing organizations
ESK for Low-income	Yes	Yes	Available to housing organizations

6.1. Fridge buy-back program

The Fridge buy-back program is available to BC Hydro account holders. BC Hydro picks up the old fridge and recycles it and also offers a \$30 rebate.

The landlords are responsible for maintaining and replacing most appliances in rental property. Landlords who wish to recycle and old refrigerator can take part in the program.

6.2. Live Smart BC

BC Hydro also partners with the Province on the Live Smart BC program. The program offers incentives to homeowners who have completed an energy assessment by a certified energy advisor and implement the recommended energy efficiency measures.



The program is available for both owner occupied and rental properties.

6.3. Appliance Rebate

The Appliance Rebate program offers between \$25 and \$75 to BC Hydro account holders who purchase select ENERGY STAR clothes washers, refrigerators, dishwashers, and freezers.

Landlords who purchase an ENERGY STAR appliance for a rental unit can still qualify for the incentive even if the tenant is the account holder. The landlord can either apply for the incentive under his own account or she can contact BC Hydro obtain approval for the incentive.

6.4. Lighting Offers

Power Smart's lighting incentives are applied upstream at point of purchase. They are therefore available to both landlords and tenants.

6.5. Home Electronics

Power Smart's home electronics incentives are applied upstream at point of purchase. They are therefore available to both landlords and tenants.

6.6. Energy Conservation Assistance Program

BC Hydro's Energy Conservation Assistance Program (ECAP) provides qualified low-income BC Hydro residential account holders with free home energy evaluation, installation of energy saving products, and energy efficiency advice. The energy saving products may include CFLs, low-flow showerhead, faucet aerators for the kitchen and bathroom, water heater pipe wrap and blanket, draft proofing, low wattage night light, insulation, and ENERGY STAR refrigerator.

The program is available to both homeowners and tenants and eligibility is based on the household income of the account holder. Tenants who wish to take part in the program must obtain the consent of the landlord.

Power Smart also offers bulk delivery of ECAP for housing organizations with multiple units.

Approximately 3,500 households have taken part in the program since the program was launched in 2010. This represents approximately 0.2% of BC Hydro's customers. Since 37% of rental households are eligible for BC Hydro's low-income programs, this report assumes that 37% of ECAP participants are rental households. As a result, **the number of rental households that have taken part in ECAP is estimated at 1,295 or approximately 0.5% of the rental market.**

6.7. Energy Saving Kit for Low-income Households

Power Smart offers a free Energy Saving Kits (ESK) for low-income households. The kit includes a number of simple, easy to install energy saving products including CFLs, weatherstripping, fridge and



freezer thermometers, and a low-flow showerhead. ESK is available to both low-income tenants and homeowners.

Power Smart also offers bulk delivery of ESK for housing organizations with multiple units. Power Smart also offers the option for the housing organization to receive Direct Installation Funding (approximately \$30 per kit to cover the labour and administrative costs associated with installing the kits for clients).

Approximately 50,000 households have taken part in the program since the program was launched in 2008. This represents approximately 3% of BC Hydro's customers. Since 37% of rental households are eligible for BC Hydro's low-income programs, this report assumes that 37% of ESK participants are rental households. As a result, **the number of rental households that have taken part in ESK is estimated at 18,500 or approximately 7% of the rental market.**

6.8. Availability of Power Smart Offers for Rental Market

All current Power Smart offers for the residential market are available for the rental market. Table 28 summarizes the availability of the Power Smart programs to tenants and landlords.

The lighting and home electronic offers provide incentives at point of purchase. As a result, these offers are available to all households in BC.

The fridge buy-back is available to all landlords who wish to take advantage of the program to recycle the second fridge in a rental property. However, many landlords may not take part in the program because they may use the second refrigerator in the property as a selling feature.

The Live Smart BC program is available to property owners; however, it is available for both owner occupied and rental properties.

The Appliance Rebate program is available to all BC Hydro account holders, including both landlords and tenants.

ECAP for low-income households is available to all low-income BC Hydro account holders; however, eligible tenants must obtain landlord consent. Furthermore, housing organizations that provide low-income rental housing can take part in the program.

ESK for low-income households is available to all low-income BC Hydro account holders. Furthermore, housing organizations that provide low-income rental housing can take part in the program.

Table 29 summarizes the estimated percentage of the residential rental market that can participate in existing Power Smart programs.



Table 29. Percentage of Residential Rental Market Who Can Participate in Existing Power Smart Programs

	Single Family Dwelling	Semi-detached (Duplex)	Other single detached house	Apt Duplex (secondary Suite)	Row house	Apt. bldg 5 or more storey	Apt. bldg less than 5 storeys	Mobile Home
Fridge buy-back	100%	100%	100%	100%	100%	100%	100%	100%
Live Smart BC	100%	100%	100%	100%	100%	100%	100%	100%
Appliance Rebate	100%	100%	100%	100%	100%	100%	100%	100%
Lighting Offers	100%	100%	100%	100%	100%	100%	100%	100%
Home Electronics	100%	100%	100%	100%	100%	100%	100%	100%
ECAP*	37%	37%	37%	0	37%	0	0	37%
ESK	37%	37%	37%	37%	37%	37%	37%	37%

Note: * Landlord must apply

7. Costs & Benefits of Extending ESK to Rental Market

The measure costs for BC Hydro's current ESK offering for low-income households includes:

- Incentive cost of \$35 per kit
- Administration cost of \$15 per kit, which includes postage and packing
- Direct install cost of \$30 per kit when the building manger installs the kits

BC Hydro estimates energy savings per ESK of 199 kWh per ESK installed by the customer and 346 kWh per ESK installed by building managers. These energy saving estimates include free rider adjustment to account for the customers in the rental market who qualify for BC Hydro's low-income programs. The actual free ridership rate may be higher because some rental dwellings who do not qualify for the low-income programs may implement some energy efficiency measures without any incentives. However, this rate could not be determined. The estimated energy savings for ESK installed by building managers is higher because is it expected that building managers will install all measures, while occupants may not install all measures included in ESK.

An average cost of \$50 per ESK installed by the customer and an average cost of \$80 per ESK installed by the building manager was used to estimate the total measure cost if ESK were installed in all 256,000 rental dwellings. The total measure cost for installing ESK in all rental dwellings is shown in Table 30. These costs include direct measure costs and exclude any fixed program costs.

Table 30. Measure Cost for Installing ESK in all Rental Dwellings

	Measure Cost per Participant	Market Size	Total Measure Cost
Customer Installed ESK	\$50	256,000	\$12,800,000
Direct Installed ESK	\$80	256,000	\$20,480,000



BC Hydro uses an average persistence of 9 years for energy savings resulting from installing ESK. The total energy savings from ESK were calculated by multiplying the energy savings associated with ESK by the persistence of the measure. This results in energy savings of 1,791 kWh per ESK installed by the customer and 3,114 kWh per direct installed ESK. The total energy savings associated with installing ESK in all rental dwellings over the 9 year life of the measure is shown in Table 31.

Table 31. Energy Savings for Installing ESK in all Rental Dwellings

	Energy Saving per Unit (kWh/yr)	Persistence (years)	Market Size	Potential Energy Savings (GWh)
Customer Installed ESK	199	9	256,000	458
Direct Installed ESK	346	9	256,000	797

Direct measure costs per kWh for ESK in rental dwellings was then estimated by dividing the total measure cost from Table 30 by the potential energy savings from Table 31. The measure cost per kWh is shown in Table 32. The measure costs shown in Table 32 exclude free riders (estimated at over 37%) and fixed program costs. Furthermore, participation rates for energy efficiency programs in the rental market can be expected to be lower than owner occupied dwellings. Including free riders, fixed program costs, and the lower participation rates will impact the cost effectiveness of ESK for the rental market significantly.

Table 32. ESK Measure Cost per kWh in all Rental Dwellings

	Total Measure Cost	Potential Energy Savings (GWh)	Measure Cost (\$/kWh)
Customer Installed ESK	\$12,800,000	458	\$0.0280
Direct Installed ESK	\$20,480,000	797	\$0.0257

8. Market Barriers to Energy Efficiency in Residential Rental Property

Market barriers to energy efficiency in the residential rental sector can be grouped into seven categories:

1. Lack of Information
2. Performance Uncertainty
3. Transaction Costs
4. Capital Cost
5. Split Incentive
6. Energy Efficiency is not Reflected in Property Values/Rents
7. Fragmented Market



8.1. Lack of Information

Lack of information includes availability, accuracy, and reliability of information associated with proper application of energy efficiency measures and the expected cost savings.

Many homeowners, landlords, and tenants often do not have the right information about cost effective energy efficiency measures. They may also lack information about the energy consumption of appliances. This may prevent them from investing in energy efficiency upgrades.

8.2. Performance Uncertainty

Performance uncertainty includes difficulties faced by consumers in assessing projected energy savings and managing the risk associated with achieving these energy and cost savings.

Energy consumption and energy savings depend on several factors. These factors include the energy efficiency of equipment and operations of the equipment as well as building characteristics such as insulation levels. Variations in these factors and their interrelated impact on energy consumption introduce some uncertainty in estimating and achieving energy savings.

8.3. Transaction Costs

Before energy efficiency measures are implemented, the appropriate measures must be identified, their cost and energy savings must be determined, qualified service providers must be identified, and paperwork for any incentives must be completed. These activities are time consuming, particularly for comprehensive energy efficiency improvements. Many landlords and tenants do not have the time and resources to allocate to such activities.

Transaction costs can also be referred to as the “hassle factor”.

While Power Smart incentives are primarily targeted at homeowners with BC Hydro accounts, tenants and landlords can still qualify for Power Smart incentives. However, if the tenant is implementing the energy efficiency measures, he must obtain the landlord’s authorization for implementing the measures and if the landlord is implementing the measures and the tenant is the account holder, the landlord must contact Power Smart to explain the situation. This increases the transaction costs for the participant. Table 33 illustrates the actions required by the tenants and landlords to qualify for Power Smart incentives based on which party is the account holder and which party is implementing the energy efficiency measures.



Table 33. Actions Required for Power Smart Incentives

Account Holder		Person Implementing Energy Efficiency Measures	
		Tenant	Landlord
Tenant	<ul style="list-style-type: none"> • Tenant must apply for incentive • Tenant must obtain landlord authorization 	<ul style="list-style-type: none"> • Landlord can use personal account or must contact PS and explain situation 	
Landlord	<ul style="list-style-type: none"> • Landlord must apply for incentives 	<ul style="list-style-type: none"> • Landlord must apply for incentive 	

8.4. Capital Cost

Capital cost of energy efficiency upgrades is often cited as the single most important market barrier to energy efficiency projects.

Major residential energy efficiency improvements often require investment in new equipment or building upgrades. While some energy efficiency improvements such as replacing light bulbs may not be very expensive, other measures such as purchase of new ENERGY STAR appliances or building improvements may cost several hundred or several thousand dollars. The funds may not always be available or the return on the invested capital may be perceived to be inadequate.

