FORTISBC

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June 18, 2010

Via Email
Original via mail

Ms. Erica M. Hamilton
Commission Secretary
BC Utilities Commission
Sixth Floor, 900 Howe Street, Box 250
Vancouver, BC V6Z 2N3

Dear Ms. Hamilton:

Re: FortisBC Inc. Application for Approval of 2011 Capital Expenditure Plan

Please find enclosed for filing 20 copies of FortisBC Inc.'s ("FortisBC" or the "Company") Application regarding its 2011 Capital Expenditure Plan ("2011 Capital Plan").

The 2011 Capital Plan consists of projects with expenditures of $103.3 million in 2011 and $5.3 million in 2012. These expenditures are necessary to continue to provide reliable service, ensure public and employee safety, and to deliver Demand Side Management programs to the Company's growing customer base. Of those amounts, $37.1 million in 2011 and $3.8 million in 2012 have been previously approved by the Commission.

FortisBC's capital expenditure program since 2005 has been guided by its long-term 2005-2024 System Development Plan (the "2005 SDP"), which identified the need for significant reinforcements in the bulk transmission system, regional transmission and distribution systems, and associated communications and protection systems. 2011 marks the completion of the major medium-term projects identified in the 2005 SDP. In 2011, the Company plans to complete and file a long-term Integrated System Plan, which will outline a 20-year horizon of planned investment spending on generation, transmission and distribution assets, general plant, and Demand Side Management in addition to the Company's plans to meet its electricity resource requirements.

For the most part, the 2011 Capital Plan is focused on sustaining and supporting the Company's power system, generation and business infrastructure assets. As the projects for which approval is requested are generally of a routine nature, with respect to both content and magnitude, FortisBC proposes that the 2011 Capital Plan be disposed of by way of a written public hearing. A 2011 Capital Plan Workshop will be held on Wednesday, August 4, 2010, at the Manteo Resort, 3762 Lakeshore Road in Kelowna, B.C.

The Company will provide notice of this Application and of the August 4, 2010 Workshop to intervenors and interested parties registered in FortisBC's Capital Plan, Revenue Requirements, Rate Design, and CPCN proceedings filed within the previous two year period.

Order Requested
FortisBC files the 2011 Capital plan pursuant to Sections 44.2 (1) (a) and (b) of the Utilities Commission Act, and seeks an Order of the Commission that the 2011 Capital Plan satisfies the requirements of Section 45(6), and that the Commission accepts the 2011 Capital Plan and finds that the capital projects contained in the listed tables in the 2011 Capital Plan are in the public interest pursuant to Section 44.2 (3) (a):
Table 2.1 Generation;
Table 3.1 Transmission and Stations;
Table 4.1 Distribution;
Table 5.1 Telecommunications, SCADA, and Protection and Control;
Table 6.1 General Plant; and
Table 7.1 Demand Side Management.

Should you require further information in this matter, please contact the undersigned at 250 717 0890.

Sincerely,

Dennis Swanson
Director, Regulatory Affairs

2011 Capital Expenditure Plan

(“2011 Capital Plan”)

June 18, 2010

FortisBC Inc.

Table of Contents

1

1. Introduction

The 2011 Capital Expenditure Plan ("2011 Capital Plan") of FortisBC Inc. ("FortisBC" or the "Company") consists of expenditures of $103.3 million in 2011 and $5.3 million in 2012. These expenditures are necessary to continue to provide reliable service, ensure public and employee safety, and to deliver Demand Side Management ("DSM") programs to the Company's growing customer base. The projects associated with these expenditures support British Columbia's energy objectives as defined in Section 2 of the Clean Energy Act S.B.C 2010, c. 22 (the "Clean Energy Act"), and the requirements set out in the Utilities Commission Act, R.S.B.C c. 473 (the "UCA"), and are consistent with the November 2008 Demand-Side Measures Regulation ("the "DSM Regulation"), and applicable policy actions as outlined in the 2007 BC Energy Plan (the "Energy Plan") and are in the public interest.

In 2004, FortisBC prepared and filed its long-term 2005-2024 System Development Plan (the "2005 SDP"), which identified the need for significant reinforcements in the bulk transmission system, the regional transmission and distribution systems, and the communications, protection, and SCADA (System Control and Data Acquisition) systems owned by the Company. In all, more than 100 system development and improvement projects were to be implemented over the subsequent six-year period, including a number of projects required to serve increasing loads largely driven by population growth in the FortisBC service area. Incorporating updated load forecasts, equipment condition assessments and other information detailed in Updates to the 2005 SDP, which were filed in 2005, 2006, and 2008, the Company has substantially executed the SDP by way of its 2006, 2007-2008 and 2009-2010 Capital Expenditure Plans.

With a few exceptions as identified in the Updates, the major 2005 SDP projects planned during the medium term will have been completed by year-end 2011.

In 2011, the Company plans to complete and file a 20 year Integrated System Plan. The Integrated System Plan will outline a 20 year horizon of planned investment spending on transmission and distribution assets, generation assets, general plant including office facilities and Information Technology requirements, and DSM, in addition to the Company's plans to meet its electricity resource requirements.

SUMMARY OF 2011 CAPITAL EXPENDITURE PLAN

FortisBC's 2011 Capital Expenditure Plan is summarized in the following Table 1.1. The Company seeks approval of capital projects in the amount of $67.6 million, consisting of $66.2 million in 2011 and a further $1.5 million in 2012 for the completion of projects that will begin in 2011. Further expenditures of $37.1 million in 2011 and $3.8 million in future years have already been approved by way of Certificates of Public Convenience and Necessity ("CPCNs") or other Commission orders. Total new expenditures on Plant and Equipment for 2011 is forecast at $91.3 million. Inclusive of Cost of Removal (net of salvage recoveries) and Demand-Side Management expenditures, FortisBC's 2011 Capital Expenditure Plan is forecast at $103.3 million in 2011 and $5.3 million in 2012.

Table 1.1
2011 Capital Expenditure Plan

1		**2011**	**2012**	**2011**	**2012**	**2011**	**2012**
2				($000s)			
3		**Requested**		**Previously Approved**		**Total**	
4	Generation	2,513	1,439	16,156	3,842	18,669	5,281
5	Transmission and Stations	12,291	-	16,056	-	28,347	-
6	Distribution	23,604	-	-	-	23,604	-
7	Telecommunications, SCADA, and Protection and Control	5,600	-	1,540	-	7,140	-
8	General Plant	12,968	-	595	-	13,563	-
9	**Subtotal - Plant and Equipment**	**56,976**	**1,439**	**34,347**	**3,842**	**91,323**	**5,281**
10	Demand Side Management	5,764	-	-	-	5,764	-
11	**Subtotal - Additions**	**62,740**	**1,439**	**34,347**	**3,842**	**97,087**	**5,281**
12	Cost of Removal (net)	3,411	36	2,781	6	6,192	42
13	**Total**	**66,151**	**1,475**	**37,128**	**3,848**	**103,279**	**5,323**
14							
15	Annual Operating Savings					**128**	**283**

FortisBC notes that during 2011 it expects to submit an application for a CPCN for its Advanced Metering Infrastructure ("AMI") project. Pursuant to Commission Orders G-193-08 and G-162-09, preliminary and CPCN development costs for the AMI project are recorded in a non-rate base deferral account, pending disposition of the CPCN application. The capital project is expected to commence in 2012.

Table 1.1 identifies Operating and Maintenance cost savings associated with the 2011 Capital Plan projects, estimated at $0.13 million in 2011 and $0.28 million in 2012.

PUBLIC CONSULTATION

FortisBC recognizes the value of stakeholder consultation in the planning and implementation of projects to meet customers' needs. A broad program of public consultation is, in the view of FortisBC, required in the development of its long-term capital plans, and will be a prominent component of the Integrated System Plan to be filed in 2011.

A comprehensive consultation program was designed and carried out as part of the development of the 2011 DSM Plan. The consultation process was developed to ensure that interested customers, government and business stakeholders were provided with an opportunity to learn about DSM and provide input on potential DSM program options. Stakeholder feedback indicated support for DSM programs and expenditures at or above the levels contained in the 2011 Capital Plan. A complete description of the public consultation activities is included in the 2011 DSM Plan document.

For the most part, the 2011 Capital Plan is focused on sustaining and supporting the Company's power system, generation and business infrastructure assets. All of the projects included in the 2011 Capital Plan are either being constructed on or within existing facilities, or, as in the case of the Okanagan Transmission Reinforcement Project, have previously been the subject of significant public consultation. FortisBC did not in this instance undertake general public consultation related to the 2011 Capital Plan, for which it assessed the impact on public to be low. As set out in the proposed regulatory timetable below, a workshop for the review of the 2011 Capital Plan will form part of the regulatory review process.

The following describes a typical cycle of consultation at the individual project level. For each project for which significant public interest or impact is possible, a consultation program is developed which involves greater detail as project planning and engineering advances.

System Planning engineers remain in contact with community planners on an ongoing basis to remain familiar with current and planned development. Once a specific need is determined and potential solutions identified, FortisBC contacts stakeholders to discuss any issues in the community that can be addressed in the project planning stage. Such stakeholders normally consist of local and Provincial Governments and agencies, First Nations, potentially affected landowners, and other local groups such as tourism associations and community and/or residents' associations.

A wider public consultation process may then be developed to elicit local issues and concerns, and allow various stakeholders to meet the project team, ask specific questions, and build constructive local relationships. Notice of such information sessions is provided through local newspapers and radio, and general mailings of notices. Known stakeholders are invited by way of mail, telephone, or email. Attendees are provided with a FortisBC contact person for future information, comment, or follow-up.

The Company continues to provide information and when appropriate to solicit input from its stakeholders throughout the planning, regulatory and construction stages to project completion. This input is critical in the Company's efforts to balance the needs of individuals, affected communities and other ratepayers.

FIRST NATIONS CONSULTATION

FortisBC's plant and equipment includes a number of facilities and lines located on reserves and in traditional First Nations territories. The Company values its strong working relationships with the nine bands and three nations within or adjacent to its service territory and considers the potential impacts on First Nations in its operations and capital planning processes.

No First Nations have been identified as being potentially affected by any of the projects proposed in the 2011 Capital Plan. As the 2011 Capital Plan does not require the construction of any new (greenfield) infrastructure, with all of the planned work being conducted on or within existing facilities, and as no First Nations have been identified as being potentially affected by the proposed projects, FortisBC has not undertaken any consultation or accommodation efforts with respect to First Nations.

FortisBC will advise First Nations prior to commencing work on any of the projects included in the 2011 Capital Plan that impact FortisBC facilities on or adjacent to any First Nations lands or reserves. Any issues or concerns identified by First Nations will be addressed by FortisBC as they arise.

LEGISLATIVE AND REGULATORY FRAMEWORK

FortisBC files this 2011 Capital Plan pursuant to sections 44.2 (1) (a) and (b) and 45 (2) of the UCA, and seeks an Order of the Commission that the 2011 Capital Plan is in the public interest pursuant to section 44.2 (3) (a) and satisfies the requirements of section 45 (6), and that the Commission approves the capital projects contained in the listed tables in the 2011 Capital Plan:

Table 2.1 Generation;
Table 3.1 Transmission;
Table 4.1 Distribution;
Table 5.1 Telecommunications, SCADA, and Protection and Control;
Table 6.1 General Plant; and
Table 7.1 Demand Side Management.

A draft Order approving the 2011 Capital Plan is attached as Appendix 1 to this Application.

Pursuant to section 44.2 (5) of the UCA, as amended by the Clean Energy Act, in reviewing the 2011 Capital Plan the Commission must consider:

(a) the applicable of British Columbia's energy objectives,

(b) the most recent long-term resource plan filed by the public utility under section 44.1, if any,

(c) the extent to which the plan is consistent with the applicable requirements under sections 6 and 19 of the Clean Energy Act,

(d) if the schedule includes expenditures on demand-side measures, whether the demand-side measures are cost-effective within the meaning prescribed by regulation, if any, and

(e) the interests of persons in British Columbia who receive or may receive service from the public utility.

For the purposes of the 2011 Capital Plan, the following are the applicable of British Columbia's energy objectives as defined in section 2 of the Clean Energy Act:

> (a) to achieve electricity self-sufficiency;
>
> (b) to take demand-side measures and to conserve energy, including the objective of the authority reducing its expected increase in demand for electricity by the year 2020 by at least 66%;
>
> (c) to generate at least 93% of the electricity in British Columbia from clean or renewable resources and to build the infrastructure necessary to transmit that electricity;
>
> (d) to use and foster the development in British Columbia of innovative technologies that support energy conservation and efficiency and the use of clean or renewable resources;
>
> (g) to reduce BC greenhouse gas emissions….; and
>
> (h) to encourage the switching from one kind of energy source or use to another that decreases greenhouse gas emissions in British Columbia.

In addition, the Clean Energy Act anticipates the implementation in British Columbia of smart metering and smart grid technology, and provides at section 17 (6) that

> "if a public utility, other than the authority, makes an application under the Utilities Commission Act in relation to smart meters, other advanced meters or a smart grid, the commission, in considering the application, must consider the government's goal of having smart meters, other advanced meters and a smart grid in use with respect to customers other than those of the authority".

The projects contained in the 2011 Capital Plan support British Columbia's energy objectives and applicable Policy Actions contained in the Energy Plan and, where appropriate, this support is identified in the relevant sections of the Application. The 2011 Capital Plan, including the 2011 DSM Plan, is also consistent with the Company's long-term Resource Plan filed on May 29, 2009 (the "2009 Resource Plan"), for which an evidentiary update (the "Resource Plan Update") will be filed pursuant to section 44.1 of the UCA.

Section 6 of the Clean Energy Act, referenced in section 44.2 (5) (c) of the UCA, relates to provincial electricity self-sufficiency in the context of FortisBC's pending Resource Plan Update. Section 19 of the Clean Energy Act relates to clean or renewable resources and is applicable to BC Hydro and to prescribed public utilities. FortisBC is not a prescribed public utility for the purpose of Section 19. For the purposes of the 2011 Capital Plan, the goals of self-sufficiency and the production and generation of electricity from clean or renewable sources are contained in British Columbia's energy objectives enunciated in section 2 of the Clean Energy Act, and the 2011 Capital Plan includes projects that support those objectives.

The considerations for determining the cost-effectiveness of DSM measures for the purposes of section 44.2 (5) referenced above are set out in Section 4 of the DSM Regulation and provided in the 2011 DSM Plan accompanying this Application as Appendix 3.

PROPOSED REGULATORY PROCESS

FortisBC proposes that this Application be disposed of by way of a written public hearing. As the projects for which approval is requested are generally of a routine nature, with respect to both content and magnitude, FortisBC believes that this form of process will provide an effective forum and best reflects the ongoing nature of its 2011 Capital Plan and the type of expenditures for which FortisBC is seeking approval.

Of the forecast 2011 and 2012 expenditures shown in Table 1.1 above, 38 percent have been previously approved by the Commission. This application therefore seeks approval for projects totalling $66.2 million in 2011 and $1.5 million in 2012. The expenditures are primarily for projects required to sustain the life of existing assets, or are expenditures on Demand Side Management or General Plant such as Vehicles, Information Systems, Buildings, and Furniture. Therefore, FortisBC submits that these expenditures can be adequately examined in the context of a written hearing.

In its 2005 Revenue Requirement Application, FortisBC proposed the following criteria to determine whether a project should be the subject of a CPCN application by FortisBC:

(a) the total project cost is $20 million or greater; or

(b) the project is likely to generate significant public concerns; or

(c) FortisBC believes for any reason that a CPCN application should proceed; or

(d) after presentation of a Capital Plan to FortisBC stakeholders, a credible majority of those stakeholders express a desire for a CPCN application.

In its Decision accompanying Order G-52-05, the Commission stated its general agreement with these criteria, but noted that the Commission intends to review each capital expenditure plan and will determine with reasons which project will require a CPCN. None of the projects proposed in this 2011 Capital Plan, unless already approved, meets any of the first three criteria set out above, therefore subject to a Commission direction to submit a CPCN application for any of the projects, FortisBC is requesting approval of the 2011 Capital Plan expenditures as identified in Table 1.1 above.

The form of the Order requested by FortisBC is set out in Appendix 1 of this Application.

FortisBC will hold a workshop in Kelowna, BC on August 4, 2010, and additionally proposes the following regulatory timetable:

– Commission Information Request No. 1 (IR1)	July 7, 2010
– FortisBC Response to Commission IR1	July 28, 2010
– Workshop in Kelowna, B.C.	August 4, 2010
– Commission IR No. 2 (IR2) and Intervenor IR1	August 13, 2010
– FortisBC Response to BCUC IR2 and Intervenor IR1	September 3, 2010
– FortisBC Final Submission	September 10, 2010
– Intervenor Submissions	September 17, 2010
– FortisBC Reply	September 24 2010
– Commission Decision (requested)	October 29, 2010

A Commission decision by the requested date is consistent with the regulatory process followed by FortisBC under the terms of its existing Performance-Based Regulation plan for determining Revenue Requirements, which has a goal of achieving firm rates by December 1 for the following year.

EXPENDITURES BY PLANT CATEGORY

The following table provides a summary of the 2011 Capital Plan by major category.

Table 1.2
Expenditures by Plant Category

1		2011	2012	2011	2012	2011	2012
2		($000s)					
3		Requested		Previously Approved		Total	
4	**Generation**						
5	Growth	-	-	-	-	-	-
6	Sustaining	2,513	1,439	16,156	3,842	18,669	5,281
7	**Subtotal**	**2,513**	**1,439**	**16,156**	**3,842**	**18,669**	**5,281**
8	**Transmission and Stations**						
9	Growth	5,341	-	16,056	-	21,397	-
10	Sustaining	6,950	-	-	-	6,950	-
11	**Subtotal**	**12,291**	**-**	**16,056**	**-**	**28,347**	**-**
12	**Distribution**						
13	Growth	11,529	-	-	-	11,529	-
14	Sustaining	12,075	-	-	-	12,075	-
15	**Subtotal**	**23,604**	**-**	**-**	**-**	**23,604**	**-**
16	**Telecommunications, SCADA, and Protection and Control**						
17	Growth	4,049	-	1,540	-	5,589	-
18	Sustaining	1,551	-	-	-	1,551	-
19	**Subtotal**	**5,600**	**-**	**1,540**	**-**	**7,140**	**-**
20	**General Plant**						
21	Mandatory Reliability	-	-	595	-	595	-
22	Vehicles	2,000	-	-	-	2,000	-
23	Metering	213	-	-	-	213	-
24	Information Systems	5,550	-	-	-	5,550	-
25	Telecommunications	358	-	-	-	358	-
26	Buildings	1,244	-	-	-	1,244	-
27	Kootenay Operations Centre	485	-	-	-	485	-
28	Kelowna Long Term Solution	489	-	-	-	489	-
29	Furniture	176	-	-	-	176	-
30	Tools and Equipment	601	-	-	-	601	-
31	PCB Environmental Compliance	1,852	-	-	-	1,852	-
32	Subtotal	**12,968**	**-**	**595**	**-**	**13,563**	**-**
33	**Subtotal - Plant and Equipment**	**56,976**	**1,439**	**34,347**	**3,842**	**91,323**	**5,281**
34	**Demand Side Management**	**5,764**				**5,764**	
35	**Subtotal - Additions**	**62,740**	**1,439**	**34,347**	**3,842**	**97,087**	**5,281**
36	Cost of Removal (net)	3,411	**36**	2,781	**6**	6,192	42
37	**Total**	**66,151**	**1,475**	**37,128**	**3,848**	**103,279**	**5,323**

Table 1.2 continued
Expenditures by Plant Category

38		**2011**	**2012**	**2011**	**2012**	**2011**	**2012**
39				($000s)			
40		**Requested**		**Previously Approved**		**Total**	
41	Growth	20,919	-	17,596	-	38,515	-
42	Sustaining	23,089	1,439	16,156	3,842	39,245	5,281
43	General Plant	12,968	-	595	-	13,563	-
44	Demand Side Management	5,764	-	-	-	5,764	-
45	Cost of Removal (net)	3,411	36	2,781	6	6,192	42
46	**Total**	**66,151**	**1,475**	**37,128**	**3,848**	**103,279**	**5,323**

2. Generation

FortisBC's generation facilities consist of 15 hydroelectric generating units in four plants located on the Kootenay River. These hydroelectric generating plants, initially constructed between 1897 and 1932, are renewed by both major projects which include the Upgrade and Life Extension ("ULE") program that began in 1998 and additional capital sustaining projects, which are relatively small in scope and are necessary to maintain safe and efficient operation of the plants. These planned projects will ensure the continued long-term reliability of the generating units.

By maintaining or increasing the capacity and energy of its hydroelectric generating facilities, the Company supports British Columbia's energy objectives as defined in the Clean Energy Act, in particular the objectives:

(a) to achieve electricity self-sufficiency; and

(c) to generate at least 93% of the electricity in British Columbia from clean or renewable resources and to build the infrastructure necessary to transmit that electricity.

Table 2.1 below summarizes the 2011 and 2012 expenditures for Generation projects for which FortisBC is seeking approval, or for which approval has already been granted.

Table 2.1
Generation Projects

1		Approval	to 2010	2011	2012	Total
2		($000s)				
3	South Slocan Unit 1 Life Extension	G-52-05	15,777	41		15,818
4	Corra Linn Unit 1 Life Extension	G-147-06	13,505	2,433		15,938
5	Corra Linn Unit 2 Life Extension	C-5-09	3,248	12,373	3,464	19,085
6	Generating Plants Upgrade Station Service Supply	G-147-06	3,324	1,309	378	5,011
7	Upper Bonnington Spill Gate Rebuild			610	1,010	1,620
8	**Subtotal Major Projects**		**35,854**	**16,766**	**4,852**	**57,472**
9	South Slocan Plant Automation			243		243
10	South Slocan Fire Panel			266		266
11	Lower Bonnington & Upper Bonnington Plant Totalizer Upgrade			86	85	171
12	Lower Bonnington Powerhouse Plant Windows			351	344	695
13	All Plants Minor Sustaining			957		957
14	**Subtotal Small Projects**			**1,903**	**429**	**2,332**
15	**Total**		**35,854**	**18,669**	**5,281**	**59,804**

MAJOR PROJECTS

The scope of a ULE project is a “water to wires” refurbishment of each of the generating units’ systems. By the end of 2010, nine units will have been completed under the ULE program. The current program schedule includes the completion of Corra Linn Unit 1 in 2011 and Corra Linn Unit 2 in 2012. This will complete eleven of the fifteen generating units at FortisBC’s four generating plants. The potential for refurbishment of the remaining four old units at Upper Bonnington is under review and will be addressed at a later date.

The major generation projects in the 2011 Capital Plan include the completion of projects previously approved by the Commission, the continuation of the unit-by-unit ULE program and the spill gate rebuild at Upper Bonnington.

The following gives an overview of the Generation Major Projects contained in the 2011 Capital Plan.

South Slocan Unit 1 Life Extension (Replace Turbine)

The South Slocan Unit 1 Life Extension project is the ninth unit in the program and was approved by Commission Order G-52-05. The generating unit was returned to service in February 2010. The project is to be completed and closed in the first quarter of 2011.

The project currently has a total estimated cost of $15.818 million.

Corra Linn Unit 1 Life Extension (Replace Turbine)

The Corra Linn Unit 1 Life Extension project is the tenth unit in the program and was approved by Commission Order G-147-06. This project entails the replacement in kind of the existing turbine, but will not include a capacity upgrade. It is a multi-year project with completion forecast for 2011.

The project currently has a total estimated cost of $15.938 million.

Corra Linn Unit 2 Upgrade Life Extension

The Corra Linn Unit 2 Upgrade Life Extension project is the eleventh unit in the program and was approved by Commission Order C-5-09. The project is a multi-year project with initial expenditures occurring in 2009 and project completion forecast for 2012. The project consists of a rewind of the Unit 2 generator, replacement of the rotating exciter with a static exciter, upgrade of the unit control and protection systems, installation of a new high-pressure unit governor system, upgrade of the cable bus system, replacement of the existing three single-phase transformers with a single three-phase transformer, various improvements to the transformer switchyard, and replacement of the existing deteriorated turbine.

The project also includes three minor capital projects approved as part of the CPCN, namely the Corra Linn Overhead Crane Upgrade, the Spillgate Isolation Study and the Wingdam Handrail Upgrade. The Spillgate Isolation Study and Wingdam Handrail Upgrade are scheduled for completion in 2010, and the overhead crane upgrade will be completed in 2011.

This project currently has a total estimated expenditure of $19.085 million.

Generating Plants Station Service Supply

This project, which was approved by Commission Order G-147-06, involves installing new equipment and back-up power sources to ensure operational reliability and to address environmental concerns at all four FortisBC generating plants. The first plant, South Slocan, was completed in 2009. The second plant, Corra Linn, is scheduled to be completed in 2010, with Lower Bonnington scheduled for completion in 2011 and Upper Bonnington in 2012. The project currently has a total estimated cost of $5.011 million.

Upper Bonnington Spill Gate Rebuild

The spill gates at Upper Bonnington are over 80 years old and are at risk of failure. There is currently a risk of the gates jamming and not opening during maximum flood conditions, resulting in water over topping the dam and causing damage to the powerhouse. Deterioration as a result of age as well as corrosion can cause the collapse of skin plates (outer steel plates), which would cause water to spill from the dam. Presently there is no practical means of isolating these gates to initiate repairs or refurbishment. The 2011 portion of this project is to cut stop log slots in the existing structure so that stop logs can be installed to provide isolation. The 2012 portion involves the refurbishment of the two gates. The total estimated cost of this project is $1.620 million.

SMALL SUSTAINING PROJECTS

FortisBC's four generating plants contain turbines, generators, switchgear, civil structures (concrete dams, concrete powerhouse buildings and structure steel assemblies), cranes, gates, and gantries, cooling pumps and fans, roads and fences.

Consistent with previous years, the 2011 Generation capital expenditures include a number of plant sustaining projects that are necessary for the safe and efficient operation of the plants. These projects have been identified based on considerations of safety, environment, plant reliability and provincial and federal regulatory compliance.

South Slocan Plant Automation

Currently, FortisBC utilizes a time based maintenance system in its generation facilities, and intends to move towards a condition based maintenance system which will permit improved maintenance decisions on the new equipment installed in the facilities. The South Slocan Plant Automation project involves installing "smart" motor overloads and additional process monitoring sensors at the South Slocan Plant. The information collected will be used as the basis for a condition based maintenance system which will capitalize on the technology invested in the units during the ULE projects.

Parameters such as motor run times, motor current, oil turbidity, temperature and humidity will be fed back to the existing historian database (eDNA) using Kepware software. Schweitzer SEL-5040 Report server software and PML ION enterprise software already in use by the Company will be used to collect data from protection relays and power monitor relays.

Under a condition based maintenance program, the timing of maintenance intervals can be more closely matched with equipment need. It is expected that the intervals between certain maintenance activities, most notably major overhauls currently undertaken on a ten year interval, may be extended based on the condition of the equipment. This will result in lower overall maintenance costs per unit in the long term.

The estimated expenditure for this project is $0.243 million in 2011.

South Slocan Fire Panel

This project involves the installation of a fire alarm panel at the South Slocan generating station. Presently there is no alarm system in the plant except for the water deluge system for the generating units. The proposed fire alarm panel will be multi zone and will include fire pull stations; audible and visual alarms; and fire and smoke detectors. This alarm panel is for employee safe egress only. The panel will not include controls nor will it be linked to a suppression system. The fire panel will annunciate to a central monitoring location. The estimated expenditure for this project is $0.266 million in 2011.

Lower Bonnington and Upper Bonnington Plant Totalizer Upgrade (Revenue Meter Replacement)

This project will replace the seven existing PSI Quad 4 meters with five new PML-7650 meters. Accurate metering is required in order to determine plant output and Entitlement use under the Canal Plant Agreement. The existing revenue metering at the Lower Bonnington and Upper Bonnington plants is obsolete and unreliable (the internal clocks are known to be inaccurate); replacement parts are no longer available and the computer firmware is obsolete. During the first half of 2010, operations personnel have responded to two trouble calls at Lower Bonnington related to these meters and on one of those occasions a battery replacement resulted in the meter becoming locked out.

The new meters are data-network capable so they do not require meter reading every month or resetting twice a year for daylight savings time, thus reducing operating and maintenance costs. The PML-7650 meters are already installed at FortisBC's South Slocan generating plant, and will be installed at Corra Linn during the Units 1 and 2 ULE projects in 2011 and 2012. Expenditures are estimated at $0.086 million for Lower Bonnington in 2011 and $0.085 million for Upper Bonnington in 2012.

Lower Bonnington Powerhouse Windows

Windows in the powerhouses at all four of FortisBC's generating plants are manually operated on a routine basis to regulate the temperature within the powerhouse. These windows are over 70 years old and are at risk of falling out, creating a risk to the safety of operating personnel who may be standing below. All of the powerhouse windows, frames and opening hardware at the Lower Bonnington plant have been identified as having the highest risk of failure of the four plants. At Lower Bonnington, half of the powerhouse windows will be replaced in 2011 and the remainder in 2012, at an estimated cost of $0.351 million and $0.344 million respectively. In future years, only windows identified to be at risk of failure at the remaining three plants are expected to be repaired or refurbished. Replacement of windows at the remaining three plants will be included in a future capital expenditure plan application.

All Plants Minor Sustaining Capital

This project involves expenditures for repairs that are identified at the generating plants as a result of safety inspections, storm damage, aging equipment, reports by on-call personnel and other inspections. The projects will be executed as scheduled in the budget year unless a new, previously unidentified project deemed of higher priority is approved by Management to replace it. This list of projects may then change throughout the year. The list will be managed as if it were a single project. The Minor Sustaining Capital project is composed of two projects greater than $0.150 million in value and a group of projects individually valued under $0.150 million.

The total estimated expenditure for this project is $0.957 million in 2011 as shown in Table 2.2 below.

Table 2.2
All Plants Minor Sustaining Capital

1		2011	2012	Total
2		($000s)		
3	All Plants Power House Crane Brakes	231		231
4	UBO Extension Power House Crane Upgrade	241		241
5	Projects Under $150,000	485		485
6	**Total**	**957**		**957**

All Plants Power House Crane Brakes

The All Plants Power House Crane Brakes project is required as the existing brakes have recently been slipping under heavy loads, imposing a risk to employee safety. The project consists of repairing the brakes on the main and auxiliary hooks at all four powerhouse cranes at the FBC plants.

Upper Bonnington Extension Power House Crane Upgrade

The Upper Bonnington Extension Power House Crane Upgrade project involves the installation of new equipment primarily to meet WorkSafe BC Occupational Health and Safety Regulation Part 14.2. The Upper Bonnington Crane, which is of the same vintage as those previously upgraded at the Lower Bonnington, Corra Linn, and South Slocan plants, has deficiencies in various crane functions and also extensive wear from past usage. Following an assessment of the crane, it is expected that the project will include components similar to those performed on the previously upgraded cranes, such as adding bridge and trolley mechanical end stops and adding upper and lower travel limit switches on both hooks and may involve replacing the load display system, programmable logic controller and drive modifications, auxiliary hooks, non-destructive testing inspections, runway alignment and block sheave guards.

3. Transmission and Stations

The 2011 capital requirements for Transmission and Stations follow the direction of the 2005 SDP and subsequent Updates. The 2005 SDP is a comprehensive plan including protection and control facilities and communication facilities, including analysis of the maintenance requirements. The 2005 SDP included a long-term (20 year) study of the transmission system, a shorter (5 year) study for the distribution system, a review of the maintenance programs and a detailed assessment of all lines and equipment. It identified necessary projects to reinforce and upgrade the bulk transmission system, the regional transmission and distribution systems, the telecommunications and SCADA networks, and protection systems owned and operated by FortisBC, primarily to meet load growth and to maintain or improve system reliability.

The Okanagan region consisting of the Kelowna, Penticton, Oliver, Osoyoos and Princeton areas had in past years experienced robust customer growth, most notably in the Kelowna area, and now shows signs of recovery from the recent downturn in the business cycle. The Okanagan Transmission Reinforcement project and the Ellison, Black Mountain and Benvoulin Substation projects in Kelowna are projects either recently completed or in progress in order to meet this increased load growth. Two additional growth-driven projects are proposed in the 2011 Capital Plan: the Ellison to Sexsmith Transmission Tie and the Huth Bus Reconfiguration. The areas served by the Ellison and Sexsmith substations in Kelowna and by Huth Substation in Penticton are urban areas that presently do not meet single contingency (“N-1”) levels of reliability, which is the minimum requirement adopted by most utilities, as acknowledged by the Commission in its Decision G-52-05. The proposed projects will provide N-1 reliability, avoiding extended outages for repair or reconfiguration following interruptions of supply to those areas.

A complete review of the maintenance plans and equipment condition was undertaken as part of the 2005 SDP. The 2005 SDP documents both the age and condition of the facilities and recommends capital spending levels to adequately maintain the safety and reliability of the system. The recommended levels are based on a combination of condition based analysis and criticality of facilities. The sustaining projects contained in the 2011 Capital Plan are consistent with the recommendations of the 2005 SDP.

The completion of these transmission and substation projects supports British Columbia’s energy objectives as defined in the Clean Energy Act, in particular the objective:

> (c) to generate at least 93% of the electricity in British Columbia from clean or renewable resources and to build the infrastructure necessary to transmit that electricity.

The projects also support the Policy Actions outlined in the Energy Plan, in particular Policy Action:

> (12) … to ensure that British Columbia's transmission technology and infrastructure remains at the leading edge and has the capacity to deliver power efficiently and reliably to meet growing demand.

Table 3.1 below summarizes the 2011 and 2012 expenditures for Transmission and Stations projects for which FortisBC is seeking approval, or for which approval has already been granted.

Table 3.1
Transmission and Stations Projects

1		**Approval**	**to 2010**	**2011**	**2012**	**Total**
2	**Growth**	**($000s)**				
3	Okanagan Transmission Reinforcement	C-5-08	89,923	16,056		105,979
4	Ellison to Sexsmith Transmission Tie			667		667
5	Huth Bus Reconfiguration		373	4,674		5,047
6	**Subtotal Growth**		**90,296**	**21,397**		**111,693**
7	**Sustaining**					
8	**Transmission**					
9	Transmission Line Urgent Repairs			468		468
10	Transmission Line Condition Assessment			443		443
11	Transmission Rehabilitation			1,518		1,518
12	Right-of-Way Enhancements			402		402
13	Right-of-Way Reclamation			534		534
14	Transmission Pine Beetle Hazard Tree Removal			242		242
15	**Stations**					
16	Station Condition Assessment & Minor Projects			913		913
17	Station Urgent Repairs			676		676
18	Lambert 230kV Switch Replacement			535		535
19	OKM Load Tap Changers Upgrade			681		681
20	Addition of Arc Flash Detection to Legacy Metal-Clad Switchgear			538		538
21	**Subtotal Sustaining**			**6,950**		**6,950**
22	**Total**		**90,296**	**28,347**		**118,643**

Listed below are further details of the projects contained in the 2011 Capital Plan. For reference, Appendix 2 contains high level maps identifying the major transmission system components in FortisBC's service territory. A list of FortisBC substations is also included in Appendix 2.

TRANSMISSION AND STATION GROWTH PROJECTS

Okanagan Transmission Reinforcement ("OTR")

This project, which was approved by Commission Order C-5-08 on October 2, 2008, is an aggregate of several discrete but related projects that were previously identified in the 2005 SDP. The OTR is the umbrella project that includes the following list of 2005 SDP projects:

- Double Circuit 230 kV Vaseux Lake Terminal to RG Anderson Terminal;
- 230/161/138 kV Bentley Terminal Station;
- 230 kV Vaseux to Bentley;
- Kelowna Shunts; and
- Convert Existing Oliver to 138/63/13 kV Distribution Source Station.

This project provides capacity and reliable service to the customers in the Penticton, Summerland and Kelowna areas.

Commission Order C-5-08 approving the OTR project directed FortisBC to advise the Commission "on the status of the OTR Project cost outlook and the variances from its CPCN Application, and to report on specific measures it has taken, or will take, to control the costs of the OTR Project as part of its next Capital Expenditure Plan filing."

The OTR Project is currently forecast at $109.2 million, $29.9 million under budget (including Cost of Removal). The budget is based on a revised estimate and schedule submitted to the BCUC on March 10, 2009, pursuant to Order C-5-08. Cost savings to date are a result of key equipment, material, and construction labour tenders coming in significantly lower than the 2007 based estimate due to current market conditions. The forecast reflects current contracts in place, contingency and inflation adjustments along with associated AFUDC savings, which are primarily due to a refined schedule, optimized cash flow resulting from staged material and equipment delivery, and contractors' schedule submissions.

Ellison to Sexsmith Transmission Tie

The Ellison and Duck Lake Substations currently are fed radially from the Lee Terminal Station via 46 Line. A fault on this line will cause an outage to both stations. With a single transmission line into the area, it is not possible to completely restore supply until that transmission line is repaired. Additionally, there is minimal distribution backup into this area as the adjacent Sexsmith distribution source is already heavily loaded and is a long distance from the majority of the load concentration (5 kilometres and greater). There are also a number of large customers in this area including the University of British Columbia Okanagan, Kelowna International Airport and Kelowna Flightcraft. These customers would be significantly impacted by an extended outage.

The need for the Ellison to Sexsmith tie was identified in the application for a CPCN for the Ellison Substation, approved by Commission Order C-4-07, and at that time was anticipated to be constructed in 2010. In its 2009 SDP Update, the Company rescheduled the transmission loop for the Sexsmith, Ellison and Duck Lake substations to the 2011 or later timeframe.

With the addition of new distribution load (BC Hydro customers in the Winfield area) onto the Duck Lake Substation in 2010, a transmission outage on 46 Line will affect approximately 9,700 customers served by this line. During the negotiations with BCTC for the Duck Lake Wheeling Agreement, it was understood that two sources of supply were being planned for the Duck Lake substation by 2012 (as documented in the Duck Lake Wheeling Agreement Application approved by Commission Order G-19-10), consistent with the 2009 SDP Update.

This project involves adding a 138 kV line termination and all associated bus work at the Ellison Substation and the construction of a 138 kV line from the Ellison Substation to a tap into 50 Line near the Sexsmith Substation. Subject to detailed engineering, this line will be overbuilt on the existing 13 kV distribution in the area. The construction of this line segment will provide a 138 kV loop in the northern portion of Kelowna, complementing the two existing 138 kV transmission loops, thus providing N-1 transmission reliability for all areas of Kelowna.

This project will also provide the option of taking 46 Line out of service for maintenance thereby eliminating the need for using live-line procedures or taking outages on both the Duck Lake and Ellison Stations when conducting maintenance work on 46 Line. Live-line work at 138 kV is significantly more complex, costly and risky (both in terms of safety and reliability) than work involving de-energized lines.

Figure 3.1 below shows the Kelowna area system and the proposed Ellison to Sexsmith Transmission Tie.

Figure 3.1
Ellison to Sexsmith Transmission Tie

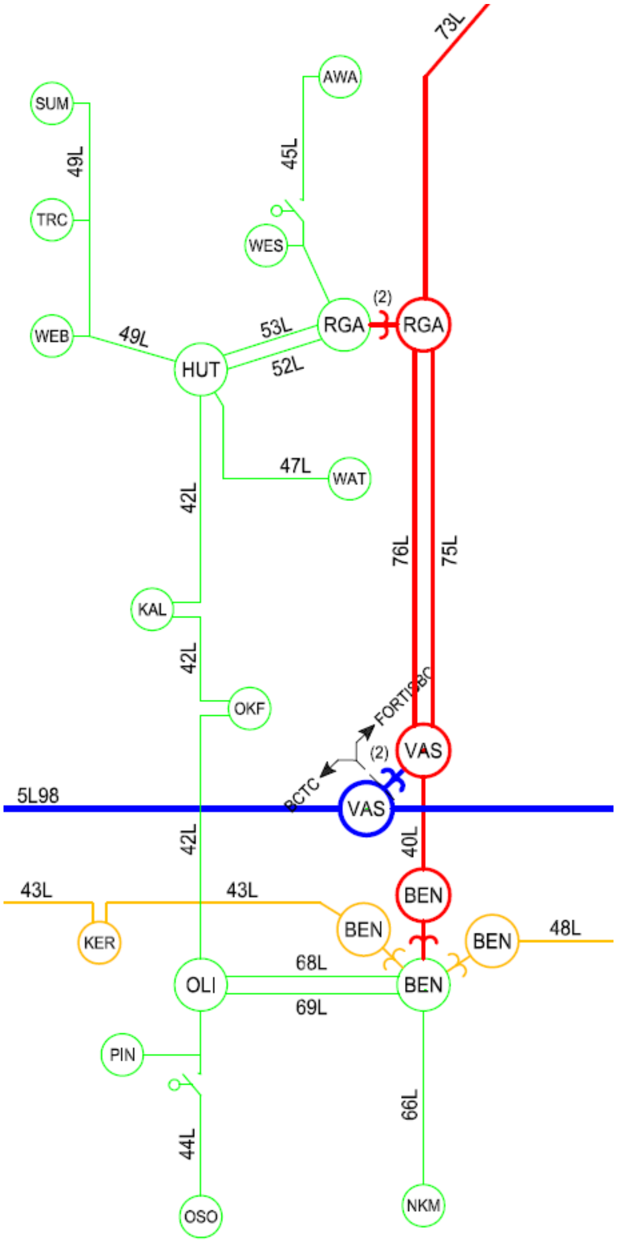
FortisBC is seeking approval for engineering and final estimating for this project in 2011 in the amount of $0.667 million. Expenditures for the execution phase of the project will be the subject of a future application.

Huth Bus Reconfiguration

This project will upgrade the 63 kV facilities at the Huth Avenue Substation (“Huth”) in order to establish an N-1 level of reliability for a population base of approximately 50,000 residents in the area along Okanagan Lake from Summerland in the north to Skaha Lake in the south. These residents are served from Huth, the three substations (Trout Creek, Summerland and West Bench) connected to it via 49 Line, and the Waterford, Okanagan and Kaleden Substations connected via 41 Line and 42 Line. The combined peak load for these substations is in excess of 80 MVA. At the present time, Huth is connected to the RG Anderson Substation in Penticton via 52 Line and 53 Line, and to Oliver Substation in the south via 42 Line. The circuit arrangements at Huth are such that the three lines cannot be operated in parallel. The substation is normally operated with either 52 Line or 53 Line closed and 42 Line open. When the circuit that is serving Huth is subject to an unplanned outage, crews must be dispatched to reconfigure the 63 kV supply to the substation requiring approximately two hours to reconfigure the system and to restore power. FortisBC considers a two hour interruption to a population base of approximately 50,000 to be an unacceptable level of reliability.

This project involves the installation of three termination towers and circuit breakers, a rearrangement of the existing 63 kV bus work and an upgrade to the circuit protection to provide necessary circuit coordination. A single-line diagram of the final area transmission network (following completion of the OTR project and the Huth Reconfiguration) is shown in Figure 3.2.

Figure 3.2
South Okanagan Area Final Transmission Network



A complete ring bus alternative was considered and rejected primarily because the extra cost did not justify the small increase in reliability that would have been gained. Instead, the recommended option is to modify the existing bus arrangement to convert it into a typical single-bus configuration with two source lines (operated in parallel) and five load breakers (two local transformers and three transmission lines). The recommended alternative meets all of the current FortisBC transmission planning criteria and the modifications are consistent with a long-term 63 kV sub-transmission development between Oliver and RG Anderson. Essentially both Oliver and Huth Substations will be supplied by two 63 kV lines each with 42 Line as a tie between the two substations. Overall area reliability and capacity will increase as a result.

This project was originally identified (and proposed as a full ring-bus) as part of the 1998 System Development Plan and subsequently scheduled to be completed in 2010 as part of the 2005 SDP. The construction of this project requires 41 Line and 42 Line to be out of service. However the completion of the OTR project requires that 76 Line be out of service. Outages on 41 Line or 42 Line at the same time as an outage on 76 Line significantly increases the risk of interruptions to customers in this area. Consequently the Huth Substation Rebuild Project was rescheduled to follow the completion of the OTR. This project is required to maintain service reliability for the growing customer base in the south Okanagan area. Expenditures for the planning and engineering phase of this project were approved by Order G-11-09.

The execution of the project is expected to be completed in 2011 at a cost of $4.674 million, for a total project cost, including the engineering phase, of $5.047 million.

SUSTAINING PROJECTS

FortisBC has approximately 58 transmission lines consisting of approximately 1,400 kilometres of line and 15,000 poles. Approximately 65 percent of these lines are more than 30 years old, and some are in excess of 60 years old. The transmission line sustaining projects are required for rehabilitation and ongoing upgrades of the transmission system to ensure safe, reliable service.

Transmission line sustaining programs and projects planned for 2011 are described in more detail following.

Transmission Line Urgent Repairs

The Urgent Repairs project is required to replace transmission line facilities that fail in service due to severe weather, vandalism or other unexpected reasons. The project is required to address public and employee safety issues, environmental concerns and to maintain reliable service to FortisBC customers.

The estimate for this project is based on a three year average of historical expenditure from 2007 to 2009, adjusted for inflation and changes in overheads. The following table shows the actual expenditures for the years 2007 to 2009 as well as the forecast for 2010 and plan for 2011.

Table 3.2
Transmission Line Urgent Repairs

Year	**2007**	**2008**	**2009**	**2010**	**2011**
Cost ($000s)	351	362	526	343	468

Transmission Line Condition Assessment

The transmission system requires a proactive program to manage the risk to employee and public safety, and to ensure an acceptable level of service to FortisBC customers.

The transmission line assessment program is based on an eight-year cycle of inspecting and testing all FortisBC transmission line facilities in order to extend the life of the pole and ensure the integrity of the lines. The program consists of a test and treat component and an above ground visual condition inspection. The test and treat component of the program is aimed at the section of pole at the ground level and below and consists of drilling test holes in each pole to identify internal rot, adding pole treatment into the hole to reduce internal rot, and if needed placing a pole wrap around the base to reduce surface rot. The above ground visual inspection focuses on the condition of the pole itself and all equipment (anchoring, cross-arms, insulators, guying and grounding) above ground. If an issue is detected during the condition assessment then the deficiency is documented and will be corrected under the following year's transmission rehabilitation budget.

The project is required to address public and employee safety issues, environmental concerns and to maintain reliable service to FortisBC customers.

The program is managed in an eight-year cycle to levelize both the budget and the resources required. The condition assessment project will include the following lines in 2011.

Table 3.3(a)
2011 Transmission Line Condition Assessment Projects

	Line	**Location**	**Poles**
1	9E-2	Grand Forks to Ruckles to Christina Lake	364
2	10E-2	Grand Forks to Ruckles to Christina Lake	353
3	43	Bentley to Princeton	1,403
4	43A	Tap to Apex mine	71

The following table shows the actual expenditures for the transmission line condition assessment project for 2007 to 2009 along with the forecast for 2010 and plan for 2011. The estimates are based on historical cost information, adjusted for inflation and changes in overheads, and knowledge of the transmission lines being assessed.

Table 3.3(b)

Transmission Line Condition Assessment

Year	**2007**	**2008**	**2009**	**2010**	**2011**
Cost ($000s)	152	639	413	496	443

Transmission Line Rehabilitation

The specific rehabilitation projects for various transmission lines involve expenditures for structural stabilization of the defects identified for rehabilitation in previous years' assessments. Included in the scope of work is stubbing of poles, replacement of cross-arms and poles, maintenance of structures, insulator changes and guy wire changes.

In 2011 the Company will undertake rehabilitation on the transmission lines assessed in 2010.

This project is required to address public and employee safety issues, environmental concerns and to maintain reliable service to FortisBC customers.

The following table shows the actual expenditures for transmission line rehabilitation for 2007 to 2009 along with the forecast for 2010 and plan for 2011. The estimates are based on historical cost information, adjusted for inflation and changes in overheads, and knowledge of the transmission lines being assessed.

Table 3.4
Transmission Line Rehabilitation

Year	**2007**	**2008**	**2009**	**2010**	**2011**
Cost ($000s)	336	1,316	1,392	1,888	1,518

Right-of-Way Enhancements

This project is required for acquiring rights-of-way and easements for existing power systems that cross over customer property, where a historical trespass situation exists. Easements for new projects are obtained as part of the new project and are not included in this estimate. Expenditures will also address access issues with respect to existing rights-of-way. Many of the transmission lines have no road access to sections of the right-of-way. Access is required for operation and maintenance of these lines. The estimate for this project is based on a three year average of historical expenditure from 2007 to 2009, adjusted for inflation and changes in overheads. The following table shows the actual expenditures for the years 2007 to 2009 as well as the forecast for 2010 and plan for 2011.

Table 3.5
Right-of-Way Enhancements

Year	**2007**	**2008**	**2009**	**2010**	**2011**
Cost ($000s)	332	333	395	345	402

Transmission Right-of-Way Reclamation

The reclamation project is required to allow FortisBC to remove trees and, where necessary and feasible, expand the tree-free zone around the transmission lines. The expanded tree-free zones increase clearances improving both safety and reliability of the transmission system. A tree is removed when it is considered to be a hazard and has a high probability of falling directly onto an energized transmission line or when removal is more economical than cyclical trimming or brushing.

The project is required to address public and employee safety issues, environmental concerns and to maintain reliable service to FortisBC customers.

The planned expenditures for 2011 are based on a three year average of historical expenditure from 2007 to 2009, adjusted for inflation and changes in overheads. The following table shows the actual expenditures for the years 2007 to 2009 as well as the forecast for 2010 and plan for 2011.

Table 3.6
Transmission Right-of-Way Reclamation

Year	**2007**	**2008**	**2009**	**2010**	**2011**
Cost ($000s)	821	162	421	496	534

Transmission Pine Beetle Kill Hazard Tree Removal

This project involves the removal of hazard trees killed by the Mountain Pine Beetle (“MPB”) that have a high probability of falling directly onto energized transmission lines.

A study conducted by the BC Forest Services in 2008 identified the timelines and areas of increased risk due to MPB infestation. The study concluded that the Okanagan, Boundary, and West Kootenay area will have significant Pine Beetle infestation between 2009 and 2015.

Trees that have been attacked by the MPB will deteriorate quickly, losing stem wood strength. Based on discussions with BC Hydro regarding its experience, dead stem wood is failing much quicker than anticipated and Ponderosa pine is failing quicker than Lodgepole pine.

When trees identified within this program fail, they have a high probability of falling directly onto energized lines, breaking conductors, insulators, cross-arms and possibly even the poles themselves. Risks include:

- Downed conductors remaining energized and creating an electrical contact situation;
- Risk of fire due to arcing and ignition of the tree and surrounding foliage even if the conductor does not break; and
- The impact on reliability of an outage which at a minimum requires a line patrol to visually locate the fallen tree and clear it, and may require replacement of damaged components.

The project is required to address public and employee safety issues, environmental concerns and to maintain reliable service to FortisBC customers.

The following table shows the actual expenditures for 2009 along with the forecast for 2010 and plan for 2011.

Table 3.7
Transmission Pine Beetle Kill Hazard Tree Removal

Year	**2009**	**2010**	**2011**
Cost ($000s)	218	821	242

Station Sustaining Programs and Projects

The Station Sustaining projects involve the rehabilitation and ongoing upgrades of the substation system. These projects are necessary to ensure continuous service of the substation system which includes transformers, breakers, batteries, ground grids and related equipment. FortisBC owns 66 substations, which include more than 2,000 major pieces of equipment, and over 2,000 protection and ancillary systems.

These projects are required to maintain service reliability for customers, a safe work environment for employees, and to address any environmental or public safety issues identified during the assessment process.

Station Condition Assessments and Minor Planned Projects

The station condition assessment program reviews the environmental, safety and reliability issues at the Company's 66 substations. Required work identified by the condition assessments is then executed in the following year as minor planned projects. The projects will be executed as scheduled in the budget year unless a new, previously unidentified project deemed of higher priority is approved by Management to replace it. This list of projects may then change throughout the year. The list will be managed as if it were a single project. The Minor Sustaining Capital project is composed of two projects greater than $150,000 in value and a group of projects individually valued under $150,000. The planned expenditure for station assessment and minor planned projects for 2011 is $0.913 million.

Table 3.8
Station Condition Assessments and Minor Planned Projects

1		**2011**	**2012**	**Total**
2		($000s)		
3	Replace DC Protection Systems	257		257
4	Gap - Type Surge Arrestor Replacement	154		154
5	Projects under $150,000	502		502
6	**Total**	**913**		**913**

Replace DC Protection Systems

A DC (direct current) system is required to operate substation protection and control equipment. Batteries supply these systems in the event of a power outage at the station. The protection and control equipment operates station breakers and switches and communicates vital information to the System Control Centre regarding the status of system alarms and transformer monitoring devices. This project will include replacement of battery banks that have been tested and require replacement or reach the end of life.

Replace Gap-Type Silicon Carbide Arrestors

Surge arrestors are used to protect electrical equipment and other assets from lightning and switching surges that can damage equipment. There are two reliability issues involving gapped surge arresters; adequacy of protection and consequential damage resulting from in service failure. Gap-Type Silicon Carbide Surge Arresters have a higher rate of failure than Gapless Metal Oxide Varistor ("MOV") arresters. Replacement of aging and failing Gap-Type Surge Arresters will provide greater protection for existing assets from lightning and switching surges, and because of the potential for explosive failure of surge arresters, replacing the gapped arresters will also improve work site safety.

The replacement of these surge arrestors began in 2009. FortisBC is requesting approval of only the 2011 expenditures in this Application.

Station Urgent Repairs

The station urgent repair project is required to replace station equipment that fails in service due to severe weather, vandalism, or other unexpected reasons. The project is required to address public and employee safety issues, environmental concerns and to maintain reliable service to FortisBC customers. The estimate for this project is based on a three year average of historical expenditure from 2007 to 2009, adjusted for inflation and changes in overheads. The following table shows the actual expenditures for the years 2007 to 2009 as well as the forecast for 2010 and plan for 2011.

Table 3.9
Station Urgent Repairs

Year	**2007**	**2008**	**2009**	**2010**	**2011**
Cost ($000s)	417	597	774	448	676

Lambert 230 kV Switch Replacement

This project involves the 'End of Life' replacement of two motorized disconnect switches at Lambert Terminal Station ("Lambert") to address reliability and operational and safety issues. The disconnect switches involved (2D21 and 2D22) are load break devices and are critical for the timely restoration of the 230 kV supply to Lambert following a transmission line fault on BCTC's Line 2L294.

BCTC transmission line, designated 2L294, supplies Lambert from BCTC's Nelway and Cranbrook Stations at 230 kV. Lambert is connected to 2L294 approximately midway between BCTC's Nelway and Cranbrook stations. During a fault on either section of 2L294, supply to

Lambert is interrupted until the faulted line section can be isolated by operating disconnect switches 2D21 or 2D22 at Lambert. A failure of either switch leaves BCTC's transmission line open and the entire Lambert Terminal Station without supply. Lambert supplies local distribution load, supplies Creston Central substation with transmission and is an alternate transmission supply for the Crawford Bay area.

Numerous problems with disconnect switches 2D21 and 2D22 have been noted over the years. These problems include:

- Seized bearings in the drive mechanisms;
- Binding of the switch arms resulting in blown fuses in the motor operator circuits;
- The poles of the switches do not open symmetrically which causes an unbalance on line 2L294 and results in the line being tripped off by BCTC's line protection. This condition limits the switching conditions to occur only when load carried on 2L294 is under 70 MVA. As a result of this restriction, coordinating maintenance work at Lambert can only be accommodated around BCTC's schedule. 2L294 is one of BCTC's main transmission lines connecting to the Alberta grid system and provides importing and exporting capabilities. This line typically carries over 100MVA of load; and
- Parts are no longer available for the switches due to their 1970s vintage.

In order to address the safety hazards for personnel operating or working near the disconnect switches and to avoid the possibility of future prolonged outages on this main transmission line, the switches need to be replaced. The estimated expenditure for this project is $0.535 million in 2011.

Okanagan Mission Load Tap Changers Upgrade

This project proposes to replace the legacy and underrated On-Load Tap Changer (OLTC) on the Okanagan Mission (OKM) substation transformer T1. The OKM T1 transformer has a capacity rating of 32 MVA with a maximum continuous current rating of 1400 amps, while the present OLTC has a 1200 Amp maximum continuous current rating. This is a limiting factor during peak load periods.

The legacy Federal Pioneer OLTC on the OKM T1 is one of the most problematic legacy units FortisBC has in operation which, as noted in the 2005 SDP, are known for failures due to excessive contact wear as well as insulating oil leakage into the main tank. Voltage disturbances and equipment failures have been experienced as a direct result of this particular tap changer. Similar models have already been replaced in 2002, 2003 and 2005. The failure of an OLTC results in the transformer being unavailable for an extended period of time. In addition, there is the risk of single phasing occurring when an OLTC fails, which may result in damage to some types of customer equipment. The estimated expenditure for this project is $0.681 million in 2011.

Addition of Arc-Flash Detection to Legacy Metal-Clad Switchgear

In 2011 the Company plans to implement a program of installing arc-flash detector relays in legacy metal-clad switchgear installations. Metal-clad switchgear presents a significant risk of injury to operating personnel if a fault occurs within the switchgear. These arc-flash detection devices provide additional protection to operating personnel by significantly reducing the fault detection time, and thus the energy intensity and exposure duration associated with metal-clad insulation failures. During a fault, these relays will trip either the transformer high-side breaker or low-side main breaker, as applicable.

There are approximately 19 locations that are eligible for the program which will be addressed over a five to six year period. FortisBC is developing a program to address this issue at an estimated total cost of $2.7 million. FortisBC is requesting approval for the installation of arc-flash detection relays in three locations with metal-clad switchgear in 2011, at an estimated cost of $0.538 million.

4. Distribution

The 2011 Capital Plan for distribution consists of Distribution Growth projects, including Customer Connects, and Distribution Sustaining projects.

Customer Connects involves projects to provide service to new customers. The remaining projects in the Distribution Growth category are driven by general load growth that over a period of time require capacity upgrades or additions to lines in order to meet service requirements or legislated and industry standards. The 2011 Capital Plan does not contain any planned Distribution Growth projects.

The Distribution Sustaining category includes those projects necessary to rehabilitate or upgrade distribution lines in order to ensure employee and public safety, and reliable customer service.

Table 4.1 below summarizes the 2011 expenditures for Distribution projects for which FortisBC is seeking approval.

Table 4.1
Distribution Projects

1		Approval	2011	2012	Total
2				($000s)	
3	**Growth**				
4	New Connects - System Wide		10,581		10,581
5	Distribution Growth Projects		-		-
6	Unplanned Growth Projects		948		948
7	**Subtotal Growth**		**11,529**		**11,529**
8	**Sustaining**				
9	Distribution Urgent Repair		2,274		2,274
10	Distribution Line Condition Assessment		938		938
11	Distribution Line Rehabilitation		2,331		2,331
12	Distribution Line Rebuilds		1,783		1,783
13	Distribution Right-of-Way Reclamation		578		578
14	Distribution Pine Beetle Hazard Tree Removal		1,913		1,913
15	Small Planned Capital		802		802
16	Forced Upgrades and Line Moves		1,456		1,456
17	**Subtotal Sustaining**		**12,075**		**12,075**
18	**Total**		**23,604**		**23,604**

DISTRIBUTION GROWTH PROJECTS

New Connects System Wide

This project includes the installation of new electric services requiring additions to FortisBC overhead and underground distribution facilities. These capital expenditures allow FortisBC to meet its obligations to provide reliable service to customers in the service area.

All costs except the transformer, drop service and metering equipment (as set out in Schedule 74 of FortisBC's Electric Tariff) are charged to the customer as a Contribution In Aid of Construction ("CIAC"). This project will also fund any "forced upgrade" costs associated with upgrading FortisBC facilities to provide service for the extension or drop service.

The cost of new connects is based on historical averages, adjusted for projected customer growth, inflation and changes to overheads.

The estimated expenditures for this project for 2011 are $10.581 million.

FortisBC notes that its 2009 Rate Design Application ("RDA") is before the Commission at the time of this Application. The RDA proposed a new methodology for calculating the amount that the Company contributes toward the construction of a customer extension. Under the proposed methodology, a capital credit or allowance is provided to each new customer, which is predicated on the amount of investment in distribution poles, conductors, and transformers for each rate class covered in the applicable retail rate. Any investment in poles, conductors and transformers needed to provide service to a new customer in excess of this credit or allowance would be paid as a capital contribution by the new customer.

If the RDA is approved as filed, the Company contribution of the transformer, drop service and meter will be replaced by the capital credit in 2011. This change is not expected to have a material impact on the estimated expenditures for this project.

Unplanned Growth Projects

Capacity upgrades and line extensions are required periodically to keep pace with normal load growth on the distribution system and to ensure continuing acceptable standards of service. These service standards include operation of facilities at or below normal continuous thermal limits, maintaining voltage consistent with CSA recommended levels, and short circuit levels in a range to allow for safe operation of the electrical system. Capacity increases must also be designed to provide sufficient redundancy to maintain supply during planned and unplanned outages on the distribution system.

Experience has shown that unforeseen load emergence will require capacity upgrades and voltage correction projects not specifically identified in the capital planning process. The projects typically include service upgrades, voltage regulation, ties to accommodate load splitting, single phase to three phase upgrades and conductor upgrades. Also included is the interconnection of feeders to permit load transfers. As the distribution load grows in different areas, feeder loading becomes unbalanced; the interconnection of feeders allows FortisBC to optimize loading. This project is required to provide for such items that were unforeseen at the time the expenditure plan was prepared.

The estimates are based on a three year average of historical expenditure from 2007 to 2009, adjusted for inflation and changes in overheads. The following table shows the actual expenditures for the unplanned growth project for the years 2007 to 2009 as well as the forecast for 2010 and plan for 2011.

Table 4.2
Unplanned Growth Projects

Year	**2007**	**2008**	**2009**	**2010**	**2011**
Cost ($000s)	1,063	832	596	994	948

DISTRIBUTION SUSTAINING PROGRAMS AND PROJECTS

The distribution sustaining projects are for rehabilitation and ongoing upgrades of the distribution system to ensure safe, reliable service.

Distribution Urgent Repairs

Component failures on the distribution system, for example due to weather, defective equipment, animal intrusions, vandalism, abnormal operating conditions, or vehicle collisions, can cause outages or present risks that must be addressed in an expedient manner.

This program is required to address public and employee safety issues, environmental concerns and to maintain reliable service to FortisBC customers.

The planned expenditures for this program are based on a three year average of historical expenditure from 2007 to 2009, adjusted for inflation and changes to overheads. The following table shows the actual expenditures for the years 2007 to 2009 as well as the forecast for 2010 and plan for 2011.

Table 4.3
Distribution Urgent Repairs

Year	**2007**	**2008**	**2009**	**2010**	**2011**
Cost ($000s)	2,030	2,244	1,706	1,805	2,274

Distribution Line Condition Assessment

The distribution system requires a proactive program to manage the risk to employee and public safety, and to ensure an acceptable level of service.

The distribution line assessment program is based on an eight-year cycle of inspecting and testing all FortisBC transmission line facilities in order to extend the life of the pole and ensure the integrity of the lines. The program consists of a test and treat component and an above ground visual condition inspection. The test and treat component of the program is aimed at the section of pole at the ground level and below and consists of drilling test holes in each pole to identify internal rot, adding pole treatment into the hole to reduce internal rot, and if needed placing a pole wrap around the base to reduce surface rot. The above ground visual inspection focuses on the condition of the pole itself and all equipment (anchoring, cross-arms, insulators, guying and grounding) above ground. In underground systems, the distribution line condition assessment consists of visually inspecting all accessible underground facilities for overall condition (connector heat scanning, corrosion, moisture, vegetation, rodents, etc.). If an issue is detected during the condition assessment then the deficiency is documented and corrected under the following year’s distribution rehabilitation budget.

The following tables show the distribution lines scheduled for assessment in 2011.

Table 4.4(a)
2011 Distribution Line Condition Assessment Projects

1	Area	Substation	Feeder	Poles
2	Kootenay	Creston	CRE1	1,742
3	Kootenay	Lambert	AAL3	363
4	Kootenay	Blueberry	BLU1	260
5	Kootenay	Ruckles	RUC5	867
6	Kootenay	Fruitvale	FRU1	1,125
7	Kootenay	Beaver Park	BEP1	378
8	Kootenay	Beaver Park	BEP2	920
9	Kootenay	Cascade	CSC1	318
10	North Okanagan	Big White	BWS1 BWS2 BWS3	843
11	North Okanagan	Duck Lake	DUC2	470
12	North Okanagan	Hollywood	HOL2	324
13	North Okanagan	Hollywood	HOL4	398
14	North Okanagan	Hollywood	HOL5	1,076
15	North Okanagan	Hollywood	HOL7	182
16	North Okanagan	Joe Riche	JOR1	1,017
17	South Okanagan	Keremeos	KER1	1,698
18	South Okanagan	Oliver	OLI1	1,286
19	South Okanagan	Oliver	OLI2	699
20	South Okanagan	Arawana	AWA1	630
21	South Okanagan	Princeton	PRI4	1,664
22			Total	16,260

The following table shows the expenditures for the distribution line condition assessment project for the years 2007 to 2009 as well as the forecast amount for 2010 and plan for 2011. The estimates are based on historical information adjusted for inflation and overheads, and knowledge of the distribution lines being assessed.

Table 4.4(b)
Distribution Line Condition Assessment

Year	2007	2008	2009	2010	2011
Cost ($000s)	928	692	659	667	938

Distribution Line Rehabilitation

The specific rehabilitation work for the various distribution lines involve expenditures for stubbing poles, replacing poles, replacing cross-arms, guy wires, hot tap connectors, and other defects identified for rehabilitation in previous years assessments.

In 2011 the Company will undertake rehabilitation of the distribution lines assessed in 2010.

In 2009, the Company introduced an initiative in conjunction with the other distribution rehabilitation initiatives. This initiative, commonly referred to as “Hot Tap Connector Replacement”, involves the removal of hot tap connectors that are connected directly to the primary line and the installation of a device called a stirrup to provide a location to which the hot tap connector can be safely attached. This initiative addresses employee and public safety, and reliability issues associated with conductor burn off caused by deteriorated hot tap connectors. In the Company’s 2009-2010 Capital Plan, it was estimated that expenditures of approximately $0.5 million per year would be required for the years 2011 to 2016 to cover the cost of this initiative. These additional expenditures for 2009 and 2010 were approved by Commission Order G-11-09.

The program is required to address public and employee safety issues, environmental concerns and to maintain reliable service to FortisBC customers.

The following table shows the actual expenditures for the distribution line rehabilitation program for the years 2007 to 2009 as well as the forecast amount for 2010 and plan for 2011. The estimates are based on historical information adjusted for inflation and changes to overheads, and knowledge of the distribution feeders being assessed, supplemented with funds for the hot tap connector replacement initiative.

Table 4.5
Distribution Line Rehabilitation

Year	2007	2008	2009	2010	2011
Cost ($000s)	1,231	3,000	2,634	3,209	2,331

Distribution Line Rebuilds

This project involves the replacement of aged and/or deteriorated equipment. Items include rebuilding failing overhead and underground conductor and includes replacing rotted poles and platforms, replacing leaking transformers, installing ground grids at ungrounded services, and the replacement of copper conductor in areas considered to be a risk to public or employee safety. These deficiencies were identified through site assessments and normal daily operations.

The project is required to address public and employee safety issues, environmental concerns and to maintain reliable service to FortisBC customers.

The following table shows the actual expenditures for the years 2007 to 2009 as well as the forecast for 2010 and plan for 2011.

Table 4.6
Distribution Line Rebuilds

Year	2007	2008	2009	2010	2011
Cost ($000s)	1,470	1,284	1,056	1,167	1,783

Distribution Right-of-Way Reclamation

The reclamation program is required to allow FortisBC to remove trees and, where necessary and feasible, expand the tree-free zone around its distribution lines. The increased tree-free zones improve clearances, enhancing both safety and reliability of the distribution system. A tree is removed when it is considered to be a hazard and has a high probability of falling directly onto an energized distribution line or when removal is more economical than cyclical trimming or brushing.

The program is required to address public and employee safety issues, environmental concerns and to maintain reliable service to FortisBC customers.

The planned expenditures for 2011 are based on a three year average of historical expenditure from 2007 to 2009, adjusted for inflation and changes to overheads. The following table shows the actual expenditures for the years 2007 to 2009 as well as the forecast for 2010 and plan for 2011.

Table 4.7
Distribution Right-of-Way Reclamation

Year	**2007**	**2008**	**2009**	**2010**	**2011**
Cost ($000s)	641	327	558	646	578

Distribution Pine Beetle Kill Hazard Tree Removal

This program involves the removal of hazard trees killed by the Mountain Pine Beetle (“MPB”) that have a high probability of falling directly onto energized distribution lines.

A study conducted by the BC Forest Services in 2008 identified the timelines and areas of increased risk due to MPB infestation. The study concluded that the Okanagan, Boundary, and West Kootenay area will have significant Pine Beetle infestation between 2009 and 2015.

Trees that have been attacked by the MPB will deteriorate quickly, losing stem wood strength. BC Hydro experience indicates that dead stem wood is failing much quicker than anticipated and that Ponderosa pine is failing quicker than Lodgepole pine.

When trees identified within this program fail, they have a high probability of falling directly onto energized lines. The size of tree involved can break conductors, insulators, cross-arms and possibly even the poles themselves. Risks include:

- Downed conductors remaining energized and creating an electrical contact situation;
- Risk of fire due to arcing and ignition of the tree and surrounding foliage even if the conductor does not break; and
- The impact on reliability of an outage which at a minimum requires a line patrol to visually locate the fallen tree and clear it, and may require replacement of damaged components.

The program is required to address public and employee safety issues, environmental concerns and to maintain reliable service to FortisBC customers.

The following table shows the actual expenditures for 2009 along with the forecast for 2010 and plan for 2011.

Table 4.8
Distribution Pine Beetle Kill Hazard Tree Removal

Year	**2009**	**2010**	**2011**
Cost ($000s)	1,721	551	1,913

Small Planned Capital

This program is similar to the Distribution Condition Assessment and Rehabilitation programs but captures off-cycle work required to keep the distribution lines safe and reliable. Each year operational and safety concerns on the distribution system including storm damage, clearance problems and aging equipment, are identified by field staff outside of the normal assessment cycle. Repairs to address these concerns are required to maintain a safe and reliable distribution system. The repairs are generally non-urgent in nature and consequently are not completed under the distribution urgent repair program. They are normally completed within one year of the initial request. The planned expenditures for this program are based on a three year average of historical expenditure from 2007 to 2009, adjusted for inflation and changes to overheads. The following table shows the actual expenditures for the years 2007 to 2009 as well as the forecast for 2010 and plan for 2011.

Table 4.9
Small Planned Capital

Year	**2007**	**2008**	**2009**	**2010**	**2011**
Cost ($000s)	1,030	481	596	747	802

Forced Upgrades and Line Moves

This program is required to complete distribution upgrades driven by third party requests. Relocation of distribution lines due to highway/road widening or improvements will be initiated based on requests from the BC Ministry of Transportation and/or municipalities. Miscellaneous customer line move requests where FortisBC does not have sufficient land rights for the facilities located on customer property are also included in this program. The planned expenditures for this program are based on a three year average of historical expenditure from 2007 to 2009, adjusted for inflation and changes to loadings. The following table shows the actual expenditures for the years 2007 to 2009 as well as the forecast for 2010 and plan for 2011.

Table 4.10
Forced Upgrades and Line Moves

Year	**2007**	**2008**	**2009**	**2010**	**2011**
Cost ($000s)	1,564	385	1,908	1,461	1,456

5. Telecommunications, SCADA, and Protection and Control Projects

FortisBC operates a telecommunications system to support protection, control and monitoring of the power system, as well as operations and business communications requirements. Approximately 102 locations are presently or potentially served by the telecommunications system, including 66 stations, 12 mountain-top radio repeaters and 6 office locations. The telecommunications system also connects to other utilities for the exchange of protection signals and operational voice and data communications.

The Telecommunication Projects are consistent with the Policy Actions contained in the Energy Plan, in particular Policy Actions:

> (12) … to ensure that British Columbia's transmission technology and infrastructure remains at the leading edge and has the capacity to deliver power efficiently and reliably to meet growing demand; and
>
> (14) to ensure the province remains consistent with North American transmission reliability standards

FortisBC's proposed Telecommunications Projects will also facilitate the government's goal, enunciated in section 17 (6) of the Clean Energy Act, of having advanced meters and smart grid technology in use for all electricity customers in British Columbia.

Table 5.1 below summarizes the 2011 and future expenditures for Telecommunications, SCADA, and Protection and Control projects for which FortisBC is seeking approval, or for which approval has already been granted.

In addition to the ongoing Distribution Substation Automation project, FortisBC is proposing two projects for the enhancement of its fibre-optic communications network. The telecommunications system is an integral component of the protection relaying system, Remedial Action Schemes, substation operations and control, and generation dispatch systems. Presently FortisBC's fibre-optic based communications infrastructure is a combination of Company-owned and leased systems. The two projects proposed will improve the adequacy and security of FortisBC's telecommunications, commensurate with the increasing importance of this infrastructure to the Company's operations and to the bulk electric system.

Table 5.1
Telecommunications, SCADA, and Protection and Control Projects

1		Approval	to 2010	2011	2012	Total
2	**Growth**	($000s)				
3	Distribution Substation Automation Program	C-11-07	4,966	1,540		6,506
4	Kelowna 138kV Loop Fibre Installation			3,382		3,382
5	Grand Forks to Warfield Fibre Installation			667		667
6	**Subtotal Growth**		**4,966**	**5,589**		**10,555**
7	**Sustaining**					
8	Lee to Vernon 230kV Line Protection Upgrade			1,286		1,286
9	Communication Upgrades			265		265
10	**Subtotal Sustaining**			**1,551**		**1,551**
11	**Total**			**7,140**		**12,106**

GROWTH PROJECTS

Distribution Substation Automation Program

This project involves the provision of remote monitoring and control to distribution level substations, including power-quality monitoring of lines, transformers and feeders, fault recording and locating, and equipment condition monitoring. FortisBC has already developed standardized protection, control and monitoring systems that are applied to new substation construction. This project will retrofit these systems to the remainder of the legacy distribution substations. The scope of the project and the location of the substations to be addressed was the subject of a CPCN Application which was approved by Commission Order C-11-07.

The project is expected to be completed in 2011 at an estimated cost of $1.540 million; the total estimate for the project is $6.506 million.

Kelowna 138 kV Loop Fibre Installation

This project is the first stage of a multiple-year project to improve the communications and protection systems in the Kelowna area. Following the completion of the Benvoulin Substation in 2010, there will be twelve distribution and terminal stations which supply the customer load in the Kelowna area. Of the twelve stations, currently only five (the Lee and Bell Terminals and the Black Mountain, Ellison and Duck Lake Substations) have fibre-optic connectivity. The remaining seven facilities (Sexsmith, Glenmore, Recreation, Saucier, Hollywood, OK Mission, and Benvoulin) are distribution substations that collectively serve over 40,000 direct and indirect customers with a combined peak load of 240 MW. The only communications to these sites is via a FortisBC-owned multipoint microwave system supplemented by leased facilities from local telecommunications providers. Both of these systems have reliability issues and in the case of the leased services there are associated ongoing monthly O&M costs, in addition to the potential contractual risk associated with ownership of the facilities by a third party.

There are four 138-kV transmission lines which supply nine distribution substations in Kelowna. Each of these lines is operated radially supplying between two to five substations. This operating configuration can result in widespread and lengthy outages following a single contingency. In current operations, if a permanent fault occurs on a transmission line section, the first step is to determine the location of the line fault. Once this is done, the System Control Centre dispatchers can then isolate the faulted section and manually reconfigure the network to restore power to the affected stations. This procedure is normally done by remote control; however, it can still take up to 30 minutes to fully restore all load. This has historically been referred to as “N-1 (long-term outages)” reliability.

The radial operating configuration described above is necessary because the distribution substations lack the protection and communications equipment to permit meshed operation of the transmission lines. Once all phases of the proposed project are complete, all Kelowna-area substations will have full fibre-optic connectivity and it will be possible to operate the Kelowna subtransmission network in a fully meshed configuration such that the loss of one supply source does not result in the loss of any substation load. This level of reliability is referred to as “N-1 (all outages)” reliability.

Due to the significant amount of load potentially exposed to long duration outages, FortisBC considers it appropriate to begin implementation of this project which will improve the safety and reliability for this growing urban area. Additionally, completion of all phases of this project will provide high-bandwidth communications for current-day operations as well as support future Smart Grid initiatives such as FortisBC’s planned Advanced Metering Infrastructure project or distribution network automation. It will also reduce operating costs by reducing the dependence on third-party providers both for operational and corporate communications.

This fibre will reduce operating costs by replacing existing microwave communication equipment which is both aged (approximately 20 years old) and unreliable, as well as removing the dependency on third-party telecommunications providers for critical operational communications. The existing Kelowna-area microwave system is intended to carry critical operations traffic such as SCADA control and monitoring information back to the FortisBC System Control Centre. This system has proven to be unreliable and difficult to maintain. The master radio for this system is located at a mountain-top site which is shared with numerous other telecommunications companies and their transmitting equipment. Maintaining and troubleshooting equipment at this site is difficult due to the high elevation which precludes vehicle access for much of the year due to snow. During the winter months (typically from November through April at this elevation) access via helicopter is the only practical method. This is costly as well as unpredictable as extensive valley cloud cover during the winter can prevent even helicopter access to the mountain-top site for significant portions of the winter months. FortisBC estimates that approximately $50,000 of operating and maintenance costs have been incurred maintaining and troubleshooting problems with this system since 2006.

If radio system failures occur at the same time as a major station or transmission outage, it may be impossible for the System Control Centre to reconfigure the power system by remote control. Instead, crews need to be dispatched to individual substations to operate the backup local control systems. The field crews attempt to restore the system under the voice direction of the SCC dispatchers. However, when power is lost to one or more substations the consequent effects on the area can be significant; even short outages to traffic control signals can create traffic jams which significantly delay the crews from reaching the substations to operate them locally. In situations where remote control of the stations is lost, outages which could be resolved within minutes could instead take multiple hours to fully restore all customer load. FortisBC considers this unacceptable in an urban area such as Kelowna.

Following is a high-level summary of each stage:

Stage 1 – 2011	Install 25 kilometres of overhead fibre-optic cable in the Kelowna area to interconnect all distribution substations.

Stage 2 – 2012	Install fibre-optic multiplexing equipment at seven distribution substations for SCADA, voice and teleprotection communications.
Stage 3 – 2013 to 2016	Install protection relays and perform necessary station modifications to allow the Kelowna 138 kV subtransmission system to be operated fully meshed.

Of the total 25 kilometres in fibre cable identified for Stage 1, approximately 20 kilometres will be installed (under-built) on existing FortisBC 138 kV transmission lines and approximately 5 kilometres will be installed on existing distribution circuits (overhead or underground depending on the availability of existing infrastructure).

The deficiencies and recommended improvements for the Kelowna subtransmission system were first introduced in the FortisBC 2005 System Development Plan (SDP) with the project name "Close 138 KV Loops Kelowna". At that time, the complete project was scheduled for the 2006 to 2009 timeframe. In the 2007 SDP Update the project was deferred to the 2010/12 timeframe due to the large amount of substation work which was both upcoming and underway in the Kelowna area. In the 2009 SDP Update, the meshing of the Sexsmith, Ellison and Duck Lake Substations was rescheduled for the 2011/12 timeframe. The initial phase of that project is described separately in this Application as the "Ellison to Sexsmith Transmission Tie". Meshing of the remainder of the Kelowna area was deferred to the 2012 or later timeframe. The multi-year, multi-stage project described in this section will complete the meshing of the sub-transmission system as originally envisioned in the 2005 SDP.

FortisBC has investigated alternate communications methods including power-line carrier, wireless and leased communications. FortisBC standards do not permit the use of third-party (leased) equipment for teleprotection communications circuits. These circuits must have very high reliability (due to equipment and life-safety issues associated with protection signaling) and third-party providers are unable to meet the needed reliability levels. Wireless and power-line carrier solutions were found to be either more costly or technically infeasible compared to the recommended solution.

At this time, FortisBC is only seeking approval for the 2011 costs to install the inter-substation fibre-optic cable at an estimated cost of $3.382 million. This cable will be under-strung on existing FortisBC transmission and distribution structures. No new rights-of-way or line construction is required. FortisBC will request approval of expenditures for Stages 2 and 3 of this project, estimated to be $12.4 million, in a future application.

Grand Forks to Warfield Fibre Installation

This project addresses a portion of the communications constraints identified in the 2005 SDP (“Mawdsley-Okanagan High Capacity Communication Network”), which anticipated the implementation of fibre-optic technology to improve the reduced level of system communications and protection and control in the Oliver to Trail cross-section. A portion of this link (between Oliver and Grand Forks) has already been completed as part of the Kettle Valley Substation project. Currently, FortisBC operates two major fibre-optic backbones, one in the Kootenays and one in the Okanagan. There is a gap between the backbones as there is no fibre-optic cable installed between Grand Forks and Warfield, as shown in the following map.

Figure 5.1
Fibre-Optic Network

At the present time this gap is mitigated by the use of leased-line communications and by a small number of data channels provided by the BC Hydro microwave system between Vaseux Lake and Kootenay Canal.

This project will install a high-speed fibre-optic communication link connecting the substations in the South Okanagan, Boundary and Kootenay areas. It will be comprised of a new 72 strand fibre-optic cable between the Grand Forks and Mawdsley Terminal Stations, complete with required splice points and fibre-optic terminations at both substations, and will be patched through existing fibre-optic cable to the FortisBC System Control Centre. It is required for system protection purposes as well as for monitoring and controlling the system remotely. It will displace existing east-to-west leased lines currently used for system control and operational communications and alleviate the need for new leased-lines for future substations. This will help reduce the dependence on third-party telecommunication providers for critical operations data. The backbone will provide ample capacity to meet FortisBC's Okanagan to Trail operational and corporate telecommunications needs well into the future.

FortisBC is seeking approval for engineering and final estimating for this project in 2011 at a cost of $0.667 million. Expenditures for the execution of the project, estimated at $4.4 million, will be the subject of a future application.

SUSTAINING PROJECTS

These projects include protection and fault locating upgrades, utility systems standards compliance and communication upgrades. They will enhance the protection, control and monitoring of the FortisBC power system as well as operations and business communications requirements.

Lee to Vernon 230 kV Line Protection Upgrades

This project will update the relaying and teleprotection equipment for 72 Line (“72L”) and 74 Line (“74L”) at both FortisBC’s Lee and BCTC’s Vernon Terminal stations. As well, the protection relays on 73 Line (“73L”) at Lee will be replaced to be consistent with the devices installed on 72L and 74L (the relays at the other ends of 73L have been upgraded under previous projects). The existing analog teleprotection equipment will be retired and direct, digital relay-to-relay communications will be used instead to provide improved reliability and power quality. For example, additional functionality of the new equipment will include continuous self-monitoring to immediately provide an indication and location of problems experienced by the protection system, thus improving response time for corrective action. Power quality for the entire Kelowna area will be improved by reducing the duration of voltage disturbances during power system faults.

The existing protection equipment on the two 230 kV lines (72L and 74L) between Lee Terminal and Vernon Terminal was last updated in 1996 when the 230 kV ring bus was first installed at the Lee Terminal. The protection relays are some of the earliest microprocessor-based devices which were installed by FortisBC. While the protection relays themselves have provided reliable service for 14 years, devices of this vintage do not offer the features provided by current-generation products. More critically, the underlying teleprotection equipment between Lee and Vernon is much older and dates to the 1970s. This teleprotection equipment is analog based and spare parts are no longer available. A failure of either the relaying or teleprotection equipment could affect the reliability of the two 230 kV transmission lines between Lee and Vernon. While these lines are owned by FortisBC, they are part of the Okanagan bulk electric system and provide a utility interconnection at the Vernon Terminal; thus, both FortisBC and BCTC consider these lines to be directly subject to scrutiny under the BCUC's Mandatory Reliability Standards (MRS) program. Misoperations and/or equipment failures could make FortisBC subject to sanctions under the MRS program. The estimated expenditure for this project is $1.286 million in 2011.

Communication Upgrades

This project will upgrade telecommunications routes and will improve emergency response capability. With the recent upgrades approved in previous capital plans, much of the FortisBC communications infrastructure has been modernized. However, there still remains some telecommunication equipment which is near or beyond its designed operational life. Individual components are unreliable, and the manufacturers no longer supply spare parts. In some extreme cases, equipment can no longer be regularly tested and adjusted because it fails when test systems are operated, which results in it not being able to be put back into service in a timely manner. This equipment can cause failure of the transmission and distribution systems it supports, or prevent restoration efforts, exposing the system to possible equipment damage, extended outage times, or possibly causing public safety issues. The Communications Upgrade project is composed of a group of projects individually valued under $75,000. The estimated expenditure for this project is $0.265 million in 2011.

6. General Plant

General plant consists of vehicles, metering, information systems, telecommunications, buildings, furniture and fixtures, and tools and equipment. Expenditures in 2011 also include regulatory and legislative compliance initiatives.

The proposed General Plant Projects support British Columbia's energy objectives as defined in the Clean Energy Act, in particular the objectives:

> (b) to take demand-side measures and to conserve energy, including the objective of the authority reducing its expected increase in demand for electricity by the year 2020 by at least 66%;
>
> (g) to reduce BC greenhouse gas emissions…; and
>
> (h) to encourage the switching from one kind of energy source or use to another that decreases greenhouse gas emission in British Columbia.

The proposed projects also support Policy Actions contained in the Energy Plan, in particular Policy Action:

> (14) ensure that the province remains consistent with North American transmission reliability standards.

The following table shows the 2011 expenditures for General Plant.

Table 6.1
General Plant Projects

1		Approval	to 2010	2011	2012	Total
2		($000s)				
3	Manadatory Reliability Standards Compliance	G-67-09, G-162-09	2,000	595		2,595
4	Vehicles			2,000		2,000
5	Meter Inventory			213		213
7	Information Systems			5,550		5,550
8	Telecommunications			358		358
9	Buildings			1,244		1,244
10	Kootenay Operations Centre			485		485
11	Kelowna Long Term Solution			489		489
12	Furniture and Fixtures			176		176
13	Tools and Equipment			601		601
14	PCB Environmental Compliance			1,852		1,852
15	**Total**		**2,000**	**13,563**		**15,563**

The following sections provide a brief description of the General Plant requirement for 2011.

MANDATORY RELIABILITY STANDARDS COMPLIANCE

This project is the continuation of compliance efforts for the Mandatory Reliability Standards as approved by Commission Order G-67-09. The 2011 expenditures are related to the completion of the projects to implement protection and the recovery plan for the Company's Critical Cyber Assets. The work includes installation of an electronic security perimeter (firewalls), physical security (primarily lockable cabinets and card readers) and a backup system control centre. Capital expenditures for 2010 were included in FortisBC's 2010 Revenue Requirements Application, approved by Commission Order G-162-09. The project will be completed in 2011 with estimated expenditures of $0.595 million.

VEHICLES

This project involves the replacement and/or addition of heavy fleet vehicles, service vehicles, passenger vehicles, equipment and off road vehicles necessary for FortisBC to conduct its operations in a safe and efficient manner.

FortisBC has 346 units in its fleet, of which 280 units are owned and 66 units are leased.

In 2011 FortisBC plans to replace twenty-three units. Consistent with the government's energy objective regarding greenhouse gas reduction, the Company's fleet currently has four hybrid low emission passenger vehicles and a hybrid low emission service truck. The Company is planning to continue to monitor progress with hybrid vehicle technology and evaluate such units as part of its ongoing purchases.

FortisBC's equipment replacement guidelines are listed in Table 6.2(a) below. In making an individual replacement decision many key issues are considered including, suitability to meet current and future business requirements, ability to maintain adequate safety, age, condition, and compliance with regulations. A replacement decision is done on a unit by unit basis.

Table 6.2(a)
Replacement Criteria Trigger

Class	Description	Trigger
1	Passenger Vehicles	5 years/160,000 km
2	3/4 Tons & Smaller	5 years/160,000 km
3	Service Vehicles (3/4 and 1 Tons) 2 Wheel Drive	5 years/160,000 km
4	Service Vehicles (3/4 and 1 Tons) 4 Wheel Drive	5 years/160,000 km
5	Single Axle Line Truck (Digger or Aerial) 2 Wheel Drive	10 years/160,000 km
6	Single Axle Line Truck (Digger or Aerial) 4 Wheel Drive	10 years/160,000 km
7	Specialty and Small Horsepower (Forklifts, Snowmobiles, ATVs, etc.)	Individual Review
8	Trailers	20 years
9	Tandem Axle Line Truck (Digger or Aerial)	10 years/160,000 km

All units to be replaced have either exceeded their planned life cycle or are becoming a safety, reliability or compliance risk.

Table 6.2(b) lists the units to be replaced in 2011 at an estimated cost of $2.0 million. Included in the expenditure forecast is an allowance for approximately $100,000 per year to address any unanticipated requirements. This may include upgrading the specification on an existing vehicle that is to be replaced, replacing a damaged unit, or adding a new unit to the fleet.

Table 6.2(b)
Vehicle Replacements

	Category	No. of Units
1	Heavy Fleet Vehicles	3
2	Service Vehicles	17
3	Off-Road Vehicles/Trailers	3
4	Total Units	23
		($000s)
5	Total Replacement Cost	1,900
6	Contingency	100
7	Total Cost	2,000

METER INVENTORY

This project involves the purchase of new revenue metering infrastructure driven by customer growth as well as replacement for metering equipment that fails during the metering compliance or meter re-test program. Metering infrastructure includes meters, current transformers, potential transformers and ancillary equipment. The estimated expenditure for this project is $0.213 million in 2011.

INFORMATION SYSTEMS

FortisBC's Information Systems expenditures focus on enhancing and upgrading its information system infrastructure and core applications. FortisBC relies on a base of core applications, including SAP (Financial, Human Resources, Project Management and Materials Management), CIS (Customer Information System), Java based Intranet/Internet, AM/FM (Asset and Facilities Management), SCADA (System Control and Data Acquisition), and Cascade (Plant Maintenance). These applications are used to support the Company's business and technology requirements. FortisBC carefully selected these core systems for their scalability and technology, which allow them to be upgraded, enhanced and integrated without having to acquire and implement a totally new solution. The Company's strategy is to utilize the capabilities of these applications to improve safety, reliability, efficiency and customer service.

Enhancements to existing systems are initiated on a regular basis when a business requirement or opportunity arises that requires a long term solution. This has proven to be a more productive and manageable approach than collecting requirements over time and then implementing a large scale and all encompassing upgrade. These enhancements do not generally include additional licenses or hardware, but do include configuration, integration and process modification to take advantage of a particular application's inherent functionality.

Upgrades are undertaken when existing infrastructure, database or application versions are outdated to the point that they have the potential to cause productivity or reliability issues. The 2011 upgrade projects are associated with both the System Infrastructure and the Desktop Infrastructure categories.

The 2011 capital expenditures for information and business systems are primarily based on enhancing and upgrading existing technologies, system and business applications to leverage the capabilities of the existing applications and to sustain the existing infrastructure. These enhancements have been identified by the application users in conjunction with the information systems group as being necessary to maintain or improve business operations. This is common practice in other organizations that recognize the benefit of enhancing existing systems as compared to acquiring and implementing new systems, and is consistent with FortisBC's previous capital expenditure plans.

The following projects, planned for 2011, have been recognized as being critical to improving safety, productivity, customer service and efficiency by enhancing functionality and operability.

Table 6.3
Information Systems Projects

1		**2011**	**2012**	**Total**
2		($000s)		
3	Infrastructure Upgrade	939		939
4	Desktop Infrastructure Upgrade	1,010		1,010
5	SAP & Operations System Enhancements	1,198		1,198
6	AM/FM Enhancements	493		493
7	Customer Service Systems Enhancements	904		904
8	SCADA Enhancements	528		528
9	HR Payroll Conversion	478		478
10	**Total**	**5,550**		**5,550**

The following provides details with respect to the projects planned for 2011.

Infrastructure Upgrade

The infrastructure upgrade project includes replacing outdated hardware and software (operating systems and related server software) in the data centre and supporting infrastructure (switches and routers that tie the Wide Area Network together). There is approximately $2.9 million worth of hardware and software associated with the Company's Information System infrastructure. The life expectancy of the hardware infrastructure components is a maximum of five years, based on industry standards and manufacturers' support, while operating systems are typically upgraded every two years to maintain vendor support. The budget is predicated on a 20 percent replacement of the asset based on this five year life cycle. This avoids the complete replacement of all equipment once every five years and the resource issues and work disruption that would result.

Equipment and software designated for upgrade typically include servers at end of life, disk drives that have passed maximum life expectancy (over ten terabytes of disk space in the data centre), networking infrastructure replacements (failed switches, routers and hubs) and operating system and database upgrades.

The following table shows the actual expenditures for 2009 along with the forecast for 2010 and plan for 2011.

Table 6.3(a)
Infrastructure Upgrade

Year	**2009**	**2010**	**2011**
Cost ($000s)	733	794	939

Desktop Infrastructure Upgrade

Desktop Infrastructure Upgrade includes Microsoft Windows operating system, Microsoft Office Suite and other job specific hardware and software upgrades for FortisBC's personal computers (PC) environment. It is a phased approach to keeping approximately 600 PCs current and supportable, rather than replacing all PC equipment and software every five years. The life expectancy of the desktop hardware is a maximum of five years based on industry standards and manufacturers' support. The phased strategy avoids the resourcing issues that occur with large wholesale changes. The total value of FortisBC's desktop hardware and related peripherals is approximately $3 million. The Desktop Infrastructure Upgrade budget is based on a 20 percent replacement of the asset based on this five year life cycle. This avoids the complete replacement of all equipment every 5 years and the resource issues and work disruption that would result.

This project also includes the cost necessary to replace fax machines, telephones and photocopiers/printers to maintain reliability and compatibility with industry standards. This is also a staged approach based on standard lifecycles.

An asset management tool is used to track the age of all technology assets at FortisBC to ensure they are replaced in a timely manner and to realize maximum life expectancy without jeopardizing productivity.

The estimate for 2011 is based on historical requirements. The following table shows the actual expenditures for 2009 along with the forecast for 2010 and plan for 2011.

Table 6.3(b)
Desktop Infrastructure Upgrade

Year	**2009**	**2010**	**2011**
Cost ($000s)	783	847	1,010

SAP and Operations Based Application Enhancements

This project will fund any SAP and Operations based application enhancements that are required during the year. FortisBC has implemented much of the SAP suite to support a variety of the Company’s business functions, which include Human Resources, Finance, Materials Management and Project Management.

This project also includes a number of operations-based applications, including Utility Risk Management, a safety management system used to track safety incidents and training, as well as the Cascade maintenance management system used for substation equipment maintenance scheduling and planning.

SAP enhancement priorities include:

- SAP bar-coding for Supply Chain;
- company and other code consolidations;
- enhancements to the Plant Maintenance module to streamline the delivery of materials based on maintenance requirements;

- enhancements and updates required for compliance with International Financial Reporting Standards; and
- the application and testing of required upgrades and patches to SAP to maintain support.

Operations Systems enhancement priorities include:

- upgrades to the Cascade and Generation maintenance management system;
- continued leveraging of portal technology to consolidate systems and improve overall system efficiency by simplifying user interfaces;
- continuing development of reports that utilize key data collected by existing systems to support business decision making;
- continuing to make applications and information available on Personal Digital Assistants devices; and
- the application and testing of required upgrades and patches to all operational systems to maintain support.

The estimate for 2011 is based on historical requirements and available resources. The following table shows the actual expenditures for 2009 along with the forecast for 2010 and plan for 2011.

Table 6.3(c)
SAP and Operations Based Applications Enhancements

Year	**2009**	**2010**	**2011**
Cost ($000s)	1,252	953	1,198

AM/FM Enhancements

In 2008 FortisBC completed the implementation of the ESRI AM/FM system, which delivers comprehensive Geographic Information System, Asset Management and Facilities Management functionality and is identified as a core application. The ESRI system was chosen for its delivered functionality and the ability to accommodate enhancements to meet changing business needs.

The enhancement component of the 2011 plan primarily consists of a transmission records update project which will update structure numbers and identify the placement of all Transmission switching devices.

Other AM/FM enhancement priorities include:

- continued enhancement of the field user's interface in the field to improve ease of use and productivity;
- continued job processing enhancements to improve performance;
- continued configuration changes to streamline data entry; and
- application and testing of required upgrades and patches to the AM/FM system to maintain support.

The estimate for 2011 is based on historical requirements and available resources. The following table shows the actual expenditures for 2009 along with the forecast for 2010 and plan for 2011.

Table 6.3(d)
AM/FM Enhancements

Year	**2009**	**2010**	**2011**
Cost ($000s)	192	423	493

Customer Service System Enhancements

This project will fund enhancements to customer service related applications. The applications associated with the provision of customer service include the following: Customer Information System (CIS billing systems); the FortisBC internet web site (fortisbc.com); FortisBC Intranet site; Contact Centre systems (Monet Contact Centre resource scheduling software); bill printing software (Metavante CSF) and a dispatch application. The enhancements undertaken in this project are focused on improving safety, customer service, employee services, productivity and access to customer and employee information.

The enhancement component of the 2011 budget will primarily be used to complete the CIS Modernization project started in 2010. This project will complete the process to move the current CIS system onto modern infrastructure to extend the life of the system. This project avoids the cost to replace the current CIS which would otherwise be necessary to meet business requirements, such as improved customer self service and Service Oriented Architecture capabilities to communicate with other systems, and creates more efficient development capabilities for future enhancements.

Other Customer Service System enhancement priorities include:

- enhancements to accommodate various rate design changes;
- enhancements to Monet scheduling software to meet changing Contact Centre requirements and improve efficiency;
- enhancements to Metavante CSF bill print software to meet changing customer and vendor requirements;
- enhancements to the FortisBC Intranet to better serve employees and improve sharing and accessibility of departmental information;
- enhancements to the FortisBC Internet site to increase and improve customer self service capabilities, as well as improving the delivery of company information to the public, such as safety and PowerSense information;
- enhancements to the dispatch system to improve field information for safety and productivity;
- streamlining of CIS screens to improve input and searching capabilities; and
- the application and testing of required upgrades and patches to customer systems to maintain support.

The estimate for 2011 is based on historical requirements and available resources. The following table shows the actual expenditures for 2009 along with the forecast for 2010 and plan for 2011.

Table 6.3(e)
Customer Service Systems Enhancements

Year	**2009**	**2010**	**2011**
Cost ($000s)	871	794	904

SCADA Enhancements

FortisBC completed an upgrade to its SCADA system in 2007. The Survalent Worldview SCADA system provides the System Control Center dispatchers control and visibility over the electrical network. It has been in place since 1989 and is a core application. The reliability of the power system in general and the supply to FortisBC customers is highly dependent on the reliability of the SCADA system.

In 2011, compliance with British Columbia's Mandatory Reliability Standards will be fully implemented. The SCADA Enhancement component is a sustaining capital budget item that also supports the ongoing upgrade and enhancement requirements driven by these reliability standards.

The enhancement component of the 2011 budget will be used primarily to address issues involving the Cyber Infrastructure Protection standards that arise from the first Mandatory Reliability Standards audits.

Other SCADA enhancement priorities include:

- Improving and automating the interface between Worldview SCADA software and ESRI AM/FM system for better performance and reliability;
- continued enhancements to System Control applications and infrastructure to support business needs;
- continued enhancements to SCADA control systems and infrastructure to meet Energy Plan requirements or recommendations; and
- the application and testing of required upgrades and patches to all System Control systems to maintain support.

The estimate for 2011 is based on historical requirements and available resources. The following table shows the actual expenditures for 2009 along with the forecast for 2010 and plan for 2011.

Table 6.3(f)
SCADA Systems Enhancements

Year	**2009**	**2010**	**2011**
Cost ($000s)	800	688	528

Human Resources Payroll Conversion

ADP Canada ("ADP") has provided payroll service functions to the Company since 1995. The ADP system is no longer adequate to meet FortisBC's current data requirements because of insufficient capacity for employee and employer earnings and deductions codes required to meet the Company's business needs, which include historical retention requirements.

ADP does not offer an upgrade to the system it currently provides to FortisBC, and there is no confirmed plan in place to increase the number of codes in its current offering. A manual solution to the lack of codes is estimated to increase payroll processing costs by approximately $65,000 annually by 2012.

All reasonable options were considered, and it was determined that the most cost effective alternative was to switch payroll providers to Ceridian Canada Ltd. Ceridian offers the flexibility and features needed to meet the requirements of FortisBC today, and going forward, at the lowest cost. The estimated expenditure for this project is $0.478 million in 2011.

TELECOMMUNICATIONS

The telecommunications capital budget is used to purchase new or replacement communications equipment. This equipment includes landline equipment, VHF field communications equipment, microwave substation controls and the installation of isolation equipment when installing Telus lines into substations. These installations will provide voice as well as data and control communications as required.

The communications budget also covers upgrades and/or replacement of equipment that is used for remote control and operation of field devices from the SCC. The estimated expenditure for this project is $0.358 million in 2011.

BUILDINGS

FortisBC has 15 sites (ranging in age from 7 to 87 years) throughout the West Kootenay, Okanagan Valley and Similkameen regions totalling approximately 228,800 square feet of office, shop and warehouse space and approximately 51 acres of yard space. Of this, 125,000 square feet is owned, and 104,500 square feet is leased. The Facility Upgrades Project is primarily required to carry out property upgrades and building repairs necessary to conduct operational requirements in a safe, efficient and environmentally conscious manner. Site audits have been carried out at all facilities and the information has been utilized to identify deficiencies and upgrades to each facility. Site visits were also conducted with Operations personnel to identify any upgrades required for safety, health, and work efficiencies. The projects will be executed as scheduled in the budget year unless a new, previously unidentified project deemed of higher priority is approved by Management to replace it. This list of projects may then change throughout the year. The list will be managed as if it were a single project. The Buildings project is composed of four projects greater than $100,000 in value and a group of projects individually valued under $100,000. The estimated expenditure for the project is $1.244 million in 2011.

Table 6.4
Buildings Projects

1		2011	2012	Total
2		($000s)		
3	Warfield Operations Drainage	173		173
4	SCC UPS Replacement	115		115
5	Racking Upgrades	130		130
6	Emergency Building Upgrades	106		106
7	Projects under $100,000	720		720
8	**Total**	**1,244**		**1,244**

Warfield Operations Drainage Project

The Drainage Project is a continuation of recent upgrades to the storm sewer systems in the Warfield yard, and is intended to minimize the environmental impact of spills and runoff. The area behind the Fleet Services building will be paved, an oil separator installed in the drainage system, and a connection to the new drainage system will be completed in this phase of the project. This project will reduce the risk of possible negative impact on the environment.

System Control Centre UPS Replacement

The System Control Centre Uninterrupted Power Supply (“UPS”) Replacement Project is to replace the existing UPS that is approaching the end of its life and capabilities. The UPS is fully loaded and additional computer equipment cannot be connected until this project is complete. The newest computer equipment has been protected by small, stand-alone UPS units as a temporary measure. The computer system backups for FortisBC are located in this facility.

Racking Upgrades

This project provides additional and replacement racking for storage of materials at various district facilities. The new racking will be installed in yards where materials are currently stored on the ground, improving the condition of items being stored, access to materials and yard circulation, and reducing the possibility of incidents such as vehicle or physical strain.