Competing capital costs can also prevent property owners from investing in energy efficiency improvements.

8.5. Split Incentive

Split incentive occurs when someone other than the decision maker benefits from the decision. This is particularly true in rental property, where the objectives of the landlords are generally different from those of the tenants. Landlords are responsible for paying for and implementing energy efficiency measures, while the tenants often pay the utility bill when they have individual utility meters. In such cases, the landlord incurs the cost of implementing energy efficiency measures and the tenant benefits from lower energy bills.

In rental properties that have one master meter for the building and the landlord pays the energy bill, the tenant does not benefit from conserving energy.

In general, while tenants who pay their own energy bill generally want to minimize their energy costs, landlords want to minimize maintenance costs and capital costs.

The split incentive is further exacerbated in energy efficiency programs, when utility incentives are available to the utility account holder, which is often the tenant, while the landlord has the authority to implement energy efficiency measures that involve building improvements or replacement of major



appliances. Tenants are unlikely to invest in such energy efficiency measures because they are unlikely to recover the cost of their investment during the term of their lease. Even if the tenant planned to implement such energy efficiency measures, the tenant must first obtain the approval of the landlord, which adds to the transaction costs of energy efficiency.

8.6. Energy Efficiency is not Reflected in Property Values/Rents

Most tenants and homebuyers have not yet demonstrated a willingness to pay more for energy efficient homes. A May 2011 study conducted for Fresh Energy titled Enabling ENergy Efficiency in Rental Housing – Overcoming the Split Incentive Barrier. Tenants do not consider energy efficiency or energy costs when choosing an apartment. When asked what factors were important when considering an apartment, over 85% of the tenants interviewed listed rental price and location as the two most important factors. Energy costs were not a top priority for any of the tenants surveyed, and ranked second for only one out of the 35 tenants we interviewed for the study²⁴.

Rents and property values are based on comparable rents and sales in the area. Perspective tenants and homebuyers do not credit energy savings in rents they are willing to pay and the value of the property.

On the other hand, improvements that increase the visual appeal of the property may translate into higher rents and property values.

8.7. Fragmented Market

The residential rental market is highly fragmented. There are several types of ownership models as well as several types of rental dwellings. The variation in building types can create difficulties in generalizing energy saving estimates and establishing best practices that can be implemented for all building types. The variation in ownership model can create difficulties in implementing energy efficiency because of the different drivers for the various types of property owners.

9. Strategies for Overcoming Market Barriers

This section describes some strategies for overcoming the market barriers to energy efficiency in residential rental market as identified in section 0.

9.1. Lack of Information

BC Hydro already provides information about various energy efficiency measures and incentives. The information BC Hydro provides about residential energy efficiency measures and incentives is targeted to a general residential audience.

²⁴ Enabling Energy Efficiency in Rental Housing – Overcoming the Split Incentive Barrier, by John Mitchell & Will Nissen, Humphrey School of Public Affairs, University of Minnesota, May 2011.



BC Hydro may consider using the existing content and presenting the content in such a way that it is specifically targeted at landlords and tenants.

9.2. Performance Uncertainty

BC Hydro's web site provides some good information on expected energy savings from various energy efficiency measures such as energy efficient lighting, programmable thermostats, draft proofing, window upgrades, low-flow showerheads, and appliances (http://www.bchydro.com/guides_tips/green-your-home.html).

BC Hydro also provides a web-based appliance and lighting calculator, which allows users to estimate energy use for various appliances and different types of lights (<https://www3a.bchydro.com/appcalc/pg1.asp?id=0>). This is a very helpful tool in allowing users estimate the energy costs of different appliances. However, it does not allow users to estimate the energy savings from ENERGY STAR appliances over standard efficiency appliances. Including a feature that allows users to compare energy consumption of ENERGY STAR appliances against standard appliance would be very helpful.

BC Hydro also partners with the Province on the Live Smart BC program. Certified Energy Advisors complete an energy assessment of the home and recommend specific energy efficiency measures with expected energy saving and costs. The information provided in the energy assessment report provides participants with some assurance about the potential energy savings.

9.3. Transaction Costs

While Power Smart incentives are primarily targeted at homeowners with BC Hydro accounts, tenants and landlords can still qualify for Power Smart incentives. However, some the transaction costs associated with some Power Smart programs are greater than other programs.

There are virtually no transaction costs associated with the lighting offer and the home electronics offer as the incentives are applied at the retail level.

The appliance rebate program represents significant transaction costs. Since the landlord is responsible for replacing the appliances and she may not be the account holder, in order to receive the incentive, she must contact BC Hydro and make special arrangement for his incentive cheque. **An upstream incentive similar to the lighting and home electronics offer would eliminate the transaction cost for the appliance rebate offer.**

The transaction costs for other Power Smart programs are similar for owner occupied dwellings and tenanted dwellings.



9.4. Capital Cost

BC Hydro already provides incentives to help reduce the capital cost of energy efficiency measures for participants. These incentives are based on incremental cost of the energy efficiency measures and the expected energy savings to ensure the implemented measures are cost effective for BC Hydro, participants, and rate payers.

9.5. Split Incentive

Since the landlords are responsible for capital investments in the property and often the tenants benefits from the lower energy costs, the landlords are generally not willing to invest in more energy efficiency measures that are more expensive than standard practice.

BC Hydro may consider increasing its incentives to cover the full cost of energy efficiency initiatives in rental properties. However, this may impact the cost effectiveness of the programs and will raise fairness issues resulting from higher incentives for landlords.

9.6. Energy Efficiency is not Reflected in Property Values/Rents

Most tenants and homebuyers have not yet demonstrated a willingness to pay more for energy efficient homes.

BC Hydro may consider providing more information about the cost savings and other benefits of energy efficiency specifically targeted at tenants.

BC Hydro may also work with various levels of government to introduce a home labelling to increase consumer awareness of energy efficient homes.

10. Conclusions

- More renters tend to be low-income households than in the past.
- Households in the bottom 20% of the income distribution are the fastest-growing segment of the residential rental market.
- 80% of rental dwelling are occupied by one or two people.
- The adjusted 2011 median income of rental households of \$37,075 is approximately 57% of the adjusted 2011 median income of \$65,358 for all BC household.
- Approximately 37% of rental households are eligible for BC Hydro's low-income programs.
- 30% of BC households are rental dwellings, while only 16% of BC Hydro customers live in rental dwellings.



- Secondary suites represent approximately 4% of all dwellings and approximately 13% of rental dwellings
- Apartment units represent approximately 72% of rental dwellings that are BC Hydro customers
- The residential rental market uses approximately 1,660 GWh per year, which represents approximately 9%²⁵ of residential electricity sales.
- After accounting for free riders, the residential rental market has the potential for approximately 125 GWh per year of electricity savings, if all energy efficiency measures currently available through BC Hydro's residential programs were implemented.
 - Potential energy saving opportunity from ENERGY STAR appliances is approximately 26 GWh per year
 - Potential energy saving opportunity from replacing all incandescent bulbs with efficient lighting is approximately 78 GWh per year
 - Potential energy saving opportunity from water heating upgrades is approximately 8 GWh per year
 - Potential energy saving opportunity from space heating upgrades is approximately 14 GWh per year
- Most jurisdictions offered low-income programs that were available to both low-income tenants and homeowners.
- Some jurisdictions also offered programs targeted at the property owners and managers of multifamily residential buildings.
- With the exception of BC Hydro's low income programs, other programs are available to all rental dwellings.
- BC Hydro's ESK and ECAP are available to low income households.
- Approximately 18,500 rental households or approximately 7% of the rental market have taken part in ESK.
- Extending ESK to all 256,000 rental households has the potential to result in annual electricity savings of approximately 51 GWh at a variable measure cost of approximately \$0.0280 per kWh over the 9 year life of the measure, if the kits are installed by customers and annual electricity savings of approximately 89 GWh per year at a variable measure cost of approximately \$0.0257

²⁵ Based on Fiscal 2011 residential sales of 17,797 GWh



per kWh over the 9 year life of the measure, if the kits are directly installed by building managers. These measure costs exclude free riders (estimated at over 37%) and fixed program costs.

- Including free riders, fixed program costs, and the lower participation rates will impact the cost effectiveness of ESK for the rental market significantly.
- Approximately 1,295 rental households or approximately 0.5% of the rental market have taken part in ECAP.
- BC Hydro does not provide information about its energy efficiency programs specifically targeted at tenants and landlords.
- Transaction costs for all BC Hydro programs are similar for rental and owner occupied households with the exception of the appliance rebate program, which has significantly higher transaction costs for rental units.
- Tenants have not demonstrated a willingness to pay more for energy efficient homes.
- Tenants are less likely to invest in energy efficiency because they do not believe they can recover their investment during the term of their leases.
- Landlords are less likely to invest in energy efficiency because they do not benefit from the lower energy costs.

11. Recommendations

- Any programs for rental market should focus on lighting as lighting represents the greatest potential for energy savings.
- Investigate implementing an upstream incentive for major appliances similar to the lighting and home electronics incentives.
- Use energy efficiency and program content from existing program and present the content in such a way that it is specifically targeted at landlords and tenants
- Work with various levels of government to introduce a home labelling to increase consumer awareness of energy efficient homes.



Appendix A. Low-Income Programs Available to Tenants in Other Jurisdictions

A1. NYSERDA

NYSERDA offers Home Performance with ENERGY STAR for existing home renovations and Assistance for Low and Moderate Income Households. Both tenants and homeowners are eligible for the low-income programs.

Home Performance with ENERGY STAR®, Existing Home Renovations²⁶

Under the Home Performance with ENERGY STAR program, most New York residents qualify for a free or reduced cost home energy audit and low cost financing. The program uses accredited independent contractors to perform an energy audit of the home and implement the recommended measures. NYSERDA provides some or all of the cost of the energy audit based on how the household income compares to the area's median income. Only homeowners are eligible for this program.

Assistance for Low and Moderate Income Households²⁷

NYSERDA has a number of programs targeted at low income households, both tenants and homeowners. These programs include:

- **Assisted Home Performance with ENERGY STAR**

Under the Assistance for Low and Moderate Income Households program, households can receive between \$5,000 and \$10,000 for energy improvements. Households with an income equal to or less than 80% of the state or area median income can receive additional financial incentives.

- **EmPower New York**

Under the EmPower New York program, income eligible tenants and homeowners can receive cost-effective electric reduction measures, particularly lighting and refrigerator replacements, as well as other cost-effective home performance strategies such as insulation, and health and safety measures at no cost.

Households that live in buildings with less than 100 units or are considered low income households are eligible to participate in this program.

²⁶ <http://nyserdera.ny.gov/en/Page-Sections/Residential/Programs/Existing-Home-Renovations>

²⁷ http://nyserdera.ny.gov/Page-Sections/Residential/Programs/Low-Income-Assistance.aspx?sc_database=web



- **Weatherization Assistance Program**

The Weatherization Assistance Program is administered by the New York State Housing and Community Renewal. The program assists low-income households reduce their heating/cooling costs and improving the safety of their homes through energy efficiency measures.