Emergency Building Upgrades

This project is required to address unforeseen issues that arise that cannot be deferred to the next planning cycle such as breakdown of Heating, Ventilation and Air Conditioning and other building systems.

LONG-TERM FACILITIES SOLUTIONS

The Company is requesting development funding to determine appropriate and cost-effective long-term solutions for its Kootenay and Kelowna area Operations Centres. Approval for implementation costs will be sought pending the outcome of the development phases for these two projects.

Kootenay Operations Centre

This project was prompted by the aging and inadequate sizing of current facilities at Generation, Castlegar and System Control Centre as well as opportunities to integrate certain work, such as station maintenance between Generation and Network Services. The Generation facilities in particular require a significant investment to continue to utilize the existing aged buildings.

Review of these facilities has resulted in the recommendation for a new Operations centre in the Castlegar area that would accommodate administration, warehousing, and crews from Generation and Castlegar and, System Control Centre Warfield Network Operations. The recommendation also takes into account the Company’s commitment to maintain its facility assets in a responsible manner while providing employees with a worksite that meets the Company’s safety, health, environmental & energy efficiency standards.

FortisBC is requesting approval in 2011 for expenditures related to the development of building and site plans, estimated at $0.485 million.

Kelowna Operations Centre

In 2011, expenditures are planned to develop a long-term solution for a facility to house all Kelowna operations staff, warehouse and fleet maintenance.

Currently FortisBC occupies two operations sites in Kelowna. The Enterprise Road site is a leased combination of office, warehouse and yard facilities expiring in December 2012, which houses Purchasing, Warehousing, Planning, Engineering and Construction and Maintenance crews. The Company-owned Benvoulin Road site accommodates Kelowna Network Operations and Fleet Maintenance. Neither site is large enough to accommodate both groups.

Having two operations sites in Kelowna results in inefficient disbursement of material to crews, disjointed operations among Planning and Construction and Maintenance crews, lost productivity due to travel between sites in heavy traffic, and lost efficiencies in utilization of administrative functions.

FortisBC is requesting approval of expenditures of $0.489 million in 2011 for a review of existing owned sites and development of alternative building and site plans.

FURNITURE AND FIXTURES

This project is required for the replacement of deteriorated furniture and the addition/modification of furniture to accommodate changing needs within the organization.

In 2003, the Company undertook an inventory of furniture at all sites. At that time the condition of the furniture was assessed placing it in one of 3 categories (disposal, poor and good). Using this process together with the Company's Environment, Health and Safety Standard 108, (Section 2.2) "Monitoring the Work Environment", the capital requirements are upgraded each year. Typically chairs are replaced every five years and workstations are reviewed for functionality every eight to ten years. The estimated expenditure for this project is $0.176 million in 2011.

TOOLS AND EQUIPMENT

This project involves the purchase of tools and equipment necessary to construct, operate, and maintain the generation, transmission, and distribution system. This budget covers all capital expenditures for tools and equipment in excess of $500 and includes replacement tools that have reached the end of their service life and additional tools that are more appropriate for the various trades from an ergonomic and/or safety perspective.

The estimated expenditure for this project is $0.601 million in 2011.

PCB ENVIRONMENTAL COMPLIANCE

FortisBC established a Polychlorinated Biphenyls ("PCB") testing program in response to Environment Canada's review of PCB regulations and release of a draft regulation in 2002.

Scientific evidence suggests that the toxic, persistent, and bioaccumulative properties of PCBs represent a serious hazard to human health and the environment. Health and global environmental concerns about PCB releases into the environment prompted the federal government to increase control and the ultimate elimination of PCBs from industrial use. The draft regulation suggested that depending on the PCB contamination, some contaminated equipment would be required to be removed from service. As a proactive effort to ensure worker safety and regulatory compliance with the pending regulation, FortisBC submitted a seven-year PCB contaminated oil sampling program to the BCUC as part of its 2005 Revenue Requirements Capital. The testing program was predominantly focused on distribution pole top and pad mount transformers. In September 2008, the new PCB Regulations (SOR/2008-273) under the Canadian Environmental Protection Act (the "PCB Regulations") came into force. The regulations set specific deadlines for elimination of electrical equipment with PCB concentrations at or above 500 parts per million ("ppm"). Pole top transformers with PCB contamination are allowed to stay in service until 2025. The regulation also establishes best management practices for the remaining PCBs in use (i.e. those with content of less than 500ppm).

The PCB Regulations specified end-of-use dates for all PCB contaminated electrical equipment. The type of equipment, level of PCB contamination and location of the units determines the end-of-use date. Before the release of the PCB Regulations in 2008, substation equipment was considered contained and low risk for PCB release and not a subject of concern based on previous testing and decontamination of the high oil volume equipment. The new regulations require all substation equipment including small volume units such as bushings and instrument transformers to be addressed by 2014.

The 2008 regulations require the Company's PCB Program to be changed for compliance purposes. All substation equipment requires testing to confirm compliance with the new regulations. The large volume equipment has been tested and meets the regulation but the smaller ancillary system components have not been tested. Testing of some components will require power outages to access the units, and sealed equipment components will require destructive testing in order to be able to accurately determine the PCB content. This equipment includes some bushings, current transformers, potential transformers and capacitors. These units may be completely destroyed during testing. Delivery time for replacement units such as bushings, current transformers and potential transformers, can be up to 18 months. Given this constraint it was very difficult for industry as a whole to meet the compliance requirements of December 2009. Consequently, FortisBC applied for and has been granted an extension from Environment Canada allowing FortisBC additional time to assess, plan, test and replace PCB contaminated or destructive tested oil filled units manufactured before 1980. The extension will allow FortisBC to establish compliance by 2014.

The revised PCB Program will establish an assessment, testing, and planning focus in 2010 to develop a sound efficacious plan for systematically finding and removing PCBs to meet the new regulation by 2014. The assessment and testing plans will take existing maintenance plans into consideration for efficiency and consider station outages to access equipment.

By the end of 2014, FortisBC will be compliant with the PCB Regulations for station equipment and must shift focus to the 2025 end of use compliance for all oil filled equipment to less than 50 ppm PCB. Planning, testing, removal and destruction of PCB for overhead distribution equipment will start in 2015, based on best management practice and experience gained in the previous PCB program.

FortisBC is requesting approval of $1.852 million in 2011 for work required to enable compliance with the PCB Regulations within the required timeline. Future expenditures will be submitted for approval in subsequent capital expenditure plans. The estimated cost to reach compliance for the station equipment by 2014 is currently expected to be in the range of $15 to $25 million.

7. Demand Side Management

Demand Side Management ("DSM") or energy efficiency programs have been offered to FortisBC customers since 1989 and are available to all customers served by FortisBC and its wholesale customers of Grand Forks, Kelowna, Nelson Hydro, Penticton, and Summerland.

FortisBC's 2011 DSM Plan is found at Appendix 3 of this Application. The 2011 DSM Plan builds on the strategic objectives identified in FortisBC's 2008 Strategic DSM Plan, which was filed with the Commission on December 29, 2008. In 2009 the Company carried out Residential and Commercial sector End Use Surveys and has completed a 2010 Conservation and Demand Potential Review ("CDPR"). The final DSM Plan incorporates extensive public consultation and input from customers and stakeholders.

Planned expenditures in 2011 at $5.764 million exceed approved 2010 expenditures by more than 100 percent on a net of tax basis. This expenditure increase reflects the major shift in provincial policy that places demand side management as the priority resource to meet growing electricity demand in BC and is reflected in the UCA and the DSM Regulation. FortisBC's 2009-2010 Capital Expenditure Plan application stated that:

> "The Company is supportive of the Energy Plan goal of having conservation offset 50 percent of cumulative load growth by 2020. Over the last number of years, DSM has offset approximately 25 percent of FortisBC's annual energy growth requirements, thus effectively requiring an overall doubling of the current DSM resource acquisition rate in order to meet the Provincial Government's objective. New programming will include collaboration with government agencies and the other energy utilities in the province to work towards the objectives of the Energy Plan, and to ensure customers in BC are receiving a consistent DSM message."

The 2011 DSM plan portfolio includes programs for the residential, general service, industrial and irrigation sectors and is intended to capture potential savings identified in the CDPR. It also includes new programs that have been mandated as part of the 2008 DSM Regulation.

The 2011 DSM Plan supports British Columbia's energy objectives as defined in the Clean Energy Act, including the objective:

(b) to take demand-side measures and to conserve energy, including the objective of the authority reducing its expected increase in demand for electricity by the year 2020 by at least 66%.

These projects facilitate the Policy Actions contained in the Energy Plan, in particular Policy Actions:

(2) ensure a coordinated approach to conservation and efficiency is actively pursued in British Columbia; and

(3) encourage utilities to pursue cost effective and competitive demand side management opportunities.

The 2011 DSM Plan was also developed in the context of the DSM Regulation, as discussed in the plan document attached as Appendix 3.

Table 7.1 below shows the proposed 2011 DSM energy savings, expenditures (nominal and net of tax), and Benefit/Cost Ratios by program sector or component.

Table 7.1
2011 Demand Side Management Plan

1	**Sector/Component**	**Savings**	**Cost**	**TRC**
2		MWh	($000s)	Benefit/Cost
3	Residential	16,422	3,636	1.8
4	General Service	13,940	2,118	2.7
5	Industrial	9,360	613	4.8
6	**Subtotal Programs**	**39,722**	**6,367**	**2.4**
7	Supporting Initiatives		725	
8	Planning and Evaluation		750	
9	**Total**	**39,722**	**7,842**	**2.2**
10	Income Tax Impact		(2,078)	
11	**Total (Net of Tax)**		**5,764**	

The following tables illustrate the Residential General Service and Industrial Programs and include energy savings, program costs, Total Resource Cost ("TRC"), and status of the program components compared to existing programs.

Table 7.2
Residential Programs

1		Savings	Cost	TRC	Status
2		MWh	($000s)	Benefit/Cost	
3	Building Envelope	5,460	1,379	1.7	Enhanced
4	Heat Pumps	3,397	694	1.4	Enhanced
5	Lighting	3,420	438	2.4	Enhanced
6	New Home	105	54	1.4	Enhanced
7	Appliances	680	245	1.4	New
8	Electronics	180	49	4.8	New
9	Water heating	960	162	2.1	New
10	Low Income	540	305	3.0	Enhanced
11	Behavioural	1,680	310	6.8	Enhanced
12	**Total**	**16,422**	**3,636**	**1.8**	

Table 7.3
General Service Programs

1		Savings	Cost	TRC	Status
2		MWh	($000s)	Benefit/Cost	
3	Lighting	7,130	1,080	2.4	Enhanced
4	Street Lighting				New
5	Building Improvement	3,010	572	2.8	Enhanced
6	Weatherization				
7	Building envelope				
8	Refrigeration				
9	HVAC				
10	Pumps and fans				
11	Compressed air				
12	Computers	240	34	2.6	Enhanced
13	Servers/Networks				New
14	Municipal	3,560	432	3.9	Enhanced
15	Wastewater				
16	Irrigation				
17	**Total**	**13,940**	**2,118**	**2.7**	

Table 7.4
Industrial Efficiency Programs

1		**Savings**	**Cost**	**TRC**	**Status**
2		MWh	($000s)	Benefit/Cost	
3	Integrated Building	80	10	0.5	New
4	Optimization				
5	Industrial Efficiency	9,280	603	5.2	Enhanced
6	Lighting				
7	Pumps and Fans				
8	Refrigeration				
9	Motor Rewinds				
10	Compressed Air				
11	Information Systems				
12	**Total**	**9,360**	**613**	**4.8**	

In addition, the 2011 Plan includes several components which will complement and support the incentive-based programs listed above. These include education, awareness, Codes and Standards support, and community engagement initiatives, estimated at a cost of $0.725 million. Planning and evaluation is forecast at $0.750 million.

BRITISH COLUMBIA UTILITIES COMMISSION

ORDER NUMBER G-XX-10

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IN THE MATTER OF
the Utilities Commission Act, R.S.B.C. 1996, Chapter 473

and

An Application by FortisBC Inc.
for Approval of a 2011 Capital Expenditure Plan

BEFORE: XXXXXX, Commissioner
XXXXXX, Commissioner Month XX, 2010

O R D E R

WHEREAS:

A. On June 18, 2010 FortisBC Inc. ("FortisBC") filed a 2011 Capital Expenditure Plan (the "Application") with the British Columbia Utilities Commission (the "Commission") pursuant to Sections 44.2 (1) (a) and (b) and 45 (2) of the Utilities Commission Act (the "Act"); and

B. FortisBC is seeking an order that the 2011 Capital Expenditure Plan is in the public interest pursuant to Section 44.2 (3) (a) and satisfies the requirements of section 45(6), and that the Commission approves the 2011 Capital Expenditure Plan and the capital projects contained in **[the listed tables]** therein; and

C. By Order G-XX-10 the Commission established a Written Hearing Process and Regulatory Timetable for its review of the Application; which included a Workshop in Kelowna, B.C. on August 4, 2010; and

D. The Commission has considered the Application, evidence and submissions of FortisBC and Intervenors.

NOW THEREFORE Commission determines that

1. The 2011 Capital Expenditure Plan is in the public interest pursuant to Section 44.2 (3) (a) and meets the requirements of Section 45 (6) of the Act; and

BRITISH COLUMBIA
UTILITIES COMMISSION

ORDER
NUMBER G-XX-10

2. The 2011 Capital Expenditure Plan, and the capital projects contained in **[the listed tables]** therein, are approved.

DATED at the City of Vancouver, in the Province of British Columbia, this day of Month 2010.

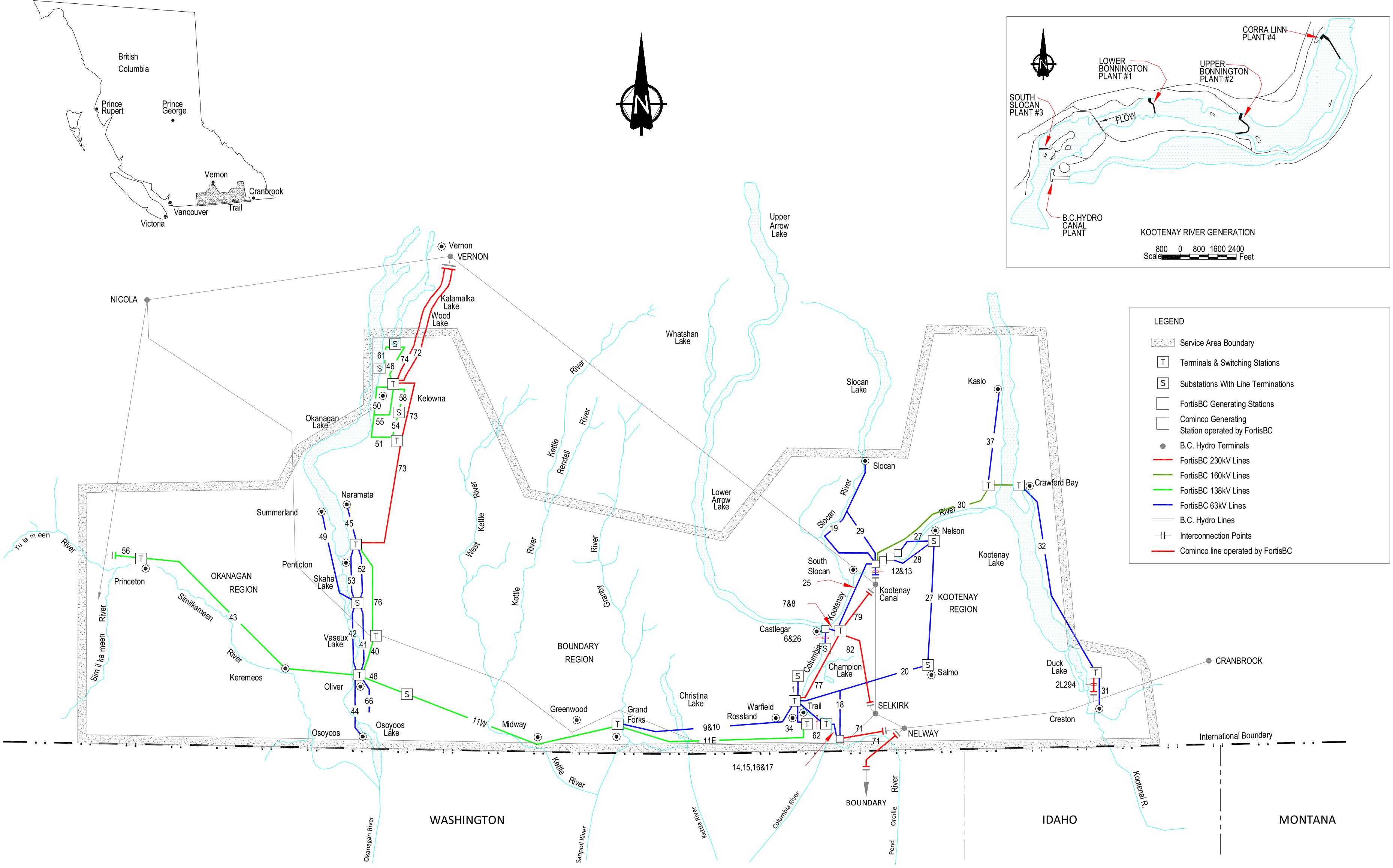
BY ORDER

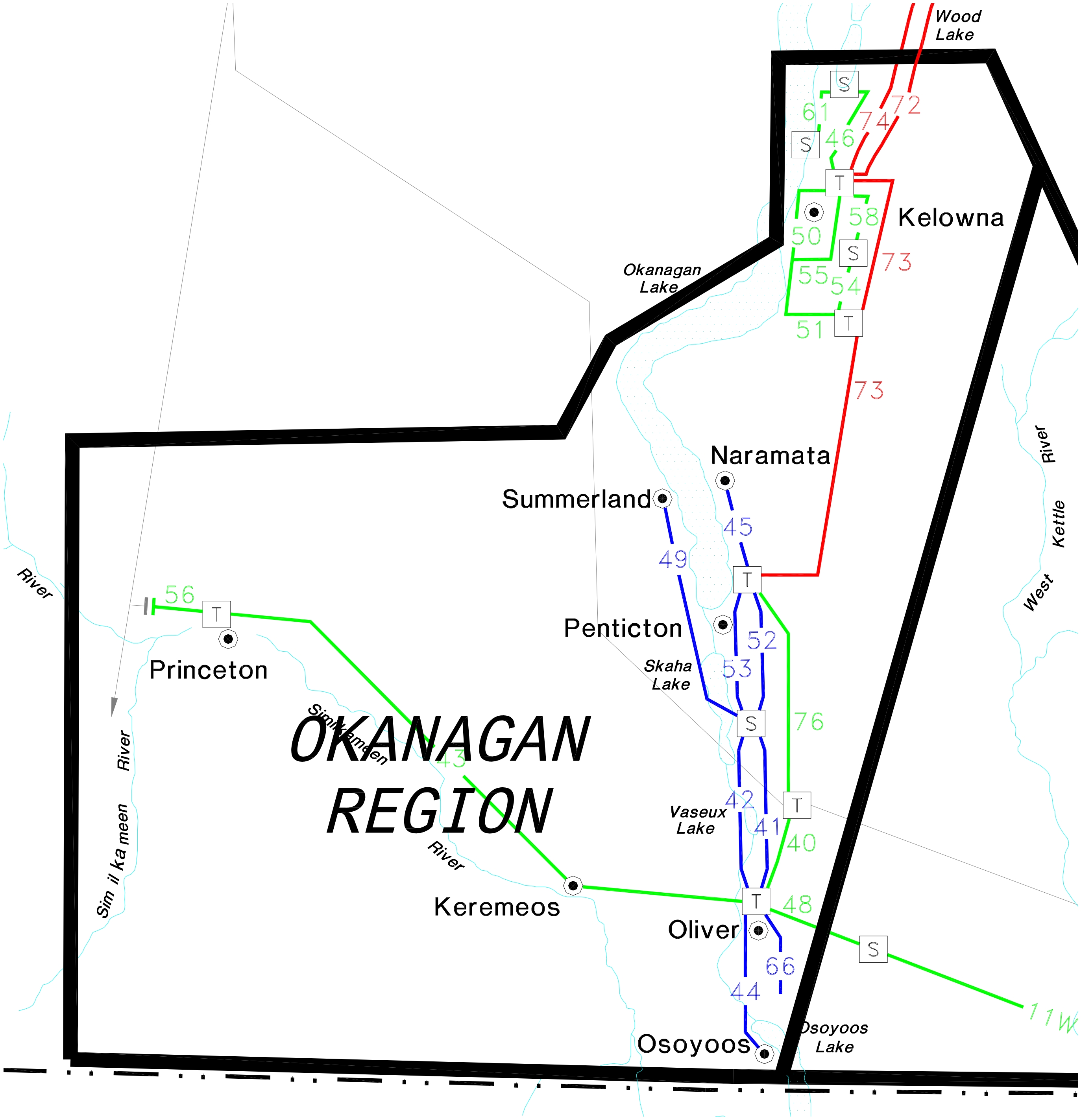
Original signed by:

XXXXXXX
Panel Chair and Commissioner

Appendix 2: Service Area Maps and Substation List

FORTISBC SERVICE AREA

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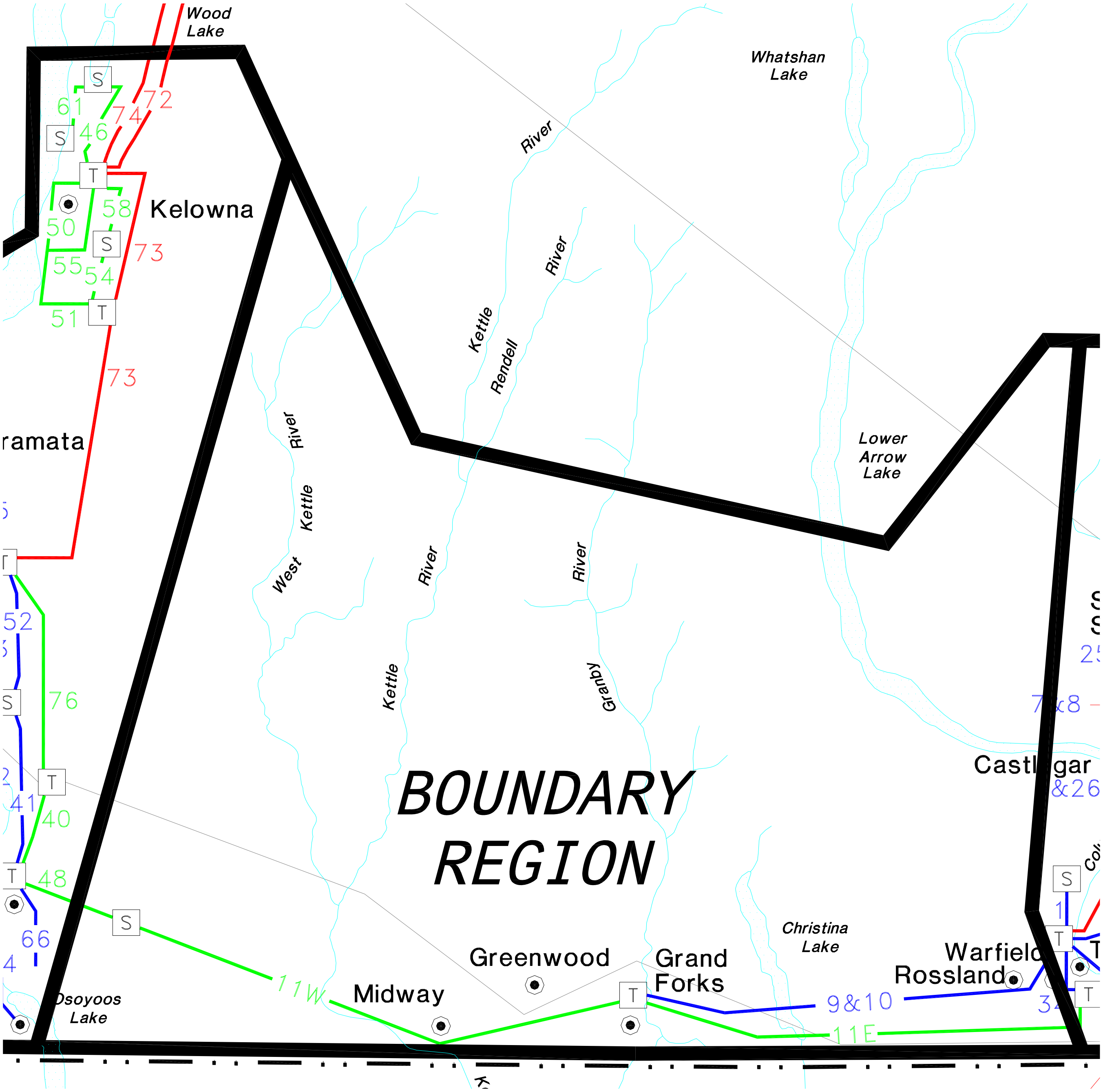
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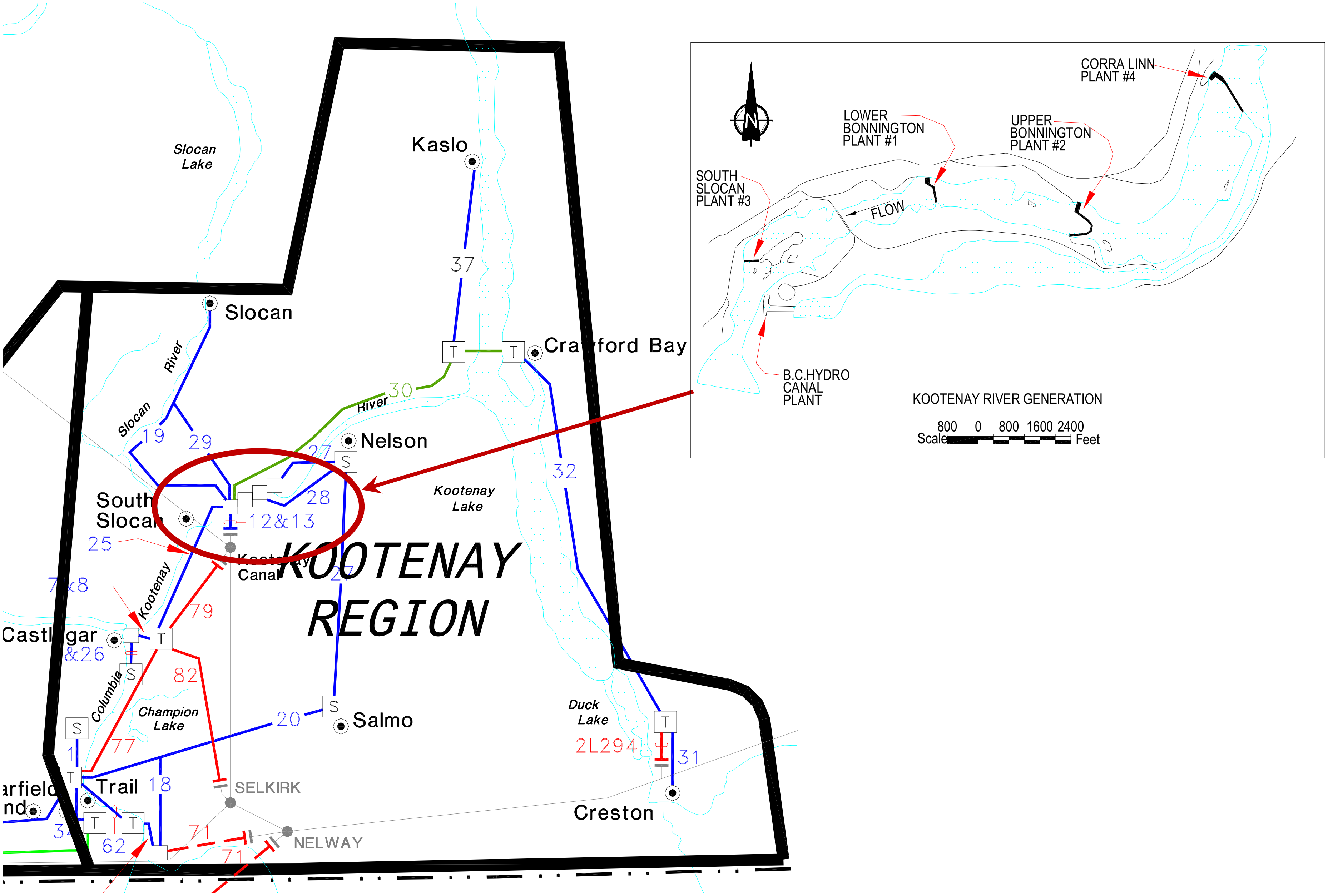
Midway
Greenwood
Grand Forks
9&10
11E
Christina Lake
Warfield
Rossland
Castlegar
&26
7&8
25
Lower Arrow Lake
Kettle River
Rendell
West Kettle River
Kettle River
Granby River
BOUNDARY REGION
S
T


KOOTENAY REGION
Kaslo
Slocan
Slocan Lake
Slocan River
Crawford Bay
Nelson
Kootenay Lake
River
South Slocan
Kootenay Canal
Castlegar
Columbia
Kootenay
Champion Lake
Salmo
Trail
Duck Lake
Creston
SELKIRK
NELWAY
37
30
32
31
29
19
27
28
12&13
25
7&8
&26
79
82
77
20
18
1
62
71
2L294
T
S
KOOTENAY RIVER GENERATION
CORRA LINN PLANT #4
UPPER BONNINGTON PLANT #2
LOWER BONNINGTON PLANT #1
SOUTH SLOCAN PLANT #3
B.C.HYDRO CANAL PLANT
FLOW
N
Scale 800 0 800 1600 2400 Feet

2010 Substation List

	Name	Abbreviation	Service Area	Subtype
1	ARAWANA	AWA	Penticton	Distribution Substation
2	BEAVER PARK	BEP	Trail	Distribution Substation
3	BENVOULIN*	BEV	Kelowna	Distribution Substation
4	BENTLEY*	BEN	Oliver	Terminal Station
5	BIG WHITE	BWS	Kelowna	Distribution Substation
6	BLACK MOUNTAIN	BLK	Kelowna	Distribution Substation
7	BLUEBERRY	BLU	Castlegar	Distribution Substation
8	CASCADE	CSC	Trail	Distribution Substation
9	CASTLEGAR	CAS	Castlegar	Distribution Substation
10	CHRISTINA LAKE	CHR	Grand Forks	Distribution Substation
11	COFFEE CREEK TERMINAL	COF	Kaslo	Distribution Sub/Terminal
12	CORRA LINN PLANT #4	COR	South Slocan	Generating Station
13	COTTONWOOD	COT	Salmo	Distribution Substation
14	CRAWFORD BAY	CRA	Crawford Bay	Distribution Substation
15	CRESTON	CRE	Creston	Distribution Substation
16	D.G. BELL	DGB	Kelowna	Distribution Sub/Terminal
17	DUCK LAKE	DUC	Kelowna	Distribution Substation
18	ELLISON	ELL	Kelowna	Distribution Substation
19	FRUITVALE	FRU	Salmo	Distribution Substation
20	GLENMERRY	GLM	Trail	Distribution Substation
21	GLENMORE	GLE	Kelowna	Distribution Substation
22	GRAND FORKS TERMINAL	GFT	Grand Forks	Distribution Sub/Terminal
23	GREENWOOD	GRE	Greenwood	Distribution Substation
24	GREENWOOD STEP DOWN	GRS	Greenwood	Distribution Substation
25	HEARNS	HER	Salmo	Distribution Substation
26	HEDLEY	HED	Keremeos	Distribution Substation
27	HOLLYWOOD	HOL	Kelowna	Distribution Substation
28	HUTH AVENUE	HUT	Penticton	Distribution Substation
29	JOE RICHE	JOR	Kelowna	Distribution Substation
30	KALEDEN	KAL	Penticton	Distribution Substation
31	KASLO	KAS	Kaslo	Distribution Substation
32	KEREMEOS	KER	Keremeos	Distribution Substation
33	KETTLE VALLEY	KET	Greenwood	Distribution Substation
34	LAMBERT TERMINAL	AAL	Creston	Distribution Sub/Terminal
35	LEE TERMINAL	LEE	Kelowna	Distribution Sub/Terminal

* In Service date Q4 2010

2010 Substation List, cont'd

Name		**Abbreviation**	**Service Area**	**Subtype**
36	LOWER BONNINGTON PLANT #1	LBO	South Slocan	Generating Station
37	MAWDSLEY TERMINAL	ASM	Trail	Terminal
38	MIDWAY STEP-DOWN	MDY	Greenwood	Distribution Substation
39	NK'MIP	NKM	Osoyoos	Distribution Substation
40	O.K. FALLS	OKF	Penticton	Distribution Substation
41	OKANAGAN MISSION	OKM	Kelowna	Distribution Substation
42	OLIVER TERMINAL	OLI	Oliver	Distribution Sub/Terminal
43	OOTISCHENIA	OOT	Castlegar	Distribution Substation
44	OSOYOOS	OSO	Oliver	Distribution Substation
45	PASSMORE	PAS	South Slocan	Distribution Substation
46	PINE STREET	PIN	Oliver	Distribution Substation
47	PLAYMORE	PLA	South Slocan	Distribution Substation
48	PRINCETON TERMINAL	PRI	Princeton	Distribution Sub/Terminal
49	R.G. ANDERSON TERMINAL	RGA	Penticton	Distribution Sub/Terminal
50	RECREATION	REC	City Of Kelowna	Distribution Substation
51	ROSEMONT SWITCHING STATION	RSM	South Slocan	Distribution Substation
52	RUCKLES	RUC	Grand Forks	Distribution Substation
53	SALMO	SAL	Salmo	Distribution Substation
54	SAUCIER	SAU	City Of Kelowna	Distribution Substation
55	SEXSMITH	SEX	Kelowna	Distribution Substation
56	SOUTH SLOCAN PLANT #3	SLC	South Slocan	Generating Station
57	STONEY CREEK	STC	Trail	Distribution Substation
58	SUMMERLAND	SUM	Penticton	Distribution Substation
59	TARRYS	TAR	South Slocan	Distribution Substation
60	TROUT CREEK	TRC	Penticton	Distribution Substation
61	UPPER BONNINGTON PLANT #2	UBO	South Slocan	Generating Station
62	VALHALLA	VAL	South Slocan	Distribution Substation
63	VASEUX TERMINAL	VAS	Oliver	Distribution Sub/Terminal
64	WARFIELD TERMINAL STATION	WTS	Trail	Terminal
65	WATERFORD	WAT	Penticton	Distribution Substation
66	WEST BENCH	WEB	Penticton	Distribution Substation
67	WESTMINSTER	WES	Penticton	Distribution Substation
68	YMIR	YMR	Salmo	Distribution Substation

FORTISBC
powersense

[2011 DSM PLAN]

Table of Contents

1. The DSM Environment

FortisBC's 2011 Demand-Side Management Plan (the "2011 DSM Plan") is filed pursuant to section 44.2 (1) (a) of the Utilities Commission Act R.S.B.C 1996, c 473 (the "UCA"), which, together with the Clean Energy Act S.B.C. 2010, c. 22 (the "Clean Energy Act"), the 2008 Demand-Side Measures ("DSM") Regulation (B.C. Reg 326/288) and the B.C. Government's 2007 BC Energy Plan (the "Energy Plan"), establish by policy and regulation that a public utility's long-term resource planning must, where prudent to do so, position DSM resources before all other resources when considering either the acquisition of new energy and capacity resources or additional energy purchases to meet customer load.

1.1 The Energy Plan and Clean Energy Act

The Energy Plan highlighted the importance of DSM as a key component of future electricity supply, setting a target in Policy Action 1 to acquire 50 percent of BC Hydro's incremental resource needs through conservation by 2020. This target was increased to 66 percent under the Clean Energy Act.

Other Energy Plan objectives and policy actions influencing DSM programs for public utilities are:

(a) ensure a coordinated approach to conservation and efficiency is actively pursued in British Columbia (Policy Action 2); and

(b) encourage utilities to pursue cost effective and competitive demand side management opportunities (Policy Action 3).

The Clean Energy Act gives effect to the province's strategic direction, defining a "demand-side measure" to mean a rate, measure, action or program undertaken

(a) to conserve energy or promote energy efficiency,

(b) to reduce the energy demand a public utility must serve, or

(c) to shift the use of energy to periods of lower demand,

but does not include

(d) a rate, measure, action or program the main purpose of which is to encourage a switch from the use of one kind of energy to another such that the switch would increase greenhouse gas emissions in British Columbia, or

(e) any rate measure, action or program prescribed.

The specific energy objectives set out in the Clean Energy Act relevant to the 2011 DSM Plan are:

(b) to take demand-side measures and to conserve energy, including the objective of the authority reducing its expected increase in demand for electricity by the year 2020 by at least 66%; and

(d) to use and foster the development in British Columbia of innovative technologies that support energy conservation and efficiency and the use of clean or renewable resources.

1.2 The UCA and DSM Regulation

Section 44.1 (2) of the UCA requires that FortisBC file a long-term resource plan which includes the following related to DSM:

(a) an estimate of the demand for energy the public utility would expect to serve if the public utility does not take new demand-side measures;

(b) a plan of how the public utility intends to reduce the demand referred to in paragraph (a) by taking cost-effective demand-side measures;

(c) an estimate of the demand for energy that the public utility expects to serve after it has taken cost-effective demand-side measures; and

(f) an explanation of why the demand for energy to be served by facilities the utility intends to construct or extend are not planned to be replaced by demand-side measures.

The DSM Regulation issued in November 2008 under the UCA supports the Energy Plan and defines how a DSM plan portfolio is determined to be “adequate” and “cost effective”. Section 3 of the DSM Regulation provides that FortisBC’s DSM plan, for the purpose of its long-term resource plan, must include the following to be adequate:

(c) a demand-side measure intended specifically to assist residents of low-income households to reduce their energy consumption;

(d) a demand-side measure intended specifically to improve the energy efficiency of rental accommodations;

(e) an education program for students enrolled in schools; and

(f) an education program for students enrolled in post-secondary institutions in the public utility’s service area.

The DSM Regulation also provides in section 4 that the Commission, in determining the cost-effectiveness of a DSM measure proposed in a long-term resource plan or an expenditure schedule:

(1) may compare the costs and benefits of the measure individually, or together with other demand-side measures in the portfolio, or of the portfolio as a whole;

(2) must, for measures intended to assist residents of low-income households, also use the total-resource cost ("TRC") test, and consider the benefit of the measure to be 130 percent of its value;

(3) must consider the benefit of the avoided supply cost to be BC Hydro's long-term marginal cost of acquiring new electricity

(4) must determine the cost-effectiveness of a demand-side measure by determining whether the portfolio is cost-effective as a whole;

(5) must determine the cost-effectiveness of a public awareness program as defined in the DSM Regulation by determining whether the portfolio is cost-effective as a whole;

(6) may not determine that a proposed measure is not cost effective on the basis of a rate-impact measure ("RIM") test; and

(7) may, in the case of a measure related to a regulated item to which a specified standard has not yet commenced, include in the benefit a proportion of the benefit that may result from the application of the specified standard.

1.3 FortisBC's Long-Term Resource and Conservation Planning

In May 2009, FortisBC filed its long-term Resource Plan and is currently preparing an evidentiary update, which will be filed pursuant to section 44.1 of the UCA. The Company also expects to file an Integrated System Plan which will include expenditures related to the Resource Plan Update component of a comprehensive long term capital expenditure plan. In order to facilitate the integration of DSM options into long term infrastructure plans and to best satisfy the legislative and policy requirements outlined above, FortisBC will submit the long-term 2012 DSM Plan (previously called the 2011 DSM Plan) in conjunction with the Resource Plan Update.

2. DSM Plan Development

2.1 Planning Principles

The 2011 DSM Plan was created using the following guiding principles:

1. The DSM Plan will be customer focused;
2. The DSM Plan will be cost effective;
3. The DSM Plan will be inclusive of best practices; and
4. The DSM Plan will be compliant with the DSM Regulation.

2.2 Planning Steps

The 2011 DSM Plan was developed using the following steps:

1. Identify the strategic objectives for DSM at FortisBC (the 2008 Strategic DSM Plan);
2. Understand how FortisBC customers use energy within their homes and businesses (2009 Residential End Use Survey, 2009 Commercial End Use Survey);
3. Quantify potential energy savings available (2010 Conservation and Demand Potential Review);
4. Identify alternative measures for consideration and screen them based on the TRC test;
5. Develop three scenarios or plan options, namely Low, Medium and High;
6. Conduct public consultation and solicit input from customers and stakeholders on the options; and
7. Integrate input into a final set of programs for the 2011 DSM Plan.

The 2008 Strategic DSM Plan

FortisBC's Strategic DSM Report, filed in December 2008, analyzed the changing environmental factors affecting DSM and provided clear objectives for the development of a detailed plan that would guide the Company's PowerSense programs over the years 2011-2020. The document outlined twelve objectives for the DSM planning years 2011-2020. Those objectives and how they are being met are described below in Table 2.2.1.

Table 2.2.1: DSM Planning Objectives 2011 - 2020

Objective 1:	The 2011 DSM Plan should provide a forecast for achieving the 50 percent target on an annual basis, broken down by customer class. *The 2011 Plan achieves an estimated 42% offset of the anticipated load growth without codes and standards, and conservation rates.*
Objective 2:	The 2011 DSM Plan should provide TRC calculations for all programs on an individual, sector and portfolio basis. *This information is detailed in Tables 3.2.1 through 3.2.3.*
Objective 3:	The 2011 DSM Plan must include a listing of collaborative demand-side measures. *This information is detailed in section 3.3.*
Objective 4:	The 2011 DSM Plan should describe how FortisBC will provide education and awareness programs to promote conservation in the community. *This information is available in section 3.4*
Objective 5:	The 2011 DSM Plan will include details of a low-income program. *This information is available in section 3.3.*
Objective 6:	The 2011 DSM Plan should specify how PowerSense will assist the private rental market. *This information is available in section 3.3.*
Objective 7:	Ensure meaningful and appropriate consultation with the Demand Side management Advisory Committee regarding PowerSense program changes, and engage broader stakeholder groups as appropriate. *FortisBC completed consultation on the 2011 DSM Plan as described in Appendix A.*
Objective 8:	The 2011 DSM Plan will utilize BC Hydro's blended long-term marginal cost of energy and capacity when calculating DSM benefits. *This information is provided in section 5.2.*
Objective 9:	The 2011 DSM Plan should include a conservation and energy efficiency potential study for each customer class, preliminary investigation and analysis of demand reduction options and detailed business planning, with savings and demand reduction targets derived from the conservation potential work. *The 2010 CDPR study has been included as Appendix D.*
Objective 10:	The 2011 DSM Plan should identify the type of studies that should be undertaken that will allow development of effective demand response programs. *In addition to the Residential and Commercial End Use Surveys and the Conservation and Demand Potential Review that have been included in this document, further studies will be undertaken during 2011.*
Objective 11:	The 2011 DSM Plan should include an updated monitoring and evaluation plan, if required, that will apply to all new and existing programs, and will be compliant with any provincial standards. *This information has been included in section 3.5.*
Objective 12:	The 2011 DSM Plan should include new programs that promote technologies that are proven to be effective, but do not yet provide an economic payback for customers within 10 years. *Both the solar hot water and EnerGuide90 measures have extended paybacks over ten years, as discussed in section 3.1.*

2009 End Use Surveys

During 2009, research was undertaken by FortisBC to understand how customers use energy in their homes and businesses for the purposes of forecasting future electrical demand and to design Demand Side Management and information and communications programs.

The specific objective of the Residential End Use Survey ("REUS") and the Commercial End Use Survey ("CEUS") was to collect detailed information about the characteristics and features of customers' homes and businesses, as well as different ways in which electricity is used in them.

In addition to collecting the end-use information, the study also set out to solicit customer opinions, attitudes and behaviours related to electricity and conservation. This information will be beneficial for segmenting the customer base, as well as for further informing program development and communications strategies.

Methodology

On July 2009, surveys were mailed to a sample of FortisBC residential customers (5,000 surveys) and commercial customers (4,000 surveys). The total sample residential customers consisted of 3,500 direct and 1,500 indirect customers. These customers were randomly selected from the customer base. A further 4,000 direct FortisBC customers were randomly chosen from the database of customers for whom FortisBC has email addresses. These 4,000 email addresses were a mixture of mainly residential (3,736) and commercial (264) customers who had chosen to receive their monthly bills via email. The customers were sent an email inviting them to participate in the survey and the email included a link to the online residential and online commercial surveys.

Each potential respondent contacted by mail was sent a survey package which included a survey with a cover letter and a postage paid return envelope. Respondents were offered two ways to participate in this study:

- Complete the survey and return it in the postage paid envelope via regular mail; or
- Complete the online version of the survey and submit it electronically.

Of the 8,736 residential customers that were approached, 2,049 surveys were completed, giving a total response rate of 23.5 percent with an achieved margin of error of ± 2.2 percent, at a 95 percent confidence interval. A lower percentage, 9.9 percent, of commercial customers responded achieving a margin of error of ± 5.0 percent, with a 95 percent confidence interval.

The sample was weighted by region to ensure the collected sample matched the geographic composition of FortisBC's customer base. In addition, comparisons were made with the responses collected from BC Hydro customers in the Southern Interior of BC for the 2006 BC Hydro REUS.

Highlights of Results

One of the items studied by the REUS was the key building characteristics (such as type of building, heating fuel, building envelope) for FortisBC's residential customers. Table 2.2.2 outlines the results of that analysis.

Table 2.2.2: Residential Building Characteristics

	Single Family	Mobile, Other	Apartment, Condo	Duplex, Row, Townhouse
Building Type	**69%**	**8%**	**13%**	**11%**
Electric Heat	31%	27%	80%	42%
Gas Heat	57%	47%	18%	57%
Other Heat	12%	26%	2%	1%
Own Home	95%	92%	65%	82%
Before 1950	12%	0%	2%	1%
1950-1975	25%	25%	5%	14%
1976-1985	18%	31%	10%	19%
1986-1995	21%	21%	23%	28%
1996-2009	24%	22%	53%	32%
Full Basement	60%	2%	11%	46%
Partial Basement	12%	1%	2%	8%
Crawlspace	20%	26%	3%	27%
No Basement	8%	71%	85%	19%
Average Size (Sq Ft)	2,250	981	1,187	1,688

The survey also summarized key appliance saturations and the average age of appliances for residential customers, shown below in Table 2.2.3.

Table 2.2.3: Residential Appliance Saturation

Cooking and Food	Share	Average Age, Years	Electronics	Share
Refrigerator Auto Defrost	90%	7.3	DVD	75%
Chest Freezer	52%	12.6	VCR	52%
Upright Freezer (not part of fridge)	21%	6.9	Digital Cable or Satellite TV	47%
Refrigerator Manual Defrost	20%	8.6	CRT TV <32 inches	61%
Microwave	87%		CRT TV >32 inches	24%
Electric Range (cook top + oven)	81%		LCD Flat Screen TV	38%
Electric Cook Top	11%	9.0	Laser Printer	15%
Gas Range (cook top + oven)	11%		Plasma flat screen TV	13%
Separate Electric Oven	10%		Rear projection TV	7%
Gas Cook Top	5%		Desktop Computer	69%
Cleaning			Inkjet printer	65%
Electric Clothes Dryer	92%	7.8	Laptop computer	49%
Automatic Dishwasher	82%	7.0	Fax	19%
Clothes Washer (top load)	64%	9.5	Audio entertainment video games	24%
Clothes Washer (front load)	35%	3.6	Surround System	32%
Gas Dryer	2%	8.7	Other	2%
Water Heating			**Miscellaneous**	
Gas Water Heater	50%	6.9	Jetted Bathtub	11%
Electric Water Heater	49%	6.6	Hot Tub (outdoor)	11%
AC			Swimming Pool (outdoor)	7%
Central Air Conditioning	50%		Indoor hot tub	2%
Window AC	16%		Separate workshop	18%
Portable AC	7%		Electric Car Block Heater	21%

Summary reports for Residential and Commercial End Use Surveys are presented in Appendix B and Appendix C respectively.

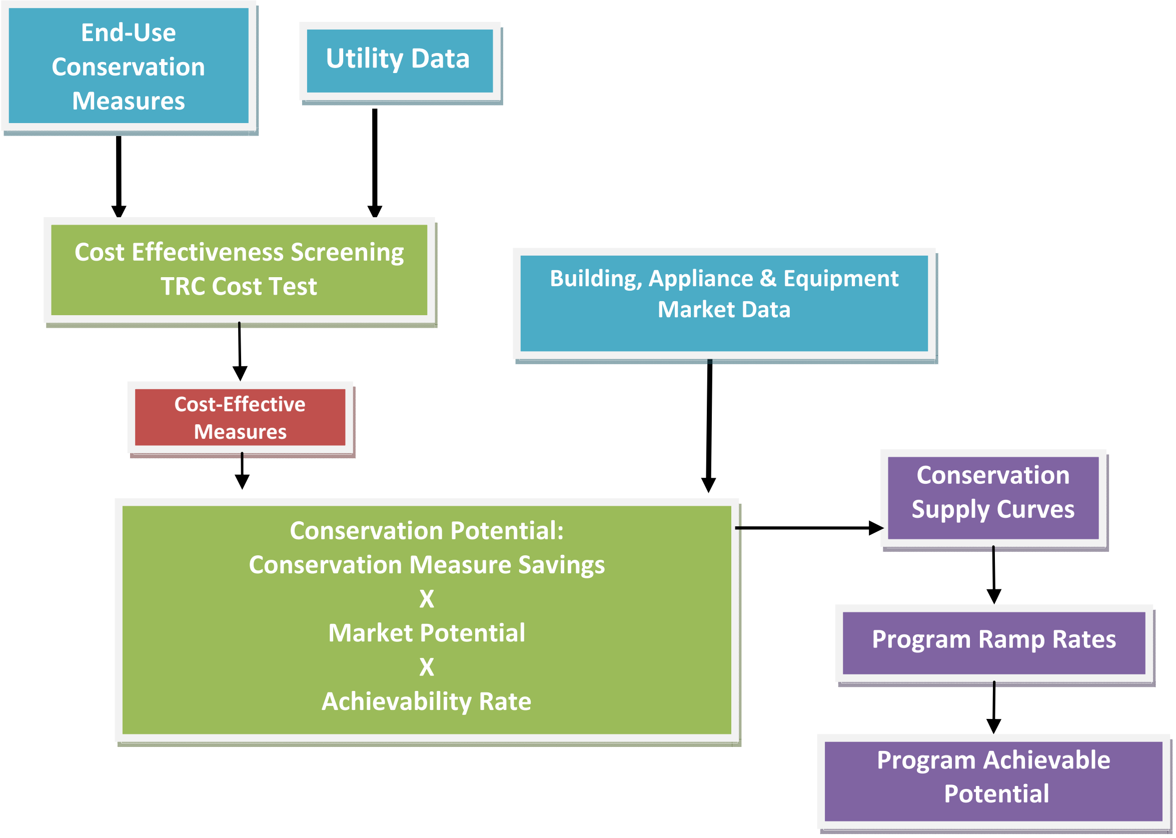
2010 Conservation and Demand Potential Review (CDPR)

The CDPR was completed in June 2010 by EES Consulting. It provides estimates of potential energy and peak demand savings by sector for the period of 2011 - 2030. The assessment considers a wide range of conservation and demand resources that are reliable, available, and cost-effective. In addition, some emerging technologies, small scale generation, and behavioural measures are considered.

Methodology and Results

The CDPR was created using multiple inputs and is illustrated by Figure 2.2.1 and described below.

Figure 2.2.1: Conservation Potential Assessment Process



The results of the completed end use surveys were combined with utility specific data to provide a breakdown of how FortisBC's customers use power in their homes and businesses. From this, individual energy efficiency measures were identified along with the number of kWh that could be saved annually from the installation of these measures. The kWh savings from each measure was then multiplied by the total number of measures that could be installed over the life of the program. The resulting figure is the total "technical potential", which is the amount of energy efficiency potential that is available regardless of cost or other constraints such as willingness to adopt measures. It represents the theoretical maximum amount of energy or capacity reduction if these constraints are not considered.

Figure 2 through Figure 7 below show the comparison of projected energy use and demand by sector in 2030, with the second bar in each figure reduced by the amount of technical potential that was identified, excluding fuel switching or customer-owned generation.

Figure 2.2.2

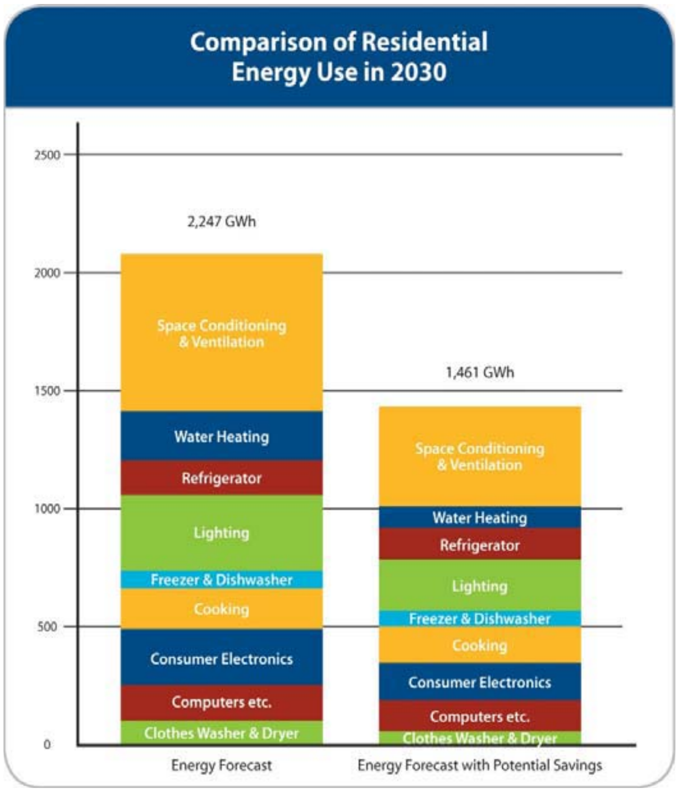


Figure 2.2.3

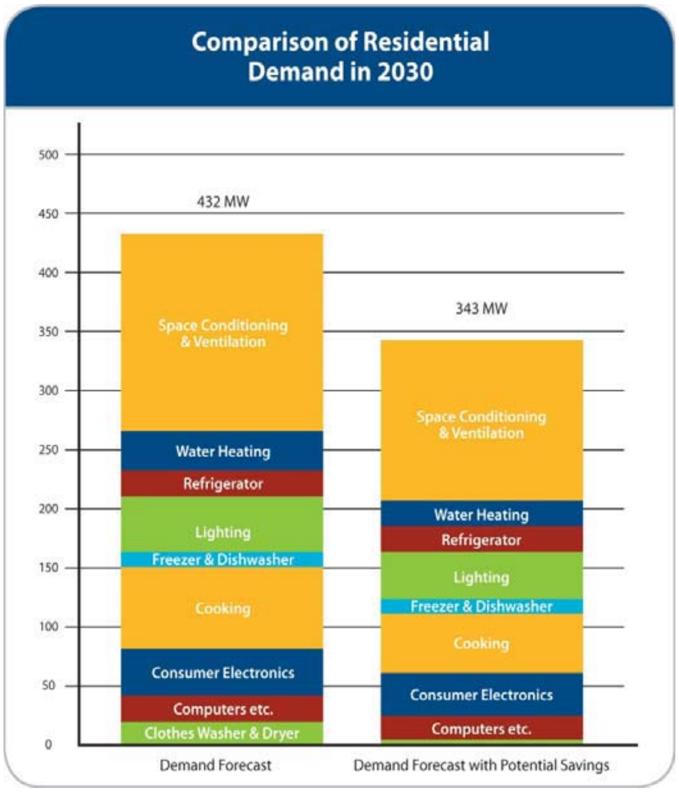


Figure 2.2.4

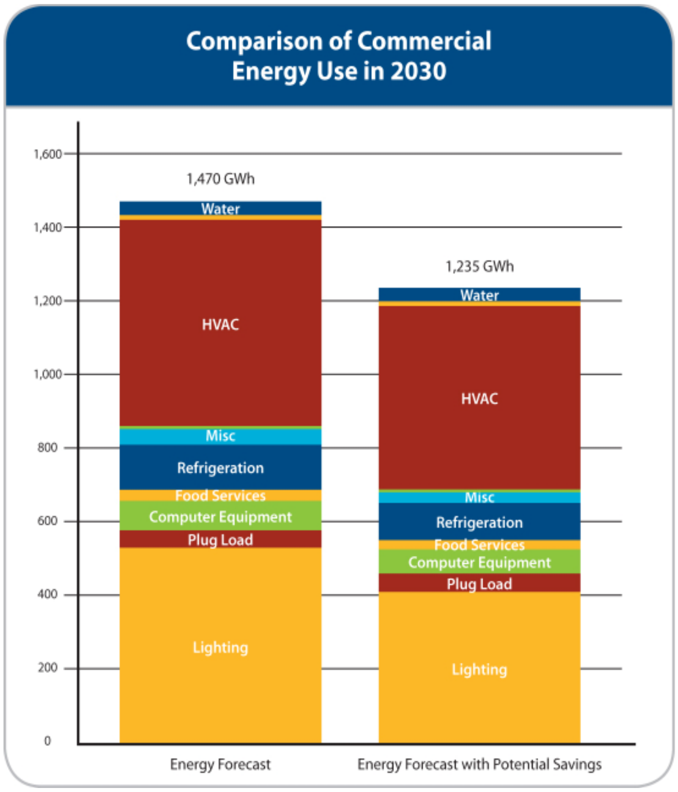


Figure 2.2.5

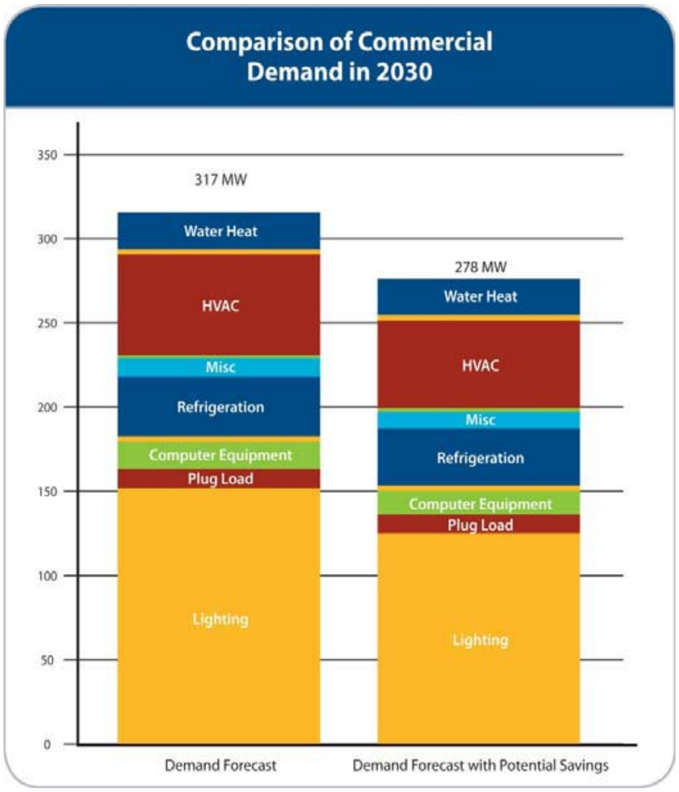


Figure 2.2.6

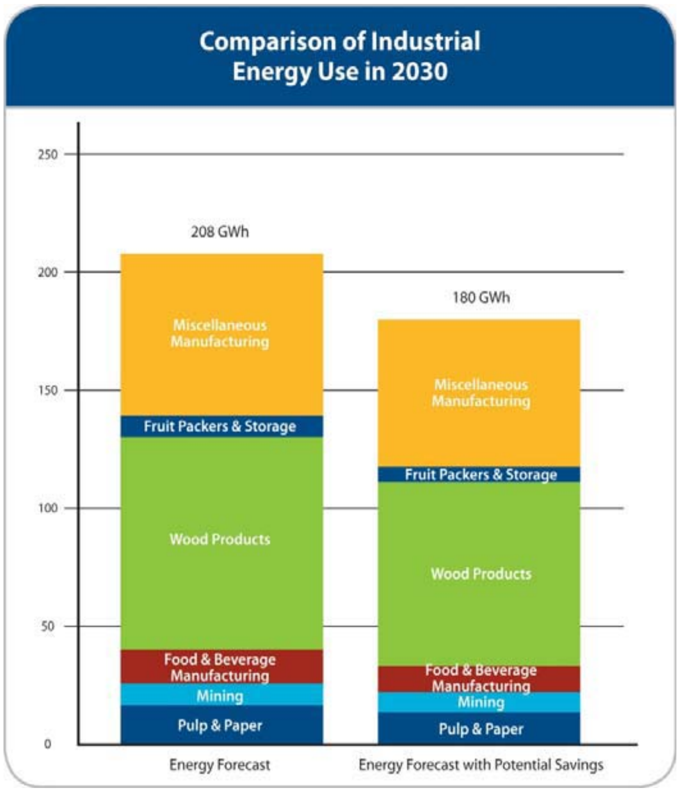
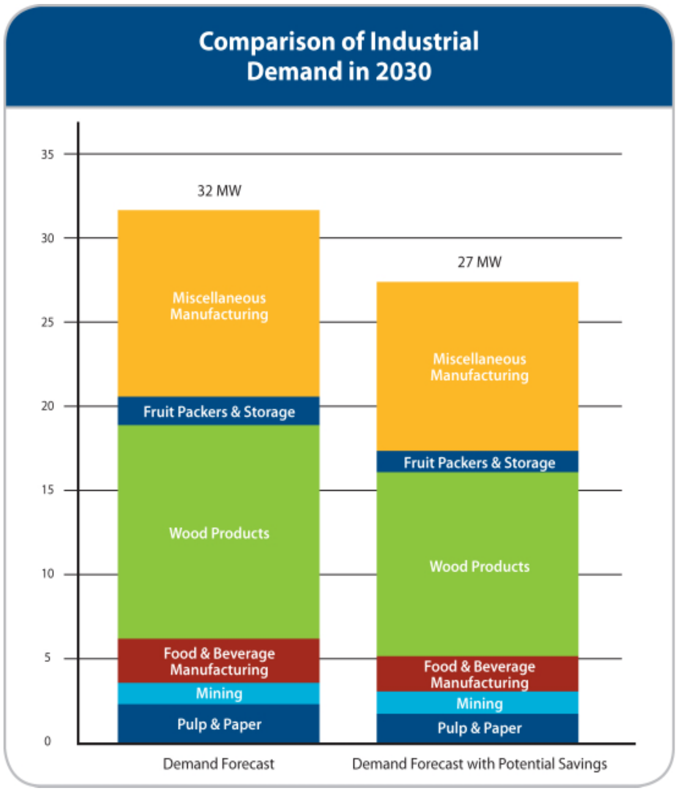


Figure 2.2.7



All identified measures were then screened to determine their cost-effectiveness potential using the TRC test. The TRC test considers all costs and benefits for each energy efficiency measure regardless of occurrence. Costs and benefits include capital cost, operations and maintenance costs over the life of the measure, program administration costs, distribution and transmission benefits, energy savings benefits and non-energy savings benefits if quantifiable. The amounts of savings associated with measures that pass the TRC test are identified as Economic Potential.

To account for customer willingness to adopt measures, achievability rates were then applied to the economic potential. The Northwest Power and Conservation Council uses an 85 percent achievability factor for all measures and has published a white paper describing the basis for using this value[1]. This means that over the course of a 20-year potential study period, 85 percent of all technical potential can be achieved, regardless of how it is achieved.

The final step was to assign “ramp rates” to the achievable potential of each measure. The ramp rate reflects how quickly savings from a particular measure is achieved over the period which depends on several factors, including:

- Availability of technology;
- Program status (continuing or new);
- Timing of measure implementation; and
- Changes in codes or standards.

The final result is the program achievable potential, or the amount of potential a utility could reasonably expect to obtain over the time period given best current knowledge and a defined incentive level. The ramp rates that were used for each individual measure can be found in the CDPR report located in Appendix D.

Program Options Overview

Three program options were developed from combinations of the measures and incentive levels identified within the CDPR. Each option had different costs and energy offset targets and also varied in the number and kind of energy efficiency programs provided, and in the magnitude of incentives offered. Table 2.2.4

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[1] “Achievable Savings: A Retrospective Look at the Northwest Power and Conservation Council’s Conservation Planning Assumptions.” August 2007. http://www.nwcouncil.org/library/2007/2007-13.htm.

below outlines the three options that were developed and presented during the stakeholder consultation process.

Table 2.2.4: DSM Program Options

	Low Option $5 million	**Medium Option $9 million**	**High Option $20 million**
% of new electricity needs offset	Energy 36% Demand 28%	Energy 51% Demand 41%	Energy 93% Demand 53%
Incentive levels[2]	25%	40%	50%
TRC B/C ratio	> 1.5	> 1.0	> 0.9
Residential programs	• Appliances • Consumer electronics • Lighting • Heating / AC systems • Building envelope	Low Option + • Additional appliances • Electric thermal storage • Appliance fuel switch	Medium Option + • Solar Photovoltaic • Solar hot water • Residential wind
Commercial programs	• Lighting • Street lighting • Municipal infrastructure • Refrigeration • Computer servers / networks • Weatherization • Building envelope	Low Option + • Additional municipal infrastructure • Enhanced lighting	Medium Option + • Solar Photovoltaic
Industrial programs	• Lighting • Pumps & fans • Refrigeration • Motor rewinds • Compressed air • Energy management information systems	Same	Same
Irrigation programs	• Pump upgrade • Pivot systems	Same	Same
Low income & rental	• Energy Savings Kits (ESK)	Low Option + • ESK installation • Energy evaluations	Medium Option + • Home retrofits
Social marketing	• Website • Direct and face-to-face information • Collateral • Product and sample give-aways	Low Option + • Social networking • Additional product and sample give-aways • Additional targeted	Medium Option + • Mass market information • Bill comparison pilot

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[2] Incentive levels expressed as a percentage of Total Resource Cost (TRC)

	• Targeted customer information • Partnerships • Public relations	customer information	
Education	• Destination Conservation • Sponsorship of ENGO programs	Low Option + • Additional sponsorship of ENGO programs • Sponsorship and support for trades training	Medium Option + • Curriculum delivery

These options were outlined to customers during the public consultation process that is outlined in the following section.

Consultation and Stakeholder Involvement

The Public Consultation Process

FortisBC engaged in consultation with the public and stakeholders during March and April 2010. The consultation process was developed to ensure that interested customers, government and business stakeholders were provided with an opportunity to learn about DSM and provide input on potential DSM program options.

FortisBC hosted a Demand Side Management Advisory Committee meeting following four public open houses in Creston, Castlegar, Osoyoos, and Kelowna. Upon invitation, FortisBC also made a presentation to the City of Grand Forks Council which was broadcast over local cable. For interested parties that could not attend the open houses, the DSM project information was hosted on the FortisBC website including survey forms.

The consultation in general, and open houses in particular, encouraged FortisBC customers to learn more about DSM, and to evaluate the three program options presented in order to provide input on what future programs should include and to what level DSM should be supported by FortisBC.

FortisBC's goal is to develop a DSM program that balances program cost-effectiveness and the interests of customers and stakeholders. To this end, three plan options or portfolios were presented for review, namely a Low, Medium and High Option with TRC B/C ratios of ≥1.5, ≥1.0 and ≥0.9 respectively. The Low Option was listed as $5 million per year and broadly outlined programs similar to what FortisBC currently provides, plus new low income, rental and education programs required by the aforementioned legislation. The Medium Option was estimated as $9 million per year and the High Option shown as $20 million per year. The Medium and High Options included higher incentive levels and additional or enhanced programs. The High Option included customer-owned generation (COG), both residential & commercial, which do not have a positive TRC B/C ratio until sometime later in the 20-year study period.

The DSM Consultation Report is attached as Appendix A.

Consultation Results

FortisBC's consultation program and notification strategies sought feedback through e-mail and mail, by telephone and through recorded comments and surveys at four public open houses, a DSM Advisory Committee meeting, and a City of Grand Forks Council meeting.

FortisBC received considerable feedback through the consultation process at the open houses and through written feedback.

Key findings as recorded on the returned surveys (n=37) include:

- 57 percent of survey respondents said they strongly agreed and a further 30 percent agreed with the statement, "In my opinion, DSM programs are needed to encourage energy conservation";
- 84 percent of survey respondents said they strongly agreed or agreed with the statement, "FortisBC should continue to support DSM";
- 51 percent supported the $20 million or high option for residential DSM;
- 32 percent supported the $9 million or medium option for residential DSM;
- 17 percent supported the $5 million or low option for residential DSM;
- 32 percent supported the $20 million or high option for the commercial DSM program; and
- When asked, "What would you change, if anything, in your preferred option", the three highest suggestions were more information and education, more renewable energy programs and higher incentive levels.

Based on these findings, the Company made the following conclusions:

- There is support for up to $20 million per year for DSM programs from the stakeholders that provided input;
- Additional programming is desired for low or fixed income residents and those in rental units;
- Potential participants would like to see simple access to information and incentives – a "one stop shop";
- Specific program components were supported such as:

  - EnergyStar appliances and lighting products;
  - heating systems, such as heat pumps;
  - refrigeration and lighting (commercial); and
  - a renewable technology, namely solar hot water.
- There is strong support for additional information and education of DSM programs;
- An incentive increase from the current level is supported;
- There is considerable interest in renewable resources; and
- Societal benefits like reducing impact on the environment are supported in addition to the desire to lower electrical costs to program participants.

First Nations Consultation

FortisBC mailed invitation letters to the public open houses, containing information on its DSM Plan, and offers to meet, to nine area bands and three nations within or adjacent to its service territory. In addition, FortisBC requested an opportunity to make a presentation to the Okanagan Nation Alliance. No written responses were received, other than a note from one of the nations, indicating that representatives were not available to attend the open houses.

3. The 2011 DSM Plan

3.1 Plan Development

Selection of plan option

The public consultation indicated strong support for increased DSM program spending and savings acquisition – 83 percent chose either the medium or high option. The medium option was selected as appropriate as a baseline for the 2011 DSM Plan. This decision was based on the strong customer support for this option, the increased demand side benefits it yields and the need to escalate in a prudent fashion from the existing base of established programs. The high option also received significant support, and FortisBC intends to escalate programs and spending further in subsequent DSM Plan years as internal capacity is developed.

Refinement of selected (medium) option

The selected medium option was taken, by and large, from the CDPR, and forms the underlying basis for the 2011 DSM Plan. Some energy savings measures were discarded due to their trivial savings potential, or else they could not be readily incorporated into an existing program. A demand reduction measure, Electric Thermal Storage heaters, was deferred for lack of time-based rates by which customers could take full advantage of such programs. Time-based rates can be implemented after Advanced Metering Infrastructure ("AMI") is implemented.

Several measures were included in the 2011 DSM Plan despite having a Benefit to Cost ratio of less than 1.0. Residential solar hot water (SHW) was incorporated due to public support as expressed in the public consultation and as a continuation of the current collaboration with Solar BC and Natural Resources Canada. The CDPR indicates that residential SHW will achieve a positive Benefit to Cost ratio in 2013.

An EnerGuide 90 new home measure is also included in the 2011 DSM Plan which supports the BC Ministry of Housing challenge that all new housing be built to "net zero" energy (and emission) by 2020. The FortisBC initiative provides support for "pilot project" housing to be built to "near net zero standards" and will demonstrate what can be achieved in terms of energy-efficient new housing.

Costs and savings estimates

The CDPR measures unit savings (kWh, kW), unit costs, achievable savings potential and ramp rates were used as the underlying basis of the 2011 DSM Plan. The measure incentives, which had been based on 40 percent of TRC for the medium-option, were modified to either an incentive rate (¢/kWh) or to a unit incentive ($/measure) to make the programs simpler for customers to understand. The medium option used a 20 percent of TRC proxy to estimate administrative costs. The 2011 DSM Plan program administration costs are based on the existing 2010 approved expenditures, prudently escalated, with the addition of staffing required to administer the higher level of program participation.

The measure benefits are based on unit savings and measure life, sourced from the CDPR report, multiplied by the avoided power purchase costs provided in the assumptions section 5.0 of the 2011 DSM Plan.

The CDPR report excludes from program achievable savings all known (provincial and federal) Codes and Standards through the appropriate UEC (unit energy consumption) – for products regulated beforehand, or by modification of the ramp rates for affected measures – for products to be regulated in the future.

3.2 Plan Overview

The 2011 DSM Plan portfolio includes programs for the residential, general service, industrial and irrigation sectors and is intended to capture potential savings identified in the CDPR. It also includes new programs that have been specified as part of the DSM Regulations issued in November 2008 pursuant to the UCA as described above.

The following tables illustrate the Residential General Service and Industrial Programs and include kWh savings, the program costs, the TRC, and status of the program components.

Table 3.2.1: Residential Programs in the 2011 DSM Plan

Residential Programs				
Program Description	**MWh**	**Cost ($000s)**	**TRC**	**Status**
Building Envelope	5,460	1,379	1.7	Enhanced
Heat Pumps	3,397	694	1.4	Enhanced
Lighting	3,420	438	2.4	Enhanced
New Home	105	54	1.4	Enhanced
Appliances	680	245	1.4	New
Electronics	180	49	4.8	New
Water heating	960	162	2.1	New
Low Income	540	305	3.0	Enhanced
Behavioural	1,680	310	6.8	Enhanced
Residential Total	**16,422**	**3,636**	**1.8**	

Table 3.2.2: General Service Programs in the 2011 DSM Plan

General Service Programs				
Program Description	**MWh saved**	**Cost ($000s)**	**TRC**	**Status**
Lighting Street Lighting	7,130	1080	2.4	Enhanced New
Building Improvement Weatherization Building envelope Refrigeration HVAC Pumps and fans Compressed air	3,010	572	2.8	Enhanced
Computers Servers/Networks	240	34	2.6	Enhanced New
Municipal Wastewater Irrigation	3,560	432	3.9	Enhanced
General Service Total	**13,940**	**2,118**	**2.7**	

Table 3.2.3: Industrial Programs in the 2011 DSM Plan

Industrial Efficiency Programs				
Program Description	**MWh saved**	**Cost ($000s)**	**TRC**	**Status**
Integrated Building Optimization	80	10	0.5	New
Industrial Efficiency Lighting Pumps and fans Refrigeration Motor rewinds Compressed air Information systems	9,280	603	5.2	Enhanced
Industrial Total	**9,360**	**613**	**4.8**	

In addition, the 2011 Plan includes several components which will complement and support the incentive-based programs listed above.

1 **Table 3.2.4: Supporting Initiatives**

Component	Details	Budget ($000s)
Education	Sponsorship of ENGO programs (schools) Support and sponsorship of trades training	250
Awareness	Direct and face-to-face information Collateral Product and sample give-aways Targeted customer information campaigns Public relations Partnerships Social networking	200
Codes & Standards Support	Support of policy development initiatives	25
Community Engagement	Support and sponsorship of community energy efficiency programs, workshops and events Support and sponsorship of community events Public consultation	250
Total		**725**

3.3 Planning and Evaluation

(a) This component of the DSM budget includes provisions for the programs manager, technical and reporting staff, as well as external expertise and facilitating the DSM Advisory Committee. Additional management, planning and evaluation of the escalated DSM activities are required to properly plan and control the proposed DSM expenditures and ensure the increased resource acquisition goals are prudently met.

(b) The Company filed a Monitoring & Evaluation (M&E) plan in 2008, for the 3-year period 2009-2011 inclusive. This plan is critical to ensure that the increased program expenditures will yield the savings expected and that the programs are operating effectively. To that end, a newly-hired M&E analyst will provide timely review of pilot initiatives before they are scaled up, and provide oversight of external M&E consulting reports on existing programs.

Table 9 shows all 2011 Plan costs and associated electrical savings.

Table 3.3.1: Summary of 2011 DSM Plan

Summary of 2011 Plan			
Sector/Component	**Savings (MWh)**	**Budget ($000s)**	**TRC B/C**
Residential	16,422	3,636	1.8
General Service	13,940	2,118	2.7
Industrial	9,360	613	4.8
Programs sub-total	**39,722**	6,367	**2.4**
Supporting Initiatives		725	
Planning & Evaluation		750	
Total Expenditure	**39,722**	**7,842**	**2.2**

3.4 Programs

Based on the aforementioned criteria and local market knowledge, program components were developed. The following briefly outlines a description of each incentive program and the primary delivery mechanisms to be deployed. All programs are new or enhanced in 2011, as described in Tables 3.2.1, 3.2.2 and 3.2.3.

Residential Sector Programs

Home Improvement Programs

The major component of the Home Improvement Program (HIP) is building envelope improvements (insulation, air sealing and Energy Star windows and doors). The HIP program will include increased incentive levels and a new measure, electronic thermostats, has also been introduced.

Heat Pumps

Heat pump technology has been promoted by FortisBC since 1992 and is one of the most energy efficient options available for space heating and cooling. The heat pump program will continue, with incentives for owners of electrically heated homes to exchange less efficient heating systems for either air source heat pumps, ductless (mini) heat pumps or geo-exchange systems. The incentive values, which will be doubled to increase program participation in 2011, will be based on the size of the system needed and provided for new and retrofitted single-family homes, as well as for multi-family units.

In addition to direct financial incentives, FortisBC will provide low-interest loans for qualifying customers to purchase the technology and pay back the loan over time. On a pilot project basis, FortisBC will also introduce an upgrade and maintenance incentive program to ensure customers continue to experience the maximum efficiencies available.

New Home Program

To encourage whole home energy efficiency via a performance path (as an alternative to a prescriptive path), incentives to achieve an EnerGuide rating of 80 or 90 will be offered. To further encourage uptake of energy efficient technologies for larger developments and multi-family structures, funding for engineering studies and other assessments will be provided.

General Lighting Program

It is estimated that 21 percent of all electrical use within the FortisBC service area is attributable to lighting. To encourage greater lighting efficiency, an enhanced rebate program will be offered to all residential and small business customers to purchase specialty Energy Star fluorescent and LED lighting.

Energy Star Appliances and Electronics

Energy Star rated electrical appliances and electronics are among the most energy efficient in their class. New rebate and incentive programs encouraging customers to purchase Energy Star Appliances and Electronics rebates will be introduced for appliances and electronics (for example, Energy Star Tier 3 clothes washers and televisions).

Water Heating

Approximately 50 percent of FortisBC customers' water is heated with electricity. To encourage more efficient water heating, FortisBC will enhance its rebate offer for the installation of solar hot water systems for customers with electrically heated water. To make the application process as straight forward for customers as possible, the rebate will be marketed and administered in collaboration with SolarBC[3]. A new Heat Pump Water Heater (HPWH) measure will be introduced, and a new generation of low-flow showerheads will be offered.

Behaviour Programs

Research shows that behaviour change programs can achieve measurable savings by influencing customer behaviour to conserve energy or invest in more energy efficient technologies. Using Community-Based Social Marketing (CBSM) best practices to help build normative conservation behaviour, the programs will target specific time-sensitive or seasonal themes. The CBSM tactics to be used for message delivery include: public relations, community outreach, strategic partnerships, behaviour pledges/commitments, product sampling, promotional contests, an interactive FortisBC webpage and limited media information campaigns. Some social networking tools will also be used.

The behaviour programs planned for 2011 are:

- To build awareness for energy conservation and efficiency, the Company continues to promote PowerSense month. This initiative features an educational campaign during October which includes an interactive contest for customers and a multi-media information campaign. FortisBC will also host the annual PowerSense Awards to honour the businesses and individuals that have made the greatest energy conservation efforts in our communities.
- Lighting awareness campaigns to encourage customers to make use of day-lighting, to turn off all unnecessary lights and switch to energy efficient lighting. Two campaigns, Earth Hour and a compact fluorescent lighting ("CFL") rebate program, will be the "event drivers" for this messaging;

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[3] SolarBC is administered by the BC Sustainable Energy Association (BCSEA), a non-profit society of citizens, professionals and practitioners committed to promoting the understanding, development and adoption of renewable energy technologies, energy efficiency and conservation in British Columbia.

- Two major Cooling and Heating awareness and educational campaigns will be run in early summer and winter to encourage customers to set back temperature, heat only occupied areas of a home, maintain weatherproofing, close windows and blinds, etc;
- In combination with the electronics rebate program, an awareness and educational program will promote turning off or unplugging computers and other electronics when not in use. Two full information campaigns will run in the early spring and fall and will be augmented by retail point-of-purchase info cards and posters;
- A laundry program will promote the use of cold water wash and hanging clothes to dry, and provide rebates for the purchase of "Tier 3" Energy Star washers and dryers. Promotion includes product samples, behaviour pledges, as well as the rebates and partnerships with municipal governments and Terasen Gas; and
- In conjunction with the appliance rebate programs, an intensive information campaign will be conducted to build awareness and encourage behaviour change regarding appliance use: i.e., maintain proper refrigeration temperatures, minimize use of hot water, and air dry dishes. Hot water and refrigerator/freezer temperature gauge give-aways will augment the campaign.

General Service Sector Programs

Lighting

Incentives for lighting measures are varied and range from $0.02 to $0.17 per kW.h savings, with the rebate limited to achieving a two-year payback on incremental cost.

FortisBC will also promote adaptive street light technologies (street lights capable of dimming) for municipal customers and customers with large parking lots.

Building Improvements Program (BIP)

Program assistance and financial incentives include a free initial assessment of the building design's level of energy efficiency and, where a more detailed assessment is required, 50 percent of an approved study cost to a maximum of $5000. FortisBC also will provide rebates towards the incremental cost of efficiency measures compared to standard "baseline" construction (the rebate entitlement is based on $0.15 per estimated annual kWh savings, with the maximum rebate calculated to achieve a two-year payback on incremental cost).

In addition, FortisBC will develop a suite of standardized fixed rebates (product option) for the most common heating, ventilation & air conditioning (HVAC) measures, pumps and motors, compressed air and refrigeration technologies.

Computers – Data Centre and Server Program

To encourage the use of the most efficient technologies and measures, FortisBC will introduce a Data Centre and Server program to provide financial incentives and tools to help commercial customers identify and implement server consolidation solutions in their data centres. The program would include data centre assessment studies to identify consolidation (virtualization software and hardware consolidation) opportunities and best approaches to improving energy efficiency in data centres. In addition, projects would receive funding to install consolidation and energy conservation measures.

Municipal Programs

FortisBC will continue to offer a “Partners in Efficiency” Program for local governments. In addition to the incentives offered in the form of rebates and financial incentives, PowerSense representatives will work closely with the municipalities’ staff to help determine the economics for energy efficiency upgrades. Most impacted are water and waste water treatment operations and street lighting. In addition, municipalities are working to significantly reduce carbon emissions and are investigating innovative energy efficient technologies like community energy systems, which FortisBC will support if potential electrical savings are anticipated.

Industrial Sector Programs

Integrated Programs

FortisBC will provide financial incentives based on calculated energy savings and operational assistance for the purchase of building and process optimization technology, which will help to ensure larger commercial and industrial customers achieve maximum energy efficiency by monitoring and tracking their energy usage. Recommended strategies are identified through an investigation process with additional focus on documentation and training to realize persistence of savings.

Industrial Efficiency

Similar to the Building Improvement Program, FortisBC will offer customized assistance and financial incentives for industrial customers. This will include free initial assessment of the building design’s level of energy efficiency; and where a more detailed assessment is required, 50 percent of an approved study’s costs. FortisBC also will provide rebates towards the incremental cost of efficiency measures compared to standard “baseline” construction (the rebate entitlement is based on $0.05 to $0.12 per estimated annual kW.h savings, with the maximum rebate calculated to achieve a two-year payback on incremental cost).

Irrigation Sector Programs

Irrigation Rebates

Rebates will continue to be offered for upgrading irrigation systems and equipment with energy efficient features such as variable speed drives, energy efficient motors and pumps and digital controls. Rebates are based on $0.05 of the estimated annual kW.h saved. The maximum rebate is 50 percent of the incremental project cost or the amount required to provide the customer with a two-year payback, whichever is less.

Residential Low-Income Households Program

The Residential Low-Income Households program is an energy efficiency initiative that assists FortisBC's low-income customers in reducing their electricity bills. Phase 1 is the distribution of the popular Energy Saving Kits (ESKs) to qualified customers, which began in 2010 and will continue throughout 2011.

In collaboration with Terasen Gas and BC Hydro, it is expected that FortisBC will distribute 2,000 ESKs throughout the FortisBC service area. To maximize efficiencies, information distribution will be targeted specifically to advocates and service delivery organizations, as well as social housing societies. PowerSense representatives will also promote the kits at health and seniors' trade shows and at events or functions targeting low-income households.

During 2011, to support those households that may not have the ability to install all the components of the ESK, FortisBC will contract a company or individuals to install more than 400 kits.

Also in collaboration with Terasen Gas and BC Hydro, in 2011 FortisBC will deliver a more in-depth Energy Conservation Assistance Program (ECAP) for those customers with higher electricity consumption and without the financial ability to make their home more energy efficient. FortisBC will provide approximately 150 qualified applicants with a free home energy evaluation and select energy efficiency upgrades.

Rental Accommodation Programs – Single- and Multi-Family

In its first phase, the Single-Family Rental Accommodation Program will be delivered in the same manner as the Low-Income Program. ESKs will be made available to all qualifying households and if residents are physically unable to install the ESK items, a contractor will provide the installation services needed.

In its second phase, to be introduced in mid-2011, the Company in collaboration with Terasen Gas and BC Hydro, will direct-market financial incentive offers to landlords, property managers and rental agencies to upgrade rental properties. Similar to the LiveSmart collaborative program, a suite of "whole home" rebates and incentives for energy building evaluations will be offered. Additional information collateral that target renters directly will also be provided to help inform landlords and renters.

The Multi-Family program will have the same components as the Single-Family program but will also include a social marketing tactic using tenant based energy saving teams to encourage behavioural changes and energy audits and financial incentives to encourage landlords to invest in "whole building" retrofits (insulation, draft-proofing and windows and doors) and energy efficient lighting. A 2010 rental program pilot will inform the detail delivery mechanism of the program.

First Nations Residential Households Program

In partnership with Terasen Gas and the First Nation communities, FortisBC will distribute a minimum of 1,000 ESKs directly to First Nation housing societies. To assist with installation of the ESKs and deliver energy efficiency and conservation messaging to each First nation community, FortisBC will also train and contract residents of the First Nations community to deliver the program locally.

Improved Efficiencies

The 2011 DSM Plan will employ enhanced program delivery mechanisms which will significantly improve efficiencies. These efficiencies come primarily from mass-delivery tactics and partnerships, including:

- partnerships with retailers and wholesalers for point-of-sale rebates;
- partnerships with other utilities and levels of government to collaboratively deliver programs and program messaging;
- partnerships with trades organizations and individual trades people to deliver program messaging;
- partnerships with non-profit organizations to deliver savings (i.e., Green Motors);
- more standardized rebates or product option offers; and
- improved application processes (i.e., development of "one-stop" electronic rebate portal).

The new delivery mechanisms will free PowerSense representatives to spend more time with larger industrial, general service and residential (builders and contractors) customers to analyze opportunities for improvement, make recommendations and provide incentives; thus making their efforts more productive.

Table 3.4.1 compares 2011 and 2010 DSM Plans in regard to improved program delivery efficiencies.

Table 3.4.1: Program Delivery Costs as Percentage of Total Budget

Budget Allocation	2011	2010
Incentives	62%	52%
Program administration	19%	31%
Conservation culture	3%	4%
Community energy planning	3%	0%
Trades training	1%	0%
Education	2%	1%
Planning & Evaluation	10%	13%

Collaborative Program Summary

During 2011, FortisBC will explore, initiate or continue partnerships in the following collaborative programs which directly support Policy Action 2 of the Energy Plan:

- LiveSmart BC: partnership with BC Hydro, Terasen Gas and the BC Ministry of Energy, Mines, and Petroleum Resources. LiveSmart BC is a residential retrofit program that encourages customers to upgrade building envelopes (insulation, windows, doors, draft proofing) and upgrade home space and water heating systems;
- Appliance Take-Back (Refrigerators): partnership with retailers to co-promote the program and collect and safely dispose of (recycle) older appliances;
- Appliance and Electronics Rebate Programs: collaboration with BC Hydro, Manitoba Hydro, Ontario Hydro and Quebec Hydro to work with manufacturers to provide substantial rebates for specific high level Energy Star appliances and electronics. FortisBC will work closely with local retailers to promote the rebate programs;
- Energy Efficient Lighting: arrange contracts with large retailers to provide instant point-of-sale rebates for specialty CFL and LED lighting;
- Low-Income Program: partnership with BC Hydro and Terasen Gas to provide energy saving kits and installation of additional energy efficiency upgrades to income qualified customers (Energy Conservation Assistance Program);
- First Nation: working with First Nation and funding organizations to provide training and program delivery specifically tailored to First Nations' needs;

- Wholesale Program: continue partnerships with local electrical wholesalers to provide instant point-of-purchase rebates for specific lighting and other identified energy efficient measures;
- Product Option Program: partnerships with local electrical, refrigeration, HVAC, and pump supply wholesalers to provide instant point-of-purchase rebates for specific identified energy efficient measures;
- Green Motors: partnership with non-profit organization, Green Motors Practices Group, to provide instant rebates for "green" motor rewinds;
- City of Penticton: partnership with City of Penticton, Regional District of Okanagan Similkameen, and Terasen Gas to provide environmental audits for small businesses throughout the South Okanagan; and
- Training and Education: partnerships with many organizations and BC Hydro and Terasen Gas to provide trades training and school educational programming.

3.5 Supporting Components

The following initiatives are vital to the success of the DSM Plan in 2011 because they provide the program support, education and technology required to enable the potential savings that have been identified.

While these initiatives may result in direct energy savings, the amount of savings is difficult to separate from the savings of the programs themselves. Because such savings would only be a rough estimate and may not be realized for five to ten years in the future, savings have not been directly attributed to these initiatives.

The DSM Plan’s supporting initiatives include awareness and education programs and support for energy efficient codes and standards.

Customer Education and Program Delivery

To promote the rebate programs and energy efficiency and conservation in general, collateral such as brochures, posters, point-of-sale materials, business case reports and promotional items is required. Collateral and promotional items will be distributed to residential customers at trade shows and community events. It will also be provided to trade allies (electrical contractors, appliance retailers, heat pump suppliers) for distribution to customers. The point-of-sale materials highlighting energy efficiency and conservation will be provided to wholesale and retail partners who sell energy efficiency equipment.

Targeted information campaigns with specific messaging about programs and energy efficiency will be purchased for trade magazines, newsletters and other industry focused information pieces.

Education Programs

Elementary, Middle and High School Education Programs

FortisBC has long supported elementary, middle and high school energy conservation education initiatives through financial sponsorship of educational events (such as science fairs and tours) and programs (Environmental Mind Grind, Climate Change Showdown) and delivery of curriculum approved longer-term educational programs through non-profit organizations like the Pacific Resource Conservation Society's Destination Conservation program. In 2009, FortisBC, in collaboration with Terasen Gas, BC Hydro and the Ministry of Energy, Mines and Resources, contracted the services of a consulting company to design a curriculum-based Grade 11 course on energy and energy conservation.

FortisBC will continue to build on existing partnerships and seek additional opportunities in 2011.

Trades Training

Similarly, FortisBC provides sponsorships for training and support for a number of initiatives from the building trades and electrical non-profit trade organizations[4], as well as support for energy management planning training like Natural Resources Canada's "Spot the Savings" workshops. Committed to growing the energy efficiency knowledge amongst the trades, FortisBC will continue to provide this support.

FortisBC will work closely with Terasen Gas and BC Hydro to provide leadership to help develop new training opportunities that support energy efficiency, as well as provide greater financial support for programming.

Community Energy Planning

Provincial legislation adopted in 2008 requires all local governments to identify Greenhouse Gas ("GHG") reduction targets, policies, and actions in their Official Community Plans (OCP) and Regional Growth Strategies. As a result, BC local governments are completing energy and greenhouse gas emissions plans for their communities and are seeking support from public utilities. As the community energy plans directly impact future electrical use and may include significant savings attributed to good planning, it is appropriate to support our communities in their efforts. To assist our communities and help

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[4] TECA (Thermal Environmental Comfort Association), SICA (Southern Interior Construction Association), CHBC (Canadian Home builders Association), BCSEA (BC Sustainable Energy Association), GeoExchangeBC, etc.

strategize to achieve greater energy efficiencies, FortisBC will support community studies and planning sessions.

Codes & Standards Support

A number of international and national organizations like the Consortium for Energy Efficiency, the Canadian Standards Association, and Natural Resources Canada are working to set new efficiency standards for many consumer electronics, fan motors and portable air conditioners, amongst other equipment and technologies. Similarly, municipal, provincial and federal governments are setting policy and regulations to increase energy efficiency or take measures to raise awareness to increase energy efficiency (for example, EnerGuide building ratings). To support codes and standards policy making and research, FortisBC will budget $25,000.

Monitoring and Evaluation

FortisBC has an established DSM Monitoring and Evaluation Plan for the period 2009 – 2011, as filed in its December 2008 DSM Strategic Plan. Monitoring and Evaluation of energy efficiency programs provides internal and external accountability by reducing uncertainty in the estimates of energy and demand savings, and by determining the cost effectiveness of these programs compared to other energy resource options. A Monitoring and Evaluation study of a demand-side management or energy efficiency program involves:

- Objective and systematic measurement of program operations and performance;
- Use of social-science (behaviour) and engineering data and methods;
- Verifying actual (achieved) energy and demand savings attributable to the program;
- Estimating permanent changes in the market penetration (market transformation) of energy efficient technologies attributable to the program; and
- Providing a basis for future decisions related to a program or portfolio of programs (modifies, expands, or discontinues).[5]

Planned 2011 Monitoring and Evaluation Activities

Building on the established plan, there are several activities that will take place in 2011 including incorporating new programs into the plan, performing studies on existing programs, and establishing a Monitoring and Evaluation plan for 2012 and beyond.

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[5] From FortisBC's DSM Monitoring and Evaluation Plan 2009 through 2011

a. Incorporating New Programs

FortisBC intends to enhance monitoring and evaluation of each new DSM program that will be introduced in 2011. These plans will be incorporated into the existing Monitoring and Evaluation plan.

b. Planned Monitoring and Evaluation Activities

Residential Lighting

A Monitoring and Evaluation study to determine the impact and effectiveness of the residential lighting program will be conducted which will include participants between January 2010 and December 2010. The study will set out to improve the engineering estimates used to determine the energy and demand savings attributable to the program. It will also incorporate the market effects resulting from the energy efficient lighting measures and promotional activities directly to customers, as well as examine the influence of FortisBC field staff on the distribution and retail channels. The focus will be on the market effects and acceleration of the adoption of residential energy efficient lighting in the FortisBC service territory. A baseline trend analysis of the naturally occurring deployment of EE lighting measures in the FortisBC service area will be derived from earlier Monitoring and Evaluation studies.

The study will use a combination of consumer and supply side (supply/distribution) surveys to assess the naturally occurring effects, the direct effects and market effects attributable to the program. Shelf space and price trends in retail stores should be captured to assess the penetration of EE lighting measures, and recommendations made on incentive level changes or strategy.

Commercial Lighting

A Monitoring and Evaluation study of the Commercial Lighting program will be undertaken during 2011 based on installations completed prior to December 2009. The study will address process, market and impact issues (gross and net impacts), and how this program has supported the transformation of the market for more efficient lighting technologies in FortisBC's service territory. The report will assess the relevance of the current incentive level for the measures included in the program.

The study will also review the process of delivery, its effectiveness and suggestions for improvement, as well as assess customer satisfaction with the process of dealing with FortisBC staff, the satisfaction with the work of the contractors, and satisfaction with the installation.

Behavioural Programs

Although difficult to measure, and recognizing that behaviour change usually takes several years to show tangible results, FortisBC will perform a Monitoring and Evaluation study of the Behavioural programs early in 2011. The study will provide base data to measure success of programming. It will address process, market and impact issues, attitudes and levels of knowledge about energy efficiency, as well as self-reported behaviours.

c. Tracking Plan Progress

FortisBC will also monitor the progress of the 2011 DSM Plan by tracking several indicators:

- the implementation of new codes and standards;
- FortisBC expenditures;
- Participation rates;
- Program costs and savings; and
- Public attitudes and awareness related to conservation.

d. DSM Reporting

FortisBC participates in a provincial task force on Measurement, Analysis and Reporting which seeks to harmonize public utility Monitoring and Evaluation practices. The task force has identified key variables in determining actual load impact including free riders and persistence. A preliminary report was submitted to the over arching BC EE Partnership steering committee, and FortisBC intends to adopt common practices, once confirmed, to ensure the appropriate level of due diligence in its DSM reporting.

FortisBC will also create an updated Monitoring and Evaluation plan for the period of 2012 and beyond, which is expected to be filed along with the 20 year DSM Plan described in section 1.3.

Costs

The December 2008 Monitoring and Evaluation plan for 2011 estimated an expenditure of $200,000. However, the level of spending and scope of programs described in this 2011 DSM Plan necessitates an increase in 2011 Monitoring and Evaluation expenditures to $250,000.

These costs include internal resources, data collection, contractor liaison, research and analysis and report preparation.

Monitoring and Evaluation costs are incorporated into the Planning & Evaluation budget. Beginning in the 2010 fiscal year, the Company will disaggregate Monitoring and Evaluation spending, and report such figures to meet recent BCUC requirements.

3.6 Conservation Rates

3.6.1 2009 Rate Design Application (RDA)

Regulatory review of FortisBC's RDA is underway at the time of this application. Several aspects of the proposed rate design, if approved, will have an impact on energy conservation. These include flattening or reducing declining General Service block rates, which do not discourage higher energy consumption and a more accurate reflection of cost causation principles in demand charges.

Although FortisBC expects to see conservation impacts from the RDA once implemented, at this time it has not attempted to quantify any impacts associated with the proposed changes in rate design.

4. Plan Risks

4.1 Codes and Standards Risks

Changes to codes and standards are driven and controlled by governments. Any codes and standards not anticipated but implemented in 2011 could impact the overall costs and savings within the 2011 DSM Plan.

Given that the 2011 DSM Plan is a one year plan, FortisBC considers the risks from significant changes to planned codes and standard changes in this short timeframe to be low.

FortisBC has allocated $25,000 in spending in 2011 to participate in and provide support for government efficiency initiatives and standards development. This will ensure that FortisBC is aware of any changes to codes and standards from what is planned and is able to react to them.

4.2 Program Risks

The following section summarizes possible risks to achieving the results outlined in this plan and provides a brief analysis of the risks and how FortisBC plans to mitigate them.

Participation rates

The DSM Plan is based on assumed participation rates from customers. The level of savings is, therefore, dependent on the number of customers that participate in these programs. Assumed participation rates were developed by the CDPR consultant and were based on the best information available.

This risk will be monitored through the Monitoring and Evaluation Plan described in section 3.4. In the event that participation rates are higher or lower than expected, supporting initiatives – such as education and information – can be modified to address the issue and achieve the planned savings results.

Savings per participant

Planned savings per participant is an important variable in achieving the planned energy and capacity savings within the 2011 DSM Plan. As the planned savings per participant were estimated, the savings could be higher or lower than forecast. The savings were developed by EES Consulting using results from the End Use Surveys, industry best practices and FortisBC’s historical results for similar programs, so it is expected that they are reasonable and achievable.

Results will be monitored within the Monitoring and Evaluation Plan described in section 3.4. In the event that the level of savings is higher or lower than expected, information efforts will be adjusted.

Program costs

Similar to participation rate risks, there are program costs – incentive and non-incentive – that could be higher or lower than forecast. Program costs will be closely monitored as part of the Monitoring and Evaluation Plan to help determine if they are appropriate. If non-incentive program costs are not meeting projections, adjustments can be made easily within the timeline of the one-year Plan. If incentive costs are not appropriate, adjustments will also be made; however, the results may not occur within the prescribed timeline.

Failure of measure before end of useful life/ Removal or early replacement

As DSM supports newer energy efficiency technologies, there is the possibility that the technologies do not perform as expected or that the marketplace responds negatively. The Monitoring and Evaluation Plan recognizes this risk and will monitor for potential measure problems. Adjustments to the program, either by working collaboratively with the industry or by changing incentives, will be made if deemed appropriate. However, the results will most likely extend beyond the 2011 DSM Plan.

5. Plan Assumptions

The Total Resource Cost test calculations, in the 2011 DSM Plan, were calculated using the following criteria.

5.1 General Assumptions

Discount Rate (Real) 8%

Line Losses 8.8%

5.2 Avoided Power Purchase Costs

A blend of long-term avoided power purchase costs was used, based on the portion of energy procured from BC Hydro. The CDPR determined the levelized BC Hydro avoided energy costs to be $140.78 per MWh, and the Company's 2009 Resource Plan determined the Company's long-term avoided energy costs to be $159.35 per MWh. These are firm energy prices, inclusive of capacity benefits.

Table 5.2.1: Long-Term Avoided Power Purchase Costs

Component	Source	Long-term Avoided Cost	Proportion	Blended
Energy ($/MWh)	BC Hydro 2007 CPR 2009 Resource Plan	$140.78 $159.35	28% 72%	$154.15

Appendix A: 2011 Demand Side Management Plan

Public Consultation Report

Table of Contents

1

1.0 BACKGROUND

FortisBC Inc. (FortisBC) is developing a 2011 Demand Side Management Plan (DSM) for filing with the BC Utilities Commission (BCUC) as part of the FortisBC 2011 Capital Expenditures Plan. The DSM Plan outlines a proposed program for 2011 and sets the framework for the following years.

FortisBC engaged in consultation with the public, stakeholders and First Nations during March and April 2010. FortisBC hosted one Demand Side Management Committee meeting and four public open houses in March 2010. In addition, FortisBC was invited to provide a presentation to the City of Grand Forks Council.

The consultation in general, and open houses in particular, encouraged FortisBC customers to learn more about DSM, and to evaluate program options in order to provide feedback on what future programs should include and to what level DSM should be supported by FortisBC.

2.0 CONSULTATION PROCESS

FortisBC engaged in public consultation for the 2011 DSM Plan development to ensure that interested customers, government and business stakeholders, as well as First Nations were provided with an opportunity to learn about DSM and were able to provide feedback about program options. The feedback was considered as the DSM Plan was drafted.

FortisBC’s goal is to develop a DSM program that balances program cost-effectiveness and the interests of customers, stakeholders and First Nations. To this end, three plan options or portfolios were presented for review and included a Low Option, Medium Option and High Option. The Low Option was listed as $5 million per year and broadly outlined programs similar to what FortisBC currently provides, plus new low income programs required by recent legislation. The Medium Option was listed as $9 million per year and the High Option shown as $20 million per year. The Medium and High Options were shown to provide higher incentive levels and additional or enhanced programs.

An overview of public consultation activities for the 2011 DSM Plan is provided below.

2.1 Consultation Notification and Invitation to Open Houses

2.1.1 Written Invitations (Email and Mail)

Stakeholders including regular intervenors, Mayor and Council of service area municipalities, Members of Parliament, Members of the Legislative Assembly, Chambers of Commerce, Economic Development Commissions, BC Municipal Electrical Utilities customers and First Nations were notified of the DSM consultation in a letter and by email. The notification included an invitation to the open houses and provided a link to the project information on the FortisBC website. See Appendix A1 and A2 for copies of the letter and the stakeholder list. See Appendix A3 for a screen capture of the FortisBC webpage.

2.1.2 Website

Project information including open house times and dates, open house materials and surveys were posted on FortisBC's public website at the following link: http://www.fortisbc.com/about_fortisbc/rates/other_applications/DemandSideManagement.html. Appendix A3 provides a screen capture of the webpage.

2.1.3 Contact Centre

FortisBC's Contact Centre was provided with copies of the advertisement and with a set of expected questions and their answers, so that contact centre agents could easily respond to calls. See Appendix A4 for a copy of the Contact Centre Q&As.

2.1.4 Advertising

Newspaper advertisements were placed in print media throughout the service area to notify interested customers about the open houses. See Appendix A5 for copies of the advertisement and Appendix A6 for the advertisement booking list including media outlet and the date each ad was booked to run.

2.1.5 News Release

A news release was distributed to all service area media (print, radio, TV and online) on March 18, 2010 announcing the DSM consultation process and open houses. See Appendix A7 for a copy of the news release.

2.1.6 Demand Side Management Committee

FortisBC's Demand Side Management Committee, which is made up of the public and stakeholders was invited to meet on March 31, 2010. The committee reviewed the plan options, the feedback from the open houses and then provided their input.

2.2 Public Open Houses

2.2.1 Open House Location and DSM Team

Open houses were held in four communities as shown below. At each location attendees had an opportunity to ask questions and discuss the DSM options with the team members identified.

Creston Open House - March 22, 2010
Adam Robertson Elementary School
Mark Warren – Customer Services Director
Carol Suhan – PowerSense Service Manager
Keith Veerman – PowerSense Program Manager
Blair Weston – PowerSense Technical Advisor
Stacey Smith – Administrative Assistant
Jodie Foster Sexsmith – Communications Advisor

Castlegar Open House - March 23, 2010
Sandman Hotel
Carol Suhan – PowerSense Service Manager
Keith Veerman – PowerSense Program Manager
Blair Weston – PowerSense Technical Advisor
Stacey Smith – Administrative Assistant
Jodie Foster Sexsmith – Communications Advisor

Osoyoos Open House - March 24, 2010
Osoyoos Seniors Centre
Mark Warren – Customer Services Director
Carol Suhan – PowerSense Service Manager
Keith Veerman – PowerSense Program Manager
Perry Feser – PowerSense Technical Advisor
Phil Hawkes – Power Sense Technical Advisor
Stacey Smith – Administrative Assistant
Jodie Foster Sexsmith – Communications Advisor

Kelowna Open House March - 25, 2010
Holiday Inn Express
Mark Warren – Customer Services Director
Carol Suhan – PowerSense Service Manager

Keith Veerman – PowerSense Program Manager
Kelly Hewson – PowerSense Technical Advisor
Kim Jones – Power Sense Technical Advisor
Stacey Smith – Administrative Assistant
Jodie Foster Sexsmith – Communications Advisor

2.2.2 Open House Format

Open houses were held from 6:00 pm to 8:00 pm, with scheduled time to review poster boards and discuss the program options with FortisBC staff members. A PowerPoint presentation was provided at 6:30 pm with an opportunity for open house participants to ask questions.

Upon entering, attendees were asked to sign-in and were provided with copies of a Discussion Guide (Appendix A8), the presentation PowerPoint slides (Appendix A9) and a survey (Appendix A10). They were asked to return the survey before leaving.

There were 8 attendees who signed in at the Creston open house, 23 in Castlegar, 5 in Osoyoos and 18 in Kelowna.

2.3 Consultation Feedback

FortisBC's consultation program and notification strategies sought feedback through e-mail and mail, by telephone and through recorded comments and surveys at four public open houses, a DSM committee meeting and a City of Grand Forks Council meeting.

FortisBC received considerable feedback through the consultation process at the open houses and through written feedback. In total, 25 surveys were collected at the open houses and a further 12 surveys and 6 written responses were returned by mail or email. A spread sheet recording survey responses and additional comments is included in Appendix A11. A summary of the feedback is provided below.

2.3.1 Key themes from discussions at Open Houses

Participant's questions and comments were recorded (Appendix A12) during the open house presentations. Following the open houses the application team summarized key themes as follows.

- Clarification of cost-benefit ratio for DSM;
- Clarification of how DSM program is funded;
- Interest in net metering program;
- Interest in "smart metering";
- Options for those on low or fixed income and in rental units – would still like to participate in DSM program but cannot afford long-term payback or large investment items;
- Would like one stop to find out about all energy efficiency rebates as opposed to going to FortisBC, Terasen Gas, provincial government, and federal government for different programs;
- Questioning why FortisBC would encourage energy efficiency when selling customers electricity;
- Information seeking regarding current FortisBC, SolarBC, and LiveSmart programs;
- Information seeking on energy efficiency technologies such as CFLs, LEDs, heat pumps, instant hot water tanks, photovoltaic panels, etc; and
- Questioning whether FortisBC influences building codes and product manufacturers for higher energy efficient homes and products, especially appliances and electronics. Support FortisBC's continued involvement in these processes.

2.3.2 Survey Feedback

Appendix A11 provides a tabulation of survey responses. Key findings have been summarized below.

- Approximately 57 percent (21 of 37) of survey respondents said that they strongly agreed with the statement, "In my opinion, DSM programs are needed to encourage energy conservation". A further 30 percent (11 of 37) agreed with the same statement;

- Approximately 54 percent (30 of 37) of survey respondents said that they strongly agreed with the statement, “FortisBC should continue to support DSM”. A further 30 percent (11 of 37) agreed with the same statement;
- Approximately 51 percent (19 of 37) said that they supported the $20 million or high option for residential DSM;
- Approximately 32 percent (12 of 37) supported the $9 million or medium option for residential DSM;
- Approximately 32 percent (12 of 37) supported the $20 million or high option for the commercial DSM program; and
- When asked, “What would you change, if anything, in your preferred option”, the three highest suggested were more information and education, more renewable energy programs and higher incentive levels.

2.3.3 Written Feedback through Mail and Email Responses

In addition to survey responses from the open houses, FortisBC received 6 emailed comments and a further 12 surveys (8 email and 4 mail). These are recorded in Appendix A11.

2.3.4 Follow-up Mechanisms

To ensure attendees’ input was considered in the draft application, the last slide during the open houses presentation included a number of feedback mechanisms. These were communicated verbally during the open house presentations and were also included on the website and in the notification and stakeholder letters.

All open house participants that left contact information and those who provided comments in writing will be notified when the application is submitted to the BC Utilities Commission.

3.0 GOVERNMENT CONSULTATION

FortisBC sent addressed mail to Mayor and Councils, MPs and MLAs with a notification of the DSM consultation and an invitation to attend the open houses. No written responses were received but attendees to the open houses included representatives from:

- Nelson Hydro
- Area D (Kaslo) director from Regional District of Central Kootenay
- Mayor of Warfield
- Village of Montrose
- City of Kelowna
- Town of Creston
- Town of Osoyoos

4.0 FIRST NATIONS CONSULTATION

Notification letters (Appendix A13) with information on the DSM consultation and including invitations to the open houses and an offer to meet were mailed to the nine area bands and three nations. In addition, FortisBC asked to make a presentation to the Okanagan Nation Alliance Chief and Council at the ONA March 2010 meeting date. No written responses were received, other than a note from Westbank First Nation indicating that representatives were not available to attend the open houses.

5.0 CONSULTATION CONCLUSIONS

FortisBC’s consultation on the 2011 DSM Plan enabled the Company to make the following conclusions based on the feedback received.

- Feedback from open house participants and those who sent in written responses indicated that they are in support of the program and would be willing to contribute up to $20 million per year for DSM programs;
- Additional programming is desired for low or fixed income residents and those in rental units;
- Potential participants would like to see simple access to information and incentives – a “one stop shop”;
- Specific program components are supported such as appliances, lighting, heating systems, refrigeration and lighting (commercial), and some renewables such as solar hot water;
- There is support for additional information and education of DSM programs;
- An incentive increase from the current level is supported;
- There is considerable interest in renewable resources; and

- Societal benefits like reducing impact on the environment are supported in addition to the desire to lower electrical costs to program participants

6.0 APPENDICES

Appendix A1 Stakeholder Letter

Appendix A2 Stakeholder List

Appendix A3 FortisBC Website Screenshot

Appendix A4 Contact Centre Q&As

Appendix A5 Advertisement Copy

Appendix A6 Advertisement Booking

Appendix A7 News Release

Appendix A8 Discussion Guide

Appendix A9 PowerPoint Presentation

Appendix A10 Survey

Appendix A11 Survey Responses and Feedback Comments

Appendix A12 Open House Recorded Comments and Questions

Appendix A13 First Nations Letter

Appendix A1: Stakeholder Letter

Mark Warren
Director of Customer Service
FortisBC

FortisBC Inc.
Suite 100
1975 Springfield Road
1-866-4FORTIS
powersense@fortisbc.com
www.fortisbc.com

March 1, 2010

FortisBC will be holding a series of open houses in March to solicit input from interested parties as we update our PowerSense demand side management program, which helps customers manage their electricity bills through energy efficiency improvements. Since it began in 1989, the PowerSense program has helped customers save more than 360 million kilowatt hours — enough electricity to power about 27,700 homes for a year.

Feedback received from customers and stakeholders will be considered, along with technical and financial information, as FortisBC prepares to file the 2011 Demand Side Management Plan with the BC Utilities Commission later this spring, as part of the FortisBC Capital Expenditures Plan.

Please drop by any of the following open houses – project information panels will be on display and a presentation is scheduled for 6:30 p.m.

Creston:	Monday, March 22, 2010 | 6 – 8 p.m. Adam Robertson Elementary School, 421 9th Ave N.
Castlegar:	Tuesday, March 23, 2010 | 6 – 8 p.m. Sandman Hotel, 1944 Columbia Ave
Osoyoos:	Wednesday, March 24, 2010 | 6 – 8 p.m. Osoyoos Seniors Centre, 17 Park Place
Kelowna:	Thursday, March 25 | 6 – 8 p.m. Holiday Inn Express, 2429 Highway 97 N.

Public, First Nations and stakeholder feedback is an important part of the consultation process. If you are unable to attend an open house but are still interested in learning more or providing input, visit www.fortisbc.com/about_fortisbc/rates/other_applications.html. Open house materials will be added to the site as they become available. **Written comments must be returned by April 5, 2010** to be considered in the regulatory filing.

For more information or to return written comments, please contact me by telephone at (250) 469-8010, by email at mark.warren@fortisbc.com, or by regular mail at Suite 100,1975 Springfield Road, Kelowna, BC, V1Y 7V7.

Sincerely,

Mark Warren
FortisBC, Director of Customer Service

Appendix A2: Stakeholder List

Method of Contact	Organization	Position	City
Intervenors			
Invite / Letter and email	Nova Independent Resources Ltd.	President	Kelowna
Invite / Letter and email + DSM	Okanagan Environmental Industry Alliance	Executive Director	Kelowna
Invite / Letter and email	MGM Management		Osoyoos
Invite / Letter and email	Individual		Rossland
Invite / Letter and email	Horizon Technologies Inc.		Victoria
Invite / Letter and email	BC Sustainable Energy Association		Victoria
Invite / Letter and email	Individual		Trail
Invite / Letter and email + DSM	BC Public Interest Advocacy Centre		Vancouver
Invite / Letter and email	Econalysis Consulting Service Inc.		Toronto
Invite / Letter and email	Individual		Kaslo
Invite / Letter + DSM	Individual		Osoyoos
Invite / Letter and email + DSM	Natural Resource Industries		Hedley
Invite / Letter and email + DSM	Individual		Grand Forks
Letter only	Individual		Kaslo
Email only	Commercial Energy Consumers of BC		Vancouver
Invite / Letter and DSM	Individual		Castlegar
Invite / Letter and DSM	BC Ministry of Energy, Mines and Petroleum Resources	Director - Energy Efficiency	Victoria
BCMEU Wholesale			
Letter and Email invite	City of Grand Forks	BC Municipal Electrical Utilities	Grand Forks
Letter and Email invite	City of Penticton	BC Municipal Electrical Utilities	Penticton
Letter and Email invite	City of Kelowna	BC Municipal Electrical Utilities	Kelowna
Letter and Email invite	District of Summerland	BC Municipal Electrical Utilities	Summerland
Letter and Email invite	Nelson Hydro	BC Municipal Electrical Utilities	Nelson
Chambers of Commerce			
Invite letter and email	Castlegar and District Chamber of Commerce	Executive Director	Castlegar
Invite letter and email	Creston and District Chamber of Commerce	Executive Director	Creston
Invite letter and email	Grand Forks Chamber of Commerce	Executive Director	Grand Forks
Invite letter and email	Greenwood Board of Trade	Executive Director	Greenwood
Invite letter and email	Kaslo and Area Chamber of Commerce	Executive Director	Kaslo
Invite letter and email	Lake Country Chamber of Commerce	Executive Director	Lake Country
Invite letter and email	Nelson and District Chamber of Commerce	Executive Director	Nelson
Invite letter and email	Penticton & Wine Country Chamber of Commerce	Executive Director	Penticton
Invite letter and email	Rossland Chamber of Commerce	Executive Director	Rossland
Invite letter and email	Salmo and District Chamber of Commerce	Executive Director	Salmo
Invite letter and email	Summerland Chamber of Commerce	Executive Director	Summerland
Invite letter and email	Trail and District Chamber of Commerce	Executive Director	Trail
Invite letter and email	Christina Lake Chamber of Commerce	Vice president	Christina Lake
Invite letter and email	South Okanagan Chamber of Commerce	Executive Director	Oliver
Invite letter and email	Kelowna Chamber of Commerce	Executive Director	Kelowna
Invite letter and email	Similkameen Country	Executive Director	Keremeos
Invite letter and email	Slocan District Chamber of Commerce	Executive Director	New Denver
Economic Development Commissions			
Invite Letter and email	District of Summerland	Director of Economic Development	Summerland
Invite Letter and email	Westbank First Nation	Chief	Kelowna
Invite Letter and email	Central Okanagan Economic Development Commission		Kelowna
Invite Letter	Oliver and District Community Economic Development Society	Economic Development Officer	Oliver
Invite Letter	Destination Osoyoos	Economic Development Officer	Osoyoos

Method of Contact	Organization	Position	City
Invite Letter and email	Regional District of Kootenay Boundary	Community Economic Development Coordinator	Grand Forks
Invite Letter and email	Nelson Economic Development Partnership	General Manager of Community Futures	Nelson
Invite Letter and email	Osoyoos Indian Band	Osoyoos Indian Band	Oliver
Local Government			
Email and Letter for information and invite with cc: to CAO	City of Castlegar	Mayor	Castlegar
Email and Letter for information and invite with cc: to CAO	Town of Creston	Mayor	Creston
Email and Letter for information and invite with cc: to CAO	Village of Fruitvale	Mayor	Fruitvale
Email and Letter for information and invite with cc: to CAO	City of Grand Forks	Mayor	Grand Forks
Email and Letter for information and invite with cc: to CAO	City of Greenwood	Mayor	Greenwood
Email and Letter for information and invite with cc: to CAO	Kaslo	Mayor	Kaslo
Email and Letter for information and invite with cc: to CAO	City of Kelowna	Mayor	Kelowna
Email and Letter for information and invite with cc: to CAO	Village of Keremeos	Mayor	Keremeos
Email and Letter for information and invite with cc: to CAO	District of Lake Country	Mayor	Lake Country
Email and Letter for information and invite with cc: to CAO	District of Lillooet	Mayor	Lillooet
Email and Letter for information and invite with cc: to CAO	Village of Midway	Mayor	Midway
Email and Letter for information and invite with cc: to CAO	Village of Montrose	Mayor	Montrose
Email and Letter for information and invite with cc: to CAO	City of Nelson	Mayor	Nelson
Email and Letter for information and invite with cc: to CAO	Town of Oliver	Mayor	Oliver
Email and Letter for information and invite with cc: to CAO	Town of Osoyoos	Mayor	Osoyoos
Email and Letter for information and invite with cc: to CAO	City of Penticton	Mayor	Penticton
Email and Letter for information and invite with cc: to CAO	Town of Princeton	Mayor	Princeton
Email and Letter for information and invite with cc: to CAO	City of Rossland	Mayor	Rossland
Email and Letter for information and invite with cc: to CAO	Village of Salmo	Mayor	Salmo
Email and Letter for information and invite with cc: to CAO	Village of Slocan	Mayor	Slocan
Email and Letter for information and invite with cc: to CAO	District of Summerland	Mayor	Summerland
Email and Letter for information and invite with cc: to CAO	City of Trail	Mayor	Trail
Email and Letter for information and invite with cc: to CAO	Village of Warfield	Mayor	Warfield
Email and Letter for information and invite with cc: to CAO	Regional District of Central Kootenay	Chair	Nelson
Email and Letter for information and invite with cc: to CAO	Regional District of Central Okanagan	Chair	Kelowna
Email and Letter for information and invite with cc: to CAO	Regional District of Kootenay-Boundary	Chair	Trail

Method of Contact	Organization	Position	City
Email and Letter for information and invite with cc: to CAO	Regional District of Okanagan-Similkameen	Chair	Penticton
Elected officials	Riding		
Letter and Email for information	Penticton	MLA	Penticton
Letter and Email for information	Boundary-Similkameen	MLA	Osoyoos
Letter and Email for information	Kootenay West	MLA	Castlegar
Letter and Email for information	Nelson-Creston	MLA	Nelson
Letter and Email for information	Westside-Kelowna	MLA	West Kelowna
Letter and Email for information	Kelowna-Lake Country	MLA	Kelowna
Letter and Email for information	Kelowna-Mission	MLA	Kelowna
Letter and Email for information	Fraser Nicola	MLA	Merritt
Letter and Email for information	Okanagan-Coquihalla	MP	Penticton
Letter and Email for information	Kelowna-Lake Country	MP	Kelowna
Letter and Email for information	British Columbia Southern Interior	MP	Castlegar
Letter and Email for information	Kootenay Columbia	MP	
First Nations			
Letter to Chief and Council with offer of meeting re: DSM and Cap Ex and invite to public open houses - Sent Feb 26, 2010	Penticton Indian Band	Chief and Council	Penticton
Letter to Chief and Council with request to present and / or offer for meeting re: DSM and Cap Ex and invite to public open houses - Sent Feb 26, 2010. cc:d to Matilda Allison and Pauline Terbasket	Okanagan Nation Alliance	Grand Chief and Council	West Kelowna
Letter to Chief and Council with offer of meeting re: DSM and Cap Ex and invite to public open houses - Sent Feb 26, 2010	Osoyoos Indian Band	Chief and Council	Osoyoos
Letter to Chief and Council with offer of meeting re: DSM and Cap Ex and invite to public open houses - Sent Feb 26, 2010	Lower Kootenay Indian Band	Chief and Council	Creston
Letter to Chief and Council with offer of meeting re: DSM and Cap Ex and invite to public open houses - Sent Feb 26, 2010	Upper Similkameen Indian Band	Chief and Council	Keremeos
Letter to Chief and Council with offer of meeting re: DSM and Cap Ex and invite to public open houses - Sent Feb 26, 2010	Lower Similkameen Indian Band	Chief and Council	Keremeos
Letter to Chief and Council with offer of meeting re: DSM and Cap Ex and invite to public open houses - Sent Feb 26, 2010	Ktunaxa Nation	Chief and Council	Cranbrook

Appendix A3: FortisBC Website Screenshot

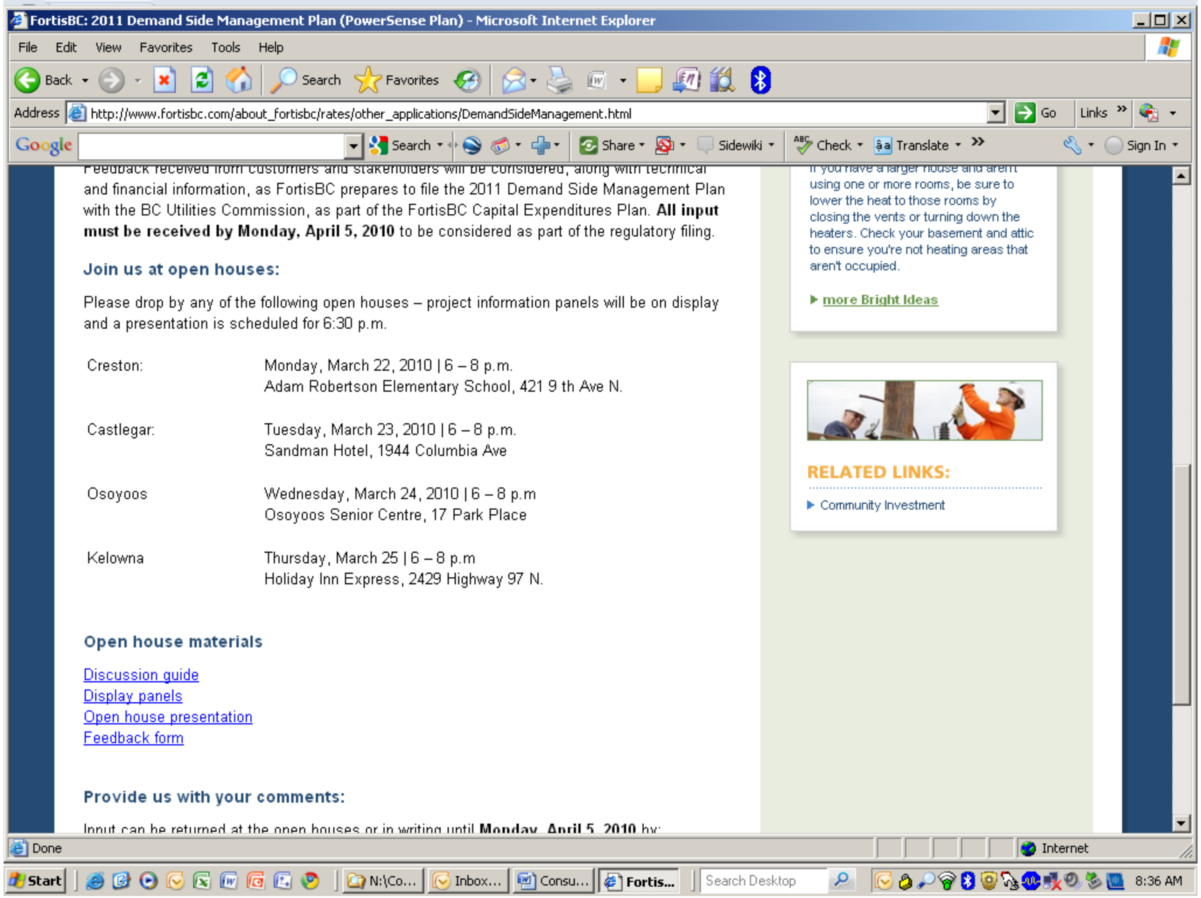
2011 DEMAND SIDE MANAGEMENT PLAN (POWERSENSE PLAN)

FortisBC is seeking public input as we update our PowerSense demand side management program which helps customers manage their electricity bills through energy efficiency improvements . Since it began in 1989, the PowerSense program has helped customers save more than 360 million kilowatt hours — enough electricity to power about 27,700 homes each year.

Over the next few months, FortisBC will be completing a review of existing PowerSense

ABOUT FORTISBC

- Company Profile
- Media Centre
- Investor Centre
- Planning for the Future
- Rates & Regulatory
  - Rates
  - FortisBC's Electric Tariff
  - Revenue Requirements Applications
  - Capital Expenditure and System Development Plans
  - Certificate of Public Convenience and Necessity (CPCN) Applications
  - Other Applications
  - Orders and Decisions
- Facilities and Operations
- Leadership Team
- Contact Us



Feedback received from customers and stakeholders will be considered, along with technical and financial information, as FortisBC prepares to file the 2011 Demand Side Management Plan with the BC Utilities Commission, as part of the FortisBC Capital Expenditures Plan. **All input must be received by Monday, April 5, 2010** to be considered as part of the regulatory filing.

Join us at open houses:

Please drop by any of the following open houses – project information panels will be on display and a presentation is scheduled for 6:30 p.m.

Creston:	Monday, March 22, 2010 | 6 – 8 p.m. Adam Robertson Elementary School, 421 9 th Ave N.
Castlegar:	Tuesday, March 23, 2010 | 6 – 8 p.m. Sandman Hotel, 1944 Columbia Ave
Osoyoos	Wednesday, March 24, 2010 | 6 – 8 p.m Osoyoos Senior Centre, 17 Park Place
Kelowna	Thursday, March 25 | 6 – 8 p.m Holiday Inn Express, 2429 Highway 97 N.

Open house materials

Discussion guide
Display panels
Open house presentation
Feedback form

Provide us with your comments:

Input can be returned at the open houses or in writing until **Monday, April 5, 2010** by:

If you have a larger house and aren't using one or more rooms, be sure to lower the heat to those rooms by closing the vents or turning down the heaters. Check your basement and attic to ensure you're not heating areas that aren't occupied.

- more Bright Ideas

RELATED LINKS:

- Community Investment

Appendix A4: Contact Centre Q&As

Demand Side Management Public Consultation – March 2010
Frequently Asked Questions

Background

FortisBC will be holding a series of open houses in March to solicit input from interested parties as we update our PowerSense demand side management program, which helps customers manage their electricity bills through energy efficiency improvements. Since it began in 1989, the PowerSense program has helped customers save more than 360 million kilowatt hours — enough electricity to power about 27,700 homes for a year.

Advertising, as well as stakeholder and First Nations notification will start the week of March 1, 2010 inviting participants to drop by any of the following open houses. Project information panels will be on display and a presentation is scheduled for 6:30 p.m.

Creston:	Monday, March 22, 2010 | 6 – 8 p.m. Adam Robertson Elementary School, 421 9th Ave N.
Castlegar:	Tuesday, March 23, 2010 | 6 – 8 p.m. Sandman Hotel, 1944 Columbia Ave
Osoyoos:	Wednesday, March 24, 2010 | 6 – 8 p.m. Osoyoos Seniors Centre, 17 Park Place
Kelowna:	Thursday, March 25 | 6 – 8 p.m. Holiday Inn Express, 2429 Highway 97 N.

All input must be received by **Monday, April 5, 2010 to be considered in the regulatory filing. Feedback can be provided at open houses or by written comment.

Why are you asking for input?

Feedback received from customers and stakeholders will be considered, along with technical and financial information, as FortisBC prepares to file the 2011 Demand Side Management Plan with the BC Utilities Commission later this spring, as part of the FortisBC Capital Expenditures Plan. FortisBC believes that public, stakeholder and First Nations feedback is an important part of the process.

What is demand side management (DSM)?

Demand side management or DSM is the planning and implementation of programs designed to modify energy consumption on the customer's side of the meter by encouraging customers to improve energy efficiency, reduce electricity use, change the time of use, or use a different energy source.

Examples of DSM program options include rebates for residential heat pumps, and commercial lighting, providing low income programs for making energy efficiency improvements in residences, as well as public energy efficiency education.

What is the PowerSense program?

PowerSense is FortisBC's demand side management program and it has been in operation since 1989. PowerSense offers energy efficiency rebates and programs for all customer groups including residential, commercial (general service) and industrial.

The PowerSense program serves both direct and indirect customers (wholesaler) within the FortisBC service area.

Why would an electrical utility want to help save energy?
The PowerSense program is based on the principle that is less expensive to fund programs and rebates than it is to purchase energy or build new generation facilities.

- FortisBC generates less than half the energy used by its customers, and the remainder must be purchased from other generators. The cost of DSM programs is about half the cost of long-term power purchases.
- Minimizing energy consumption lessens the need for new generation resources, transmission and distribution lines, and substations required to safely and reliably meet customer's future electricity needs.
- And all of these savings help the environment, creating a cleaner, more sustainable future for the communities in FortisBC's service area.

FortisBC is committed to energy efficiency and supports the provincial government's 2007 BC Energy Plan. FortisBC is also is obligated to provide some programs under the Utilities Commission Act (Bill 15-2008).

- The Energy Plan and the Utilities Commission Act have established policies and regulations that require utilities, where prudent to do so, to position DSM resources before all other resources when considering either the acquisition of new energy and capacity resources or additional energy purchases to meet customer load in long term resource plans.

What are you are considering in the plan?
FortisBC is considering three portfolios of DSM components. The portfolios vary in the types of programs, how the program is delivered, levels of rebates / incentives and the total cost of each portfolio.

Examples of DSM rebates include residential heat pumps, commercial lighting and energy efficiency evaluation incentives. Examples of programs include residential low income, rental household, and municipal, as well as general energy efficiency education.

What will you be asking us to comment on?
FortisBC values the input of our customers, stakeholders and First Nations. At open houses and through written comment, FortisBC will be asking for feedback on preference of the three portfolios, as well as the components within the portfolios. We'll also be asking if there are any specific programs that we should be investigating as part of this plan.

Who pays for the demand side management program?
The PowerSense demand side management program is paid for by all FortisBC customers and is included in your electrical bill.

The program also includes indirect customers in municipal wholesale areas (Kelowna, Penticton, Summerland, Nelson and Grand Forks). These program costs are recovered through the municipal wholesale customers.

Why only a one year plan?
FortisBC is currently undertaking a number of long terms strategic plans such as the Resource Plan and the Integrated System Plan. Since demand side management is an integral part of these plans, a one-year DSM plan will allow programs to continue through 2011, but a longer term plan is required as a component of the Resource Plan and Integrated System Plan.

How will public input be used on this project?
Feedback received from customers and stakeholders will be considered, along with technical and financial information, as FortisBC prepares to file the 2011 Demand Side Management Plan with the BC Utilities Commission later this spring, as part of the FortisBC Capital Expenditures Plan.

How can I participate in the regulatory process?
FortisBC will be filing the 2011 Demand Side Management Plan with the British Columbia Utilities Commission (BCUC) in late spring, as part of the 2011 Capital Expenditures Plan. Once filed, the BCUC will set a schedule for a regulatory review process for the FortisBC Capital Expenditures plan including the 2011 Demand Side Management Plan.

For more information or to become involved in the regulatory process visit the BCUC's website at www.bcuc.com.

What if I can't come to the open house? / Where can I get more information?
If you are unable to attend an open house but are still interested in learning more or providing input, visit www.fortisbc.com/about_fortisbc/rates/other_applications.html. Open house materials will be added to the site as they become available.

Written comments must be returned by April 5, 2010 to be considered in the regulatory filing.

For more information or to return written comments, please contact:
Keith Veerman, PEng
PowerSense Program Manager
Telephone (250) 469-8072
Email powersense@fortisbc.com
Mail Suite 100, 1975 Springfield Road, Kelowna, BC, V1Y 7V7

About FortisBC Inc.
FortisBC Inc. is an integrated, regulated electric utility based in Kelowna, British Columbia. Focused on the safe delivery of reliable and cost-effective electricity, FortisBC serves approximately 159,000 customers directly and indirectly through wholesale utilities in the southern interior of B.C. FortisBC owns and operates four regulated hydroelectric generating plants and approximately 7,000 kilometres of transmission and distribution power lines. FortisBC employs over 500 people in British Columbia and is an indirect wholly owned subsidiary of Fortis Inc., the largest investor-owned distribution utility in Canada. Fortis Inc. shares are listed on the Toronto Stock Exchange and trade under the symbol FTS. Additional information can be accessed at www.fortisinc.com or www.sedar.com.

Appendix A5: Advertisement Copy

Public open house

PowerSense Program Plan for 2011

Your views are important to us

FortisBC is seeking public input as we update our PowerSense demand side management program which helps customers manage their electricity bills through energy efficiency improvements. Since it began in 1989, the PowerSense program, has helped customers save more than 360 million kilowatt hours — enough electricity to power about 27,700 homes each year.

Over the next few months, FortisBC will be completing a review of existing PowerSense programs and planning for new and enhanced programs for 2011. We invite you to learn more about demand side management and share your thoughts on the topic with us. Examples of program options include residential heat pumps, commercial lighting, low income programs, as well as general energy efficiency education.

Feedback received from customers and stakeholders will be considered, along with technical and financial information, as FortisBC prepares to file the 2011 Demand Side Management Plan with the BC Utilities Commission, as part of the FortisBC Capital Expenditures Plan.

Please drop by any of the following open houses – project information panels will be on display and a presentation is scheduled for 6:30 p.m.

Creston:	Monday, March 22, 2010 | 6 – 8 p.m. Adam Robertson Elementary School, 421 9th Ave N.
Castlegar:	Tuesday, March 23, 2010 | 6 – 8 p.m. Sandman Hotel, 1944 Columbia Ave
Osoyoos:	Wednesday, March 24, 2010 | 6 – 8 p.m. Osoyoos Seniors Centre, 17 Park Place
Kelowna:	Thursday, March 25, 2010 | 6 – 8 p.m. Holiday Inn Express, 2429 Highway 97 N.

For more information, call 1-866-4FORTIS (1-866-436-7847) or visit www.fortisbc.com

Energizing your community.

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www.fortisbc.com

Appendix A6: Advertisement Booking

Outlet	Media Type	City	Run dates
Castlegar News	Newspaper	Castlegar	March 4,18
Creston Valley Advance	Newspaper	Creston	March 4,11
Boundary Creek Times Mountaineer	Newspaper	Greenwood	March 18
Pennywise	Newspaper & Trades	Kaslo	March 2,16
Boundary Weekender (Grand Forks)	Newspaper	Distributed to: Beaverdell, Bridesville, Christina Lake & area, Grand Forks, Greenwood, Midway, Rock Creek and Westbridge	March 5,12
Kelowna Capital News	Newspaper	Kelowna	March 3,17
Keremeos Review	Newspaper	Okanagan Falls, Keremeos, Hedley, Cawston, and the Similkameen Valley	March 4,18
Nelson Star	Newspaper	Nelson	March 4,18
Oliver Chronicle	Newspaper	Oliver	March 3,17
Osoyoos Times	Newspaper	Osoyoos	March 3,17
Okanagan Saturday/Sunday	Newspaper	Distributed by Kelowna Daily Courier, Penticton Herald	March 6,21
Similkameen News Leader	Newspaper	Princeton, Coalmont, Tulameen, Hedley, Keremeos, Cawston	March 2,16
Summerland Review	Newspaper	Summerland	March 4,18
Trail Rossland News	Newspaper	Trail	March 4,18
The Weekender (West Kootenay)	Newspaper	Distributed by: Trail Daily Times, Nelson Daily News, Grand Forks Gazette	March 5,12

Appendix A7: News Release

FORTISBC

News Release

FOR IMMEDIATE RELEASE:

PowerSense Open Houses

Kelowna, BC, March 18, 2010: FortisBC Inc. is hosting a series of open houses next week to gather public feedback as the utility updates plans for its PowerSense program.

“PowerSense is FortisBC’s demand side management program, which helps customers manage their electricity bills through energy efficiency improvements,” said Michael Mulcahy, FortisBC Vice President of Customer and Corporate Services. “Since it began in 1989, the PowerSense program has helped customers save more than 360 million kilowatt hours. That’s enough electricity to power about 27,700 homes for a year.”

Over the next few months, FortisBC will be completing a review of existing PowerSense programs and planning for new and enhanced programs in 2011. Examples of program options include residential heat pumps, commercial lighting, low income programs as well as public energy efficiency education.

“The open houses will provide an opportunity for customers to learn more about demand side management and share their thoughts on the topic with us. If you are unable to attend an open house, you can also visit the FortisBC website to review information about what we’re considering and provide your comments,” said Mulcahy.

Feedback received from customers, stakeholders and First Nations before April 5, 2010 will be considered, along with technical and financial information as FortisBC prepares the 2011 Demand Side Management Plan. The plan will be filed with the British Columbia Utilities Commission (BCUC) as part the FortisBC Capital Expenditures Plan later this spring. Once the plan has been submitted, BCUC will establish a schedule for the regulatory review process.

Drop by any of the open houses – project information panels will be on display and a presentation is scheduled for 6:30 pm in each location.

Creston:	Monday, March 22, 2010 | 6 – 8 p.m. Adam Robertson Elementary School, 421 9th Ave N.
Castlegar:	Tuesday, March 23, 2010 | 6 – 8 p.m. Sandman Hotel, 1944 Columbia Ave
Osoyoos:	Wednesday, March 24, 2010 | 6 – 8 p.m. Osoyoos Senior Centre, 17 Park Place
Kelowna:	Thursday, March 25 | 6 – 8 p.m. Holiday Inn Express, 2429 Highway 97 N.

For more information about the PowerSense program, the open houses or how you can provide comments, call the toll free number at 1-866-4FORTIS (1-866-436-7847) or visit FortisBC's website at www.fortisbc.com.

About FortisBC
FortisBC Inc. is an integrated regulated electric utility based in Kelowna, British Columbia. Focused on the safe delivery of reliable and cost-effective electricity, FortisBC serves approximately 159,000 customers directly and indirectly through wholesale utilities in the southern interior of B.C. FortisBC owns and operates four regulated hydroelectric generating plants and approximately 7,000 kilometres of transmission and distribution power lines. FortisBC employs over 500 people in British Columbia and is an indirect wholly owned subsidiary of Fortis Inc., the largest investor-owned distribution utility in Canada. Fortis Inc. shares are listed on the Toronto Stock Exchange and trade under the symbol FTS. Additional information can be accessed at www.fortisinc.com or www.sedar.com.

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For further information contact:
Jodie Foster Sexsmith
Communications and Media Relations Advisor
Corporate Communications, FortisBC Inc.
Tel: (250) 469-8007, Media Tel: (250) 718-1718
www.fortisbc.com

Appendix A8: Discussion Guide

FORTISBC

Discussion Guide

A demand side management program

Use your PowerSense

www.fortisbc.com

2011 PowerSense planning

FortisBC is seeking input as we update our PowerSense demand side management (DSM) program, which helps our customers manage their bills by reducing energy consumption. Since it began in 1989, PowerSense has helped customers save more than 360 million kilowatt hours — enough electricity to power about 27,700 homes for a year.

FortisBC is committed to open dialogue with customers, stakeholders and First Nations. We believe that your feedback is an important part of the process. Please share your thoughts on this topic with us at an open house or by sending written comments before April 5, 2010 to:

Email: powersense@fortisbc.com
Fax: (250) 717-0801
Mail: Keith Veerman, PowerSense
Programs Manager
Suite 100–1975 Springfield Rd
Kelowna, BC, V1Y 7V7

Public consultation and regulatory process

A series of open houses is being held across FortisBC's service area in March, 2010 to invite public input. For those unable to attend an open house, FortisBC is providing opportunities for input by providing information about demand side management options on our website and by accepting written comments until April 5, 2010.

Feedback received from customers and stakeholders will be considered, along with technical and financial information, as FortisBC prepares to file the 2011 Demand Side Management Plan with the British Columbia Utilities Commission (BCUC) later this spring, as part of the FortisBC Capital Expenditures Plan.

Once filed, the BCUC will set a schedule for a regulatory review process for the FortisBC Capital Expenditures plan including the 2011 Demand Side Management Plan.

For more information visit http://www.fortisbc.com/about_fortisbc/rates/other_applications.html or to become involved in the regulatory process visit the BCUC's website at www.bcuc.com.

Demand side management in BC

The provincial government has placed an increased emphasis on conservation, including the introduction of policy such as the 2007 BC Energy Plan and amendments to the Utilities Commission Act.

The BC Energy Plan requires that 50% of future power needs be offset by conservation by 2020. We've made progress toward that target and in 2009, 30% of FortisBC's new power needs were offset by the conservation encouraged through the PowerSense program.

FortisBC is also obligated to provide low income, rental and education programs under the Utilities Commission Act. The Utilities Commission Act also requires utilities, where prudent to do so, to position DSM before all other resources when considering new energy and capacity resources.

Demand side management

Demand side management or DSM is the planning and implementation of programs designed to modify energy consumption on the customer's side of the electrical meter by encouraging customers to improve energy efficiency, reduce electricity use, change the time of use, or use a different energy source.

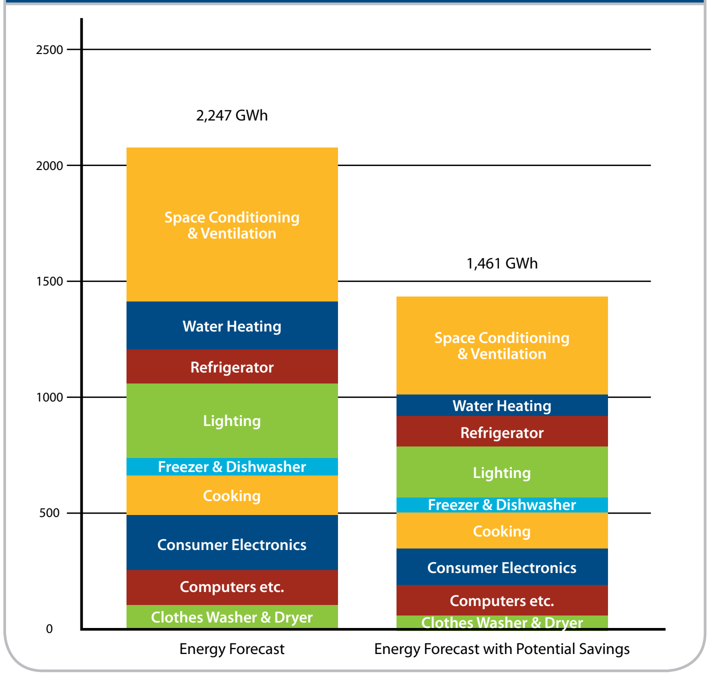
PowerSense is FortisBC's demand side management program. It provides programs and incentives encouraging energy efficiency for FortisBC's 159,000 direct and indirect customers.

Program planning principles

When putting together options for consideration, FortisBC used the following principles to guide decision making. Options must:

- Be customer focused
- Be cost effective
- Meet the BC 2007 Energy Plan and the Utilities Commission Amendment Act requirements
- Use best practices
  - Implement recommendations from public input and from research on FortisBC customers and other utilities
  - Use multiple strategies including community-based social marketing, partnerships, and financial incentives (rebates)

Comparison of Residential Energy Use in 2030



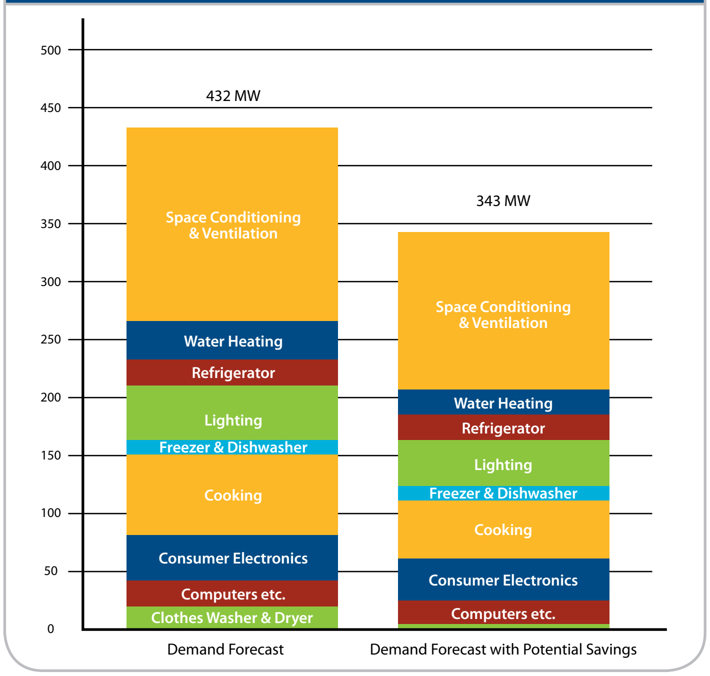
Customer use and savings potential

The following graphs show electricity use forecast in 2030 for residential, commercial and industrial customers with and without the potential DSM savings.

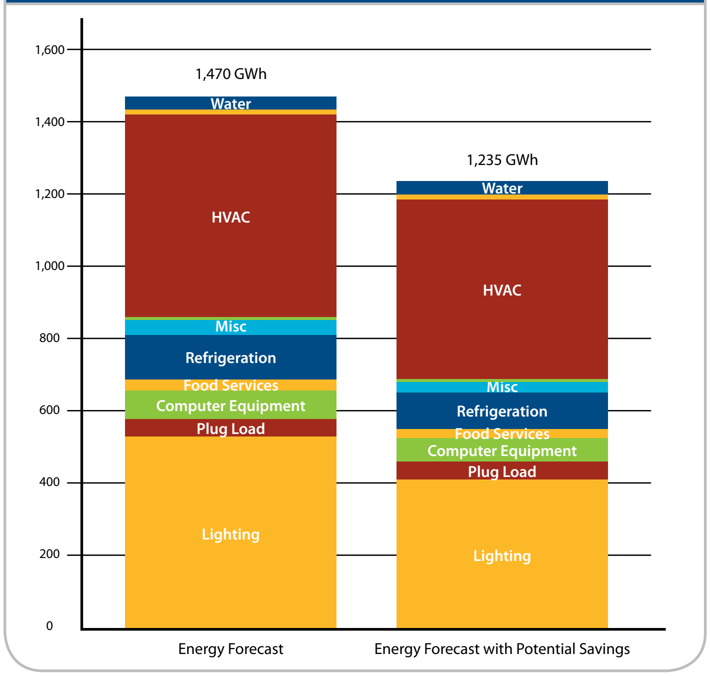
One gigawatt hour (GWh) equals one million kilowatt hours (kWh) and is enough energy for about 75 homes for a year.

One megawatt (MW) equals one thousand kilowatts (kW). A toaster requires about 1.2 kW (1200 watts) of power to operate.

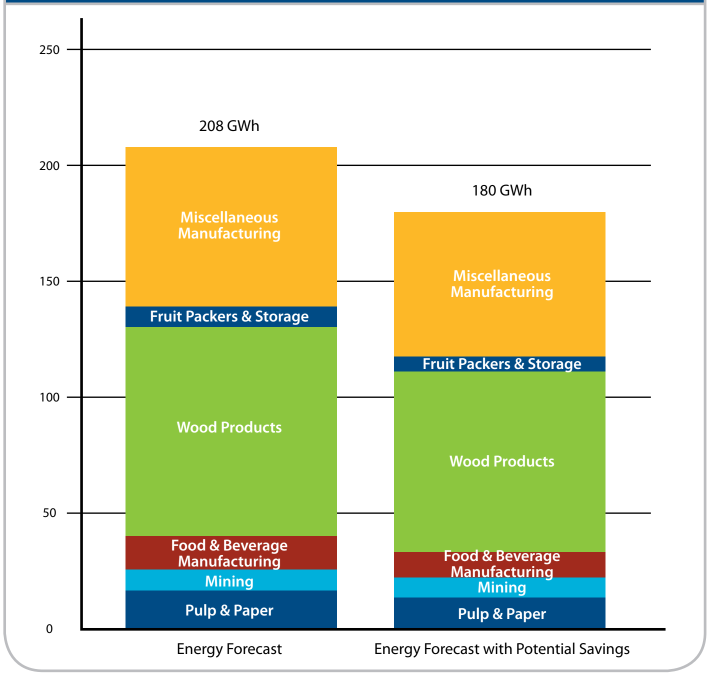
Comparison of Residential Demand in 2030



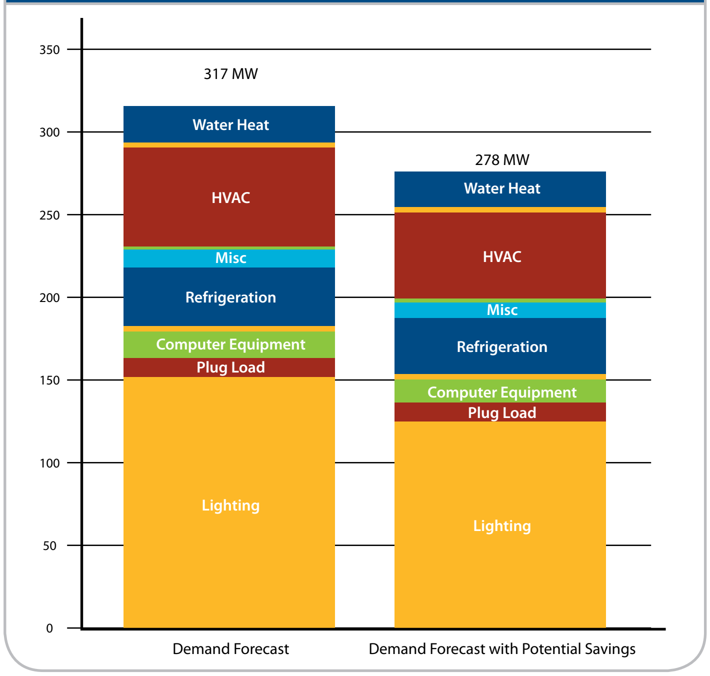
Comparison of Commercial Energy Use in 2030



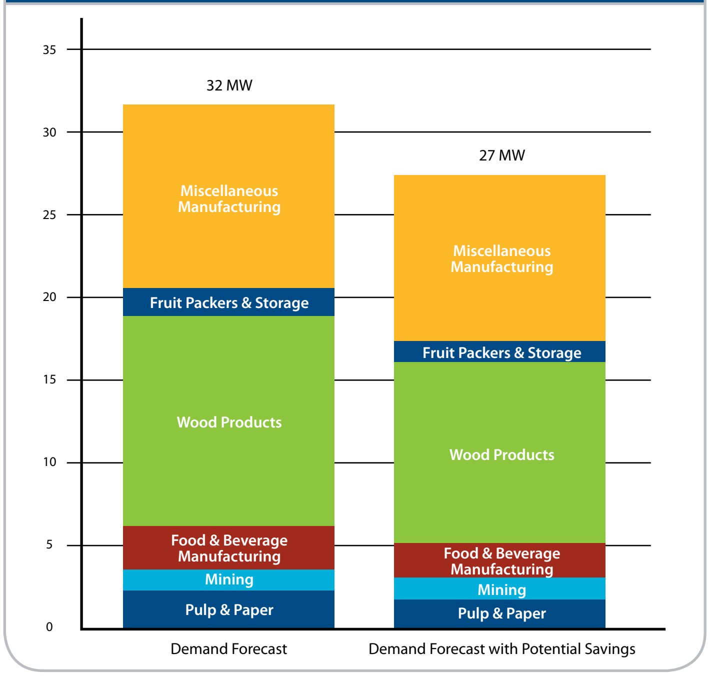
Comparison of Industrial Energy Use in 2030



Comparison of Commercial Demand in 2030



Comparison of Industrial Demand in 2030



Program options for consideration

FortisBC is considering three program options. Each option has different costs and energy offset targets but also varies in the number and kind of energy efficiency programs provided and in the incentives (rebates) offered.

	Low Option $5 million	**Medium Option $9 million**	**High Option $20 million**
% of new electricity needs offset	Energy 36% Demand 28%	Energy 51% Demand 41%	Energy 93% Demand 53%
Incentive levels	25%	40%	50%
Residential programs	• Appliances • Consumer electronics • Lighting • Heating / AC systems • Building envelope	• Additional appliances • Electric thermal storage • Appliance fuel switch	Medium Option + • Solar Photovoltaic • Solar hot water • Residential wind
Commercial programs	• Lighting • Street lighting • Municipal infrastructure • Refrigeration • Computer servers / networks • Weatherization • Building envelope	Low Option + • Additional municipal infrastructure • Enhanced lighting	Medium Option + • Solar Photovoltaic
Industrial programs	• Lighting • Pumps & fans • Refrigeration • Motor rewinds • Compressed air • Energy management information systems	Same	Same
Irrigation programs	• Pump upgrade • Pivot systems	Same	Same
Low income & rental	• Energy savings kits (ESK)	Low Option + • ESK installation • Energy evaluations	Medium Option + • Home retrofits
Social marketing	• Website • Direct and face-to-face marketing • Collateral • Product and sample give-aways • Targeted advertising	Low Option + • Social networking • Additional product and sample give-aways • Additional targeted advertising	Medium Option + • Mass market advertising • Bill comparison pilot
Education	• Destination Conservation • Sponsorship of ENGO programs	Low Option + • Additional sponsorship of ENGO programs	Medium Option + • Curriculum delivery

What it means

- **Appliance fuel switching** - achieves electrical savings by substituting natural gas appliances for electrical appliances.
- **Building envelope** - the exterior surface of a building's construction including the walls, windows, doors and roof with a focus on insulation (R-value).
- **Collateral** - is a collection of marketing and communications pieces used as part of an organization's overall marketing strategy. Can include brochures, newsletters and product samples.
- **Compressed air** – measurement and repair of air leaks in an air delivery system, sequencing of compressors and use of variable speed compressors.
- **Destination Conservation** – an ENGO sponsored program for elementary and middle schools that combines curriculum-based learning outcomes with energy conservation. Destination Conservation is designed to increase sustainability by helping schools conserve energy and water, reduce waste and protect the environment while at the same time saving money.
- **Electric thermal storage** – a fan forced heater containing thermal bricks that are heated or reheated during lower cost "off-peak" times.
- **Energy management information systems** – a dashboard or internet portal through which a building's energy usage is monitored & tracked.
- **ENGO** – environmental non-government organization, for example the David Suzuki Foundation.
- **Motor rewinds** – motor rebuild to extend the life of a motor that meets or exceeds the original motor efficiency rating.
- **Pivot systems** – wheeled irrigation sprinklers that move in a circular fashion, operating with low-pressure, reduced volume sprinkler heads.
- **Social networking** –using social contacts to network or the interaction between a group of people who share a common interest. A traditional example is a church community, more recent examples on the internet include Facebook, YouTube & Twitter
- **Solar photovoltaic** – a solar panel comprised of silicon cells, which directly converts incoming sunlight into electricity.
- **Weatherization** – air sealing (caulking & door/window weather stripping), insulation and other measures to reduce heating load.

Frequently asked questions

What is the difference between energy and demand?

Energy is a measure of how much electricity used or produced over a period of time and is measured in kilowatt hours (kWh), as you would see on your electrical bill or gigawatt hours (GWh) as utilities measure the total electricity load.

Demand is a measure of how much power is used or produced at any instant in time. Its unit of measure is kilowatts (kW) or kilovolt amperes (kVA). A customer's peak demand for the billing period is shown as a demand charge on most non-residential bills. Utilities measure the total system load in megawatts (MW).

Why would an electrical utility want to help save energy?

FortisBC supports the provincial government 2007 BC Energy Plan. In addition to provincial policy, the PowerSense program is based on the principle that it is less expensive to fund programs and rebates than it is to purchase energy or build new generation facilities.

- FortisBC generates less than half the energy used by its customers and less than one third of the demand required. The remainder must be purchased from other generators. The cost of DSM programs is about half the cost of long-term power purchases.
- Minimizing energy consumption lessens the need for new generation resources, transmission and distribution lines, and substations required to safely and reliably meet customer's future electricity needs.
- And all of these savings help the environment, creating a more sustainable future for the communities in FortisBC's service area.

Frequently asked questions

Who pays for the demand side management program?

The reduced electrical load resulting from DSM pays for a portion of the PowerSense program, the remainder is paid for by all FortisBC customers and is included in your electrical bill. The program includes direct customers as well as indirect customers in municipal wholesale areas (Kelowna, Penticton, Summerland, Nelson and Grand Forks). Indirect customer program costs are recovered through the municipal wholesale rates.

Over time, DSM programs are also more cost effective than building new electrical infrastructure.

What happens to DSM in 2012 and beyond?

FortisBC is currently undertaking two other long term strategic plans, the Resource Plan and the Integrated System Plan. Since demand side management is an integral part of these plans, a one-year DSM plan will allow programs to continue through 2011, but a longer term plan is required as a component of the Resource Plan and Integrated System Plan.

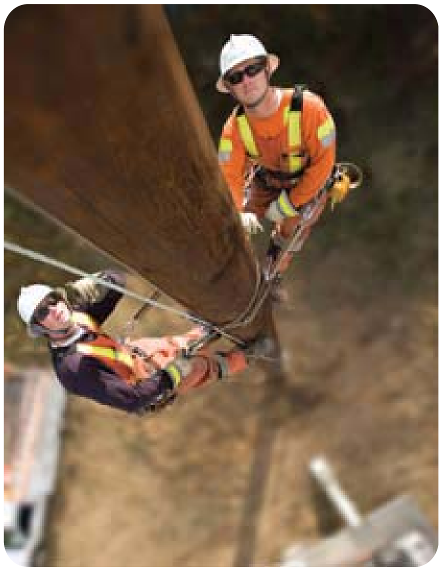
Next steps

All feedback received will be considered along with technical and financial information as FortisBC prepares to file the 2011 Demand Side Management Plan as part of the Capital Expenditure Plan later this spring. Once the plans have been filed, the BCUC manages the regulatory process and makes the final decision on program options.

The BCUC will set a schedule for a regulatory review process, by the BCUC and interested parties. For more information or to become involved in the regulatory process visit the BCUC's website at www.bcuc.com

For more information about PowerSense, the 2011 Demand Side Management Plan or the FortisBC Capital Expenditure Plan filing
Call: 1-866-4FORTIS
(1-866-436-7847)
Email: powersense@fortisbc.com
Or visit: www.fortisbc.com/about_fortisbc/rates/other_applications.html

FortisBC Inc. is a Canadian owned
electric utility operating in the
southern interior of British Columbia



About FortisBC Inc.

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FortisBC employs over 500 people in British Columbia and is an indirect wholly owned subsidiary of Fortis Inc., the largest investor-owned distribution utility in Canada. Fortis Inc. shares are listed on the Toronto Stock Exchange and trade under the symbol FTS. Additional information can be accessed at www.fortisinc.com or www.sedar.com.

Appendix A9: PowerPoint Presentation

2011 PowerSense Plan

Demand Side Management

Presenters

Keith Veerman, PowerSense Programs

Carol Suhan, PowerSense Operations

Lower Bonnington Generation Station

FORTISBC

Outline

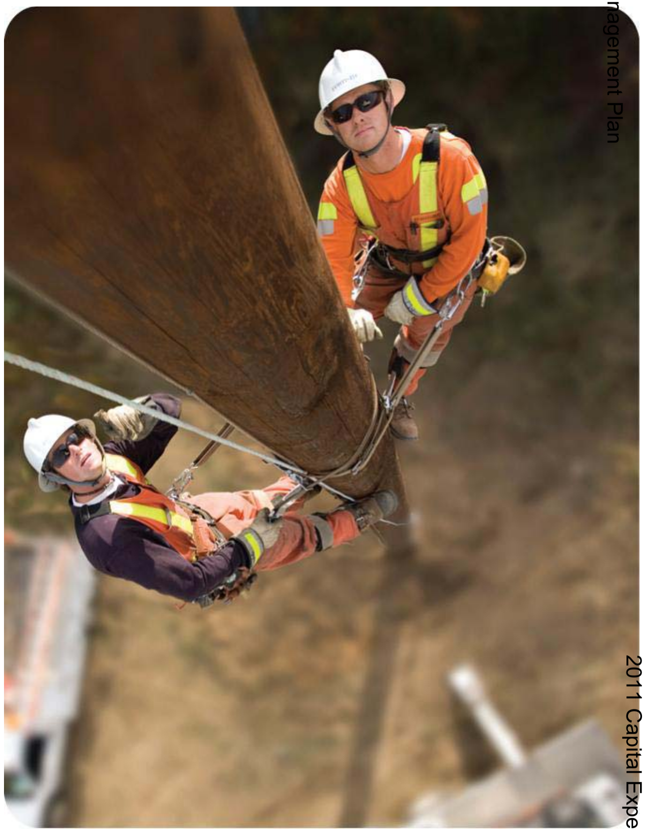
- FortisBC Background
- What is DSM?
- History of PowerSense
- The DSM Planning Process
- Planning Principles
- Review of the Options
- Next Steps

Sysco Foods: lighting retrofit, refrigeration, building optimization

FORTISBC

About FortisBC

- We serve approx. 159,000 customers
  - 111,000 direct
  - 49,000 indirect
- Employs more than 500 people
- Canadian owned utility
  - headquartered in Kelowna
  - 14 field offices
- Own four hydroelectric generating plants
- Build, maintain and upgrade power lines and facilities

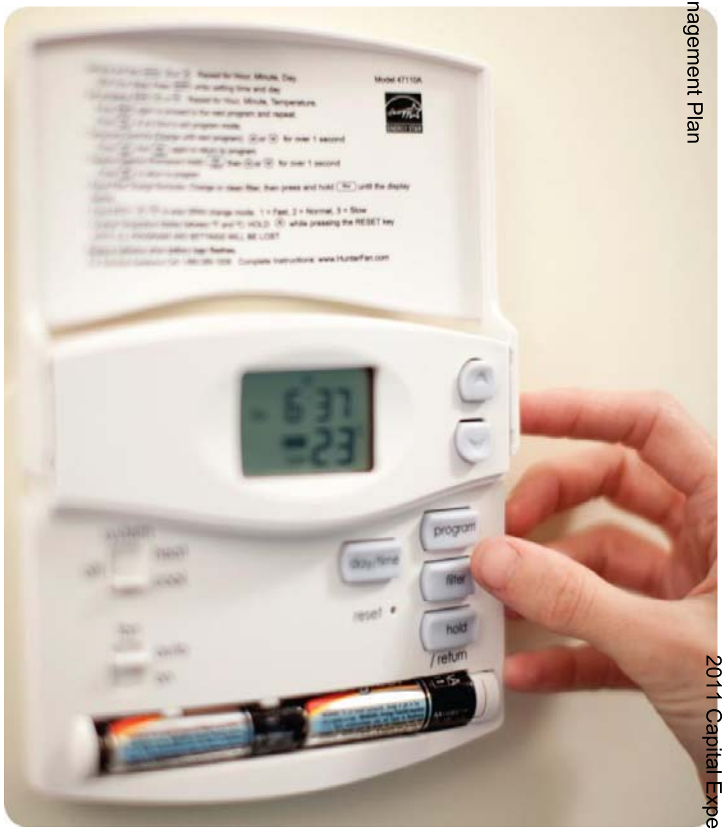


FortisBC employees

FORTISBC

What is Demand Side Management (DSM)?

- PowerSense is DSM program
- Programs to modify electricity use
  - energy efficiency
  - energy conservation
  - different energy source
  - shift time of energy usage

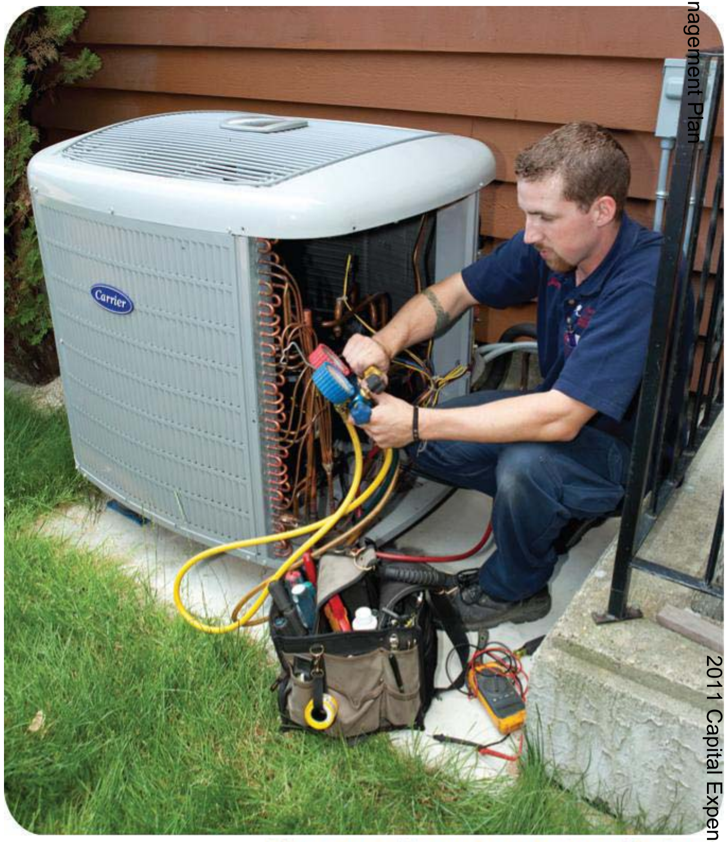


Programmable thermostat

FORTISBC

History of FortisBC's PowerSense

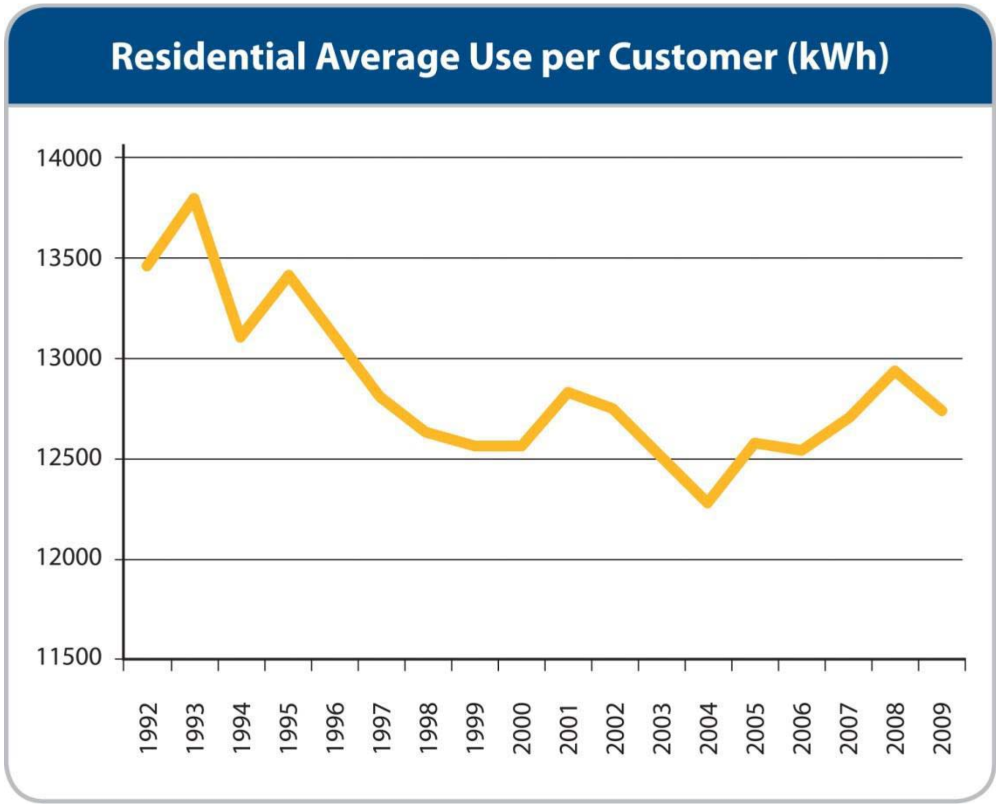
- Launched in 1989
- Award winning
- Cost-effective
- 360 GWh saved to date
    - enough to power 27,000 homes
- $37.8 M investment
- Offsets 30% of load growth
    - Energy Plan target is 50% by 2020



Air source heat pump installation

FORTISBC

Average residential electricity use (kWh)



Installing weather stripping

FORTISBC

Existing PowerSense programs

- Residential
  - new homes
  - heat pumps
  - LiveSmart BC
- Commercial
  - lighting
  - building & process improvements
- Industrial
  - compressors
  - industrial efficiency
- Conservation Culture

InVue Condominiums: geo-exchange, HVAC, thermal windows

FORTISBC

2009 PowerSense conservation culture

- Earth Hour
  - community challenge
  - 9 MW reduction
- Laundry promotion
  - 5,000 clotheslines
  - $100 rebates for EnergyStar laundry sets
- 20/20 CFL exchange
  - 27,000 lighted exchanged

Giving away clotheslines

FORTISBC

Grandview Heights – 2009 residential project

- Energy efficient features
  - air source heat pumps
  - EnergyStar windows
- $12,500 rebate from FortisBC
- 108,000 kWh savings
  - 8 homes

25 duplex homes for seniors

FORTISBC

City of Grand Forks – 2009 municipal project

- Waste water treatment plant
    - Variable speed drive
- $30,000 rebate from FortisBC
- Saves 650,000 kWh
    - 48 homes

FORTISBC

The DSM Planning Process

- BC 2007 Energy Plan
- Utilities Commission Amendment Act
- End use surveys
- Conservation and Demand Potential Review
- Scenario development
- Public consultations
- 2011 DSM Plan filing

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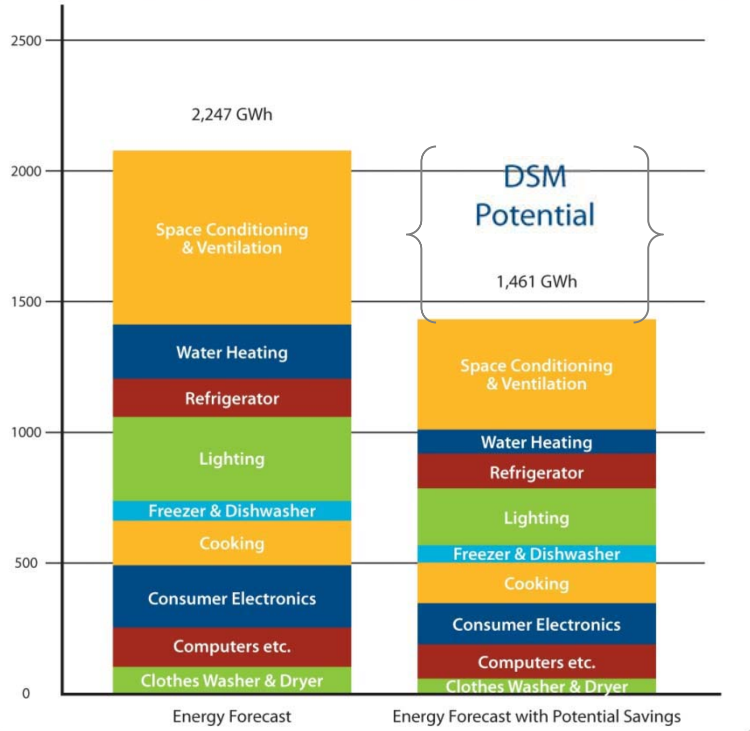
Planning Principles

- Customer focused
- Cost effective
- Meet regulatory requirements
- Best practices
    - public input and research
    - incentives
    - community-based social marketing

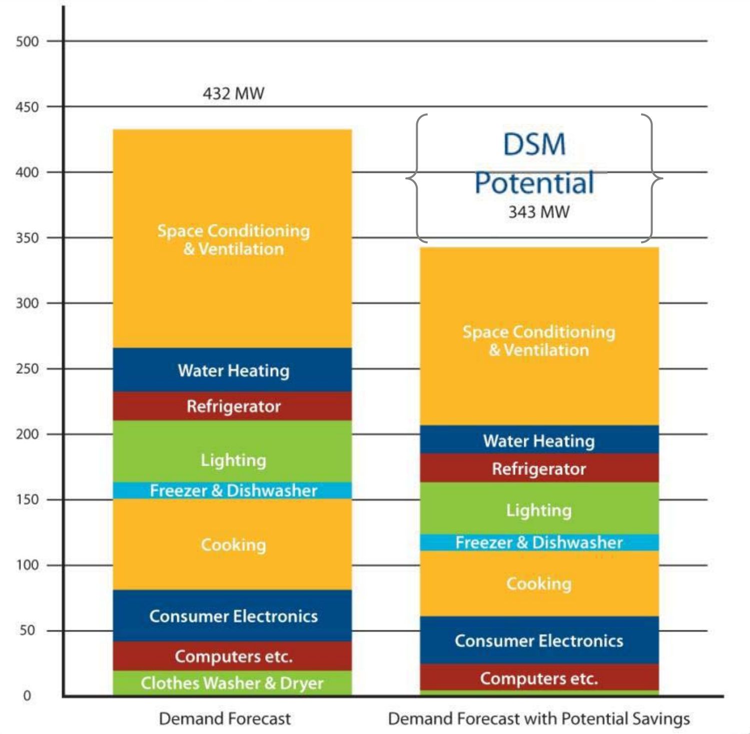
FORTISBC

Residential energy use and demand in 2030

Comparison of Residential Energy Use in 2030



Comparison of Residential Demand in 2030



FORTISBC

DSM Options

Options	Low	Medium	High
budget	$5 million	$9 million	$20 million
% of new energy needs offset	36%	51%	93%
incentive levels	25%	40%	50%

FORTISBC

DSM Option 1 - Low

	Low option – $5 million	
% of new electricity needs offset	Energy 36% Demand 28%	
Incentive levels	25%	
Residential programs	Appliances Lighting	Electronics Heating/AC systems
Commercial programs	Lighting Municipal infrastructure Computer servers/networks Building envelope	Street lighting Refrigeration Weatherization
Industrial programs	Lighting Refrigeration Compressed air	Pumps and fans Motor rewinds Energy management info systems
Irrigation programs	Pump upgrade	Pivot system
Low income and rental	Energy saving kits (ESK)	
Social marketing	Website Collateral/product samples	Direct and face-to-face Targeted advertising
Education	Sponsorship of ENGO programs	Sponsorship of trades training

DSM option 2 - Medium

	Medium option – $9 million	
% of new electricity needs offset	Energy 51% Demand 41%	
Incentive levels	40%	
Residential programs	Low Option + Additional appliances	Electric thermal storage Appliance fuel switch
Commercial programs	Low Option + Additional lighting	Additional municipal infrastructure
Industrial programs	Same	
Irrigation programs	Same	
Low income and rental	Low Option + ESK installation	Energy evaluations
Social marketing	Low Option + Social networking	Additional product samples Additional targeted advertising
Education	Low Option +	Additional sponsorship of ENGO and trades training programs

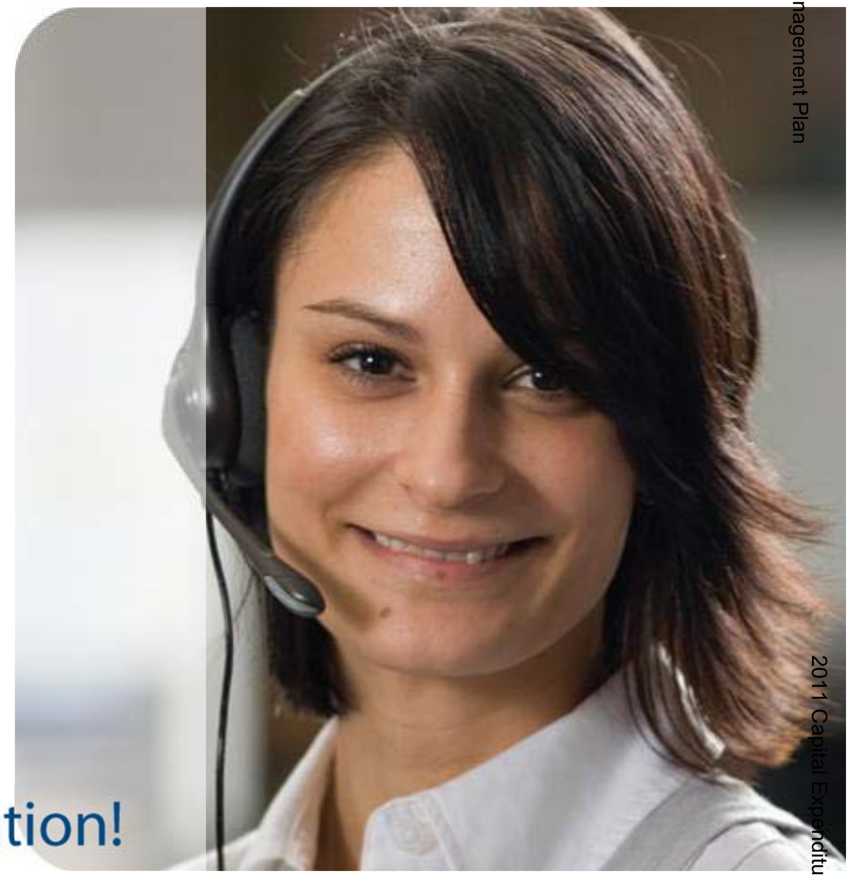
DSM option 3 - High

	High option – $20 million	
% of new electricity needs offset	Energy 93% Demand 53%	
Incentive levels	50%	
Residential programs	Medium Option + Solar Photovoltaic	Solar hot water Residential wind
Commercial programs	Medium Option + Solar Photovoltaic	
Industrial programs	Same	
Irrigation programs	Same	
Low income and rental	Medium Option +	Home retrofits
Social marketing	Medium Option + Mass market advertising	Bill comparison pilot
Education	Medium Option +	Curriculum delivery

Provide your feedback!

Deadline for written feedback: April 5th

- Sign-in sheets
- Surveys
- Hand-outs
- Website: www.fortisbc.com/2011DSM
- E-mail: powersense@fortisbc.com
- Mail: Keith Veerman, PEng
  Manager, PowerSense Programs
  Suite 100 – 1975, Springfield Road
  Kelowna, BC, V1Y 7V7



We encourage your ongoing participation!

FORTISBC

Next Steps

- Open houses: March 22-25th
- Meetings with DSM Advisory Committee
    - March 29th
- Deadline for written feedback: April 5th
- File 2011 DSM Plan to BCUC

- Further regulatory process: www.bcuc.com

Thank you!

Deadwood Junction: lighting upgrades

FORTISBC

Questions?

FORTISBC

Appendix A10: Survey

FORTISBC

Open house feedback form | March 2010

2011 Demand Side Management plan feedback form

Now that you've had the opportunity to learn about the 2011 Demand Side Management (DSM) plan, please provide us with feedback by rating the following statements and sharing your comments below.

General Questions

In my opinion, DSM programs are needed to encourage energy conservation and efficiency.

1	2	3	4	5
Strongly Agree				Strongly Disagree

FortisBC should be the customer's source of information on energy conservation and efficiency.

1	2	3	4	5
Strongly Agree				Strongly Disagree

DSM is an effective method of meeting FortisBC's power needs.

1	2	3	4	5
Strongly Agree				Strongly Disagree

FortisBC should continue to support DSM.

1	2	3	4	5
Strongly Agree				Strongly Disagree

Any change in my electric bill, significantly impacts my monthly budget

1 2 3 4 5

Strongly Agree				Strongly Disagree

It is important that FortisBC understands your level of agreement. Please provide any additional comments on DSM Programs below:

____

____

____

It is important for FortisBC to understand why DSM is important to you. Please **RANK** the following in order of importance from 1—5:

______ Supports green technologies

______ Lowers electricity costs for program participants

______ Reduces environmental impacts

______ Reduces requirements for new infrastructure (dams, distribution lines etc)

______ Other ____

Residential Customers - DSM Program Alternatives

Which of the presented program options do you prefer?

______ Low Option ($5 million)

______ Medium Option ($9 million)

______ High Option ($20 million)

What would you change, if anything, in your preferred option?

______ Increase incentive levels

______ Add more programs

______ Add more low income, rental and First Nations programs

______ More renewable energy programs

______ More marketing and education

______ Other ____

Please indicate how likely you are to participate in the following types of programs within your preferred option :

	Very Likely		Perhaps		Not very likely
Appliances	1	2	3	4	5
Lighting	1	2	3	4	5
Heating system	1	2	3	4	5
Air conditioning	1	2	3	4	5
Programmable thermostats	1	2	3	4	5
Hot water heater	1	2	3	4	5
Window replacements	1	2	3	4	5
Home insulation / draft proofing	1	2	3	4	5
Renewable sources (PV or Wind)	1	2	3	4	5
Other ______________________	1	2	3	4	5

Commercial Customers - DSM Program Alternatives

Which program option do you prefer?

______ Low ($5 million)

______ Medium ($9 million)

______ High ($20 million)

What would you change, if anything, in your preferred option?

______ Increase incentive levels

______ Add more programs

______ Add more low income, rental and First Nations programs

______ More renewable energy programs

______ More marketing and education

______ Other ____

Please indicate how likely you are to participate in the following types of programs within your preferred option :

	Very Likely		Perhaps		Not very likely
Lighting	1	2	3	4	5
Street / Parking lot lighting	1	2	3	4	5
Refrigeration	1	2	3	4	5
Computer servers / networks	1	2	3	4	5
Weatherization / building envelope	1	2	3	4	5
Energy management info systems	1	2	3	4	5
Renewable sources (PV or Wind)	1	2	3	4	5
Other ____________________	1	2	3	4	5

Anything else?

Were there any other programs that we missed that you would be interested in participating in?

____

____

____

Final Comments

Please provide any final comments

____

____

____

About you

Your feedback will be considered along with technical and financial input as FortisBC prepares the 2011 Demand Side Management Plan for filing. Feedback collected at open houses, through feedback forms and via written comments will be recorded and summarized in the consultation report which will be provided to the British Columbia Utilities Commission during the regulatory review process.

Please indicate if your account is (check all that apply):
______ Residential ______ Industrial ______ Wholesale
______ General Service ______ Irrigation ______ Lighting

Did you attend an open house? ______ Yes ______ No

______Creston ______Castlegar ______Osoyoos ______Kelowna

How did you hear about the open house?
______ Newspaper ______ Letter / Email of invite ______ Other (describe below)
______ Radio ______ From a friend or colleague ____________________________________

Please provide your contact information (optional):
Name ____
Address ____
Email ______________________________ Phone ______________________________

Deadline for feedback forms or written comment is **Monday, April 5th, 2010**.
You can return written feedback forms or comments by:
Email powersense@fortisbc.com or mail Keith Veerman at 100—1975 Springfield Road, Kelowna, BC, V1Y 7V7

Appendix A11: Survey Response and Feedback Comments

Feedback form summary

Open House sign-in sheet numbers	Creston	Castlegar	Osoyoos	Kelowna		
	8	23	5	18		
Surveys returned at open house	3	13	3	6		
Additional survey / comments mailed or email in (surveys included in numbers below - comments attached at end)	18					
General Questions	Strongly agree				Strongly disagree	
	1	2	3	4	5	
Question 1 - In my opinion, DSM programs are needed to encourage energy conservation	21	11	3	4	1	
Question 2 - FortisBC should be the customer's source of information on energy conservation and efficiency	13	9	10	2	3	
Question 3 - DSM is an effective method of meeting FortisBC's power needs	16	13	4	3	1	
Question 4 - FortisBC should continue to support DSM	20	11	1	3	1	
Question 5 - Any change in my electric bill significantly impacts my monthly budget	6	4	9	8	7	

Comments

My personal financial implications are the prime motivators to reduce energy use

Have encouraged as an intervenor since 1988-89 GT hearing in Oliver (transcript)

It is confusing to have to go to 3rd parties (other than utility company) such as SolarBC

FortisBC needs to comply with BC Government's Energy Plan which sets a goal of providing 50% of new growth through DSM. Hence the $9 million/year option to meet this provincial goal is the obvious choice.

We have built a new home and have done as much as possible to put in energy conserving / green technologies

Must disincent load expansion

DSM makes utility expenditures for new power (which tends to be more expensive) less necessary. Everyone saves in the long run.

DSM needs to keep a sharp eye on energy supply ie - from garbage - solar - wind in some parts
Add solar hot water to medium options because this has higher efficiency than P.V., wind etc. right now
Important for meeting Bill 44. Public education and awareness is very important. Look how poorly some cities did during Earth Hour.
I strongly support what you are doing
I am a faculty member at the UBC Okanagan, teaching in the School of Engineering. My expertise is in the areas of engineering economics, and sustainable development. I am very pleased to see FortisBC pursuing this, and would like to see buyback programs accelerated to individual households within the year. The technology exists, but I have not seen or heard of it in any Kelowna locations.
We need to focus on influencing behaviour changes in order to become more sustainable. Strongly support the use of a multi-faceted approach that includes policy and education / communication (community-based social marketing)
Go to it
I think Fortis is starting to make people aware but more must be done
Why not connect Fortis, Terasen, BC Hydro, PNG and PEECA (?) options province wide, regardless of service boundaries
Strongly believe in energy conservation (not just saving electricity), have been recycling waste heat (OE processes) since 1967
Any benefits are positive and should be pursued aggressively

Question 6 - It is important to understand why DSM is important to you. Please Rank the following in order of importance from 1-5	**1**	**2**	**3**	**4**	**5**	
Supports green technology	7	9	9	9	2	
Lowers electricity costs for program participants	3	2	11	12	5	
Reduces environmental impacts	10	12	3	6	2	
Reduces requirements for new infrastructure	9	7	8	7	3	
Other						
encourages energy conservation and efficiency - educate						
Promotes conservation, sustainability						
Time is right, people are receptive	1					
Modernization requirement	1					
Helps keep fossil fuels in the ground for future generations		1				
Encourages communities to engage in energy saving practices		1				
Promotes a culture of mutual support and cooperation	1					

Sustainability						
Residential Customers - DSM Program Alternatives						
	Low	**Med**	**High**			
Question 7 - Which of the presented program options do you prefer?	**5**	**12**	**19**			
Question 8 - What would you change, if anything, in your preferred option	**Increase incentive levels**	**Add more programs**	**Add more low income, rental and FN**	**More renewable energy programs**	**More marketing and education**	**Other**
	13	6	7	16	17	Whatever makes sense (and financially viable)
						Maintenance rebates - double the complexity with traditional back up system
						Any demand increase (build out) should pay
						None
						I support a $15 million option - I think $20 million is perhaps too aggressive

						Strengthen involvement of target low-income community members
Question 9 - Please indicate how likely you are to participate in the following types fo programs within your preferred option	**Very Likely**		**Perhaps**		**Not very likely**	
	1	**2**	**3**	**4**	**5**	
Appliances	16	7	8		2	
Lighting	20	9	3	1	1	
Heating system	15	4	5	1	6	
Air Conditioning	9	3	7	4	7	
Programmable thermostats	11	4	6	2	8	
Hot water heater	13	9	3	3	2	
Window replacements	9	6	9	3	5	
Home insulation / draft proofing	12	7	5	5	3	
Renewable sources	9	6	7	2	7	
Other						
SHW	1					
Time of Use	1					
Solar / Solar thermal	3					
Commercial Customers - DSM Program Alternatives						
	Low	**Med**	**High**			
Question 10 - Which of the presented program options do you prefer?	2	4	12			
Question 11 - What would you change, if anything, in your preferred option	**Increase incentive levels**	**Add more programs**	**Add more low income, rental and FN**	**More renewable energy programs**	**More marketing and education**	**Other**

	6	2		4	6	EMIS solutions for larger sites
						Increase cost / kw. Nothing is as effective as a higher cost - BC's carbon tax has been a good thing.
						Incentive needs to be 50% of net equipment cost and not of net differential for solar PV to work in BC

Question 12 - Please indicate how likely you are to participate in the following types fo programs within your preferred option	**Very Likely**		**Perhaps**		**Not very likely**	
	1	**2**	**3**	**4**	**5**	
Lighting	10	3	3			
Street / parking lot lighting	4	5	3	2	2	
Refrigeration	6	4	3	1	2	
Computer servers / networks	3	7	4	1	1	
Weatherization / building envelope	6	5	3		1	
Energy management info systems	5	5	4			
Renewable sources	4	4	5		3	
Other						
Geothermal solar thermal	2					
Solar DHW	1					

Question 13 - Were there any other programs that we missed that you were interested in participating in?
Not really
Address the total picture. Lands… who cleans up the system
I would like to have more information on larger scale (ie neighbourhood) geothermal technology
A solar hot water program, air source heat pumps
Smart metering and further cash back
Industrial energy use reduction studies and support to structured in-house energy management programs as power the BC Hydro Power Smart
Energy manager program similar to BC Hydro's, continuous optimization program similar to BC Hydro's, online billing and consumption data reporting
Timer switches in the home for short term evening lighting and decorative units such as water fountains. Hard wired timer switches for bathroom fans. Possibly expenditures on these type of switches could be included in the lower option of DSM.
Solar DHW, Energy Manager, Continuous Optimization - see BCH
Fuel cell for residential use (e.g. Bloom energy), geothermal, heat and electrical storage units for re. homes
Commercial energy audits
Questions 14 - Please provide any final comments
Good steps in the right direction
Please carry on!
Very good presentation. It is too bad more people were not here.
DSM publicity does not reach smaller communities. FortisBC billing should be more like BC Hydro's - much more readable and contains useful information that encourages conservation
Type of generation must be considered ie dependable power not sporadic hydro eg IPP. Need dependable hydro!!! Available in peak demand
Are you 'gearing up' for the advent of the electric car?
Good presentation - patient staff. I would like more info on how to take advantage of PowerSense programs
Please supply me with a new power meter 'digital. I do not trust the old one. Please, I don't know any other way.
You're on the right track Keep up the energy (no pun intended)
Appreciate the historical DSM program and look forward to much enlarged program from 2011 onwards
With the loss of the federal EcoEnergy program, the improvement of incentives from Fortis will go a long way towards making changes to sustainable green technologies affordable for the average household and business
Thank you for the opportunity to voice our opinion. I am looking forward to reducing my energy consumption and reducing infrastructure costs well into the future. I believe that renewable energy incentives and education are key to our future. Thank you

The Residential Average Use per customer looks high (2009 was 12750 kWh). To curb wasteful usage I think consideration should be given to a system where the user pays more per kWh as the usage increases

I would like you or some agency to track spin-off effects of emerging conservation program. They are often used on "low-hanging fruit". I'd like to know which programs stimulate the greatest overall community benefits

Excellent work - I like your program approach - good planning, good consultation. Keep up te good work.

About you

Question 15 - Please indicate if your account is:	Residential	General service	Industrial	Irrigation	Wholesale	Lighting
	32	4	1		1	1

Question 16 - Survey from Open House in:	Creston	Castlegar	Osoyoos	Kelowna		
	4	13	4	9		

Question 17 - How did you hear about the open house?	Newspaper	Radio	Letter / email	Friend / colleague	Other	
	13	1	14	4	Sandwich board outside	
					Walking dog, saw sign	
					Invite as an intervenor	
					Can't remember	
					Walked in	
					Member of council	

Additional comments emailed/mailed

Hello Keith, I am writing to introduce myself and my company, Climate Sense. Climate Sense is a new concept in climate-friendly energy-saving programs for BC which is being very well received by individuals, companies, utilities and governments. We are already in discussions for possible collaboration with BC Hydro Power Smart. I've attached a short power-point presentation to give you an overview what we're doing and possibilities we can offer. We would love the opportunity to get together and discuss this in more detail at your convenience. Thanks very much, Cheryl Graham, President. www.climatesense.ca (604) 786-0420

Dear Sirs: I believe you should employ DSM Option 3-High. We could all benefit from more use of solar and wind power and there is much left to be done in the area of education. I already do all I can to conserve but would like more promotion of LED lighting as I cannot tolerate the CFL's. Assistance with retrofitting older homes would also be of much interest. Thank you.

Hi there, I wanted to email my comments via a scanned 2011 DSM plan feedback form however I am having technical difficulties so my comments by email will have to suffice. I strongly agree that DSM programs are needed to encourage conservation and efficiency. The market alone cannot be relied upon to direct cultural change towards energy usage awareness. Whilst information naturally is delivered to people via many routes, it is helpful to have a single body to spearhead information and drive social change and it makes sense that that party be the utility provider. A single driver helps the customer in an often confusing minefield of conflicting information with regards to how to act upon decreasing energy use. In terms of ranking what DSM is important, I can't find a reason why it would not be important and does not make sense. Usually in the environmental field the economic reasons don't quite add up; a choice has to be made to do the cleanest thing from the cheapest thing. The great thing about DSM is that it is an investment with great financial and environmental returns and by default fosters not only greater energy awareness but footprint/consumer awareness too.

I support the high option with the investment of $20 million for the reason above; the information from the open house confirmed that it makes financial sense. It makes sense to pursue reduction before finding increasing sources of energy. I am likely to participate as a resident in a number of the programs given that my partner plans to turn his house into a duplex.

I am a residential customer and attended the open house in Castlegar which I heard about via the paper and through Blair Weston. Many thanks.

Re: 2011 Power Sense Planning-- I am in favor of the medium plan, but think that there should be some incentive added for Solar Hot Water systems. This is relatively affordable and the technology is available-with more marketing to increase awareness, the demand for it will go up and cost will go down.

Hi Keith, I was at the open house on March 22nd in Creston but did not have enough time to do the survey. I did look over the displays and read the brochure. Here are my thoughts.

I prefer the High Option program. The reason for this is I like that you are considering looking at solar, and wind options and continuing with home retro fits as well as all the ideas in the lower options. My son recently purchased a 90 year old house in Creston that we are helping him renovate. It is amazing in its lack of energy efficiency. The exterior wall aren't even insulated. We have had an energy audit done and are going to save a bundle of energy as we redo the house. By offering help to home owners by saving $ will certainly encourage people to do this. If you want to use the little house as an example of what can be done I can send you pictures and information.

Also I am a Grade 4 teacher and I am pleased to see that curriculum delivery is included in the High Option. ENGO programs do address some of the kids while curriculum reaches just about everyone. I also teach student teachers Science, for the U.Vic ed program and by having conservation delivery in the curriculum will also teach the adult educators (teachers). This part will be especially effective if you can package the unit and either have someone like Blair deliver it or bring it in to the schools. All the best,

Hi Keith, I went through your material and provide the following:

1) In general I support more than less. At a minimum the $9M option and open to spending more if it can be demonstrated that it it cost effective.

2) It is a surprise to see that solar and wind are expected to provide that much benefit. It has always been my understanding that this power s not seen as sufficiently reliable (non-firm) to be a source that could defer the need for alternative generation capacity (i.e. natural gas fired electrical peaking stations).

▨ 10 or more surveys indicated this response

**Please note that because of respondent variables, some questions were not answered or anwered more than once

Appendix A12: Open House Recorded Comments and Questions

FortisBC
Demand Side Management Open House

NO OF ATTENDEES:	8 people
LOCATION:	Creston, B.C. Adam Robertson Elementary School
MEETING DATE/TIME:	March 22, 2010 People arrived at various times and we did not do a presentation, just circulated the room answering one on one questions.

ITEM #	ITEM DESCRIPTION
	• Questions asked and answered on a one to one basis
	•

FortisBC
Demand Side Management Open House

NO OF ATTENDEES:	23 people
LOCATION:	Castlegar, B.C., Sandman Hotel
MEETING DATE/TIME:	March 23, 2010 Presentation started at 6:33 and ended at 6:50 Question period started at 6:50 and ended at 8:40

ITEM #	ITEM DESCRIPTION
1.	• How do you measure cost effectiveness?
	• *Benefits are greater than the costs. Costs of the programs are less than the amount we save on the program. Dams only produce half the amount of the power that we use, the rest of the power we have to purchase, so if less power is being used, we purchase less, which means overall it costs the customers less.*
2.	• You should be able to demonstrate savings in generation. How do the savings show up in generation?
	• *In statistics, monitoring and evaluation reports.*
3.	• Who is paying for the 50% in the high option? Shouldn't the government become more involved? We appreciate what you are doing; you are doing more than the government does.
	• *It is being paid for by the customers, it is being invested by Fortis, and they earn a return and the rate payers are paying for the 50%. We do work with the government, and they decided that the DSM is something we as the utility need to do.*
4.	• Cost of the programs is spent and somewhat subsidized by saving power? If we don't need to purchase as much power does that not mean that the cost to the customer may not need to increase? If you accomplish one of these levels of DSM, would it not be a savings to the customer?
	• *There would be saving on the infrastructure, if there was no new load growth, we wouldn't have to build new substations etc to supply the power.*
5.	• If we pick the high option, does that mean we will have an increase in the power bills?
	• *Yes, the medium 0.2% impact, high option 0.7%. Average customer that would be $2.5 for medium, and $8.50 on the high option.*

ITEM #	ITEM DESCRIPTION
6.	• Do we lobby the government for any changes to the legislation?
	• *Mark Warren is on a provincial co-ordination committee, we do work with them for changes to the legislation.*
7.	• How do we monitor the risk or manage it?
	• *Power planners do have contingency plans. The lower cost the lower the risk, but there is always risk of power lines coming down etc. DSM is considered low risk. Whether we have the low, med or high option we will continue to supply power that will not be affected.*
8.	• What about giving the customers a list of things that they should purchase?
	• *We don't tell you as a customer what to buy; we just give you a rebate if you buy something that is energy efficient. The consumer has the decision, we don't tell you what to purchase. Customers need to research the product, and not rely on FortisBC to tell them what to purchase.*
9.	• Isn't that opening the problem of people purchasing things that aren't actually energy efficient? Wouldn't it be better to give guidelines so that people purchase the correct items?
	• *We will have a list of the types of things we would recommend and will have a criteria set up to help customers with their purchases.*
10.	• Since you want us to put turbines etc in to provide our own power, are you willing to put in reversible meters?
	• *Yes, we are. It was a program that was just approved last year through the BCUC through net metering. Bi- directional meter with self generation. Details are on the website.*
11.	• Do you offer any subsidies, sub-metering for management purposes?
	• *We don't have a program on sub-metering per say, but for our industrial customers we offer an energy management system where customers can watch there usage, but we have not gotten to the residential level yet, but do plan too in the future.*
12.	• Fortis is going to make money on this. We want information so that we can make a decision on this.
13.	• Is this an option that we choosing for 2011? If we go for the high option, would that be for 2011 and on? Would it not make sense to do a ramp up to it rather than an immediate effect on rates?
	• *We are choosing the direction for the next 10 years. It would be our intention that it would be for 2011 and beyond. It would be a ramp up, not a 20 million jump next year.*
14.	• How much is the administration cost and how much is the revenue? What are the returns on the investment? What are the numbers on heat pump installations and the savings?

ITEM #	ITEM DESCRIPTION
	• *We offer different options to different customers because everyone needs and/or wants different things. A heat pump return on investment would be 8-10 years and a 10-12% return on investment.*
15.	• Does FortisBC have any input to building codes, wall thickness, insulation etc.?
	• *No, it is set by provincial government but we do have some input.*
16.	• Three options- majority of people here are thinking of residential. Profits, how much are they and where do they go? There is a huge project in trail and the residential people are paying for it. As a resident, it is the other costs as consumers that we are going to have to absorb, as well as the new options for FortisBC. Where is the listening ear for the people that unable to pay more for these changes, with the economy the way it is.
	• *Cost of all our energy will be going up over the next decade. Retrofits, we have to make changes to existing buildings to make the changes, and it will be a cost now, but a savings later. In Canada we waste 48% of our energy.*
17.	• Good opportunities to have everyone openly discuss the issues and I don't feel like we were given the opportunity to do so. I feel that it should be an open forum for discussion amongst the people that have come rather than a presentation.
18.	• Great educational tool to do this, hope you don't stop because of some of the comments you have received this evening.
	• *Open houses are important as we need the feedback. Any regulatory filing we normally would do an open house. BCUC wants to see that we have gone out and gotten the public's opinion.*
19.	• Rate of return? What is the cost of doing these open houses, do you find that they make a difference?
	• *They are not particularly expensive, but it depends on the open houses and what we need for the presentations. Most utilities do open houses in order to get feedback from the communities. The hardest part of doing the open houses are getting people to come out.*
20.	• What about garbage incineration? This seems like it would be a good way to get rid of the garbage rather than burying it in the ground. It could provide a lot of energy. Is FortisBC looking into this?
	• *The cost effectiveness of using solid waste and turning it into energy is not effective in a small community, but it would be in a big community.*
21.	• Why is there not a legislation that new subdivisions have to have solar power? Why do we not go to the provincial government and get them to have a legislation that they have to have solar power etc.
	• *Government is trying to get communities to look at energy plans. Opportunities exist everywhere and municipalities will become more involved if they see the incentives.*

ITEM #	ITEM DESCRIPTION
22.	• Encourage buying new products which have had energy gone into producing them and it may reduce our energy usage but what about the building costs for these products?
	• *In the whole life of the CFL you will save by throwing away the old one and putting in the new one. Most programs we look at the whole life of the program.*
23.	• What are the power generators doing to tell the people who create electronics that they should build things that run on solar etc.?
	• *CEE lobby specifically to manufacturers to develop more energy efficient appliances etc.*
24.	• Should be emphases from the utilities to help people be able to save power, low income seniors can't afford to put new windows in or a heat pump.
	• *We have the ability to loan the money to those who cannot afford it at a low interest rate.*
25.	• What is FortisBC doing to change the most wasteful energy use, which is in grocery stores, such as the freezers and fridges?
	• *We have been working with retail stores and they have been making changes. Consumers have a voice and should let the stores hear their views on these types of things.*

FortisBC
Demand Side Management Open House

NO OF ATTENDEES:	5 people
LOCATION:	Osoyoos, B.C., Osoyoos Seniors Centre
MEETING DATE/TIME:	March 24, 2010 Presentation and questions started at 6:35 ended at 7:45

ITEM #	ITEM DESCRIPTION
1.	• Without some kind of monitoring system, it will not have an effect on the customer base as people need to see their savings to have them make the effort.
	• *We want to implement advanced metering; it will allow you as a customer to see your consumption whenever you want.*
2.	• Do you find a difference in the change of time, daylight savings?
	• *We do not have any proof of that.*
	• I read an article in a magazine (Economist) study recently that it is a 1% increase in energy for daylight savings not a decrease.
3.	• *Some of our programs are for residents which include new homes, we provide incentives for better windows/doors, lighting etc. We also have a live smart program which is for older homes if they want to replace things like single pane windows, or base board heaters with heat pumps.*
4.	• What is the heat pump? What is the cost?
	• *It is a different type of heat. The heat pump is like an air conditioner but also acts as a heater, it has a dual purpose. Typically around $5,000.00. The price varies on how large your house is etc.*
5.	• How much energy do you save?
	• *Depends on the load you use in the house, each residence would be different.*
6.	• If I had a heat pump, would I use less energy than my air conditioner?
	• *It would be a more efficient source of heat. It would also reduce greenhouse gas emissions.*
	• *We are co-investing with our customers, for those that wish to purchase products that are energy efficient, we will provide a rebate for the purchase.*

ITEM #	ITEM DESCRIPTION
7.	• When you dim the street lights how much electricity are you really saving?
	• *You may save 40% by diming the lights down 50%. We did a pilot program by diming at 8 by 30% and 50% at midnight and saved 30% in Kelowna.*
8.	• What percentages of municipalities are using more efficient street lights?
	• *We do not have a percent, but we are assuming communities are using efficient types.*
9.	• What do we do with our old Christmas light bulbs? In bigger cities you can bring them somewhere but haven't heard of anything in our community.
	• *You can just throw them in the garbage, they are not recyclable.*
10.	• What in dollars do we expect to save on the three different levels?
	• *Going back to the cost effectiveness, if we spend 5 million next year, we expect to save 10 million in the next few years.*
11.	• So you would save in power purchases or building infrastructure?
	• *A good part of it is reoccurring which is the power purchasing, and part of it is infrastructure return. Most of the return is saving on power purchasing, not on the infrastructure.*
12.	• I heard that wood is better for retaining the heat within your home as opposed to aluminum for the frame work, a 50% savings.
	• *I would believe it if it were 15%, but 50% sounds like a big number.*
13.	• I have filled out the form, but am hoping that I will not get calls from random places like Florida?
	• *No, we do not distribute the information to anyone; it is for our information only. Your information is used only for us to be able to give you feedback on the regulatory process.*
14.	• We planted trees around our house when we moved and within two years we noticed a huge difference in the amount we used our air conditioner in the summer.
	• *Tree planting around your house is a form of energy conservation because it will help with lessening the use of your air conditioner as the sun will be blocked by the trees.*
15.	• Do you recommend specific contractors?
	• *We have a list of contractors that can be used to install the different energy efficient products, but we will not recommend one certain contractor.*
16.	• Do the heat pumps need electric backup for the very cold weather?
	• *Yes, some of them will cut out at -10 to -20, so you will need backup for when it becomes really cold. It would automatically switch back and forth when it was needed.*

ITEM #	ITEM DESCRIPTION
17.	• That is more efficient then gas heat?
	• *Yes it is. For everyone one kilowatt hr you buy from us, you get around 3 hrs of heat.*
18.	• You need more information about the different programs you have out there.
	• *We did have a program running, but could do another one for any new people that have moved into the area.*
	• *We want to help our customers out, whether they are large or small.*

FortisBC
Demand Side Management Open House

NO OF ATTENDEES:	18 people
LOCATION:	Kelowna, B.C., Holiday Inn Express
MEETING DATE/TIME:	March 25, 2010 Presentation started at 6:38pm ended at 7:27pm Question period started at 7:27pm ended at 8pm

ITEM #	ITEM DESCRIPTION
1.	• When you are getting into the high option, if you are spending the extra money, what are you exactly doing with it?
	• *The last three slides describe the three different options, as each one increases in price; they also increase in the options, and the amount of the incentives.*
2.	• What is the bill comparison?
	• *You would get targeted mail outs showing how many kilowatt hrs you used, and it would be compared to around 50 other houses showing whether or not they are using more or less than you are so you know whether you are being energy efficient or not.*
3.	• AUDITS- are you doing them on an intermittent basis, or can I call to get one done?
	• *They are going on right now, and the Live Smart program will be re-launching and once it gets started you can go online and get auditor names and have someone come in to audit your home. It costs $300, FortisBC and the government will pay for half, and you have to pay for the other half. They will advise you on the different options that you can do in your home to improve your energy consumption.*
4.	• I heard that the LED lights that are on each appliances amount to $50 a year in energy. Everything seems to have LEDs on them, stereos, TVs, etc. We are paying extra money every year.
	• *It wouldn't be per appliance, it would be an estimate of all the LEDS per year, which we call phantom power.*
	• *We work with the government and with the companies that create the appliances to try and get them to create items that are more efficient, and try to get the government to create laws regarding this.*

ITEM #	ITEM DESCRIPTION
6.	• Street lighting- do you receive push back from municipalities- isn't it a safety issue if you are dimming them at night?
	• *Street lightning is not for cars, it is for pedestrian conflict. There is a Pilot Program in Prince George and they have gotten full clearance from the RCMP, Ambulance service etc. Obama is going to a pass law next year that all street lightning will have to have a 2 type option.*
7.	• On demand water heating option wasn't on the list of options?
	• *Instant hot water without a tank? It poses a real peak load on our system. A normal tank poses a 3-4 kilowatt load on the system, and if you tried to do it instantly it would be a 30-40 kilowatt load on the system.*
8.	• Option three- incremental cost is in the millions over the next few years, what if you don't do this, what are the options for purchasing power etc.?
	• *Cost effectiveness test, which is 2:1. For every $1 we have spent on the programs we have gotten a $2 payback. The payback is not instant, but over time is it more cost effective than not doing anything.*
9.	• Where is the business case?
	• *Cost of PV has been going down. Every time we go and buy another kilowatt hour, its costs more than the power we have under contract.*
	• *Provincial government has a goal that in 2020 houses are going to be net 0, no purchased energy.*
10.	• The government should the ones leading this, not the utilities. I am not against the ideas; just feel that the government should be the ones doing it.
11.	• Why are we so interested in saving power, isn't it your business to sell power?
	• *Electric utility is a special business; the return is on the infrastructure, not the sales. Any money we spend on DSM is from capital, so any money we spend on DSM we earn a return on it. We are also required under BCUC to provide the programs.*
12.	• Fluorescent lights have poisonous gases in them and don't you have to dispose of them properly?
	• *CFLs last 6-10 yrs, and use ¼ the amount of electricity. They have a small amount of mercury in them, about a pin size. In Alberta, they produce energy by mining coal, which produces mercury, so the whole life cycle of these lights is better for the environment than the old types. When they run out, take them to the proper locations for recycling and disposal.*

Appendix A13: First Nations

BOB GIBNEY
FIRST NATIONS EXECUTIVE LIAISON

FortisBC Inc.
Suite 100, 1975 Springfield Road
Kelowna, British Columbia V1Y 7V7
250-469-8006
www.fortisbc.com

February 25, 2010

Grand Chief Stewart Phillip and Council
3255C Shannon Lake Road
West Kelowna, BC, V4T 1V4

Dear Grand Chief Phillip:

FortisBC is committed to open dialogue with First Nations and is currently preparing for two projects which may be of interest to the Okanagan Nation Alliance.