Both single-family and multifamily buildings are eligible. Program is available to both homeowners and renters, with priority given to senior citizens, families with children and persons with disabilities.

The program offers an energy audit of the home or apartment to identify specific measures to increase energy efficiency. Based on the results of the energy audit, the measures that may be implemented include weather stripping and caulking around doors and windows; cleaning, testing, repairs, or replacement of heating systems; replacement or repair of storm windows; replacement or repair of broken windows and/or outside doors; addition of insulation to walls or ceilings; and, mitigation of health and safety concerns, including indoor air quality improvements, correction of ventilation problems that can lead to mold growth, and identification of lead paint hazards. Weatherization Services may also include other energy-related improvements such as: water heater repair/replacement, roof repair/replacement, chimney repairs, lighting fixture replacement, venting systems, heating distribution system replacement, refrigerator replacement, installation of GFCI outlets, and electrical service upgrade, where indicated by an energy audit and an inspection of the unit.

A2. National Grid (Massachusetts Electric)²⁸

National Grid (Massachusetts Electric) does not offer any programs for rental or low-income households.

A3. Pacific Cost Gas & Electric (PG&E)²⁹

PG&E offers energy efficiency programs targeted at tenants, landlords, and low-income households. Its low-income programs are available to both tenants and homeowners.

Energy Savings Assistance Program³⁰

PG&E's Energy Savings Assistance Program provides income-qualified renters and homeowners with easy, free solutions to help manage their energy use and save money on their monthly energy bills.

The measures include CFLs, caulking, low-flow showerhead, minor home repairs, and replacement of old refrigerator, furnace and water heater.

²⁸ <https://www.nationalgridus.com/masselectric/home/energyeff/energyeff.asp>

²⁹ <http://www.pge.com/myhome/saveenergymoney/energysavingprograms/smartac/renters/>

³⁰ <http://www.pge.com/myhome/customerservice/financialassistance/energysavingsassistanceprogram/>



A4. Southern California Edison

Southern California Edison has a program for property owners and managers of multifamily buildings and a program for low-income households, which is available to both tenants and homeowners.

Energy Savings Assistance Program³¹

The Energy Savings Assistance Program helps low-income households conserve energy and reduce their electricity costs. SCE pays all the costs of purchasing and installing energy-efficient appliances and equipment.

The measures include replacement of air conditioners, a refrigerator, pool pumps, as well as weatherization services and installation of CFLs.

The program is available to both tenants and homeowners. Tenants who wish to take part in the program must obtain the landlord's written permission.

A5. San Diego Gas & Electric (SDGE)

San Diego Gas and Electric has a program for property owners and managers of multifamily buildings and a program for low-income households, which is available to both tenants and homeowners.

Energy Savings Assistance Program³²

The Energy Savings Assistance Program offers free energy efficiency measures to low-income tenants and homeowners. Some of the eligible energy efficiency measures include energy efficient refrigerators, air conditioners, lighting upgrades, upgrades to windows and doors, microwaves, water heaters high efficiency clothes washers, insulation, weather-stripping, and caulking.

Tenants must have written permission from landlord to participate.

A6. Manitoba Hydro

Manitoba Hydro offers tenants, homeowner, and property owners and managers of multifamily residential properties a free water and energy savings kit. It also has a low income energy efficiency program.

Lower Income Energy Efficiency Program³³

The Lower Income Energy Efficiency Program offer low-income homeowners free qualifying insulation upgrades, a new high efficiency natural gas furnace for only \$19/month for a fixed term, a free in-home energy efficiency review and basic energy saving items. An energy advisor will review the home's energy

³¹ <http://www.sce.com/residential/income-qualified/ema/energy-savings-assistance.htm>

³² <http://www.sdge.com/assistance2/esap/index.shtml>

³³ http://www.hydro.mb.ca/your_home/lieep/index.shtml



efficiency. During the energy efficiency review, the advisor will provide free basic energy efficient items, such as low-flow showerheads and CFLs. Based on the results of the energy efficiency review, insulation can be added to the attic, basement, crawlspace and/or wall cavity.

A7. Puget Sound Energy (PSE)

PSE has a program for property owners and managers of multifamily buildings and a program for low-income households, which is available to both tenants and homeowners.

Free Home Insulation and Weatherization³⁴

PSE works with community agencies to administer the insulation and weatherization improvement program for free. The program offers free home weatherization and insulation improvements to low-income tenants and homeowners, apartments. Apartments qualify for weatherization if the property owner agrees to take an active role in preparing their buildings for weatherization and insulation improvements. The free measures in the program include insulation of walls, attics, and basements, insulation of hot water pipes, sealing air leaks around windows and walls, sealing seams in heating and cooling ducts, refrigerator replacement, and installing energy-efficient products such as low-flow showerheads and CFLs.

A8. Energy Trust of Oregon

The Energy Trust of Oregon has a program for low-income tenants and homeowners and a program for multifamily properties.

Savings Within Reach³⁵

The Savings Within Reach program offers higher cash incentives for various energy efficiency measures for low-income tenants and homeowners. The energy efficiency measures include insulation, high efficiency heat pumps, ductless heat pumps, high efficiency gas furnaces, duct sealing, and air leakage testing. This program is available to single family homes and residential complexes with up to four units.

A9. Portland General Electric

Portland General Electric has a weatherization assistance program that is available to both low-income tenants and homeowners.

³⁴ <http://pse.com/savingsandenergycenter/ForHomes/Pages/Weatherization-Assistance.aspx>

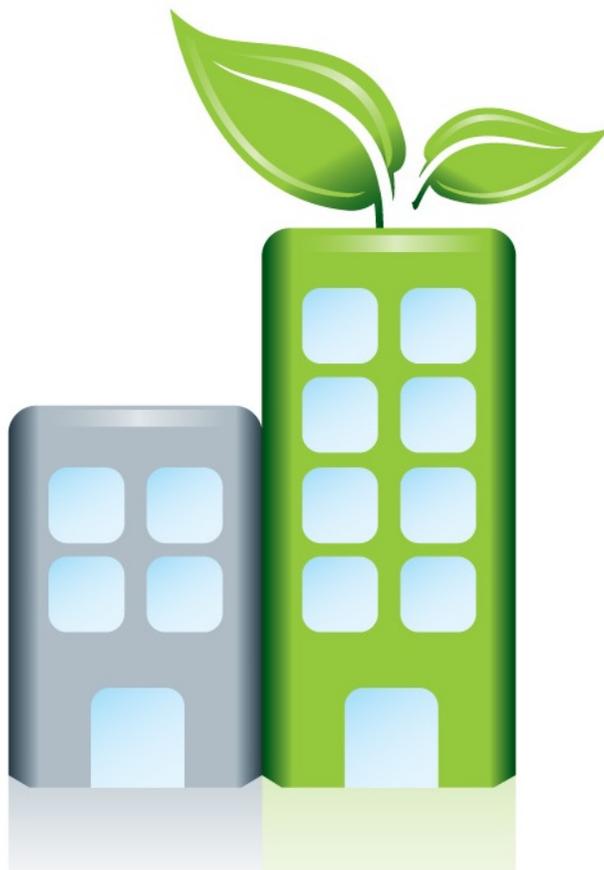
³⁵ <http://energytrust.org/savingswithinreach/>

**Weatherization Assistance³⁶**

The Weatherization Assistance program is available to low-income homeowners and tenants. The program offers a free audit to assess the energy performance of the home and the appropriate weatherization measures for the home. The weatherization measures included in the program include ceiling, wall and floor insulation, energy-related minor home repairs, air-infiltration reduction, furnace repair and replacement, heating duct improvements, and energy conservation education. While the tenants are also eligible for participating in the program, the landlord must agree to have the work done.

³⁶ http://www.portlandgeneral.com/residential/energy_savings/weatherization/weatherization_assistance.aspx

Addressing the Split Incentives Issue in British Columbia



Presented to the Electricity Conservation & Efficiency Advisory
Committee by the Split Incentives Working Group

May 28, 2009

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Introduction

One of the barriers to energy conservation and efficiency identified by the Electricity Conservation & Efficiency (EC&E) Advisory Committee is that of split incentives in the rental market. This is where the landlord incurs the cost for implementing energy efficient measures but the tenant is the party that ultimately benefits through energy cost savings. To address this issue, a new Working Group was formed to identify the specific barriers to energy conservation and efficiency in the rental market and to formulate solutions for developers, property owners and occupants.

Although some of the recommendations contained in this document go beyond the scope of the Split Incentives Working Group and may have broader implications, the Working Group was motivated to make significant contributions and to work towards considerable progress on the split incentives issue.

Split Incentives Solutions that are Common to the Commercial and Residential Sectors

Public Education and Awareness

Description

Public education and awareness is essential in the united understanding of a knowledgeable consumer, who can make informed decisions that set the foundations for the creation of a culture of conservation.

Current Status

There is a lack of effective public education and awareness programs to drive conservation, as well as an inconsistency in information dissemination, the coordination of information and the issue of competing messages. A strategy needs to be created in order for the message to be received and understood, which differs depending on the target demographic, ethnicity, language, cultural groupings and level of interest.

Benefits

The benefits of successful education and awareness campaigns include:

- An informed and attentive customer base, motivated to reduce energy consumption; and
- Third party reiteration of BC Hydro's conservation message.

Recommendations

The Working Group recommends:

- Researching how other jurisdictions have developed targeted messaging and programs;
- Developing multiple public education and awareness programs to reach targeted audiences, such as youths and seniors;
- Working in partnership with various organizations, such as the Seniors Services Society, to inform and educate their constituents;
- Ensuring that information is available in a variety of different mediums and languages to eliminate barriers to communication; and
- Working in conjunction with both landlord and tenant organizations, such as the BC Apartment Owners and Managers Association (BCAOMA), the BC Non-Profit Housing Association (BCNPHA) and the Tenants Resource and Advisory Centre (TRAC), to develop a pilot project to promote energy efficiency measures where the benefit is derived by both the owner and the tenant.

Tax Incentives

Description

Municipal property tax incentives and federal and provincial tax credits can be utilized to encourage conservation in split incentives situations.

Current Status

There are no existing tax incentives to address the split incentive barrier for energy efficiency improvements in the rental market.

Benefits

The benefits of introducing tax incentives to address the split incentive barrier for energy efficiency improvements in rental accommodations include:

- Maintaining the standards established under the newly revised building codes for energy consumption by rewarding maintenance and reduction and penalizing excessive consumption;
- Providing financial incentives for upgrades;
- Motivating landlords to encourage energy conservation among tenants; and
- Rewarding energy conservation.

Recommendation

The Working Group recommends:

- This issue be further examined by the Government Policy Enablers Working Group, and that they consider the following tax incentives:
 - Property tax rebates that are equivalent to the costs of energy efficiency upgrades or adjustments to municipal property tax, so the assessed value is independent of energy efficiency upgrades;
 - Federal and provincial tax credits in relation to the cost of energy upgrades; and
 - Categorizing residential landlords as business owners so that they are able to access the various tax incentives available to businesses.

Working with First Nations

Description

First Nation individuals and communities are generally provided with programs and services by the First Nation government administration, *Indian and Northern Affairs Canada* and the provincial *Ministry of Aboriginal Relations and Reconciliation*. First Nations communities are currently engaged in varying aspects of the treaty-making process or in developing social and economic agreements with other orders of government to dramatically improve the lives of Aboriginal people and build healthier communities.

Current Status

The Province of British Columbia is building relationships with Aboriginal people and communities. Working with First Nations and Aboriginal community leaders, the Province is focusing its collective efforts on closing the socio-economic gaps that separate Aboriginal people from other British Columbians, and building a province where everyone can fully participate in a prosperous economy.

Benefit

One of the benefits of this new relationship is:

- Working with First Nations communities and individuals to determine appropriate avenues for participation in BC Hydro's split incentive initiatives.

Recommendation

Due to a lack of understanding and expertise, the Working Group did not look at First Nations issues as they relate to split incentives in detail. The changing nature of the relationships between the Provincial Government and First Nations communities likely means that opportunities to work together will continue to evolve as well.

The Working Group recommends:

- Further developing relationships with First Nations through the appropriate channels within BC Hydro.

Split Incentives Solutions in the Commercial Sector

Champions in the Industry

Description

A champion is an organization or individual who is an ardent supporter or defender of a cause. In this instance, the industry champion refers to an organization or individual who leads the way in changing the status quo regarding energy conservation, inspiring others to do the same.

Current Status

Although leaders exist in the industry, they have not yet emerged as champions for energy conservation. For example, WalMart has become a leader in energy conservation, but has not yet emerged as a champion. To do so, they would have to inspire others in the industry to adopt the same standards.

Benefits

The benefits of establishing champions in the industry include:

- Establishing new industry standards and encouraging and promoting others to adopt these new standards; and
- Third party endorsement of BC Hydro's conservation message.

Recommendation

The Working Group recommends:

- BC Hydro and commercial organizations, such as BOMA BC, work to identify and cultivate leaders in the retail, office and light industrial sectors to champion energy conservation in the commercial sector. The successful initiatives of these champions will be showcased to the commercial sector as a whole, to inspire new industry standards.

Commercial Building Labelling

Description

Commercial building labelling aims to give standardized energy performance ratings for buildings that are fairly and independently assigned, and are openly communicated to prospective owners and tenants. Although labelling is not a stand-alone solution as it will not encourage significant new conservation activity, it opens the door to encourage energy conservation through programs, incentives, and regulations.

Current Status

There is no agreed-upon common standard for commercial building energy efficiency standards in Canada, and commercial building representatives have expressed concerns that varied uses from building-to-building would make it difficult to design a fair rating system. The City of Vancouver is undertaking a pilot project in conjunction with Natural Resources Canada (NRCan)

that is examining the relationship between commercial building labelling and property tax incentives.

Benefits

The benefits of commercial building labelling include:

- Established performance standards for buildings;
- Energy efficiency information for potential tenants;
- Transparency in the lease negotiation process;
- Set benchmarks for landlords;
- Creation of an environment where tenants will opt to occupy green-labelled buildings; and
- A foundation upon which additional programs, incentives and regulations can be referenced.

Recommendations

The Working Group recommends:

- BC Hydro engage with the City of Vancouver and NRCan and other relevant agencies to develop standards around commercial building labelling, and ensure that adequate staff and technical resources are made available so that those efforts can proceed in a timely manner;
- Undertaking further research to determine how commercial building labelling has been implemented in other jurisdictions; and
- Further review of this issue by the Working Group once the results of the pilot project are known.

Green Leases

Description

A lease is a written document that governs the relationship between landlord and tenant. A green lease includes conventional lease information, while also communicating sustainable building maintenance and management practices, and providing greater assurance that environmental standards are met. In addition, green leases include clauses that make it easier for landlords to share the energy cost savings achieved by energy efficiency improvements.

Current Status

Some landlords are already using green leases in B.C., but they are far from standard practice. The issue of green leases will be addressed in the *Commercial Building Energy Conservation and Greenhouse Gas Reduction Memorandum of Understanding (MOU)* between The Province of British Columbia, BC Hydro and BOMA BC.

Benefits

The benefits of green leases include:

- Increased comparative property values (once energy efficiency opportunities have been acted upon);

- Education and awareness for landlords and tenants;
- Increased simplicity for building managers to recover the costs of energy efficiency improvements; and
- Increased simplicity for tenants to have their building manager implement energy efficiency improvements.

Recommendations

The Working Group recommends:

- Using the MOU as a model to extend beyond BOMA BC to the entire commercial sector and property developers;
- Using the MOU as a platform to promote the development and/or adoption of standardized green lease language for B.C.'s commercial sector; and
- Creating a public education and awareness campaign to promote the benefits of green leases to property managers, large tenants, and leasing agents. As part of this campaign, the group recommends including public awareness seminars for landlords and case studies that demonstrate the benefits of energy efficiency improvements and tenant engagement programs.

Split Incentives Solutions in the Residential Sector

The BCSEA's Green Landlord's Project

Description

In April of 2009, the BC Sustainable Energy Association (BCSEA) published the *Green Landlord's Project: Solving the Rubik's Cube of Energy Efficiency in Rental Housing*. The report provided recommendations on behavioural education, financing options and improved financial incentives. The Split Incentives Working Group participated in and supported the research and development of the *Green Landlord's Project*.

Current Status

The report has been released as final, and has been presented to and reviewed by the Working Group, who have identified key components for further review.

Benefits

The potential benefit of reviewing the recommendations outlined in the BCSEA's *Green Landlord's Project* is:

- This document serves as a good starting point for investigating other potential solutions to the split incentives issue.

Recommendation

The Working Group recommends:

- BC Hydro review the following components of the BCSEA's *Green Landlords Project* and either implement them or undertake additional research to fill critical gaps:
 - Improved financial incentives;
 - Financing options; and
 - Behavioural education.

Incentives for Landlords and Tenants

Description

The creation of incentives for landlords and tenants will help to encourage energy conservation.

Current Status

Although there are incentives in place for landlords, there needs to be more accessible information on energy efficiency programs and initiatives and how to maximize financial benefits. There is also an inequity between landlords and tenants in regards to accessibility of incentives and programs to conserve energy. In regards to MURBs, there is difficulty in accessing energy assessments and funding.

Benefits

The benefits of providing and promoting incentives to landlords and tenants to motivate them to conserve energy include:

- More extensive energy efficient upgrades; and
- Increased property values and decreased energy consumption and costs.

Recommendations

The Working Group recommends:

- Creation of a centralized source of information on the available programs and incentives for energy efficient upgrades for MURBs, and that this resource links to the current LiveSmart BC program. It would also be important to ensure that tenant, landlord, and condominium organizations are familiar with those resources, enabling them to refer their members as appropriate;
- Initiatives for tenants are targeted to specific demographic groups, such as youths and seniors; and
- The Government Policy Enablers Working Group research the possibility of a Provincial Sales Tax (PST) exemption on electricity bills for MURBs with no commercial applications. This exemption would only be available if a specified threshold of electricity savings was achieved, similar to the program in place with Terasen Gas. This discussion could be broadened to encompass a full suite of PST exemptions on energy prices for efficient homes and buildings.

Initiatives for Low-Income Households and Affordable Housing Providers

Description

Affordable housing is a term used to describe dwelling units whose total housing costs are deemed “affordable” to those who have a median income. Low-income households are defined by those who are in the lower income ranges of a geographical area.

Current Status

Low-income households and housing providers often lack capital to invest in energy efficient upgrades. BC Hydro has already launched a limited-in-scope program for low-income customers, and will be required to continue offering such programs under new provincial legislation.

Benefits

The benefits of targeting low-income households and providers of affordable housing include:

- Making energy efficiency more accessible to low-income households by addressing key barriers;
- Providing low-income households with the opportunity to reduce their energy consumption and reduce their electricity bill; and
- Increasing knowledge and awareness about energy conservation among low-income households.

Recommendations

The Working Group recommends:

- BC Hydro develops targeted incentives, such as utility bill financing (or comparable financing models) for all customers with zero-interest rate options for low-income households living in affordable housing. Any financing programs should align with BC Hydro, LiveSmart, and EcoEnergy incentives and learn from potential local improvement charge pilot projects being investigated by Vancouver and Dawson Creek; and
- Power Smart make changes to their Product Incentives Program (PIP) and Pre-authorized Payment Plan (PPP) programs so that landlords are able to claim the product incentive for upgrades they perform on units where the bill is paid by a tenant.

Residential Building Labelling

Description

Residential building labelling aims to give standardized energy performance ratings for housing that are fairly and independently assigned, and openly communicated to prospective owners and tenants. Although labelling is not a stand-alone solution as it will not encourage significant new conservation activity, it opens the door to encourage energy conservation through programs, incentives, and regulations.

Current Status

The Provincial Government is partnering with the Victoria Real Estate Board to run residential building labelling pilot projects in Oak Bay and Salt Spring. In addition, a separate pilot project will take place in Prince George later in this fiscal year. The objective of these projects is to better understand the issues surrounding mandatory building labelling, and determine whether building labelling will encourage the owners of single-detached homes to upgrade their residences.

Residential building labelling was recently mandated in Ontario under the *Green Energy Act*. However, due to intense opposition from home owners and real estate agents, the legislation has been changed to only be necessary if the potential buyer requests the energy assessment rating prior to completing the sale.

Building labelling has been implemented in California, the European Union (EU), Florida, and New Zealand. The EnerGuide rating is already applicable to single-detached homes and is standardized across Canada. There is no standardized residential building label that is applicable to multi-unit residential buildings (MURBs), and there is no established framework for this in Canada.

Benefits

The benefits of building labelling include:

- Established performance standards for buildings;
- Energy efficiency information for potential tenants;
- Transparency in the lease negotiation process;
- Set benchmarks for landlords;

- Creation of an environment where tenants will opt to occupy green-labelled buildings; and
- A foundation upon which additional programs, incentives and regulations can be referenced.

Recommendations

The Working Group recommends:

- Implementing building labelling for new housing and then phasing in building labelling to pre-existing homes on point of sale or major retrofit;
- Researching best practices for the labelling of MURBs;
- Working with the Ministry of Energy, Mines and Petroleum Resources (MEMPR), Terasen Gas, and NRCan to ensure that adequate staff and technical resources are allocated to efforts to develop or adopt a building labelling system for MURBs in Canada; and
- Initiating a pilot project that will examine whether building labelling produces any significant changes in energy consumption over time. Potential participants will have already committed to investing in energy retrofits, and will be provided with resources to ensure optimized assistance. Pilots should be undertaken in several different types of residential MURBs. The results of this pilot should not inform whether or not to proceed with building labelling, but instead help answer questions about the scale of programs, incentives, and regulations that are needed in addition to labelling.