FortisBC is preparing the 2001 Capital Expenditures Plan application for submission to the British Columbia Utilities Commission (BCUC) later this spring. The Capital Expenditures Plan outlines proposed projects and capital costs for review by the BCUC.

Second, as part of the Capital Expenditure Plan, FortisBC is drafting a 2011 PowerSense Plan for our demand side management program, which helps customers manage their electricity bills through energy efficiency improvements. Since it began in 1989, the PowerSense program has helped customers save more than 360 million kilowatt hours — enough electricity to power about 27,700 homes for a year. Examples of program options include residential heat pumps, commercial lighting, low income programs, as well as general energy efficiency education.

First Nations feedback is an important part of both of the projects, and FortisBC would respectfully request an opportunity to provide a short presentation about the projects to the Chief and Council at your March, 2010 meeting. Your input will be considered, along with technical and financial information, as FortisBC prepares to file with the BC Utilities Commission.

FortisBC would also like to invite you to attend a series of open houses in March regarding the 2011 PowerSense Plan. The open houses have been scheduled to provide an opportunity for interested parties to learn more about demand side management and share thoughts on the topic.

Please drop by any of the following open houses – project information panels will be on display and a presentation is scheduled for 6:30 p.m.

Creston:	Monday, March 22, 2010 | 6 – 8 p.m. Adam Robertson Elementary School, 421 9th Ave N.
Castlegar:	Tuesday, March 23, 2010 | 6 – 8 p.m. Sandman Hotel, 1944 Columbia Ave
Osoyoos:	Wednesday, March 24, 2010 | 6 – 8 p.m. Osoyoos Seniors Centre, 17 Park Place
Kelowna:	Thursday, March 25 | 6 – 8 p.m. Holiday Inn Express, 2429 Highway 97 N.

If a presentation at your March meeting is not suitable but you are still interested in learning more about the 2011 Capital Expenditures Plan or 2011 PowerSense Plan and providing comments, I would be happy to meet with you one-on-one, or you can visit www.fortisbc.com/about_fortisbc/rates/other_applications.html. Open house materials will be added to the site as they become available. **Written comments must be returned by April 5, 2010** to be considered in the regulatory filing.

We look forward to hearing from you about this and any other interests you may have with respect to FortisBC activities.

Sincerely,

Bob Gibney
FortisBC First Nations Executive Liaison

cc: Matilda Allison, ONA

BOB GIBNEY
FIRST NATIONS EXECUTIVE LIAISON

FortisBC Inc.
Suite 100, 1975 Springfield Road
Kelowna, British Columbia V1Y 7V7
250-469-8006
www.fortisbc.com

February 25, 2010

Chief and Council
Indian Band
Address
Town, BC, V0X 1X0

Dear Chief and Council:

FortisBC is committed to open dialogue with First Nations and is currently preparing for two projects which may be of interest to you.

FortisBC is drafting the 2001 Capital Expenditures Plan application for submission to the British Columbia Utilities Commission (BCUC) later this spring. The Capital Expenditures Plan outlines proposed projects and capital costs for review by the BCUC.

Second, as part of the Capital Expenditure Plan, FortisBC is also preparing a 2011 PowerSense Plan for our demand side management program, which helps customers manage their electricity bills through energy efficiency improvements. Since it began in 1989, the PowerSense program has helped customers save more than 360 million kilowatt hours — enough electricity to power about 27,700 homes for a year. Examples of program options include residential heat pumps, commercial lighting, low income programs, as well as general energy efficiency education.

First Nations feedback is an important part of both of these projects and will be considered, along with technical and financial information, as FortisBC prepares to file with the BC Utilities Commission.
Please let me know if you would like to book a meeting to discuss the 2011 Capital Expenditures Plan or Demand Side Management Plan options for 2011.

FortisBC would also like to invite you to attend a series of open houses in March regarding the 2011 PowerSense Plan. The open houses have been scheduled to provide an opportunity for interested parties to learn more about demand side management and share thoughts on the topic.

Please drop by any of the following open houses – project information panels will be on display and a presentation is scheduled for 6:30 p.m.

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If you are unable to schedule a meeting or attend an open house, but are still interested in learning more or providing input, visit www.fortisbc.com/about_fortisbc/rates/other_applications.html. Open house materials will be added to the site as they become available. **Written comments must be returned by April 5, 2010** to be considered in the regulatory filing.

We look forward to hearing from you about this and any other interests you may have with respect to FortisBC activities.

Sincerely,

Bob Gibney
FortisBC First Nations Executive Liaison

FORTISBC

2009 Customer End-Use Study

Prepared For: **FortisBC**

Prepared By: **Discovery Research**

Date: **August 2009**

Table of Contents:

1. Background and objectives

FortisBC is an integrated electric utility in British Columbia. FortisBC electric utility business serves about 157,000 customers in more than 30 communities in south central BC. The customers are in two major categories:

Direct - FortisBC delivers power directly to 110,000 customers.
Indirect - FortisBC delivers power indirectly through municipal wholesaler utilities to 48,000 customers .

Research was undertaken to help FortisBC understand how customers use energy in their homes for the purposes of forecasting future electrical demand and also to design Demand Side Management and Marketing and Communications programs. Discovery Research was contracted by FortisBC to complete the study. The specific objective of this study is to collect and track over time, detailed information about the characteristics and features of customers homes, as well as different ways in which electricity is used in them. Areas of interest include, but are not limited to:

- Home characteristics and features such as housing type, age of home, size of home, etc;
- Insulation;
- Windows;
- Doors and door frames;
- Space heating;
- Space cooling;
- Water heating;
- Lighting;
- Kitchen and Laundry appliances;
- Home electronics.

In addition to collecting the end-use information, the study also set out to solicit customer opinions, attitudes and behaviors related to electricity and conservation. This information will be beneficial for segmenting the customer base as well as for further informing program development and communications strategies.

2. Methodology

Given the amount and detail of the information to be collected, the methodology utilized for this research was a self-administered mail survey coupled with an equivalent online version of the survey.

Mailed Survey:

On July 2, 2009 a total of 5000 surveys were mailed to a random sample of FortisBC customers. The total sample of 5000 consisted of 3500 Direct FortisBC customers and 1500 Indirect customers serviced through city wholesalers. The 3500 Direct customers were randomly selected from the entire FortisBC direct residential customer base. The 1500 Indirect customers were randomly selected from the regions serviced by City wholesalers according to the below distribution:

Municipal Wholesaler	Total Customers	Ratio	Indirect sample
Kelowna	13770	29%	**432**
Penticton	16613	35%	**521**
Grand Forks	2105	4%	**66**
Summerland	5436	11%	**171**
Nelson Hydro	9885	21%	**310**
	47,809	100%	**1500**

Each potential respondent was mailed a survey package which included a survey with cover letter and a postage paid return envelope. Respondents were offered two ways to participate in this study:

- Complete the survey and return it in the postage paid envelope via regular mail -OR-
- Complete the online version of the survey and submit it electronically

As an incentive for completion, respondents were entered into a draw for one of three $500 gift certificates to a home improvement retailer of their choice. Respondents were offered an additional entry into the prize draw as an added incentive to complete the survey on-line.

Emailed Survey:

On July 27 2009, 4000 Direct FortisBC customers were randomly chosen from the database of customers that FortisBC has email addresses for. These 4000 email addresses were a mixture of residential and commercial customers who have chosen to receive their monthly bills via email. The customers were sent an email inviting them to participate in the survey and the email included a link to the online residential and online commercial surveys.

Prior to emailing the survey invitations, it was not possible to determine how many of the 4000 email addresses were residential customers and how many were commercial customers. Based on response rates of the respective surveys, we will assume that 3840 email addresses were residential email addresses and 160 were commercial email addresses. Responses to the commercial surveys received are presented in another report (2009 Fortis Commercial End Use Report).

Response Rate

Mailed Survey:

Although 5000 surveys were mailed, 104 were returned to FortisBC as undeliverable – in most cases, likely due to closed accounts and other changes since the time the billing information was last updated. Of the 4896 surveys that were effectively delivered, a total of 1066 were returned: 824 via Canada Post and 242 via the Online version; yielding a response rate of **21.8%** for the Mail survey methodology.

Emailed Survey:

Of the 3840 email invitations sent out, 983 online surveys were received back, giving a response rate of **25.6%** for the Email survey methodology.

Total Response Rate:

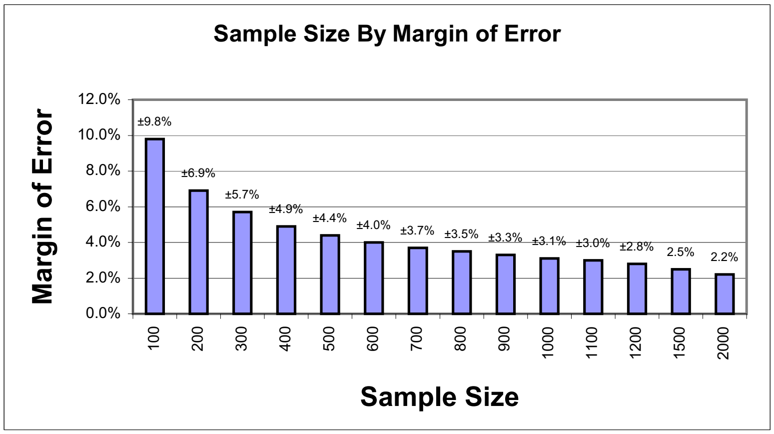
Of the 8736 Residential Customers that were approached, 2049 surveys were completed, giving a total response rate of **23.5%.**

Direct versus Indirect Residential Customer Response Rate:

Of the 1458 surveys that reached Indirect FortisBC residential customers, 230 returned a completed survey, giving a response rate among Indirect customers of **15.8%**.

Of the 7278 surveys that reached Direct FortisBC residential customers, 1819 returned a completed survey, giving a response rate for Direct customers of **25.0%**.

Margin of error



This bar graph displays the margin of error associated with various sample sizes.

Statistics generated from sample size of 2049 will be accurate within ±2.2%, at the 95% confidence interval (19 times out of 20).

Weighting the Data

The sample was weighted by region to ensure the collected sample matched the true composition of FortisBC's total customer base.

	Residential Customer Population				Unweighted Sample		Weighted Sample	
	Direct	Indirect	Total	%	Total	%	Total	%
Central Okanagan (Kelowna) including Big White	42276	12424	54700	**39.74%**	840	41.46%	805	**39.73%**
South Okanagan including Similakameen	20365	19783	40148	**29.17%**	549	27.10%	591	**29.17%**
West Kootenay/Boundary	32641	10166	42807	**31.10%**	637	31.44%	630	**31.10%**
Total	95282	42373	137655	**100.00%**	2026	100.00%	2026	**100.00%**

After applying the weights, the regional proportions in weighted sample match the regional proportions in the Population of FortisBC Customers.

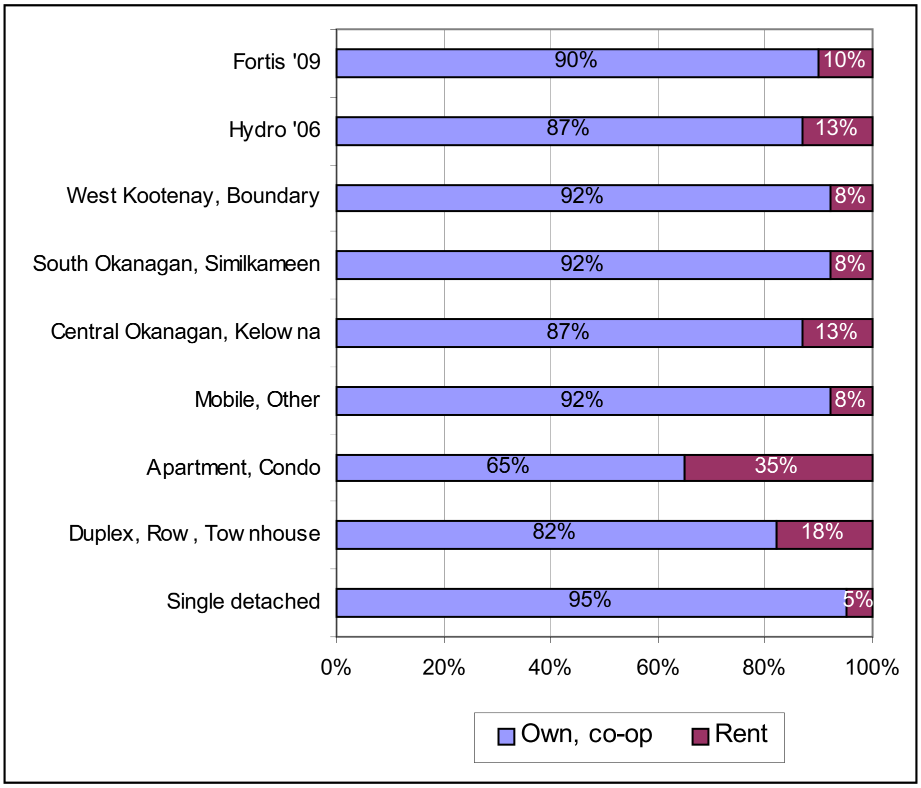
Comparison with BC Hydro 2006 Residential End Use Survey (REUS)

In 2006, BC Hydro completed a comprehensive mail survey (REUS) with their residential customers across BC. Throughout this report, comparisons are made with the response collected from 1144 BC Hydro customers in the Southern Interior of BC. These Southern Interior BC Hydro customers will be referred to as "**Hydro '06**" in comparison graphs and tables.

3. Survey Results

A. About Your Home

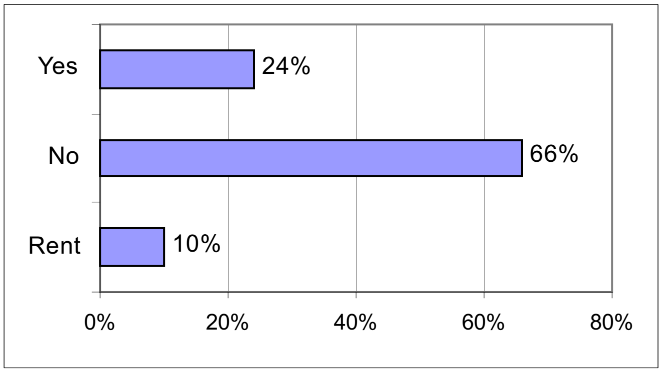
1. Do you own or rent your home?



Ninety percent of FortisBC customers own their home and 10% rent. Among 2006 Hydro customers in the Southern Interior, 87% owned their homes and 13% rented.

Only 65% of respondents who live in Apartments or Condos own their home.

2. Do you pay Maintenance Fees?



Sixty-six percent of FortisBC customers own their home and do not pay maintenance fees, 24% own and pay maintenance fees and 10% rent.

		Type of dwelling			
		Single detached	Duplex, Row, Townhouse	Apartment, Condo	Mobile, Other
Do you pay maintenance fees?	Yes	10%	61%	62%	33%
	No	85%	21%	4%	58%
	Rent	5%	18%	35%	9%
Total	Base	1326	208	245	150

Sixty-one percent of respondents that live in a Duplex, Row or Townhouse and 62% of Apartment and Condo residents pay maintenance fees.

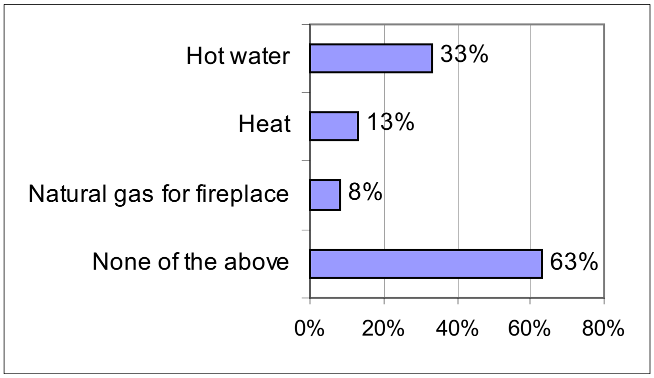
		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
Do you pay maintenance fees?	Yes	36%	21%	10%
	No	50%	71%	81%
	Rent	14%	9%	8%
Total	Base	766	555	592

Residents of the Central Okanagan are the most likely to pay maintenance fees (36%) and residents of the West Kootenay/Boundary are the least likely (10%).

BC Hydro CEUS 2006 Southern Interior Comparison:

Among Hydro customers in the Southern Interior, 31% rent or pay maintenance fees compared to 34% of FortisBC customers.

3. Which of the following are included in your Rent or Maintenance Fees?



Base: Respondents who rent or own and pay maintenance fees.
Column percentages may exceed 100% because multiple responses provided

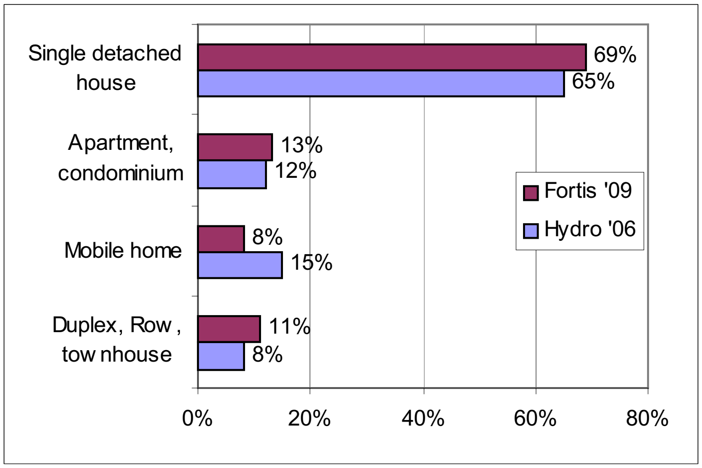
Among respondents that rent or pay maintenance fees, hot water is included for 33% and 13% have heat included. The majority, 63% don't have hot water, heat or gas for a fireplace included in there rent or maintenance fees.

		Type of dwelling			
		Single detached	Duplex, Row, Townhouse	Apartment, Condo	Mobile, Other
Which of the following are included in your rent or maintenance fees?	"None of the above"	76%	88%	28%	86%
	"Hot water"	23%	9%	65%	12%
	"Heat"	19%	4%	14%	9%
	"Natural gas for fireplace"	10%	1%	11%	3%
Total	Responses	250	163	277	76
	Base	194	159	234	68

Base: Respondents who rent or own and pay maintenance fees
Column percentages may exceed 100% because multiple responses provided

Among Apartment or Condo residents, 65% have hot water included in their rent or maintenance fees.

4. What type of dwelling do you live in?

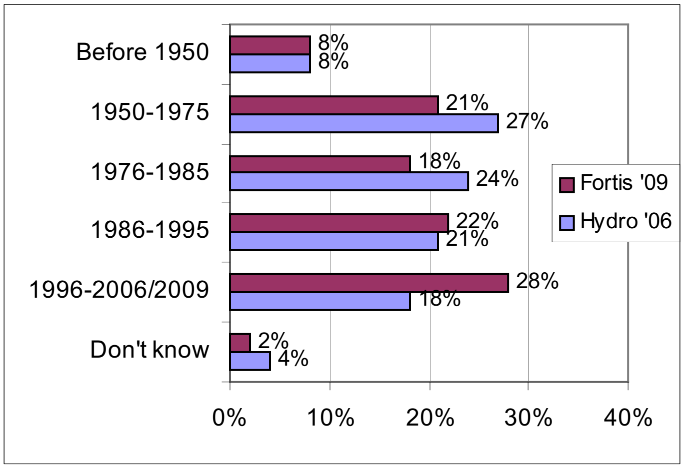


The majority (69%) of FortisBC residential customers live in a single detached house. Thirteen percent live in an apartment or condominium and 8% live in a mobile home. The BC Hydro sample had a higher percentage of residents living in Mobile Homes (15%) compared to 8% of the FortisBC sample.

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"What type of dwelling do you live in?"	"Single detached house"	54%	73%	83%
	"Apartment, condominium"	22%	8%	4%
	"Mobile home"	6%	11%	8%
	"Row, townhouse -3+ units attached"	12%	5%	2%
	"Duplex"	5%	3%	2%
Total	Base	776	569	601

Among Central Okanagan residents, 54% live in a single detached house and 22% live in an apartment or condo. West Kootenay/Boundary residents were the most likely (83%) to live in a single detached home.

5a. When was your home built?



Twenty-eight percent of homes were built between 1996 and 2009 and 29% were built before 1975. Compared to the BC Hydro sample, the FortisBC sample had a higher percentage of homes that were built in 1996 or newer because the category includes 3 extra years (2006 to 2009).

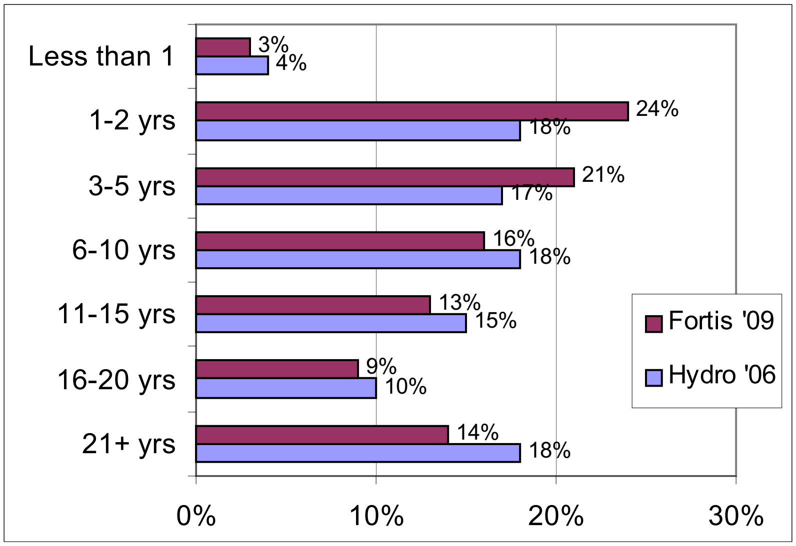
		Type of dwelling			
		Single detached	Duplex, Row, Townhouse	Apartment, Condo	Mobile, Other
"When was your home built?"	"Before 1950"	12%	1%	2%	
	"1950-1975"	25%	14%	5%	25%
	"1976-1985"	18%	19%	10%	31%
	"1986-1995"	21%	28%	23%	21%
	"1996-2009"	24%	32%	53%	22%
	Don't know	1%	5%	7%	1%
Total	Base	1343	208	244	158

Fifty-three percent of Apartments and Condos were built between 1996 and 2009.

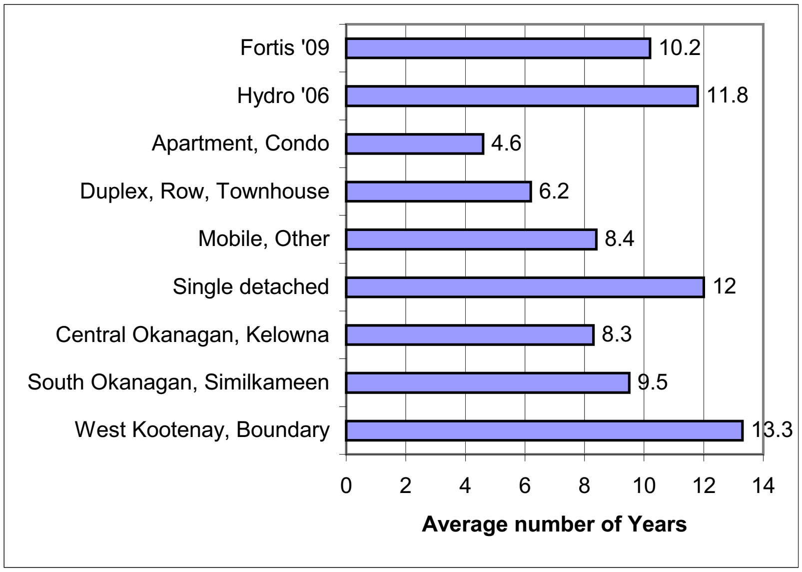
		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"When was your home built?"	"Before 1950"	2%	7%	17%
	"1950-1975"	14%	21%	31%
	"1976-1985"	16%	17%	21%
	"1986-1995"	26%	24%	13%
	"1996-2009"	39%	28%	16%
	Don't know	2%	3%	2%
Total	Base	775	565	599

Forty-eight percent of homes in the West Kootenay/Boundary were built before 1975 compared to only 16% in the Central Okanagan.

5b. How many years have you lived in this home?



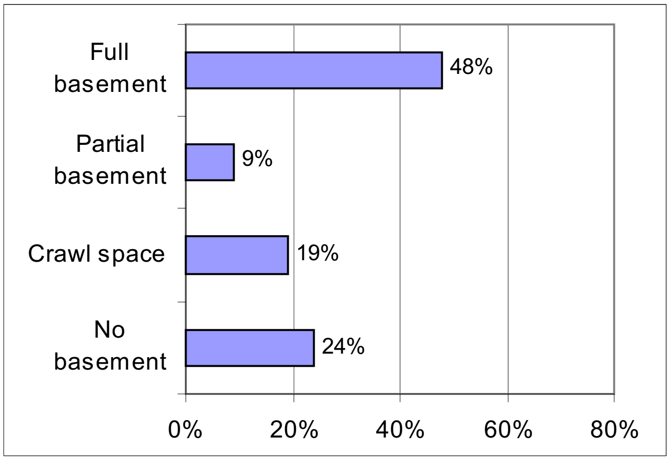
Forty-eight percent of the FortisBC sample had lived in their home for 5 years or less compared to 39% of the BC Hydro Southern Interior sample.



FortisBC customers have lived in their home for an average 10.2 years.

Residents of the West Kootenay/Boundary region have lived in their home on average for 13.3 years.

6. What type of basement does your residence have?



Almost half of residential customers (48%) have a full basement and 9% have a partial basement.

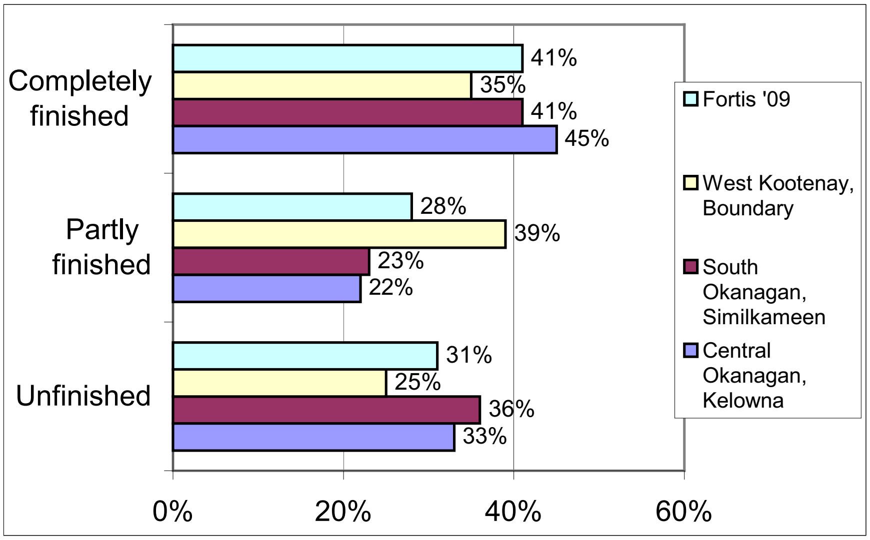
		Type of dwelling			
		Single detached	Duplex, Row, Townhouse	Apartment, Condo	Mobile, Other
"What type of basement does your residence have?"	"Full basement"	60%	46%	11%	2%
	"Partial basement"	12%	8%	2%	1%
	"Crawl space"	20%	27%	3%	26%
	"No basement"	8%	19%	85%	71%
Total	Base	1350	211	234	158

Sixty percent of single detached homes had full basements.

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"What type of basement does your residence have?"	"Full basement"	42%	41%	62%
	"Partial basement"	8%	9%	11%
	"Crawl space"	19%	27%	12%
	"No basement"	31%	24%	15%
Total	Base	774	567	599

Sixty-two percent of the West Kootenay/Boundary residents have a full basement compared to 42% of Central Okanagan residents and 41% of South Okanagan residents.

7. Is the basement area of your home finished?

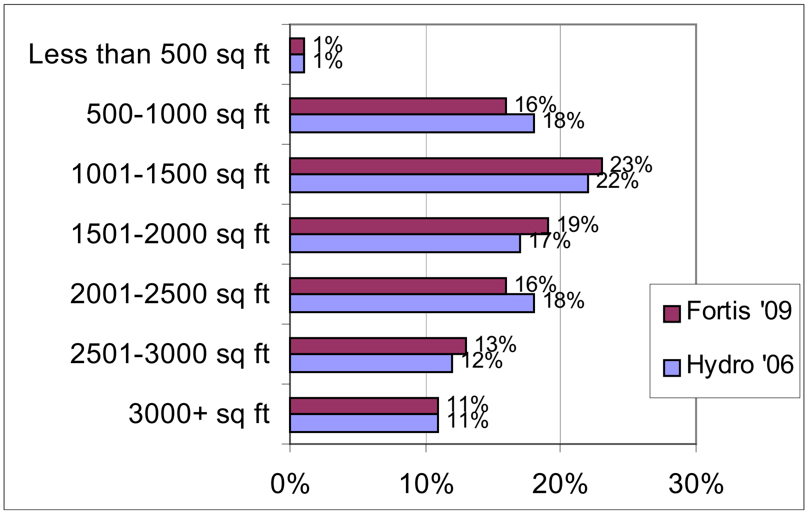


Base: Respondents with basements

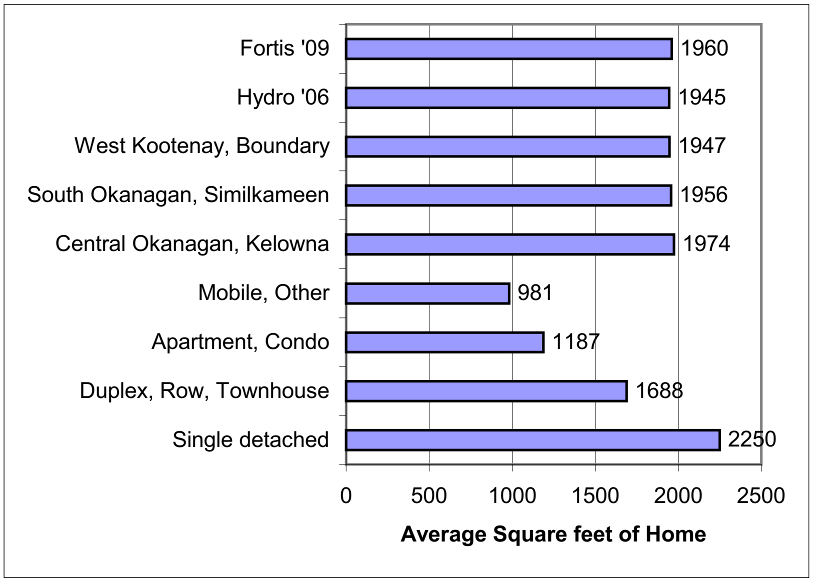
Among all respondents with basements, 41% of basements were completely finished and 28% were partially finished.

Among West Kootenay/ Boundary respondents with basements, 35% were completely finished basements and 39% were partially finished.

8. What is the total floor area of this home?

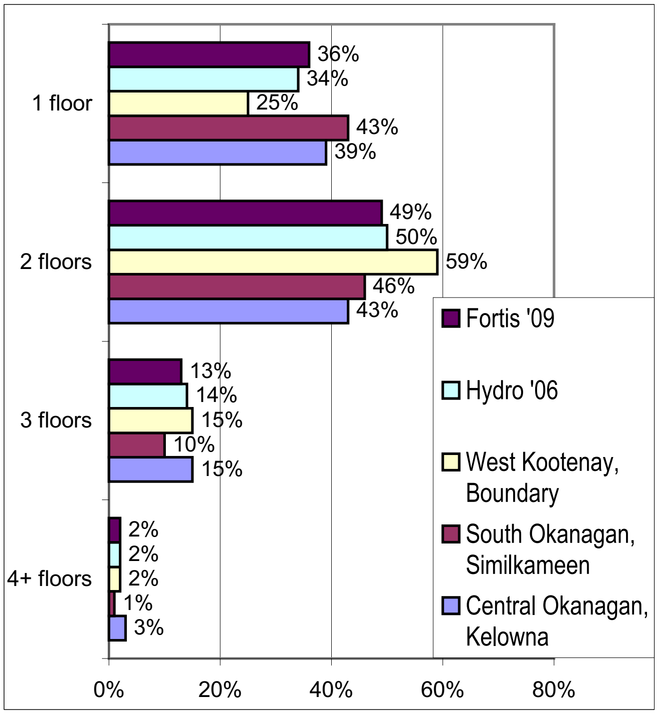


Fifty-eight percent of FortisBC homes were between 1000 and 2500 square feet. The BC Hydro sample had statistically similar home sizes.



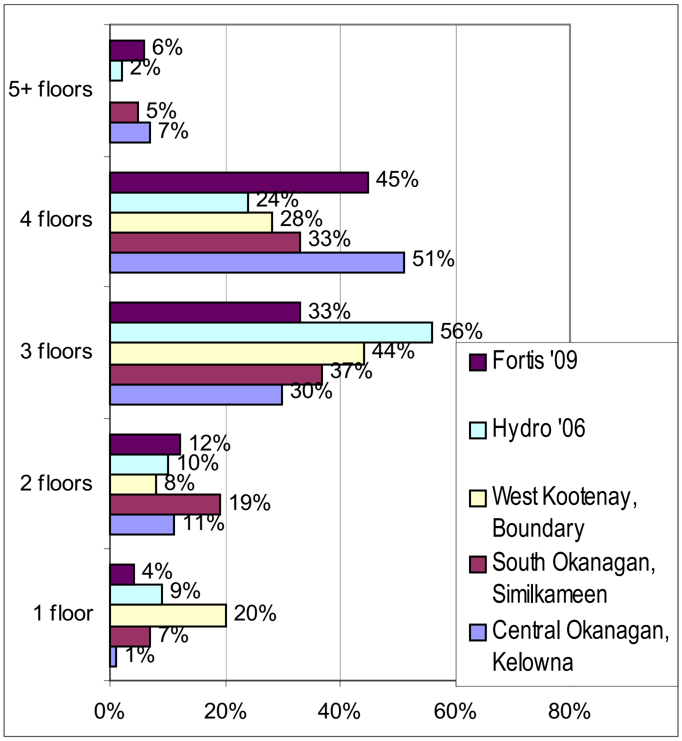
Among FortisBC customers, the average square footage of homes is 1960 square feet. This is similar for all regions.

9. How many floors of heated living space does your home have?



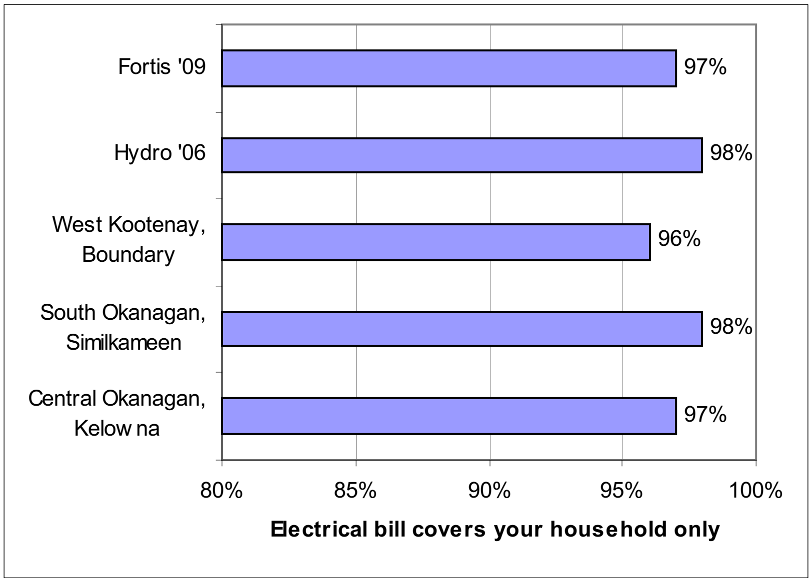
Forty-nine percent of FortisBC customers have 2 floors of heated living space and 36% have 1 floor.

10. If your home is an apartment or condominium, how many stories does your building have (not including underground parking)?



Among FortisBC customers who live in Apartments or Condominiums, 78% have 3-4 floors compared to 80% among BC Hydro southern interior customers.

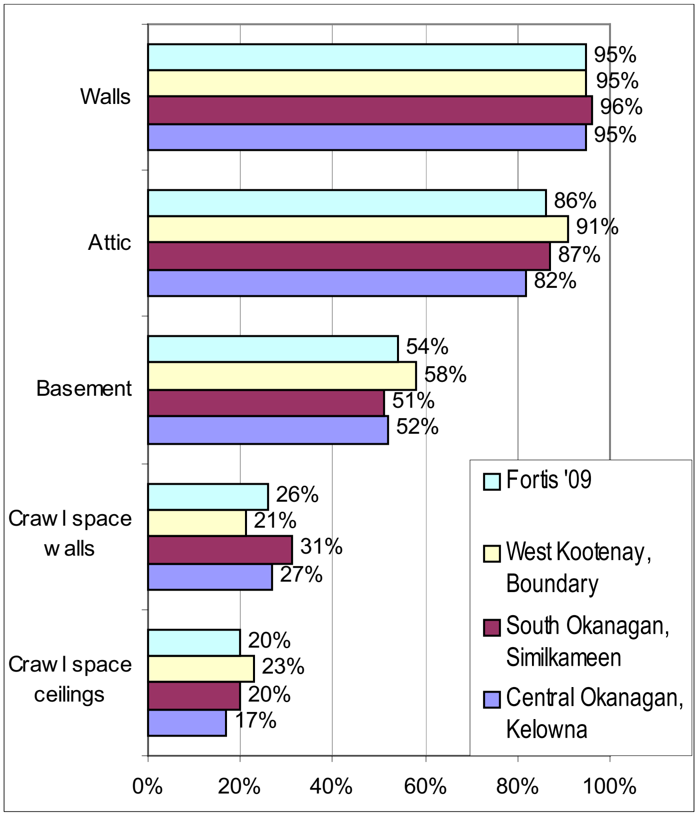
11. Does your electric bill cover only your household or is there an additional suite(s) or household(s) on the same account?



Ninety-seven percent of FortisBC customers have electric bills that cover their household only, and 3% have additional suites.

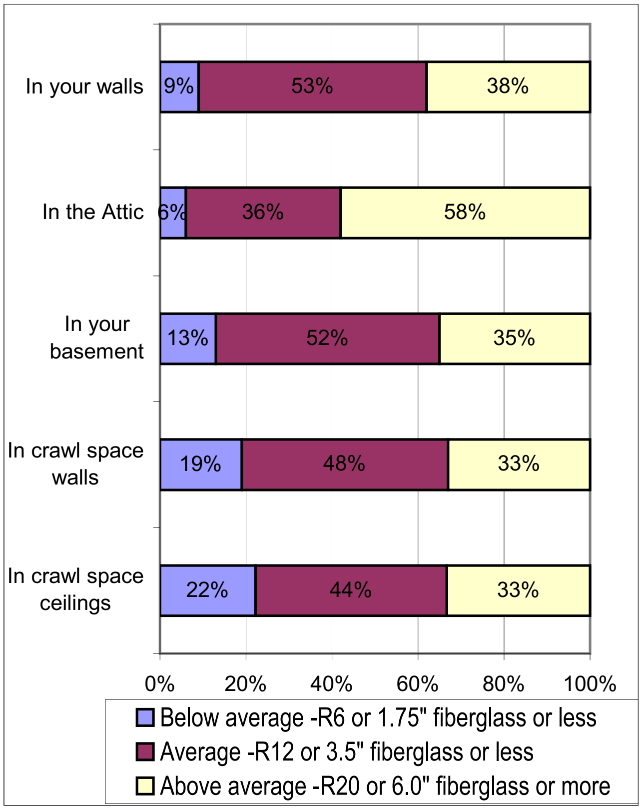
B. Doors, Windows & Insulation

12a. Which areas of your home do you have Insulation?



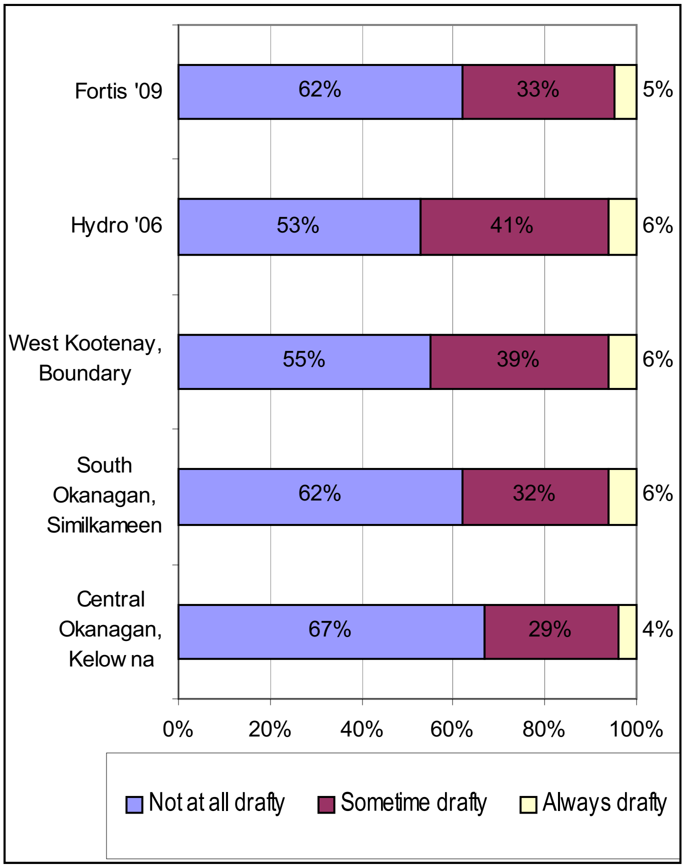
Ninety-five percent of FortisBC customers indicated they had insulation in the walls of their home and 86% said they had insulation in the Attic.

What is the quality of the Insulation?



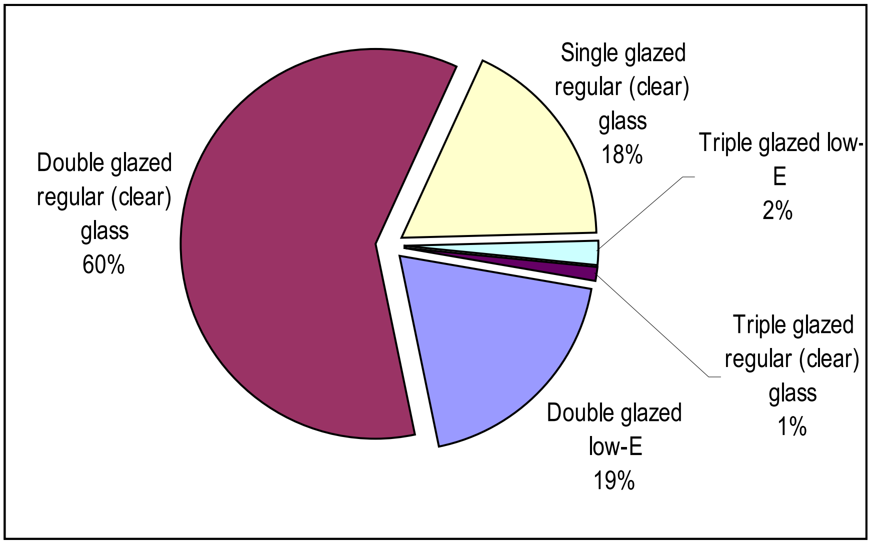
Among the customers that have insulation in their walls, 38% have above average insulation in their walls. Of respondents with insulation in the Attic, 58% have above average insulation in the Attic.

12b. Please indicate how effective the draft proofing in your home is?



Sixty–two percent of FortisBC customers indicated their homes are not drafty at all. Sixty-seven percent of residents of the Central Okanagan indicated their homes are not at all drafty compared to 55% of the West Kootenay/ Boundary area.

12c. What percentage of your windows are:



Sixty percent of the windows in respondents homes are double glazed regular glass and 19% are double glazed low- E glass.

Are the windows Argon filled?

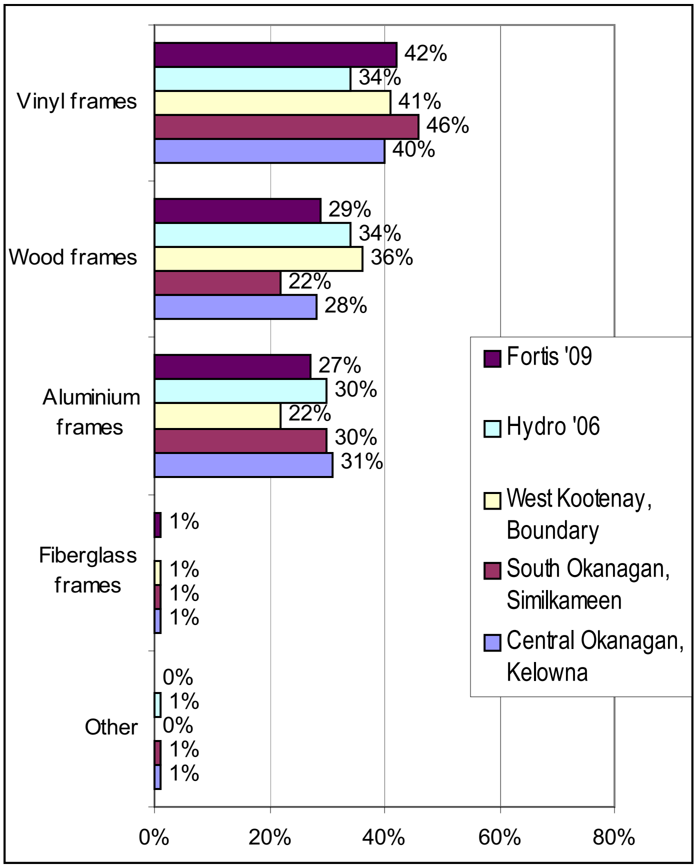
		Total
"Double glazed regular (clear) glass"	"Yes"	28%
Total	Base	714
"Double glazed low-E"	"Yes"	58%
Total	Base	508
"Triple glazed regular (clear) glass"	"Yes"	6%
Total	Base	194
"Triple glazed low-E"	"Yes"	13%
Total	Base	201

Base: Respondents who have this type of window

Among respondents who indicated they have double glazed regular glass, 28% said the windows were argon filled.

Among respondents who indicated they have double glazed low-E glass windows, 58% said the windows were argon filled.

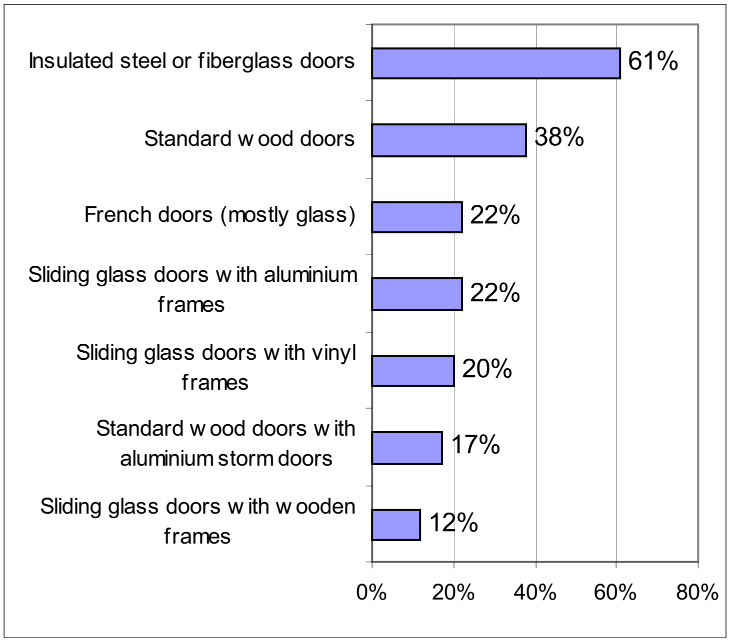
12d. Please estimate what percentage of your windows have the following frames.



On average, forty-two percent of the windows in respondents homes have vinyl frames and 29% have wood frames.

West Kootenay/Boundary homes had an average of 36% of their window frames made of wood, significantly higher than the 22% of window frames in the South Okanagan region.

12e. What type of the following types of doors does your home have?



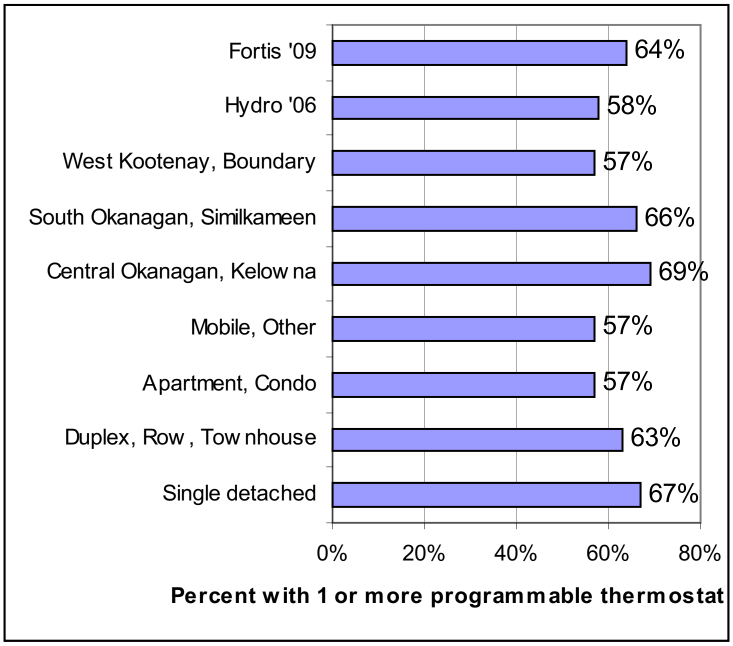
The majority (61%) of homes have one or more insulated steel or fiberglass door. Thirty-eight percent have 1 or more standard wood door.

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
Which of the following types of doors you have in your home?	Insulated steel or fiberglass doors	60%	64%	60%
	Standard wood doors	33%	36%	**47%**
	Sliding glass doors with aluminium frames	26%	26%	15%
	French doors (mostly glass)	23%	21%	22%
	Sliding glass doors with vinyl frames	21%	23%	16%
	Standard wood doors with aluminium storm doors	14%	18%	22%
	Sliding glass doors with wooden frames	12%	10%	14%
Total	Responses	1434	1138	1187
	Base	761	570	605

Column percentages may exceed 100% because multiple responses provided

Among West Kootenay/Boundary homes, 47% have one or more standard wood door compared to 33% of Central Okanagan customers.

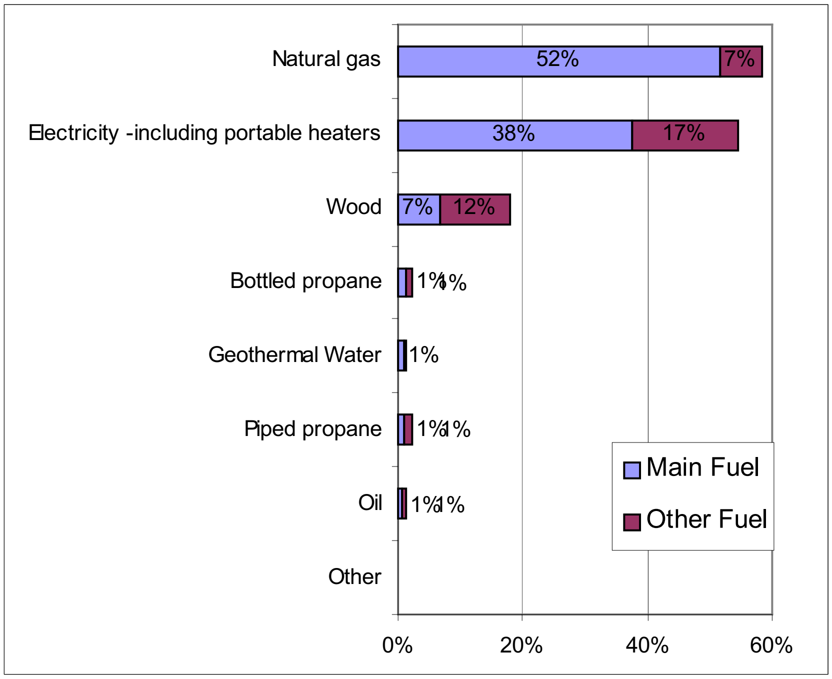
12f. How many programmable thermostats do you have in your home?



Sixty-four percent of FortisBC homes have one or more programmable thermostats. Central Okanagan homes were the most likely (69%) to have programmable thermostats.

C. Space Heating

13. Please indicate the fuels used to heat your home.



Natural gas is the main fuel used to heat 52% of homes, followed by electricity used by 38% of homes. Electricity was also used as a secondary source in 17% of homes. Seven percent of homes used wood as their primary source of heat.

		Type of dwelling			
		Single detached	Duplex, Row, Townhouse	Apartment, Condo	Mobile, Other
“Please indicate the fuels used to heat your home (main fuel)”	“Natural gas"	57%	57%	18%	47%
	“Electricity -including portable heaters"	31%	42%	**80%**	27%
	“Wood"	9%			8%
	“Bottled propane"	0%			11%
	Geothermal Water	1%	0%	0%	
	“Piped propane"	1%	0%	0%	4%
	“Oil"	0%		1%	3%
	“Don't know"	0%		0%	
Total	Base	1333	209	241	157

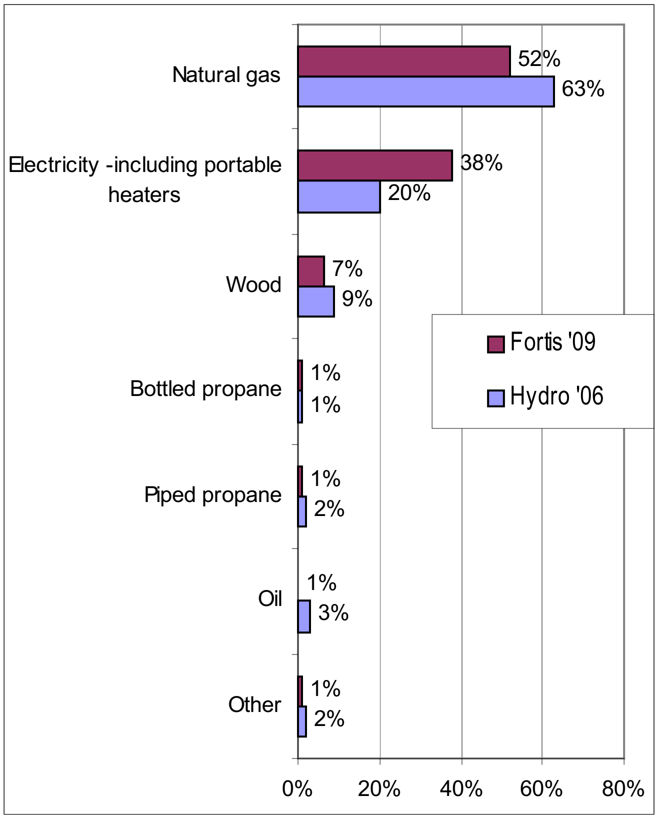
Among apartments and condos, 80% use electricity as the main fuel to heat their homes.

		Customer type	
		Direct	Indirect
“Please indicate the fuels used to heat your home (main fuel)”	“Natural gas"	51%	59%
	“Electricity -including portable heaters"	38%	33%
	“Wood"	7%	5%
	“Bottled propane"	1%	0%
	Geothermal Water	1%	0%
	“Piped propane"	1%	0%
	“Oil"	0%	1%
	“Don't know"	0%	
Total	Base	1613	225

Customers serviced by wholesalers were slightly more likely to have their homes heated by natural gas (59%) compared to 51% of direct Fortis Customers.

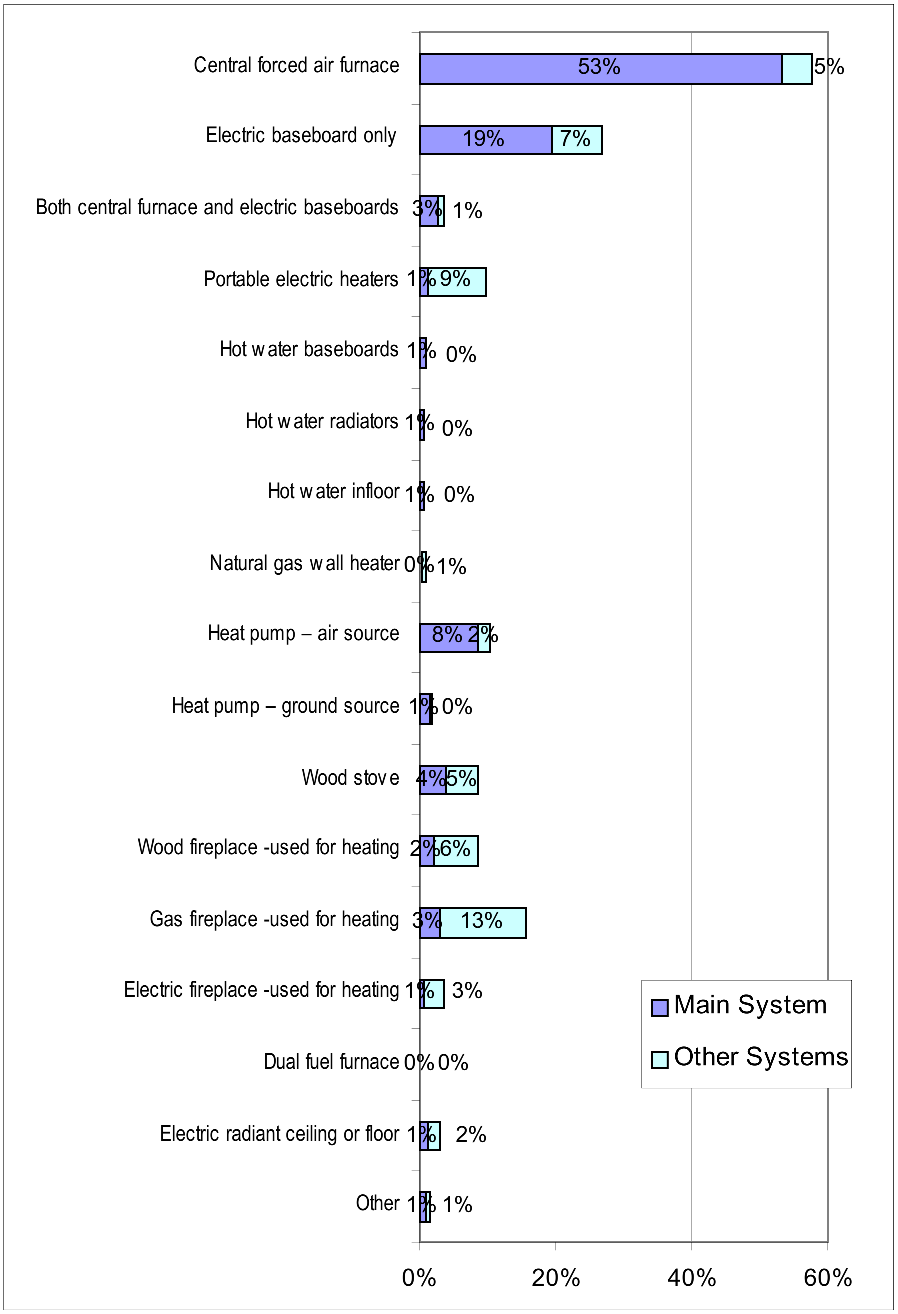
		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"Please indicate the fuels used to heat your home (main fuel)"	"Natural gas"	60%	47%	46%
	"Electricity -including portable heaters"	34%	42%	38%
	"Wood"	1%	7%	13%
	"Bottled propane"	2%	1%	0%
	Geothermal Water	1%	1%	0%
	"Piped propane"	1%	1%	1%
	"Oil"	0%	1%	1%
	"Don't know"	0%	0%	0%
Total	Base	774	572	601

Among South Okanagan residents, 42% used electricity as their main source of heat. Thirteen percent of West Kootenay/ Boundary homes have wood as the main fuel to heat their home.



Electricity is used as a main fuel source for 38% of FortisBC homes compared to 20% of BC Hydro Southern Interior homes.

14. Please indicate the main heating system you use to heat your home.



The main heating system used to heat the 53% of homes is a Central forced air furnace.

Nineteen percent use electric baseboard heating as the main heating system.

Gas fireplaces are a secondary heating system in 13% of homes.

Main Heating System used to heat your home:

		Type of dwelling				Region		
		Single detached	Duplex, Row, Townhouse	Apartment, Condo	Mobile, Other	Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"Please indicate the main heating system you use to heat your home (main system)"	"Central forced air furnace"	58.0%	54.7%	16.6%	63.9%	58.4%	50.8%	48.3%
	"Electric baseboard only"	11.3%	30.1%	**65.0%**	3.9%	23.4%	17.4%	16.3%
	"Heat pump – air source"	9.8%	6.3%	2.9%	8.7%	6.2%	**13.1%**	7.1%
	"Wood stove"	5.0%			5.9%	.2%	4.4%	7.7%
	"Gas fireplace -used for heating"	3.0%	3.3%	2.9%	1.3%	3.6%	2.5%	2.3%
	"Both central furnace and electric baseboards"	2.5%	1.5%	3.2%	2.6%	1.7%	1.9%	4.1%
	"Wood fireplace -used for heating"	2.9%	.5%		2.6%	.7%	2.5%	3.9%
	"Heat pump – ground source"	1.6%	.9%	1.2%	.6%	2.1%	1.1%	.7%
	"Electric radiant ceiling or floor"	1.4%	.5%	2.1%		.5%	1.7%	1.8%
	"Portable electric heaters"	.7%		1.6%	5.1%	.9%	.8%	1.6%
	"Other"	.9%	.5%	.8%	.7%	.6%	.8%	1.1%
	"Hot water baseboards"	.9%		.8%	.7%	.1%	.9%	1.5%
	Hot water infloor	.7%	.5%	.4%		.2%	.8%	1.0%
	"Electric fireplace -used for heating"	.3%	.5%	1.6%	1.2%	.9%	.8%	
	"Hot water radiators"	.6%	.5%	.4%			.4%	1.1%
	"Natural gas wall heater"	.2%	.5%	.4%	2.0%	.2%	.4%	.7%
	"Dual fuel furnace"	.4%			.6%	.1%		.8%
Total	Base	1332	208	242	155	773	568	602

Sixty-five percent of apartments or condo's have electric baseboard only for their main heating system. Thirteen percent of South Okanagan residents have an air source heat pump as their main heating system.

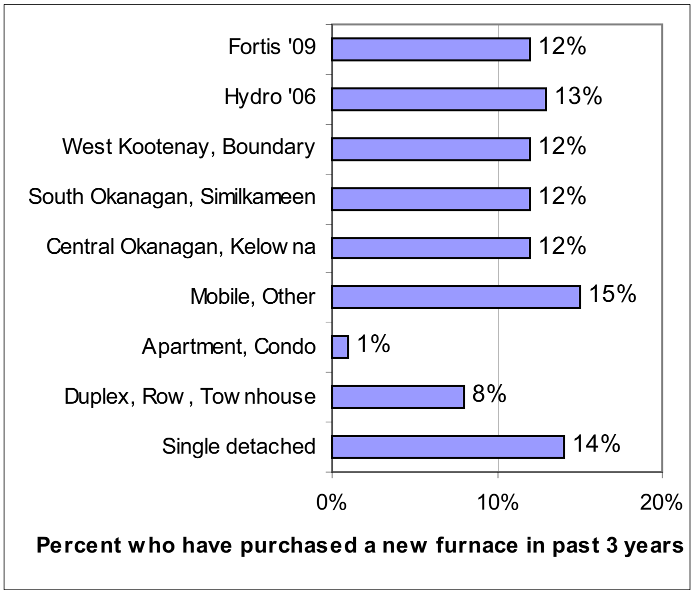
15. How many rooms do you heat in your home altogether?

		Total	Type of dwelling				Region		
			Single detached	Duplex, Row, Townhouse	Apartment, Condo	Mobile, Other	Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
Always heated	0 rooms	**8%**	5%	8%	28%	8%	11%	6%	8%
	1-3 rooms	**18%**	11%	27%	42%	27%	21%	17%	16%
	4-6 rooms	**42%**	42%	49%	28%	60%	37%	49%	43%
	7-9 rooms	**23%**	31%	14%	2%	4%	23%	20%	26%
	10+ rooms	**8%**	11%	2%			9%	8%	7%
Total	Mean	**5.4**	**6.3**	**4.5**	**2.4**	**4.3**	**5.4**	**5.3**	**5.6**
	Base	**1969**	**1331**	**206**	**244**	**158**	**776**	**573**	**600**
Sometimes heated	0 rooms	**64%**	64%	67%	57%	73%	65%	66%	62%
	1-3 rooms	**29%**	29%	27%	39%	23%	29%	29%	30%
	4-6 rooms	**5%**	6%	5%	4%	5%	6%	4%	6%
	7-9 rooms	**1%**	1%	1%			1%	1%	1%
	10+ rooms	**0%**	0%				0%	0%	0%
Total	Mean	**.9**	**1.0**	**.8**	**.9**	**.6**	**.9**	**.8**	**1.0**
	Base	**1969**	**1331**	**206**	**244**	**158**	**776**	**573**	**600**
Rarely or never heated	0 rooms	**80%**	79%	79%	80%	83%	79%	82%	77%
	1-3 rooms	**19%**	19%	20%	18%	15%	19%	16%	21%
	4-6 rooms	**2%**	2%	1%	2%	2%	2%	2%	2%
	7-9 rooms	**0%**	0%		0%		0%		
Total	Mean	**.4**	**.4**	**.4**	**.3**	**.3**	**.4**	**.3**	**.4**
	Base	**1969**	**1331**	**206**	**244**	**158**	**776**	**573**	**600**

Missing values treated as zero. Base sizes include only cases where with at least 1 heated room given.
Average percent of heated rooms includes zeros.

Among the total FortisBC sample, on average 5.4 rooms in the house are always heated; 0.9 rooms are sometimes heated and 0.4 rooms are rarely or never heated. This is statically consistent across all regions.

16a. In the past three years, have you purchased a furnace?



Twelve percent had purchased a new furnace in the past 3 years. This was consistent in all regions.

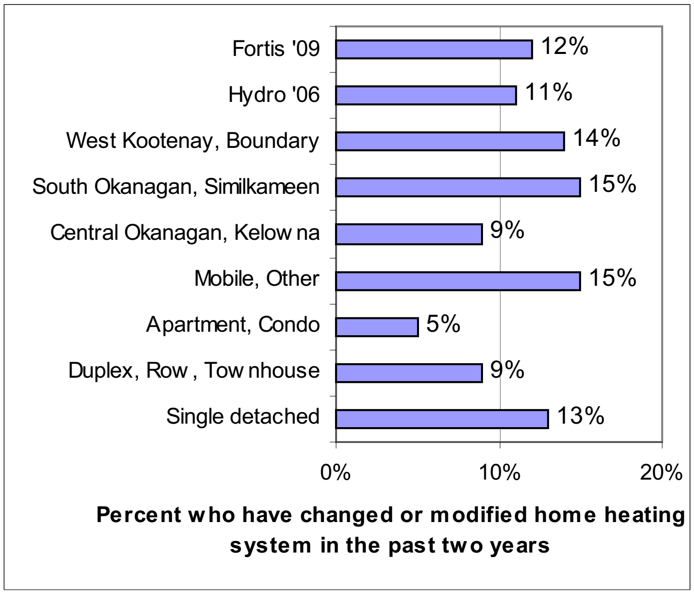
16b. Does your new furnace have a high efficiency blower motor?

		Total	Region		
			Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"Does your new furnace have a high efficiency blower motor (often called a variable speed motor or electronically controlled motor (ECM)?"	"Yes"	**69%**	65%	71%	71%
	"No"	**14%**	9%	17%	18%
	"Don't know"	**17%**	26%	12%	11%
Total	Base	**240**	**95**	**71**	**71**

Base: Respondents who have purchased a furnace in the past 3 years

Among respondents who have purchased a new furnace in the past 3 years, 69% purchased a a furnace with high efficiency blower motor, 14% did not purchase this type and 17% did not know if their new furnace had a high efficiency blower motor.

16c. Have you changed or modified your home heating system in the last 2 years?



Twelve percent had changed or modified their home heating system in the last 2 years.

What have you changed in the last 2 years?

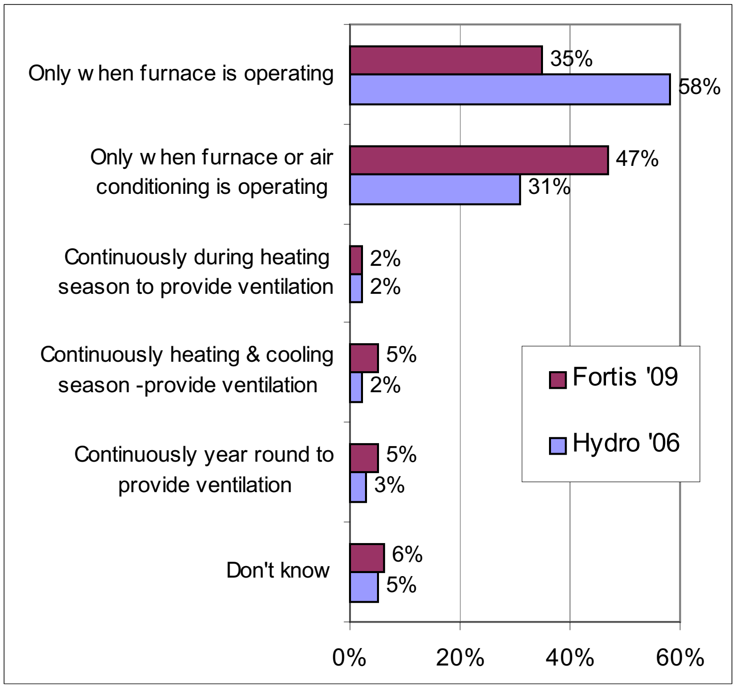
	Electric baseboard heaters	Natural gas furnace or boiler	Portable electric heater(s)	Electric fireplace	Radiant baseboard heaters	Natural gas, propane fireplace	Other
Added	1.0%	0.8%	0.8%	0.5%	0.1%	0.9%	2.8%
Upgraded	1.2%	**2.5%**	0.1%	0.0%	0.0%	0.3%	1.0%
Removed	0.5%	0.3%	0.2%	0.0%	0.1%	0.1%	0.4%
No response	97.3%	96.3%	99.0%	99.5%	99.8%	98.7%	95.7%

Among those who indicated they made some changes to their heating system in the past 2 years, 2.5% stated they upgraded their natural gas furnace or boiler; 1% added electric baseboard heaters and 3.8% said they added or upgraded some other type of heating equipment. A listing of these “other” answers appears below.

		“Other”			
		“Added”	“Upgraded”	“Removed”	No response
“Other changes or modifications to heating system”	Heat pump	29	9		11
	Wood stove	6	5	1	2
	Electric radiant floor	6			1
	Pellet	5			1
	Wood fireplace	3	2		1
	Propane furnace	1		2	
	Oil furnace			3	
	Geothermal	3			
	Gas fireplace		1		1
	Wood airtight	1			
	Propane stove			1	
	Chimney liner	1			
	Inslab water heating				1
	Space heater	1			
	Electric furnace		1		
	Central air unit	1			
	Filter system				1
Total	Base	57	18	7	19

29 respondents indicated they added a heat pump and 9 respondents said they upgraded a heat pump in the past 2 years. A further 11 respondents added (6) or upgraded (5) a woodstove.

17a. How often does your furnace fan blower operate?



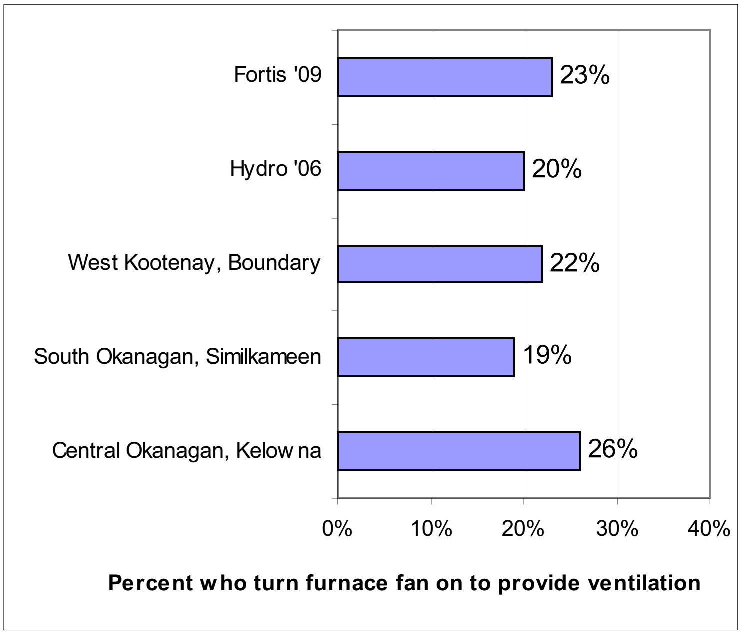
Base: Households with a furnace

Among households with a furnace, 35% of FortisBC customers indicated the furnace fan only blows when the furnace is running and 47% said it only runs when furnace or air conditioning is running.

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"How often does your furnace fan blower operate?"	"Only when furnace is operating"	23%	28%	59%
	"Only when furnace or air conditioning is operating"	55%	58%	26%
	"Continuously during heating season to provide ventilation"	2%	1%	2%
	"Continuously heating & cooling season -provide ventilation"	5%	6%	4%
	"Continuously year round to provide ventilation"	6%	5%	4%
	"Don't know"	9%	3%	6%
Total	Base	588	424	421

Fifty-nine percent of West Kootenay/Boundary residents have their furnace fan blower operating only when the furnace is running compared to 23% of Central Okanagan residents.
This difference is most likely the result of West Kootenay/Boundary residents being less likely to have air conditioning.

17b. Do you also turn the furnace fan on to provide ventilation for part of the year?

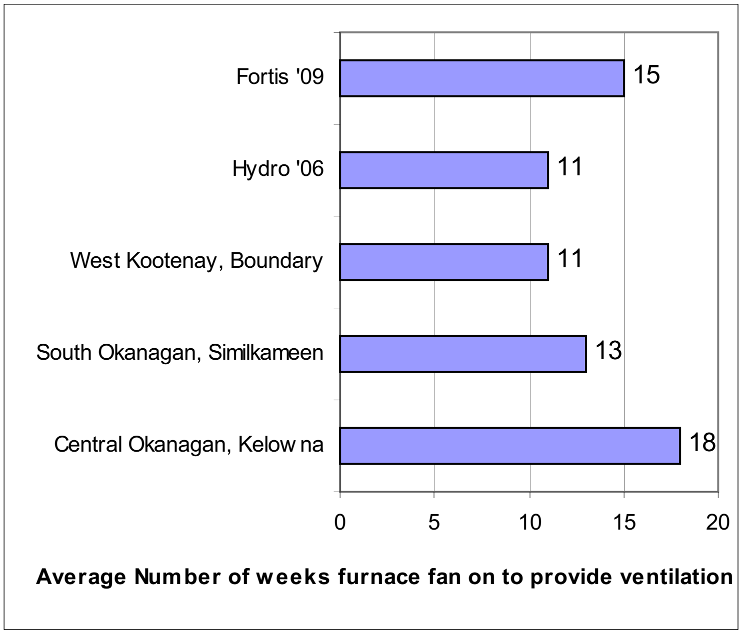


Base: Households with a furnace

Among households with a furnace, 23% of FortisBC households turn the furnace fan on for part of the year to provide ventilation.

Twenty-six percent of Central Okanagan residents turn their furnace fan on for ventilation.

Average Number of weeks the furnace fan is turned on to provide ventilation:

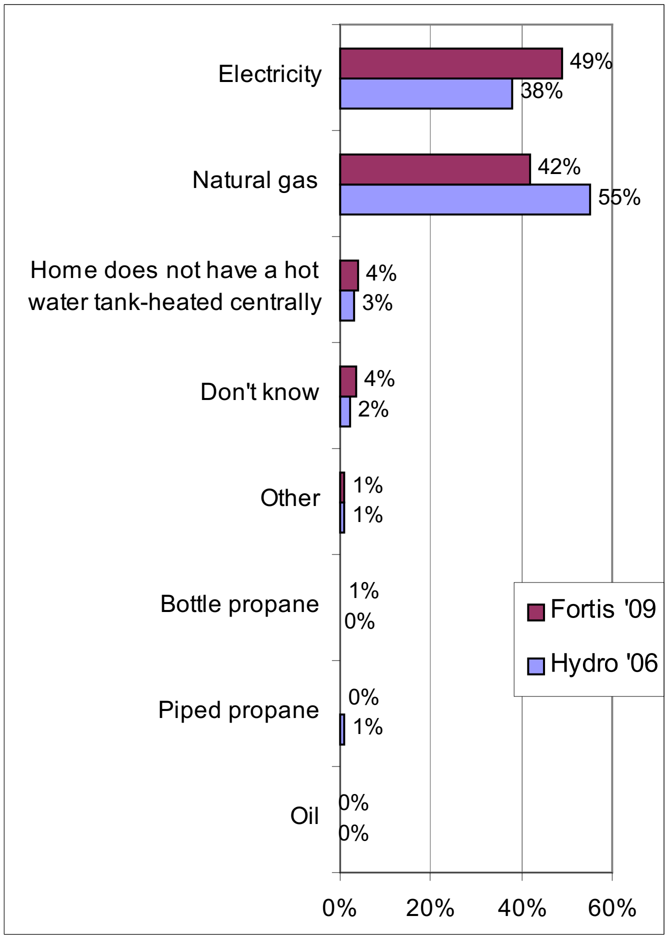


Base: Households with a furnace who turn fan on to provide ventilation

Among FortisBC households that turn on the furnace fan for ventilation, the fan runs, on average for 15 weeks per year.

D. Water Heating

18. What is the main fuel used to heat the (main) hot water tank in your home?



Forty-nine percent of FortisBC customers compared to 38% of BC Hydro customers in the Southern Interior utilize electricity to heat their main hot water tank. Forty-two percent of FortisBC customers heat their hot water tank with natural gas.

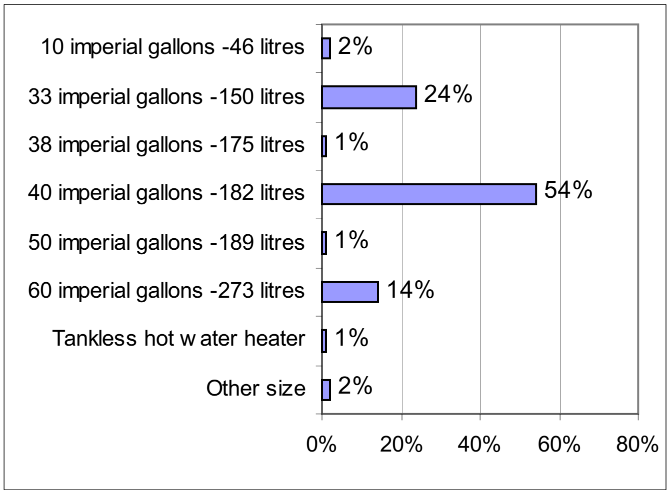
		Type of dwelling			
		Single detached	Duplex, Row, Townhouse	Apartment, Condo	Mobile, Other
"What is the main fuel used to heat the (main) hot water tank in your home?"	"Electricity"	50.3%	42.7%	28.7%	78.1%
	"Natural gas"	47.2%	54.5%	17.7%	13.1%
	"Home does not have a hot water tank-heated centrally"	.5%	.5%	29.4%	1.3%
	"Don't know"	.7%	2.3%	22.2%	1.3%
	"Other"	.8%		1.6%	
	"Bottle propane"	.2%			4.4%
	"Piped propane"	.3%		.4%	1.8%
	"Oil"	.1%			
Total	Base	1335	206	244	158

Fifty percent of single detached homes and 78% of mobile homes utilize electricity to heat their hot water tank.

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"What is the main fuel used to heat the (main) hot water tank in your home?"	"Electricity"	30.8%	56.9%	65.5%
	"Natural gas"	53.3%	37.6%	29.9%
	"Home does not have a hot water tank-heated centrally"	6.9%	2.6%	1.8%
	"Don't know"	7.3%	.7%	1.6%
	"Other"	.7%	.9%	.5%
	"Bottle propane"	.6%	.6%	.2%
	"Piped propane"	.4%	.4%	.5%
	"Oil"		.2%	
Total	Base	777	575	602

Sixty-six percent of West Kootenay/Boundary homes utilize electricity to heat their main hot water tank compared to only 31% of Central Okanagan Homes.

19a. What size is the largest hot water tank in your home?



The majority (54%) of households have a hot water tank that holds 40 imperial gallons (182 litres). Twenty-four percent have the second most common size – 33 gallons (150 litres).

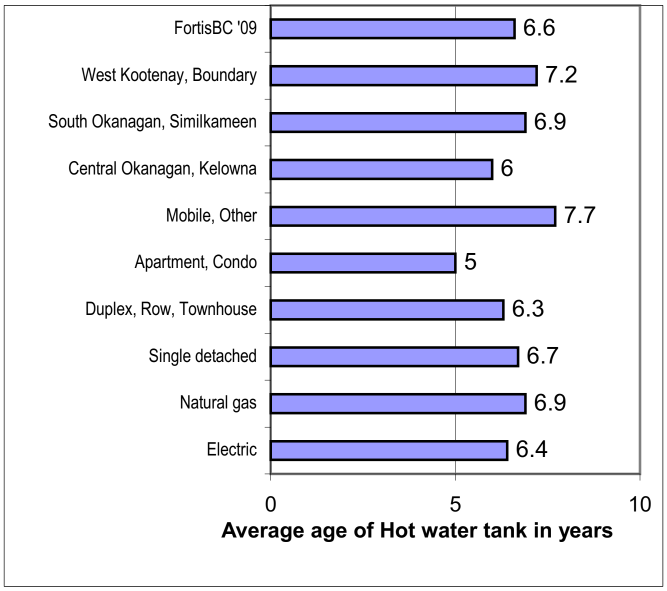
		Main fuel used to heat the hot water tank?	
		"Electricity"	"Natural gas"
"What size is the largest hot water tank in your home?"	"Tankless hot water heater"	1%	2%
	"10 imperial gallons -46 litres"	3%	1%
	"33 imperial gallons -150 litres"	18%	31%
	38 imperial gallons -175 litres	2%	
	"40 imperial gallons -182 litres"	56%	53%
	50 imperial gallons -189 litres	1%	1%
	"60 imperial gallons -273 litres"	18%	10%
	"Other"	2%	2%
Total	Base	783	678

Base: Respondent with Hot water tank

Eighteen percent of electric hot water heaters were 33 gallon tanks compared to 31% of natural gas hot water tanks.

Eighteen percent of electric hot water heaters were 60 gallon tanks compared to 10% of natural gas hot water tanks.

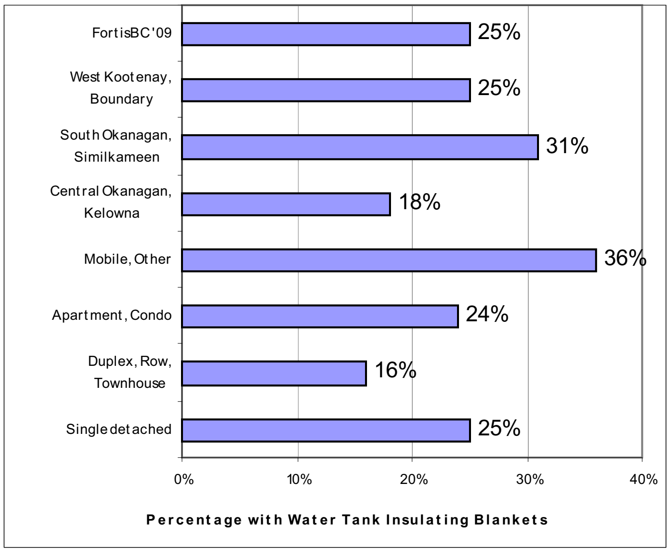
19b. How old is the largest hot water tank in your home?



The average age of hot water tanks is 6.6 years. The oldest hot water tanks are in Mobile homes with an average age of 7.7 years.

Natural gas hot water tanks are slightly older (6.9 years) than electric hot water tanks (6.4 years).

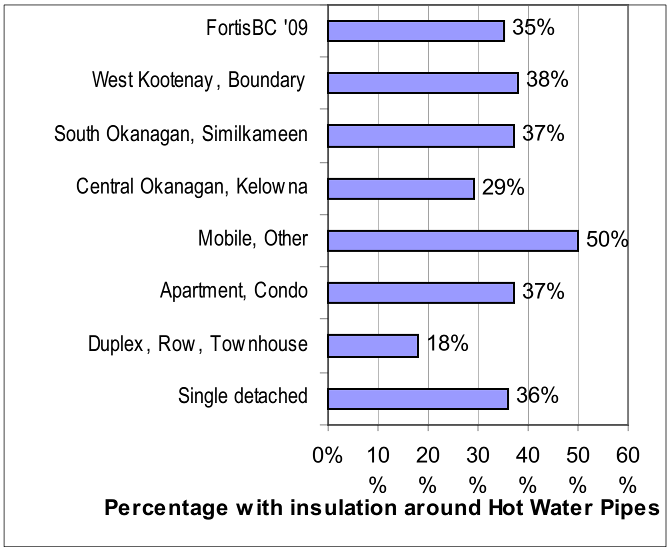
19c. Do you have water tank insulating blankets?



Base: Households with a hot water tank. Don't know responses not included.

One-in-four homes (25%) have hot water tank insulating blankets. Thirty-six percent of mobile homes have hot water tank insulating blankets.

Do you have insulation around hot water pipes?



Base: Households with a hot water tank. Don't know responses not included.

Thirty- five percent of homes have insulation around their hot water pipes. Only twenty-nine percent of homes in the Central Okanagan had insulation around their hot water pipes. Mobile homes were the most likely to have insulation around their hot water pipes (50%).

20. Have you changed your hot water heating fuel in the last two years?

		Total	Region		
			Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"Have you changed your hot water heating fuel in the last two years?"	"No"	**98.8%**	99.3%	99.2%	97.8%
	"Yes, from natural gas to electricity"	**.5%**	.3%		1.2%
	"Yes, from electricity to natural gas"	**.3%**	.3%	.2%	.5%
	"Yes, from propane to electricity"	**.2%**		.4%	.2%
	"Yes, from oil to electricity"	**.2%**	.1%	.2%	.2%
	"Other"	**.1%**			.2%
Total	Base	**1868**	**716**	**546**	**588**

98.8% of FortisBC customers had not changed their hot water heating fuel in the last two years. 1.2% of West Kootenay/Boundary respondents changed their hot water tank from natural gas to electric.

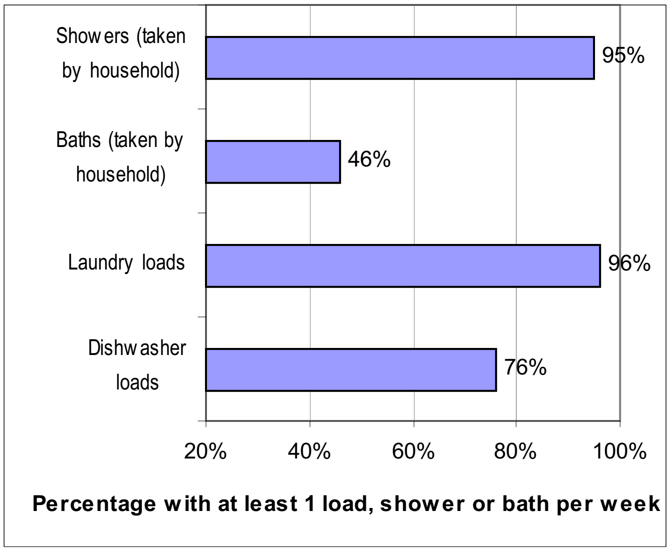
The 2006 BC Hydro results were similar with only 1% changing their hot water heating fuel.

21a. How many of the following do you have in your home? (Showerheads, Low flow shower heads and Instant hot water dispensers)

		Total	Type of dwelling				Region		
			Single detached	Duplex, Row, Townhouse	Apartment, Condo	Mobile, Other	Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
Total number of showerheads	None	**1%**	1%		1%	1%		1%	2%
	1	**32%**	26%	37%	42%	71%	25%	34%	41%
	2	**46%**	49%	46%	50%	26%	51%	46%	40%
	3+	**17%**	22%	14%	3%		20%	16%	12%
	Don't know	**0%**	0%		1%		0%		0%
	No response	**4%**	1%	2%	3%	3%	4%	4%	5%
Total	Base	**2049**	**1353**	**211**	**248**	**159**	**805**	**591**	**630**
Of these, how many are low flow shower heads?	None	**27%**	27%	30%	27%	33%	26%	26%	30%
	1	**24%**	22%	27%	28%	32%	23%	22%	27%
	2	**26%**	29%	23%	26%	15%	28%	29%	21%
	3+	**7%**	9%	7%	2%		9%	6%	5%
	Don't know	**8%**	8%	7%	10%	8%	7%	8%	9%
	No response	**8%**	5%	6%	7%	12%	6%	8%	9%
Total	Base	**2049**	**1353**	**211**	**248**	**159**	**805**	**591**	**630**
Number of instant hot water dispensers	None	**73%**	77%	71%	69%	62%	74%	71%	73%
	1	**2%**	2%	2%	1%	4%	2%	2%	2%
	2	**1%**	0%	1%	2%	1%	1%	0%	0%
	3+	**3%**	3%	4%	4%	6%	2%	4%	3%
	Don't know	**4%**	3%	4%	6%	7%	5%	3%	3%
	No response	**18%**	14%	17%	17%	20%	15%	19%	18%
Total	Base	**2049**	**1353**	**211**	**248**	**159**	**805**	**591**	**630**

Ninety-five percent of households have at least one showerhead. Fifty-seven percent of households have one or more low flow showerhead and 6% of household have at least one instant hot water dispenser.

21b. Household uses for hot water:



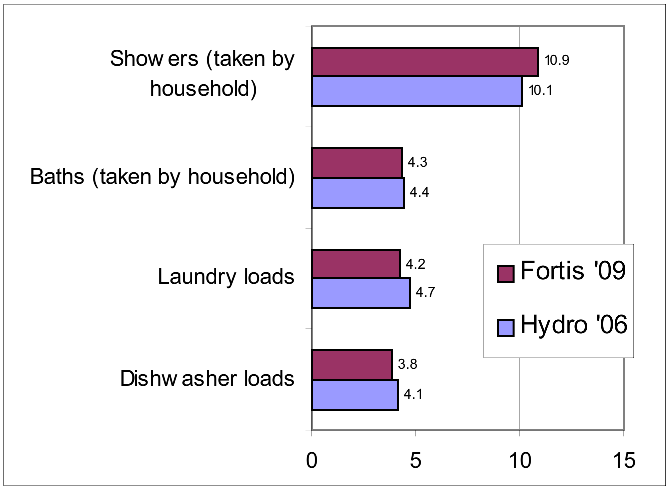
Ninety-five percent of households take at least one shower per week.

Forty-six percent of households take at least one bath per week.

Ninety-six percent of households do at least one laundry load per week.

Seventy-six percent of households complete at least one dishwasher load per week.

Average Number of loads, showers or baths per week:



Note: Zero's not included in calculation of average

Among households that take at least one shower in a week, the mean number of showers taken was 10.9. FortisBC averages were very similar to BC Hydro averages.

E. Lighting

22-30. Number and type of bulbs in house

Percent of Households with at least one bulb type in household

				Region		
		Fortis '09	Hydro '06	Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
Incandescent	1 or more bulbs	89%	97%	90%	89%	87%
Fluorescent	1 or more bulbs	59%	64%	56%	63%	59%
CFL	1 or more bulbs	68%	60%	67%	66%	72%
Halogen	1 or more bulbs	50%	42%	52%	52%	48%
Other types	1 or more bulbs	30%	22%	33%	29%	28%
Total	Base	1972	1124	777	566	612

Missing values treated as zero.

Base sizes include only cases where at least one answer was given for any bulb type

In the 2006 BC Hydro survey, 97% of respondents in the Southern Interior had at least one incandescent bulb in their home compared to 89% of the 2009 FortisBC Households. Moreover, 68% of FortisBC Households had CFL bulbs compared to 60% of BC Hydro Households.

Average number of bulbs used by bulb type:

				Region		
		Fortis '09	Hydro '06	Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
Incandescent Total	Mean	17.7	21.3	18.8	17.4	16.4
Fluorescent Total	Mean	5.4	6.0	5.1	5.3	6.0
CFL Total	Mean	11.3	7.5	11.3	10.9	11.7
Halogen Total	Mean	8.4	5.5	8.1	10.3	6.9
Other types Total	Mean	7.1	6.4	7.1	7.2	7.1

Missing values treated as zero.

Each average is based only on cases having at least 1 or more bulbs. ('zero' bulbs removed)

Among Households that had at least one CFL bulb, 2009 FortisBC Households had 11.3 CFL bulbs and 2006 BC Hydro customers had 7.5 CFL bulbs.

Average number of bulbs used by bulb type and room :

		Incandescent		Fluorescent		CFL		Halogen		Other	
		Fortis '09	**Hydro '06**	**Fortis '09**	**Hydro '06**	**Fortis '09**	**Hydro '06**	**Fortis '09**	**Hydro '06**	**Fortis '09**	**Hydro '06**
Bedrooms(s)	Mean	**3.0**	**3.6**	0.2	0.2	**2.3**	**1.4**	0.6	0.5	0.7	0.4
Bathroom(s)	Mean	**3.8**	**4.8**	0.2	0.2	**1.8**	**0.8**	1.1	0.7	1.0	1.8
Kitchen, eating area, including under and over cabinet lighting	Mean	**1.7**	**2.0**	2.1	1.9	**1.4**	**1.0**	3.2	1.8	1.0	0.6
Dining Room	Mean	**1.8**	**2.3**	0.1	0.1	**0.7**	**0.4**	0.3	0.3	2.0	1.0
Living Room	Mean	**1.6**	**1.9**	0.1	0.2	**1.3**	**1.0**	0.8	0.7	0.6	0.5
Den, Study, Office, Family & Game Room(s)	Mean	**1.2**	**1.2**	0.5	0.5	**0.8**	**0.6**	0.8	0.7	0.2	0.3
Hallway(s), Laundry & Utility room(s), Garage(s), Workshop(s)	Mean	**2.4**	**2.9**	1.8	1.8	**1.7**	**1.2**	0.6	0.4	0.4	0.4
Outdoor, Security, Porch & Landscape	Mean	**1.6**	**1.8**	0.1	0.0	**1.0**	**0.6**	1.0	0.9	1.2	1.6
Unfinished Basement	Mean	**0.7**	**0.4**	0.4	0.3	**0.4**	**0.2**	0.0	0.0	0.1	0.1
	Base	1751	4117	1160	2575	1352	2362	994	1865	593	877

Missing values treated as zero. Count of ' zero' are included in mean calculation. Average do not include cases for which no bulb count was given for that ***section****.*

2009 FortisBC customers have an average of 3.8 Incandescent bulbs in their bathrooms and 3.0 bulbs in their bedrooms. In general, the amount of CFL bulbs in all rooms of the house has increased since the 2006 BC Hydro survey.

Fluorescent lighting is most common in the Kitchen (2.1 bulbs). Halogen lighting is also most comment in the kitchen (3.2 bulbs).

Average Hours per day light used by bulb type and room :

		Incandescent		Fluorescent		CFL		Halogen		Other	
		Fortis '09	**Hydro '06**	**Fortis '09**	**Hydro '06**	**Fortis '09**	**Hydro '06**	**Fortis '09**	**Hydro '06**	**Fortis '09**	**Hydro '06**
Bedrooms(s)	Mean	1.7	2.1	1.7	2.6	1.9	2.7	1.7	1.8	2.4	3.1
Bathroom(s)	Mean	1.6	1.9	1.7	2.1	1.9	2.2	1.7	1.7	2.3	2.0
Kitchen, eating area, including under and over cabinet lighting	Mean	2.8	3.4	3.4	4.2	3.3	4.2	2.5	3.0	2.8	2.7
Dining Room	Mean	1.8	1.8	1.5	3.5	2.0	2.9	1.6	1.9	1.7	1.8
Living Room	Mean	2.7	3.1	3.1	3.2	3.0	3.8	2.4	2.8	2.2	3.3
Den, Study, Office, Family & Game Room(s)	Mean	2.5	3.0	2.7	2.6	2.9	3.6	2.5	2.8	2.5	2.5
Hallway(s), Laundry & Utility room(s), Garage(s), Workshop(s)	Mean	1.5	1.8	1.6	1.8	2.0	2.4	1.6	1.5	3.1	3.2
Outdoor, Security, Porch & Landscape	Mean	2.1	3.0	2.3	8.9	3.5	5.7	2.0	2.2	4.5	6.7
Unfinished Basement	Mean	1.1	1.2	1.1	1.8	1.4	2.2	0.9	2.8	1.0	11.6

Each average is based only on cases having at least one bulb type in the specific room.

Incandescent lights are on an average of 2.8 hours per day in the Kitchen compared to CFL lights which are on an average of 3.3 hours per day in the Kitchen. In general, in all rooms of the house, CFL lights are kept on longer than Incandescent lights.

31. Number of Light bulbs controlled by dimmers and timers

Percent of Households light switches with a dimmer

		Total	Region		
			Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
Incandescent	1 or more dimmer	39%	43%	37%	34%
Fluorescent	1 or more dimmer	1%	2%	2%	
CFL	1 or more dimmer	8%	7%	9%	8%
Halogen	1 or more dimmer	16%	17%	17%	14%
Other types	1 or more dimmer	14%	15%	18%	11%

Missing values treated as zero.

Base sizes include only cases where at least one answer was given for specific bulb type.

Among households with at least one incandescent light bulb in their house, 39% had at least one dimmer switch controlling an incandescent bulb.

Among households with at least one Halogen light bulb in their house, 16% had at least one dimmer switch.

Average number of bulbs with a dimmer

		Total	Region		
			Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
Incandescent	Mean	4.0	4.4	3.7	3.8
Fluorescent	Mean	2.9	3.6	2.4	.1
CFL	Mean	3.4	3.3	3.9	3.0
Halogen	Mean	6.5	4.4	9.6	6.5
Other	Mean	4.3	4.0	4.5	4.4

Zero's not included in mean calculation.

Each average is based only on cases having 1 or more dimmer switch

Base sizes are small, interpret results with caution

Among Households with dimmer switches on incandescent bulbs, the average number of switches was 4.

Percent of Households light switches with a timer

		Total	Region		
			Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
Incandescent	1 or more timer	10%	9%	12%	8%
Fluorescent	1 or more timer	0%	0%	0%	0%
CFL	1 or more timer	8%	10%	7%	6%
Halogen	1 or more timer	5%	6%	4%	4%
Other types	1 or more timer	6%	3%	11%	4%

Missing values treated as zero.

Base sizes include only cases where at least one answer was given for specific bulb type.

Among households with at least one incandescent light bulb in their house, 10% had at least one timer. Among households with at least one CFL light bulb in their house, 8% had at least one timer.

Average number of bulbs with a Timer

		Total	Region		
			Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
Incandescent	Mean	2.6	2.9	2.3	2.8
Fluorescent	Mean	5.9	9.5	3.0	2.0
CFL	Mean	2.4	2.7	2.1	2.2
Halogen	Mean	3.2	4.3	2.2	2.2
Other types	Mean	7.0	7.4	4.4	13.6

Zero's not included in mean calculation.

Each average is based only on cases having at least 1 or more timer

Base sizes are small, interpret results with caution

Among households with timers on incandescent bulbs, the average number of timers was 2.6.

32. Torchieres

Percent of Households with a Torchiere with the following bulb type:

		Total	Region		
			Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
Incandescent	1 or more	17%	18%	18%	15%
Fluorescent	1 or more	13%	13%	15%	11%
CFL	1 or more	4%	5%	3%	4%

Missing values treated as zero.

Base sizes include only cases where at least one bulb was given of any type.

Seventeen percent of households had at least one incandescent bulb torchiere. Thirteen percent of households had at least 1 fluorescent bulb torchiere and 4% had 1 or more CFL bulb torchieres.

Average number of torchieres by bulb type

		Total	Region		
			Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
Incandescent	Mean	1.7	1.8	1.6	1.5
Halogen	Mean	1.5	1.4	1.4	1.8
CFL	Mean	2.0	2.3	1.8	1.7

Zero's not included in mean calculation.

Each average is based only on cases having at least 1 or more torchiere

Base sizes are small, interpret results with caution

Among Households with incandescent bulb torchieres, the average number of torchieres was 1.7.

Average hours per day torchieres are on by bulb type:

		Total	Region		
			Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
Incandescent	Mean	2.2	2.2	2.3	1.9
Halogen	Mean	2.0	2.4	1.6	1.7
CFL	Mean	2.9	2.7	2.3	3.6

Zero's not included in mean calculation.

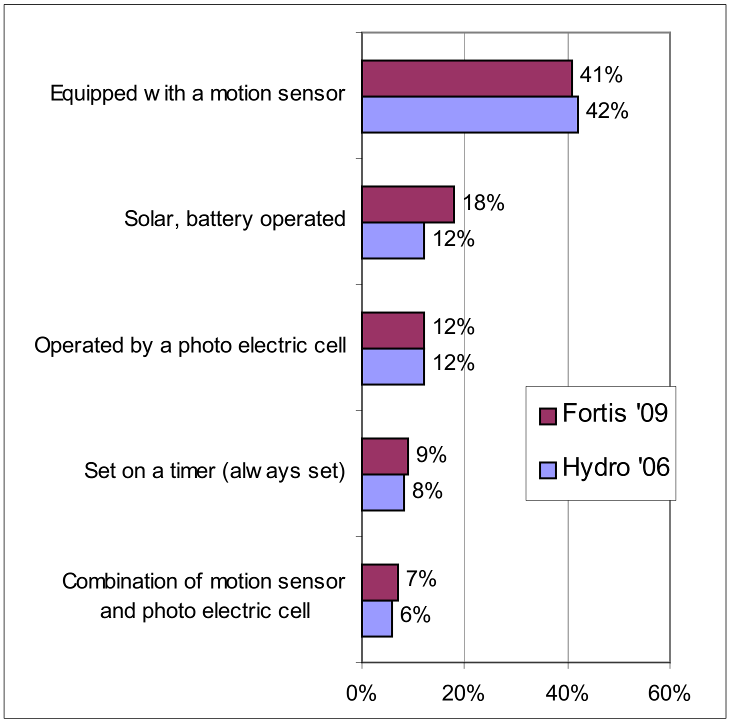
Each average is based only on cases having at least 1 or more torchiere

Base sizes are small, interpret results with caution

Incandescent torchieres are on an average of 2.2 hours per day and CFL torchieres are on an average of 2.9 hours per day.

33. Outdoor Lighting fixtures

Percent of Households with outdoor light fixtures equipped with the following:



Forty-one percent of households have outdoor lights equipped with motion sensors and eighteen percent have solar/battery operated outdoor lights.

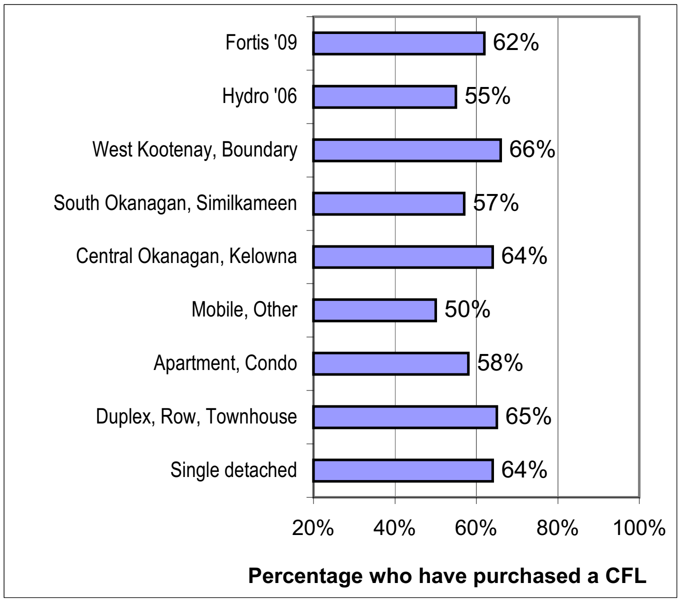
Do you have outdoor light fixtures equipped with the following?

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
Equipped with a motion sensor (turns on when movement is detected)	Yes	34%	46%	47%
Solar, battery operated	Yes	15%	21%	20%
Operated by a photo electric cell	Yes	12%	14%	12%
Set on a timer (always set)	Yes	10%	11%	6%
Combination of motion sensor and photo electric cell	Yes	5%	8%	8%

Forty-seven percent of West Kootenay/Boundary households are equipped with a motion sensor compared to 34% of Central Okanagan households.

34. Compact Fluorescent Light bulbs (CFL's)

In the past 12 months, have you purchased a CFL?



Sixty-two percent of FortisBC respondents had purchased a CFL bulb in the past 12 months compared to 55% of BC Hydro respondents.

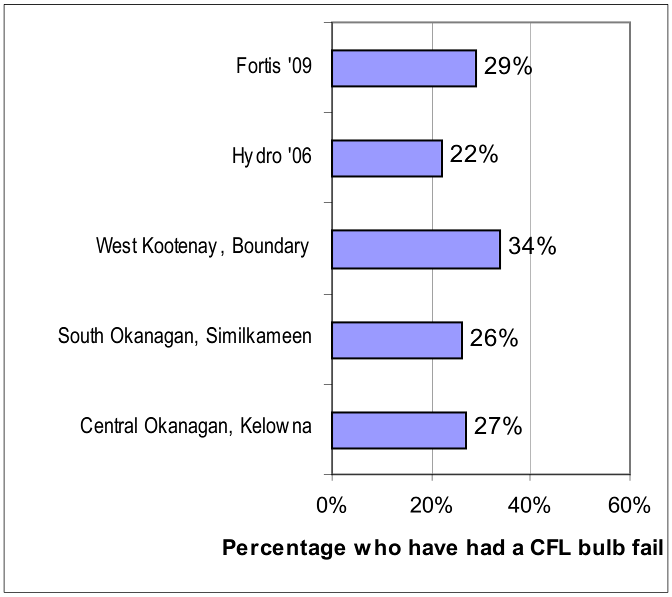
Average number of CFL bulbs:

		Fortis '09	Hydro '06
"How many in total have you purchased?"	Mean	9.2	7.3
"Of these, how many have you installed?"	Mean	6.5	4.5
"How many were rebated by FortisBC?"	Mean	.6	n/a

Base: Respondents who have purchased CFL's in past 12 months.

Not surprisingly, CFL bulbs are more commonly used in 2009 then in 2006.

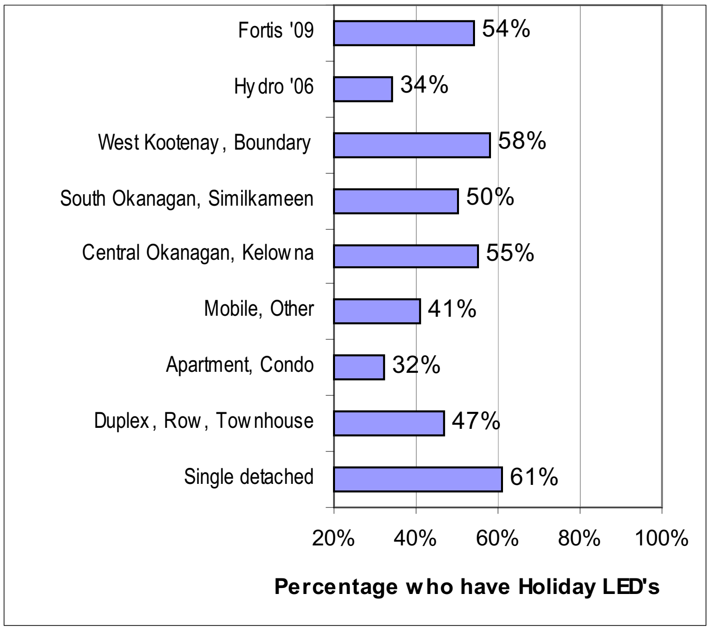
In the past 12 months, have any CFL bulbs failed?



Twenty-nine percent had a CFL bulb fail in the past 12 months. Among households that had a failed CFL bulb, the average number of failed bulbs was 2.2. Among the failed CFL bulbs, the average number that were replaced with another CFL bulb was 1.7.

35. LED Holiday Lights

Do you have Holiday LED's?



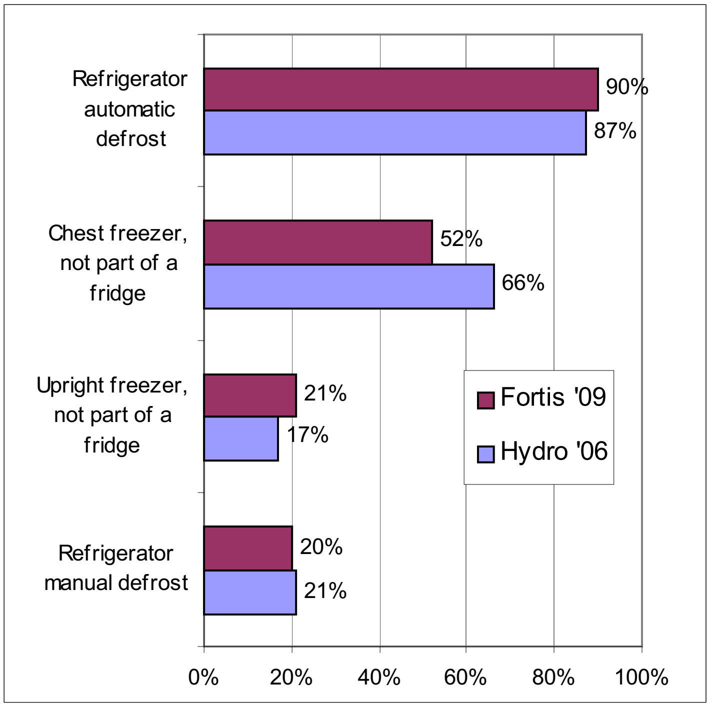
Fifty-four percent of FortisBC households have holiday LED's compared to only 34% of BC Hydro 2006 households.

Single detached homes were the most likely to have holiday LED's.

The average number of LED strings per household was 5.5 among FortisBC customers compared to 4.8 amount BC Hydro customers.

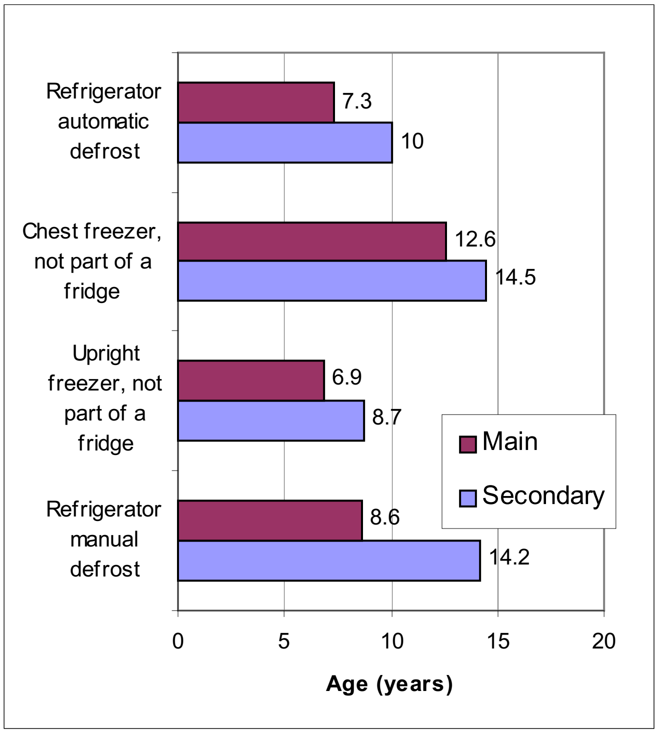
F. Appliances

36. Do you have the following Refrigerator/Freezer appliances in your home?



Ninety percent of FortisBC households have a refrigerator with automatic defrost and 52% have a chest freezer. BC Hydro households were more likely to have a chest freezer (66%).

Average age of appliances:

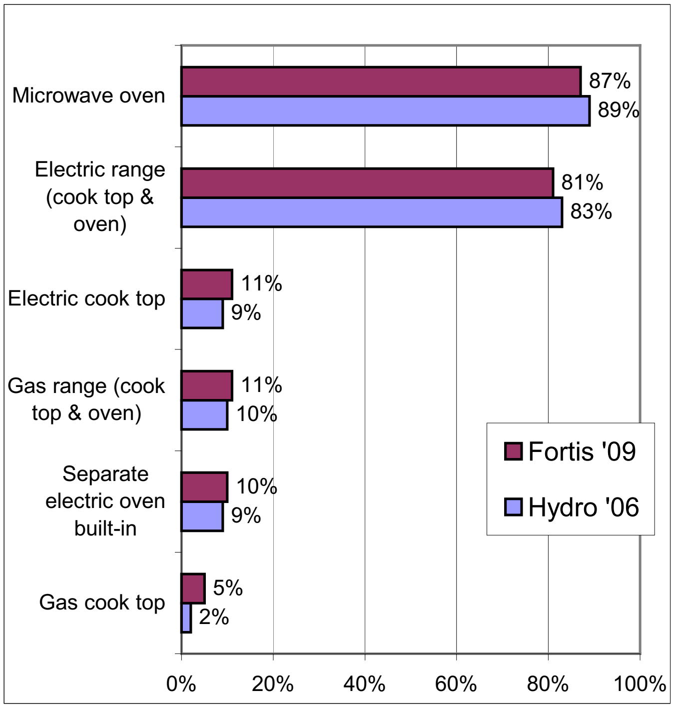


Each average is based only on cases having appliance (main or secondary)

The average age of main automatic defrost refrigerator was 7.3 years and if the refrigerator was secondary, the average age was 10 years.

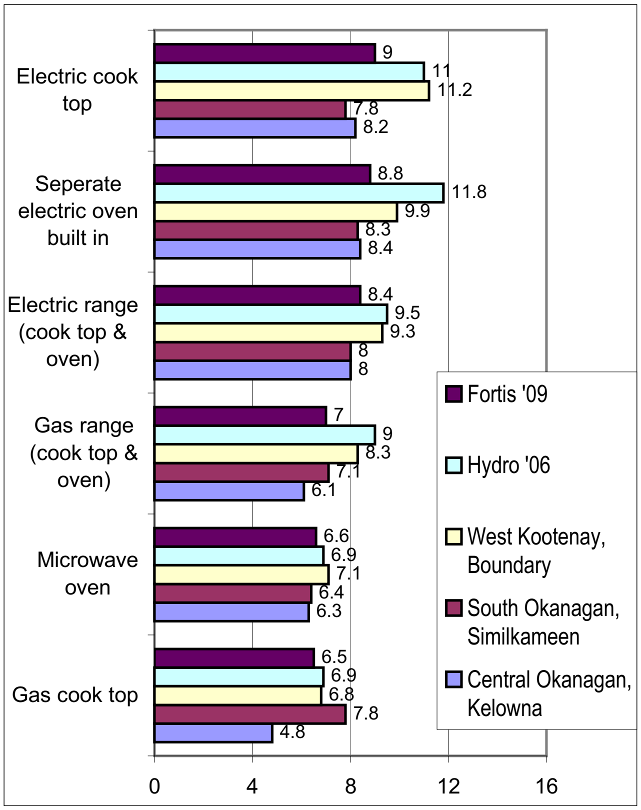
The average age of the main chest freezer was 12.6 years and the average age of upright freezers was 6.9 years.

37. Do you have the following Cooking appliances in your home?



Eighty-seven percent of FortisBC Households have a microwave oven and 81% have an electric range (cook top & oven).

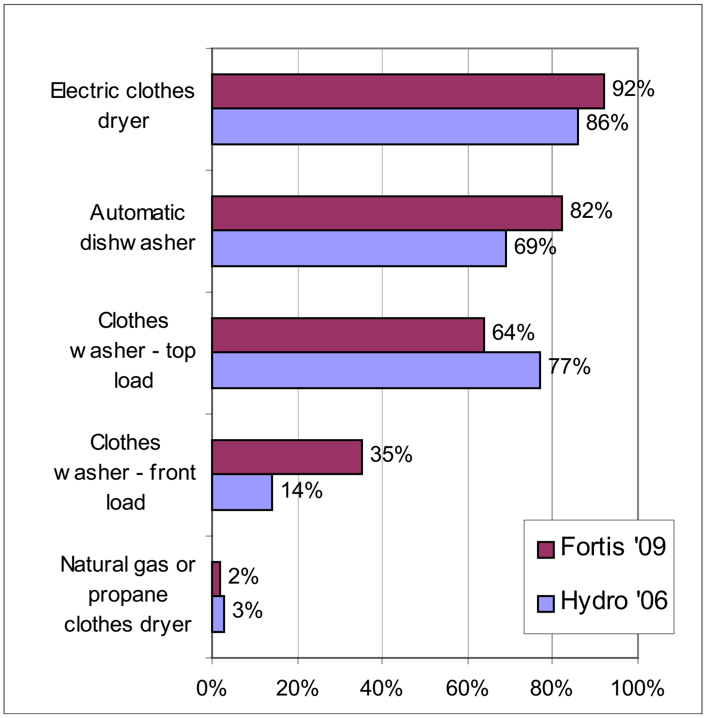
Average age of appliances:



Each average is based only on cases having appliance

The average age of Electric cook tops was 9.0 years among all FortisBC Households and 11.2 years among West Kootenay/Boundary households. Cooking appliances were on average slightly older in the West Kootenay/Boundary area.

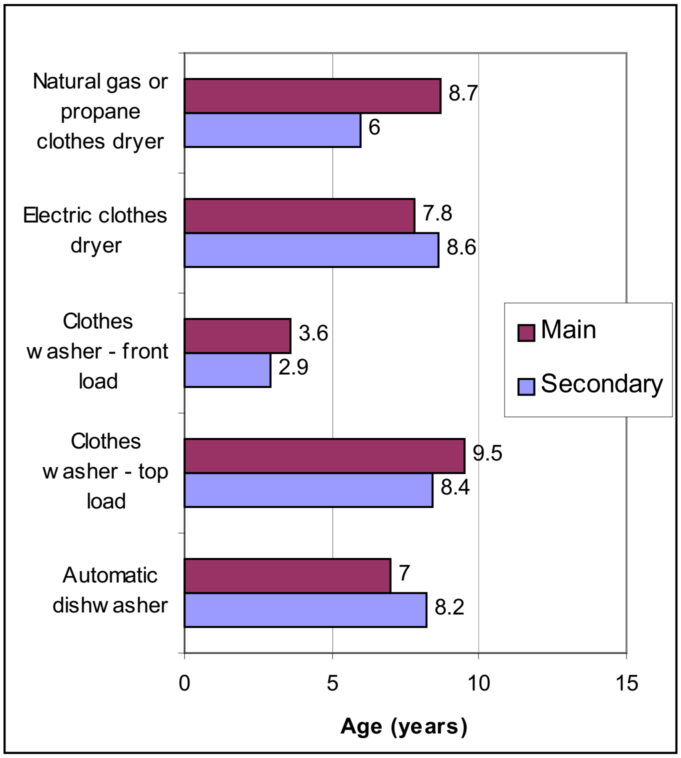
38. Do you have the following Laundry/Dryer appliances in your home?



Ninety-two percent of FortisBC Households have an electric clothes dryer and 82% have an automatic dishwasher.

Front load washing machines are more prevalent in 2009 among FortisBC Households (35%) than the were in 2006 Hydro households (14%).

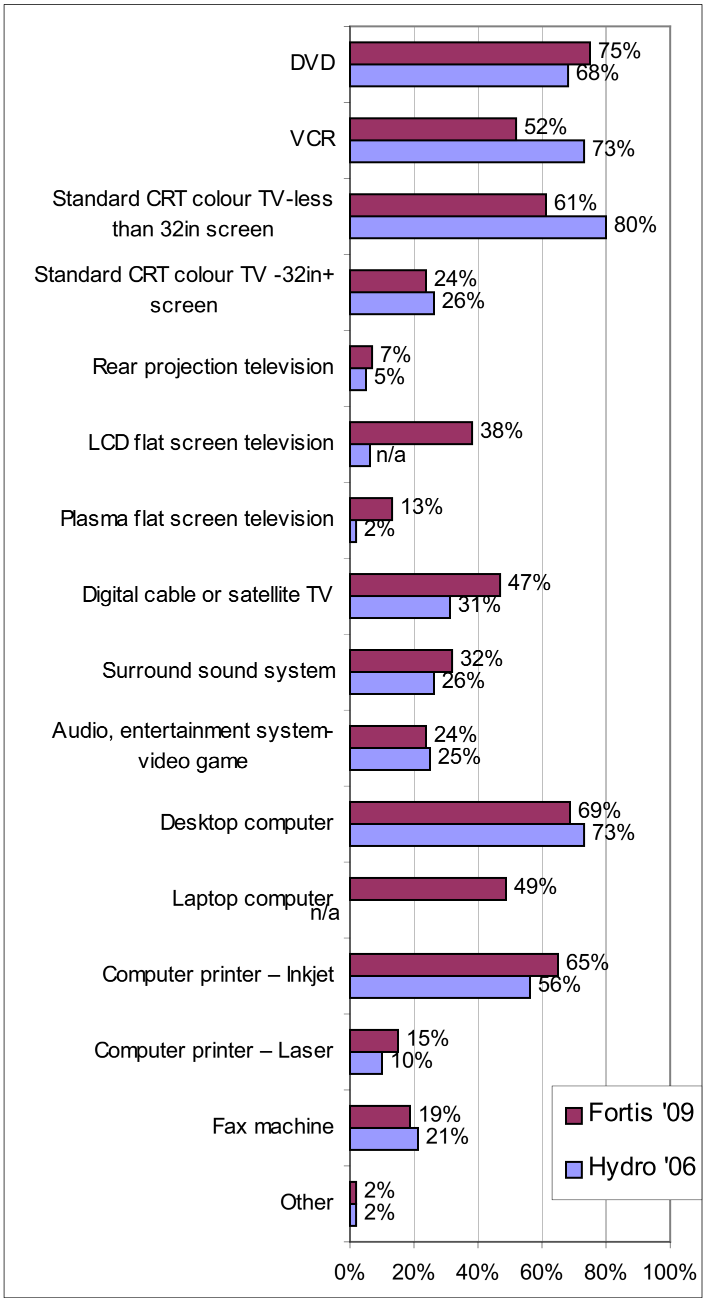
Average age of appliances:



Each average is based only on cases having appliance (main or secondary)

The average age of the main front loading washing machine is 3.6 years and the average age of top load washing machines is 9.5 years.

39. Do you have the following home electronics in your home?



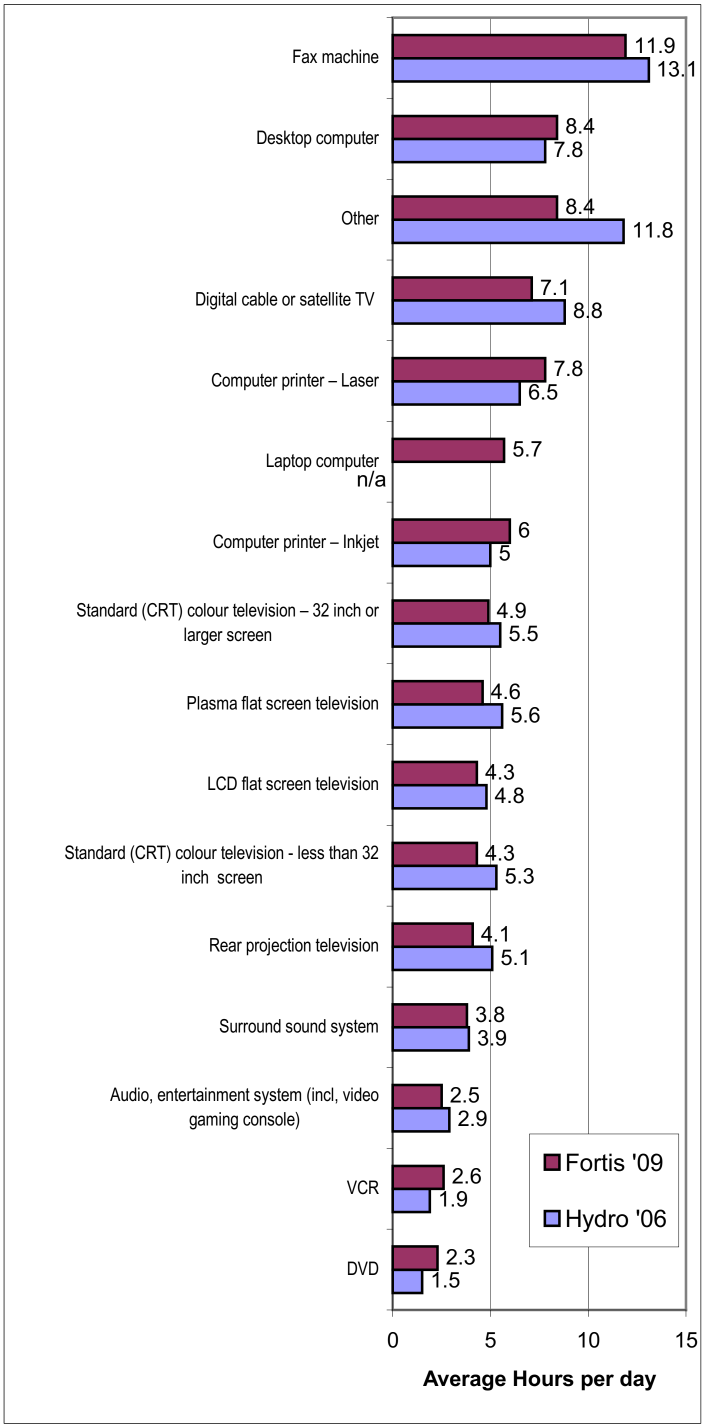
Seventy-five percent of FortisBC households have a DVD.

Only 52% of household had a VCR in 2009 compared to 73% in 2006.

In 2006, 80% of BC Hydro households had a standard TV with a 32 inch or less screen compared to 61% of FortisBC households.

Forty-seven percent have digital cable or satellite TV and 38% have an LCD flat screen TV. The percentage of households with LCD and Plasma TV's has increased significantly since 2006.

Average number of hours left on per day:



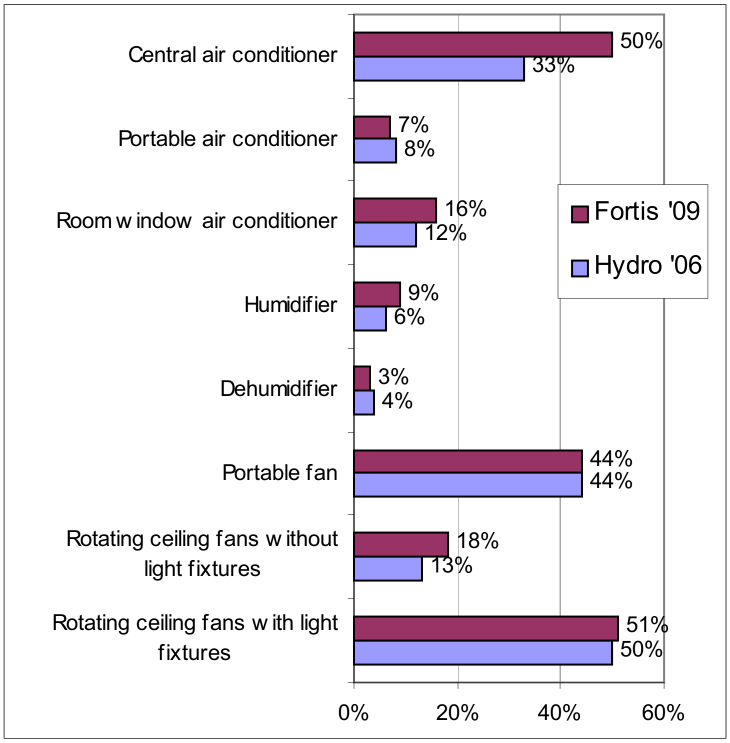
Fax machines are left on an average of 11.9 hours per day and desktop computers are left on 8.4 hours per day.

"Other" electrical items are left on an average of 8.4 hours per day. The specific other items provided by respondents are shown in the below chart:

"Other appliance"	Radio	8
	LCD projector	5
	Scanner	5
	Photocopier	5
	Fax\printer (all in 1)	4
	Cordless phone	2
	Home theatre	2
	Battery charger	2
	UPC	2
	Modem\pvr	2
	Water pumps domestic supplies	1
	Dot matrix	1
	Adding machine	1
	CD recorder	1
	Well pumps	1
	Sewing machine	1
	TV (small)	1
	Protable A\C	1
	Notebook computers	1
	Toaster oven	1
	Router\switch	1
	Hot tub	1
	Server	1
Total		50

G. Space Cooling

40a. Do you have the following Air Conditioning appliances in your home?



The majority of FortisBC homes (50%) have a central air conditioner. Only 33% of BC Hydro homes in the Southern interior have central air conditioners.

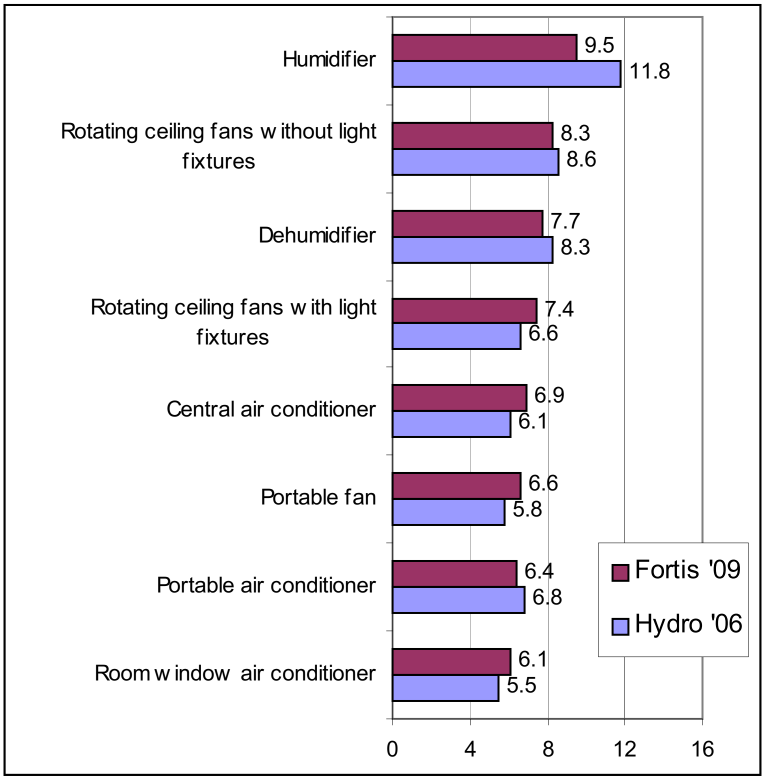
Air conditioners by region:

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
Do you have the following appliances in your home?	Central air conditioner	**63%**	**57%**	**23%**
	Portable air conditioner	7%	6%	9%
	Room window air conditioner	17%	16%	14%
	Humidifier	11%	8%	5%
	Dehumidifier	2%	3%	6%
	Portable fan	43%	39%	50%
	Rotating ceiling fans without light fixtures	16%	24%	15%
	Rotating ceiling fans with light fixtures	46%	55%	55%
Total	Responses	1551	1141	954
	Base	755	548	540

Column percentages may exceed 100% because multiple responses provided

Sixty-three percent of Central Okanagan households have a central air conditioner compared to 23% of West Kootenay/Boundary households.

Average hours per day the air conditioners are in use: (when used)

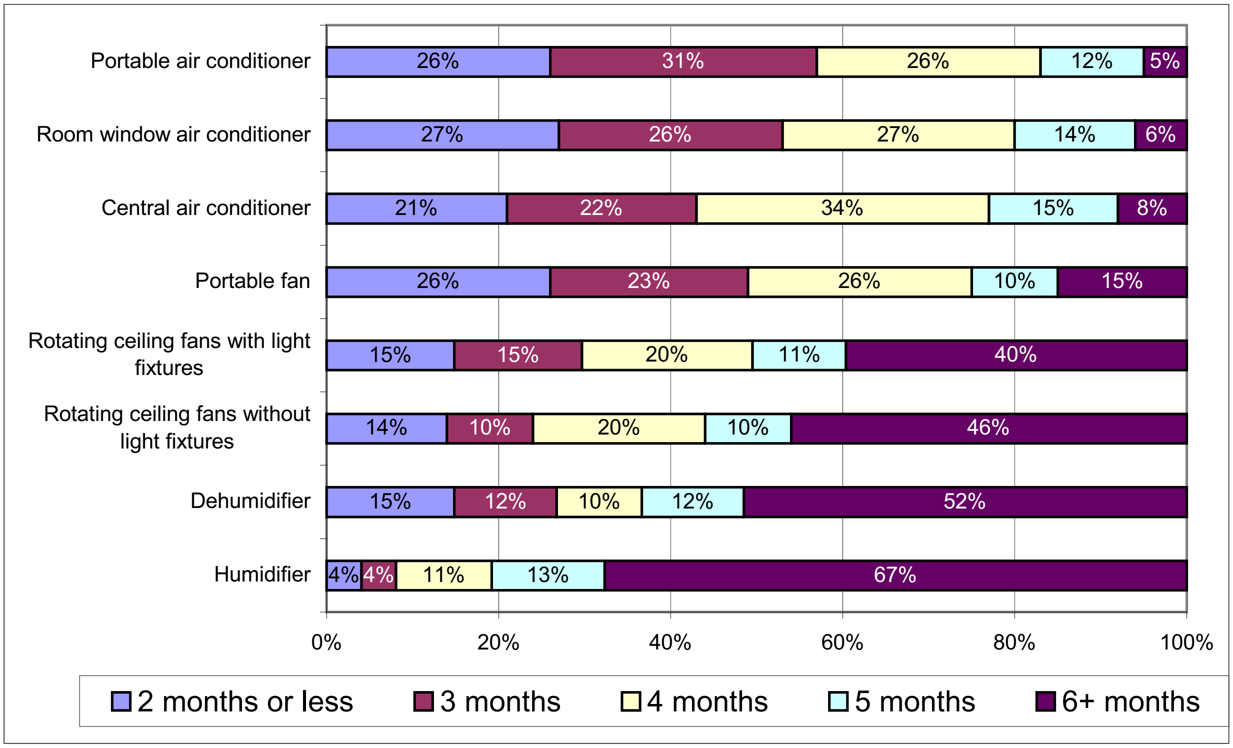


Each average is based only on cases having appliance. Zero's included.

When Humidifiers are in use, FortisBC homes will keep their humidifier on for an average of 9.5 hours per day.

When central air conditioners are in use, FortisBC homes will keep their central air conditioner on for an average of 6.9 hours per day.

Number of months air conditioners in use per year:



The majority of households utilize portable air conditioners (83%), room window air conditioners (80%), central air conditioners (77%) and portable fans (75%) for 4 months or less each year. The majority of these households utilize these air conditioners from June or July to September each year.

Dehumidifiers are utilized over 6 months per year by 52% and humidifiers are used over 6 months per year by 67%.

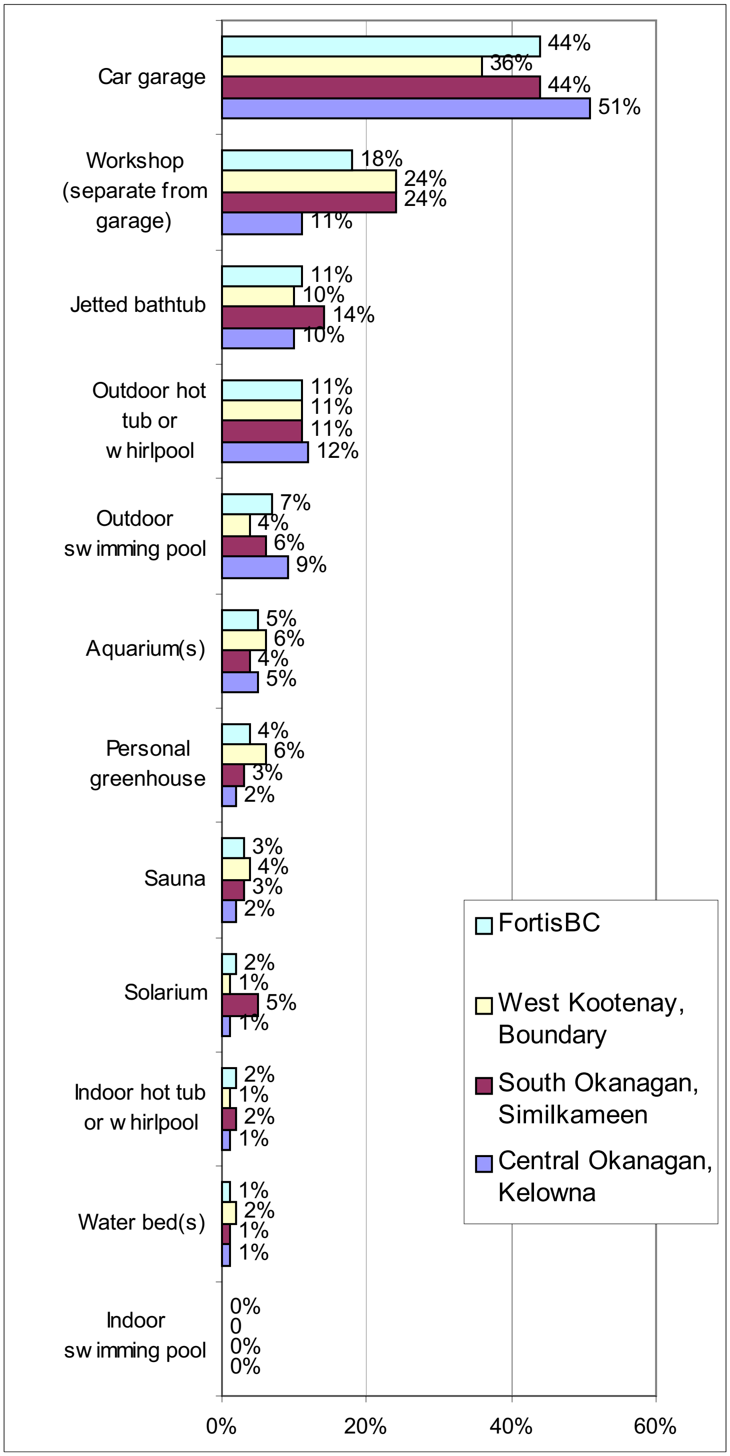
40b. Are you planning to buy the following types of air conditioners in the next 12 months?

		Total	Region		
			Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"Portable"	"Yes"	2%	2%	1%	2%
"Room"	"Yes"	2%	2%	1%	2%
"Central"	"Yes"	2%	2%	1%	4%

Only 6% of FortisBC households are planning purchasing an air conditioner in the next 12 months. This is split evenly between portable, room and central air conditioners.

H. Other End Uses

41a. Do you have the following items at your home? (Pools, hot tubs, car garage, etc).



Forty-four percent of households have a car garage, with the highest percentage in the Central Okanagan (51%).

Eleven percent have an outdoor hot tub or whirlpool. Among outdoor hot tub or whirlpool owners, 97% cover their hot tubs when not in use to save energy.

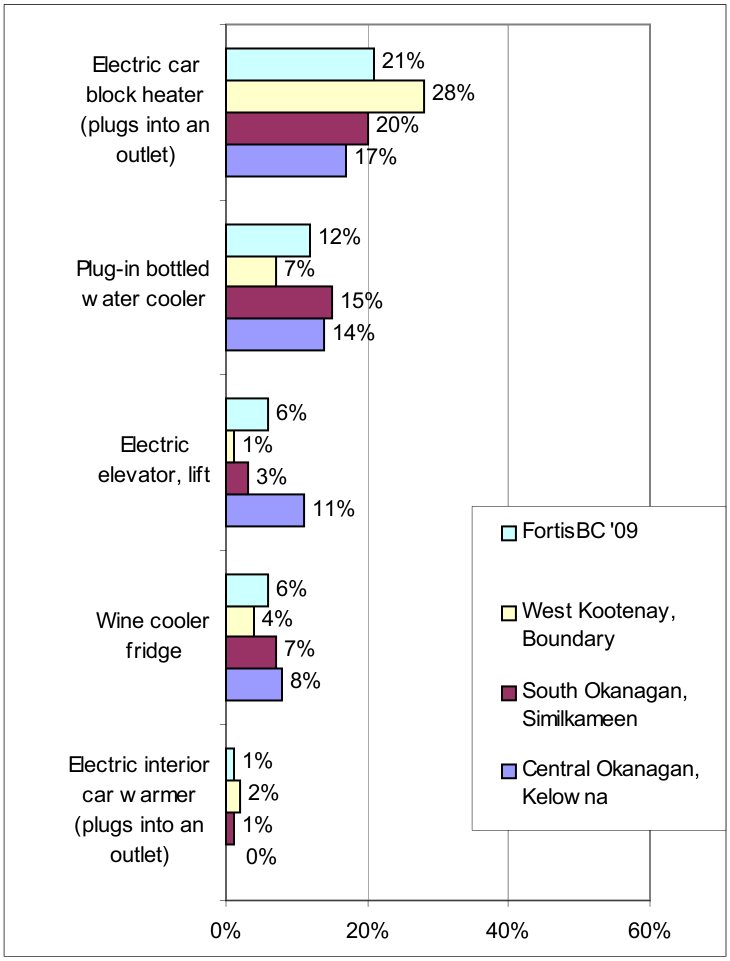
Seven percent have an outdoor swimming pool. Among swimming pool owners, 70% cover the outdoor pool when not in use to save money.

How is it heated?

	Indoor swimming pool	Outdoor swimming pool	Indoor hot tub or whirlpool	Outdoor hot tub or whirlpool	Sauna	Water bed(s)	Aquarium (s)	Car garage	Workshop (separate from garage)	Personal greenhouse	Solarium
Electric	10%	6%	57%	92%	93%	56%	63%	18%	36%	32%	15%
Gas	28%	27%	11%	4%	2%	30%	15%	28%	26%	37%	40%
Don't know	26%	7%	9%	3%	4%	0%		1%	1%	0%	0%
Not heated	36%	60%	23%	1%	2%	14%	22%	53%	38%	31%	45%
Base	11	124	56	213	54	30	107	840	357	39	67

The majority of outdoor swimming pools are not heated (60%). Ninety-two percent of outdoor hot tubs or whirlpools are electric and 93% of Saunas are electric. The majority of car garages (53%) are not heated.

41b. Do you have the following items at your home?

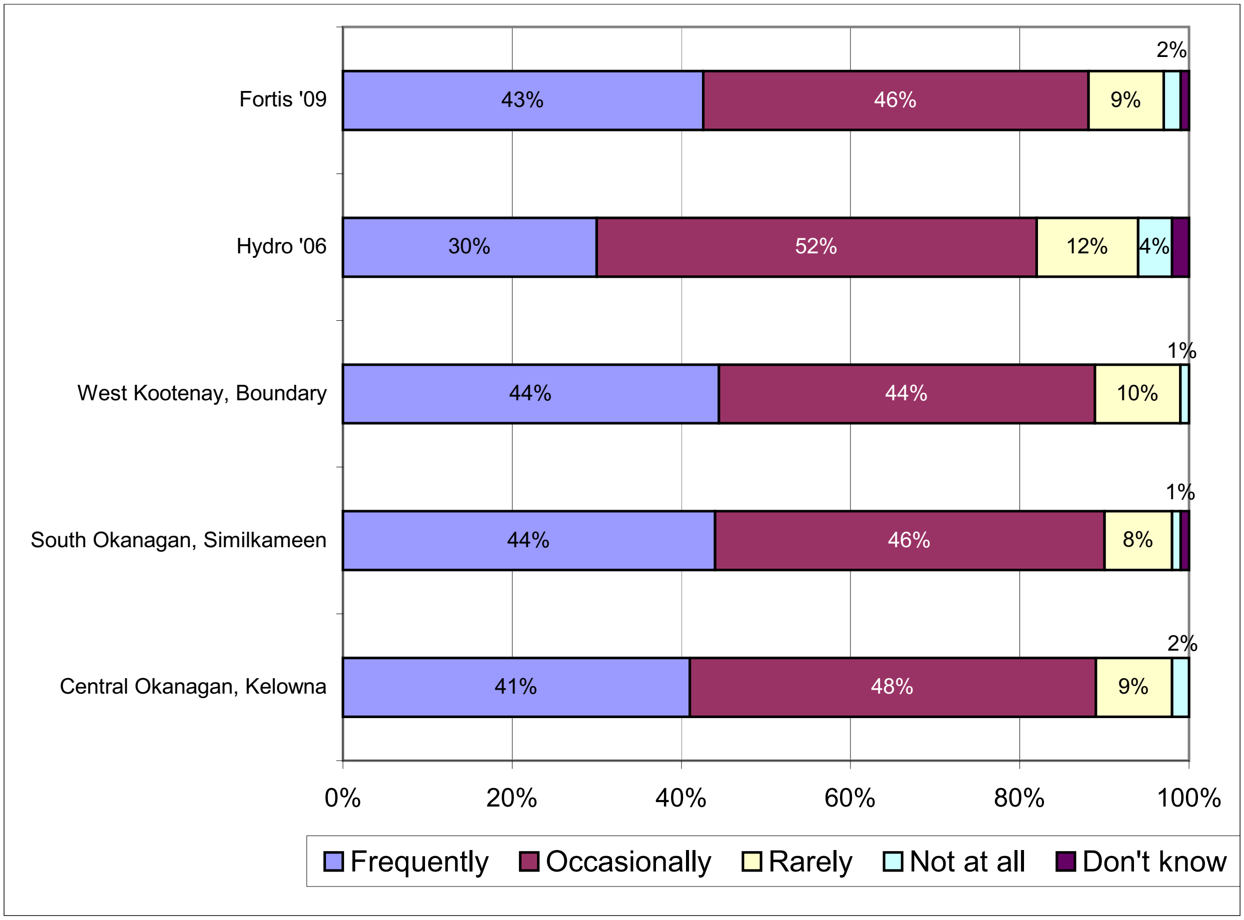


Twenty-eight percent of West Kootenay/Boundary households have an electric block heater for their car compared to 17% of Central Okanagan households.

Plug-in water coolers are more popular in the Southern and Central Okanagan than in West Kootenay/ Boundary.

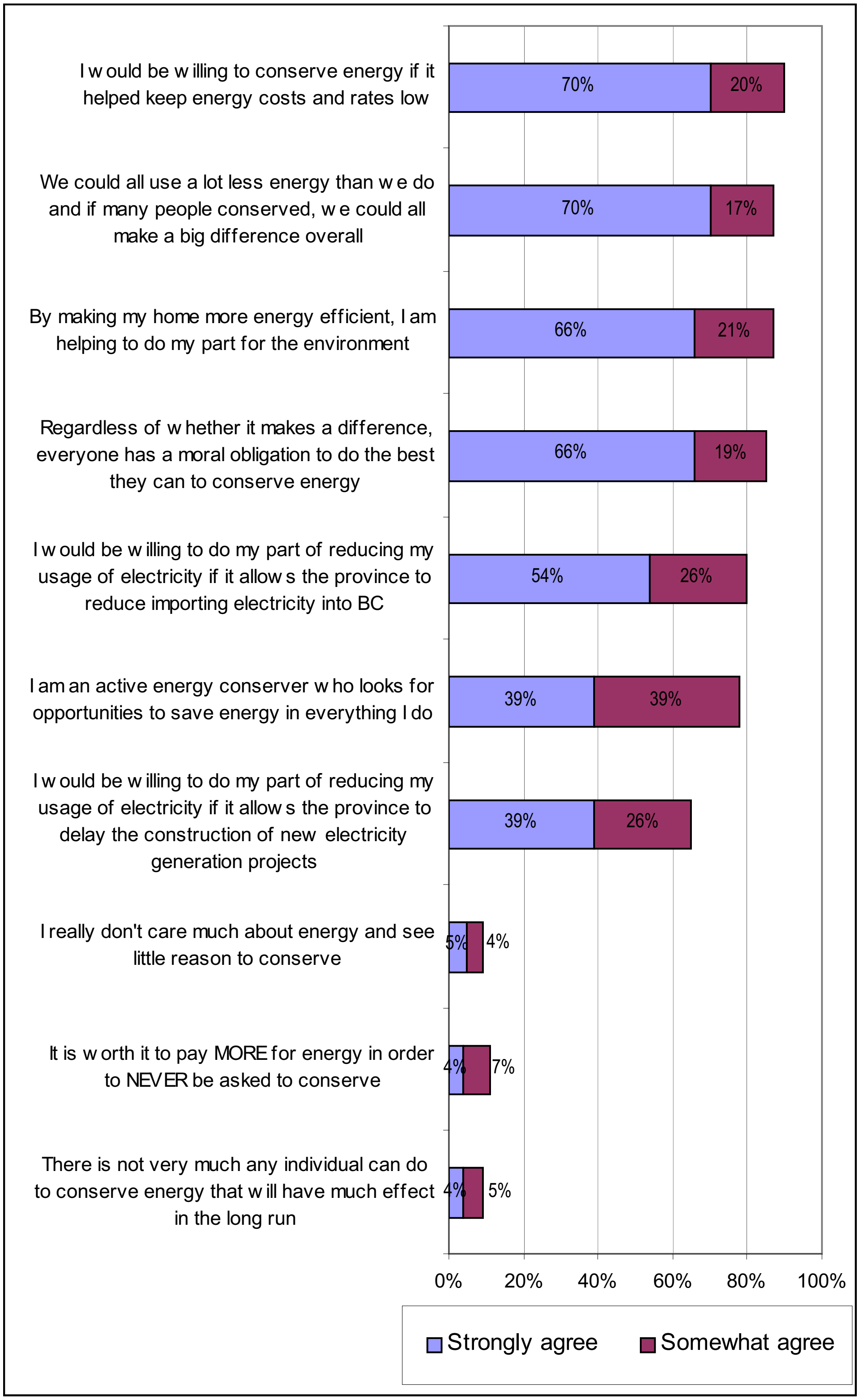
I. Electricity and the Environment

42. How much have you been thinking about energy issues in BC and how they affect you and your family and friends?



The majority of FortisBC respondents (89%) have been thinking about energy issues in BC frequently (43%) or occasionally (46%). Energy issues are more on peoples minds than they were during the 2006 Hydro survey in which 30% thought of energy issues frequently and 52% occasionally.

43. Please rate your agreement with the following: Energy conservation



Ninety percent feel they would be willing to conserve energy if it helps keep energy costs and rates low.

Eighty percent agree (strongly-54%; somewhat-26%) they would be willing to reduce usage of electricity if it allows the province to reduce importing electricity into BC.

44a. What encourages you to use less energy in your household?

	Fortis '09	Hydro '06
To reduce costs\lower bills	73%	81%
Environmental reasons\power conservation	37%	21%
It's my philosophy\habit\common sense	10%	8%
Other family members	4%	1%
Cost\availability of energy efficient appliances\technology	3%	2%
To be a good role model	2%	0.5%
Information\tips\education to save energy	1%	0.5%
Incentives\rebates	1%	1%
Advertising\reminders to save energy	1%	1%
Not at home much\don't use much energy	0.9%	0.5%
Other	0.7%	3%
Warm\summer weather	0.5%	1%
Daylight\long days	0.4%	1%
Nothing in particular	0.3%	5%

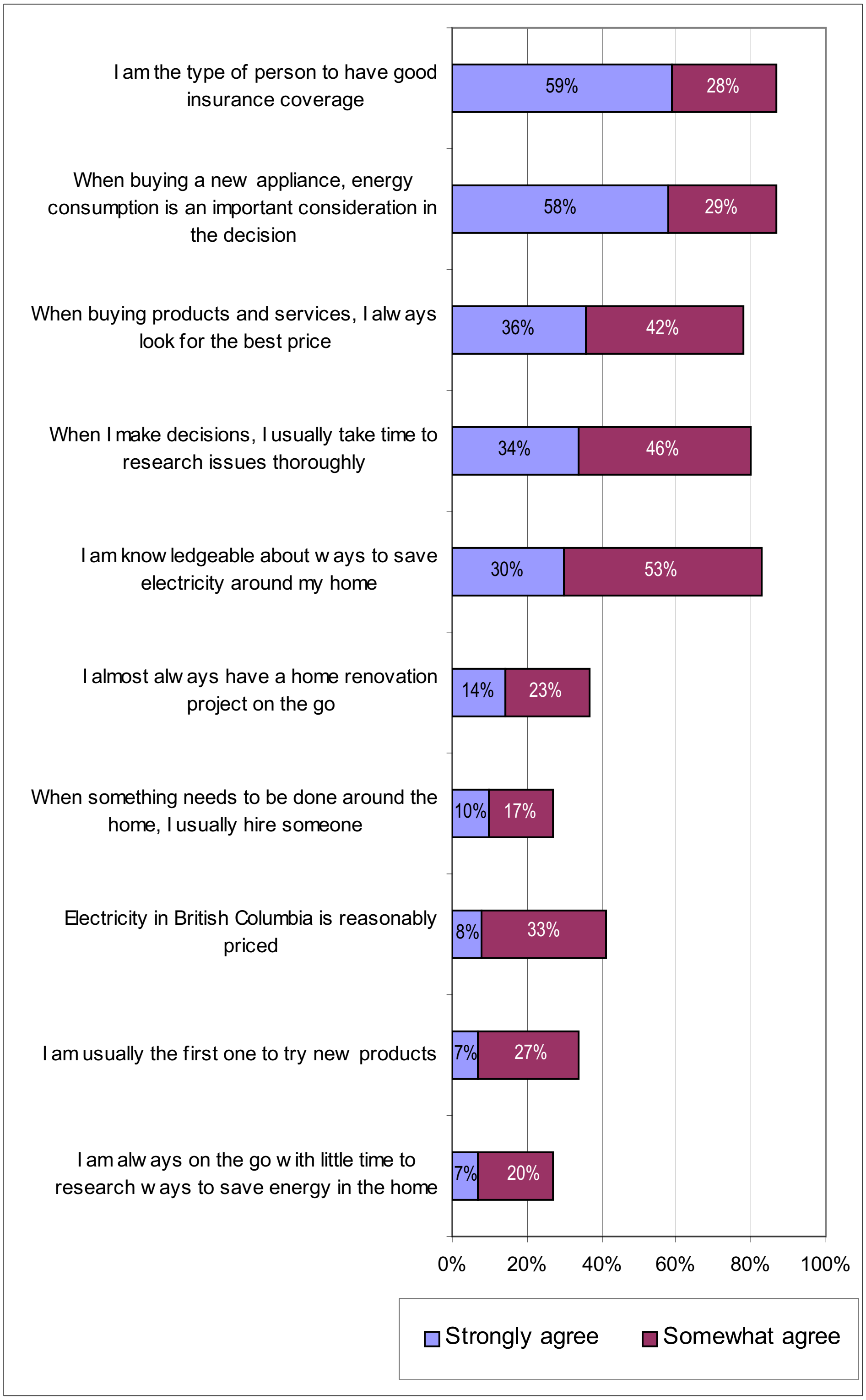
Not surprisingly, 73% of FortisBC respondents said that reducing costs/lowering bills would encourage them to use less energy. Thirty- seven percent of FortisBC customers and only 21% of Hydro customers would be encouraged to use less energy for environmental reasons or power conservation.

44b. What prevents you from using less energy in your household?

	Fortis '09	Hydro '06
Too costly to upgrade current appliances	*9%*	*7%*
Cost of upgrading\renovations\old house	*6%*	*4%*
Too costly to upgrade current windows\insulation	*3%*	*5%*
Cost of energy efficient lights\fixtures	*1%*	*2%*
Cost (general)	*10%*	*9%*
Total cost	***28%***	***27%***
Nothing in particular	15%	18%
Entertainment\lifestyle\household requirements	11%	14%
Too lazy\busy\I forget	10%	7%
Current usage is already at the minimum level	9%	10%
Comfort	9%	3%
Weather (ie. cold winter\hot summer)	9%	10%
Other family members are not participating\children	8%	9%
Convenience	5%	3%
Other	3%	4%
Problems with energy efficient bulbs	3%	1%
Darkness (ie. long winter nights) - need light	2%	5%
Don't know	2%	1%
Don't know how to save energy\lack of information	1%	1%
Rent\rental restrictions	1%	1%
Have an older furnace	1%	1%
Low cost of electricity\hydro bill	1%	1%
Security concerns	0.3%	0.4%
Have a home office	0.2%	1%

Cost prevents 28% of FortisBC customers from using less energy. Eleven percent of customers are prevented from using less energy because of their entertainment, lifestyle and household requirements. Ten percent are simply too lazy, busy or forget to use less energy.

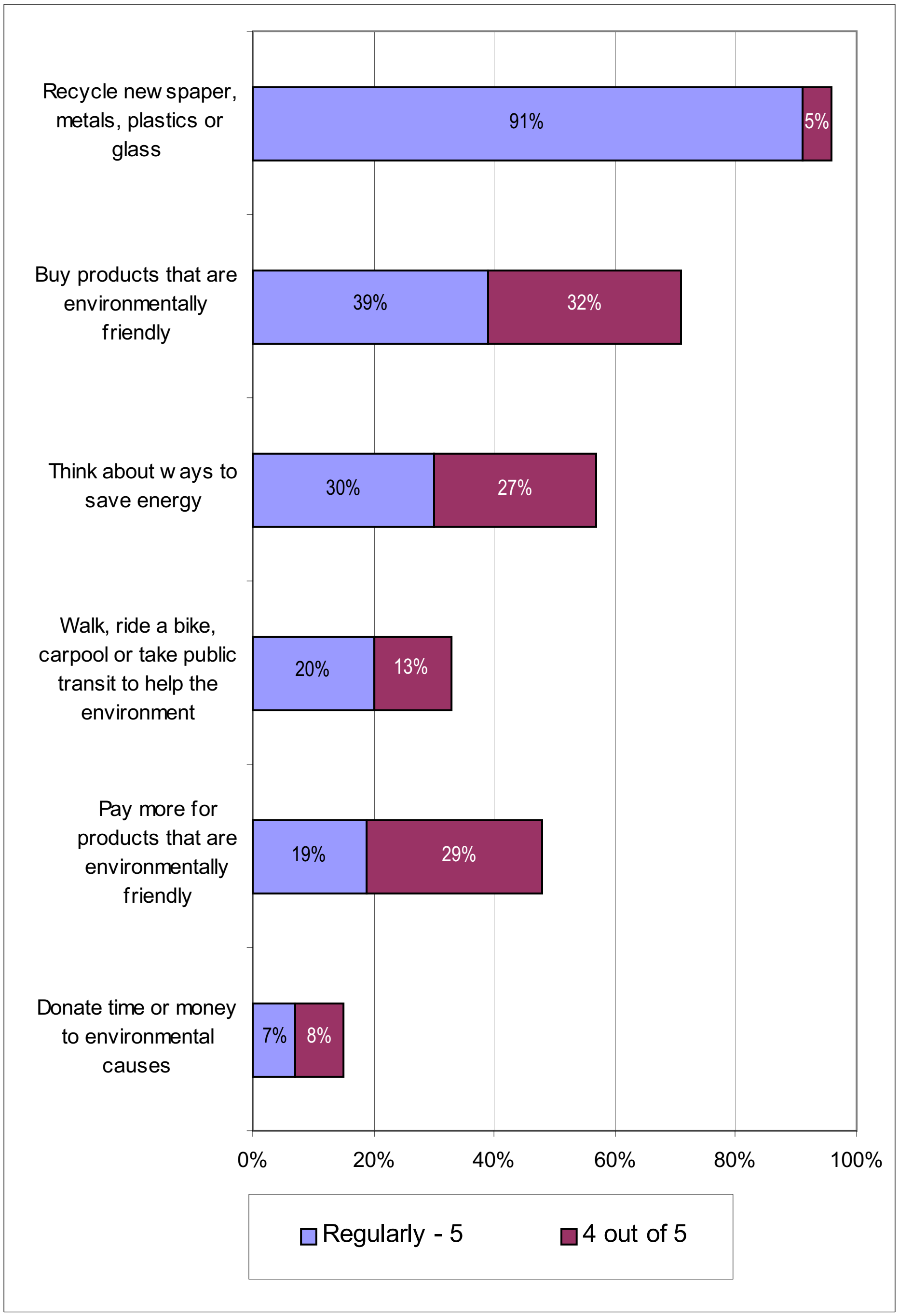
44c. Please rate your agreement with the following: New Products, Services and Electricity



The majority agree (87%) that they are the type of person to have good insurance coverage and when buying a new appliance, energy consumption is an important consideration in the decision.

Eight percent strongly agree and 33% agree that electricity in BC is reasonably priced.

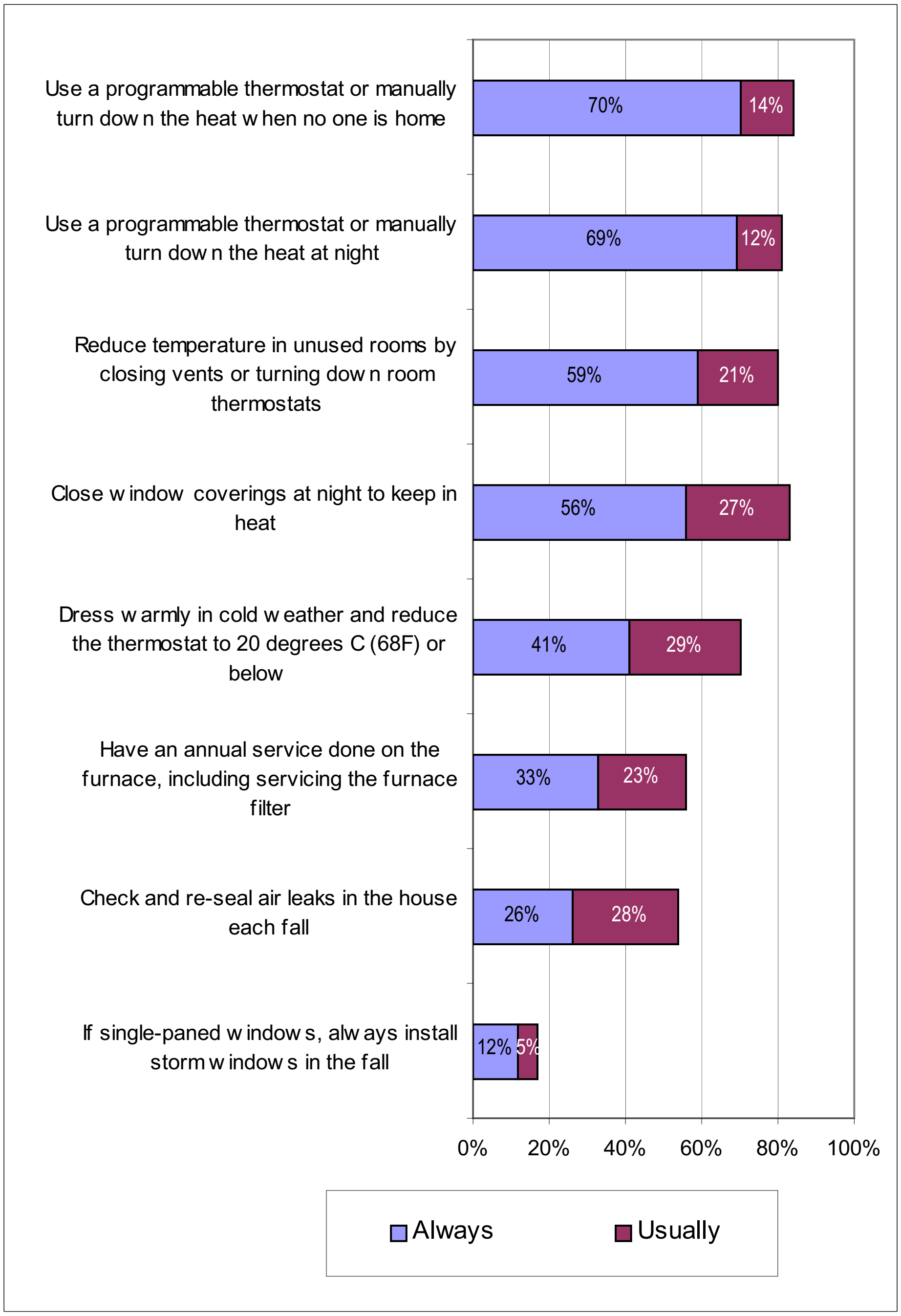
44d. Attitudes towards Environmentally friendly products, causes, and recycling



The majority (96%) recycle newspaper, metals, plastics or glass regularly. Seventy-one percent buy products that are environmentally friendly on a regular basis.

J. Managing Electricity

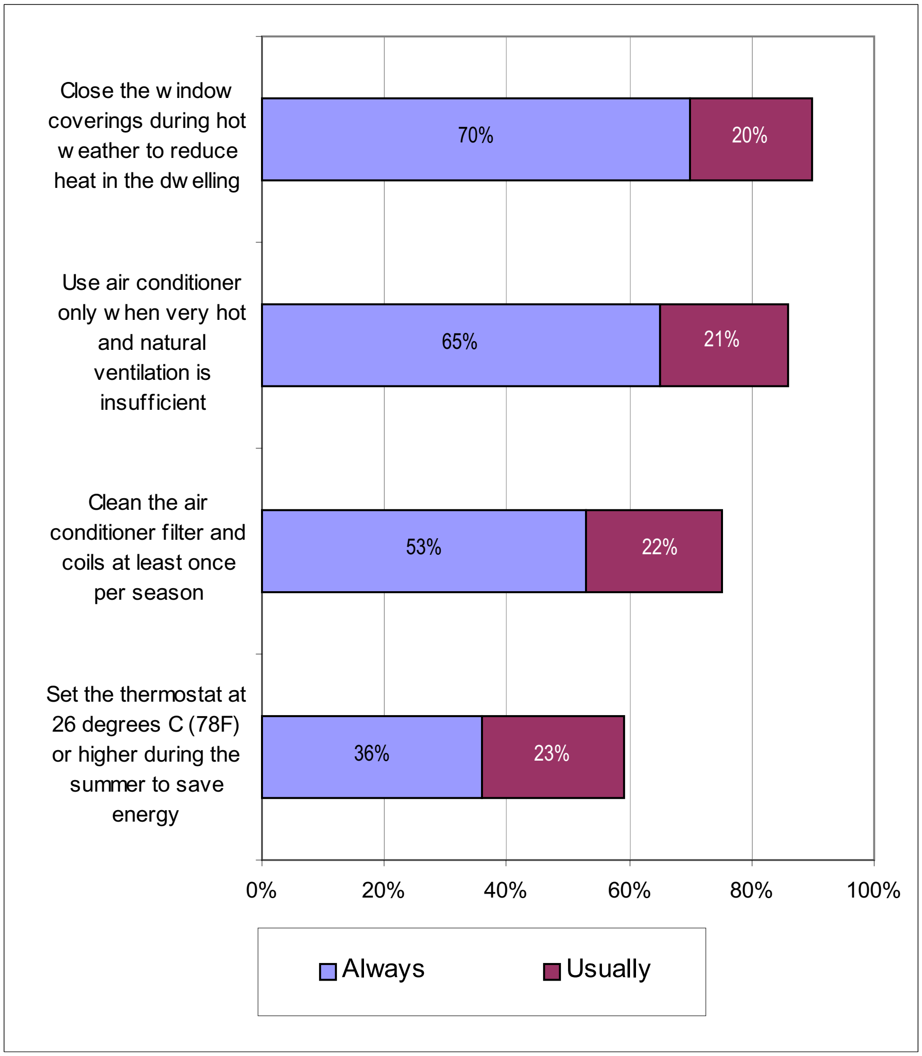
45. Space Heating Habits and Practices



Eighty-four percent turn down the thermostat when no one is home.

Eighty-one percent use a programmable thermostat or manually turn down the heat at night.

46. Space Cooling Habits and Practices



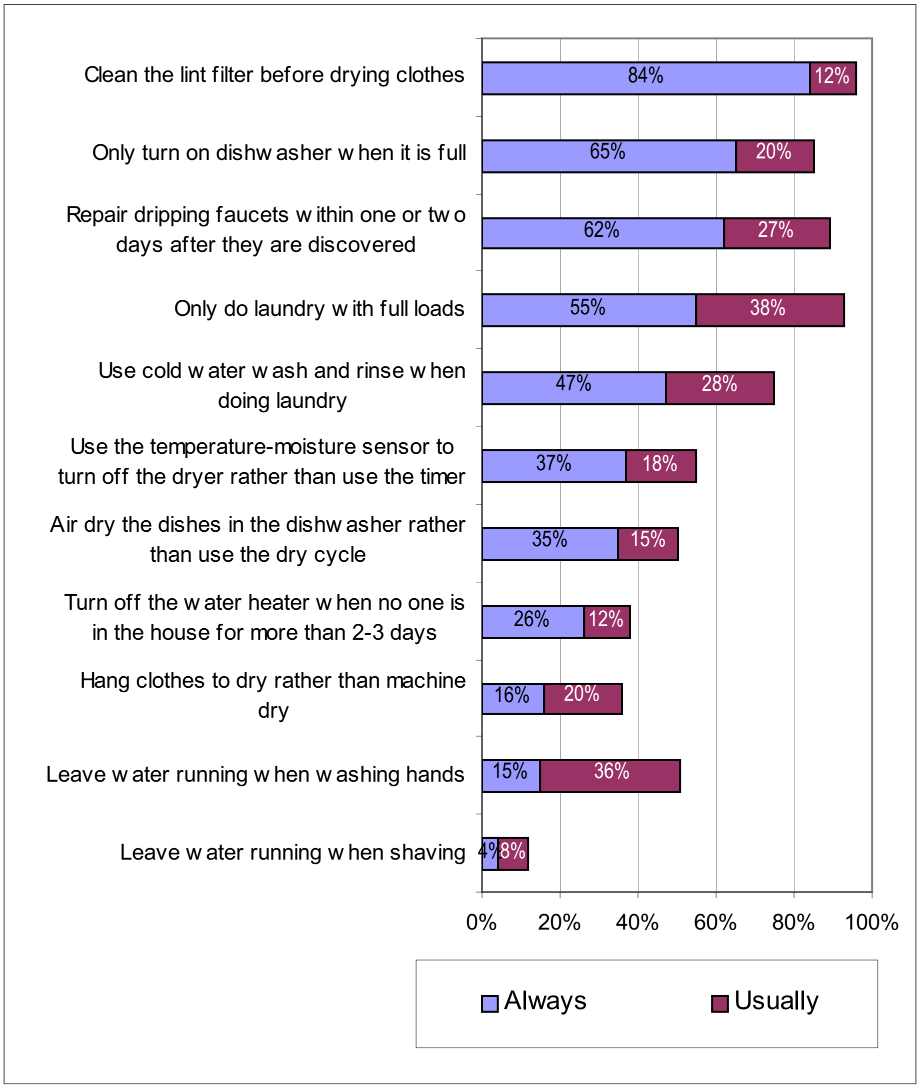
Ninety percent close the window coverings during hot weather to reduce heat in the dwelling.

Fifty-nine percent set the thermostat at 26 degrees C or higher during the summer to save energy.

Planting Vegetation or Installing shade devices to keep home cool:

Fifty percent have planted trees or other vegetation to keep their home cool. Forty-one percent have installed shading devices (i.e. awnings, pergolas) to keep their home cool.

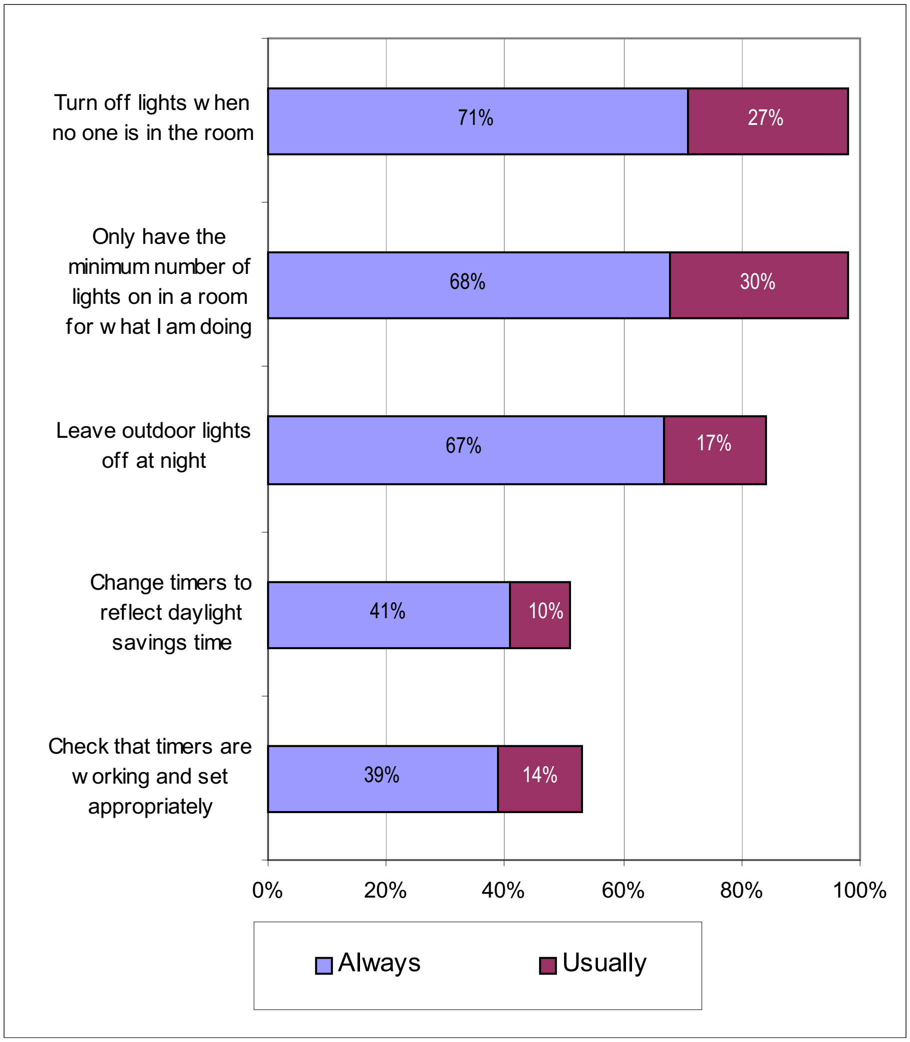
47. Water Usage / Laundry Habits and Practices



Ninety-six percent always (84%) or usually (12%) clean the lint filter before drying clothes.

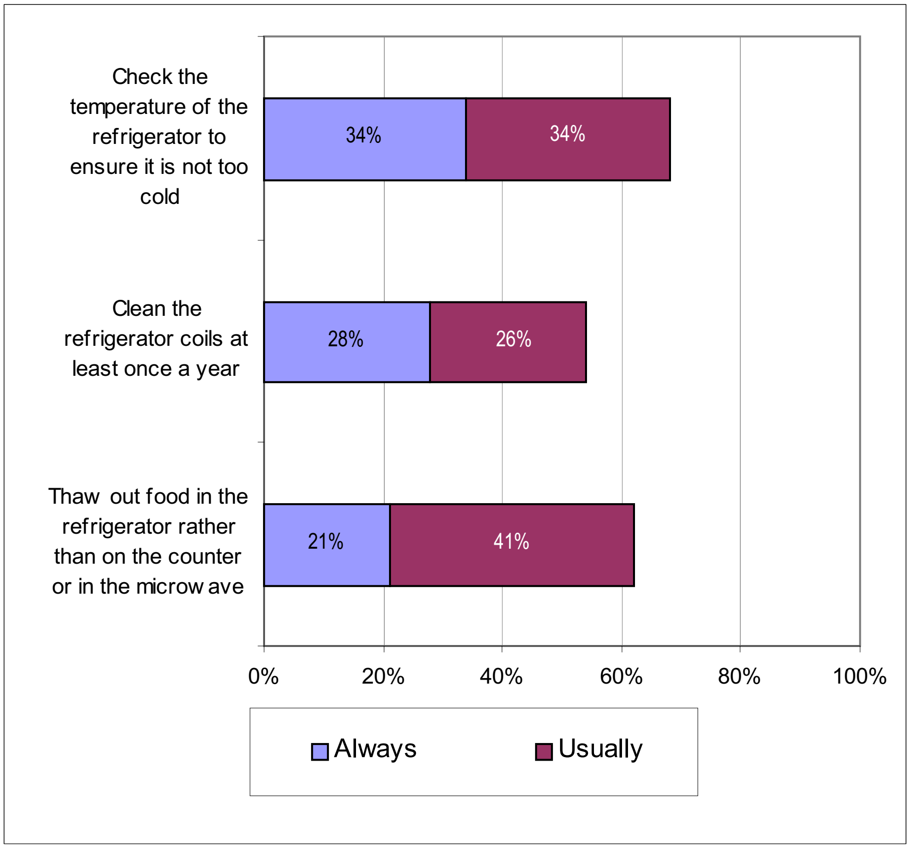
Ninety-three percent always (55%) or usually (38%) do laundry with full loads.

48. Lighting Habits and Practices



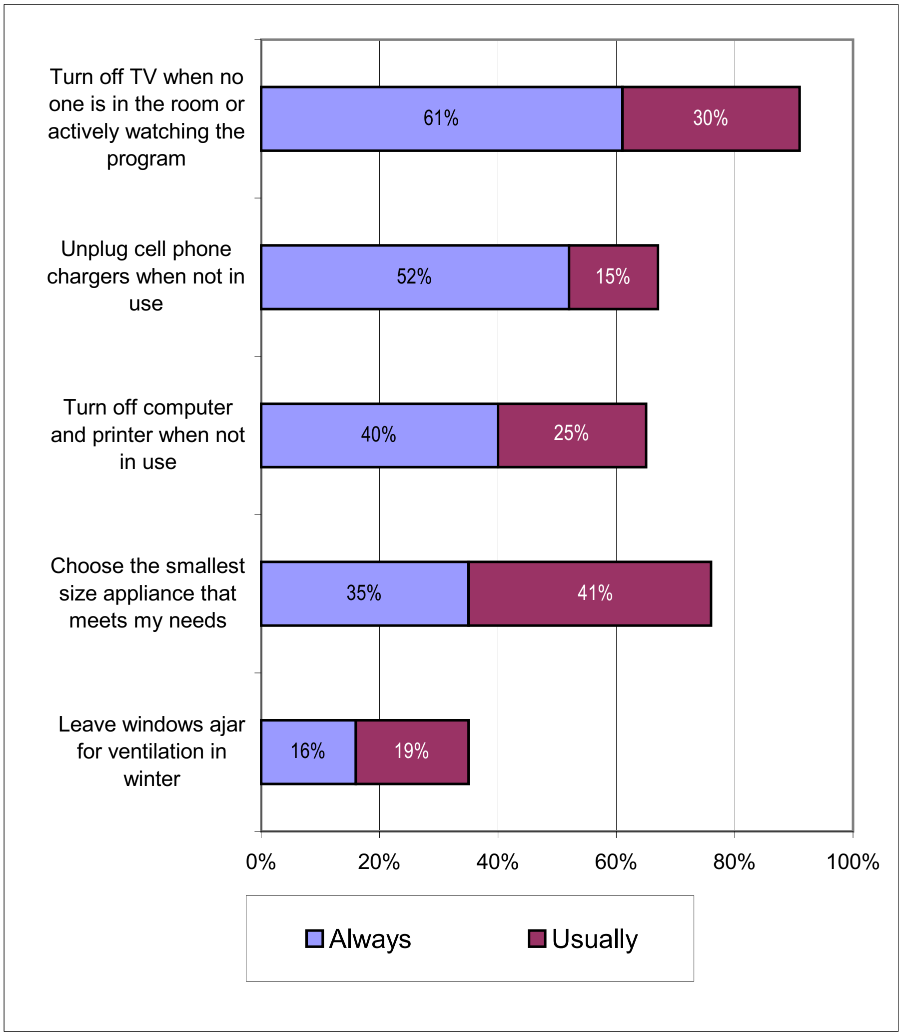
Ninety-eight percent always (71%) or usually (27%) turn off lights when no one is around.

49. Refrigeration Habits and Practices



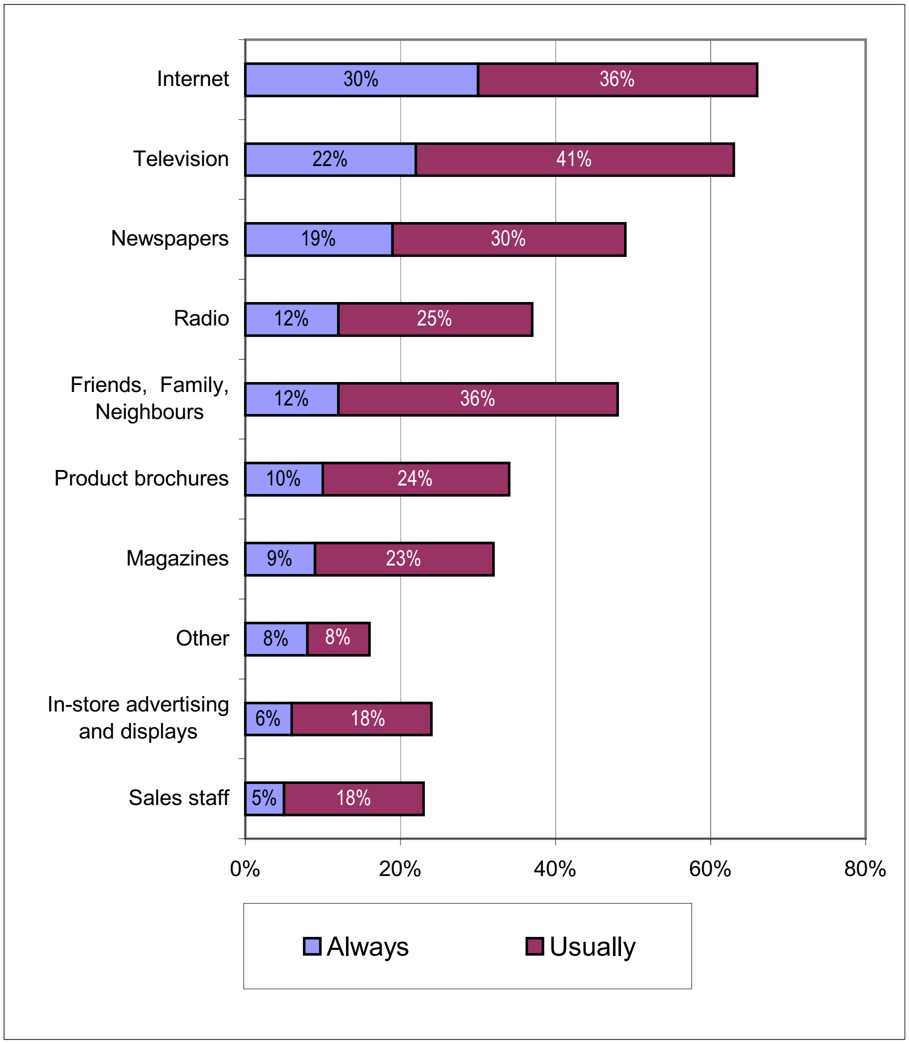
Sixty-four percent always (34%) or usually (34%) check the temperature of the refrigerator to make sure it is not too cold.

50. Other Habits and Practices



Ninety-one percent always (61%) or usually (30%) turn off the TV when no one is in the room or actively watching the program.

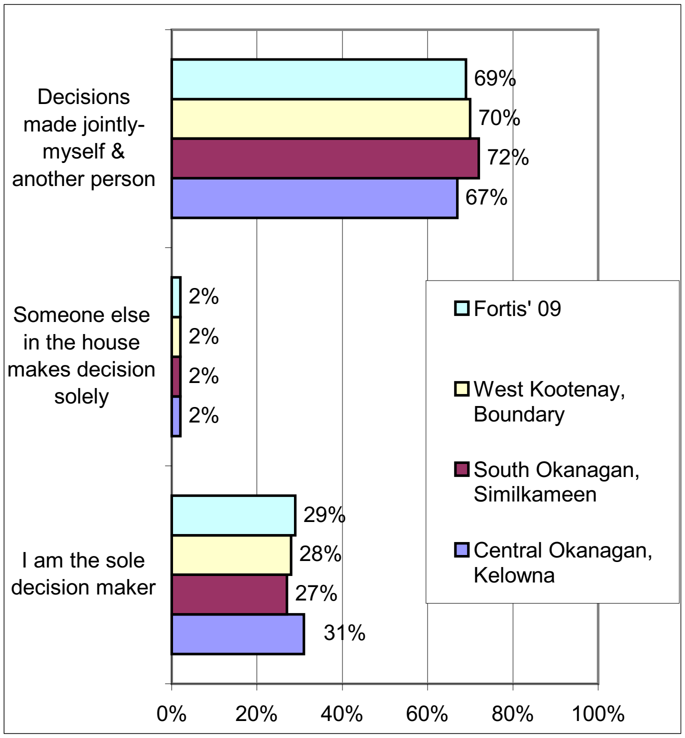
51. Information Sources



Respondents were asked where they obtain information regarding new products and services. Sixty-six percent always (30%) or usually (36%) get information from the Internet and 63% get information from TV.

K. About your Household

52a. Thinking about major appliance purchase decisions in your household, what is your role in the decision making processes?



When making major appliance purchase decisions, 69% make decisions with another person's input.

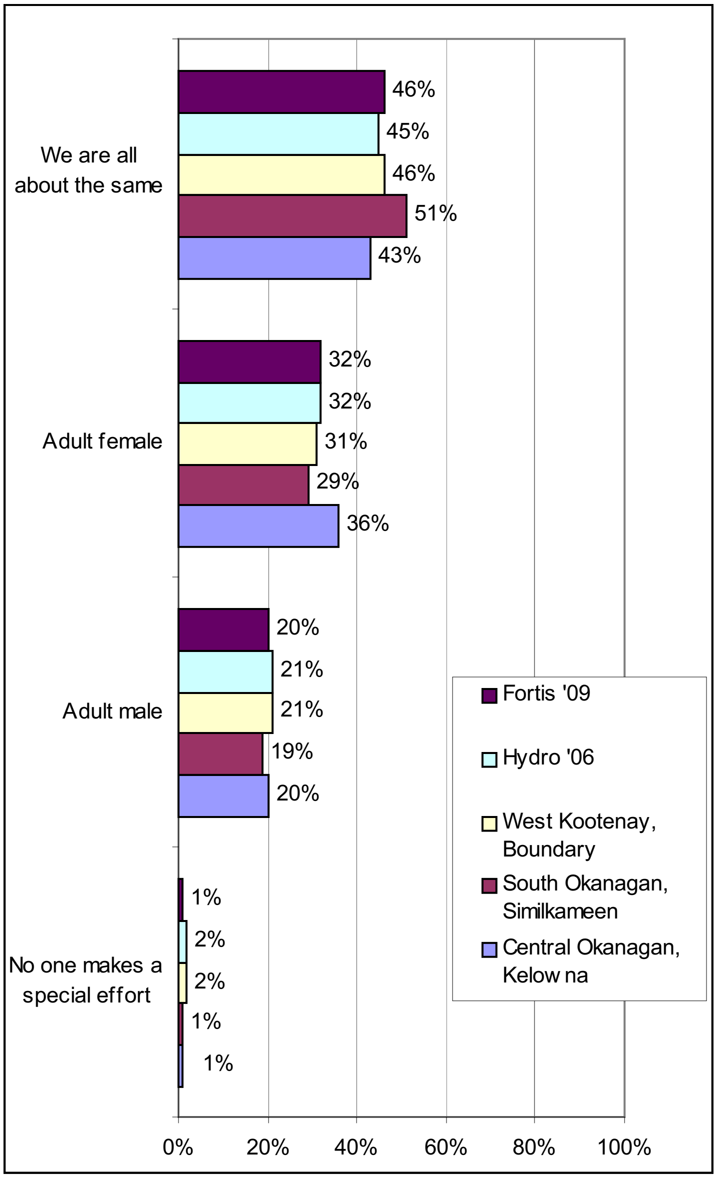
		Type of dwelling			
		Single detached	Duplex, Row, Townhouse	Apartment, Condo	Mobile, Other
"Thinking about major appliance purchase decisions in your household, please indicate your role in the decision making process"	"I am the sole decision maker"	21%	41%	47%	44%
	"Someone else in the house makes decision solely"	2%	2%	3%	5%
	"Decisions made jointly- myself & another person"	77%	57%	50%	51%
Total	Base	1322	204	240	155

Seventy-seven percent of respondents living in Single detached households will make decisions jointly when making major appliance purchases.

			Region		
		Total	Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
Gender of decision maker for major appliance purchases	Female	21%	24%	19%	19%
	Male	10%	9%	10%	11%
	Jointly - Female and someone else in home	33%	32%	34%	32%
	Jointly - Male and someone else in home	37%	35%	37%	38%
Total	Base	1976	781	576	610

Females are the sole decision maker for major appliance purchase in 21% of homes and males are the sole decision maker in 10% of homes. The majority of appliance purchase decisions are made jointly between 2 or more people in the household.

52b. Thinking about making efforts to conserve electricity in your household, please indicate your role in the decision making process:



In 46% of households, all members conserve energy about the same amount.

Adult Females are slightly more likely (32%) to conserve electricity than Male adults (20%).

53. Your age is:

			Region		
		Total	Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"Age"	"18-24 yrs"	2%	3%	1%	1%
	"25-34 yrs"	7%	11%	3%	7%
	"35-44 yrs"	11%	13%	6%	13%
	"45-54 yrs"	19%	18%	16%	23%
	"55-64 yrs"	27%	24%	32%	27%
	"65+ yrs"	34%	31%	42%	29%
Total	Base	2015	795	587	620

The majority of the respondents (61%) were 55 years or older.

54. Gender

			Region		
		Total	Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"Gender"	"Female"	53%	56%	53%	51%
	"Male"	47%	44%	47%	49%
Total	Base	2006	796	581	614

The majority of the respondents (53%) were female.

55. Education

			Region		
		Total	Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"Education"	"Less than Grade 12"	9%	7%	11%	10%
	"High school diploma"	16%	14%	20%	15%
	"Some college, vocational or technical school"	21%	22%	19%	21%
	"College, vocational or technical school graduate"	22%	22%	19%	25%
	"Some university"	7%	7%	8%	6%
	"University, graduate degree"	24%	28%	20%	23%
	"Don't know, refused"	1%	1%	1%	1%
Total	Base	2009	795	586	617

Forty-six percent of respondents had a college (22%) or university (24%) degree.

56. Age of people living in household

		Total	Region		
			Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
Ages of people living in household on full time basis.	0-5 yrs	7%	9%	4%	8%
	6-12	8%	10%	4%	10%
	13-24	15%	17%	10%	16%
	25-64	67%	66%	62%	72%
	65+ yrs	38%	34%	48%	32%
Total	Base	1963	776	574	602

Column percentages may exceed 100% because multiple responses provided

The majority of households have people aged 25-64 years of age.

57. Main Language spoken in household.

		Total	Region		
			Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"What is the main language spoken in your household?"	"English"	98.0%	97.6%	97.8%	99.0%
	"German"	.7%	.7%	.9%	.3%
	"Other"	.6%	.7%	.4%	.6%
	"French"	.2%	.2%	.4%	
	"Chinese"	.1%	.2%	.2%	
	"Japanese"	.1%	.2%		
	"Dutch"	.1%	.2%		
	"Punjabi"	.1%		.4%	
Total	Base	2013	795	590	617

English is the main language spoken in 98% of households.

58. Total Household income before taxes

		Total	Region		
			Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"Please indicate the combined total income before taxes for your household in the last year"	"Under $20k"	8%	7%	9%	9%
	"$20k to $40k"	25%	21%	27%	27%
	"$40k to $60k"	23%	21%	27%	21%
	"$60k to $80k"	18%	18%	16%	20%
	"$80k to $120k"	17%	20%	15%	15%
	"$120k or over"	9%	12%	7%	7%
Total	Base	1739	693	494	546

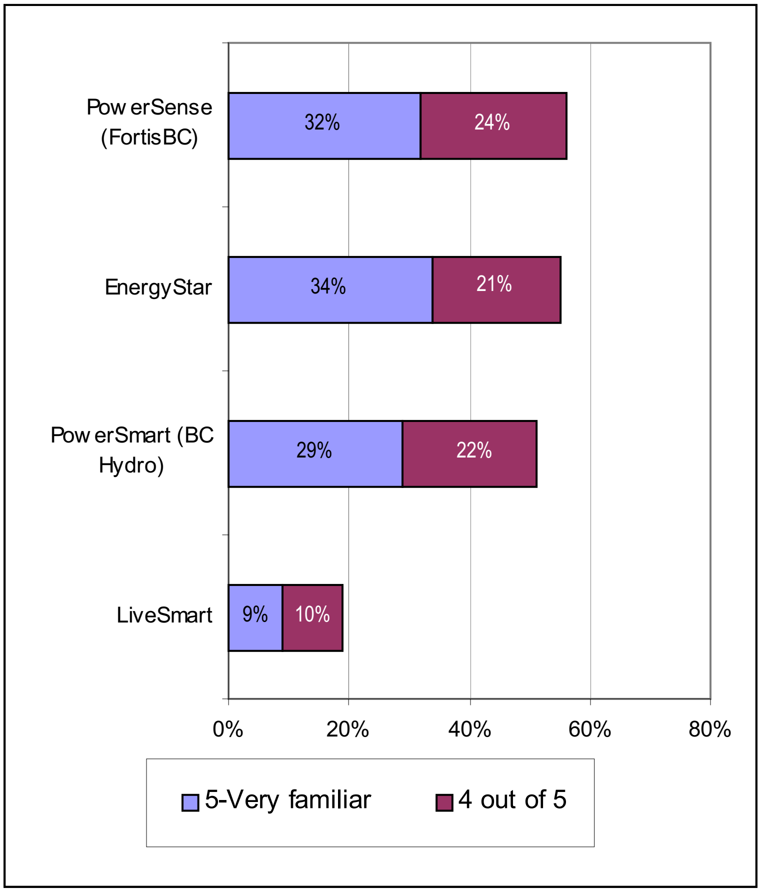
Household incomes are higher in the Central Okanagan than the other regions.

59. Is part of your home used as a full time or part time office?

		Total	Region		
			Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"Do you or anyone in your household use part of your home as a full-time or part-time office from which they conduct a business?"	"No"	79%	78%	79%	81%
	"Yes, full-time business"	5%	5%	4%	4%
	"Yes, part-time business"	16%	16%	16%	15%
Total	Base	2004	795	581	618

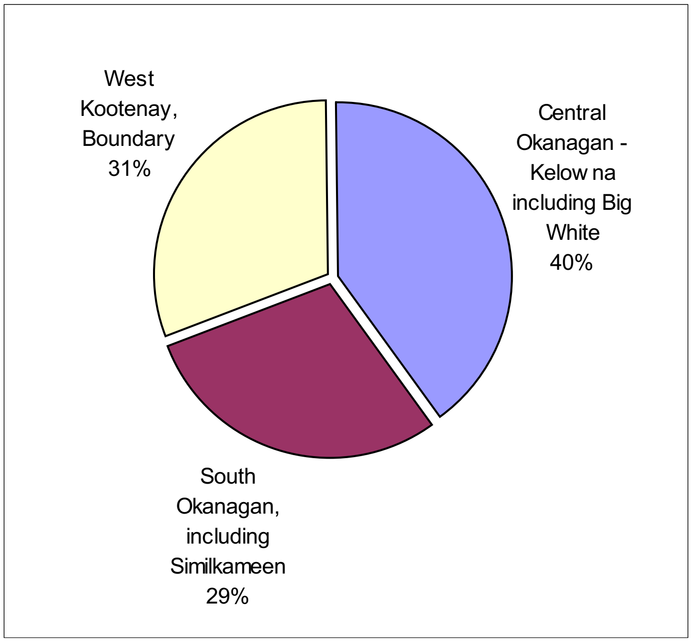
Twenty-one percent of homes are used as part of a business, 5% full time and 16% part time.

60. How familiar are you with the following trademarks?



Fifty-six percent are very (32%) or somewhat (24%) familiar with the PowerSense trademark. An equivalent percentage (55%) were familiar with the EnergyStar trademark.

61. Which region do you reside in?



Forty percent of the sample lived in the Central Okanagan; 31% in the West Kootenay/Boundary and 29% in the South Okanagan.

62. Are you a direct or indirect customer?

		Total	Region		
			Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"FortisBC provides electricity to customers directly and indirectly through city wholesalers; Local wholesalers supply electricity to some areas of Kelowna, Penticton, Summerland, Grand Forks and Nelson; Are you a direct or indirect customer?"	No response	1%	0%	1%	1%
	"Direct FortisBC customer"	82%	88%	76%	82%
	"Indirect FortisBC customer"	11%	7%	18%	11%
	"Don't know"	5%	5%	5%	7%
Total	Base	2049	805	591	630

The majority of the sample (82%) were direct FortisBC customers. Eleven percent of the sample were indirect customers and 5% did not know.

		Total
"Which wholesaler provides your electric service?"	"City of Penticton"	37%
	"City of Kelowna"	26%
	"Nelson Hydro"	25%
	"District of Summerland"	8%
	"City of Grand Forks"	4%
Total	Base	230

Base: Indirect customers only

Among the 230 indirect customers, 37% were City of Penticton customers, 26% were City of Kelowna customers; and 25% were Nelson Hydro customers.

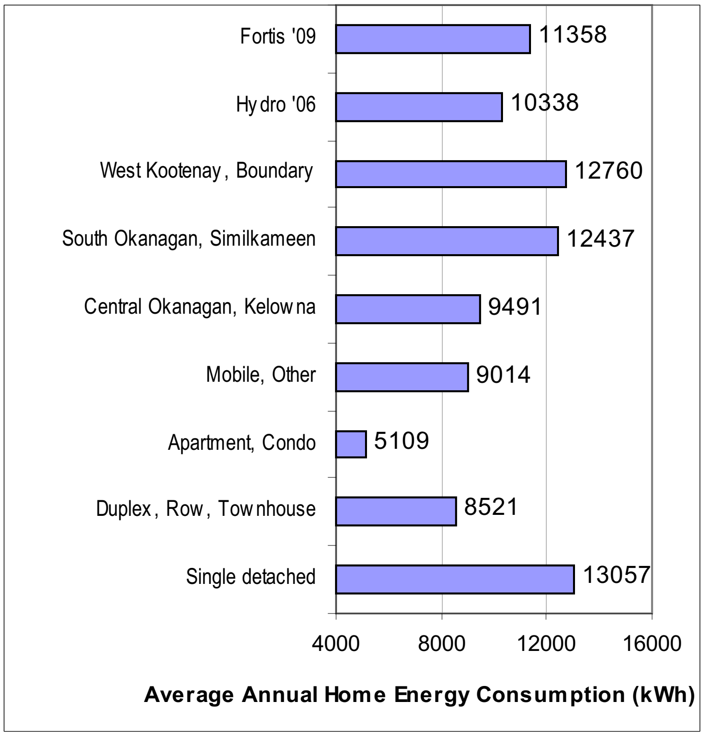
63. May we have your account number?

		Total
"FortisBC would like to access this information from your account history and link it to the responses you've given today, may we please have your permission for FortisBC to do this?"	No response	7%
	"Yes"	76%
	"No"	17%
Total	Base	2049

Seventy-six percent of respondents said it would be alright for FortisBC to use their account number. Sixty two percent actually provided an account number and 43% percent of the total sample (871 cases) provided a valid account number for which usage rates could be determined.

L. Home Energy Consumption

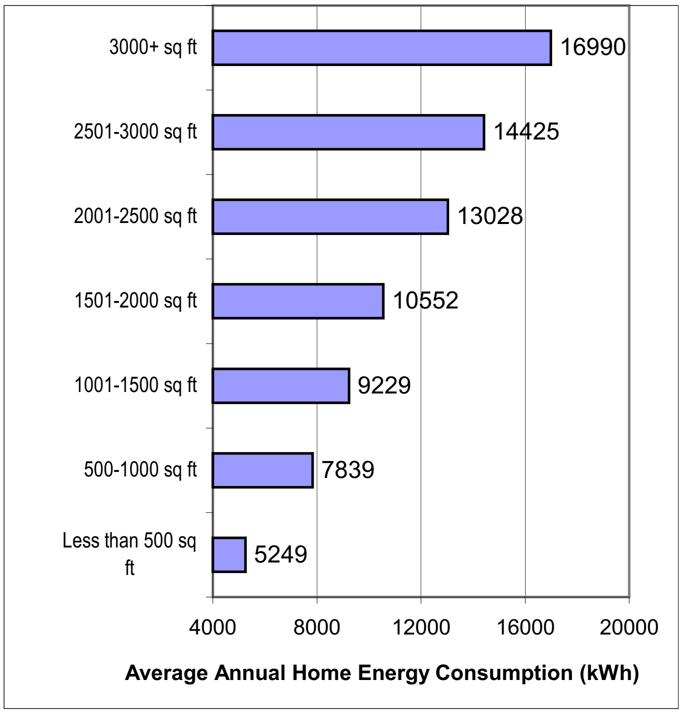
Energy consumption: Total, Region & Housing type



The average annual home energy consumption among FortisBC customers in the sample was 11358 kWh compared to Hydro customers at 10338 kWh. One possible explanation for this difference could be that the Hydro services areas in the Southern Interior with milder temperatures than Fortis.

Homes in West Kootenay/Boundary and the South Okanagan used more energy on average per year than homes in the Central Okanagan. This is most likely the result of a higher percentage of apartments and condos in the Central Okanagan. Single detached homes use the most energy at 13057kWh and apartments or condos use the least at 5109kWh.

Energy consumption: By size of Home



The average annual home energy consumption among homes larger than 3000 square feet was 16990 kWh compared to 5249 kWh for homes less than 500 square feet.