Secondary Rental Market

Description

The majority of rental accommodations in British Columbia are in the secondary rental market. According to the Canada Mortgage and Housing Corporation (CMHC), the total stock from the secondary rental market makes up approximately 25% more than the number of purpose-built rental units. These include accessory dwelling suites¹, rental condominiums and non-conforming use of non-apartment buildings².

The secondary rental market creates a unique problem. Although the majority of accessory dwelling suites and non-conforming use of non-apartment buildings have not been legalized by the municipalities, they are recognized as a necessary part of their affordable rental stock. Even in municipalities where the secondary rental market has been legalized, the majority of secondary rental accommodations do not comply with the building code requirements and municipal regulations.

Historically, community resistance in single family neighbourhoods to the secondary rental market was often a deterrence for secondary rental market legalization. This has created a culture of non-compliance among many owners who require the income from their rental suite but are fearful of the cost of upgrades, parking requirements and fees for inspections and registration.

¹ "Accessory dwelling suites" refers to a portion of a home that has been converted into an additional dwelling.

² "Non-conforming use of non-apartment buildings" includes accessory buildings that have been converted into rental units (for example: the garage or garden shed), or a duplex accommodation that has been subdivided into multiple units.

Current Status

The secondary rental market will remain a significant barrier to energy conservation and efficiency because:

- Accessory dwelling suites and suites in non-conforming use of non-apartment buildings often have only one meter per dwelling, with an informal arrangement between the landlord and tenant. The bill is either split between the landlord and tenant at an agreed-upon percentage, or a portion is factored into the rent, and in either case, conservation signals and opportunities are not clear to either party;
- In many cases, the tenant in the accessory dwelling suite or suites in non-conforming use of non-apartment buildings never sees the electricity bill;
- Tenants are often unable to regulate their own heat, causing them to rely on space heaters, which use a tremendous amount of energy;
- The majority of incentives are open to rental accommodations in single family homes, but payments are only applicable to landlords, not to the tenant. In order to qualify for the rebate, the landlord must request the energy assessment;
- According to a study done by the Union of British Columbia Municipalities (UBCM), 95 out of 150 local governments in B.C. do not enforce the bylaws regarding secondary suites, but rather respond solely to complaints;
- Secondary suites are often hidden, hence there are no accurate statistics regarding the numbers; and
- Secondary rental market landlords may be reluctant to take part in any formal energy conservation programs.

Benefits

The benefits of targeting tenants in the secondary rental market include:

- Giving tenants a feeling of ownership over their energy bill, motivating them to make the right consumption decisions;
- Fairness in utility billing;
- Improved standards of safety and health; and
- Increased awareness of conservation issues.

Recommendations

The Working Group recommends:

- Undertaking research to quantify how many residences are involved, and the potential energy savings of targeting secondary suites;
- Working with the UBCM to develop a diversity of strategies to address the issue of secondary suites; and
- Investigating the creation of a “subordinate” electricity bill, which would allow tenants to understand their energy consumption patterns.

Future Direction

Behavioural Shift

Description

A shift in behaviour occurs when a number of interrelated factors are present. These could include: government regulation and policy; choices that are available through the market; and an adoption of a different set of societal values and norms.

Current Status

The current environment in both the commercial and residential rental sectors does not encourage a culture of conservation. There are few incentives for both the landlord and the tenant to conserve energy, and there is not yet a widely accepted social norm to support energy conservation.

Benefit

The benefit of behavioural shift is:

- Energy conservation becomes the societal norm, similar to recycling and the anti-smoking sentiment.

Recommendation

The Working Group recommends:

- Research and the development of a strategy to create the kind of behavioural change that is necessary to standardize energy conservation.

Future Sustainable Planning for Municipalities

Description

Municipalities need to engage in a process of sustainable planning for integrated and healthy communities.

Current Situation

Municipal growth appears to create isolated and segregated communities. Community planning appears to be reactive rather than proactive.

Benefit

The benefit of future sustainable planning for municipalities is:

- Linking integrated community planning to energy conservation. For example, communities could have tracts of land that would be set aside for affordable housing that had adequate energy efficient measures built into the units but are not subject to market costs.

Recommendation

The Working Group recommends:

- The issue of sustainable municipal planning be researched by the Strategic Framework Working Group and their recommendations be forwarded to the Sustainable Communities group at BC Hydro for consideration.

The Split Incentives Working Group

Description

In November of 2008, the Provincial Government regulated that *“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 (b) in the plan portfolio is submitted on or after June 1, 2009, a demand-side measure intended specifically to improve the energy efficiency of rental accommodations.”*

Current Status

The Working Group has one more meeting scheduled in June, 2009, where they will review the response to this document from the Electricity Conservation & Efficiency (EC&E) Advisory Committee. There continues to be emerging and ongoing issues, several of which are identified in this report, that have not yet been addressed by the Working Group.

Benefits

The benefits of the Split Incentives Working Group are:

- The Working Group has developed a strong working relationship that is effective and efficient in regards to developing collaborative solutions;
- The members of the Working Group represent a broad spectrum of interests, and bring together a wealth of knowledge and understanding.

Recommendation

The Working Group recommends:

- The development of a work plan that will summarize the issues requiring additional consideration and input from the Split Incentives Working Group and identify specific deliverables and timelines for consideration by the EC&E Advisory Committee.

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108.0 CHAPTER 5 RESIDENTIAL RATE DESIGN

**Reference: Exhibit B-1, Section 5.6.2
 Energy Savings Kits**

1.108.5 Please provide the cost of both types of ESKs to BC Hydro, together with the cost of third party delivery.

ORIGINAL RESPONSE:

BC Hydro respectfully declines to respond to this IR on the basis that the information sought is not relevant to and cannot aid in the review of the 2015 RDA or the orders sought in respect of it, or for purposes of the Minister RIB Report Letter. The information sought in this IR, which concerns the costs of BC Hydro's ESK DSM program, is more relevant to a DSM expenditure schedule determination filed with the Commission under subsection 44.2(1)(a) of the *UCA*. As noted in BC Hydro's response to BCOAPO IR 1.102.1, BC Hydro will be submitting a DSM expenditure schedule filing contemporaneously with or as part of the F2017 RRA in February 2016.

REVISED RESPONSE:

BC Hydro's estimated kit cost is \$40 for the standard kit and \$42 for the apartment kit. These costs include the energy saving measures, box printing, packing costs, and shipping costs. Costs are net of FortisBC's contribution.

108.0 CHAPTER 5 RESIDENTIAL RATE DESIGN

**Reference: Exhibit B-1, Section 5.6.2
 Energy Savings Kits**

1.108.7 Please provide BC Hydro's forecast program expenditures on ESKs for future years, together with its estimate of energy savings.

ORIGINAL RESPONSE:

BC Hydro respectfully declines to respond to this IR for the reason set out in BC Hydro's response to BCOAPO IR 1.108.5.

REVISED RESPONSE:

This IR response also answers BCOAPO IR 1.109.7. The first table below shows forecast expenditures for the Energy Saving Kits and Energy Conservation Assistance Program from F2017 through F2024. The initiatives are modelled as a single program so the fixed costs are not separated between the two initiatives. The second table shows estimated savings by stream.

Table 1 Low Income Program Costs and Breakdown

Customer Sector/DSM Program Expenditure	F2017 (\$000)	F2018 (\$000)	F2019 (\$000)	F2020 (\$000)	F2021 (\$000)	F2022 (\$000)	F2023 (\$000)	F2024 (\$000)
ESK (Variable Costs)	462	472	481	371	379	270	276	281
ECAP (Variable Costs)	1,041	1,062	1,083	940	958	776	791	807
Fixed Costs	1,032	1,074	1,096	1,119	1,143	1,167	1,191	1,216
Total	2,535	2,607	2,660	2,430	2,480	2,213	2,258	2,305

**Table 2 Low Income Energy Savings Breakdown
 (Cumulative Run Rate in GW/h/year relative to F17)**

Customer Sector/DSM Program Expenditure	F2017	F2018	F2019	F2020	F2021	F2022	F2023	F2024
ESK	1.6	3.2	4.7	5.5	4.8	5.1	5.3	5.6
ECAP	0.9	1.8	2.7	3.2	3.2	3.7	4.1	4.4
Total	2.5	4.9	7.4	8.8	8.0	8.7	9.4	10.0

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109.0 CHAPTER 5 RESIDENTIAL RATE DESIGN

**Reference: Exhibit B-1, Section 5.6.2
 Energy Conservation Assistance Program (ECAP)**

1.109.1 Please confirm that Carillion Canada Inc. is the program contractor for ECAP. Are there any other contractors involved in the delivery of ECAP?

ORIGINAL RESPONSE:

BC Hydro respectfully declines to respond to this IR on the basis that the information sought is not relevant to and cannot aid in the review of the 2015 RDA or the orders sought in respect of it, or for purposes of the Minister RIB Report Letter. The IR is asked in the context of the Minister RIB Report Letter (section 5.6 of Exhibit B-1). Information concerning the identity of and other aspects of contractor(s) for BC Hydro's ECAP program, including when and by what process such contractor(s) were selected, and how many assessments such contractor(s) may have performed since the inception of the ECAP program in May 2009 (BCOAPO IRs 1.109.2 and 1.109.3), is not relevant to Minister RIB Report Letter Questions 4 or 5.

REVISED RESPONSE:

Yes, Carillion Canada is the delivery contractor for Energy Conservation Assistance Program. There are currently no other delivery contractors.

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109.0 CHAPTER 5 RESIDENTIAL RATE DESIGN

**Reference: Exhibit B-1, Section 5.6.2
 Energy Conservation Assistance Program (ECAP)**

1.109.7 Please provide BC Hydro's forecast program expenditures on the ECAP program for future years. Please also provide BC Hydro's estimate of energy savings by program component.

ORIGINAL RESPONSE:

BC Hydro respectfully declines to respond to this IR for the reason set out in BC Hydro's response to BCOAPO IR 1.109.6.

REVISED RESPONSE:

Please refer to BC Hydro's response to BCOAPO IR 1.108.7 for a breakdown of future expenditures and savings by program component.

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117.0 CHAPTER 5 RESIDENTIAL RATE DESIGN

**Reference: Exhibit B-1, Section 5.6.2
 Low income energy efficiency**

1.117.1 Please provide all documents within BC Hydro's custody or control which, for the United States or Canada, identifies and/or otherwise discusses the penetration of market-based energy efficiency measures in low income households.

ORIGINAL RESPONSE:

BC Hydro respectfully declines to respond to this IR, which concerns BC Hydro's RIB Report-related proposals, on the following basis:

- The IR is vague. It is not clear what is meant by the phrase "penetration of market-based energy efficiency measures". For example, it is not clear if "market-based efficiency measures" includes government policy tools such as mandatory standards that sway purchase, retail stocking and production decisions toward energy-efficient products, or if the phrase is confined to utility delivered DSM programs or extends to third party providers; and
- The IR is very broad in scope, and requests documents beyond what is reasonably required to address Questions 1 to 5 in the Minister RIB Report Letter, and therefore are of limited or no relevance. The IR is unbounded in terms of time-frame. The IR appears to seek documents concerning any and all "market-based energy efficiency measures", which likely includes any and all DSM programs and perhaps codes and standards, whether initiated in in Canada or the U.S.