Appendix: Questionnaire

FORTISBC

2009 Commercial End-Use Study

Prepared For: **FortisBC**

Prepared By: **Discovery Research**

Date: **August 2009**

Table of Contents:

1. Background and objectives

FortisBC is an integrated electric utility in British Columbia. FortisBC electric utility business serves about 157,000 customers in more than 30 communities in south central BC. The customers are in two major categories:

Direct - FortisBC delivers power directly to 110,000 customers.
Indirect - FortisBC delivers power indirectly through municipal wholesaler utilities to 47,000 customers .

Research was undertaken to help FortisBC understand how commercial customers use energy in their businesses for the purposes of forecasting future electrical demand and also to design Demand Side Management and Marketing and Communications programs. Discovery Research was contracted by FortisBC to complete the study. The specific objectives of this study is to collect information about customers businesses, but most importantly, the characteristics and features of the buildings they occupy, as well as the different ways in which electricity and other fuels are used in the buildings. Area of interest include, but are not limited to:

- Business characteristics in the building such as ownership, primary business activities, etc.;
- Building characteristics and the features such as primary building type, age of building, size of building, floors, exterior wall construction, windows, number of occupants, etc.;
- Operating schedule;
- Space heating;
- Space cooling;
- Air distribution system;
- Indoor lighting;
- Outdoor lighting;
- Building Automation systems;
- Service Water Heating Equipment;
- Refrigeration Equipment;
- Cooking Equipment;
- Office and other Commercial Equipment;
- Process Equipment.

In addition to collecting the end-use information, the study also set out to solicit customer opinions, attitudes and behaviors related to electricity and conservation. This information will be beneficial for segmenting the commercial building/customer base as well as for further informing program development and communications strategies.

2. Methodology

Given the amount and detail of the information to be collected, the methodology utilized for this research was a self-administered mail survey coupled with an equivalent online version of the survey.

Mailed Survey:

On July 2, 2009 a total of 4000 surveys were mailed to a random sample of FortisBC customers. The total sample of 4000 consisted of 3000 Direct FortisBC customers and 1000 Indirect customers serviced through city wholesalers. The 3000 Direct customers were randomly selected from the entire FortisBC direct commercial customer base. The 1000 Indirect customers were randomly selected from the regions serviced by City wholesalers according to the below distribution:

Municipal Wholesaler	Total Customers	Ratio	Indirect sample
Kelowna	13770	29%	288
Penticton	16613	35%	347
Grand Forks	2105	4%	44
Summerland	5436	11%	114
Nelson Hydro	9885	21%	207
	47,809	100%	1000

Each potential respondent was mailed a survey package which included a survey with cover letter and a postage paid return envelope. Respondents were offered two ways to participate in this study:

- Complete the survey and return it in the postage paid envelope via regular mail
- Complete the survey on the Internet and submit it electronically

As an incentive for completion, respondents were entered into a draw for one of three $500 gift certificates to a home improvement retailer of their choice. Respondents were offered an additional entry into the prize draw as an added incentive to complete the survey on-line.

Emailed Survey:

On July 27, 4000 Direct FortisBC customers were randomly chosen from the database of customers that FortisBC has email addresses for. These 4000 email addresses were a mixture of residential and commercial customers who have chosen to receive their monthly bills via email. The customers were sent an email inviting them to participate in the survey and the email included a link to the online residential or commercial surveys.

Prior to emailing the survey invitations, it was not possible to determine how many of the 4000 email addresses were residential customers and how many were commercial customers. Based on response rates of the respective surveys, we will assume that 3840 email addresses were residential email addresses and 160 were commercial email addresses.

Response Rate

Mailed Survey

Although 4000 surveys were mailed, 98 were returned to FortisBC as undeliverable – in most cases, likely due to closed accounts and other changes since the time the billing information was last updated. Of the 3902 surveys that were effectively delivered, a total of 383 were returned: 275 via Canada Post and 92 via the Online version; yielding a response rate of **9.4%** for the Mail survey methodology.

Emailed Survey:

Of the 160 email invitations sent out, 16 completed online surveys were received back, giving a response rate of **10.0%** for the Email survey methodology.

Total Response Rate:

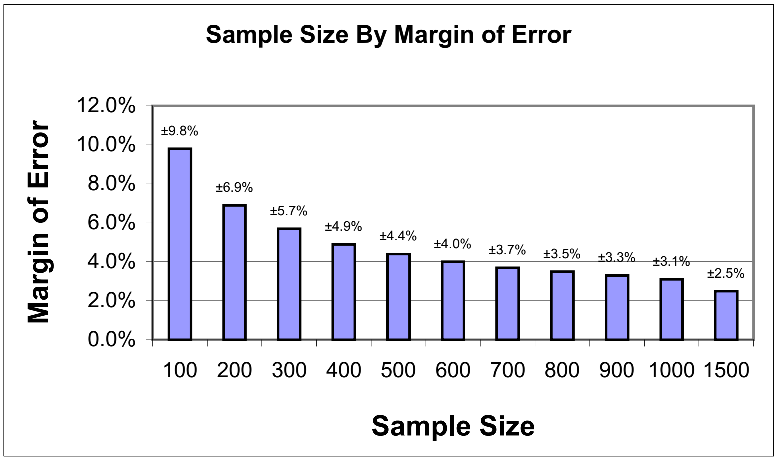
Of the 4062 Commercial Customers that were approached, 383 surveys were completed, giving a total response rate of **9.4%.**

Direct versus Indirect Commercial Customer Response Rate:

Of the 945 surveys that reached Indirect FortisBC commercial customers, 58 returned a completed survey, giving a response rate among Indirect customers of **6.1%**.

Of the 3117 surveys that reached Direct FortisBC commercial customers, 325 returned a completed survey, giving a response rate for Direct customers of **10.4%**.

Margin of error



This bar graph displays the margin of error associated with various sample sizes.

Statistics generated from sample size of 383 will be accurate within ±5.0%, at the 95% confidence interval (19 times out of 20).

Weighting the Data

The sample was weighted by region to ensure the collected sample matched the true composition of FortisBC's commercial customer base.

	Commercial Customer Population				**Unweighted Sample**		**Weighted Sample**	
	Direct	Indirect	Total	%	Total	%	Total	%
Central Okanagan (Kelowna) inlcud Big White	4102	1346	5448	**33.18%**	103	27.39%	125	**33.16%**
South Okanagan including Similakameen	4480	2011	6491	**39.53%**	110	29.26%	149	**39.52%**
West Kootenay/Boundary	2656	1824	4480	**27.29%**	163	43.35%	103	**27.32%**
Total	11238	5181	16419	**100.00%**	376	100.00%	377	**100.00%**

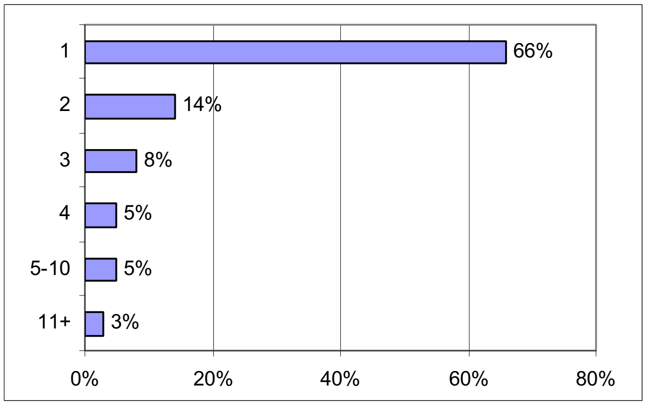
After applying the weights, the regional proportions in the weighted sample match the regional proportions in the Population of FortisBC Commercial Customers.

Comparison with BC Hydro 2006 Commercial End Use Survey (CEUS)

In 2006, BC Hydro completed a comprehensive mail survey (CEUS) with their commercial customers across BC. Throughout this report, comparisons are made with the response collected from 1946 BC Hydro commercial customers across BC. These BC Hydro customers will be referred to as "**Hydro '06**" in comparison graphs and tables. Please note that the Hydro survey results are collected from Hydro commercial customers across the entire province of BC and the Fortis results are from businesses in the Southern Interior of BC. Therefore interpret comparisons between these two surveys cautiously.

A. About the Building

1. How many buildings/structures are at this location?



The majority (66%) of locations have one building.

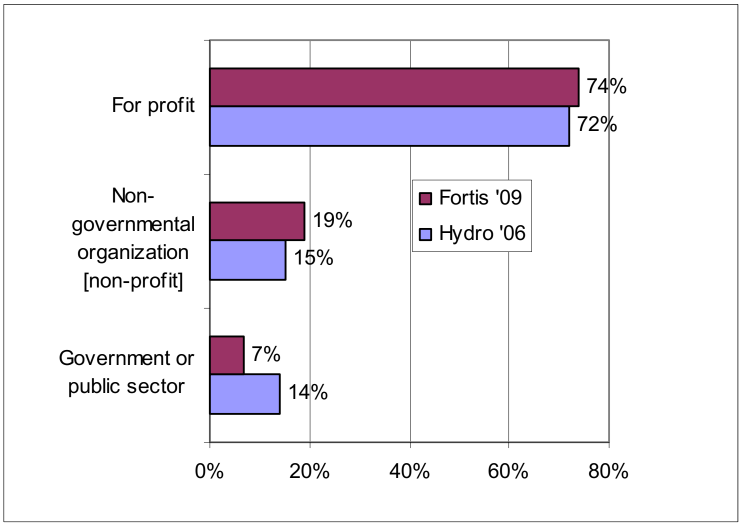
		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
"How many buildings, structures are at this location?"	"1"	56%	73%	61%	53%	72%	72%
	"2"	9%	11%	21%	24%	11%	11%
	"3"	8%	6%	7%	12%	5%	8%
	"4"	11%	2%	4%	10%		3%
	"5-10"	9%	5%	8%		5%	5%
	"11+"	8%	2%			7%	3%
Total	Base	43	80	67	48	38	91

Mixed use buildings and industrial/warehouse buildings are twice as likely to have two buildings at a location compared to other building types.

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"How many buildings, structures are at this location?"	"1"	71%	58%	71%
	"2"	13%	15%	15%
	"3"	3%	12%	5%
	"4"	4%	6%	4%
	"5-10"	6%	6%	2%
	"11+"	3%	3%	2%
Total	Base	121	146	101

Multiple buildings per location are found more frequently in the South Okanagan, Similkameen.

2. Which of the following best describes the ownership of the buildings/structures at this location?



The large majority of buildings are “for profit” enterprises (74%), whereas non-government/not for profit organizations own 19% of buildings and the government/public sector owns 7%.

2009 FortisBC commercial customers are less likely (7%) to be in buildings owned by the government/public sector than 2006 BC Hydro commercial customers (14%).

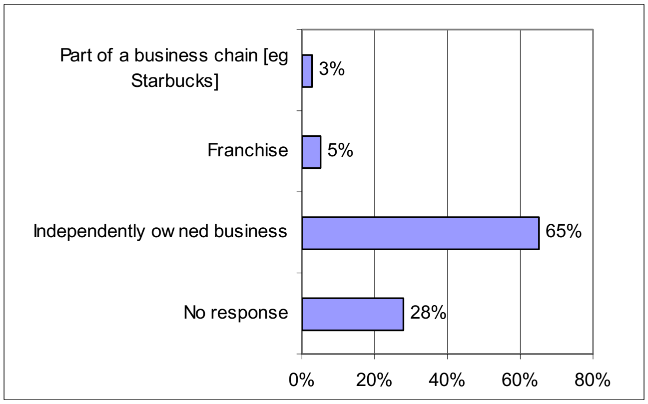
		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
“Which of the following best describes the ownership of the buildings, structures at this location?”	“Government or public sector”		8%	4%	5%	25%	3%
	“Non-governmental organization [non-profit]”	14%	57%	9%	6%	10%	7%
	“For profit”	86%	35%	88%	88%	65%	91%
Total	Base	42	81	67	48	38	91

As would be expected, the majority of buildings used for education/healthcare/public assembly purposes are either owned by government or non-government (non-profit) organizations (65%).

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
“Which of the following best describes the ownership of the buildings, structures at this location?”	“Government or public sector”	7%	7%	6%
	“Non-governmental organization [non-profit]”	8%	22%	27%
	“For profit”	85%	71%	67%
Total	Base	121	145	101

There is higher “for profit” ownership in the Central Okanagan (85%) than in South Okanagan (71%) and West Kootenay/ Boundary (67%).

2b. Which of the following best describes the building owner?



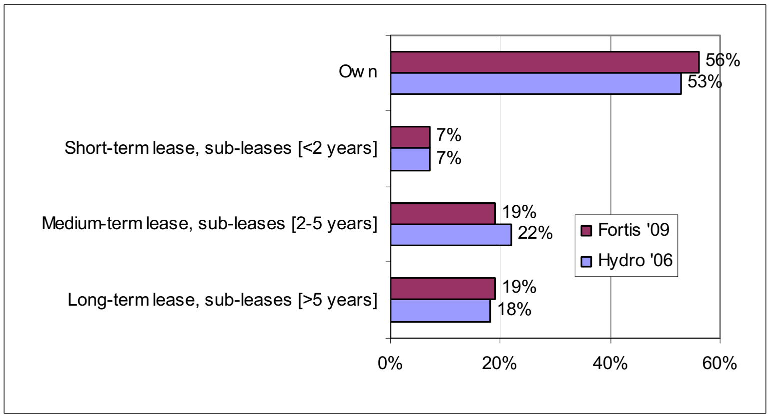
Two-thirds of buildings are owned by independent businesses.

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
“Which of the following best describes the building owner?”	No response	17%	31%	34%
	“Independently owned business”	73%	61%	61%
	“Franchise”	4%	6%	3%
	“Part of a business chain [eg Starbucks]”	6%	2%	2%
Total	Base	125	149	103

Base: Respondents who's building is used for profit

Buildings in the Central Region are much more likely to be owned by businesses compared to the South Okanagan and West Kootenay/ Boundary.

3. Do the majority of businesses within the buildings/structures at this location own or lease the space they occupy?



Most buildings are owned (56%); however, 38% indicated their buildings are on medium to longer term leases.

Building ownership was very similar between the 2009 FortisBC sample and the 2006 BC Hydro sample.

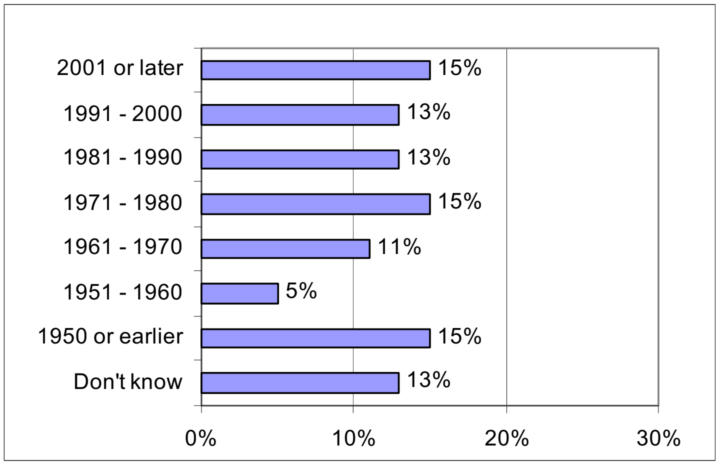
		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
"Do the majority of businesses within the buildings, structures at this location own or lease the space they occupy?"	"Own"	67%	64%	50%	68%	66%	39%
	"Short-term lease, sub-leases [<2 years]"	5%	5%	7%	9%	5%	8%
	"Medium-term lease, sub-leases [2-5 years]"	11%	14%	23%	11%	16%	27%
	"Long-term lease, sub-leases [>5 years]"	16%	17%	20%	11%	13%	25%
Total	Base	39	79	66	48	38	91

Retailers are less likely to own their premises than other business types (39%), followed by industrial warehousing facilities (50%). Over 65% of the other building types are owned.

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"Do the majority of businesses within the buildings, structures at this location own or lease the space they occupy?"	"Own"	35%	66%	67%
	"Short-term lease, sub-leases [<2 years]"	5%	8%	4%
	"Medium-term lease, sub-leases [2-5 years]"	30%	11%	16%
	"Long-term lease, sub-leases [>5 years]"	29%	14%	13%
Total	Base	120	143	96

Leasing is the predominant method in the Central Okanagan (65%) compared to the other two regions at 33%.

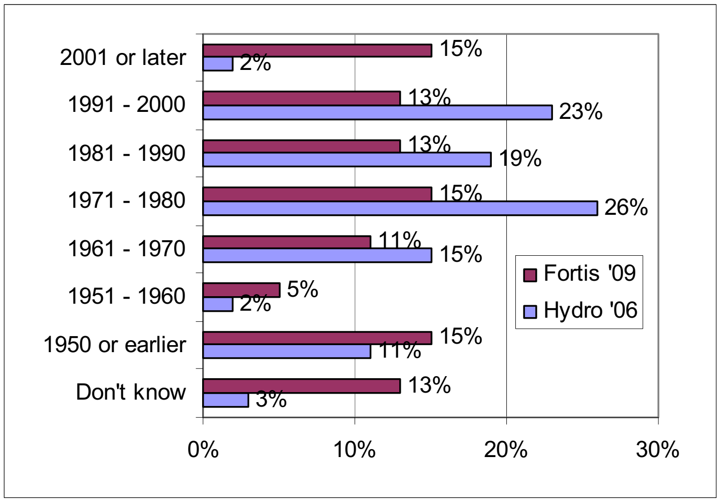
4. When was the building at this address built?



The majority of the buildings in the survey region (46%) were built before 1980.

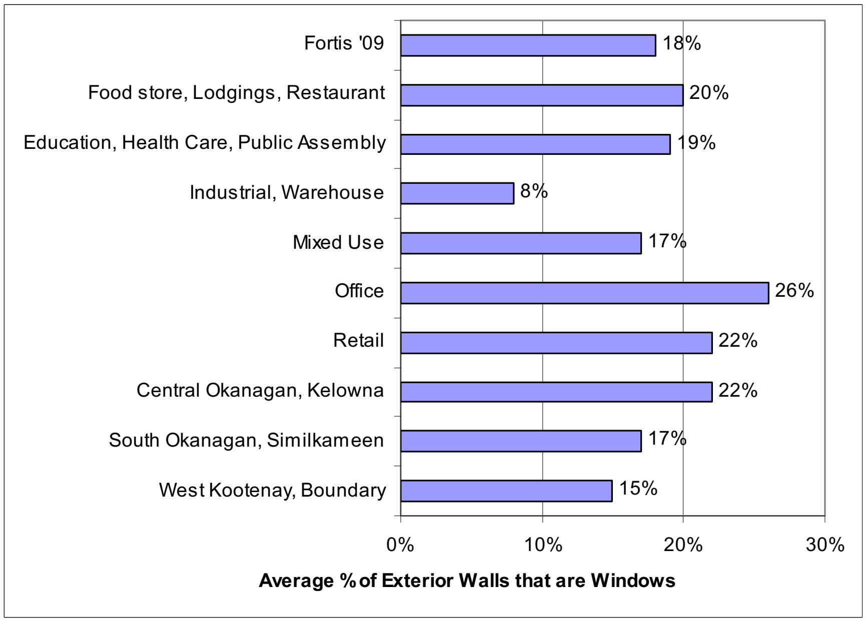
		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"When was the building at this address built?"	"2001 or later"	19%	15%	11%
	"1991 – 2000"	14%	12%	11%
	"1981 – 1990"	15%	10%	13%
	"1971 – 1980"	19%	16%	10%
	"1961 – 1970"	7%	11%	15%
	"1951 – 1960"	2%	6%	6%
	"1950 or earlier"	2%	18%	27%
	"Don't know"	22%	10%	8%
Total	Base	117	142	99

The buildings in the Central Region are significantly younger than those in the other two regions with those in the West Kootenay/ Boundary being the oldest.



The Fortis '09 and BC Hydro '06 results differ significantly with the Fortis survey indicating a younger building stock.

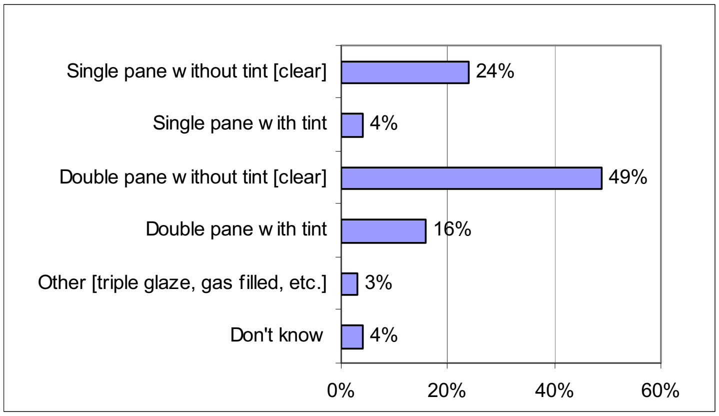
5. Approximately what percentage of the exterior walls of the building are windows?



Eighteen percent of the exterior walls of Fortis commercial customers are windows, with the smallest amount being found in the Industrial, Warehouse buildings (8%) and the highest in Offices (26%).

The newer buildings in the Central Okanagan have more window space than their older counterparts in both the South Okanagan or West Kootenay/ Boundary regions.

6. What is the main type of exterior window in the building?



Clear windows, whether double pane (49%) or single pane (24%), are most popular exterior window type.

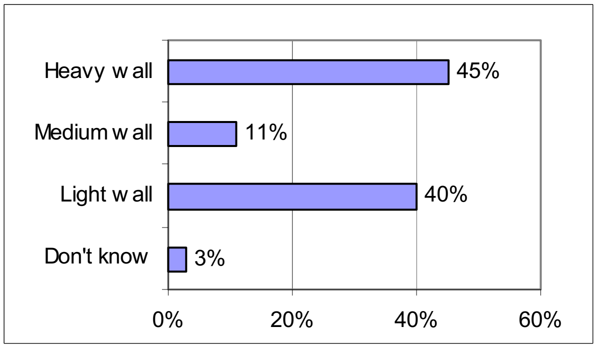
		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
"What is the main type of exterior window in the building?"	"Single pane without tint [clear]"	28%	19%	22%	21%	17%	31%
	"Single pane with tint"		7%	5%	5%	6%	3%
	"Double pane without tint [clear]"	53%	55%	53%	39%	56%	41%
	"Double pane with tint"	15%	20%	13%	18%	19%	13%
	"Other [triple glaze, gas filled, etc.]"	3%		2%	14%		2%
	"Don't know"	1%		5%	3%	2%	8%
Total	Base	42	77	53	46	38	89

The retail buildings are most likely to have single clear glass.

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"What is the main type of exterior window in the building?"	"Single pane without tint [clear]"	18%	28%	24%
	"Single pane with tint"	9%	2%	2%
	"Double pane without tint [clear]"	39%	53%	56%
	"Double pane with tint"	25%	13%	11%
	"Other [triple glaze, gas filled, etc.]"	2%	3%	5%
	"Don't know"	7%	1%	3%
Total	Base	116	134	96

The newer buildings in the Central Okanagan Region are most likely to have tinted double pane windows.

7. Which of the following best describes the exterior wall construction materials of the building?



Most wall construction material is either Heavy Wall (45%) or Light Wall (40%).

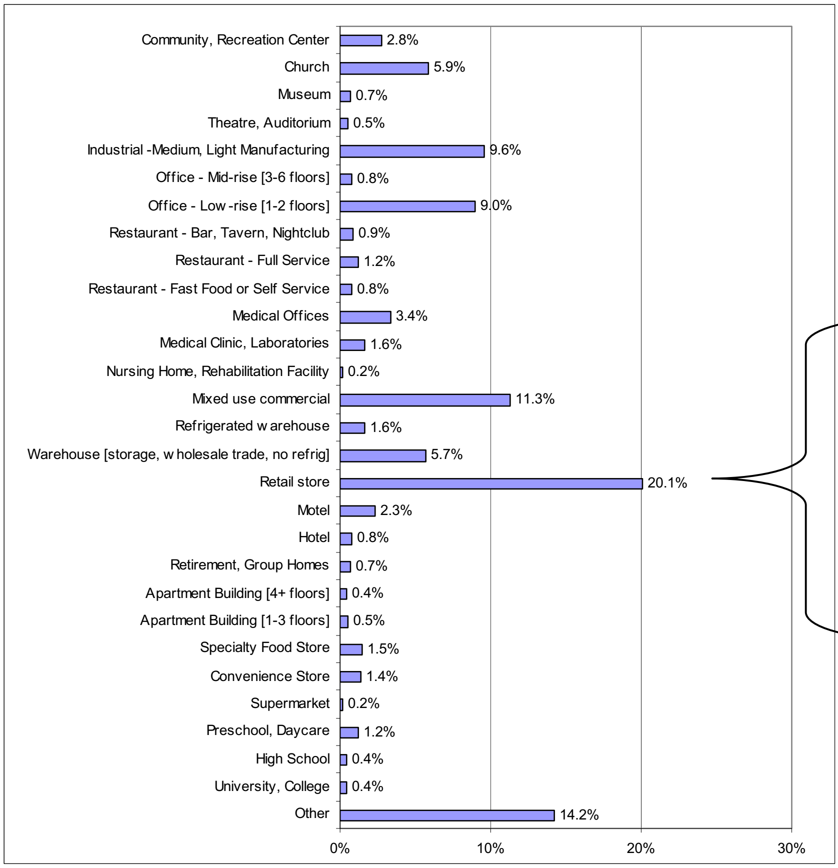
		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
"Which of the following best describes the exterior wall construction materials of the building?"	"Heavy wall [concrete block, concrete masonry]"	33%	44%	40%	30%	60%	61%
	"Medium wall [brick or stone veneer on a frame]"	15%	14%	6%	15%	13%	9%
	"Light wall [wood,shingle,aluminium panels,glass,steel]"	46%	39%	54%	55%	24%	25%
	"Don't know"	6%	3%			3%	4%
Total	Base	42	80	66	48	38	90

Heavy wall construction dominates the Office and Retail buildings whereas light wall construction is found more frequently in Industrial, Mixed Use and to a lower extent in Food Stores, Lodgings, and Restaurants.

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"Which of the following best describes the exterior wall construction materials of the building?"	"Heavy wall [concrete block, concrete masonry]"	62%	40%	35%
	"Medium wall [brick or stone veneer on a frame]"	14%	9%	12%
	"Light wall [wood,shingle,aluminium panels,glass,steel]"	21%	48%	51%
	"Don't know"	3%	3%	3%
Total	Base	121	143	101

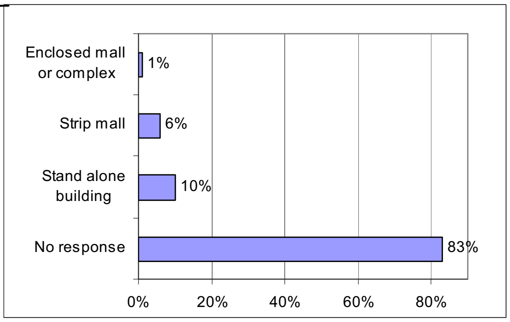
Heavy wall construction is most frequently found in the Central Okanagan (62%) followed by the Southern Region at 40% and the least used in West Kootenay (35%). Light wall construction shows the opposite pattern.

8. Primary type of business at this address.



The major uses for the buildings in the survey are: Retail - 20.1%; Mixed Use Commercial - 11.3%; Industrial Medium/Light Manufacturing - 9.6%; Offices - 9.0%

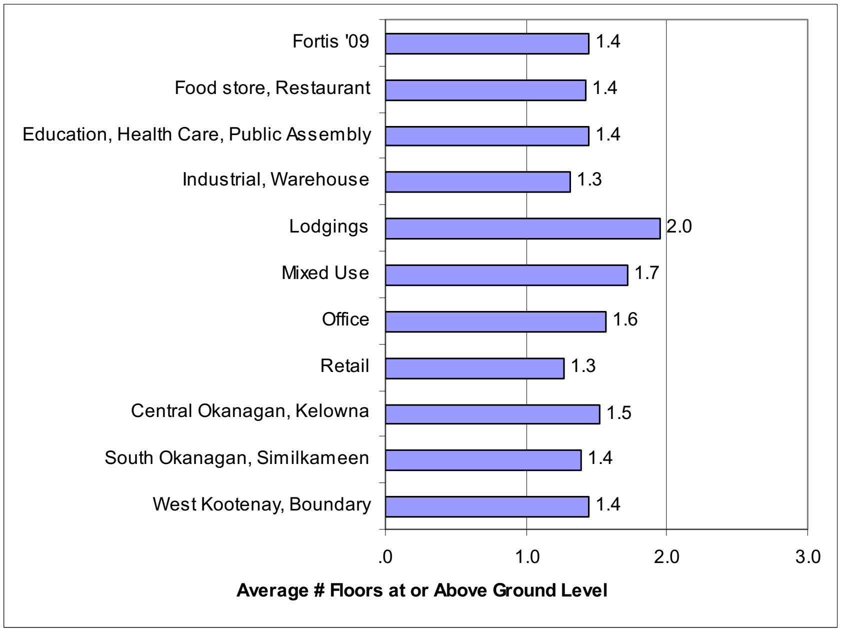
If Retail Store was selected:
Which of the following best describes the Building at this location?



Among the 14.2% that classified their business type as ‘other’, 10 respondents were auto repair/service businesses:

		Total
“Please check the one box that best describes the primary type of building at this address (other responses)”	Auto repair\service	10
	Power and\or water, club house	5
	Farm	4
	Government center\services	3
	Veterinary hospital	3
	Storage facility	2
	Caretaker residence	2
	GYM, fitness center	2
	Camp site, cabins	2
	Art gallery, paint studio	2
	Real estate - construction office	2
	Childrens summer camp	1
	Non-profit	1
	Home based sewing	1
	Flea market	1
	Heritage site	1
	Pump house	1
	Processing, dist. center, admin. For library system	1
	Funeral home and crematorium	1
	Truck crossing dock	1
	Hall for the Slocan Valley region and women's institute	1
	Picnic site kitchen, refreshment, bbq, storage	1
	Bowling center	1
	Welding shop	1
	Laundromat	1
	Airport hanger	1
Total	Base	53

9. How many floors (stories) does the building have at or above ground level?



Lodgings, Mixed Use buildings and Offices have the most above ground stories.

10a. How many floors (stories) does the building have below ground level?

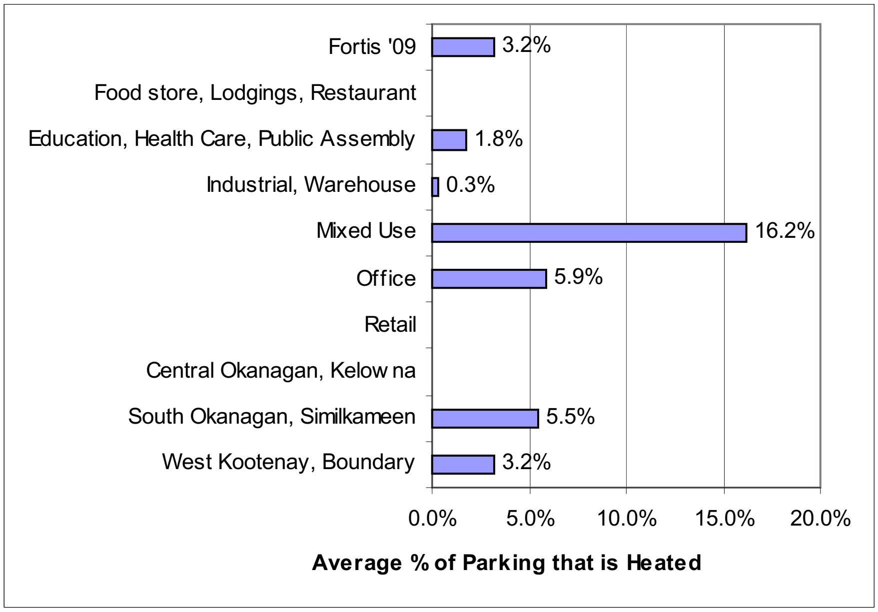
			Type of building					
		Total	Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
"How many floors (stories) does the building have below ground level (including parking levels)?"	"None"	77%	73%	68%	84%	75%	79%	80%
	"1"	23%	27%	30%	16%	24%	21%	20%
	"2"	0%		2%		1%		
Total	Base	369	43	79	66	46	38	93

Twenty-three percent of businesses have 1 floor below ground level.

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"How many floors (stories) does the building have below ground level (including parking levels)?"	"None"	86%	77%	63%
	"1"	13%	23%	36%
	"2"	1%		1%
Total	Base	121	143	99

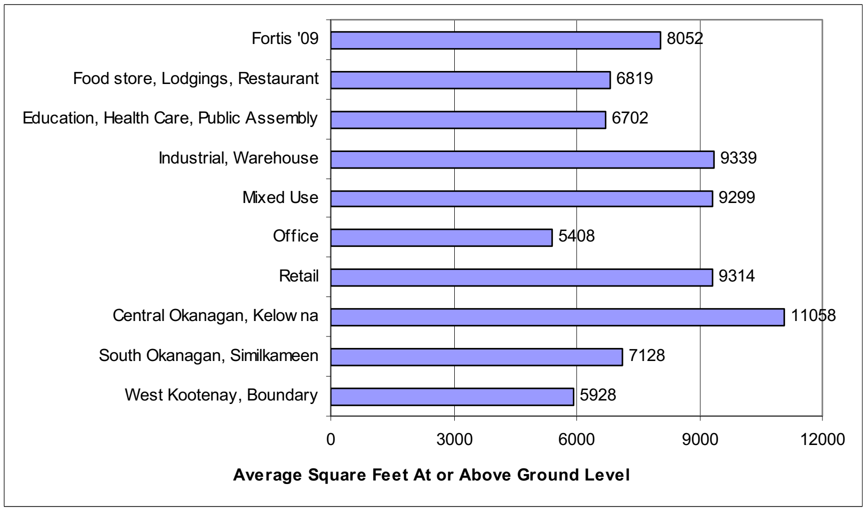
The Central Okanagan building stock is the least likely to have below ground floors (14%) compared to the Southern Region (23%) and West Kootenay/ Boundary (37%).

10b. What percentage of parking is heated?



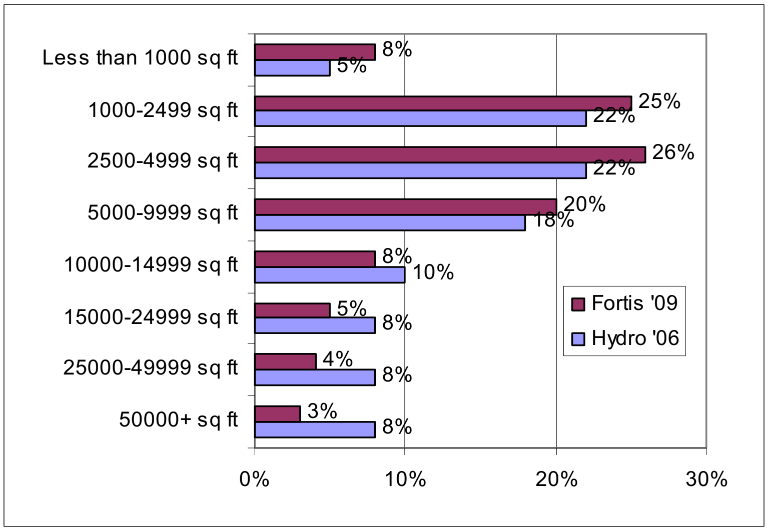
Mixed Use buildings are the most likely to have heated parking followed by Office buildings. All others are not likely to offer this amenity.

11. Please estimate the total (gross) square footage at or above ground level of the (largest) building at this location.



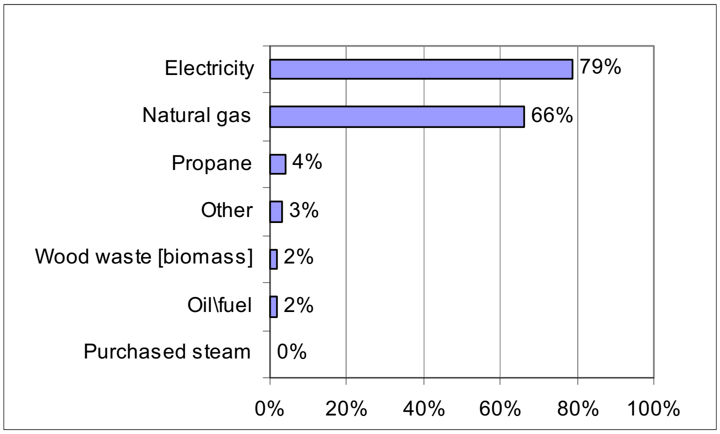
The total gross square footage of the largest building was 8052 square feet.
Mixed Use and Industrial Warehouse buildings were the largest and Offices the smallest.

Central Okanagan buildings are significantly larger than those in the two other regions.



The Fortis ’09 and BC Hydro ’06 results for building size have somewhat similar patterns, however the ’06 sample has 24% of the buildings at 15000 square feet or more compared to 12% of the 09’ sample.

12a. Which fuels provide energy for the building?



Electricity and natural gas in tandem provide the majority of energy for buildings in the sample.

		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
Which fuel provides enegy for the building?	Electricity	94%	71%	89%	81%	69%	74%
	Natural gas	38%	65%	62%	58%	79%	81%
	Propane	8%	3%	4%	3%	2%	3%
	Other	5%	3%	3%	4%		3%
	Wood waste [biomass]	3%		3%	7%		
	Oil\fuel		2%		1%		4%
	Purchased steam						1%
Total	Responses	59	113	100	70	49	142
	Base	40	79	62	46	33	86

Column percentages may exceed 100% because multiple responses provided

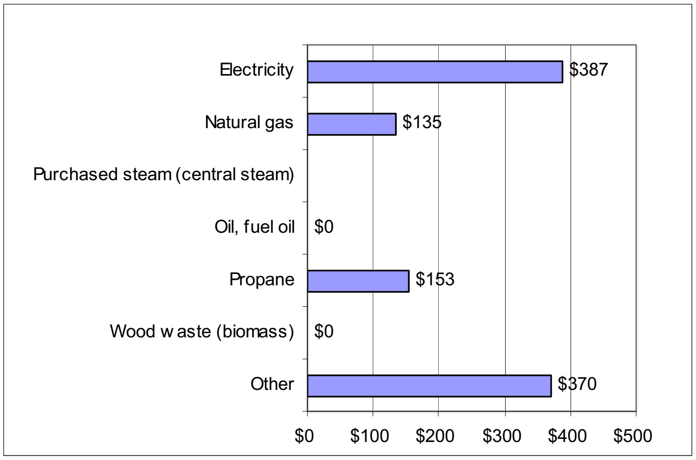
Food Stores and Restaurants are the most likely to use electricity whereas Offices and Retail rely on natural gas.

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
Which fuel provides enegy for the building?	Electricity	82%	80%	76%
	Natural gas	82%	63%	49%
	Propane	2%	5%	4%
	Other	2%	2%	5%
	Wood waste [biomass]	3%	1%	1%
	Oil\fuel		1%	5%
	Purchased steam			1%
Total	Responses	193	211	130
	Base	113	139	92

Column percentages may exceed 100% because multiple responses provided

Natural gas has the lowest penetration in the West Kootenay (49%) and highest in the Central Okanagan (82%).

12b. Provide an estimate of the average monthly fuel bill - Summer



In summer, electricity expenditures are almost triple those spent on natural gas.

Summer: Average monthly bill

			Type of building					
		Total	Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
Electricity	Mean $	$387	$577	$250	$464	$199	$183	$498
	Base	169	23	29	38	23	16	39
Natural gas	Mean $	$135	$369	$137	$98	$107	$108	$117
	Base	140	11	28	21	18	16	44
Propane	Mean $	$153	$127	$400	$250	.	.	$0
	Base	7	2	1	1	0	0	3
Other	Mean $	$370	.	$400		$478	.	.
	Base	3	0	1	0	2	0	0

Base: Respondents who have this fuel type in building and provided estimate of monthly bill

Food store, Lodgings and Restaurants have the highest average summer bill for electricity at $577/month.

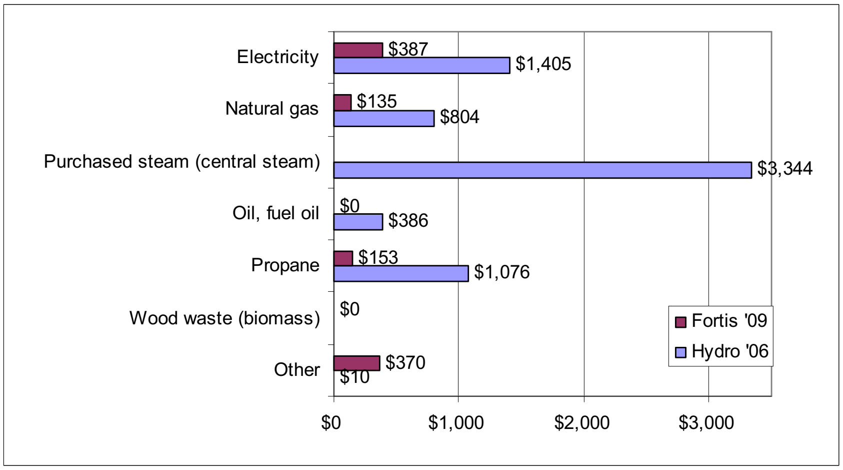
Summer: Average monthly bill

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
Electricity	Mean $	$531	$334	$261
	Base	62	62	45
Natural gas	Mean $	$130	$94	$215
	Base	59	50	30
Propane	Mean $	.	$130	$400
	Base	0	7	1
Other	Mean $	.	$700	$133
	Base	0	1	2

Base: Respondents who have this fuel type in building and provided estimate of monthly bill

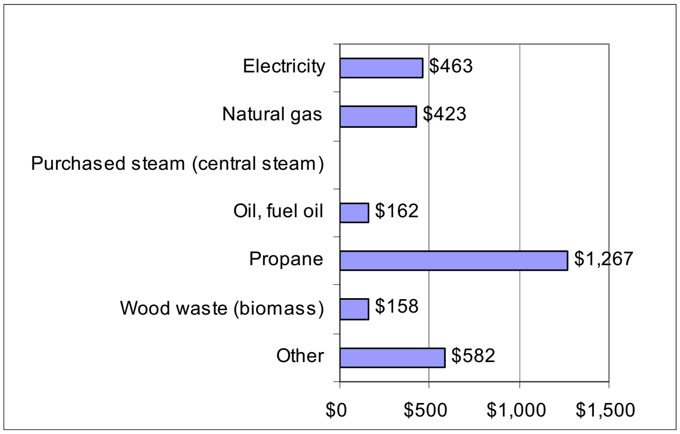
Commercial customers in the Central Region spend the most on electricity whereas West Kootenay/ Boundary customers spend the most on natural gas and propane.

Summer: Average Monthly Bill



Monthly fuel bill estimates in 2009 are significantly lower than for the 2006 Hydro survey.

12c. Provide an estimate of the average monthly fuel bill - Winter



Natural gas expenditures in the winter are almost the same as on electricity.

Winter: Average monthly bill

		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
Electricity	Mean $	$751	$358	$512	$294	$226	$532
	Base	21	27	35	23	15	40
Natural gas	Mean $	$800	$371	$303	$358	$321	$480
	Base	12	28	23	17	15	42
Purchased steam (central steam)	Mean $	.	.	.	.	.	.
	Base	0	0	0	0	0	0
Oil, fuel oil	Mean $	.	$93	.	.	.	$300
	Base	0	1	0	0	0	1
Propane	Mean $	$500	.	$2,100	$60	.	$1,310
	Base	1	0	1	1	0	3
Wood waste (biomass)	Mean $	$300	.	.	$0	.	.
	Base	1	0	0	1	0	0
Other	Mean $	.	.	$50	$750	.	.
	Base	0	0	1	2	0	0

Base: Respondents who have this fuel type in building and provided estimate of monthly bill

In winter, Food Stores and Restaurants spend the highest amounts on both electricity and natural gas of all building usage types.

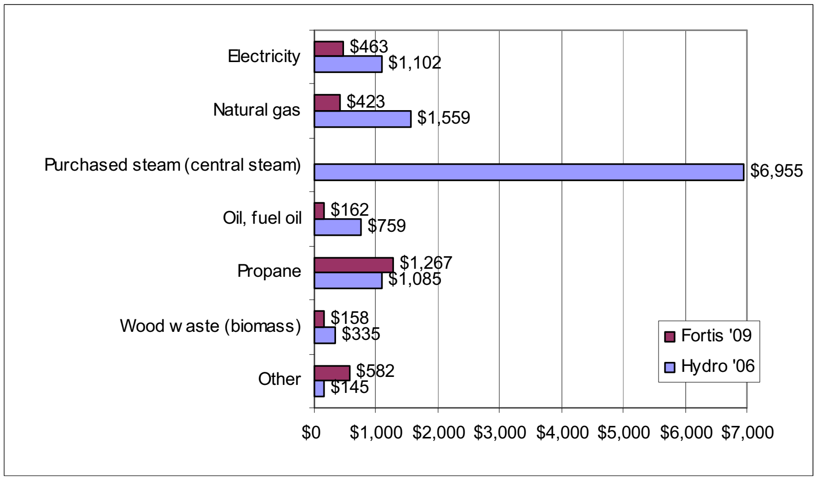
Winter: Average monthly bill

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
Electricity	Mean $	$634	$387	$341
	Base	57	61	43
Natural gas	Mean $	$483	$359	$424
	Base	56	53	30
Purchased steam (central steam)	Mean $	.	.	.
	Base	0	0	0
Oil, fuel oil	Mean $	.	.	$162
	Base	0	0	2
Propane	Mean $	.	$1,573	$280
	Base	0	4	1
Wood waste (biomass)	Mean $	$0	$300	.
	Base	1	1	0
Other	Mean $	.	$1,100	$25
	Base	0	1	1

Base: Respondents who have this fuel type in building and provided estimate of monthly bill

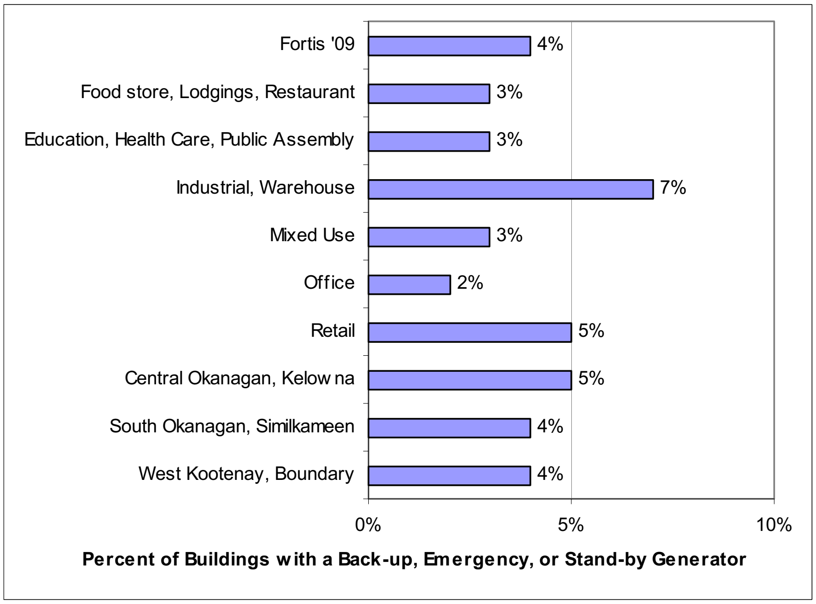
Central Okanagan business customers spend the highest amount on electricity in the winter but South Okanagan businesses spend high amounts on propane.

Winter: Average Monthly Bill



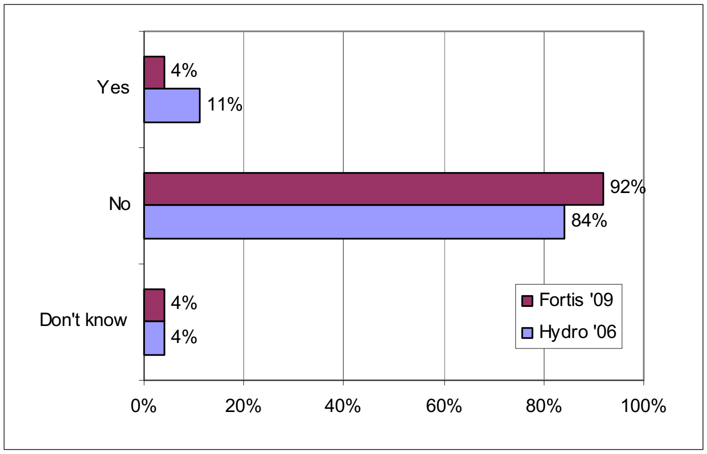
The Hydro '06 businesses had considerably higher winter bills for Electricity and Natural gas.

13. Does the building have a back-up, emergency, or stand-by generator?



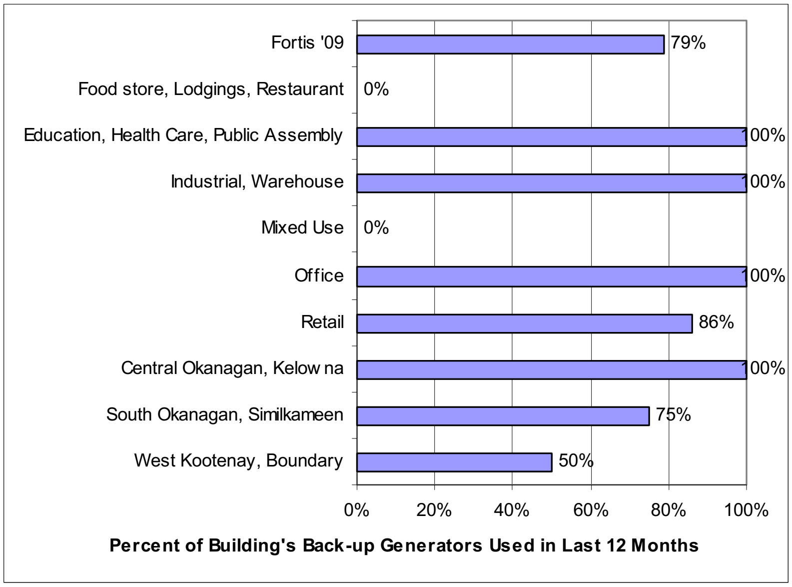
Only 4% of businesses have back-up generators for use in emergencies. The highest penetration being in the Industrial/Warehouse sector (7%).

Does the building have a back-up, emergency, or stand-by generator?

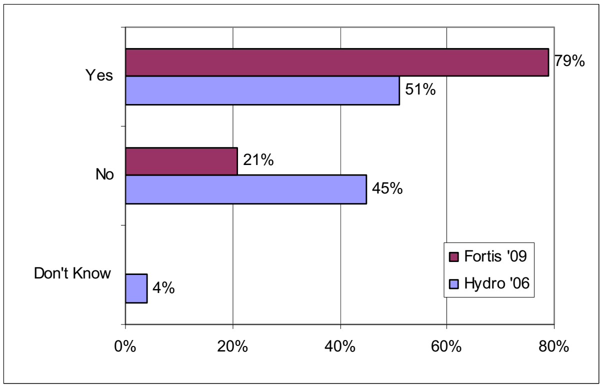


FortisBC commercial customers were less likely (4%) to have a back-up or stand by generator compared to Hydro customers (11%).

14a. Has the building's back-up generator been used in the last 12 months?



Among businesses with back-up generators, 79% had used their back up generator in the past 12 months.

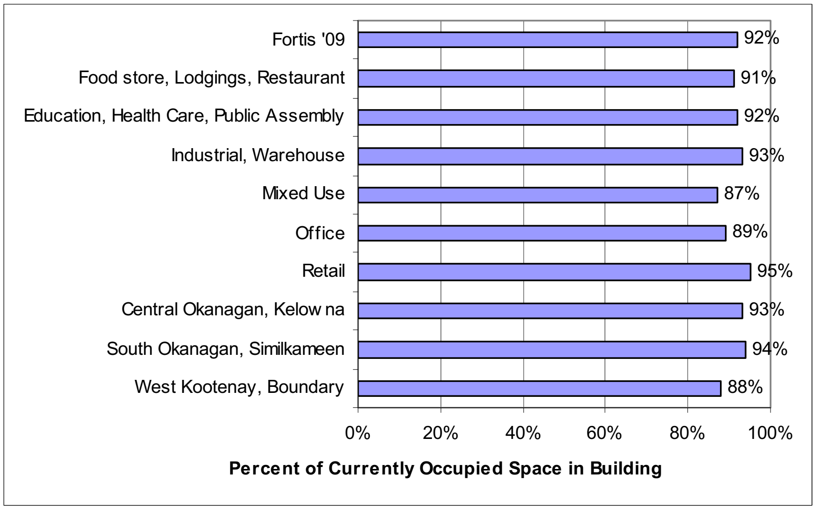


Seventy-nine percent indicated that their back-up generators had been used in the last 12 months compared to 51% in the BC Hydro 2006 survey.

14b. What is the capacity of the back-up generator?

Only 3 respondents were aware of the capacity of their back up generator. The average capacity for these 3 back up generators was 1141 kWh's.

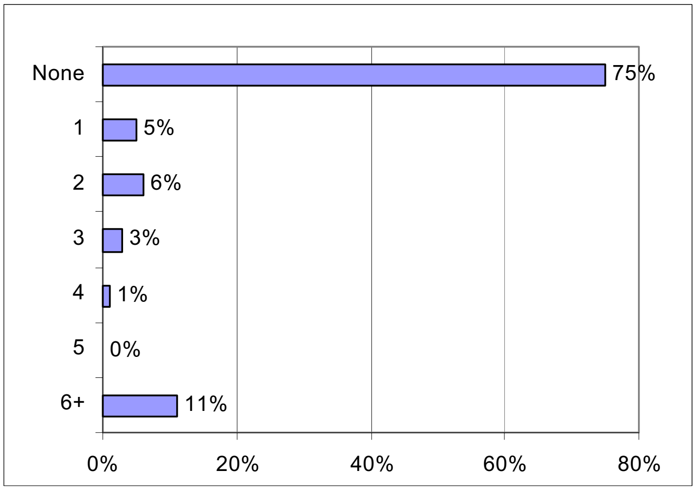
15. What percentage of the space in the building is currently occupied?



On average, 92% of space in the building is currently occupied.

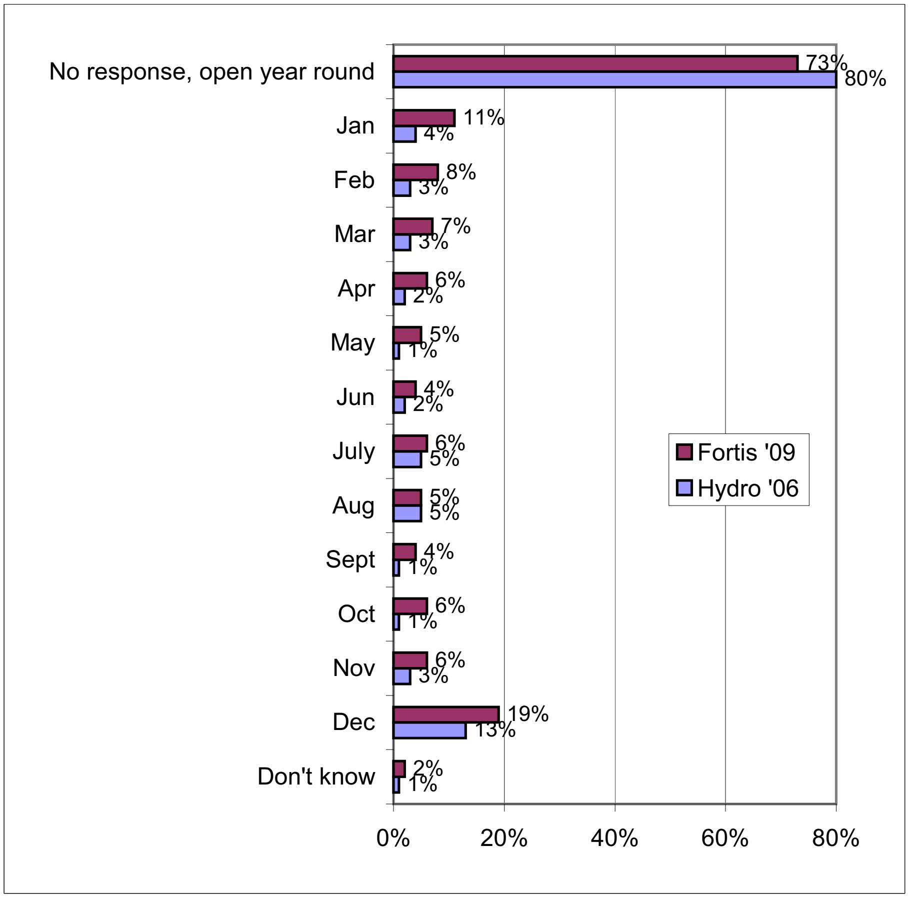
B. The Operating Schedule

16. How many weeks per year is the building closed?



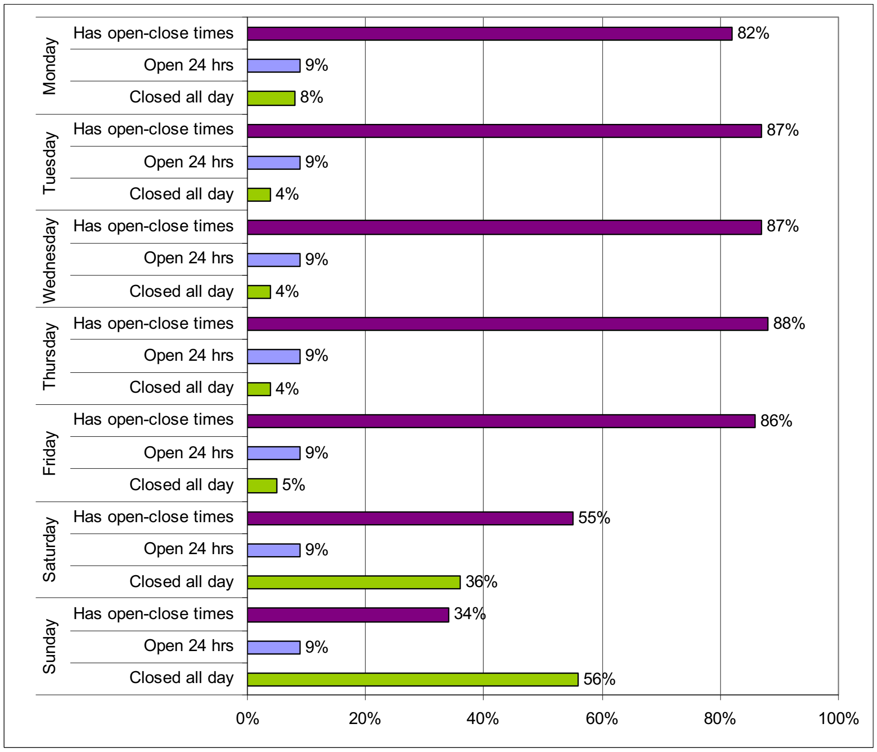
3/4 of the buildings reported in the survey do not close during the year. However, approximately 1/10 of buildings close for six weeks or more.

17. During which months is the building closed for a week or more?



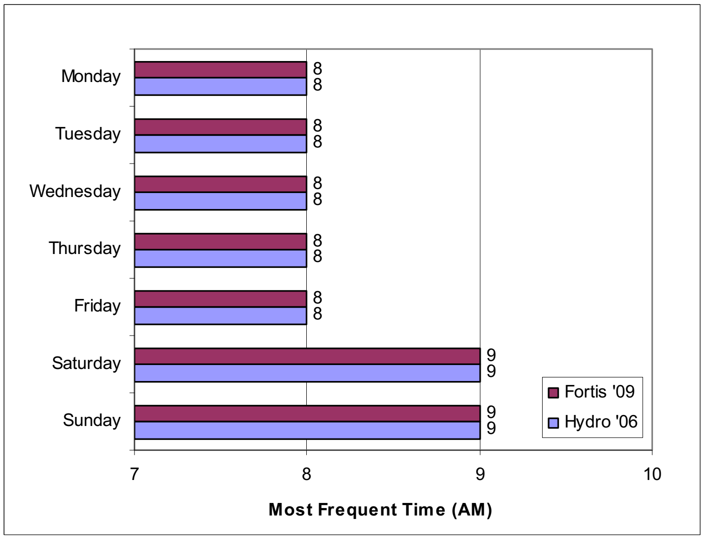
The winter months are the most likely for building closures.

18. Please identify the typical opening and closing times for the building at this location.



During weekdays over 80% of commercial buildings are open from 8am or 9am to 5pm. Nine percent of these buildings are open 24 hours. Sixty-four percent are open on Saturdays and 43% Sundays.

Opening Times



Most businesses open at 8am during the weekdays and 9am on the weekend.

Please identify typical OPENING times for the building at this location

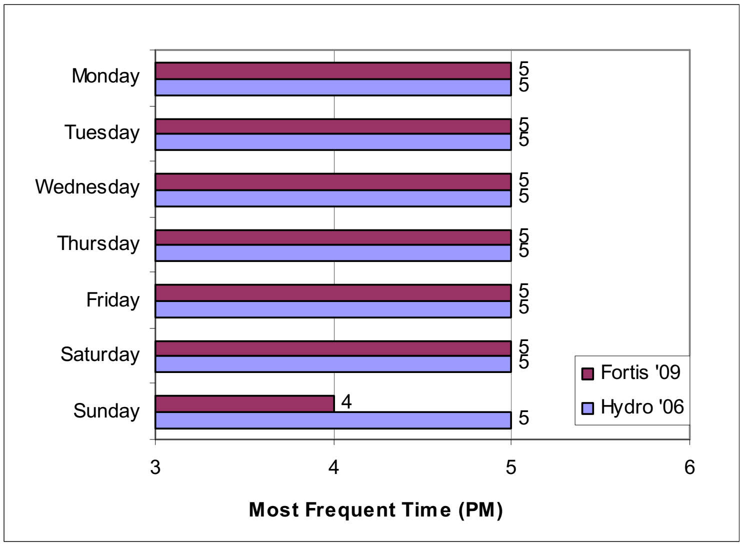
		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
Monday	Most frequent AM	8.00	8.00	7.00	8.00	8.00	9.00
	Base	25	55	53	32	36	82
Tuesday	Most frequent AM	8.00	8.00	7.00	9.00	8.00	9.00
	Base	26	65	54	32	36	85
Wednesday	Most frequent AM	8.00	8.00	7.00	9.00	8.00	9.00
	Base	26	63	53	34	36	86
Thursday	Most frequent AM	8.00	8.00	7.00	9.00	8.00	9.00
	Base	26	65	54	34	36	85
Friday	Most frequent AM	8.00	8.00	7.00	9.00	8.00	9.00
	Base	26	57	53	34	36	86
Saturday	Most frequent AM	9.00	9.00	8.00	9.00	9.00	9.00
	Base	24	32	19	21	13	70
Sunday	Most frequent AM	9.00	9.00	9.00	11.00	8.00	11.00
	Base	21	34	7	14	4	26

Base: Buildings with opening times on these days

On weekdays Industrial/ Warehouses open at 7am, Retail and Mixed Use at 9am, and all other buildings at 8am.

On weekends 9am is the norm for most buildings however 11am is the opening time for Mixed Use and Retailers.

Closing Time



Closing time is typically 5pm on most days except for Sunday when most common closing time is 4pm.

Please identify typical CLOSING times for the building at this location

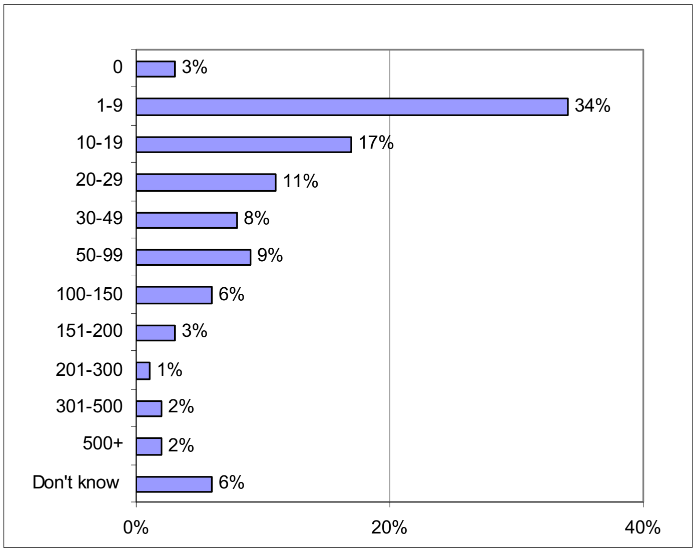
		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
Monday	Most frequent PM	9.00	5.00	5.00	5.00	5.00	5.00
	Base	25	55	53	31	36	80
Tuesday	Most frequent PM	9.00	5.00	5.00	5.00	5.00	5.00
	Base	26	65	54	30	36	85
Wednesday	Most frequent PM	9.00	5.00	5.00	5.00	5.00	5.00
	Base	26	63	53	32	36	86
Thursday	Most frequent PM	9.00	5.00	5.00	5.00	5.00	5.00
	Base	26	65	54	32	36	85
Friday	Most frequent PM	9.00	5.00	5.00	5.00	5.00	5.00
	Base	26	57	53	32	36	86
Saturday	Most frequent PM	9.00	4.00	5.00	5.00	4.00	5.00
	Base	24	32	19	21	13	70
Sunday	Most frequent PM	9.00	2.00	4.00	4.00	4.00	5.00
	Base	21	34	7	14	4	26

Base: Buildings with CLOSING times on these days

Food Stores / Lodging / Restaurants stay open until 9pm everyday.

Other buildings close at 5pm on weekdays and earlier on Sundays, except for Retail which closes at 5pm everyday.

19a. On a typical weekday, what is the average number of people present in the building during the day?

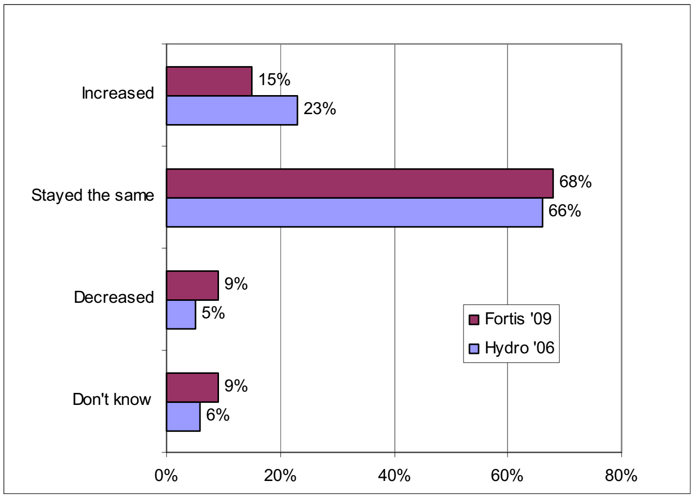


The majority (54%) of buildings have less than 20 people in the buildings at any one time. Fourteen percent have more than 100.

		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
"On a typical weekday, what is the average number of people (i.e. employees, customers, students, visitors, patients) present in the building during the day?"	"0"		5%	7%		2%	1%
	"1-9"	16%	22%	53%	51%	43%	26%
	"10-19"	21%	15%	19%	10%	13%	18%
	"20-29"	6%	20%	8%	7%	8%	13%
	"30-49"	8%	12%	6%		7%	12%
	"50-99"	16%	9%	3%	10%	6%	9%
	"100-150"	9%	5%		19%	10%	1%
	"151-200"	3%	8%			4%	2%
	"201-300"	4%					1%
	"301-500"	1%	2%			2%	3%
	"500+"	10%					2%
	"Don't know"	6%	2%	4%	4%	6%	10%
Total	Base	44	79	65	45	38	93

The largest number of people present at any one time occurs in the Food Store / Lodging / Restaurant sector.

19b. During the past 12 months, has the average number of occupants:



Eighty-three percent of respondents indicated that the number of occupants in their building had either remained the same or increased during the last 12 months.

		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
"During the past 12 months, has this average number of occupants"	"Increased"	6%	16%	13%	18%	18%	15%
	"Stayed the same"	62%	61%	79%	66%	62%	73%
	"Decreased"	9%	11%	8%	11%	13%	5%
	"Don't know"	23%	11%		6%	6%	8%
Total	Base	42	79	63	46	38	89

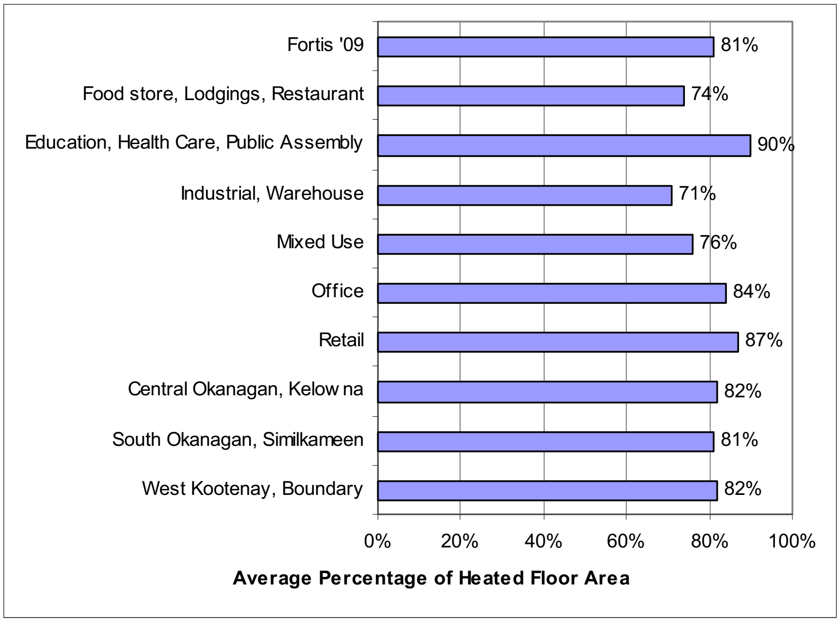
The Food Store / Lodging / Restaurant sector was the only one to indicate a net decrease in occupancy.

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"During the past 12 months, has this average number of occupants"	"Increased"	10%	18%	15%
	"Stayed the same"	69%	68%	67%
	"Decreased"	12%	4%	11%
	"Don't know"	8%	10%	7%
Total	Base	117	142	98

The Central Region respondents had noted a slight net decrease in occupancy (-2%), whereas increases in both South Okanagan (+14%) and West Kootenay (+4%) were reported.

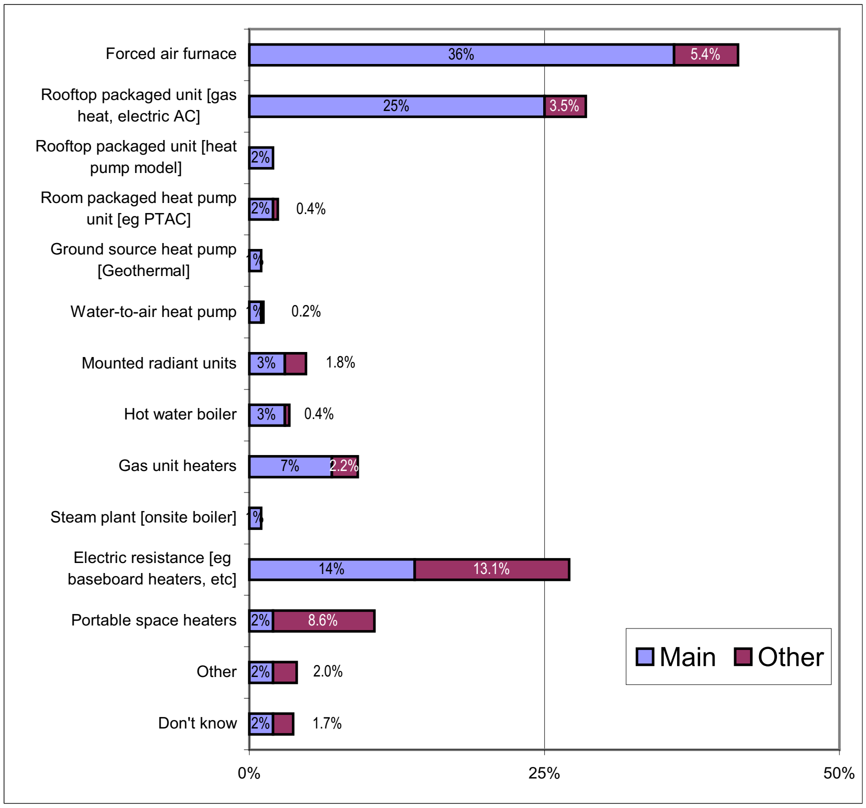
C. Space Heating

20. What percentage of the enclosed floor area in the building is heated?



Over 80% the enclosed floor areas is heated with Industrial / Warehouse buildings being the lowest (71%) and Education / Health Care / Public Assembly, the highest (90%).

21. Please indicate the main type of heating system used to heat the building. If more than one heating system, please indicate other systems.



Forced air furnaces are the primary source of building heat for over 1/3 of the buildings reported by the survey respondents.

Rooftop packaged units are next for 1/4 of the buildings, followed by electric resistance units. Electric resistant units are the main secondary supply with 13% of the buildings using this heat source.

MAIN type of heating system

		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
"Please indicate the main type of heating system used to heat the building"	"Forced air furnace"	26%	50%	26%	24%	44%	35%
	"Rooftop packaged unit [gas heat, electric AC]"	22%	18%	17%	30%	33%	33%
	"Rooftop packaged unit [heat pump model]"	2%	4%	2%		4%	1%
	"Room packaged heat pump unit [eg PTAC]"	11%	2%				1%
	"Ground source heat pump [Geothermal]"	2%	2%		3%		1%
	"Water-to-air heat pump"			2%		4%	
	"Mounted radiant units"			9%	8%		3%
	"Hot water boiler"		3%	1%	3%	4%	4%
	"Gas unit heaters"	3%	1%	11%	8%		12%
	"Steam plant [onsite boiler]"		2%	2%		2%	
	"Electric resistance [eg baseboard heaters, etc]"	33%	9%	24%	23%	8%	3%
	"Portable space heaters"		4%	1%		2%	1%
	"Other"	2%	3%	3%			4%
	"Don't know"		3%		1%		3%
Total	Base	35	76	56	42	32	83

1/2 of Education / Health Care and Public Assembly type buildings use forced air furnaces followed by Office buildings at 44% and Retail at 35%.

1/3 of Food Stores / Lodging / Restaurants are most likely to use electric resistance heaters followed by Educational / Warehouse (24%) and Mixed Use buildings (23%).

1/3 of Mixed Use, Office, and Retail have rooftop packaged units for heat.

MAIN type of heating system

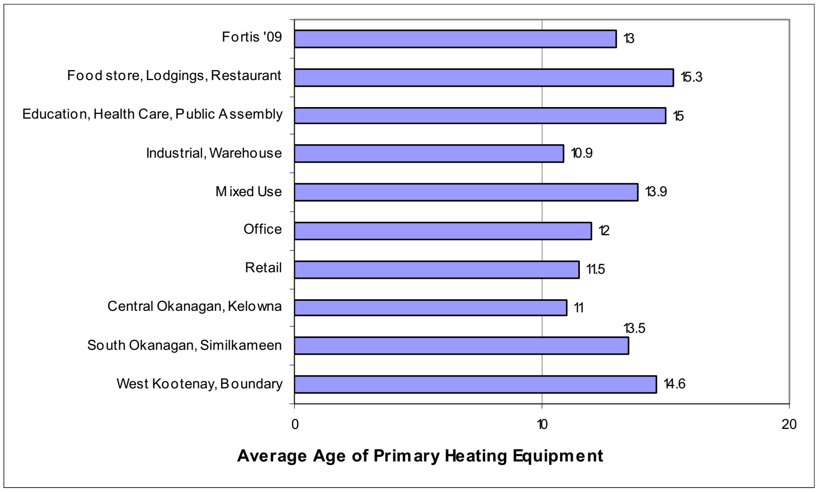
		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"Please indicate the main type of heating system used to heat the building"	"Forced air furnace"	33%	41%	31%
	"Rooftop packaged unit [gas heat, electric AC]"	39%	20%	16%
	"Rooftop packaged unit [heat pump model]"	2%	2%	1%
	"Room packaged heat pump unit [eg PTAC]"	2%	1%	2%
	"Ground source heat pump [Geothermal]"		1%	3%
	"Water-to-air heat pump"		1%	1%
	"Mounted radiant units"	5%	4%	1%
	"Hot water boiler"		2%	6%
	"Gas unit heaters"	8%	7%	4%
	"Steam plant [onsite boiler]"		2%	1%
	"Electric resistance [eg baseboard heaters, etc]"	8%	13%	24%
	"Portable space heaters"		1%	4%
	"Other"	2%	2%	3%
	"Don't know"	1%	2%	1%
Total	Base	107	128	90

In the Central Region 2/5 of buildings have rooftop packaged units as their heat source (39%) followed by 1/3 of buildings using forced air.

Forced air furnaces is the most popular for 2/5 of properties in the South Okanagan, followed by 1/5 using rooftop packaged units and just over 1/8 using electric resistance units.

Almost 1/3 of buildings in the West Kootenay Region use forced air furnaces, followed by 1/4 using electric resistance units and 1/6 using rooftop packaged units.

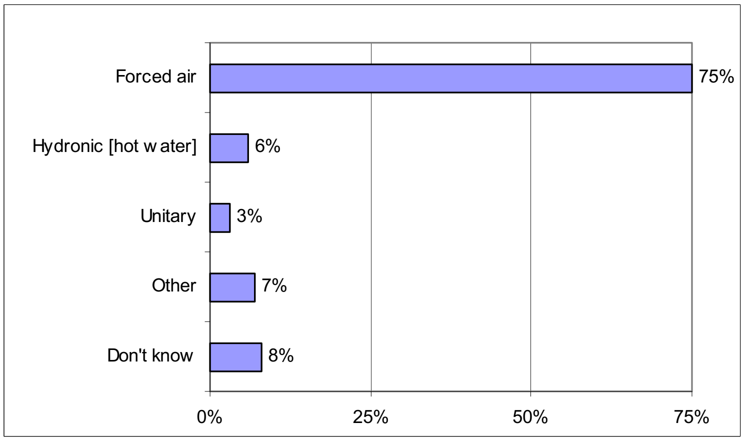
22. What is the age of the primary heating equipment?



Most heating units are in the 13 year old range with the youngest (11 years old) in Industrial, Warehouse premises and Retail.

The oldest heating units (15+ years) are in Food Store / Lodging / Restaurant and Education / Health Care / Public Assembly.

23. What is the main type of heating distribution system?

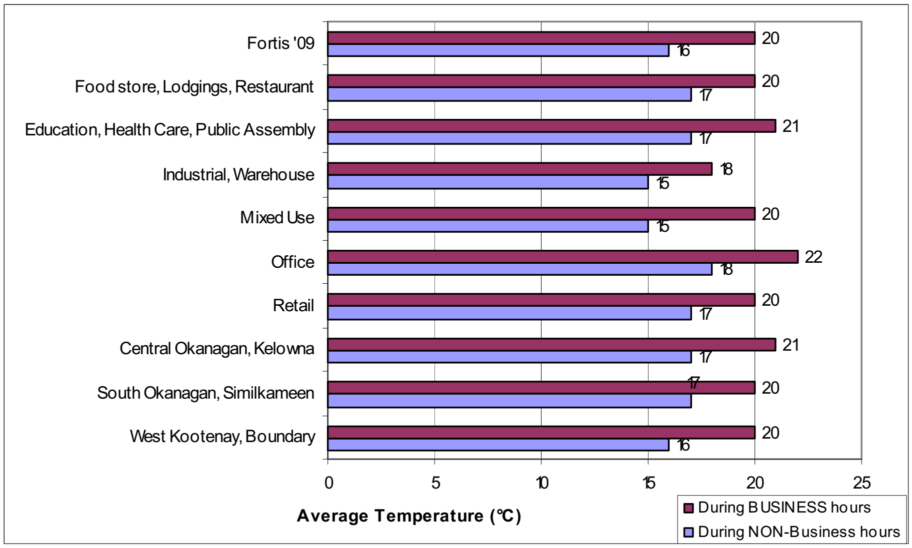


Forced air is the heat distribution system used by the vast majority (over 3/4) of buildings.

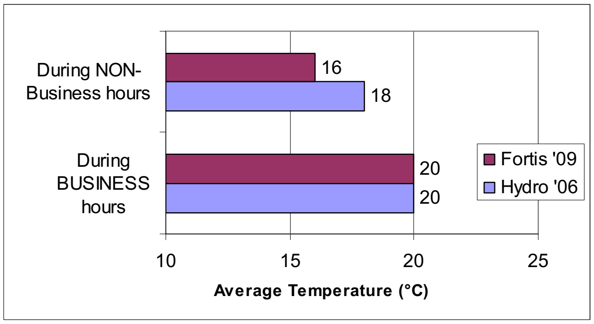
		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
"What is the main type of heating distribution system?"	"Forced air"	59%	82%	66%	64%	92%	80%
	"Hydronic [hot water]"	4%	8%	6%	6%	6%	6%
	"Unitary"	9%		6%	9%		1%
	"Other"	17%	7%	11%	10%		4%
	"Don't know"	11%	3%	11%	12%	2%	10%
Total	Base	34	74	52	41	32	82

Ninety-two percent of Office buildings use forced air distribution systems.

24. What are the typical thermostat settings during winter months?

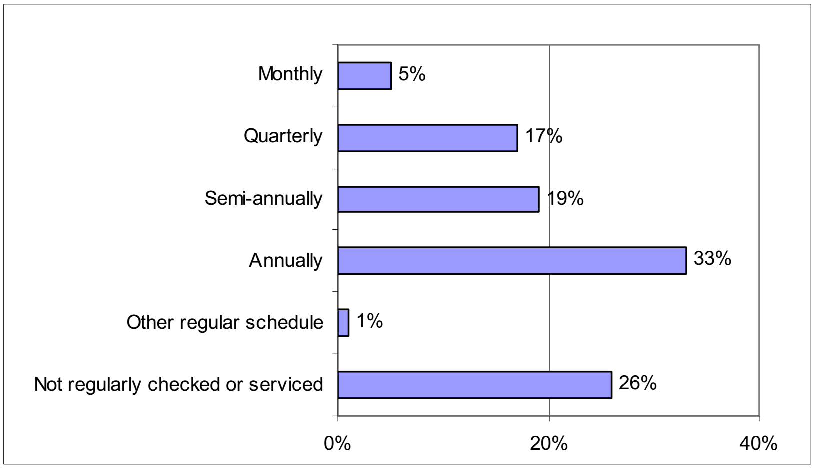


20°C is the predominant thermostat setting for most customer categories for daytime and 17°C during the evening. Industrial / Warehouse keep the temperatures the lowest for both day and night (18°C day / 15°C night).



FortisBC commercial customers keep the thermostat a little lower (16°C) than Hydro customers (18°C) during non business hours.

25. Is the heating equipment checked or serviced:



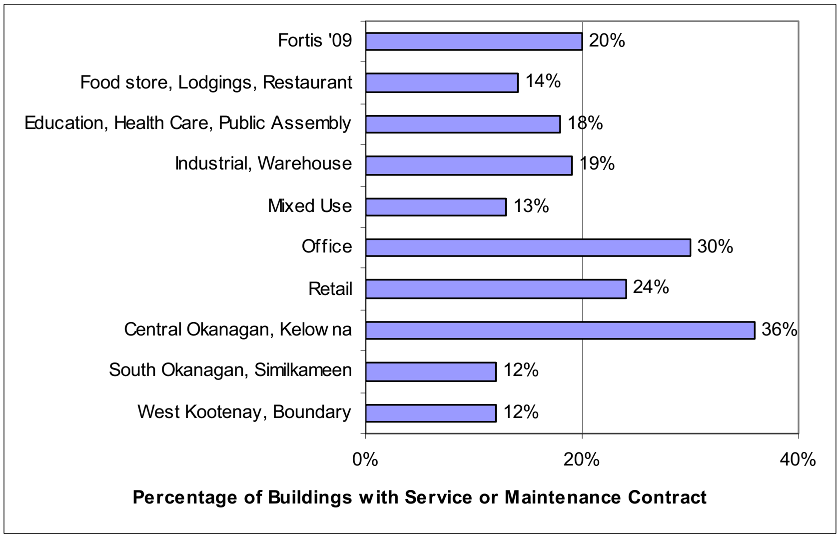
Although 1/3 of heating equipment is checked annually, 41% is checked or serviced more frequently.

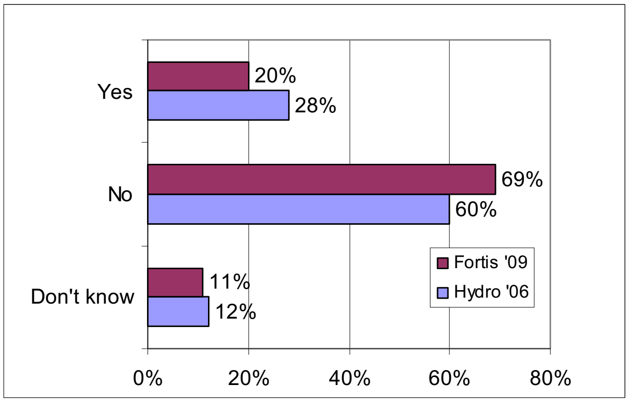
Over 1/4 of the heating equipment is not checked on a regular basis.

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"Is the heating equipment checked or serviced:"	"Monthly"	7%	4%	4%
	"Quarterly"	30%	9%	10%
	"Semi-annually"	11%	25%	18%
	"Annually"	29%	36%	36%
	"Other regular schedule"	1%		1%
	"Not regularly checked or serviced"	22%	25%	31%
Total	Base	105	128	86

Heating equipment is checked most frequently in the Central Region (37% quarterly or more frequently) and least in West Kootenay (67% annually or irregularly).

26. Is there a service/maintenance contract in place for the heating equipment?





Only 1/5 of all respondents indicated that a service / maintenance contract is in place for their heating equipment.

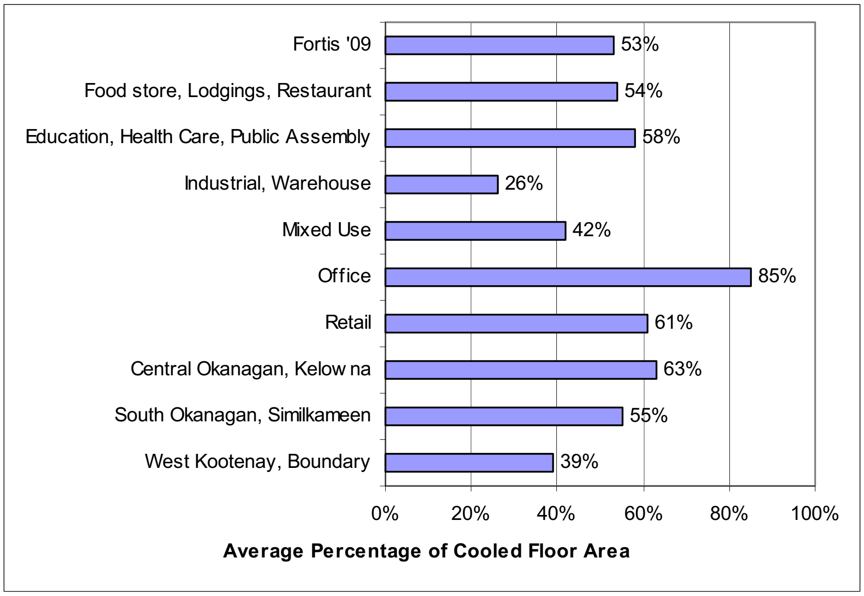
Mixed Use buildings are the least likely (13%) and Office buildings the most likely (36%).

Thirty-six percent of Central Okanagan buildings have a service contract but only 12% of buildings are covered in the other 2 regions.

Twenty-eight percent of Hydro commercial customers have a service maintenance contract in place for the heating equipment.

D. About the Space Cooling

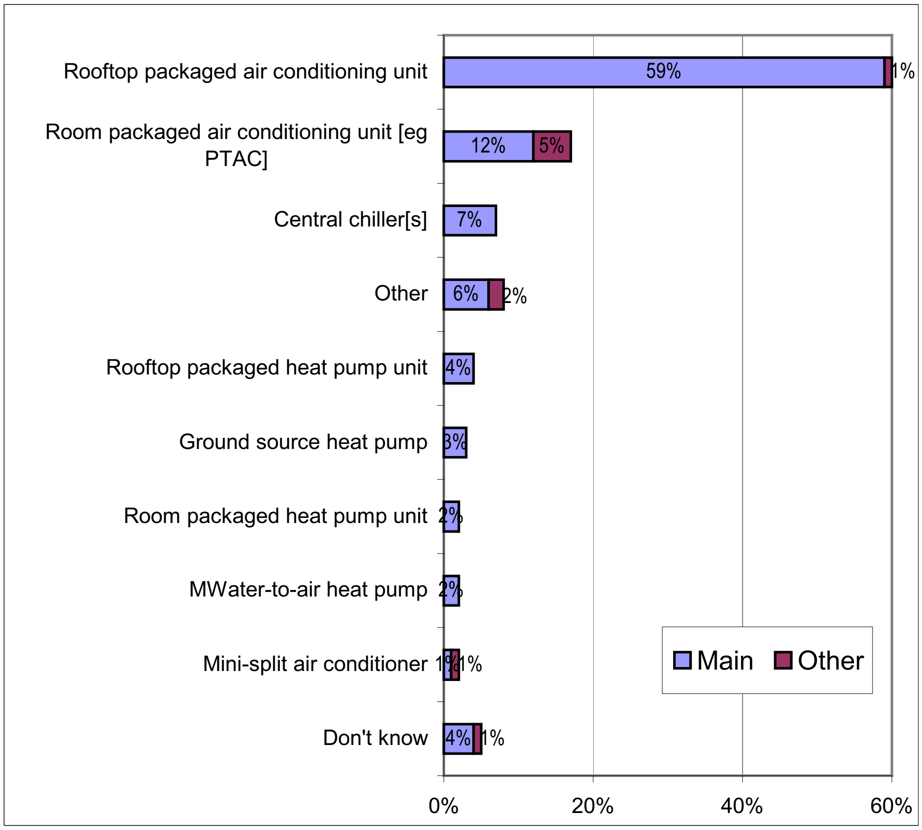
27. What percentage of the enclosed floor area in the building is cooled?



On average, 53% of the enclosed floor area of buildings surveyed are cooled. Only 26% of the enclosed floor are of Industrial / Warehouse properties are cooled and Offices are the most likely to have air conditioned space (85%).

Central Okanagan buildings are much more likely compared to those in the West Kootenay region have cooled space (63% compared to 39%).

28. Please indicate the main type of cooling equipment used to cool the building. If more than one cooling system, please indicate other systems.



Sixty percent of buildings have air conditioning provided by rooftop packaged units, followed by room packaged units (12% primary, 5% secondary).

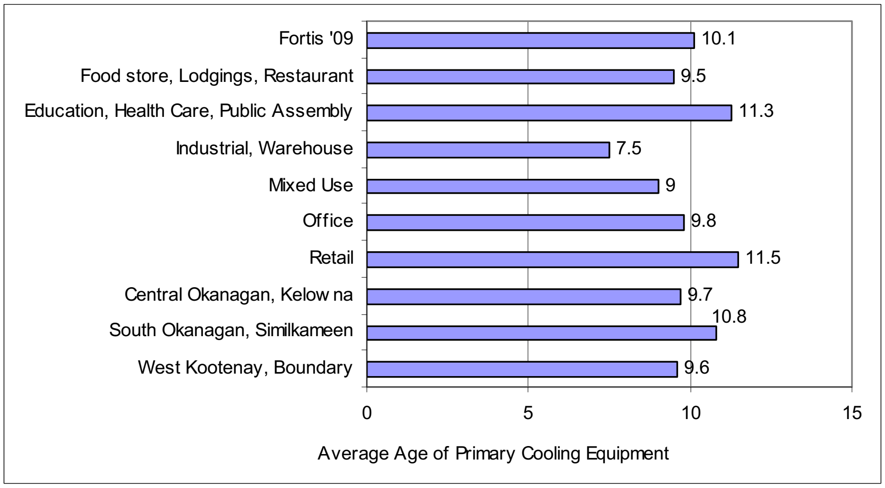
MAIN type of cooling equipment

		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
"Please indicate the main type of cooling equipment used to cool the building"	"Rooftop packaged air conditioning unit"	48%	45%	48%	76%	58%	76%
	"Rooftop packaged heat pump unit"	4%	7%	8%		7%	1%
	"Room packaged air conditioning unit [eg PTAC]"	23%	13%	18%	3%	11%	9%
	"Room packaged heat pump unit"	7%					2%
	"Mini-split air conditioner"	4%	1%				1%
	"Central chiller[s]"	4%	16%		6%	8%	5%
	"MWater-to-air heat pump"			4%		10%	
	"Ground source heat pump"	2%	6%		11%		
	"Other"	7%	6%	10%	5%	6%	3%
	"Don't know"		5%	12%			3%
Total	Base	30	51	32	24	33	65

Base: respondents with cooled building

3/4 of Mixed Use and Retail buildings use rooftop packaged units compared to approximately 1/2 of other building categories. Offices and Education / Health Care / Public Assembly buildings are the most likely to have a variety of cooling systems with the latter category the most likely to have "Central Chillers".

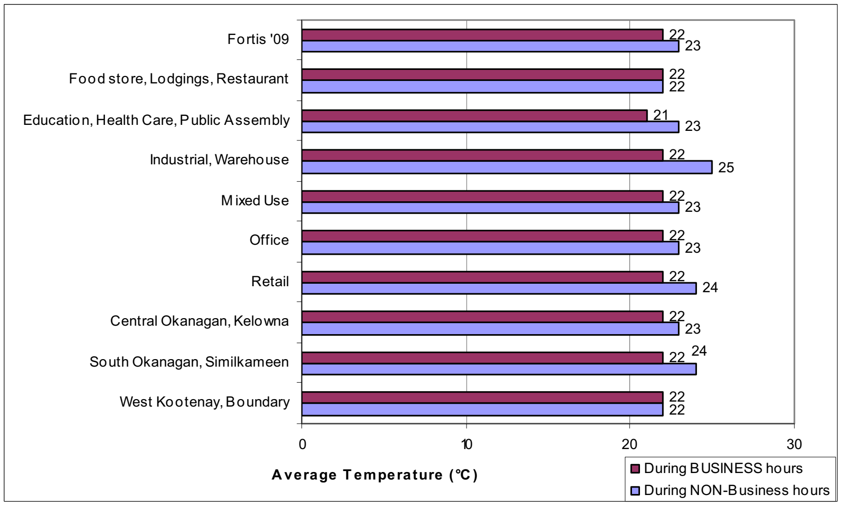
29. What is the age of the primary cooling equipment?



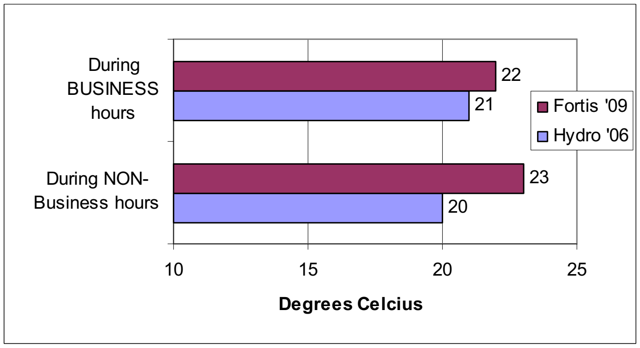
Cooling systems on average are 10 years old, with little variations by building type or by area.

Industrial / Warehouse buildings have installed cooling systems most recently (7.5 years).

30. What are the typical thermostat settings during summer months?

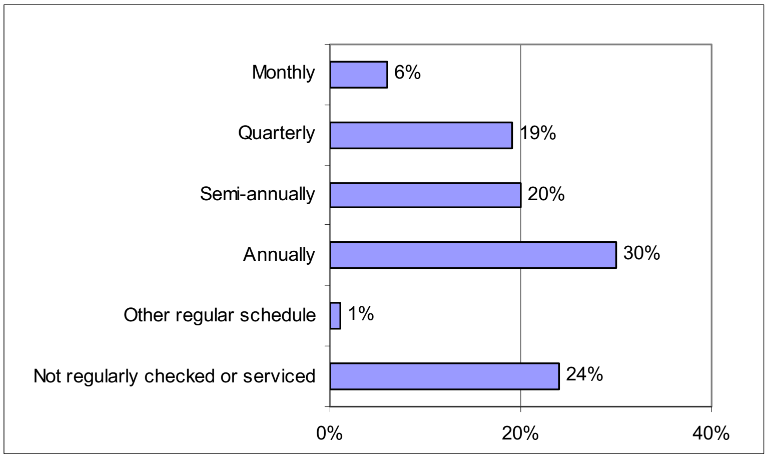


Most building types in all three regions keep their thermostats at 22°C during business hours and 23-24°C when they are not open.



Hydro customers keep the thermostat lower than FortisBC customers during the summer months.

31. Is the cooling equipment checked or serviced:



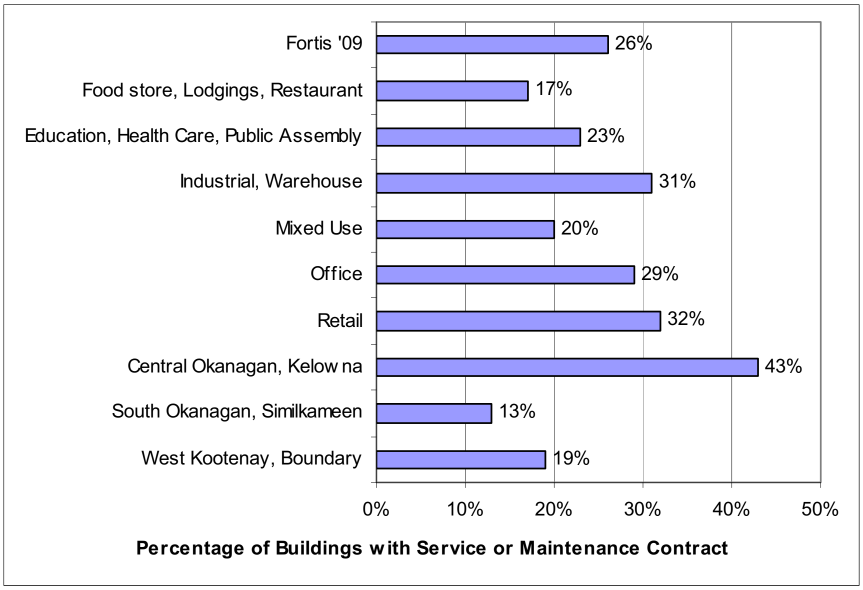
Seventy-five percent have their cooling equipment checked at least annually.

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"Is the cooling equipment checked or serviced:"	"Monthly"	6%	4%	10%
	"Quarterly"	29%	10%	16%
	"Semi-annually"	15%	24%	19%
	"Annually"	28%	40%	16%
	"Other regular schedule"		1%	1%
	"Not regularly checked or serviced"	22%	21%	38%
Total	Base	96	97	48

Base: respondents with cooled building

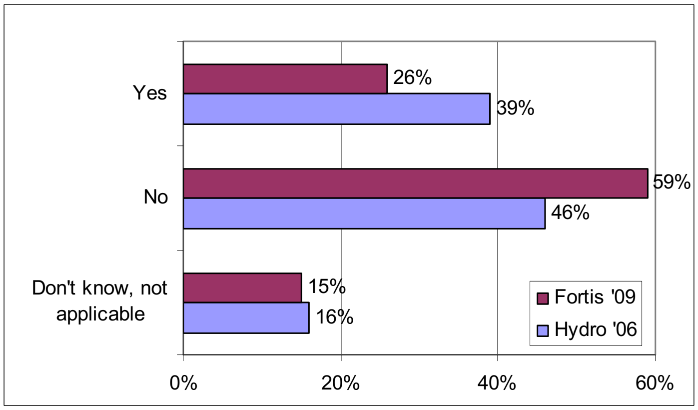
Cooling systems are checked least frequently in the West Kootenay - 2/5 are not checked on a regular basis.

32. Is there a service/maintenance contract in place for the cooling equipment?



Service contracts are in place in 1/4 of the buildings surveyed. Food Stores / Lodgings / Restaurants have the lowest level of servicing the cooling equipment.

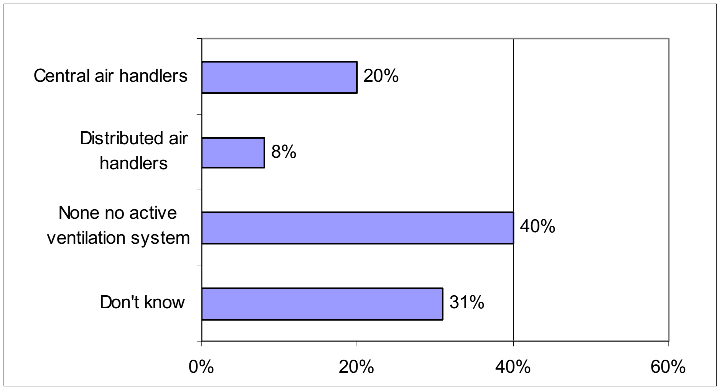
The Central Region buildings are significantly higher than average with 43% having cooling equipment service contracts compared to the South Okanagan at 13% and West Kootenay at 19%.



Hydro commercial respondents were more likely to have an service contract for the cooling equipment (39%) compared to Fortis respondents (26%).

E. Air Distribution

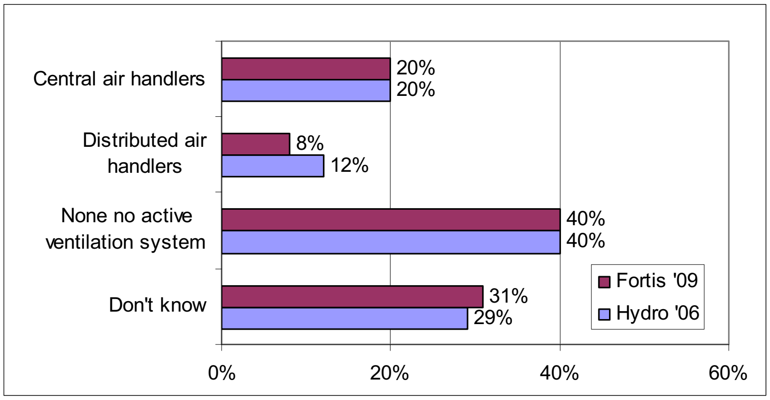
33. What type of equipment is used for the main air supply system for the building?



Central and distributed air handlers were used in 28% of the buildings for which the respondents were able to answer this question. Forty percent reported no active ventilation system and 31% were not sure what type air distribution system was used.

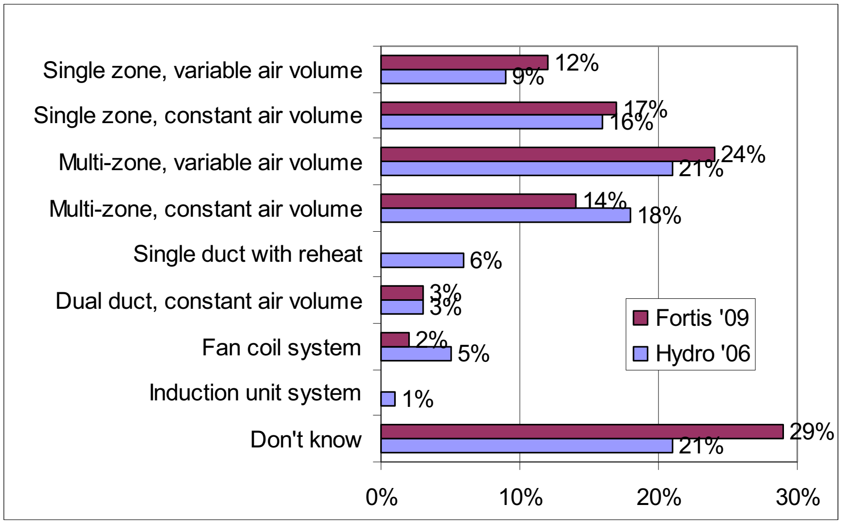
		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
"What type of equipment is used for the main air supply system for the building? (check one)"	"Central air handlers"	19%	27%	9%	24%	28%	16%
	"Distributed air handlers"	8%	7%	9%	1%	12%	11%
	"None no active ventilation system"	35%	33%	63%	41%	30%	38%
	"Don't know"	38%	34%	20%	34%	30%	35%
Total	Base	41	76	62	46	38	91

The information from those respondents who were able to answer this question indicates that air supply systems are least likely to be found in Industrial / Warehouse facilities (18%) and most likely in Education / Health Care / Public Assembly and Office buildings; 34% and 40% respectively.



The type of air distribution systems were similar for Fortis and Hydro.

34. What type of system is the main air distribution system?



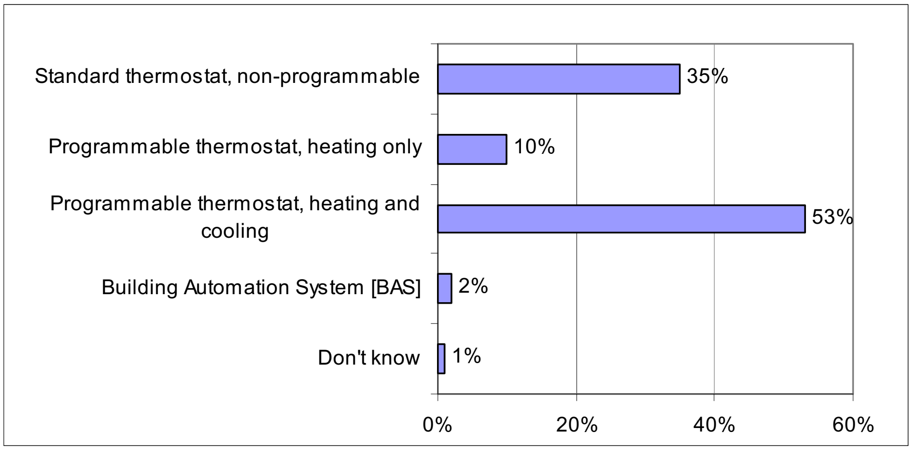
The most frequent methods of air distribution were multi-zone with variable air volume (24%) followed by single zone constant air volume (17%).

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"What type of system is the main air distribution system?"	"Single zone, variable air volume"	18%	9%	8%
	"Single zone, constant air volume"	15%	21%	12%
	"Multi-zone, variable air volume"	18%	35%	16%
	"Multi-zone, constant air volume"	21%	9%	12%
	"Dual duct, constant air volume"	3%		8%
	"Fan coil system"		3%	2%
	"Don't know"	26%	24%	41%
Total	Base	47	46	31

Base: buildings with ventilation system

In the South Okanagan, multi-zone variable air volume systems have been installed most frequently, whereas in the Central Okanagan all systems are used fairly equally.

35. What is the main type of equipment used to control temperature?



Programmable thermostats are in use in over 1/2 of buildings and standard non-programmable versions in over 1/3. Building Automation Systems are not installed frequently.

		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
"What is the main type of equipment used to control temperature?"	"Standard thermostat, non-programmable"	31%	22%	48%	33%	13%	55%
	"Programmable thermostat, heating only"	6%	17%	8%	20%	6%	4%
	"Programmable thermostat, heating and cooling"	59%	58%	39%	47%	80%	37%
	"Building Automation System [BAS]"		3%				4%
	"Don't know"	3%		4%			
Total	Base	21	35	14	13	19	31

Base: buildings with ventilation system

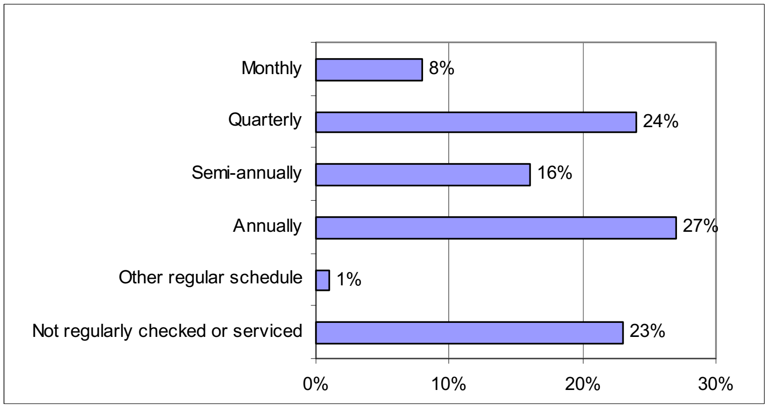
Approximately 1/2 of Retail (55%) and Industrial / Warehouse facilities (48%) have standard thermostats. 80% of Offices have programmable versions.

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"What is the main type of equipment used to control temperature?"	"Standard thermostat, non-programmable"	24%	42%	40%
	"Programmable thermostat, heating only"	10%	14%	5%
	"Programmable thermostat, heating and cooling"	63%	42%	52%
	"Building Automation System [BAS]"	2%	3%	
	"Don't know"			3%
Total	Base	50	49	37

Base: buildings with ventilation system

Programmable thermostats are most likely to be found in Central Region buildings and least in the South Okanagan.

36. Is the air distribution equipment checked or serviced?



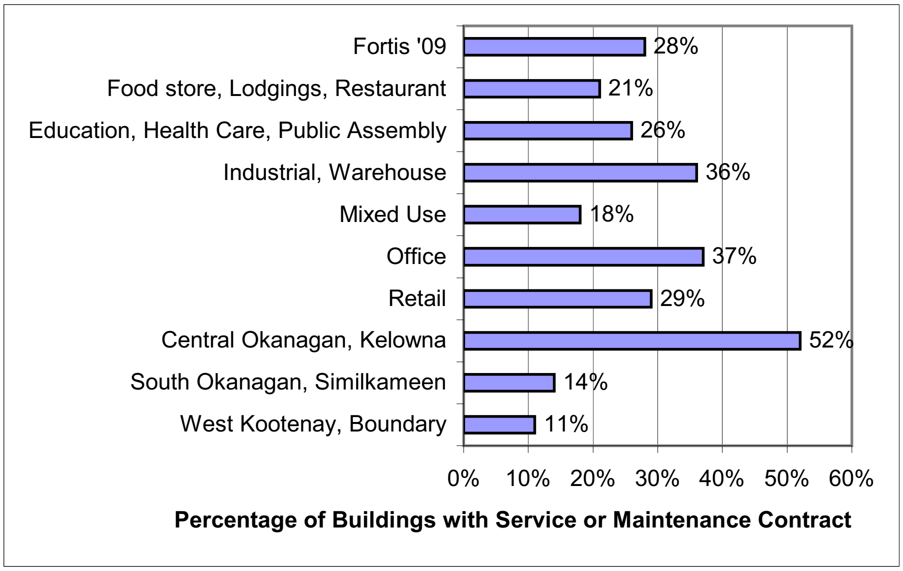
Almost 1/2 of the air distribution equipment (48%) is checked at least twice a year. Just less than 1/4 of these systems are not checked on a regular basis.

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"Is the air distribution equipment checked or serviced"	"Monthly"	5%	8%	10%
	"Quarterly"	45%	11%	15%
	"Semi-annually"	13%	19%	17%
	"Annually"	18%	36%	25%
	"Other regular schedule"		3%	
	"Not regularly checked or serviced"	18%	22%	33%
Total	Base	46	49	33

Base: buildings with ventilation system

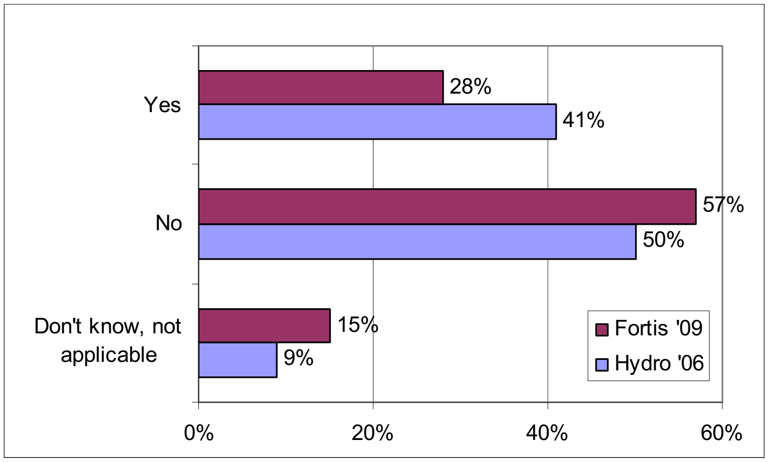
Eighty-two percent of air distribution systems in the Central Okanagan are checked at least once per year compared to 78% in the South Okanagan and 67% in the West Kootenay.

37. *Is there a service or maintenance contract in place for the air distribution equipment?*



Service contracts are most likely to be in place in Industrial / Warehouse (36%) and Offices (37%), and least likely in Mixed Use facilities.

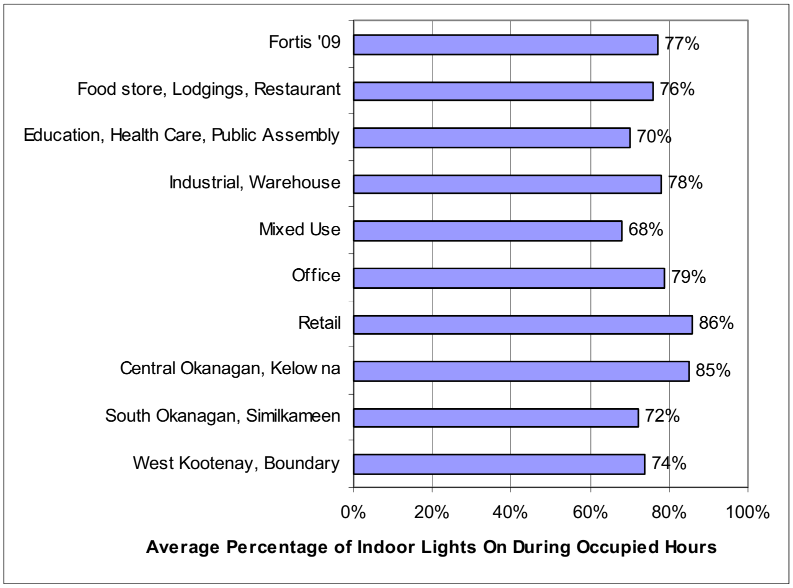
Over 50% of Central Okanagan buildings have service or maintenance contracts compared to 14% in the South Okanagan and 11% in West Kootenay.



Forty-one percent of Hydro business have service contracts in place for their air distribution equipment.

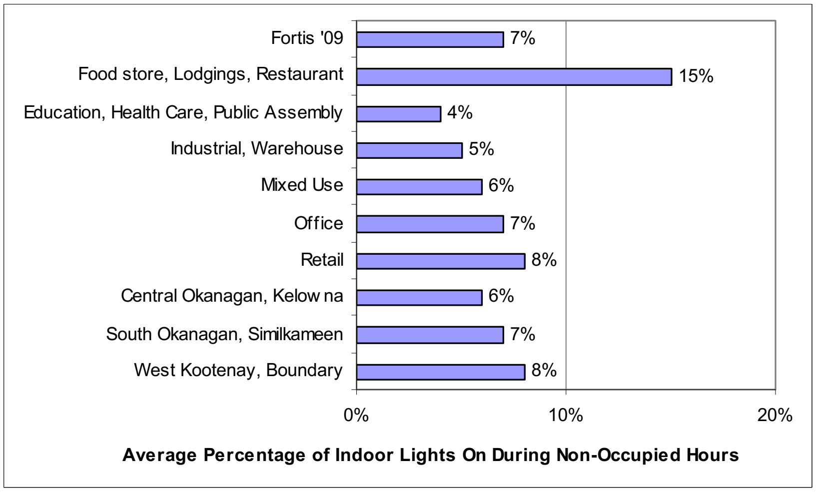
F. Indoor Lighting

38. On average, what percentage of the indoor lights on your electrical account are on during occupied hours?



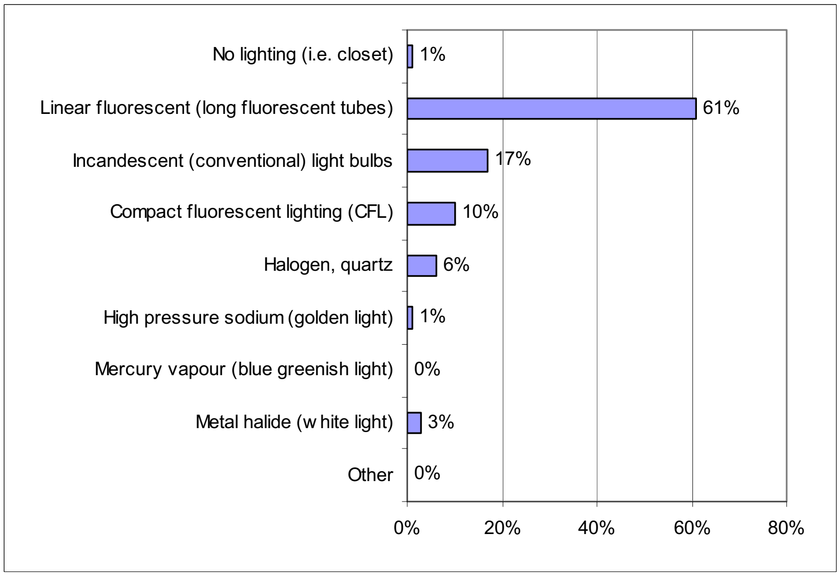
Almost 4/5 of all lights are on during the time Fortis buildings are occupied, with slightly higher amounts in:
- the Retail sector (86%)
- the Central Okanagan (85%).

39. On average, what percentage of the indoor lights on your electrical account are on during non-occupied hours?



Seven percent of all lights are kept on in buildings when they are not occupied. Among Food Store / Lodgings and Restaurants at 15% of all lights are kept on in buildings when they are not occupied.

40. Please estimate the percentage of the floor space that is lit by each type of lighting.



Linear fluorescent tubes light 61% of the floor space of buildings reported in the survey.

Standard light bulbs are used to light 17% and CFL's are used to light 10% of the floor space.

Please estimate the percentage of floor space that is lit by each type of lighting

		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
No lighting (i.e. closet)	Mean %	1%	1%	1%	3%	1%	2%
	Base	30	61	47	31	27	62
Linear fluorescent (long fluorescent tubes)	Mean %	34%	63%	62%	56%	74%	65%
	Base	30	63	48	31	27	64
Incandescent (conventional) light bulbs	Mean %	27%	23%	16%	18%	16%	9%
	Base	30	63	47	31	27	64
Compact fluorescent lighting (CFL)	Mean %	30%	8%	4%	16%	7%	6%
	Base	30	63	47	31	27	64
Halogen, quartz	Mean %	6%	4%	6%	4%	2%	10%
	Base	30	63	47	31	27	64
High pressure sodium (golden light)	Mean %	0%	1%	3%	0%	0%	2%
	Base	30	63	47	31	26	64
Mercury vapour (blue greenish light)	Mean %	0%	0%	1%	0%	0%	0%
	Base	30	63	47	31	27	64
Metal halide (white light)	Mean %	2%	0%	9%	2%	0%	5%
	Base	30	63	48	31	27	64
Other	Mean %	0%	0%	0%	0%	0%	1%
	Base	30	63	47	31	26	64

Missing values treated as zero. Base sizes include only cases where at least one lighting type was given
Average percent of lighting includes zero percent

Food Stores / Lodgings / Restaurants are most likely to use CFL's (30%) and standard bulbs (27%) and least likely to use linear fluorescent tubes (34%).

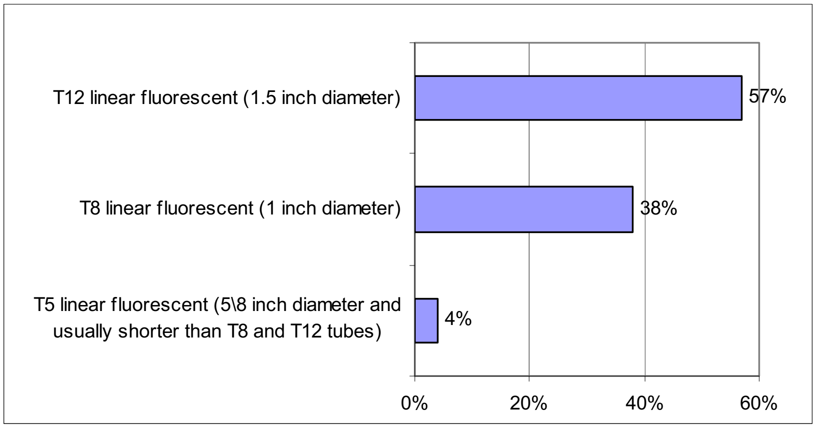
Please estimate the percentage of floor space that is lit by each type of lighting

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
No lighting (i.e. closet)	Mean %	1%	2%	1%
	Base	86	100	72
Linear fluorescent (long fluorescent tubes)	Mean %	68%	55%	59%
	Base	87	103	74
Incandescent (conventional) light bulbs	Mean %	10%	21%	21%
	Base	86	103	74
Compact fluorescent lighting (CFL)	Mean %	9%	9%	14%
	Base	86	103	74
Halogen, quartz	Mean %	8%	6%	2%
	Base	86	103	74
High pressure sodium (golden light)	Mean %	2%	0%	1%
	Base	86	103	74
Mercury vapour (blue greenish light)	Mean %	1%	0%	0%
	Base	86	103	74
Metal halide (white light)	Mean %	2%	7%	1%
	Base	87	103	74
Other	Mean %	0%	0%	1%
	Base	86	103	74

Missing values treated as zero. Base sizes include only cases where at least one lighting type was given
Average percent of lighting includes zero percent

Buildings in the Central Okanagan are more likely to use linear fluorescent tubes (68% of floor space) than those in the South Okanagan (55%) or West Kootenay (59%), and less likely to use standard bulbs (10% compared to 21% in both other regions).

41. If the building has linear fluorescent lights, please estimate the percentage breakdown of the total linear fluorescent lighting used.



T12 linear fluorescents are used in almost 60% of all buildings using this type of lighting, almost 40% choose the T8 option.

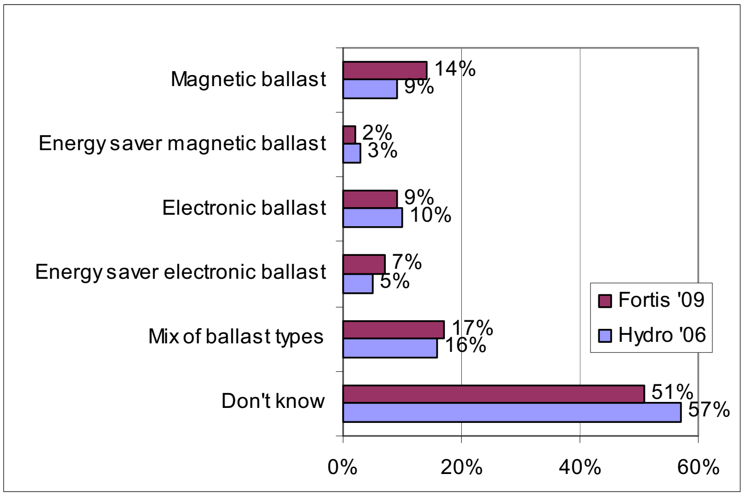
If the building has linear fluorescent lights, please estimate the percentage breakdown of the total linear fluorescent lighting used

		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
T12 linear fluorescent (1.5 inch diameter)	Mean %	54%	49%	64%	46%	65%	59%
	Base	17	38	37	16	25	46
T8 linear fluorescent (1 inch diameter)	Mean %	35%	51%	32%	52%	34%	33%
	Base	17	38	37	16	25	46
T5 linear fluorescent (5\8 inch diameter and usually shorter than T8	Mean %	11%	0%	4%	2%	1%	8%
	Base	17	38	37	15	25	46

Missing values treated as zero. Base sizes include only cases where at least one linear fluorescent lighting type was given
Average percent of lighting includes zero percent

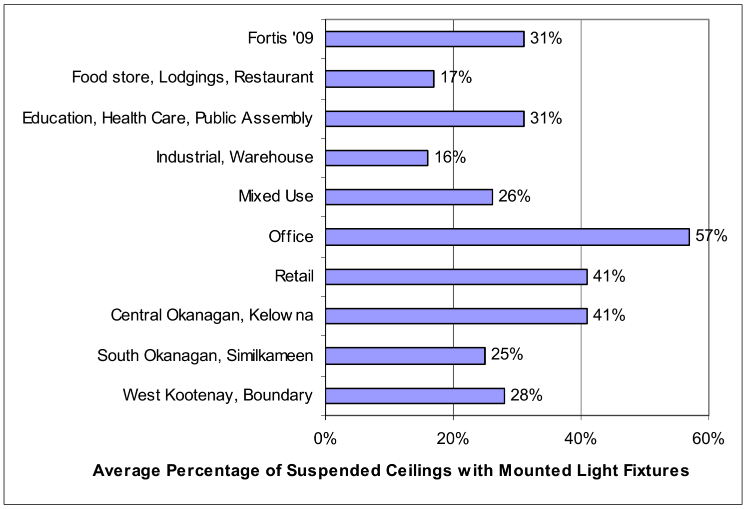
The smaller T8 tubes are used in over 1/2 of the Education / Health Care / Public Assembly and Mixed Use buildings whereas other buildings are more likely to use the larger T12's.

42. What is the main linear fluorescent ballast type in use in the building?



Over 50% of survey respondents were unable to identify the fluorescent ballast type used in their building. Of those who could, 17% reported using a mix of ballast types and 14% magnetic ballasts.

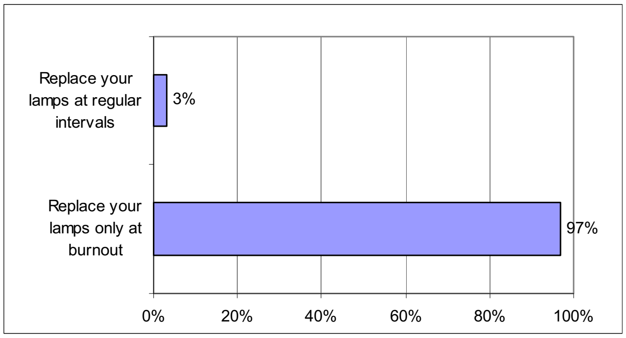
43. Approximately what percentage of the ceiling area in this building consists of suspended ceilings, where light fixtures are mounted in the ceiling?



On average, 31% of ceiling area is covered in suspended ceilings with the highest percentage being in:
- Offices (57%)
- in the Central Region (41%)

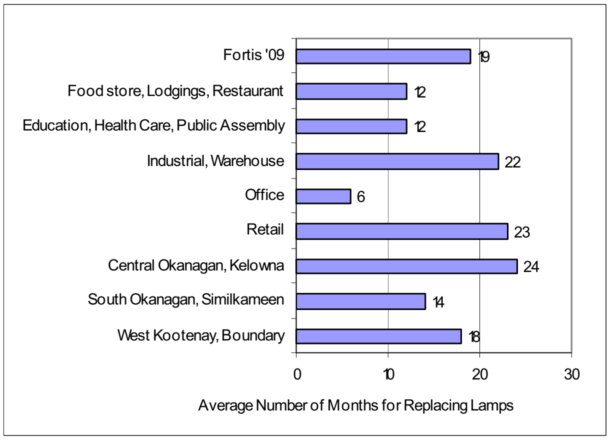
44. Which of the following maintenance methods do you use in each technology?

Lamps

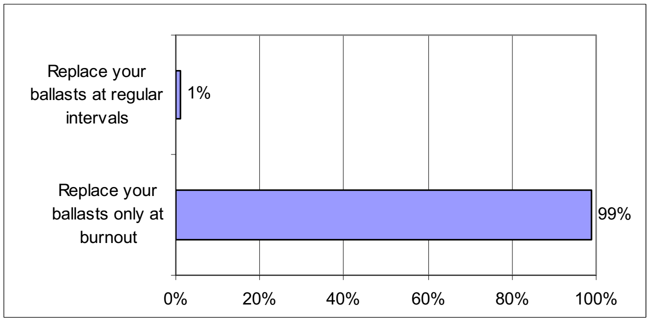


Ninety-seven percent of lamps are only replaced when they burn out. This was similar for the Hydro '06 sample.

Please specify the interval:

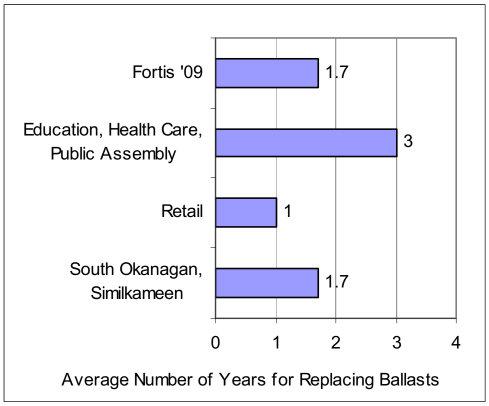


Ballasts

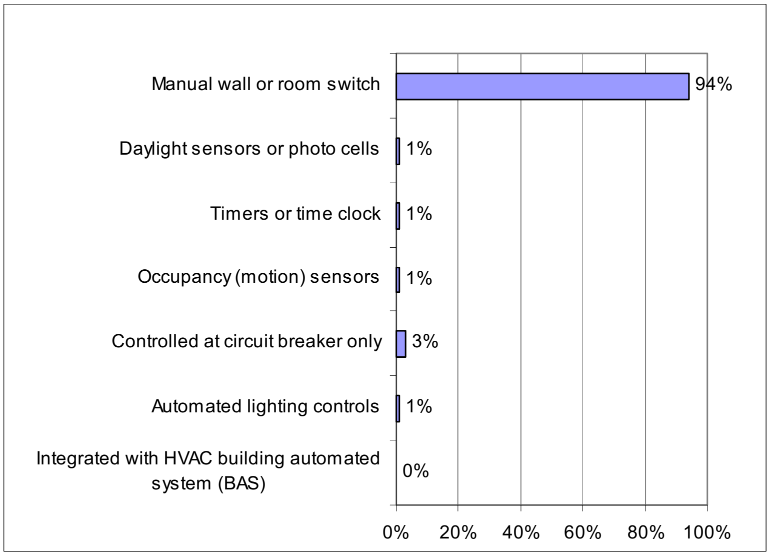


Ninety-nine percent of ballasts are replaced when they burn out.

Please specify the interval:



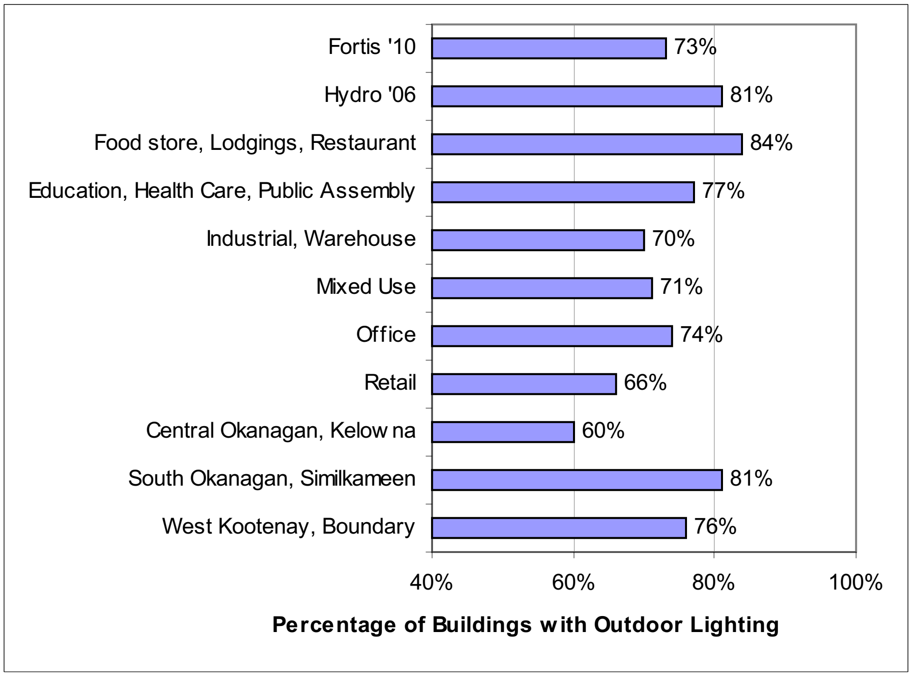
45. What is the percentage breakdown of the indoor lighting controlled by each of the following types of equipment?



The major control mechanism in almost all buildings are manual wall switches.

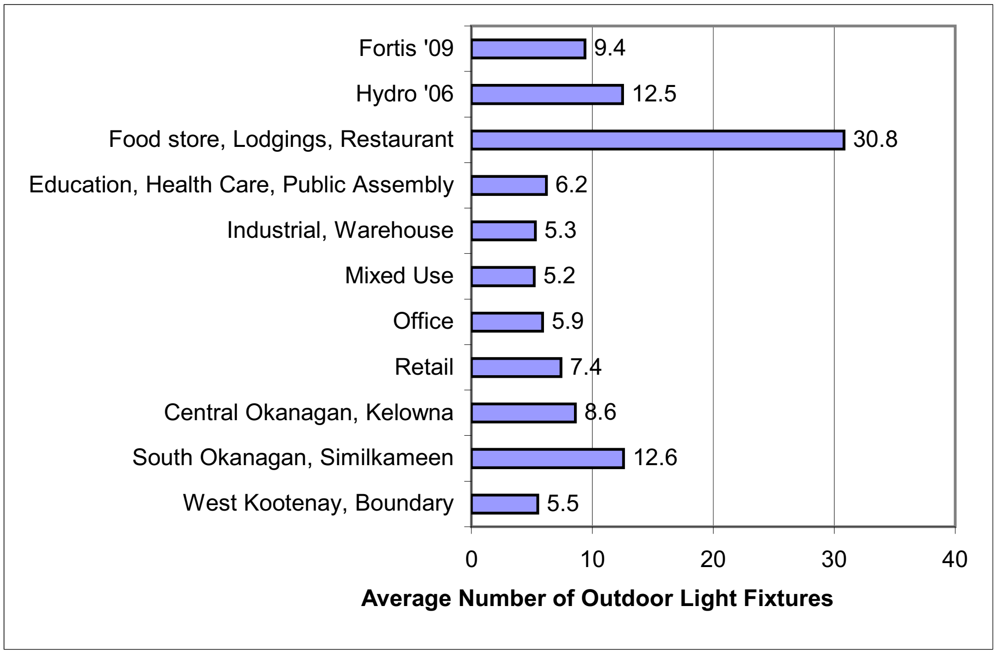
G. Outdoor Lighting

46. Is there outdoor lighting at this building that is associated with your electrical account?



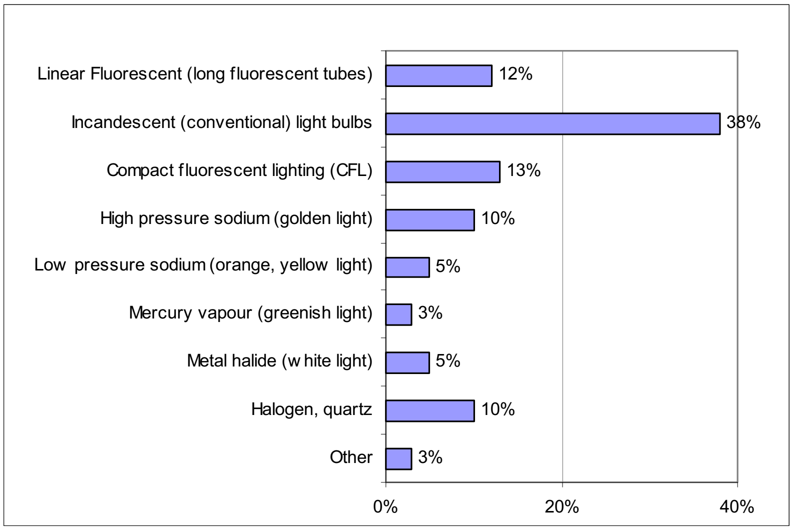
Over 70% of all commercial buildings have outdoor lighting with the highest being Food Stores / Lodgings / Restaurants (84%) and in the South Okanagan region (81%). Retail properties have the lowest incidence of outdoor lighting (60%).

47. Please estimate the total number of outdoor light fixtures (of all types) at this building?



Similar to the previous tables, the Food Store / Lodgings / Restaurant category has the largest number of outdoor lighting fixtures by a factor of 3 to 4 times all other building categories.

48. Please estimate the percentage breakdown of each type of outdoor lighting fixture in use at this building, relative to the total number of outdoor fixtures?



Conventional light bulbs are used three times more frequently for outdoor lighting than any other bulb type.

Please estimate the percentage of each type of outdoor lighting fixture in use at this building

		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
Linear Fluorescent (long fluorescent tubes)	Mean %	11%	1%	5%	14%	19%	25%
	Base	30	51	42	32	20	51
Incandescent (conventional) light bulbs	Mean %	27%	53%	25%	45%	55%	29%
	Base	30	51	42	32	20	51
Compact fluorescent lighting (CFL)	Mean %	18%	16%	10%	16%	16%	7%
	Base	30	51	42	32	20	51
High pressure sodium (golden light)	Mean %	7%	9%	17%	8%	10%	10%
	Base	30	51	42	32	20	51
Low pressure sodium (orange, yellow light)	Mean %	1%	8%	5%	6%	0%	4%
	Base	30	51	42	32	20	51
Mercury vapour (greenish light)	Mean %	6%	0%	11%	0%	0%	2%
	Base	30	51	42	32	20	51
Metal halide (white light)	Mean %	5%	2%	10%	3%	1%	9%
	Base	30	51	42	32	20	51
Halogen, quartz	Mean %	21%	6%	17%	2%	0%	10%
	Base	30	51	42	32	20	51
Other	Mean %	5%	5%	0%	5%	0%	4%
	Base	30	51	42	32	20	51

Missing values treated as zero. Base sizes include only cases where at least one outdoor lighting fixture in use
Average percent of lighting fixtures includes zero percent

Over 1/2 of both Education / Health Care / Public Assembly (53%) and Office building (55%) categories use conventional bulbs most frequently for outdoor light.

Retail buildings and Offices are the most likely to use linear fluorescent bulbs (25%).

Food Stores / Lodgings / Restaurant are the most likely to have halogen, quartz bulbs outside (21%), followed by Industrial / Warehouse facilities (17%).

Please estimate the percentage of each type of outdoor lighting fixture in use at this building

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
Linear Fluorescent (long fluorescent tubes)	Mean %	21%	9%	9%
	Base	62	100	67
Incandescent (conventional) light bulbs	Mean %	23%	45%	42%
	Base	62	100	67
Compact fluorescent lighting (CFL)	Mean %	11%	11%	18%
	Base	62	100	67
High pressure sodium (golden light)	Mean %	19%	8%	7%
	Base	62	100	67
Low pressure sodium (orange, yellow light)	Mean %	3%	5%	6%
	Base	62	100	67
Mercury vapour (greenish light)	Mean %	8%	2%	1%
	Base	62	100	67
Metal halide (white light)	Mean %	5%	7%	3%
	Base	62	100	67
Halogen, quartz	Mean %	9%	11%	9%
	Base	62	100	67
Other	Mean %	2%	3%	6%
	Base	62	100	67

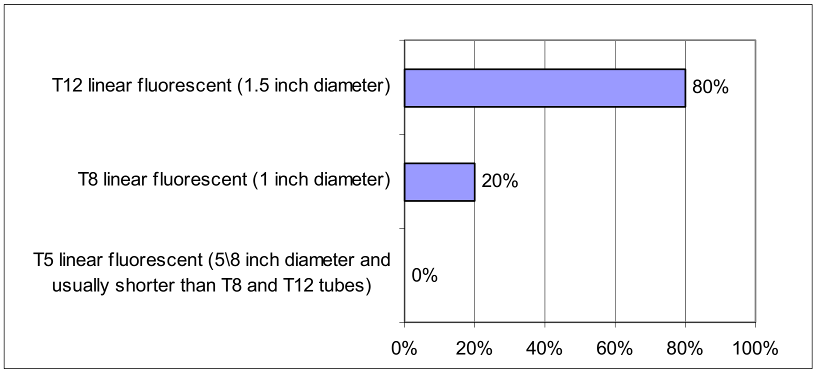
Missing values treated as zero. Base sizes include only cases where at least one outdoor lighting fixture in use
Average percent of lighting fixtures includes zero percent

Buildings in the South Okanagan (45%) and West Kootenay (42%) are twice as likely to use conventional bulbs for outdoor lighting than buildings in the Central Okanagan Region (23%).

In the Central Region, linear fluorescent (21%), high pressure sodium (19%) and mercury vapor bulbs (8%) are comparatively more popular than in the other two regions.

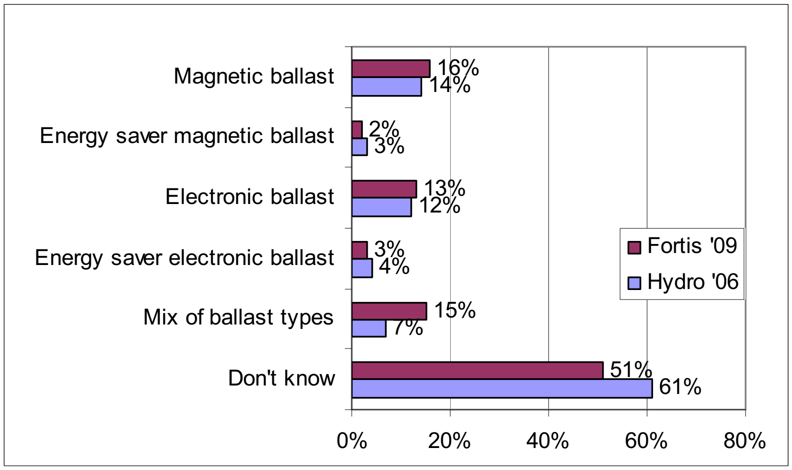
CFL's are more frequently used for outdoor lighting in the West Kootenay (18% versus 11%).

49. If the building has linear fluorescent lights outdoor, please estimate the percentage breakdown of the total linear fluorescent lighting used outdoor?



T12 linear fluorescent bulbs are four times more frequently used for outdoor lighting purposes than T8's.

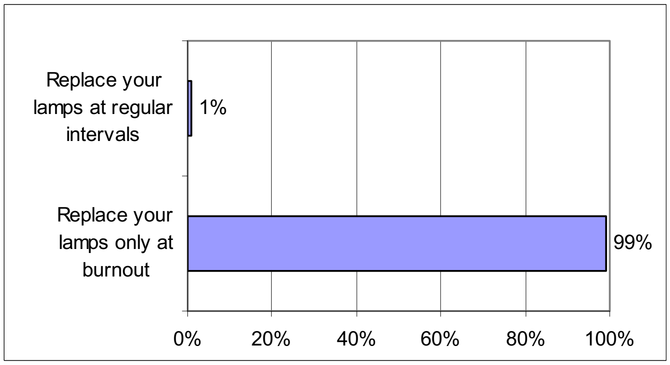
50. Which of the following is the main linear fluorescent ballast type in use?



Similar to the previous questions on ballasts, most respondents were unaware of the type used for their outdoor fluorescent lighting. Of those who could answer, 16% mentioned magnetic ballast, 13% electronic and 15% a mix of various ballast types.

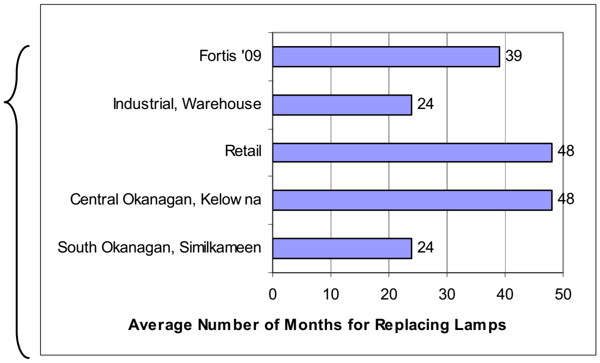
51. Which of the following maintenance methods do you use in each technology?

Lamps



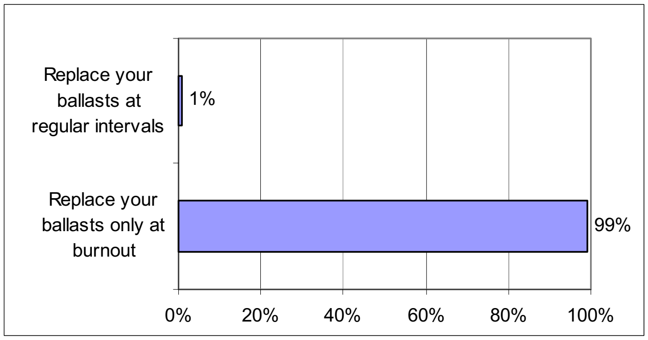
Outdoor lamps are replaced when they burn out in 99% of buildings. This was consistent with the Hydro results.

Please specify the interval:



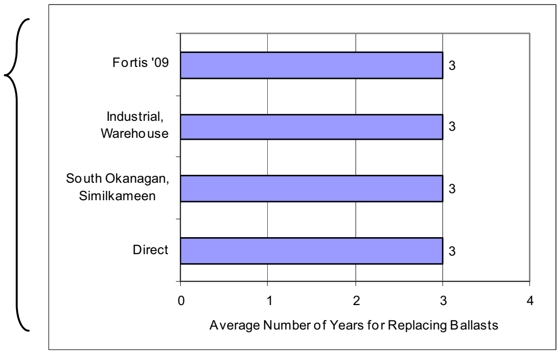
A small percentage of buildings replace their lamps on average every 39 months.

Ballasts



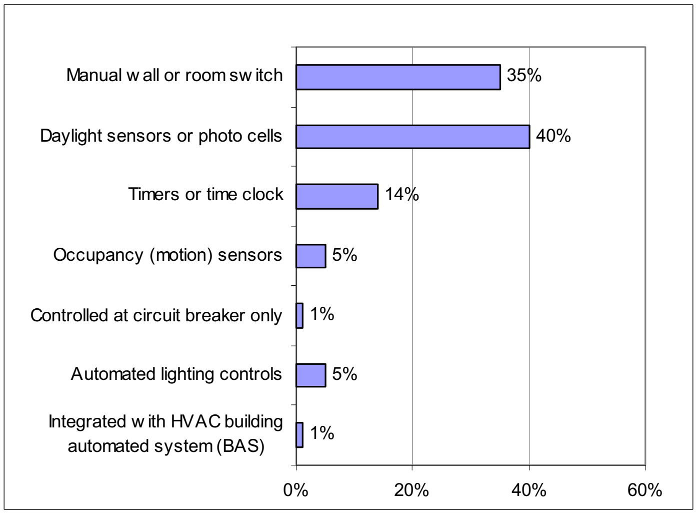
Ninety-nine percent of buildings replace ballasts only when they burn out.

Please specify the interval:



A small percentage of buildings replace their ballasts every 3 years.

52. What is the percentage breakdown of the outdoor lighting controlled by each of the following types of equipment?



Outdoor lighting is much more likely to be controlled by sensors than indoor lighting (45% compared to 1%). Thirty-five percent of outdoor lights are controlled by manual switches compared to 95% for indoor lights.

What percentage of the outdoor lighting is controlled by each of the following types of equipment?

		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
Manual wall or room switch	Mean %	32%	39%	24%	34%	29%	41%
	Base	33	54	42	32	23	53
Daylight sensors or photo cells	Mean %	29%	36%	55%	50%	50%	31%
	Base	33	54	43	32	23	53
Timers or time clock	Mean %	26%	10%	9%	6%	11%	18%
	Base	33	54	43	32	23	53
Occupancy (motion) sensors	Mean %	4%	5%	3%	11%	6%	5%
	Base	33	54	43	32	23	53
Controlled at circuit breaker only	Mean %	0%	1%	4%	0%	1%	0%
	Base	33	54	43	32	23	53
Automated lighting controls	Mean %	9%	7%	5%	0%	3%	4%
	Base	33	54	43	32	23	53
Integrated with HVAC building automated system (BAS)	Mean %	0%	2%	0%	0%	0%	0%
	Base	33	54	43	32	23	53

Missing values treated as zero. Base sizes include only cases where at least one lighting control system was given
Average percent of lighting control systems includes zero percent

Industrial / Warehouse (55%), Mixed Use (50%), and Offices (50%) use sensors compared to approximately 30% of other building categories.

Twenty-six percent of Food Stores / Lodgings / Restaurants use timer devices as do 18% of Retailers.

What percentage of the outdoor lighting is controlled by each of the following types of equipment?

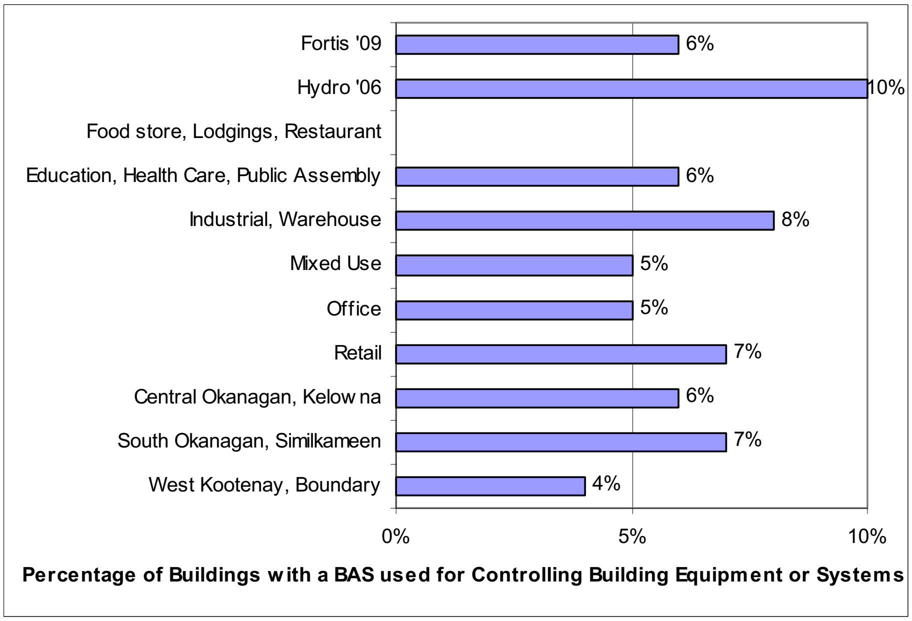
		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
Manual wall or room switch	Mean %	22%	35%	45%
	Base	63	109	69
Daylight sensors or photo cells	Mean %	55%	37%	31%
	Base	63	109	69
Timers or time clock	Mean %	19%	13%	11%
	Base	63	109	69
Occupancy (motion) sensors	Mean %	2%	7%	6%
	Base	63	109	69
Controlled at circuit breaker only	Mean %	2%	0%	2%
	Base	63	109	69
Automated lighting controls	Mean %	0%	7%	6%
	Base	63	109	69
Integrated with HVAC building automated system (BAS)	Mean %	0%	1%	0%
	Base	63	109	69

Missing values treated as zero. Base sizes include only cases where at least one lighting control system was given
Average percent of lighting control systems includes zero percent

Sensors are more frequently found in the majority of Central Okanagan buildings (55%) compared to 37% in the South Okanagan and 31% in West Kootenay.

H. Building Automation Systems

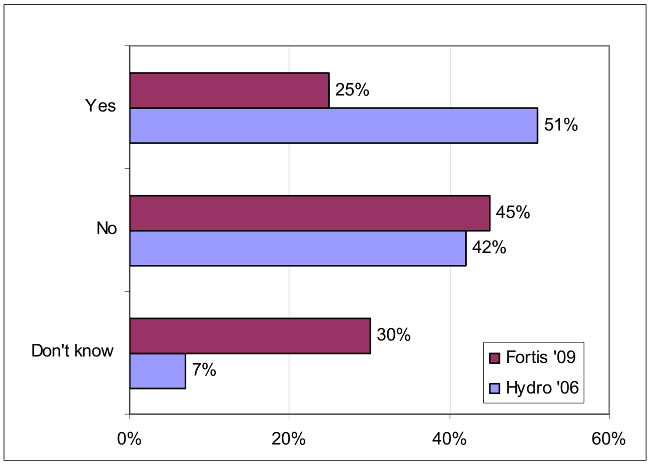
53. Is there a building automation system (BAS) used for controlling building equipment or systems?



Only 6% of the respondents indicated that Building Automation Systems are in place in their buildings. The highest penetration can be found in Industrial / Warehouse facilities (8%) and the lowest in Food Store / Lodgings / Restaurant buildings (0%).

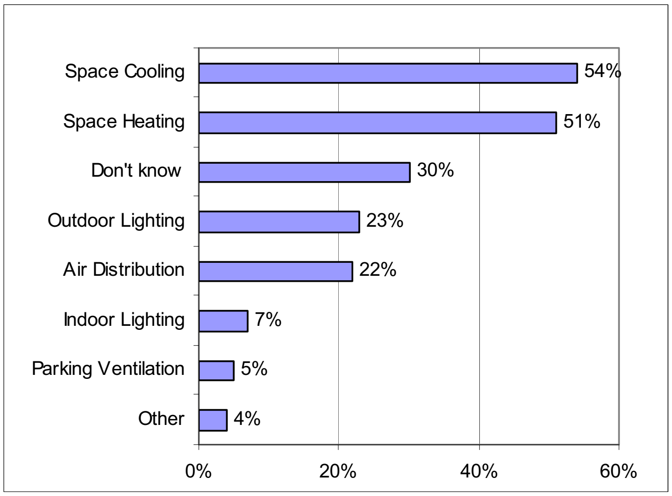
Only 4% of buildings in the West Kootenay has BAS.

54. If your building has a BAS, was it installed as a retrofit (after the building was constructed)?



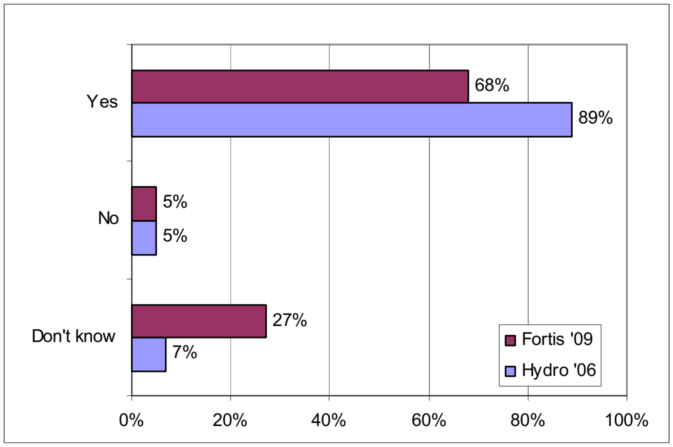
Twenty-five percent said the BAS they had was a retrofit installation and 30% did not know if it was a retrofit instalation.

55. Which equipment is controlled/scheduled by the BAS?



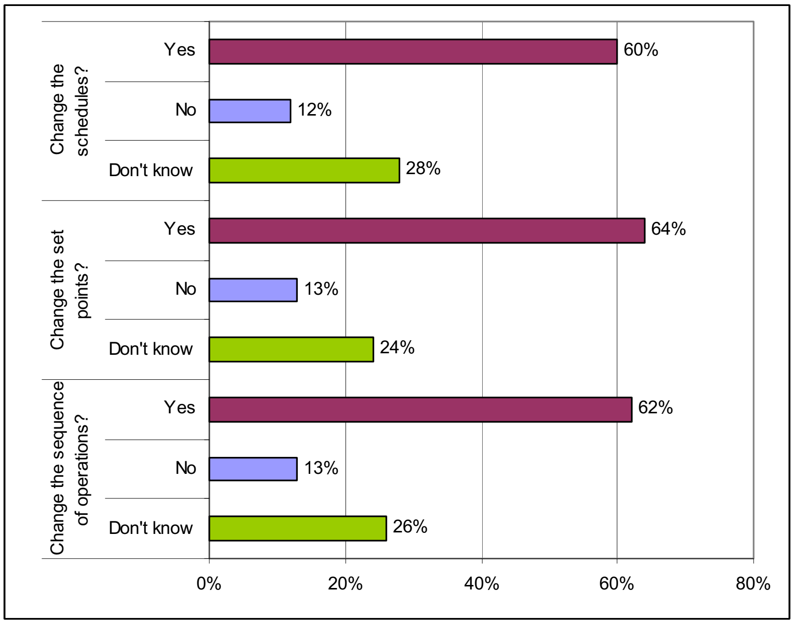
Among respondents with a BAS, 54% control space cooling systems and 51% control space heating systems.

56. Is the BAS functional and operating as designed?



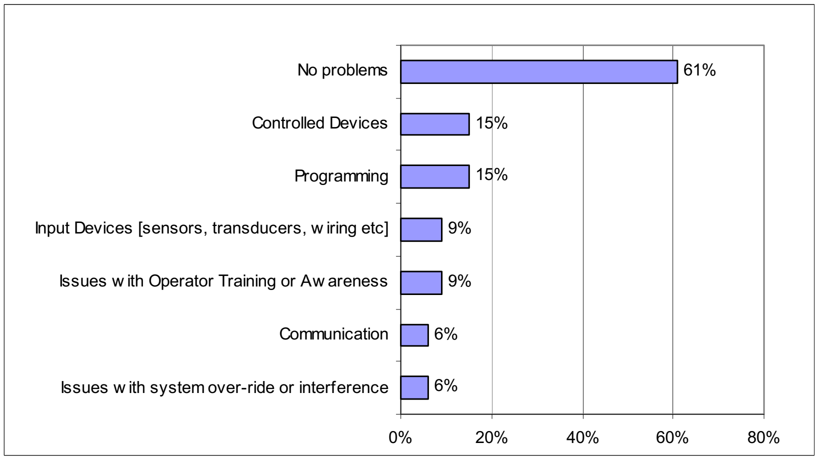
Sixty-eight percent were satisfied with the BAS functionality.

57. Do you or your BAS operator know how to:



Over 60% know how to change the BAS schedule, change the set points and change the sequence of operations.

58. Please check up to three selections that represent the most common problems with your BAS.

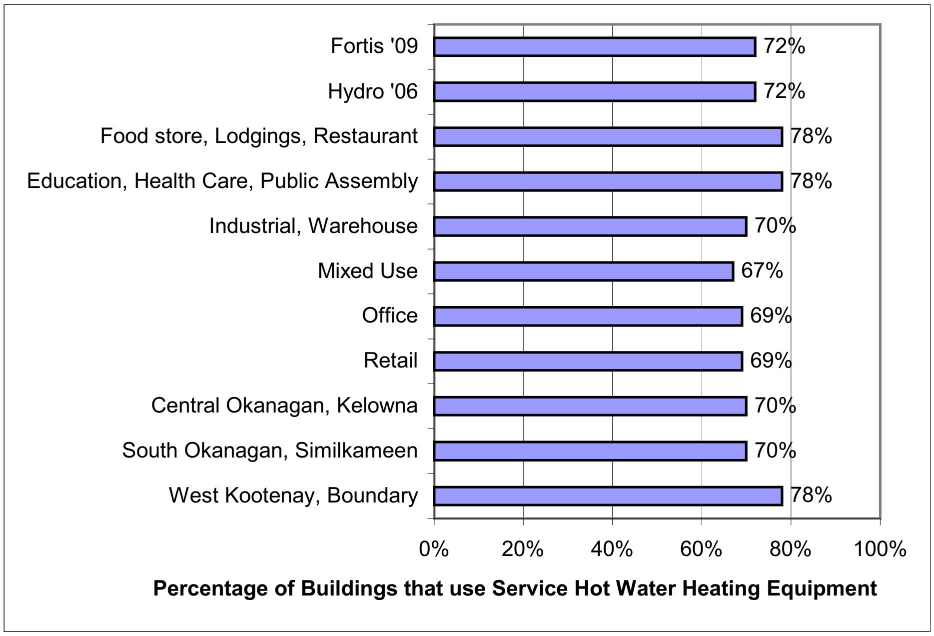


If there are problems with the BAS, the most common are with:

- controlled devices and
- programming

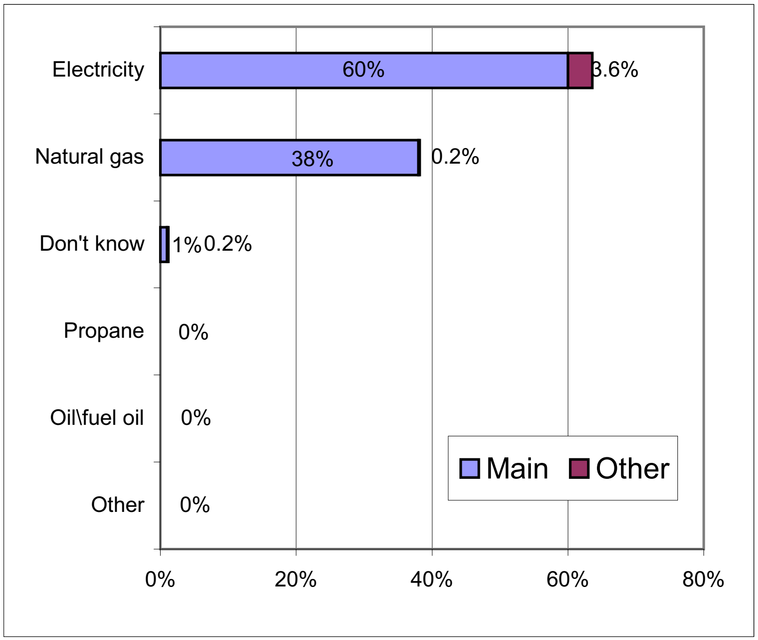
I. Service Water Heating Equipment

59. Is there service hot water heating equipment used in the building?



Seventy-two percent of buildings use service hot water heating equipment.

60. What is the main fuel type or energy source used by the service water heating system(s) for the building? If the building uses more than one fuel type for service hot water system(s), indicate any additional systems as other fuel types.



Sixty-four percent of the hot water equipment is heated by electricity and 38% by natural gas. No other fuels were mentioned.

MAIN fuel type or energy source

		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
"What is the main fuel type or energy source used by the service water heating system(s) for the building?"	"Electricity"	61%	52%	60%	61%	61%	70%
	"Natural gas"	39%	45%	38%	37%	39%	30%
	"Don't know"		2%				
	"Propane"			1%	2%		
	"Oil\fuel oil"			1%			
	"Other"		1%				
Total	Base	35	63	47	34	28	63

Base: respondents with service hot water heating equipment

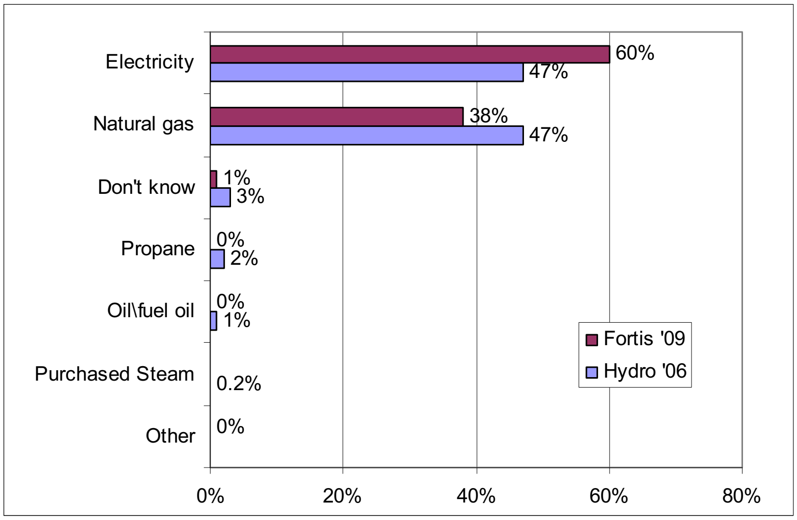
Electricity is used least by Education / Health Care / Public Assembly buildings (52%) and most in Retail establishments (70%) to heat water.

MAIN fuel type or energy source

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"What is the main fuel type or energy source used by the service water heating system(s) for the building?"	"Electricity"	54%	56%	72%
	"Natural gas"	46%	43%	24%
	"Don't know"		1%	1%
	"Propane"			2%
	"Oil\fuel oil"			1%
	"Other"			1%
Total	Base	87	107	81

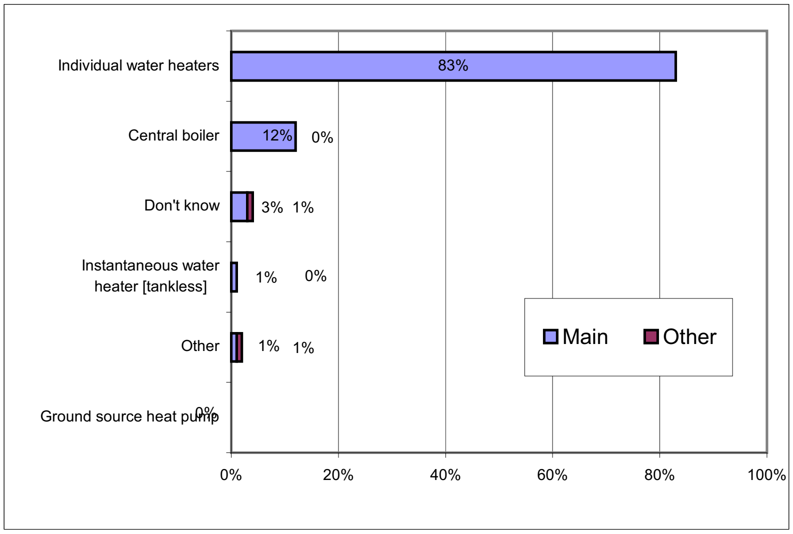
Base: respondents with service hot water heating equipment

Buildings in the West Kootenay are most likely to use electricity to heat water. Buildings in the Central Region (54%) and South Okanagan (56%) are less likely to use electricity.



Electricity is a more common energy source among Fortis customers than Hydro customers for service hot water heating systems.

61. What is the main type of hot water equipment used to produce service hot water in the building? If more than one type of service hot water system is used in the building, indicate any additional systems as other systems.



Individual water heaters are the main source of hot water (83%) with only 12% mentioning central boilers.

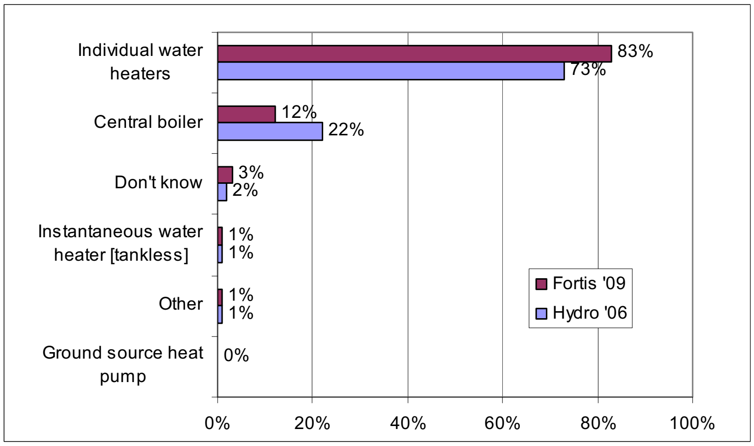
MAIN type of hot water equipment

		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
"What is the main type of hot water equipment used to produce service hot water in the building? If more than one type of service hot water system is used in the building?"	"Individual water heaters"	83%	76%	81%	78%	91%	92%
	"Central boiler"	10%	18%	12%	20%	9%	6%
	"Don't know"	6%	4%	3%	2%		
	"Instantaneous water heater [tankless]"			4%			
	"Other"		1%				2%
	"Ground source heat pump"	2%					
Total	Base	33	63	46	34	27	61

Base: respondents with service hot water heating equipment

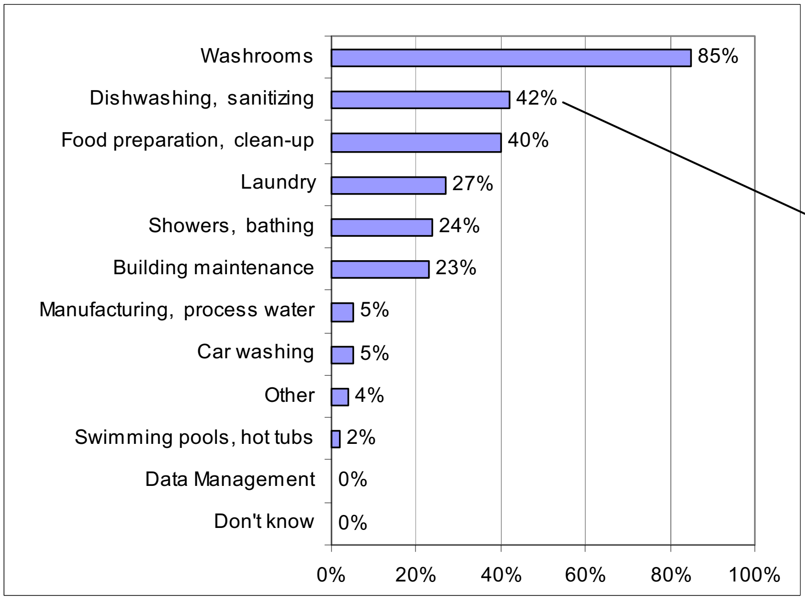
Offices (91%) and Retail outlets (92%) have the highest incidence of individual hot water heaters.
Education / Health Care / Public Assembly (18%) and Mixed Use (20%) the highest incidence of central boilers.

Main type of hot water equipment



Central Boilers are more common among Hydro commercial customers than Fortis.

62. What are the main uses for service hot water in the building?



Hot water is used in 85% of the buildings for washrooms, 42% for dishwashing, and 40% for food preparation.

		Total
"Do your dishwashers have electric booster heaters?"	"Yes"	40%
	"No"	43%
	"Don't know"	17%
Total	Base	92

Base: Respondents with service hot water heating equipment used for dishwashing, sanitizing

Among respondents that use hot water for dishwashing, 40% have electric booster heaters.

		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
What are the main uses for service hot water in the building?	"Washrooms"	76%	80%	92%	85%	84%	89%
	"Dishwashing, sanitizing"	67%	54%	17%	46%	39%	32%
	"Food preparation, clean-up"	75%	58%	14%	47%	16%	28%
	"Laundry"	56%	19%	12%	39%	7%	28%
	"Showers, bathing"	54%	10%	26%	41%	12%	15%
	"Building maintenance"	27%	21%	22%	32%	19%	20%
	"Manufacturing, process water"	4%		15%	11%		4%
	"Car washing"			3%	13%		10%
	"Other"		12%	3%	4%		2%
	"Swimming pools, hot tubs"	5%	1%				4%
	"Data Management"		2%				
	"Don't know"				2%		
Total	Responses	131	169	95	110	48	151
	Base	36	66	47	34	27	65

Base: Respondents with service hot water heating equipment
Column percentages may exceed 100% because multiple responses provided

Use of hot water for dishwashing was lowest in Industrial / Warehouse (17%). Food preparation was most common in the Food Store / Lodgings / Restaurant category (75%) and in Education / Health Care / Public Assembly buildings (58%).
Laundry made up 56% and showers / bathing (54%) of hot water use in Food / Lodging / Restaurant establishments.

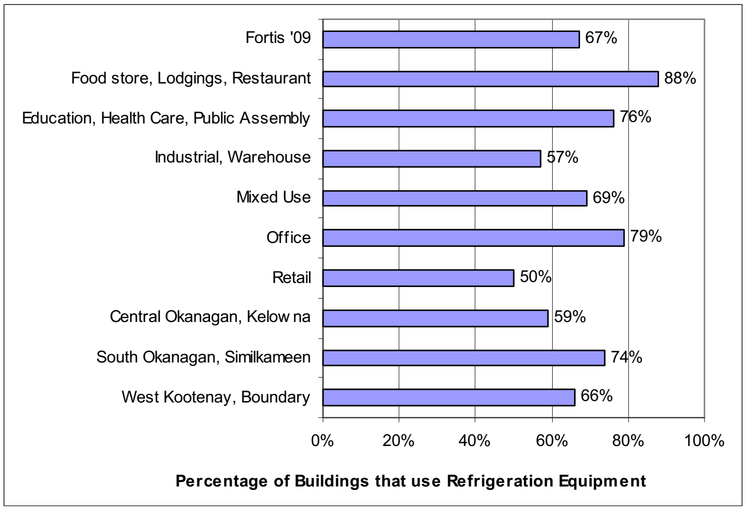
		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
What are the main uses for service hot water in the building?	"Washrooms"	93%	80%	82%
	"Dishwashing, sanitizing"	41%	46%	38%
	"Food preparation, clean-up"	26%	50%	44%
	"Laundry"	25%	33%	21%
	"Showers, bathing"	22%	28%	21%
	"Building maintenance"	15%	28%	25%
	"Manufacturing, process water"	4%	9%	2%
	"Car washing"	4%	6%	4%
	"Other"	4%	4%	5%
	"Swimming pools, hot tubs"	1%	3%	2%
	"Data Management"	1%		
	"Don't know"			1%
Total	Responses	210	308	201
	Base	88	108	82

Base: Respondents with service hot water heating equipment
Column percentages may exceed 100% because multiple responses provided

Fifty percent of the hot water produced in buildings in the South Okanagan is used for food preparation and clean-up, compared to 26% in the Central Region. Only 15% of hot water is used for building maintenance in the Central Region compared to the South Okanagan (28%) and 21% in the West Kootenay.

J. Refrigeration Equipment

63. Is there refrigeration equipment used on your electrical account?



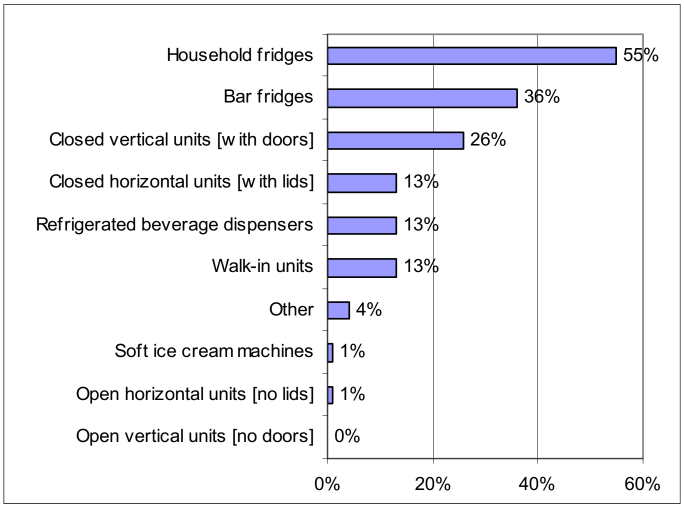
Almost 7 in 10 businesses have refrigeration equipment, with Food Stores / Lodgings / Restaurants being the most likely to have this type of equipment (88%). Retail (50%) and Industrial / Warehouse (57%) facilities are the least likely.

Refrigeration equipment is less likely to be found in the Central Region (59%) possibly due to a higher concentration of retail.

Please note that the rest of this section summarizes responses given by respondents with refrigeration equipment only.

64. Please indicate the number and total capacity of each of the following refrigeration units used in the building.

Type of refrigeration units used in building



Among businesses with refrigeration equipment, Household (55%) and Bar (36%) fridges make up the majority of refrigeration units.

Industrial units, which include closed vertical (26%) and horizontal (13%) units make up the next largest group. Walk-in units (13%) and beverage dispensers (13%) follow.

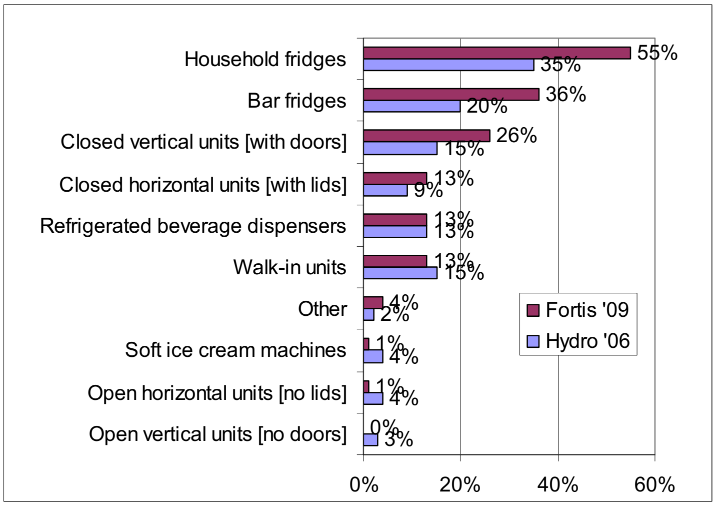
		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
Type of refrigeration units in the building	Household fridges	50%	59%	49%	80%	56%	40%
	Bar fridges	46%	30%	29%	16%	43%	46%
	Closed vertical units [with doors]	58%	31%	14%	18%	6%	18%
	Closed horizontal units [with lids]	39%	9%	9%	12%		10%
	Refrigerated beverage dispensers	15%	6%	12%	8%	19%	21%
	Walk-in units	37%	6%	13%	8%		13%
	Other	9%	2%	3%	4%		6%
	Soft ice cream machines	5%					1%
	Open horizontal units [no lids]	5%					
	Open vertical units [no doors]	3%					
Total	Responses	101	86	46	47	38	71
	Base	38	60	35	32	30	46

Base: Respondents with refrigeration units used in building
Column percentages may exceed 100% because multiple responses provided

Mixed Use buildings are the most likely to have regular household fridges (80%) with very few other types of refrigeration on site.

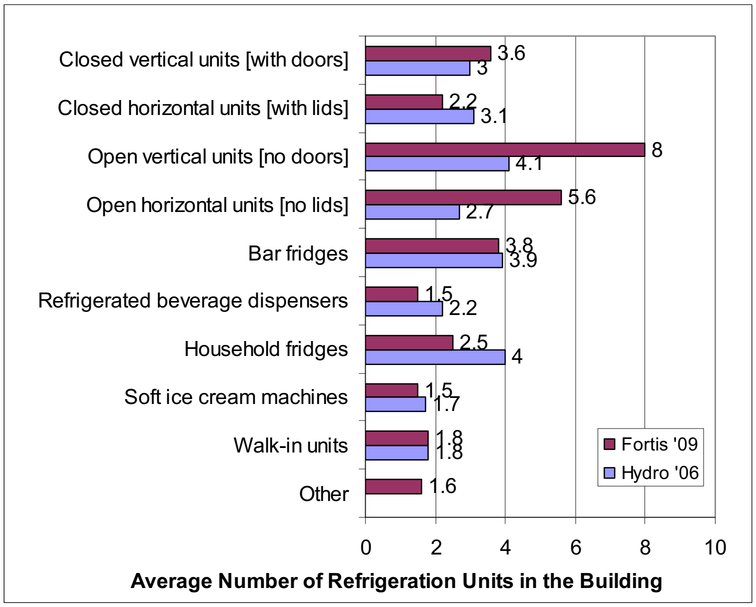
Food Stores / Lodgings / Restaurants have the widest number of refrigeration types especially the closed vertical (58%) and horizontal (39%) types and walk-in units (37%).

Retailers also have a variety of refrigeration units, especially beverage dispensers.



There is a higher percentage of household and bar fridges among FortisBC customers compared to the Hydro sample.

Number of Refrigeration Units



Although the number of buildings with open vertical (5%) and horizontal (3%) units is very low, the number of units per site is the highest - verticals 8/site and horizontals 5.6/site.

Typical Size

Please indicate the total capacity of refrigeration units used in the building:

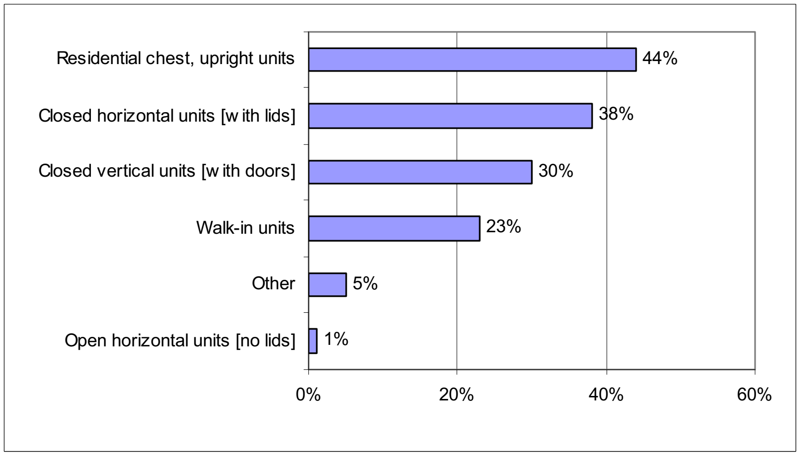
			Type of building					
		Total	Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
Closed vertical units [with doors]	Mean linear ft	18	31	6	2	14	8	4
	Base	26	12	7	1	3	1	2
Closed horizontal units [with lids]	Mean linear ft	8	9	.	3	10	.	6
	Base	12	8	0	1	1	0	1
Open vertical units [no doors]	Mean linear ft	4	4	.	.	.	.	.
	Base	1	1	0	0	0	0	0
Open horizontal units [no lids]	Mean linear ft	12	12	.	.	.	.	.
	Base	1	1	0	0	0	0	0
Bar fridges	Mean cubic ft	8	17	4	5	9	4	4
	Base	45	11	5	6	2	9	11
Refrigerated beverage dispensers	Mean cubic ft	5	8	2	.	3	5	5
	Base	10	1	1	0	1	4	2
Household fridges	Mean cubic ft	13	13	14	15	13	10	11
	Base	66	8	17	5	18	6	11
Soft ice cream machines	Mean cubic ft	1	1	.	.	.	.	.
	Base	1	1	0	0	0	0	0
Walk-in units	Mean cubic ft	1254	192	600	4945	200	.	598
	Base	16	8	1	3	1	0	3
Other	Mean cubic ft or linear ft	217706	10	.	15	921140	.	3
	Base	5	1	0	1	1	0	1

Base sizes include only cases where average capacity provided
Average capacity do not include zeros

As would be expected, Industrial / Warehouse facilities have large walk-in refrigeration units (4945 cubic ft). One Mixed Use facility reports a massive refrigeration unit of over 900,000 cubic ft.

65. Please indicate the number and total capacity of each of the following freezer units used in the building?

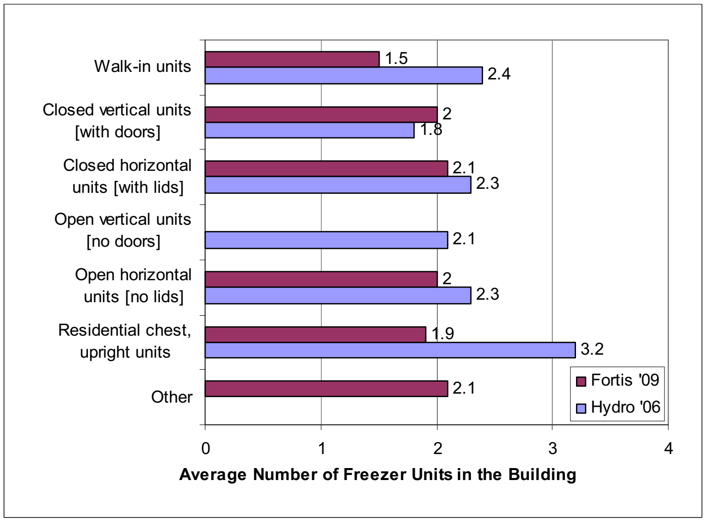
Type of Freezer Units used in building



Base: businesses with freezer units

Among businesses with freezer units, Residential chest upright freezers are found in 44% of buildings. Thirty-eight percent of the buildings have horizontal freezer units and 30% vertical freezers. Twenty-three percent of buildings have walk-in units.

Number of Freezer Units



Among businesses with walk-in units, the average number of units is 1.5. Among businesses with other types of freezer units, most have an average of about 2 units.

Capacity of Freezer Units

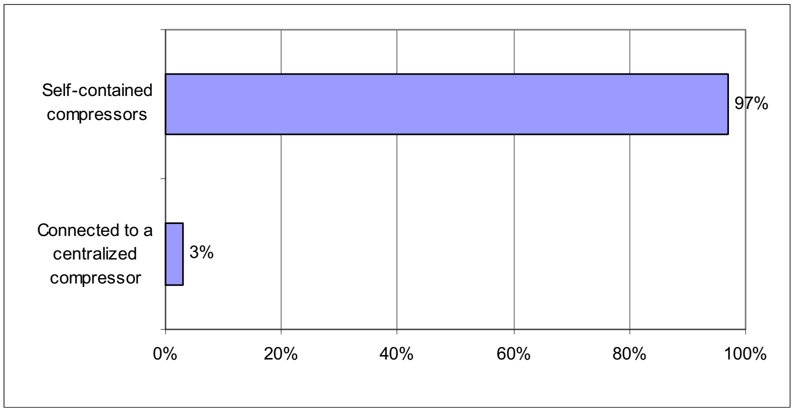
Please indicate the total capacity of freezer units used in the building:

			Type of building					
		Total	Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
Walk-in units	Mean cubic ft	638	201	.	911	2000	.	.
	Base	13	7	0	5	1	0	0
Closed vertical units [with doors]	Mean linear ft	27	29	.	.	14	.	.
	Base	10	9	0	0	1	0	0
Closed horizontal units [with lids]	Mean linear ft	10	9	9	21	20	6	5
	Base	15	6	4	1	1	1	2
Residential chest, upright units	Mean cubic ft	13	14	11	9	14	18	10
	Base	24	10	4	1	5	1	3
Other	Mean cubic ft, linear ft	3	.	.	2	4	.	.
	Base	2	0	0	1	1	0	0

Base sizes include only cases where average capacity provided
Average capacity do not include zeros

Among respondents who provided a capacity for their walk- in units, the average capacity was 638 cubic feet.

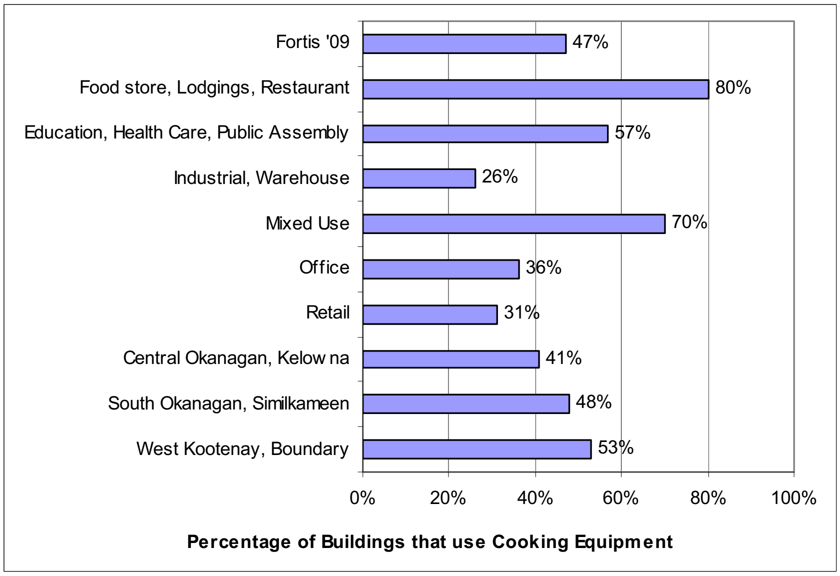
66. What percentage of your refrigerator/freezer units have self-contained compressors and what percent are connected to a centralized compressor, usually located in an equipment room?



Almost all (97%) of the freezer units were reported to have self-contained compressors.

K. Cooking Equipment

67. Is there cooking equipment used on your electrical account?



Less than half the buildings in the sample have cooking equipment on their electrical account.

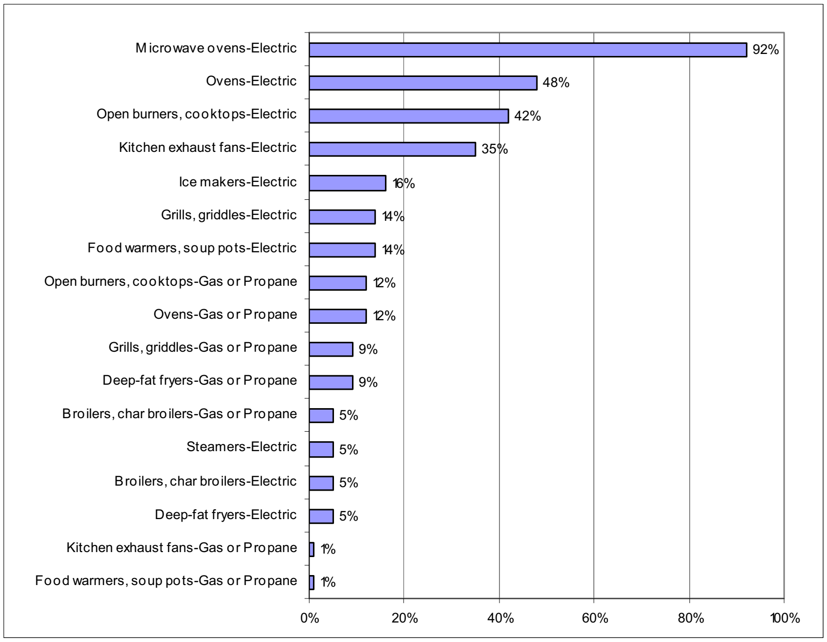
Food Stores / Lodgings / Restaurants (80%) and Mixed Use buildings (70%) being the highest and Industrial / Warehouse facilities the lowest (26%).

The highest incidence occurs in the West Kootenay (53%) and the lowest in the Central Region (41%).

Please note that the rest of this section summarizes responses given by respondents with cooking equipment only.

68. Please estimate the number of appliances in the building that use electricity, natural gas, or propane.

Type of Electrical, Natural Gas or Propane Appliances used in Building



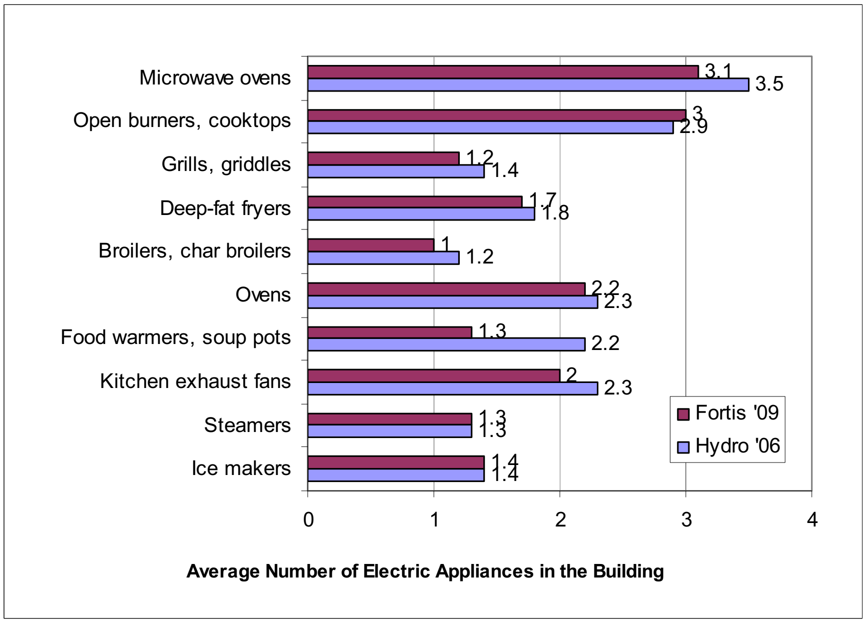
Among respondents with cooking equipment, Microwaves are found in almost all buildings (92%), whereas electric ovens (48%) and electric cooktops (42%) are not as common.

		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
Appliances in the building that use electricity, gas or propane	Microwave ovens-Electric	88%	93%	93%	83%	100%	96%
	Ovens-Electric	57%	64%	26%	45%	17%	37%
	Open burners, cooktops-Electric	54%	59%	22%	43%	16%	20%
	Kitchen exhaust fans-Electric	64%	45%		24%	8%	30%
	Ice makers-Electric	48%	1%	7%	8%	8%	15%
	Grills, griddles-Electric	20%	13%		11%	8%	24%
	Food warmers, soup pots-Electric	45%	9%		6%		13%
	Ovens-Gas or Propane	30%	15%		8%		4%
	Open burners, cooktops-Gas or Propane	30%	9%		4%		15%
	Deep-fat fryers-Gas or Propane	32%			11%		5%
	Grills, griddles-Gas or Propane	24%	5%		11%		2%
	Steamers-Electric	15%	1%		4%		9%
	Broilers, char broilers-Gas or Propane	24%			4%		
	Broilers, char broilers-Electric	10%			4%		13%
	Deep-fat fryers-Electric	8%	2%		4%		11%
	Kitchen exhaust fans-Gas or Propane		3%		3%		
	Food warmers, soup pots-Gas or Propane				3%		
Total	Responses	187	159	25	98	24	87
	Base	34	50	17	35	15	30

Base: Respondents with cooking equipment
Column percentages may exceed 100% because multiple responses provided

It certainly seems that apart from the use of microwaves, little cooking is performed in Offices and Industrial / Warehouses. Not surprisingly, propane stoves, grills, and fryers occur most frequently in the Food Store / Lodgings / Restaurant category.

Number of Electric Appliance Units



Among buildings with microwave ovens, the average number of microwave ovens is 3.1 and the average number of open burners/ cooktops is 3.0. Similar results were noted between the Fortis 2009 and BC Hydro 2006 study regarding numbers of electric food production appliances.

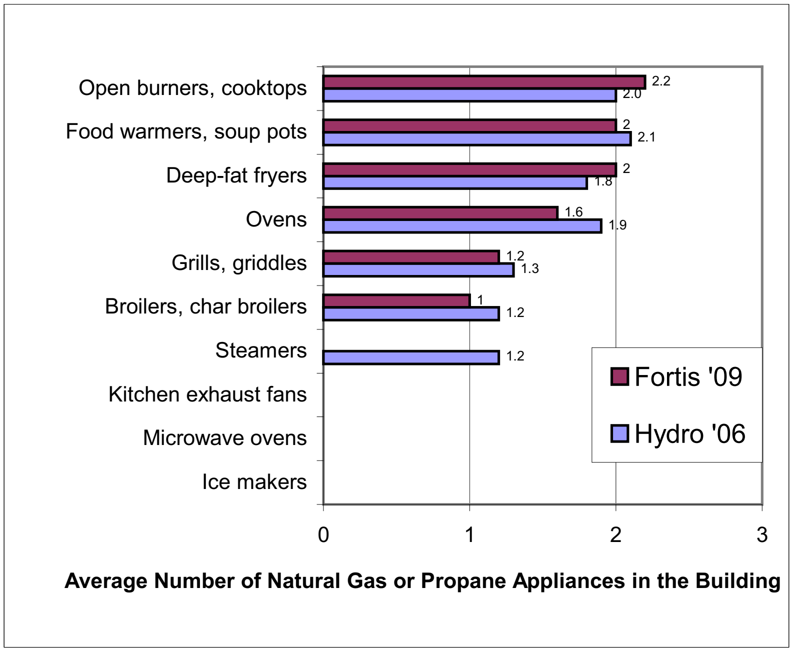
Please estimate the number of electric appliances in the building:

		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
Microwave ovens	Mean Units	10.0	1.5	1.1	2.0	1.4	1.8
	Base	30	46	16	30	15	29
Open burners, cooktops	Mean Units	6.6	2.2	1.4	1.6	1.5	1.7
	Base	18	29	4	15	2	6
Grills, griddles	Mean Units	1.3	1.4	.	1.0	1.0	1.1
	Base	7	7	0	4	1	7
Deep-fat fryers	Mean Units	2.0	1.0	.	1.0	.	2.0
	Base	3	1	0	1	0	3
Broilers, char broilers	Mean Units	1.0	.	.	1.0	.	1.0
	Base	3	0	0	1	0	4
Ovens	Mean Units	4.8	1.5	1.3	1.4	1.0	1.5
	Base	19	32	4	16	3	11
Food warmers, soup pots	Mean Units	1.4	1.0	.	1.0	.	1.8
	Base	15	4	0	2	0	4
Kitchen exhaust fans	Mean Units	2.5	2.2	.	1.1	2.0	1.1
	Base	22	22	0	9	1	9
Steamers	Mean Units	1.5	2.0	.	1.0	.	1.0
	Base	5	1	0	1	0	3
Ice makers	Mean Units	1.5	1.0	1.0	1.0	3.0	1.4
	Base	16	1	1	3	1	5

Base: respondents with cooking equipment; Base includes only cases where at least one appliance listed
Averages do not include zero appliances

In most buildings there are 1 to 2 microwaves and cooktop stoves and ovens. In the Food / Lodgings / Restaurant category, there is an average of 10 microwaves, 7 electrical cooktops, and 5 ovens.

Number of Natural Gas or Propane Appliances Units



Among businesses with open burners/ cooktops, they had an average of 2.2. The results for Fortis and Hydro were similar.

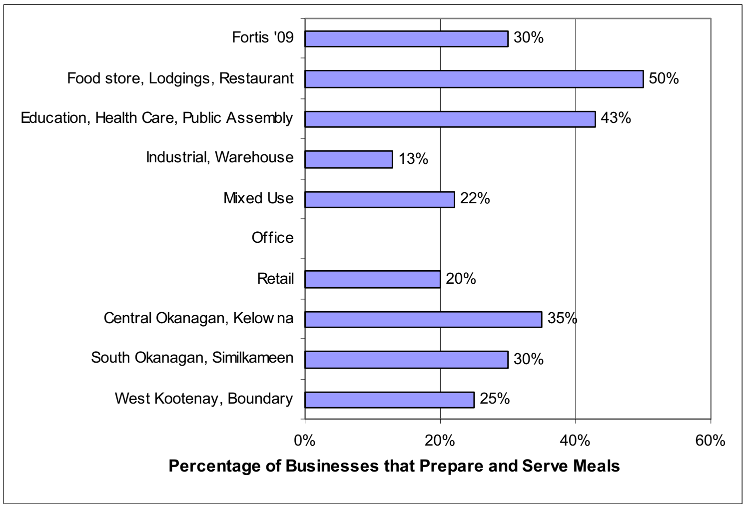
Please estimate the number of natural gas or propane appliances in the building:

		Type of building			
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Mixed Use	Retail
Microwave ovens	Mean Units	.	.	.	.
	Base	0	0	0	0
Open burners, cooktops	Mean Units	1.8	3.8	4.0	1.0
	Base	10	5	1	4
Grills, griddles	Mean Units	1.3	1.0	1.0	1.0
	Base	8	3	4	1
Deep-fat fryers	Mean Units	2.3	.	1.3	2.0
	Base	11	0	4	1
Broilers, char broilers	Mean Units	1.0	.	1.0	.
	Base	8	0	1	0
Ovens	Mean Units	1.8	1.4	1.5	1.0
	Base	10	7	3	1
Food warmers, soup pots	Mean Units	.	.	2.0	.
	Base	0	0	1	0
Kitchen exhaust fans	Mean Units	.	.	.	.
	Base	0	0	0	0
Steamers	Mean Units	.	.	.	.
	Base	0	0	0	0
Ice makers	Mean Units	.	.	.	.
	Base	0	0	0	0

Base: respondents with cooking equipment; Base includes only cases where at least one appliance listed
Averages do not include zero appliances

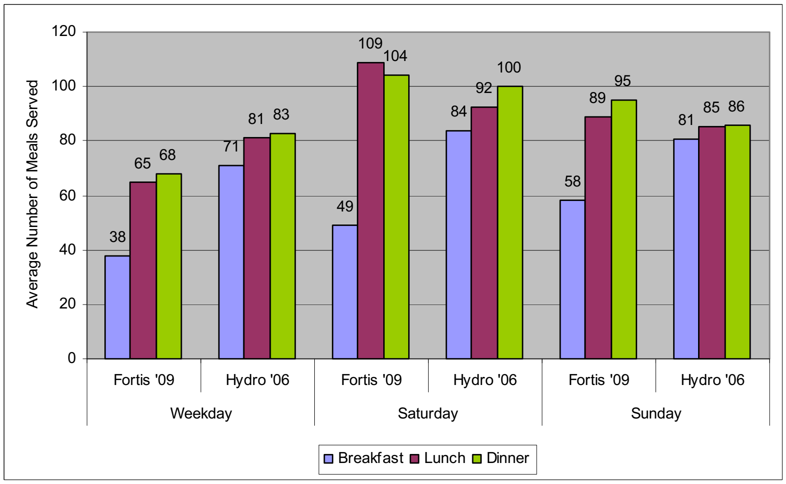
Gas stoves are more likely found in facilities that cater to larger numbers of people - the Education / Health Care / Public Assembly (3.8 stoves) and Mixed Use (4.0 stoves).

69a. Does your business prepare and serve meals?



Thirty percent of survey respondents indicated that meals were prepared on their premises with the highest being the Food Store / Lodgings / Restaurant category (50%), Education / Health Care / Public Assembly (43%), and lowest in Office buildings (0%).

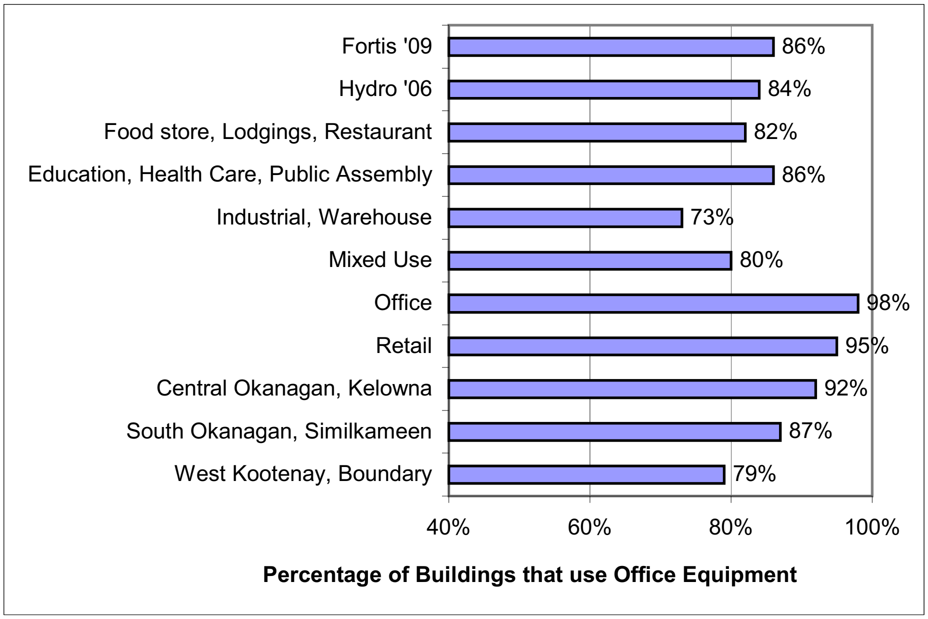
69b. If yes, please indicate the typical number of meals served in one day for each type of day:



Saturday meal production is the highest for lunches (109 meals) and dinner (104 meals). There are more Sunday breakfasts produced (58 meals) than on Saturday (49 meals) and midweek (38 meals).

L. Office Equipment and Other Commercial Equipment

70a. Is there office equipment used on your electrical account?

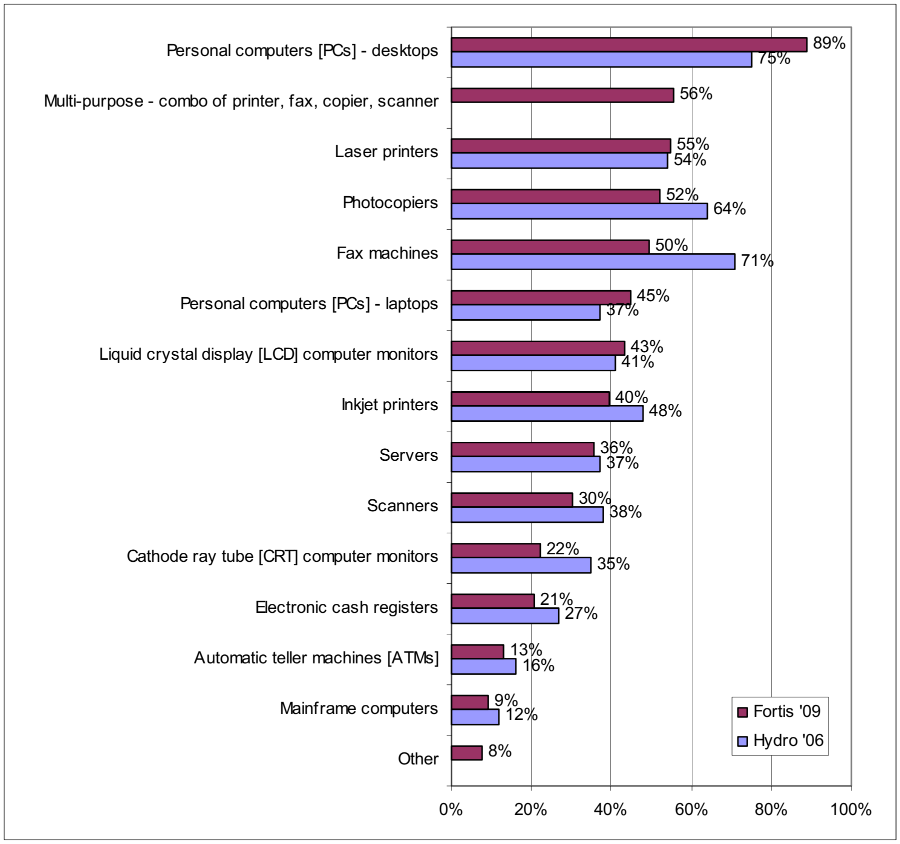


86% of all buildings have business machines that are electrically powered, led by Offices at 98% and the lowest being Industrial / Warehouse facilities at 73%.

Reflecting the different business / industrial structure of the three regions, 92% of Central Region buildings have electric office equipment on-site compared to 87% in the South Okanagan and 79% in the West Kootenay.

70b. Please estimate the number of each type of office equipment present in the building.