REVISED RESPONSE:

BCOAPO and BC Hydro agreed that for the purpose of answering this IR, BC Hydro would take reasonable efforts to search for readily available documents. The following study may provide some insight into the penetration of market based energy efficiency measures:

- **"Who Participates in Residential Energy Efficiency Programs: A look at the Key Drivers", E Source 2013 (Attachment 1)**

Who Participates in Residential Energy-Efficiency Programs?

A Look at the Key Drivers
Kim Burke, Rachel Cooper
February 12, 2013

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THE TOP FOUR DRIVERS

As the market saturation of compact fluorescent lamps (CFLs) increases and more-stringent codes and standards erode savings margins, utilities are facing diminishing returns from some of their efficiency program mainstays. Plus, climbing energy-saving goals are making it increasingly crucial for energy-efficiency program managers and marketers to understand the key drivers of program participation and to determine which customer segments to target for specific programs. Data-driven segmentation can greatly enhance marketing return on investment by enabling marketers to focus outreach efforts and spending on the right people with the right message. Our

investigation of participation drivers, based on one of the most robust sets of data in the industry, provides utilities with some of the tools and information necessary to achieve better marketing traction and to accelerate demand-side management (DSM) program participation.

E Source analyzed the 2009–2011 data sets from The Nielsen Company’s Energy Audit, an annual survey of about 32,000 US households focusing on behaviors and attitudes related to energy use. From that analysis, we identified some of the most influential factors that drive people to participate in an energy-efficiency program, such as applying for a rebate for an efficient appliance or signing up for a home energy audit. These key drivers include:

- *Home characteristics.* Customers who own their home are more likely to participate in energy-efficiency programs than renters or those who live in multifamily residences. In addition, house size is a fairly strong indicator of program participation; in fact, the likelihood of participation rises as the square footage of the house increases.
- *Age of head of household.* Younger customers are more likely to participate in energy-efficiency programs. As age increases, the likelihood of program participation decreases.
- *Income.* As income increases, so does the probability of energy-efficiency program participation, except for participation in weatherization programs. Because weatherization programs are typically targeted to lower-income segments, the likelihood of participation in this type of program decreases as income increases.
- *Participation in other energy-efficiency programs.* People who participate in at least one other energy-efficiency program are more likely to participate in additional programs.

PARTICIPATION TRENDS AND CUSTOMER CHARACTERISTICS

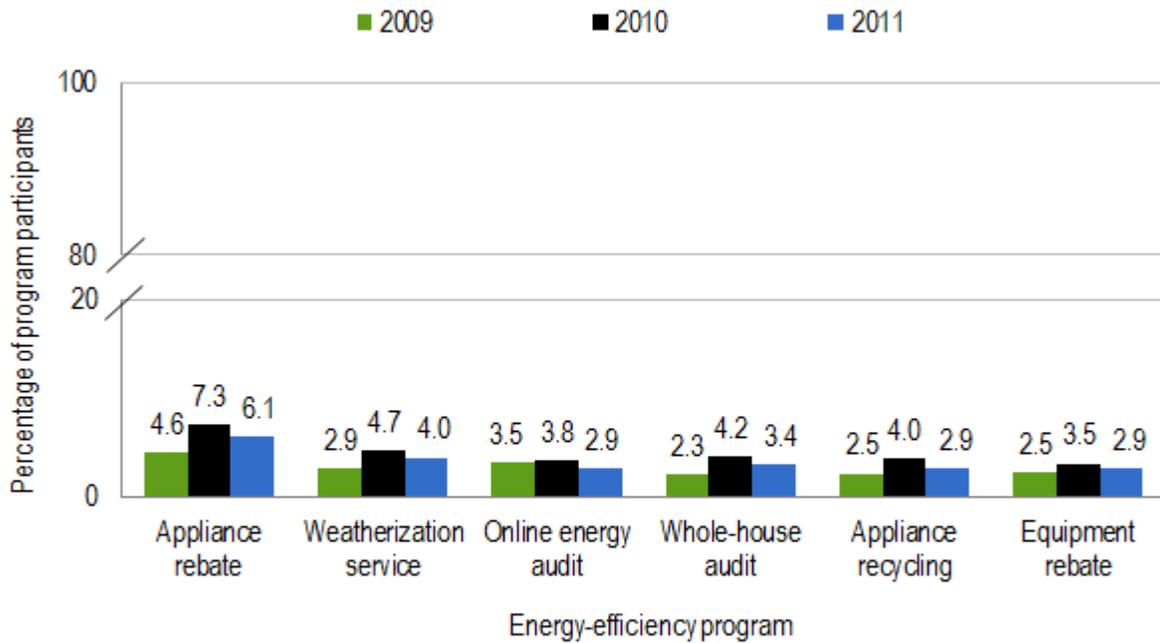
Analysis of the 2009–2011 data sets from The Nielsen Company’s Energy Audits reveals insights into participation trends in DSM programs in the past few years as well as the residential customer characteristics that influence participation.

Trends in Energy-Efficiency Program Participation

Based on self-reported data from the Nielsen Energy Audits, residential participation in energy-efficiency programs rose considerably from 2009 to 2010 and then dropped slightly in 2011 (**Figure 1**). The increase was probably due to the injection of stimulus funds from the American Recovery and Reinvestment Act (ARRA) and the resulting surge in energy-efficiency programs and rebates offered by states, utilities, and local governments. Fortunately, 2011 participation numbers didn’t drop to 2009 levels, possibly indicating that the ARRA-funded programs and publicity helped raise overall awareness of efficiency incentives. Consumers reported participating in an appliance rebate program most frequently; equipment rebates for such things as a new energy-efficient furnace or water heater had the lowest participation.

FIGURE 1: Appliance rebates are the most popular energy-efficiency program

Residential customer participation in energy-efficiency programs increased considerably from 2009 to 2010, probably due to the influx of American Recovery and Reinvestment Act funds and new efficiency programs and rebates. Participation dropped slightly in 2011 compared to 2010. Appliance rebate programs had the highest level of participation.

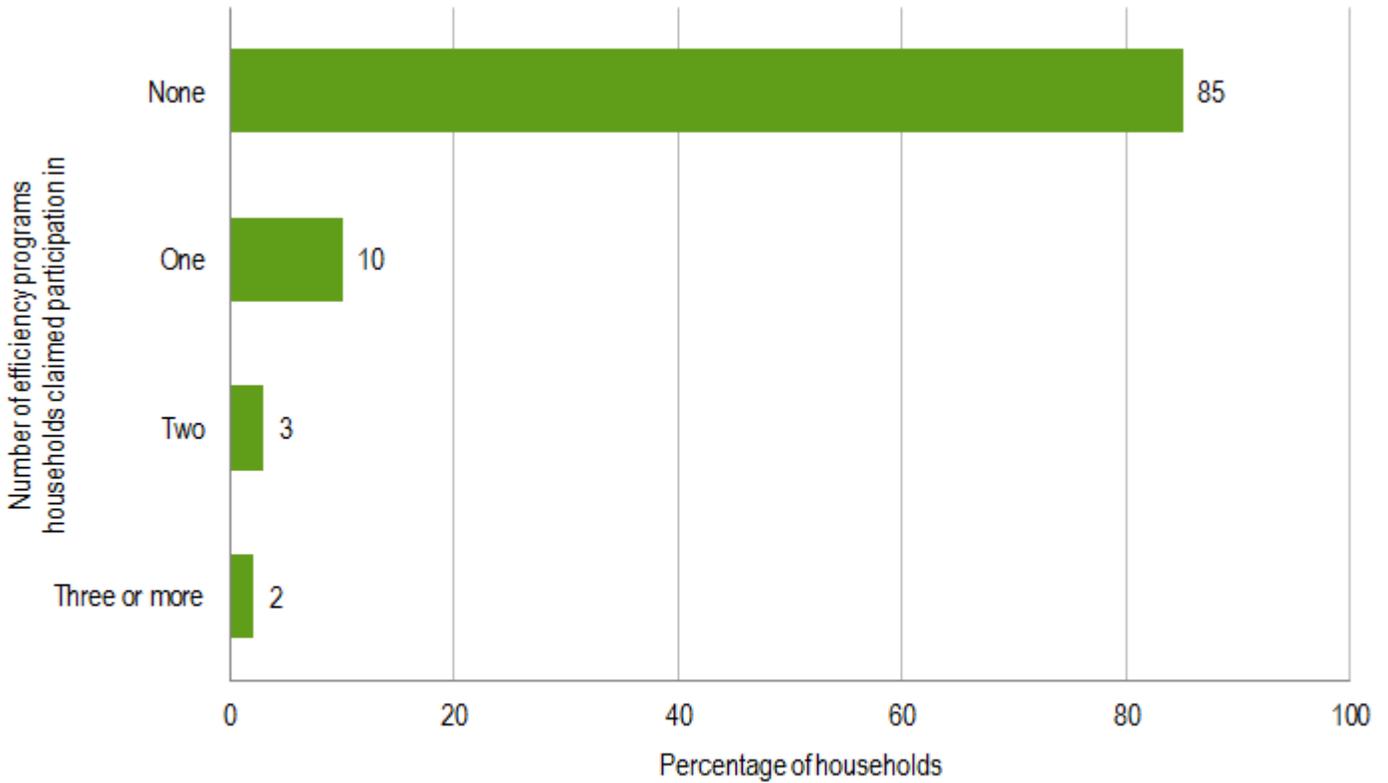


© E Source; data from The Nielsen Company
2009, 2010, and 2011 Energy Audits

Despite the relative popularity of programs like appliance rebates, utilities still aren't reaching the majority of residential customers with these offerings. Aggregated participation numbers across the US over the three-year period from 2009 to 2011 reveal that 85 percent of Americans hadn't participated in an energy-efficiency program in the 12 months prior to the survey (**Figure 2**). Ten percent of respondents had participated in one energy-efficiency program, 3 percent had participated in two programs, and 2 percent said they had participated in three or more programs. Clearly there's still a lot of potential for outreach and energy savings.

FIGURE 2: Large, untapped potential for energy-efficiency program participation still exists

From 2009 to 2011, only 15 percent of households stated they had participated in at least one energy-efficiency program in the previous 12 months. This means that a vast majority of households in the US still haven't participated in an efficiency program.



© E Source; data from The Nielsen Company 2009, 2010, and 2011 Energy Audits

Probabilities of Participation in Energy-Efficiency Programs

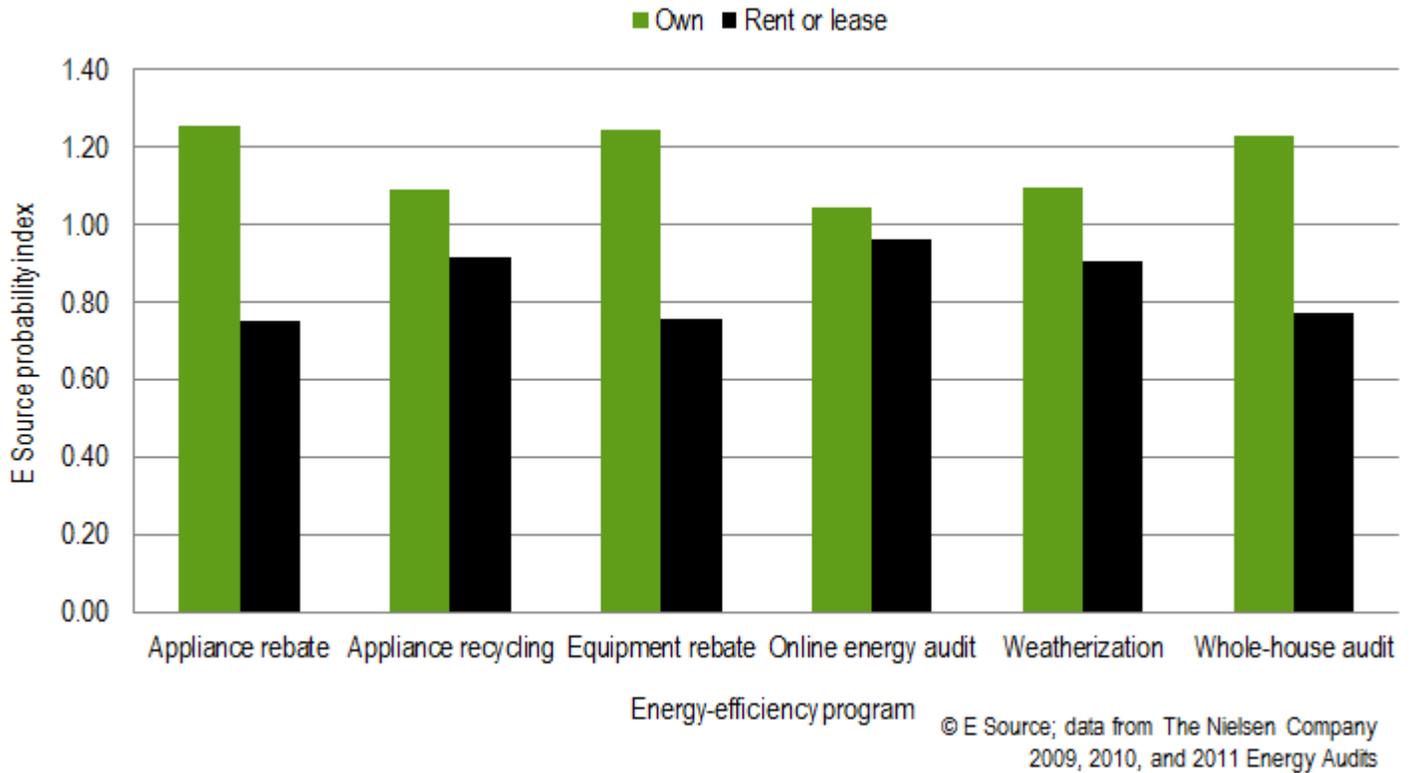
Using regression analysis, we analyzed the Nielsen Energy Audit survey data from 2009 to 2011 to explore which factors drive participation in energy-efficiency programs. We analyzed about a dozen distinct residential demographic and housing characteristics to see whether they influenced program participation. We found that the characteristics that correlate most often with efficiency program participation were home ownership, size of home, income level, age of head of household, and whether the respondents participate in other energy-efficiency programs.

To provide insight into which characteristics influence energy-efficiency program participation the most, we created probability indices, which are calculated as the probability of a certain segment to participate divided by the average probability to participate. The indices are normalized at 100: A score of 1 is average, and anything above 1 indicates a higher probability of participation than the average customer; anything below 1 has a lower than average probability of participation.

Home ownership. It’s easy to see why homeowners are more likely than renters to participate in energy-efficiency programs: First, because they own the appliances and equipment within their home, they’re more likely to replace or upgrade their equipment with newer, more efficient models. Secondly, some programs—such as residential retrofits—are only available to homeowners. Finally, because renters aren’t always required to pay utility bills, cutting energy costs isn’t typically a priority for them. As a result, homeowners have a much higher likelihood than renters to participate in appliance rebates, equipment rebates, and whole-house energy assessments (Figure 3).

FIGURE 3: Homeowners are more likely to participate in energy-efficiency programs

In contrast to renters, homeowners are more likely to participate in appliance and equipment rebates and whole-house audits. However, renters and homeowners have an almost equal probability of conducting an online energy audit.

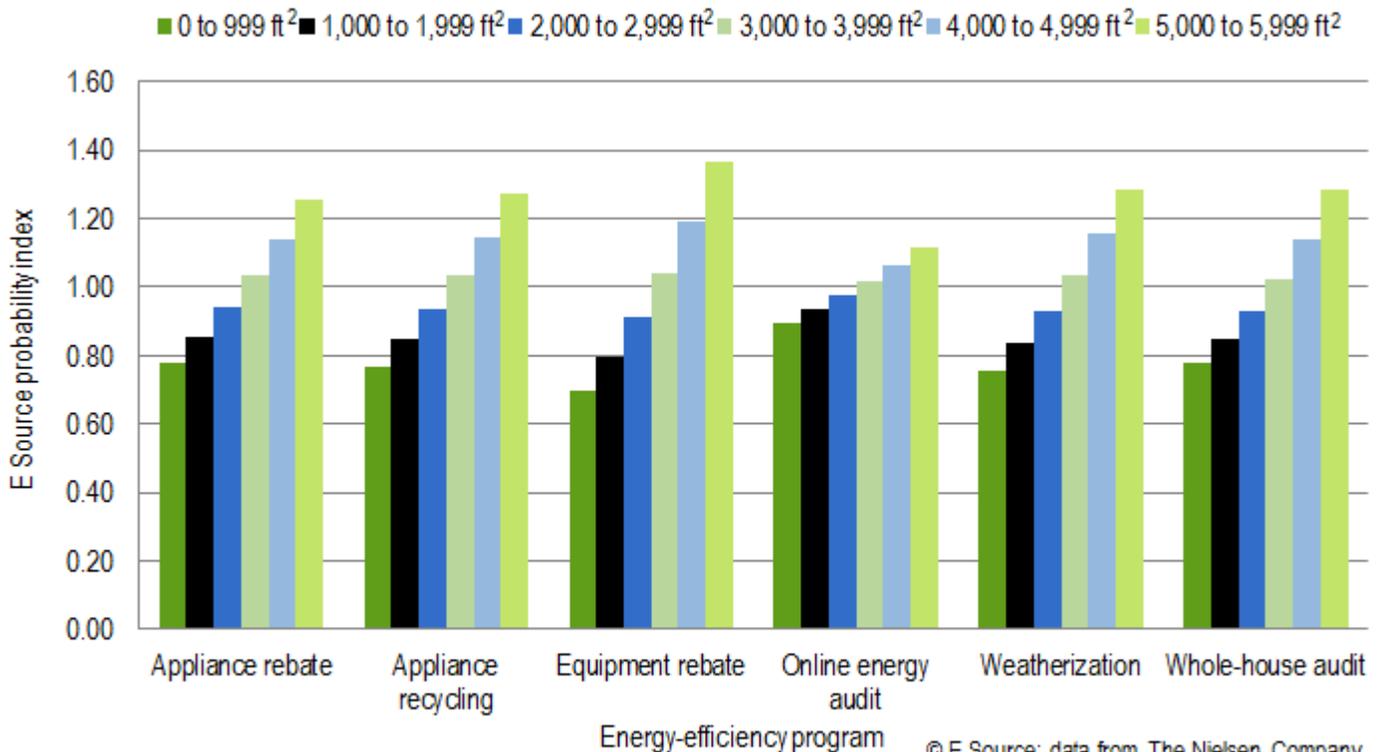


Size of home. Not only does home ownership influence energy-efficiency program participation but a home’s square footage is also a factor. Our analysis shows that the

larger the house, the more likely the household is to participate in a DSM program (Figure 4). Larger homes typically have higher utility bills than smaller homes because they cost much more to comfortably heat and cool. These factors may help drive owners of larger houses to upgrade their furnace, central air conditioning, or water heating equipment to more-efficient models and to take advantage of utility rebates.

FIGURE 4: Owners of larger homes are more likely to participate in energy-efficiency programs

The larger the home, the greater the probability that the household will participate in an energy-efficiency program. This is especially true for equipment rebate programs. The only program where home size is not an influencing factor is online energy audits.



Note: ft² = square feet.

© E Source; data from The Nielsen Company 2009, 2010, and 2011 Energy Audits

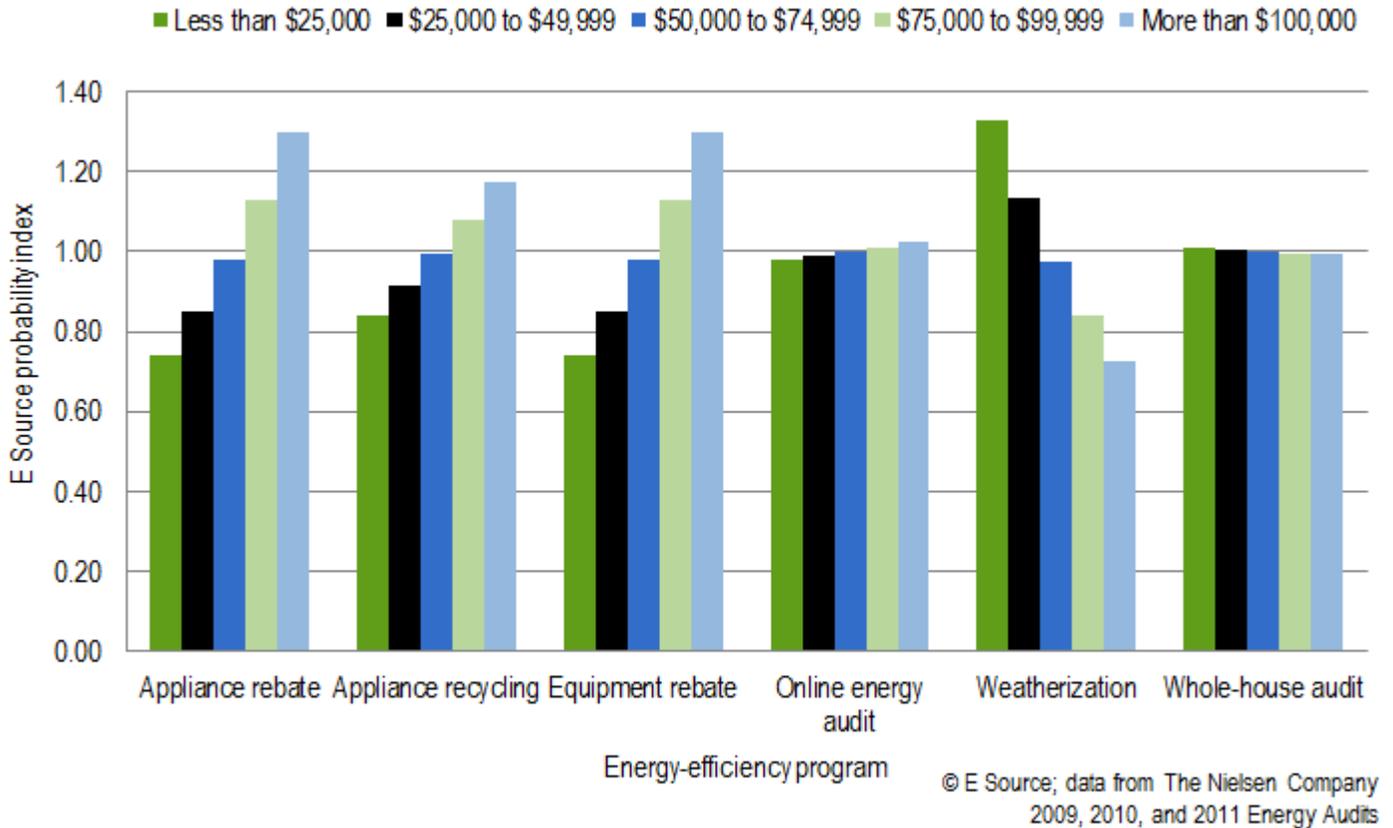
Income level. We found that income is a strong driver of energy-efficiency program participation, but it’s much more program-specific than other drivers. As income rises, so does the likelihood of a homeowner participating in appliance and equipment rebates, appliance recycling, and whole-home audit programs. It makes sense that having a higher income increases the probability of participation in certain energy-

efficiency programs because higher-income consumers have the resources to pay for newer appliances and upgrades to their home.

On the other hand, there are specific utility programs such as weatherization that offer low- or no-cost direct-installation measures and are targeted specifically to lower-income residents. Therefore, these programs have the opposite correlation: As income increases, the likelihood of participation decreases (**Figure 5**). Because online energy audits are typically free and don't require people to make an investment in their home, all income levels have about an equal probability of participation.

FIGURE 5: As income rises, so does the probability of energy-efficiency program participation

The probability of participation in an energy-efficiency program—except for weatherization programs and online energy audits—rises as income increases. Because weatherization programs that include free or low-cost direct-install measures are targeted to lower-income residents, it makes sense that the likelihood of participation increases as income decreases.

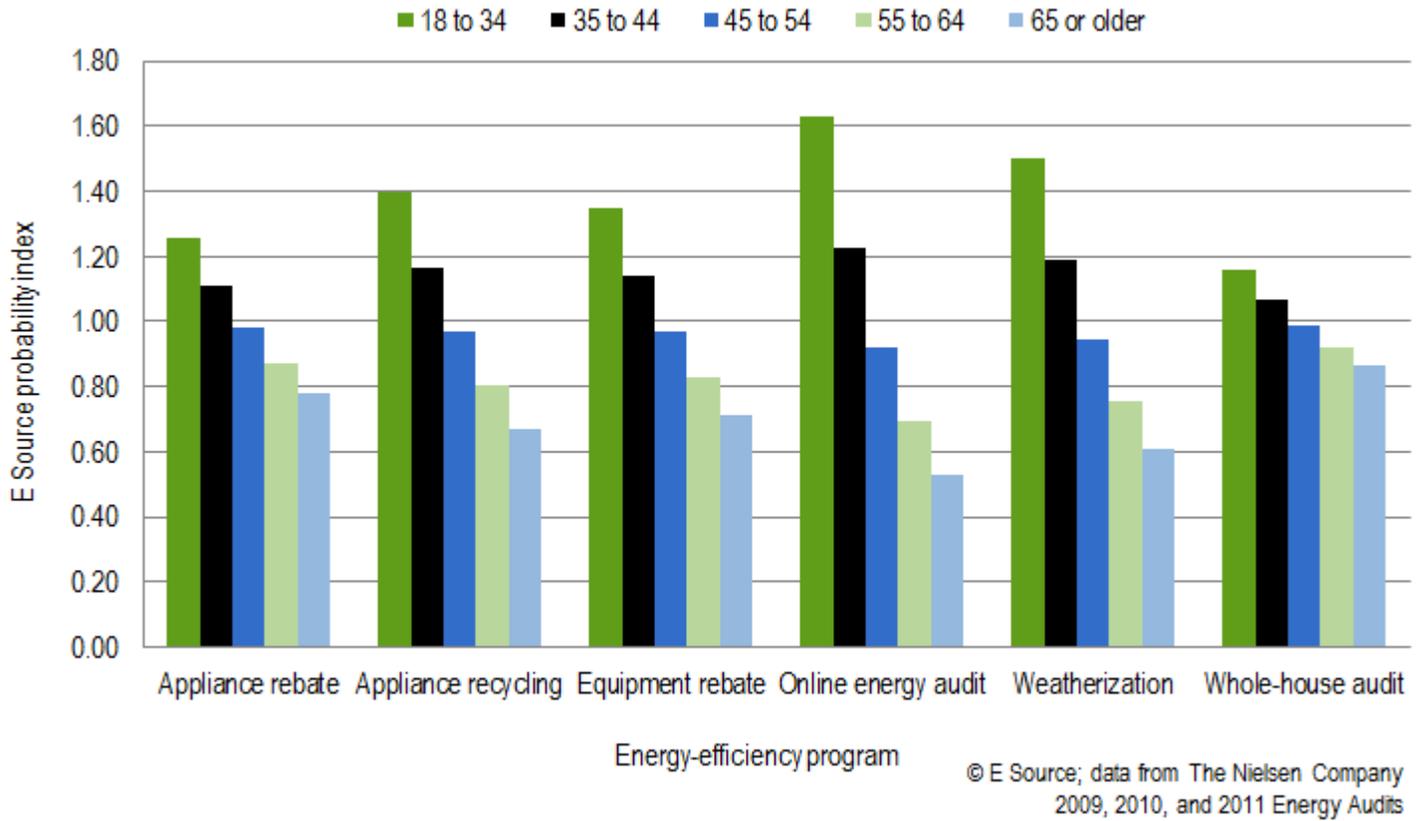


Head of household age. The age of the head of household is one of the more peculiar drivers of energy-efficiency program participation. In general, the probability of energy-efficiency program participation decreases as age increases (**Figure 6**). Why are older customers less likely to participate in utility DSM programs? It’s an intriguing question, particularly when you consider that E Source’s brand research shows that older customers tend to have a more favorable view of their utilities than younger customers. The way these programs are increasingly marketed could be one factor influencing the correlation of relative youth and energy-efficiency program participation. More utilities are using social media and online marketing channels to promote DSM programs, and this seems to be an effective way to reach younger customers where they’re already spending much of their time.

FIGURE 6: Younger people are more likely to participate in energy-efficiency programs

As people get older, the probability of their participating in an energy-efficiency program decreases. The starkest example of this influencing factor is an online energy audit: It’s

far less likely that people age 65 and older will participate in an online energy audit than 18-to-34-year-olds.



Another trend that may influence higher participation in energy-efficiency programs by younger people is the fact that a higher percentage of 18-to-34-year-olds go to their utility provider’s website to seek out energy-efficiency information and resources (Table 1). Utilities have enhanced their websites over the past few years to provide more user-friendly experiences; many utilities now offer enhanced energy analysis and online audit tools as well as detailed information about energy-efficiency programs and rebates. Some utilities even enable customers to sign up for programs or fill out rebate applications on their websites. Making it easier for customers to find information about energy-saving incentives online can help increase program participation for all age groups, but younger customers are already capitalizing on this channel’s accessibility.

TABLE 1: Younger customers go online to find energy-efficiency information

Approximately 11 percent of people in the 18-to-34-year-old age group go to their energy provider’s website to find information about energy-efficiency programs. This is compared to only 5 percent of people age 65 and older. The percentage of people who seek out this information on their utility’s website declines as they get older.

Have gone online in the past 12 months to find energy-efficiency information or resources	Age group				
	18 to 34 (%)	35 to 44 (%)	45 to 54 (%)	55 to 64 (%)	65 or older (%)
Yes	11	9	7	6	5
No	89	91	93	94	95

© E Source; data from The Nielsen Company 2009, 2010, and 2011 Energy Audits

Participation in other efficiency programs. Regardless of whether a customer is young or old, a homeowner or renter, wealthy or lower income, taking part in an energy-efficiency program is a key driver for additional program participation. Our research reveals that across all demographic and household characteristics, customers who have participated in an energy-efficiency program are much more likely to participate in another efficiency program than customers who do not participate. This may be because utility efficiency programs are providing excellent benefits and experiences to the customers they’re reaching. It could also be that participating customers already understand the importance of energy efficiency, they’re motivated to make upgrades to their homes, and they want to save money on their utility bills.

Table 2 shows a strong correlation in participation rates between related energy-efficiency programs: For example, 50 percent of customers who had participated in an appliance-recycling program had also participated in an appliance rebate program. Furthermore, of people who have participated in at least one energy-efficiency program, 67 percent participated in one program only, 21 percent participated in two programs, 7 percent participated in three programs, and 3 percent participated in four programs. Marketers can use their program participation data to cross-market related programs or to bundle program offerings.

TABLE 2: Target customers who already participate in your programs

Data collected for the E Source Residential Energy-Use Study from 2009 through 2011 show that the majority of customers who participate in one energy-efficiency program elect to participate in multiple programs. For example, of the customers who participated in a weatherization program, 28 percent also had participated in a whole-house audit program.

First energy-efficiency measure selected by participant

Additional energy-efficiency measure selected by participant	Weatherization (%)	Whole-house audit (%)	Online energy audit (%)	Appliance rebate (%)	Equipment rebate (%)	Appliance recycling (%)
Weatherization	✓	33	16	16	19	21
Whole-house audit	28	✓	17	14	21	17
Online energy audit	14	18	✓	12	17	16
Appliance rebate	25	26	21	✓	48	50
Equipment rebate	15	19	15	24	✓	24
Appliance-recycling rebate	17	16	14	26	26	✓

© E Source; data from The Nielsen Company 2009, 2010, and 2011 Energy Audits

Next Steps

This information on the drivers of energy-efficiency participation should be considered just the first step in helping utilities think about segmenting residential customers and determining who the best targets are for particular energy-efficiency programs. It’s important for utilities to analyze their own customer data and program participation statistics to find trends and drivers in their specific service territory. Marketers can dive deeply into these data to home in on the best channels and messages for certain customer segments. Tremendous opportunity exists to engage the 85 percent of customers who say they don’t participate in utility energy-efficiency programs and encourage them to sign up to save energy and money.

Resources

[Residential Energy-Use Study 2012](#), E Source, *RES-MRS-EnergyUse-12* (2012)

[E Source Residential Customer Insights Center](#) (link is external)

Gaining Efficiencies Through Residential Product Bundling, E Source, *RES-RB-12*
(2011)

2012 E Source Utility Brand Strength Study: Rankings and Drivers, E Source, *ECM-F-1*
(2012)