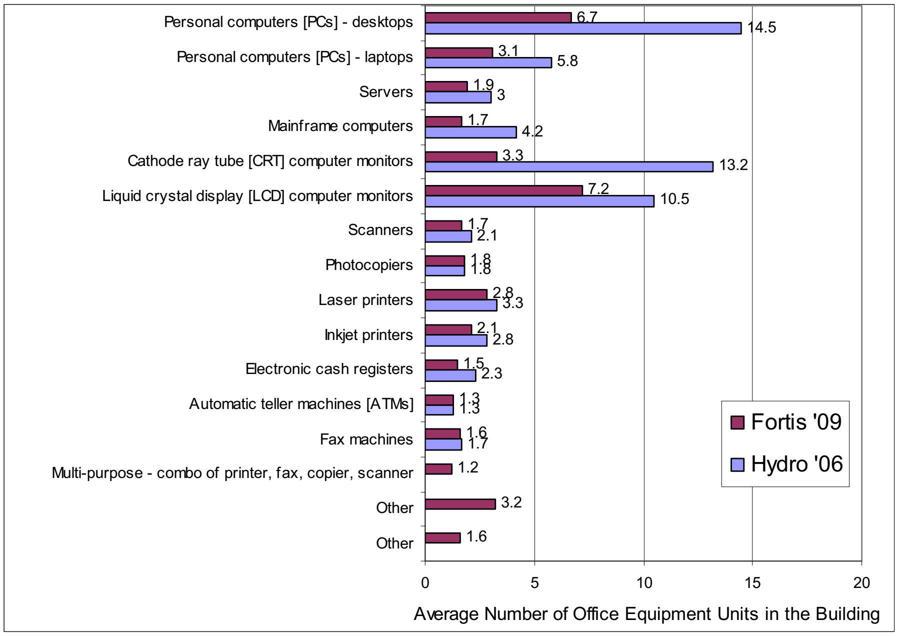
Type of Equipment Used



Desktop personal computers are present in almost 90% of buildings with office equipment. Fifty percent or more have multi-purpose combo's (printers, fax, copier, scanner), laser printers, photocopiers, and fax machines.

Reflecting technological change, more desktop and laptop PCs were reported in the 2009 survey than in 2006. Multi-purpose combinations were added to the survey and photocopiers and fax machines were less reported.

Number of Units



The results from the Fortis 2009 survey of the number of units of various office equipment shows significantly lower numbers than BC Hydro's 2006 survey.

How many of the following Office equipment items do you have?

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
Personal computers [PCs] – desktops	Mean Units	9.6	4.9	5.5
	Base	105	111	69
Personal computers [PCs] – laptops	Mean Units	4.7	2.0	2.6
	Base	52	54	38
Servers	Mean Units	2.2	1.4	2.2
	Base	52	35	28
Mainframe computers	Mean Units	1.1	1.5	3.6
	Base	13	11	6
Cathode ray tube [CRT] computer monitors	Mean Units	4.0	2.8	2.7
	Base	33	23	16
Liquid crystal display [LCD] computer monitors	Mean Units	6.9	7.8	7.2
	Base	59	43	37
Scanners	Mean Units	2.0	1.5	1.4
	Base	41	34	22
Photocopiers	Mean Units	2.6	1.4	1.5
	Base	58	66	42
Laser printers	Mean Units	3.5	2.5	2.2
	Base	69	64	44
Inkjet printers	Mean Units	2.6	1.8	1.9
	Base	47	53	26
Electronic cash registers	Mean Units	1.1	1.7	1.6
	Base	12	31	23
Automatic teller machines [ATMs]	Mean Units	1.8	1.2	1.2
	Base	12	18	13
Fax machines	Mean Units	2.4	1.2	1.3
	Base	57	58	45
Multi-purpose – combo of printer, fax, copier, scanner	Mean Units	1.3	1.2	1.2
	Base	73	62	43
Other	Mean Units	1.2	1.6	6.9
	Base	6	7	6
Other	Mean Units	1.0	1.0	2.3
	Base	1	1	3

Base includes only cases where at least one type of office equipment listed
Averages do not include zero units

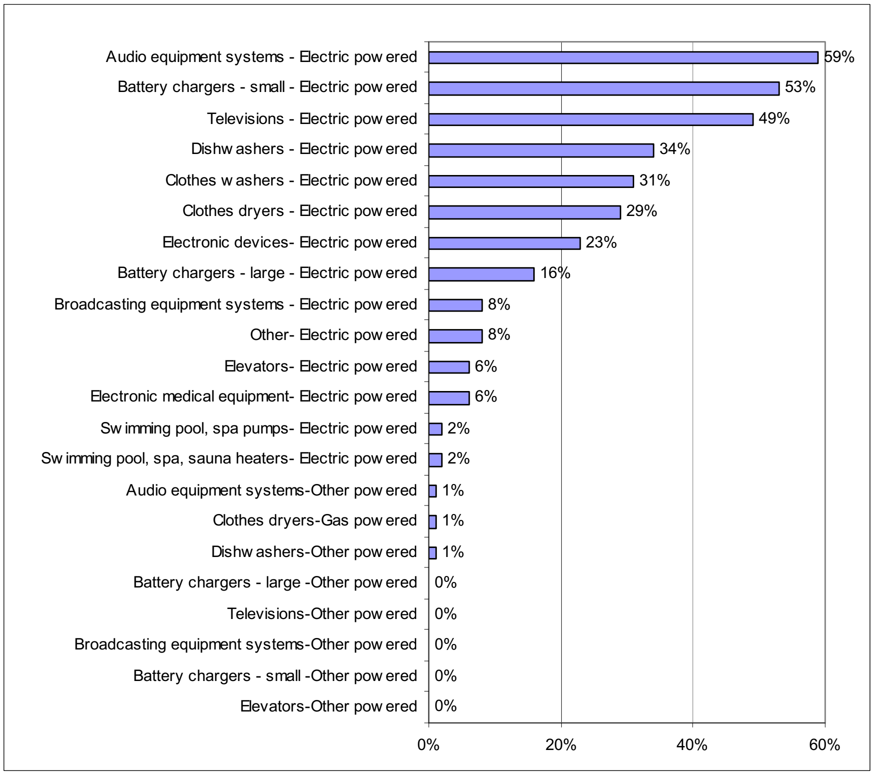
Buildings in the Central Okanagan have approximately twice as many desktop and laptop computers than the other two regions:
Desktops:
- Central 9.6
- South 4.9
- West Kootenay 5.5

Laptops:
- Central 4.7
- South 2.0
- West Kootenay 2.6

but fewer mainframes:
- Central 1.1
- South 1.5
- West Kootenay 3.6

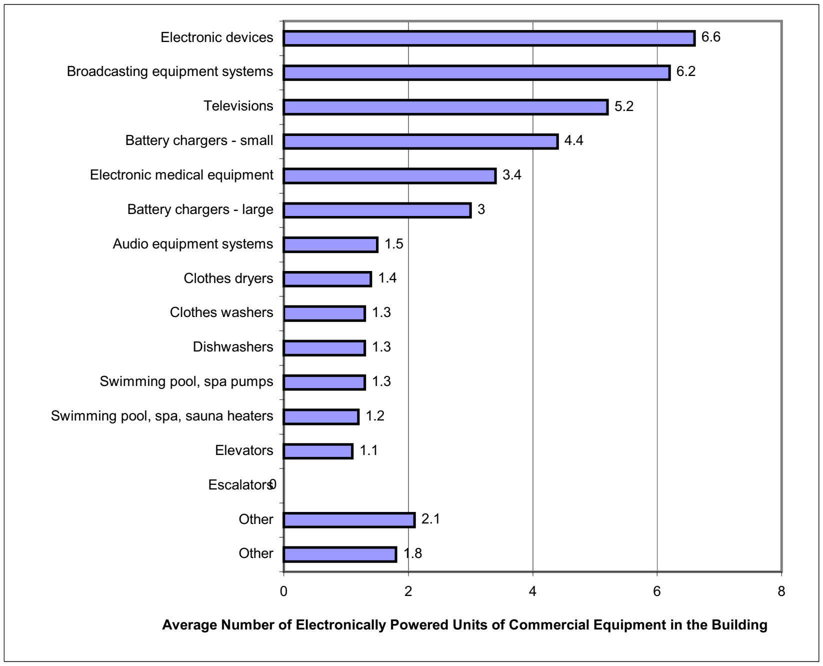
71. Number of units for each type of other commercial equipment used in the building.

Commercial equipment used in the building and the type of energy powering the equipment (Electric, Gas or Other powered)



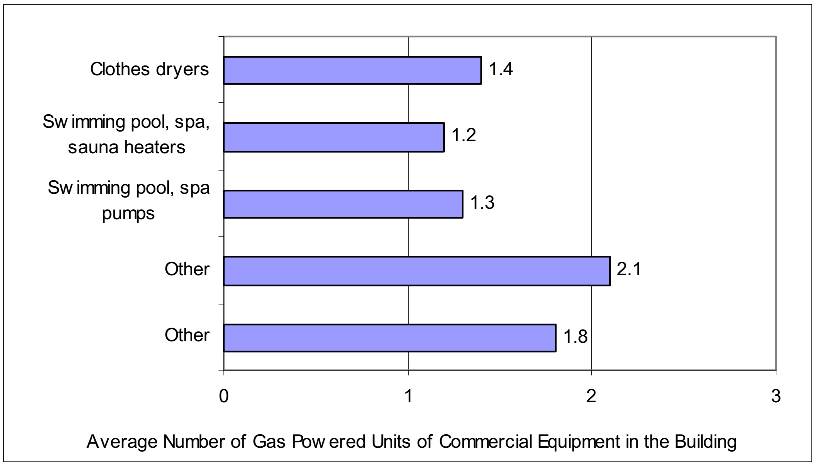
The majority of businesses (59%) have electronic audio equipment and small battery chargers (53%).

Electronically Powered Units



Among businesses that reported having electronic devices, the average number of devices was 6.6. The average number of electrically powered broadcasting equipment systems was 6.2.

Gas Powered Units

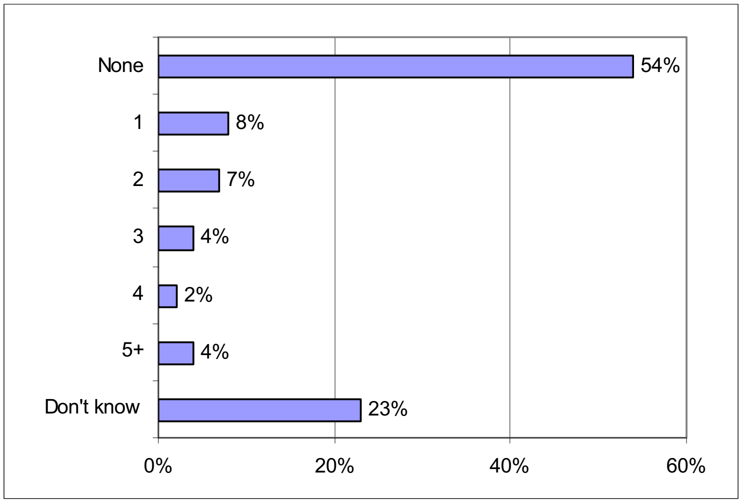


Gas powered commercial equipment is essentially restricted to laundry and swimming pool applications. Businesses with gas powered clothes dryers had an average of 1.4.

Only a few businesses used other sources of energy to power other commercial equipment. The sample size was 1 or less for most instances.

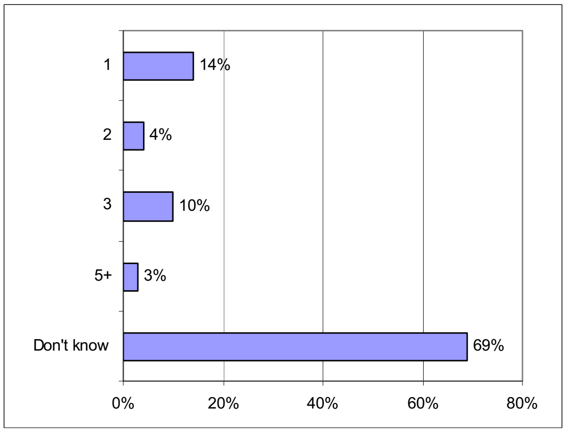
72. How many Uninterruptible Power Supplies (UPS) for systems are there within the building?

The majority of respondents who were aware of UPS protection reported none were installed in their buildings (54%).

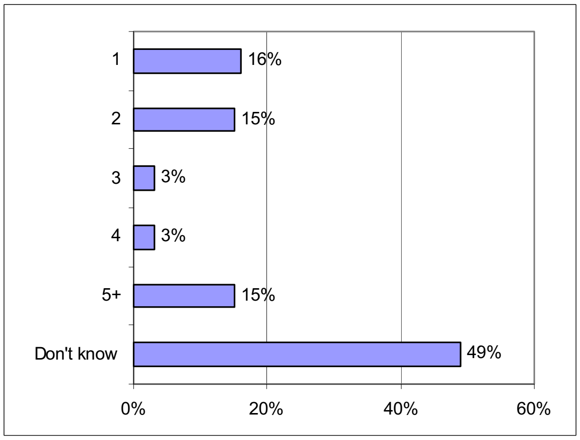


If 1 UPS or more, please indicate how many were installed before 1998.

The majority of respondents did not know when the uninterrupted power source was installed.

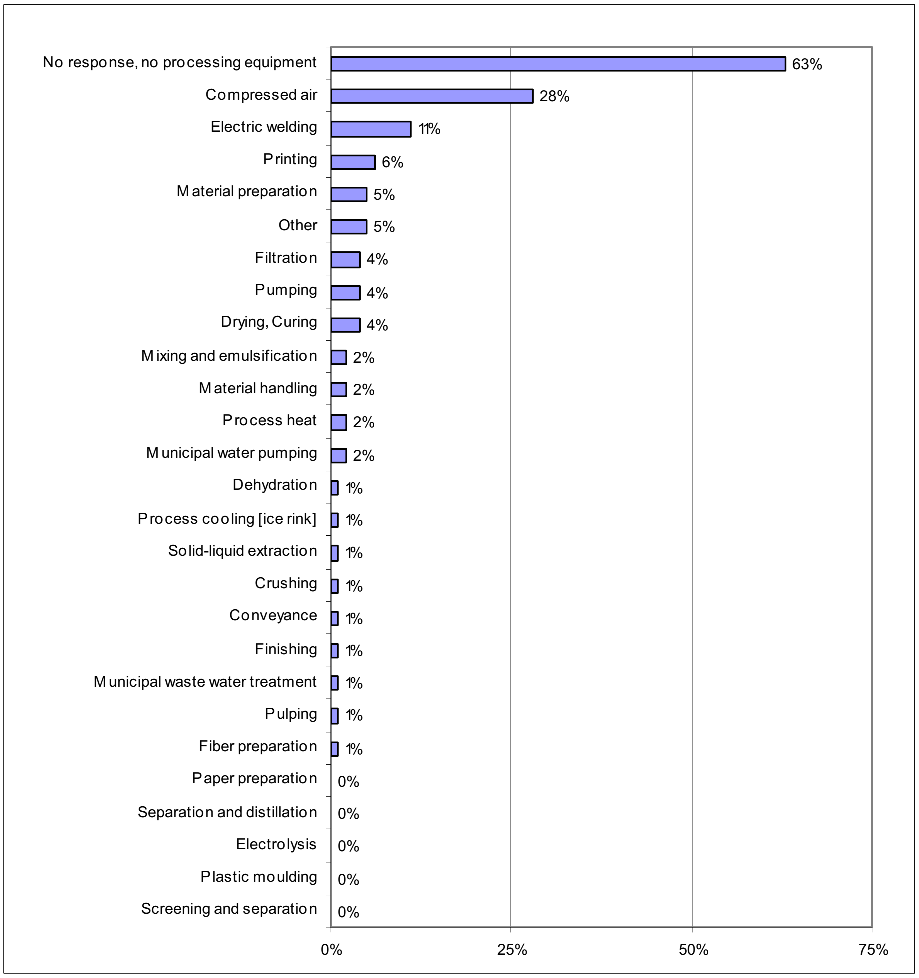


If 1 UPS or more, please indicate how many were installed after 1998.



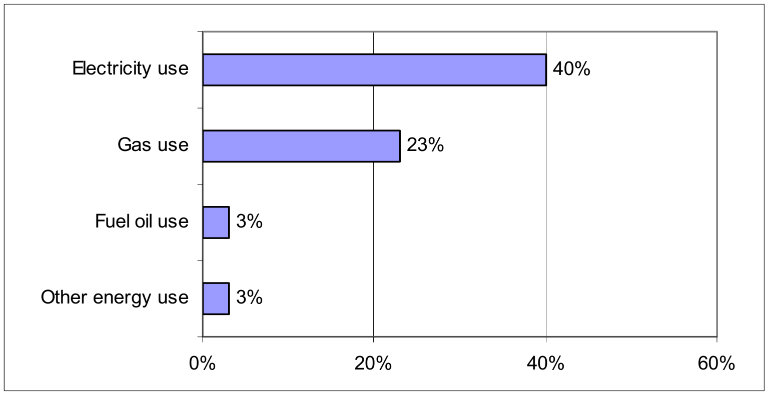
M. Process Equipment

73. Please check the types of process equipment, if any, being used on your electrical bill.



Apart from air compressors and electric welding equipment, very few respondents reported process equipment being electrically powered.

74. What percentage of the annual energy use for this space is for industrial purposes?



Among businesses that use energy for industrial purposes, on average 40% of the electricity used and 23% of gas used is for industrial processes.

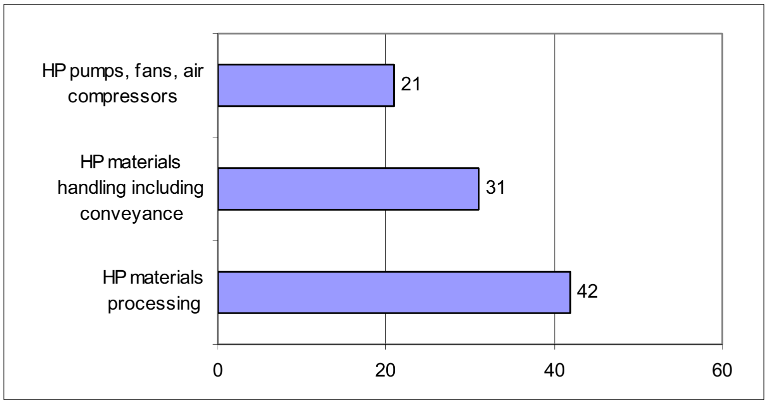
What percentage of annual energy use for this space is for industrial purposes?

		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
"Electricity use"	Mean %	16%	6%	78%	44%	28%	28%
	Base	17	32	54	28	22	50
"Gas use"	Mean %	11%	0%	44%	36%	24%	18%
	Base	16	25	28	15	21	36
"Fuel oil use"	Mean %	0%	0%	15%	0%	7%	0%
	Base	12	22	10	9	17	25
"Other energy use"	Mean %	0%	0%	14%	0%	7%	0%
	Base	12	22	10	9	17	27

Missing values not included
Average percent includes zero percent

The dependence on electricity for powering industrial applications varies widely based on the building category.

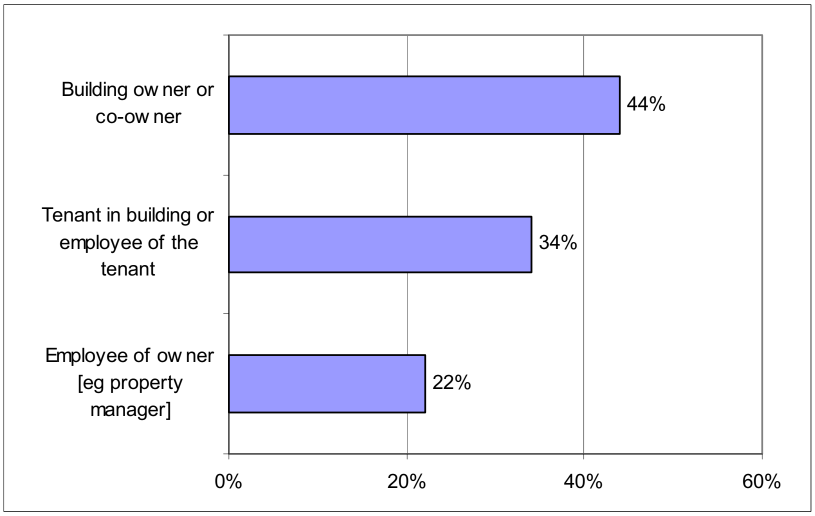
75. Please estimate the total horsepower for each type of motor used in the building?



The HP for motors used for material processing was on average 42.

N. About You

76. What is your relationship to the building?



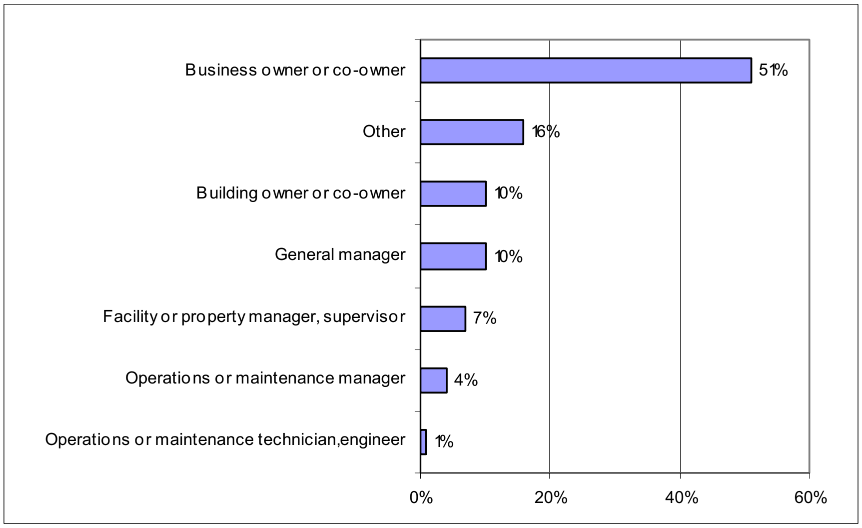
Forty-four percent of respondents were the building owners.

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
"What is your relationship to the building?"	"Building owner or co-owner"	22%	53%	58%
	"Tenant in building or employee of the tenant"	57%	24%	21%
	"Employee of owner [eg property manager]"	21%	23%	22%
Total	Base	122	141	96

The fewest owners come from the Central Okanagan (22%) and the most from the West Kootenay (58%).

Fifty-seven percent of the respondents from the Central Region were tenant or employees of the tenants.

77. Which of the following best describes your position/title within the business:

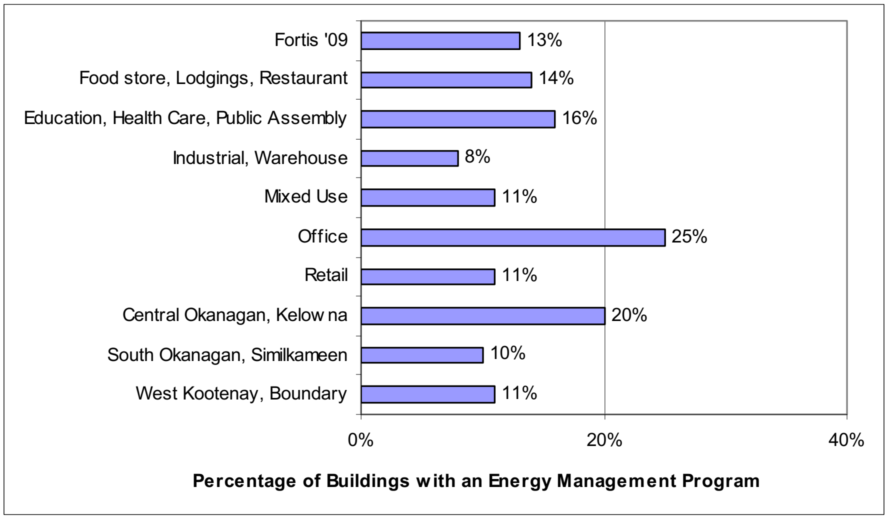


Half of the sample were the business owners.

		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
"Which of the following best describes your position\title within the business:"	"Business owner or co-owner"	67%	25%	59%	48%	28%	74%
	"Other"	9%	28%	17%	9%	20%	11%
	"General manager"	7%	11%	9%	4%	29%	7%
	"Building owner or co-owner"	12%	8%	8%	32%	10%	1%
	"Facility or property manager, supervisor"	1%	15%	5%	3%	10%	5%
	"Operations or maintenance manager"	3%	10%	2%	5%	3%	1%
	"Operations or maintenance technician,engineer"		4%				1%
Total	Base	42	75	65	48	38	90

The fewest business owners come from the Industrial / Warehouse (25%) and Office (28%) sectors, and the largest sub-sample of building owners from Mixed Use buildings (32%).

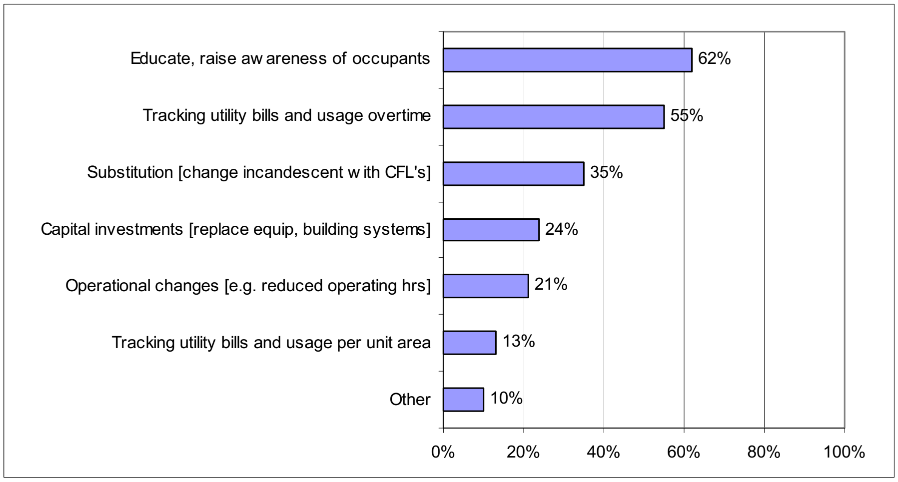
78a. Do you have an Energy Management Program in place?



Thirteen percent of all buildings have an Energy Management Program; Office buildings having the highest (25%) and Industrial / Warehouse facilities the lowest (8%).

Energy Management Programs are twice as frequently found in the Central Okanagan (20%) compared to 10%-11% in the other two regions.

78b. If yes - What energy management activities are going on?



Employee / Occupant education (62%) and monitoring energy use (55%) are the most frequently mentioned methods of managing energy consumption.

		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
If 'Yes' - What energy management activities are going on?	"Educate, raise awareness of occupants"	81%	75%	87%	25%	43%	56%
	"Tracking utility bills and usage overtime"	59%	70%	51%	50%	56%	44%
	"Substitution [change incandescent with CFL's]"	71%	31%	37%	49%	44%	11%
	"Capital investments [replace equip, building systems]"	32%	30%	37%	36%	26%	6%
	"Operational changes [e.g. reduced operating hrs]"		21%	24%	12%	32%	17%
	"Tracking utility bills and usage per unit area"		5%		75%		21%
	"Other"	10%	9%	13%		13%	12%
Total	Responses	16	31	12	13	21	19
	Base	6	13	5	5	10	11

Base: Respondents with energy management programs

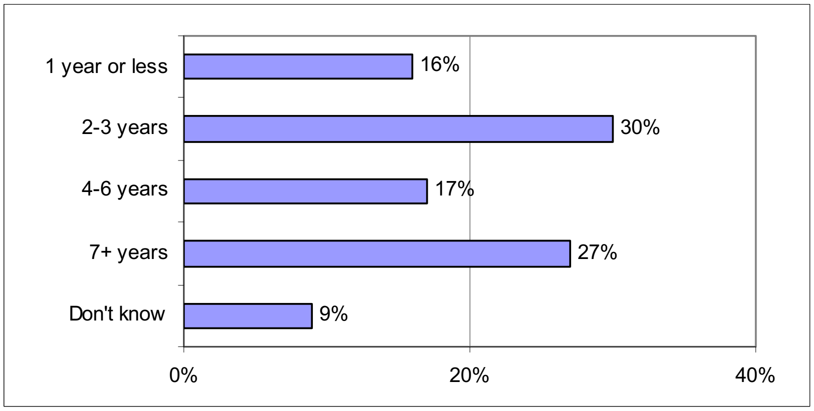
Column percentages may exceed 100% because multiple responses provided

Retailers are the least likely to have spent any monies to manage energy consumption.

Food Store / Lodgings / Restaurants are the most likely to have education in place and to have installed CFL's.

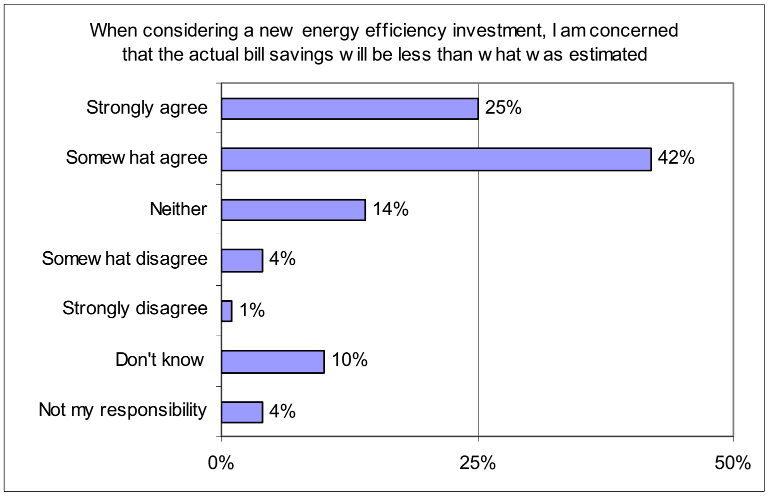
Mixed Use building managers, perhaps due to the higher incidence of owners responding from this category, are monitoring the energy consumption more closely.

78c. If yes – How long has your energy plan been in place?

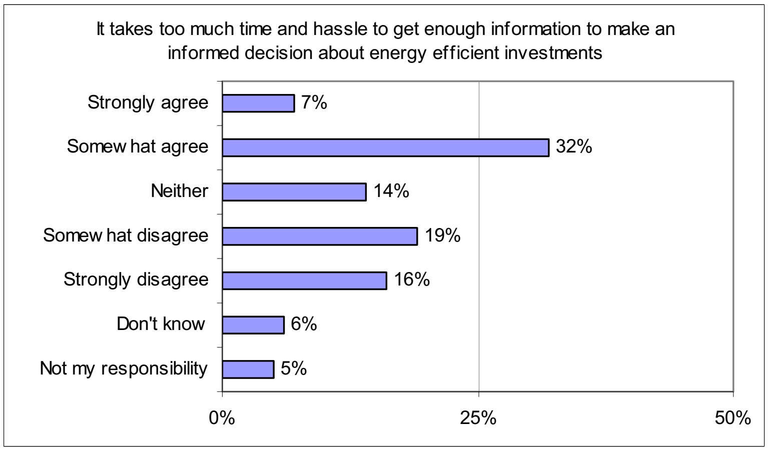


Energy plans are not new. Almost 50% have been in place for 4 years or more.

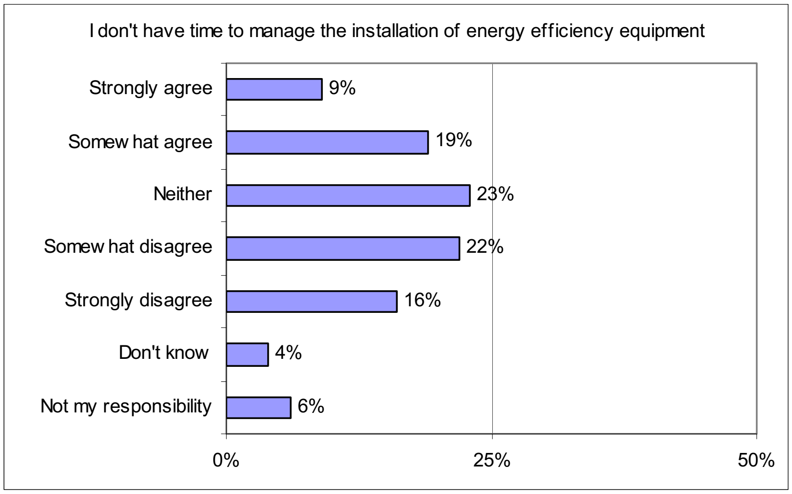
79. How well does each statement describe your beliefs about energy efficient investments or practices?



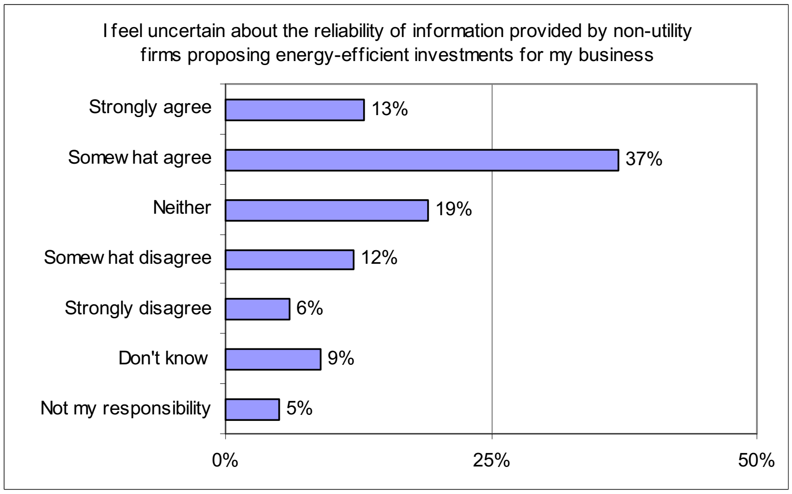
Sixty-seven percent of respondents generally expect that investments in energy efficiency will NOT result in the savings that were estimated.



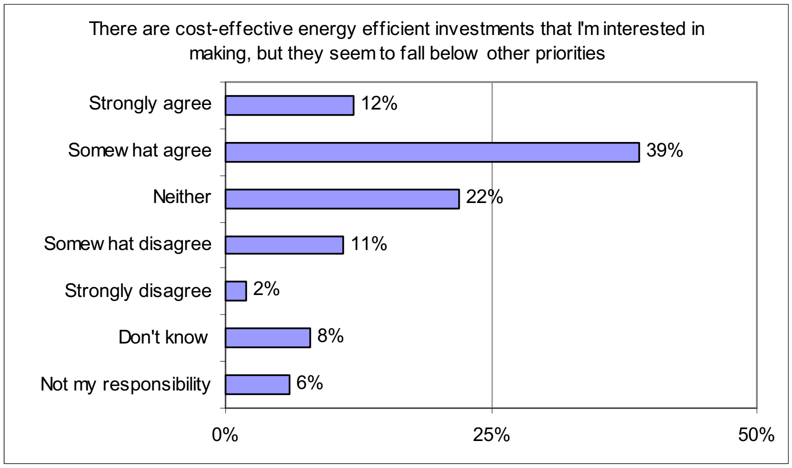
Almost as many respondents believe they have time to get this information on energy efficient investments (35%) compared to the 39% who agreed that such a process takes too much time and hassle.



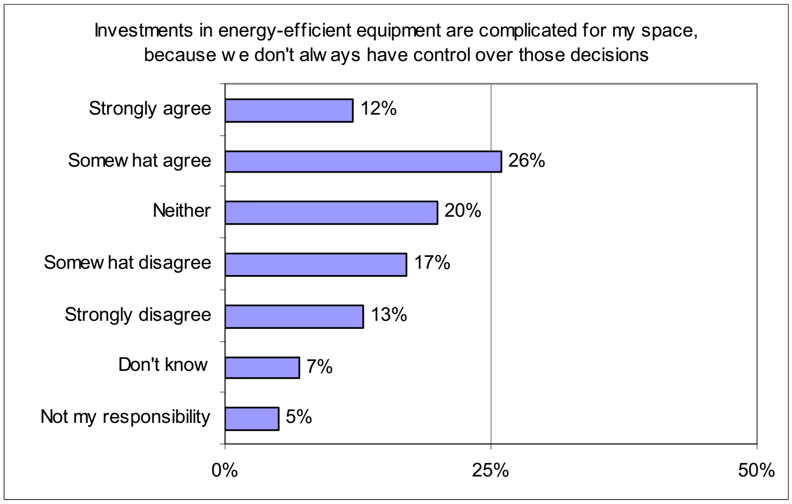
More respondents said they had time to manage the installation of energy efficient equipment (38%) than those who thought they did not have time for this process (28%).



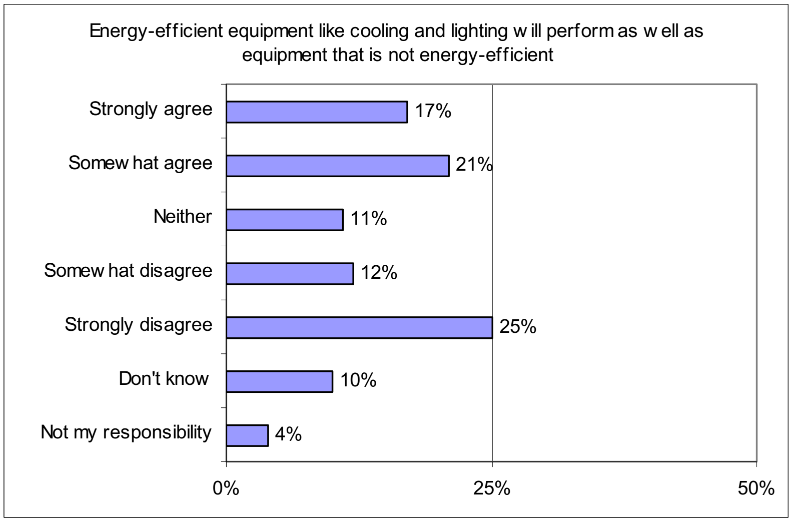
There is an uncertainty about information from non-utilities regarding proposals of energy efficient investments with 50% of those who could answer agreeing with this statement.



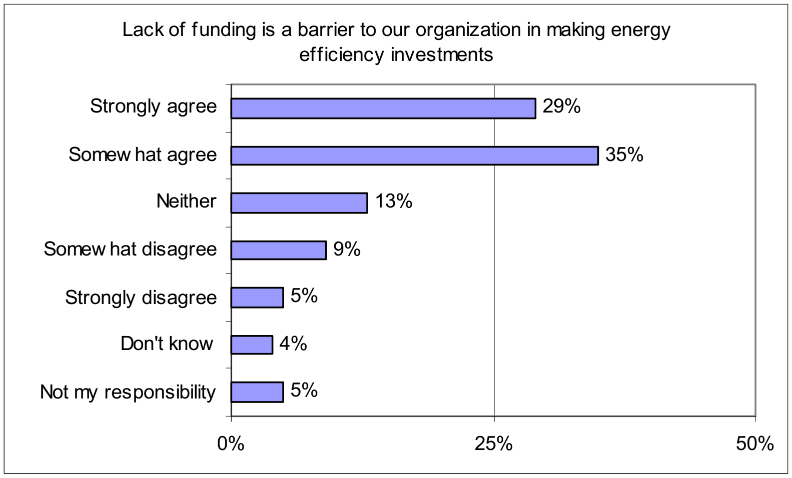
For 51%, energy efficient investments are a lower priority.



Many respondents (38%) agreed making changes to increase energy efficiency is not within their responsibility. Thirty percent, however, did not agree these types of changes would be difficult to implement.



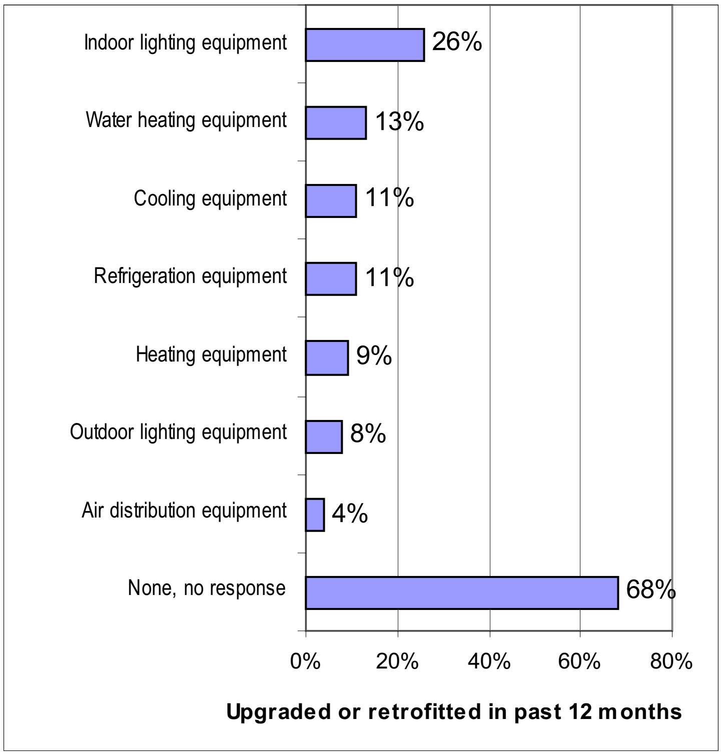
This topic splits the sample with 37% disagreeing about the effect energy efficient cooling and lighting equipment has and 38% agreeing that it could help conserve energy. Twenty-five percent strongly disagreed that such installations were not effective.



Funding, obviously, is a major deterrent to investing in energy efficient programs with 64% agreement.

O. The Business

80a. Which of the following equipment in the building has been significantly upgraded or retrofitted in the last 12 months?

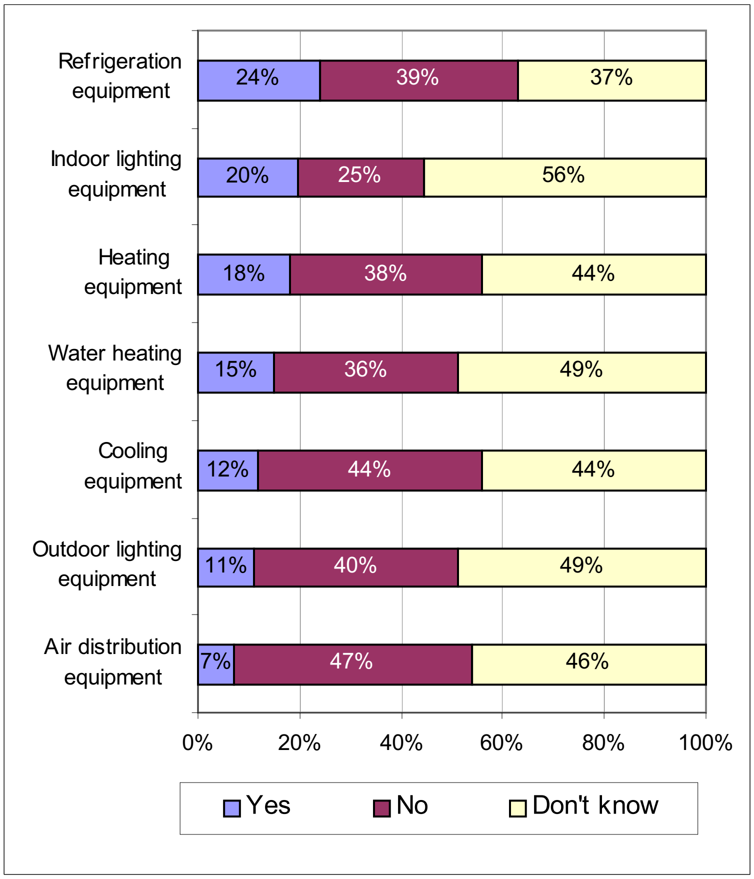


Almost 7 in 10 respondents reported that no upgrading or retrofits had been made in the last 12 months. Of those buildings to which upgrading had been made, 1/4 was for lighting, 1/6 for water heating equipment, and 1/10 had refrigeration and air cooling improvements.

		Type of building					
		Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail
Which of the following equipment in your building has been significantly upgraded or retrofitted in the last 12 months?	None, no response	58%	71%	75%	73%	65%	63%
	Indoor lighting equipment	26%	14%	28%	23%	38%	31%
	Water heating equipment	27%	20%	6%	5%	6%	13%
	Refrigeration equipment	37%	5%	4%	5%	13%	13%
	Cooling equipment	15%	8%	7%	8%	16%	14%
	Heating equipment	13%	8%	9%	9%	6%	11%
	Outdoor lighting equipment	14%	10%	10%	5%	5%	6%
	Air distribution equipment	9%	1%	3%	6%	3%	3%
Total	Responses	88	112	94	65	59	142
	Base	44	81	67	48	38	93

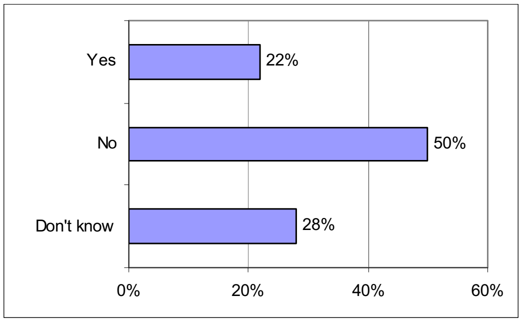
Thirty-eight percent of office buildings have upgraded or retrofitted their indoor lighting equipment in the past 12 months. Thirty-seven percent of Food store/ Lodgings/Restaurants have upgraded or retrofitted their refrigeration equipment in the past 12 months.

Did the upgrade or retrofit result in significant energy savings?



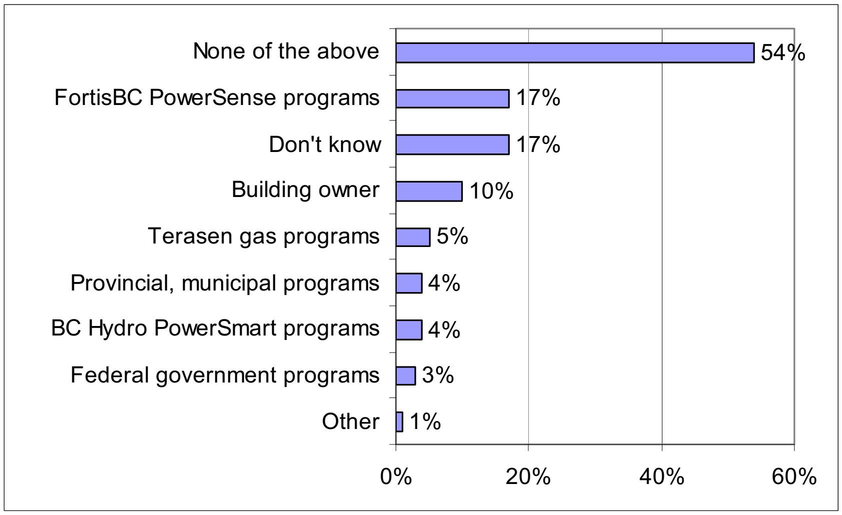
Among businesses that had their refrigeration equipment upgraded or retrofitted, 24% felt this upgrade resulted in significant energy savings. Twenty percent of businesses that upgraded indoor lighting equipment felt this upgrade resulted in significant energy savings. Almost half of respondents were not sure if any of their equipment upgrades or retrofits resulted in significant energy savings.

If the lighting equipment was upgraded, were electronic ballasts installed?



Among those who upgraded indoor lighting equipment, 22% installed electronic ballasts.

80b. Which of the following organizations provided financial assistance for the upgrades to above equipment?



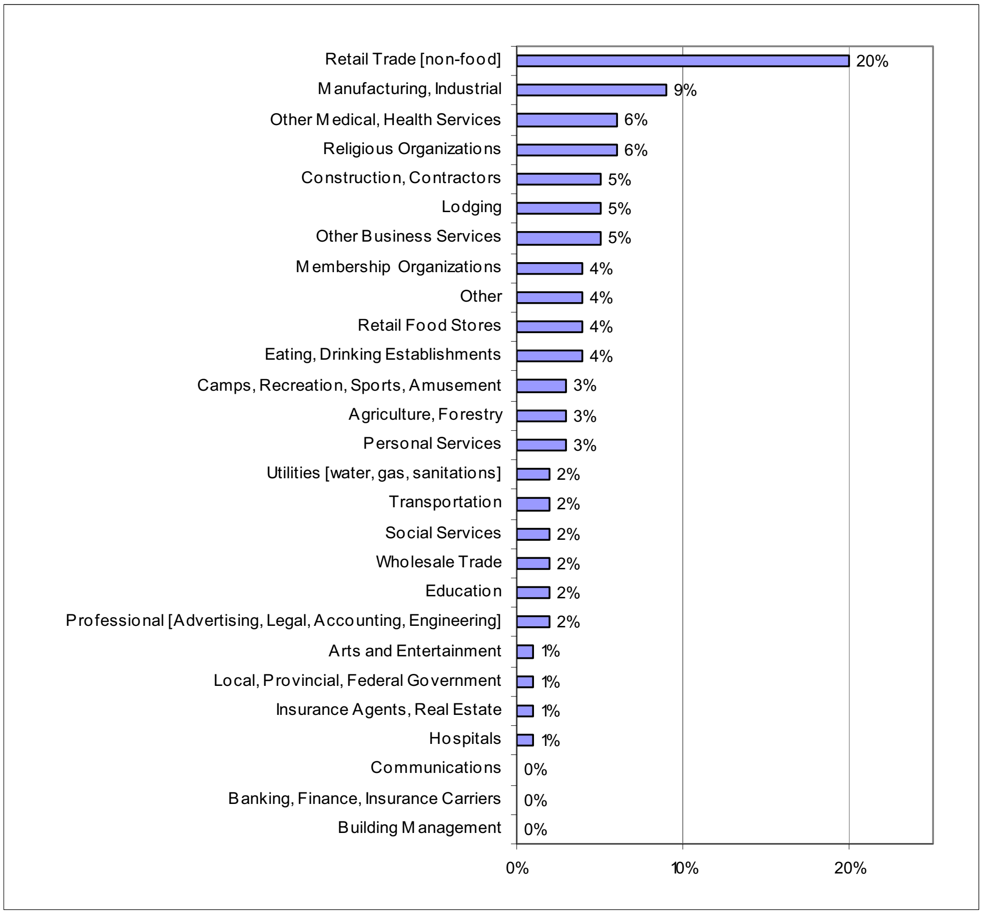
FortisBC helped finance 17% of equipment upgrades.

		Region		
		Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
If 'Yes' - Which of the following organizations provided financial assistance for the upgrades to the above equipment?	"None of the above"	61%	55%	46%
	"FortisBC PowerSense programs"	13%	18%	20%
	"Don't know"	17%	14%	20%
	"Building owner"	9%	8%	16%
	"Terasen gas programs"	4%	6%	3%
	"Provincial, municipal programs"	2%	6%	3%
	"BC Hydro PowerSmart programs"	2%	4%	5%
	"Federal government programs"	2%	4%	4%
	"Other"			3%
Total	Responses	62	77	57
	Base	56	66	48

Base: Respondent with upgraded or retrofitted equipment in their building"Column percentages may exceed 100% because multiple responses provided

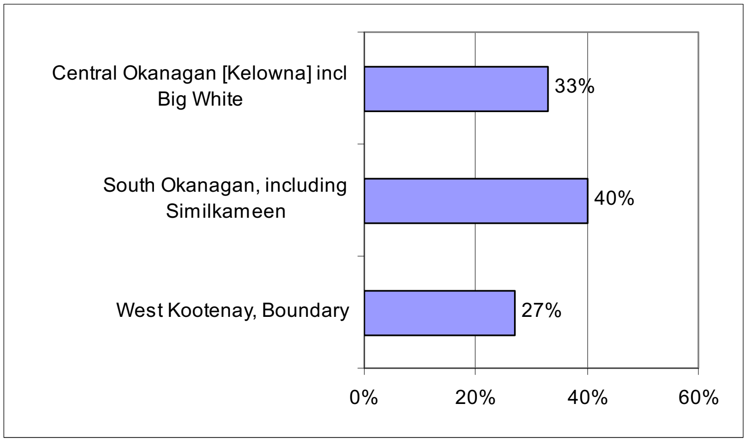
According to the survey respondents, FortisBC was most active in financing upgrades on electronic equipment in the West Kootenay (20%) and least in the Central Region (13%).

81. Please check the one box that indicates the primary activities of the businesses in the building at this location?



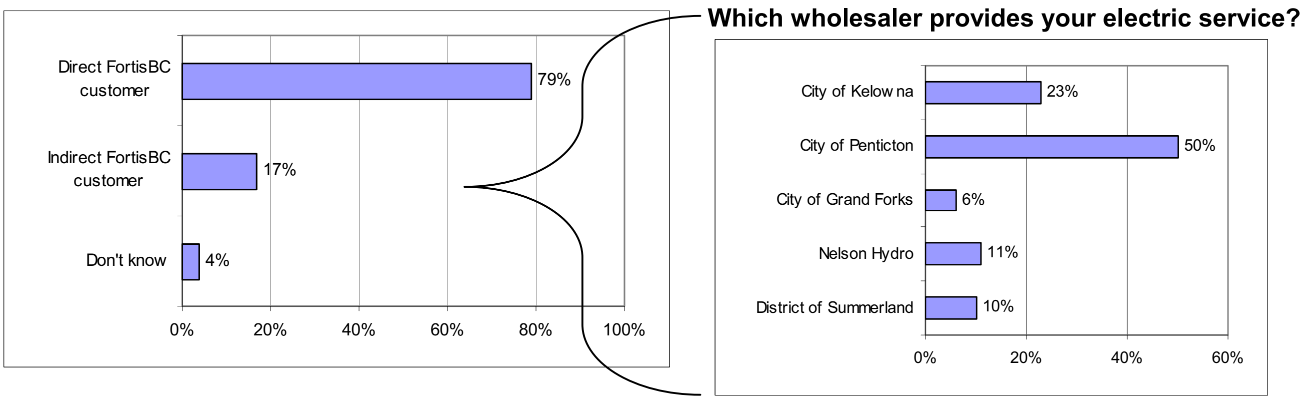
Over 24 primary business activities are represented in the FortisBC 2009 survey sample.

82. Which region do you reside in?



1/3 of the sample is from the Central Okanagan, 40% are from the South Okanagan and 27% are form West Kootenay/ Boundary.

83. Are you our direct or indirect customer?



Seventy-nine percent of the sample were direct FortisBC customers, 17% were Indirect commercial customers and 4% were not sure if they were direct or indirect. Among Indirect customers, the majority are serviced by the City of Penticton (50%).

84. May we have your account number?

		Total
"May we please have your permission for FortisBC to have your account number?"	No response	2%
	"Yes"	70%
	"No"	28%
Total	Base	383

Seventy percent of respondents said it would be alright for FortisBC to use their account number. Sixty percent actually provided an account number and 33% percent of the total sample (127 cases) provided a valid account number for which usage rates could be determined.

P. Annual Energy Consumption

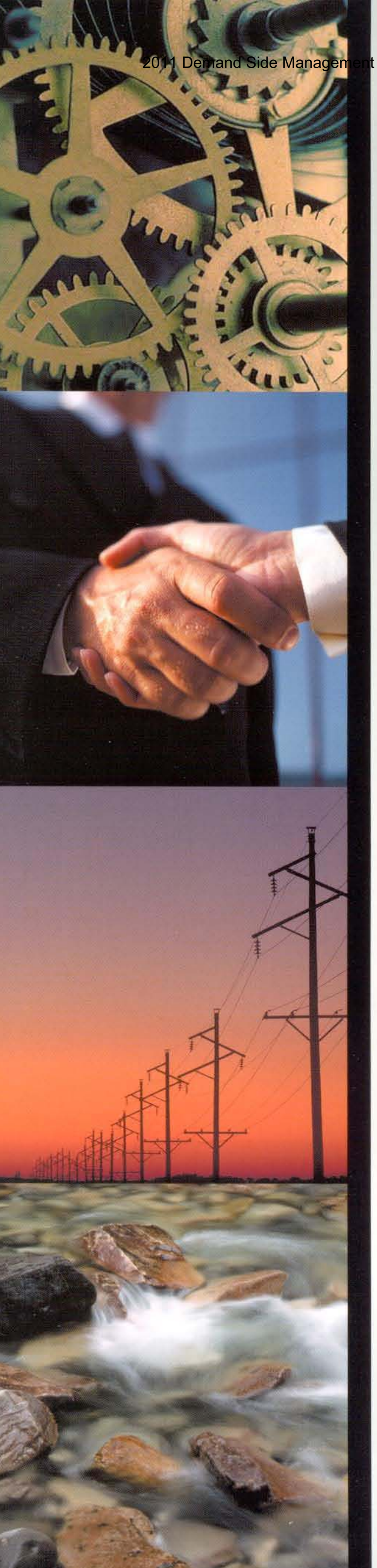
Energy consumption: Total, Building type & Region

				Type of building						Region		
		Fortis '09	Hydro '06	Food store, Lodgings, Restaurant	Education, Health Care, Public Assembly	Industrial, Warehouse	Mixed Use	Office	Retail	Central Okanagan, Kelowna	South Okanagan, Similkameen	West Kootenay, Boundary
Annual Electricity Consumption (kWh)	Under 35,000 kWh	67%	42%	37%	68%	66%	67%	75%	76%	63%	66%	72%
	35,000 kWh+	33%	58%	63%	32%	34%	33%	25%	24%	37%	34%	28%
Total	Base	127	1609	14	33	24	11	13	30	36	47	43

Respondents who provided valid account numbers

Among businesses that provided valid account numbers, 67% had annual electricity consumption of 35,000 kWh or less compared to 42% among 2006 Hydro sample. Food store, Lodgings and restaurants had the highest energy consumption rates with 63% consuming over 35,000 kWh each year.

Appendix: Questionnaire



FortisBC

EES Consulting

Conservation and Demand Potential Review

Final Report

June 10, 2010

EES Consulting

June 10, 2010

Mr. Keith Veerman, PE
Manager, Energy Efficiency
FortisBC Inc.
Suite 100, 1975 Springfield Road
Kelowna, British Columbia V1Y7V7

SUBJECT: 2010 Conservation and Demand Potential Assessment – Final Report

Dear Mr. Veerman:

Attached please find the FortisBC Conservation and Demand Potential Assessment Final Report.

We appreciate the effort by you and your staff to provide the background information and data necessary for a potential assessment. We have enjoyed working with you on this project.

Sincerely

Kevin L. Smit

Kevin Smit
Manager, Demand-Side Management

570 Kirkland Way, Suite 200
Kirkland, Washington 98033

Telephone: 425 889-2700 Facsimile: 425 889-2725

A registered professional engineering corporation with offices in
Kirkland, WA; Portland, OR; and Bellingham, WA

Contents

List of Figures and Tables

List of Figures

List of Tables

Introduction

Objectives

The objective of this report is to describe the results of the FortisBC 2010 Conservation and Demand Potential Review (CDPR). This assessment provides estimates of energy and peak demand savings by sector for the period of 2011 - 2030. The assessment considered a wide range of conservation and demand resources that are reliable, available, and cost-effective. In addition, some emerging technologies, fuel switching, small scale generation, and behavioural measures were considered.

The conservation measures are based on sources such as the Ontario Power Authority, BC Hydro's 2007 Conservation Potential Assessment, and the Northwest Power and Conservation Council. The results provide estimates of peak demand and energy savings that will assist FortisBC in their future resource and program planning.

Background

FortisBC provides service to 110,000 customers in the province of British Columbia as well as 47,500 customers through wholesale supply to municipalities such as Summerland, Penticton, Kelowna, Grand Forks, and Nelson. Residential customers make up 87 percent of the total number of customers and nearly 40 percent of energy sales. Wholesale customers make up another 30 percent of energy, with the remaining 30 percent related to commercial, industrial and other retail classes. Energy sales for FortisBC are roughly 3.5 million MWh per year, with a winter peak demand of about 700 MW. The summer peak for the system is roughly 560 MW.

FortisBC owns generation from four hydro units collectively referred to as the Kootenay River Plants. Output from these plants is governed by a water coordination contract with BC Hydro, and other parties on the Kootenay River which predefines the amount of power that can be used at various times. Peak capacity for December 2009 for the Kootenay River Plants was 223.5 MW. Plant output reflects 47 percent of the 2009 energy requirement and 35 percent of the sum of the monthly capacity requirements. The remainder of FortisBC's power supply needs is met with power supply purchases, including a wholesale contract purchase of up to 200 MW per hour from BC Hydro. While FortisBC resources and contracts provide the majority of energy required by the utility, the system is constrained with respect to capacity.

The utility has made significant investments into its electrical infrastructure increasing its gross assets by more than 200% since 1997. Much of the investment was made to accommodate ongoing capacity constraints on the FortisBC transmission and distribution systems. In addition, customer peak electrical usage has been growing quicker in the summer than in the winter due in part to increased air conditioning load. From a government policy perspective, changes to the Utilities Commission Act and the introduction of the 2007 BC Energy Plan have also necessitated consideration in FortisBC's planning process.

The latest Resource Plan for FortisBC was filed with the BCUC in May of 2009. The *2007 BC Energy Plan* played a significant role in FortisBC's evaluation of potential sources for additional power, providing public policy guidance on directions that BC would like to take in making these types of decisions. Some of the specific policy measures outlined in the 2007 Capital Expenditure Plan include:

- Acquire 50 per cent incremental resource needs through conservation by 2020;
- Ensure a coordinated approach to conservation and efficiency is actively pursued in British Columbia; and
- Encourage utilities to pursue cost effective and competitive demand side management opportunities.

The report, *Energy Efficient Buildings Strategy: More Action, Less Energy* goes a step further by setting new targets specifically for buildings that support the goals of the BC Energy Plan. These targets include:

- Reduce average energy demand per home by 20 per cent by 2020
  - Low income retrofit incentives
  - SolarBC project
  - Net zero energy homes project
- Reduce energy demand in commercial buildings by nine per cent per square meter by 2020
- Complete energy conservation plans for all B.C. communities

In 2008, FortisBC enacted policy to pursue demand-side resources prior to supply-side options. While FortisBC realizes that demand-side resources alone may not be able to close the capacity gap, the utility and its customers could benefit from these resources by reducing the need for added capacity, securing low-risk resources at relatively low costs, and realizing environmental benefits such as reduced or avoided greenhouse gas emissions.

Report Organization

This report is organized as follows:

- Methodology for Conservation Potential Estimation
- Historic FortisBC Conservation Achievement
- End-Use Load Forecast
- Residential Energy Efficiency Savings Potential
- Residential Peak Demand Savings Potential
- Commercial Energy Efficiency Savings Potential

- Commercial Peak Demand Savings Potential
- Industrial Energy Efficiency Savings Potential
- Industrial Peak Demand Savings Potential
- Infrastructure and Irrigated Agriculture Conservation Potential
- Behaviour Measures
- Scenarios
- Combined CDM Potential Summary
- Program Implications
- Glossary
- Acronyms

Within each potential section, service territory data is defined, conservation measures identified, and estimated potential is summarized. Potential estimates are summarized according to supply curves, tables, figures, and in comparison to the end-use load forecast.

In addition to the main report, the appendices contain detailed information regarding potential estimates as well as supplementary information.

Methodology

This study is a comprehensive analysis that focuses mainly on a bottom-up approach where energy efficiency measures are applied specific end-uses, such as number of refrigerators, and assigned a specific kWh/year savings. This approach differs from "top-down" approaches where, in many cases, a percentage savings is assumed for each end-use. This section describes how conservation potential is estimated in this study as well as the specific considerations, vocabulary, and reasoning behind the methodologies described. First, the types of conservation potential are defined followed by the methodology for estimating those types of potential.

Types of Potential

In developing this potential study, several different types or levels of efficiency potential are identified: technical, economic, and achievable. Technical potential is the theoretical maximum efficiency in the service territory. Economic potential is a subset of the technical potential that has been screened for cost effectiveness through various benefit-cost tests. Beyond cost effectiveness, there are physical barriers, market conditions, and other economic constraints that reduce the total potential savings from an energy efficient device. When these factors are applied, the result is called the achievable potential.

- Technical – Amount of energy efficiency potential that is available regardless of cost or other constraints such as willingness to adopt measures. It represents the theoretical maximum amount of energy efficiency if these constraints are not considered.
- Economic – Amount of potential that passes an economic cost/benefit test; in British Columbia the total resource cost test (TRC) is used. This generally means that the present value of the benefits exceeds the present value of the measure costs over its lifetime. The TRC costs include the incremental cost of the measure regardless of who pays (utility or customer). In British Columbia the Ministry of Energy, Mines and Petroleum Resources ("Ministry") has mandated that the cost effectiveness of measures be calculated either at the individual level, in a bundle with other measures, or at a portfolio level.
- Achievable – Amount of potential that can be achieved through a given set of conditions. Achievable potential takes into account many of the realistic barriers to adopting energy efficiency measures. These barriers include the willingness of consumers to adopt a measure, the non-measure costs, and the physical limitations of ramping up a program over time. The level of achievable potential can increase or decrease depending on the given incentive level of the measure.
- Program Achievable – Amount of potential that can be achieved through programs. The program achievable excludes potential that is achieved through future code changes.

Data Requirements

The data required for estimating conservation potential falls into three categories: measure data, customer characteristic, and utility data. Figure 1 illustrates specific data included in each of these categories.

Figure 1
Overview of Potential Assessment Data Requirements

Energy Efficiency Measure Data

- kWh, kW savings, load shapes
- Costs - incremental, O&M, replacement
- Energy and non-energy benefits/costs
- Measure Life

Customer Characteristic Data

- Residential: single family, multifamily, manufactured
- Commercial: Floor area by building segment, population, employment
- Industrial: consumption by sub-sector
- Building characteristics: heating fuel, vintage, basement type, HVAC types
- Appliance saturation: refrigerators, lighting
- Commercial building square footage; total and by segment
- Current measure penetration rate

Utility Data

- Load forecast
- Avoided cost
- Discount rates
- Line losses
- Past energy efficiency program achievements

Energy Efficiency Measure Data

The characterization of efficiency measures includes measure savings (kWh), demand savings (kW), measure costs ($), and measure life (years). Other features such as measure load shape, operation and maintenance costs, and non-energy benefits are also important for measure definition. Next, the end-use conservation measures data is another piece central to conservation potential modeling. Three primary sources were referenced for conservation measure data that apply to characteristics in FortisBC's service territory: the 2007 BC Hydro Conservation Potential Review, the Northwest Power and Conservation Council's 6th Power Plan, and Ontario Power Authority measure databases. Annual savings for heating, cooling, and weatherization measures are adjusted to reflect the FortisBC climate zones.

The measure data from some or all of the resources listed above include adjustments from raw savings data for several factors. The effects of space heating interaction, for example, are included for all lighting and appliance measures where appropriate. For example, if a house is retrofitted with efficient lighting, the heat that was originally provided by the inefficient lighting will have to be made up by the heating system. This energy is netted out of the savings.

Customer Characteristic Data

Customer characteristics data are another important component of a potential study. One of the best ways to obtain these data is through original research, especially end-use surveys. An end-use survey may provide all the detailed housing and commercial building data requirements. Defining service territory data is often referred to as characterizing the baseline. For this analysis, FortisBC has completed end-use surveys for their residential and commercial customers. The results are used to guide which conservation measures are applicable as well as the corresponding saturation levels of those measures.

The building, appliance, and equipment data is obtained from the FortisBC customer surveys. Using FortisBC survey data, the end-use model forecasts saturations and building segmentation data over the planning period. The end-use model allows for the estimation of conservation potential over a period of time, rather than a snap-shot in time, as survey results show. Therefore, the estimation of growth rates and saturation levels over the time period becomes an integral piece to conservation potential.

Utility Data

The third category is utility data which include current and forecasted loads, growth rates, avoided cost information, and line losses. FortisBC provided a load forecast by sector with average annual growth of 1.4 percent (gross load) over the planning period 2011 through 2030. Line losses are assumed at 8.8 percent over the period. The load forecast provided includes historic conservation trends through utility programs and code and standard changes.

The inflation rate assumed is 2 percent annually with a utility nominal discount rate of 10 percent.

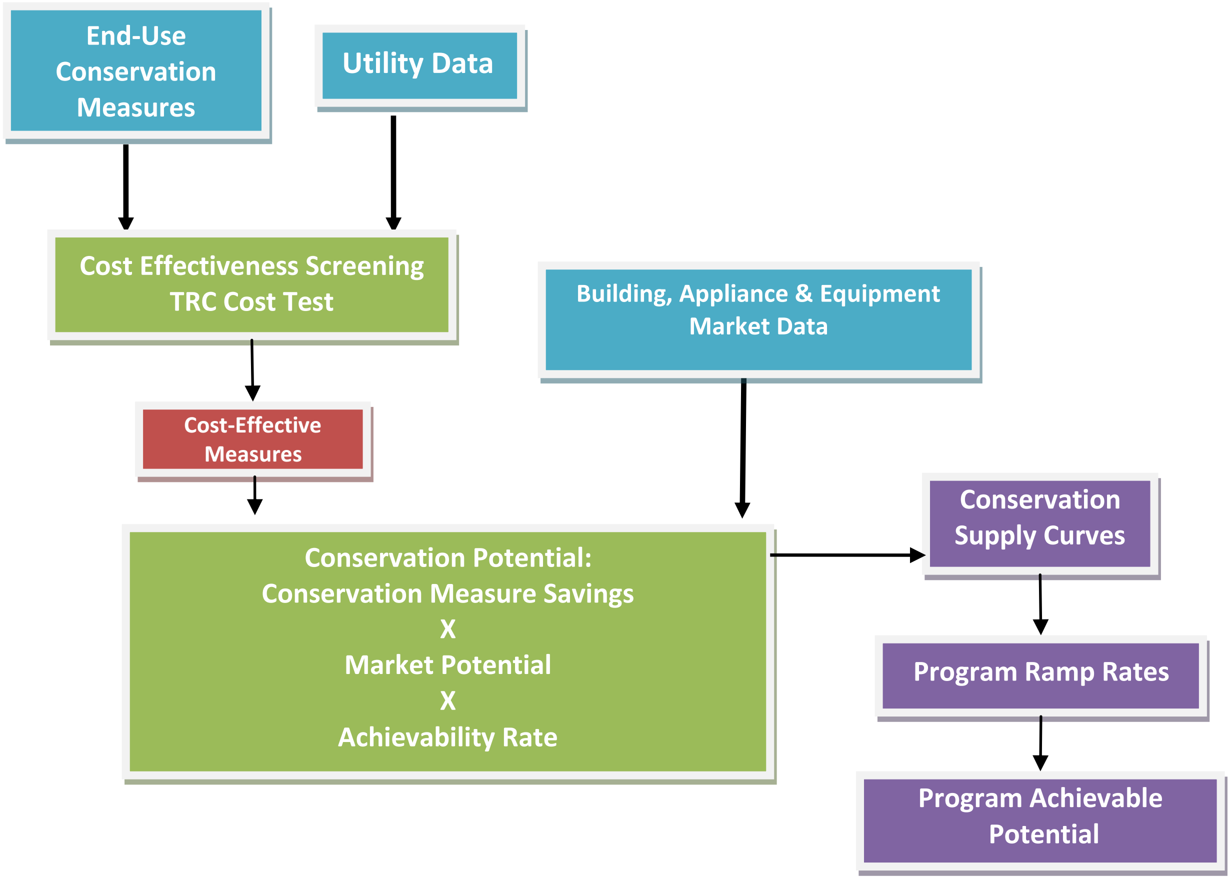
Energy Benefits

The avoided cost of electricity is the dollar value per MWh, of the conserved electricity, and accounts for the benefit value in cost effectiveness tests. In addition, avoided costs for transmission and distribution as well as peak summer and winter demand is also valued ($/kW). These energy benefits are often based on the cost of a generating resource, a forecast of market prices or an integrated resource planning process. For this study, BC Hydro's long-term avoided costs are used to value energy, peak demand, and transmission and distribution savings. Avoided costs for energy measures are $154/MWh in levelized cost terms (2010 dollars). This energy value includes local and bulk transmission savings. Winter peak savings for demand measures with primarily capacity savings are valued at $190/kW-yr (2010 dollars). This value includes both avoided capacity and infrastructure costs such as transmission and distribution. Summer peak savings are not valued.

Basic Modeling Methodology

There are two general analytical approaches to estimating conservation potential: a bottom-up approach and a top-down approach. The bottom-up approach is the primary method used for this assessment and is illustrated by Figure 2. The key factor is the number of kWh saved annually from the installation of an individual energy efficient measure. The savings from each measure is multiplied by the total number of measures that could be installed over the life of the program. Savings from each individual measure is then aggregated to produce the total potential.

Figure 2
Conservation Potential Assessment Process



Estimating Technical Potential

The technical potential is the sum of all measure savings and possible applications of the measure across the service territory. Estimating the technical potential begins with determining a value for the energy efficiency measure savings. Then, the number of "applicable units" must be estimated. "Applicable units" refers to the number of units that could technically be installed in a service territory. This includes accounting for units that may already be in place. A sample formula for calculating technical potential for a residential measure is shown below:

Measure Savings = (Per Unit Savings) x (# of households) x (Applicability) x (1- Saturation)

The "Applicability" value is highly dependent on the measure and the housing stock. For example, a heat pump measure may only be applicable to single family homes with electric space heating equipment.

In addition, technical potential should consider the interaction and stacking effects of measures. For example, if a home installs insulation and a high efficiency heat pump, the total savings in the home is less than if each measure were installed individually (i.e., interaction). In addition, the measure-by-measure savings depend on which measure is installed first (i.e., stacking).

Total technical potential is often significantly more than the amount of economic and achievable potential. The difference between technical potential and achievable and or economic potential is due to number of measures in the technical potential that are not cost-effective, and the applicability or total amount of savings of those non-cost effective measures.

Estimating Economic Potential

Energy efficiency potential assessments estimate the amount of energy savings potential that is available and cost-effective. To find cost-effectiveness potential, energy efficiency measures must pass economic screening. In British Columbia, economic potential is defined using a total resource cost (TRC) test to screen measures for cost effectiveness. A total resource cost perspective considers all costs and benefits for each energy efficiency measure regardless of to whom they occur. Costs and benefits include, capital cost, O&M cost over the life of the measure, disposal costs, program administration costs, environmental benefits, distribution and transmission benefits, energy savings benefits, economic effects, and non-energy savings benefits. Appendix B describes the TRC test as it applies in British Columbia in more detail.

Another common cost-effectiveness test is the utility cost test (UCT) (also known as the program administrator cost test). This test considers only those costs and benefits that accrue to the utility. The drawback of this method is that it does not ensure that public resources are allocated in the most efficient manner. Energy efficiency measures with significant non-energy benefits, but smaller energy benefits may not pass the screening. Also, this test does not include all the costs of the measure but only those that accrue to the utility. FortisBC requested that UCT results be presented for each measure. In addition, participant cost tests (from the participant perspective) as well as rate-payer impact tests are also included. Appendix C describes these various cost-effectiveness tests in more detail.

Estimating Achievable Potential

Achievability criteria can be applied either to technical potential or to economic potential. There are several methods for accounting for achievability, in the Pacific Northwest, the NWPCC applies achievability criteria prior to the economic cost-effectiveness tests. Specifically, the NWPCC uses an 85% achievability factor for all measures and has published a white paper describing the basis for using this value[1]. This value indicates that over the course of a 20-year potential study, 85% of all technical potential can be achieved, regardless of how it is achieved.

There are many different types of achievability factors and many ways to apply them. In addition, the achievability can be evaluated through different scenarios (e.g., high, medium, low). Scenarios can be based on the level of incentives offered or other program design factors.

Model Output - Supply Curves

Each type of potential can be summarized by a supply curve where savings potential (MWh) is graphed against the levelized cost ($/MWh). Measure costs are standardized (levelized) allowing for the comparison of measures with different lives. The supply curve facilitates comparison or demand-side resources to supply-side resources and is often used in conjunction with Integrated Resource Plans (IRPs).

Levelized Cost

The levelized cost of the measure is the discounted present value cost of the measure annualized over its life divided by the annual energy savings. The equation below illustrates how the levelized cost is calculated.

$$Levelized\ Cost = \frac{r}{1 - \frac{1}{(1+r)^{measure\ life}}} \times (capitalcost + program\ administration\ costs)$$

Where r is the interest rate.

Dividing the equation above by the annual savings (MWh) produces levelized cost in terms of dollars per MWh. This levelized cost calculation is the same as BC Hydro's Cost of Conserved Energy (CCE).

Program Achievable Potential

The last step to estimating reasonably attainable conservation potential over the time period is to assign ramp rates to each measure. Ramp rates might be individual for each measure, or one type of ramping might apply to several similar measures. How quickly savings from a particular measure is ramped up over the period depends on several factors:

---

[1] "Achievable Savings: A Retrospective Look at the Northwest Power and Conservation Council's Conservation Planning Assumptions." August 2007. http://www.nwcouncil.org/library/2007/2007-13.htm.

- Availability of technology;
- Program readiness;
- Whether the measure is implemented before or at the end of building or unit life; and
- Changes in codes or standards.

Ramp rates are applied to achievable potential; the result is program achievable potential, or the amount of potential a utility could reasonably expect to obtain over the time period given best current knowledge.

Historic Conservation Achievement

Historic conservation achievements are examined to adjust the 2008 end-use consumption estimates as well as the baseline characteristics for potential estimation. FortisBC has been active in helping their customers become more energy efficiency through their PowerSense program since 1989. Previous programs have included residential, commercial, and industrial measures. Figure 3 illustrates historic conservation efforts from 1990 through 2008.

Figure 3
Historical Energy Efficiency Achievements

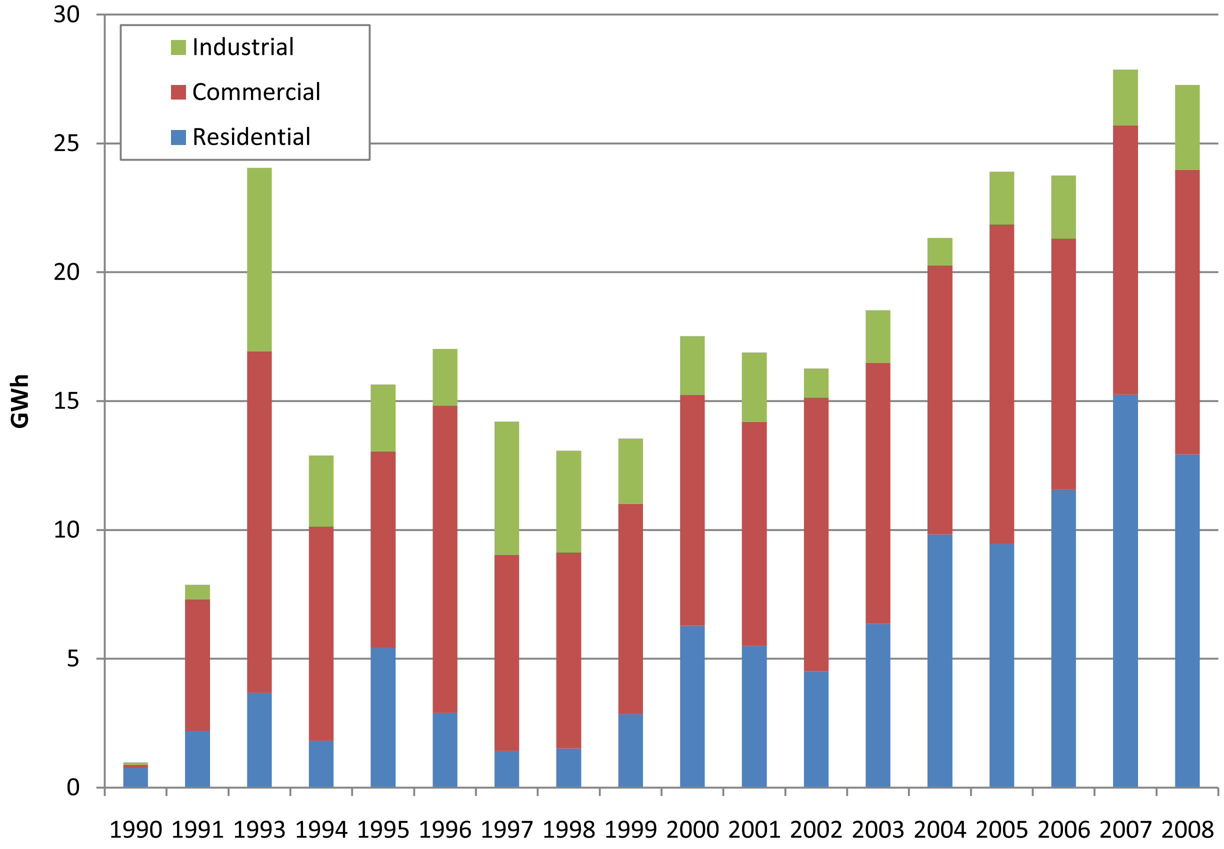
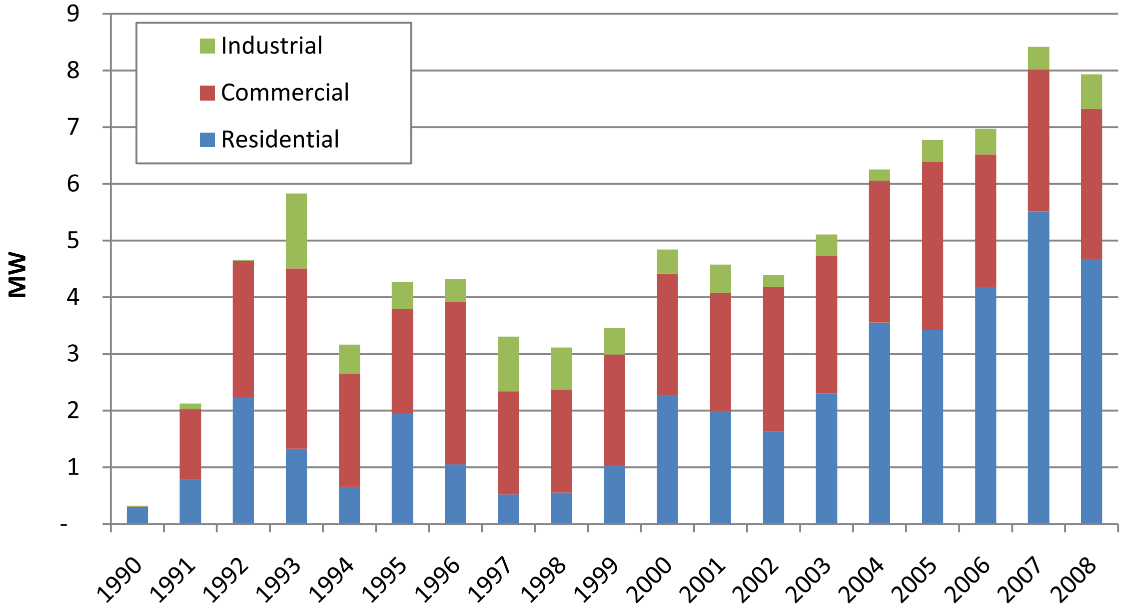


Figure 4 shows the associated demand savings for the energy savings in Figure 3.

Figure 4
Peak Demand Savings



The programs currently being utilized by FortisBC to acquire these savings are briefly described in the following sections.

Residential Incentives

LiveSmart BC - Provincial Program

To take advantage of FortisBC's energy efficiency incentives, some programs require that homeowners work through a government-run program called LiveSmart BC. This program coordinates utility, provincial, and federal promotions and has funding to operate through March 31, 2011. To take advantage of LiveSmart BC, homeowners must order an energy evaluation for their home. Some PowerSense rebates or loans are obtained through LiveSmart BC. These programs are identified in the descriptions below.

PowerSense

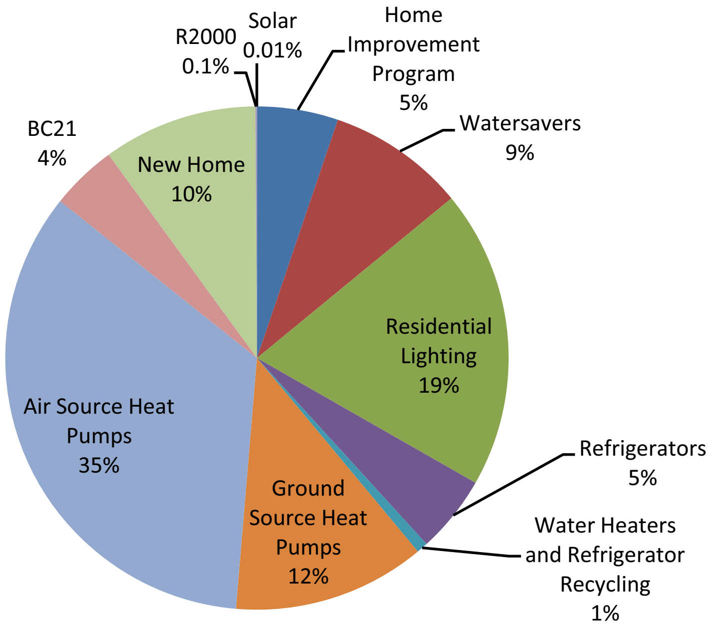
Residential energy efficiency programs include the following:

- **New Home Program (NHP)** – offers homeowners rebates on energy efficient windows, lighting, and technologies such as heat pumps for new construction projects.
- **Home Improvement Program (HIP)** – FortisBC offers several rebates for weatherization and heat pumps for electrically heated homes. Customers who receive rebates through the LiveSmart BC program are ineligible to receive rebates from the HIP.

- **Weatherization** – FortisBC offers rebates of $0.50 per square foot for windows, $0.05 per kWh savings for insulation upgrades.
- **Lighting** – Up to 10 free CFLs are available under the NHP and rebates of 50% the price of the bulb or up to $5/ bulb are available for retail sales.
- **Air Source Heat Pumps** – Customers can receive either a rebate or a low-interest loan for air source heat pumps for existing homes through the LiveSmart BC Program. The rebate amount is $0.05 per kWh savings (usually around $300per unit). The loan amount can be up to $5,000 over 10 years at 4.9%. Qualifying heat pumps must be EnergyStar rated for Canada. Incentives available through LiveSmart BC.
- **Ground Source Heat Pump** - Customers can receive either a rebate or a low-interest loan for ground source heat pumps for existing homes through the LiveSmart BC Program. The rebate amount is $0.05 per kWh savings(typically $900). The loan amount can be up to $5,000 over 10 years at 4.9%. System equipment design and installation must meet CSA Standards. Incentives available through LiveSmart BC.
- **Solar Hot Water Systems** – For new homes, a $1,000 Natural Resource Canada (NRCAN) rebate is available. Requires at least 6 square metres of South-facing roof space. A $300 rebate is available for existing homes with electric hot water heaters for the solar upgrade.

Figure 5 illustrates the share of historic energy savings by measure category. A significant share of historic savings is from heat pump installations.

Figure 5
Share of Residential Energy Efficiency Program Achievements 1990-2008



General Service Incentives

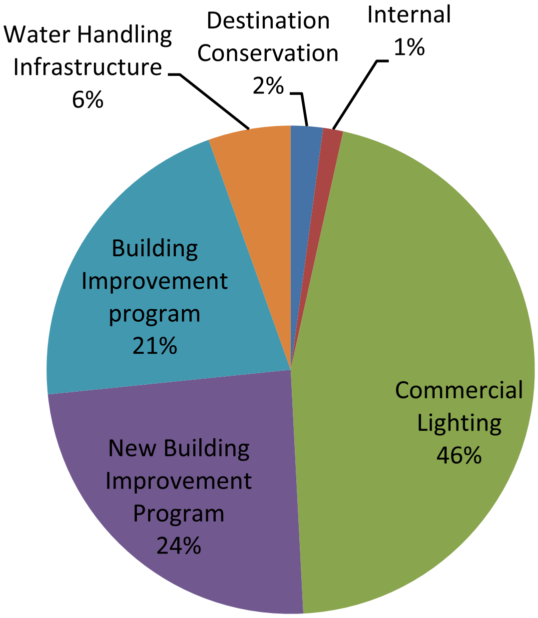
PowerSense

Commercial building energy efficiency programs include the following:

- **Lighting** – FortisBC provides rebates for compact fluorescent lighting, electronic ballasts, reflectorized luminaries, T8 fluorescents, LED and CFL exit lights, high density discharge lighting, and motion sensors or other lighting control systems.
- **New Building** – FortisBC offers a free initial assessment of new building design for energy efficiency. In cases where a more detailed assessment is required, FortisBC will cover 50% of the cost up to $5,000. Rebates are available for energy efficiency measures above the baseline construction standard.
- **Existing Buildings** – Qualified customers can take advantage of a free walk-through energy audit conducted by a qualified technical advisor to identify where conservation opportunities exist. If required, FortisBC will fund up to 50 percent, to a maximum of $5,000, of an approved consultant's fee to conduct a comprehensive energy study. Possible technologies include lighting, HVAC control systems or variable speed drives, water heating, refrigeration measures, building envelope, and motors.
- **Rebate structure –** General Service rebates are the lesser of:
    - Five cents per annual kWh saved;
    - 50% of installed retrofit cost;
        - 100% of incremental cost for new construction; or
    - Amount necessary to achieve a two-year payback.

Figure 6 illustrates the share of historic commercial energy efficiency achievements. Commercial lighting makes up almost half of historic achievement.

Figure 6
Share of Commercial Energy Efficiency Program Achievements 1990-2008



Industrial Incentives

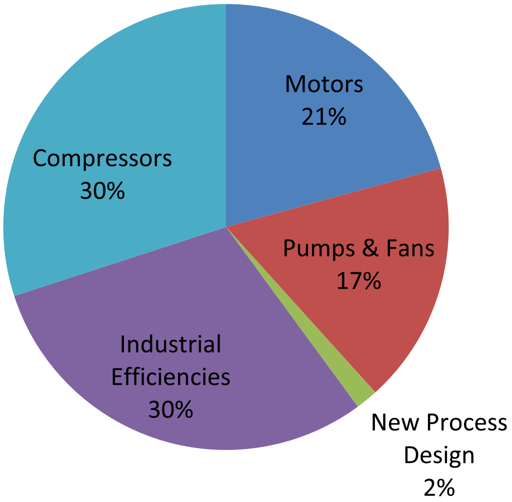
PowerSense

Industrial building energy efficiency programs include the following:

- **Walk Though Audit**– FortisBC offers a free walk through energy audit by a technical advisor to identify where potential energy savings opportunities exist. In cases where a more detailed assessment is required, FortisBC will cover 50% of the cost for an approved consultant. Energy efficiency measures may include motor upgrades, air compressor upgrades, process or non-process energy savings, pumps and fans, variable frequency drives, or other measures.
- **New Process Design** – A technical advisor or an approved consultant is available to assess new process design. Rebates are available for suggested technology upgrades for approved energy efficiency measures.
- **Rebate Structure** – same as General Service

Figure 7 illustrates the share of historic industrial energy efficiency savings.

Figure 7
Share of Industrial Energy Efficiency Achievements 1990-2008



Irrigation and Municipal Infrastructure

PowerSense

FortisBC offers audits or incentives up to 50% of an approved consultant's fee for energy audits in irrigation and municipal infrastructure. Financial incentives are available for identified projects 5 cents per kWh up to 50 percent of the incremental project cost or the amount required for a 2-year payback, whichever is less. The following areas are available for energy savings:

- Irrigation – Pumping systems can achieve increased energy efficiency through motor downsizes, upgrades, new gaskets, variable speed drives, digital control, or other equipment.

- Water and Waste Water Treatment – Annual capital improvement programs provide opportunities for energy efficiency upgrades that benefit ratepayers. FortisBC currently has agreements with each municipality to review energy efficiency potential each year.

- Traffic and Street Lighting – Similar to water and wastewater treatment agreements, energy efficiency is included in the annual capital improvement plan for city lighting. Due to successful past programs, virtually all traffic lights in FortisBC's service territory are already updated to LED technology.

Partner in Efficiency

FortisBC enters into a Partners in Efficiency (PIE) agreement with institutional, commercial, and industrial (ICI) customers such as schools, municipalities, hospitals, and other large commercial and industrial accounts. The PIE is a signed agreement that involves the following:

- Customer agreement to review their capital expenditure plan with FortisBC on an annual basis to identify key projects to improve energy use;
- FortisBC works with the customer to determine the economics for energy efficient upgrades to the project;
- Recommendations for improvements are presented with estimated costs, savings, applicable rebates;
- Rebates are presented upon project completion; and
- Monitoring and evaluation.

Summary

FortisBC has a strong history in energy efficiency achievement through its programs. FortisBC programs target energy efficiency across all customer classes including indirect customers. Energy efficiency programs target improvements from a whole-building or system perspective providing comprehensive efficiency upgrades. In addition, the Partner in Efficiency agreement continues energy efficiency conversations from year to year providing flexibility within each program for technology advancements.

End-Use Model

Introduction

This section summarizes the assumptions and results of the load forecast by end-use. End-use forecasts were prepared for commercial, residential, and industrial sectors. The end-use forecast includes all customers, both direct and indirect, that are served by FortisBC.

Residential End-Use Forecast - Energy

Methodology

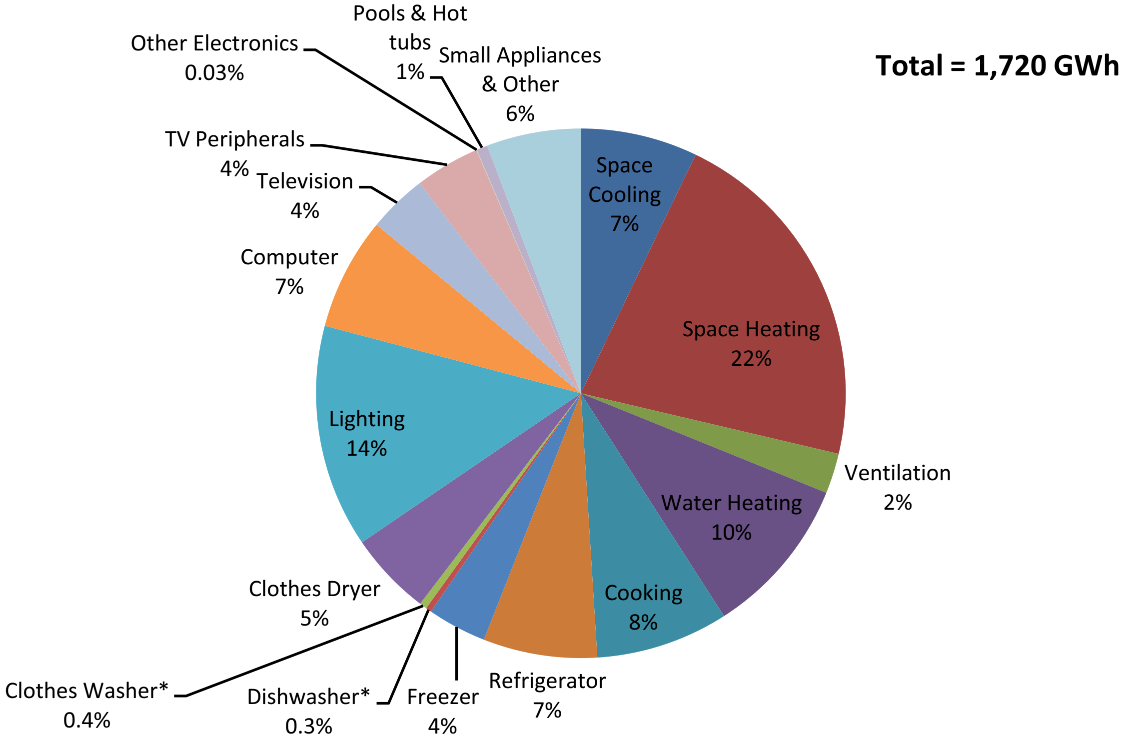
End-use consumption for residential customers was estimated based mainly on the 2009 Residential End-Use survey results. Appliance saturations, heating types and fuels as well as hours of use are used to define building characteristics. For instance, the number of refrigerators in single family homes built prior to 1976 was calculated from the survey data. Next, an average annual use was applied to the number of units. The result is energy consumption by appliance or end use.

Average use data was obtained from a combination of the BC Hydro 2007 Conservation Study as well as FortisBC's survey. The BC Hydro data is used to determine the average annual electricity use by building type, vintage, and heating fuel (i.e. single family, pre-1976, electrically heated). Average use from the FortisBC Survey is used to benchmark how well the BC Hydro data describes FortisBC customer energy consumption. Overall, the BC Hydro average use data results in average customer use by building type (single family, apartment, etc.) that is similar to the average use presented in the FortisBC survey (shown later in Table 1).

2008 Base Results

The first step was to define current end-use energy consumption for FortisBC customers. Figure 8 illustrates the share of energy consumption by end-use category. Total consumption is estimated at 1,720 GWh for 2008 (weather adjusted).

Figure 8
2008 Base Level End-Use Consumption - Residential



*Energy use is for motors etc. Use of hot water for these appliances is captured under Water Heating.

A comparison of average use by customer building type is presented in Table 1 below. The average use across all building types is within 5% of the average use collected by the 2009 survey. Variation in weather may account for some of the differences in average use.

Table 1
Average Customer Use Comparison

Building Type	End-Use Model kWh	FortisBC Survey kWh	% Difference	Units/ Customers
Single Family	13,424	13,057	-2.81%	94,431
Mobile Home	9,375	9,014	-4.01%	10,737
Apartment Condo	5,913	5,109	-15.74%	17,620
Townhouse, Duplex, Row	8,925	8,521	-4.74%	14,867
Total	11,661	11,234	-3.80%	137,655

Once the 2008 baseline is established, energy-consuming units and average use are forecasted through the end of the planning period. The results are then compared to the utility's load forecast. Building growth rates range from 0.27 to 5.64% for new construction over the period with demolition rates near 0.25% for existing homes. Existing mobile homes have slightly higher demolition rates (0.35%). Table 2 shows average annual growth rate by building type. Historic building permit data was used to distribute the total customer growth rate among building types. Building permits for apartments have increased significantly since 2004.

Table 2
Average Annual Net Growth Rate(1)
Number of Buildings

	Single Family	Mobile Home	Apartment	Row	Total
2009-2012	0.52%	0.27%	5.03%	0.41%	1.46%
2009-2020	0.50%	0.28%	5.22%	0.41%	1.46%
2009-2030	0.50%	0.28%	5.64%	0.43%	1.18%

(1) Includes demolition rates.

Appliance saturation data is estimated on a case-by-case basis. Some saturation rates such as heat types, refrigerators, freezers, and clothes washers do not change significantly over the period. On the other hand, saturations such as televisions, television peripherals, and other electronics were estimated to increase over the period. The saturation of central air conditioning as well as room or portable air conditioners is also projected to increase.

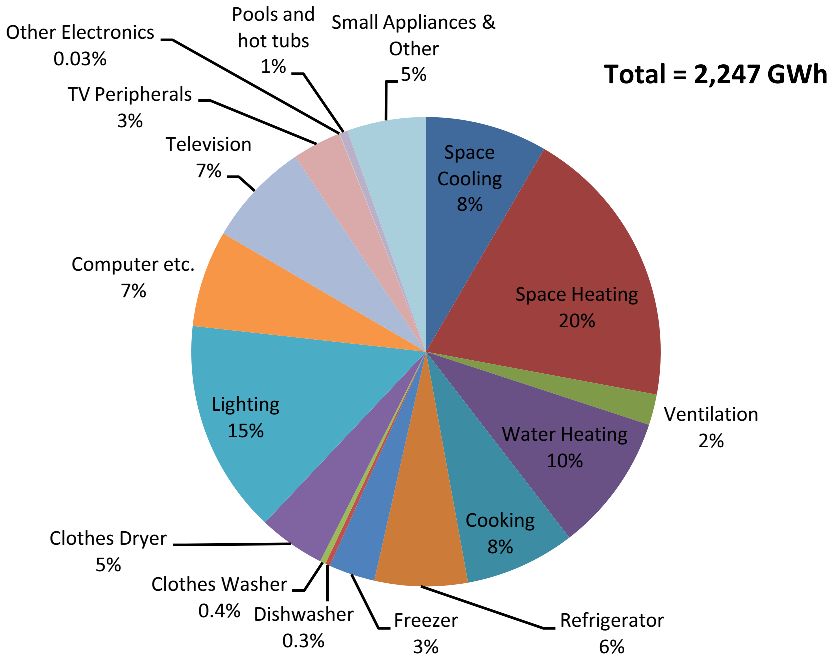
Table 3 compares the FortisBC forecast with the energy consumption estimated using end-use consumption and growth in residential building square footage. Because the FortisBC load forecast does not separate residential customer consumption from other classes within the wholesale forecast, the 2008 residential consumption from wholesale customers (Summerland, Nelson, Penticton, Kelowna, and Grand Forks) is projected at growth rates consistent with total wholesale sales growth.

Table 3
Residential Forecast Comparison - Energy

	FortisBC Load Forecast MWh	End-Use Model MWh	% Difference
2008	1,719,530	1,719,530	0.0%
2009	1,745,793	1,744,633	-0.1%
2010	1,772,466	1,771,657	0.0%
2011	1,783,712	1,800,177	0.9%
2012	1,807,542	1,822,257	0.8%
2013	1,831,541	1,844,574	0.7%
2014	1,855,710	1,866,484	0.6%
2015	1,880,701	1,888,620	0.4%
2016	1,906,346	1,910,985	0.2%
2017	1,932,249	1,933,580	0.1%
2018	1,957,970	1,956,408	-0.1%
2019	1,983,400	1,979,470	-0.2%
2020	2,008,728	2,002,769	-0.3%
2021	2,034,028	2,026,307	-0.4%
2022	2,059,050	2,050,086	-0.4%
2023	2,083,634	2,074,107	-0.5%
2024	2,107,779	2,098,374	-0.4%
2025	2,131,534	2,122,888	-0.4%
2026	2,154,780	2,147,651	-0.3%
2027	2,177,513	2,172,666	-0.2%
2028	2,199,772	2,197,989	-0.1%
2029	2,221,489	2,223,753	0.1%
2030	2,242,585	2,247,212	0.2%

Because house sizes and appliance saturation data changes over the period of the forecast, the share of end-use consumption also changes. Figure 9 illustrates the breakdown of energy consumption by end-use for 2030. Energy consumption by electronics has increased as well as lighting and space cooling energy consumption. In comparison, space heating and major appliances consume a smaller share of the total consumption.

Figure 9
2030 Residential Energy Consumption Breakdown



Residential End-Use Forecast – Peak Demand

Winter Peak Methodology

The winter peak demand forecast is estimated using the following inputs:

- FortisBC energy consumption by end use for each building type (single family, row or townhouse, apartment, and mobile home)
- BC Hydro coincident peak load by end-use and building type
- BC Hydro coincident peak demand for electric heat and annual kWh consumption[2]

Similar to FortisBC, BC Hydro's winter coincident peak occurs near either the 6:00 p.m. hour on a January or a December day. The peak is highly correlated with the coldest day of the year. Given this similarity, the relationship between energy demand by end use (kW) and total peak

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[2] Effectively, load factors from BC Hydro's study are used to estimate FortisBC load factors using data from BC Hydro's Southern Interior region.

demand for each housing type is used to estimate FortisBC peak. The advantage of using BC Hydro data in this top-down approach is that behaviours and energy use for people in similar service territories are captured. These behaviours reveal the components of coincident peak demand in the residential sector. The disadvantage of this methodology is that the differences between FortisBC customers and BC Hydro customers are not fully represented. Examples of important differences include the higher penetration of CFLs among FortisBC customers. On the other hand, differences in building types across service territories are accounted for.

2008 Base Results

The methodology above results in an estimated peak of 427 MW from residential customers (including wholesale). For comparison, the total system peak for is estimated at 701 MW (weather adjusted). Figure 10 illustrates the breakdown of the coincident peak demand. Twelve percent of coincident peak demand is due to cooking, which can be expected given the assumption that the peak occurs at 6 p.m. Also, as expected, space heating and lighting make up the largest share of peak demand for residential customers.

Figure 10 shows winter peak demand estimates by end-use for 2008. Average annual growth in winter peak demand is approximately 0.9%, according to the FortisBC load forecast.

Figure 10
2008 Winter Peak Demand - Residential

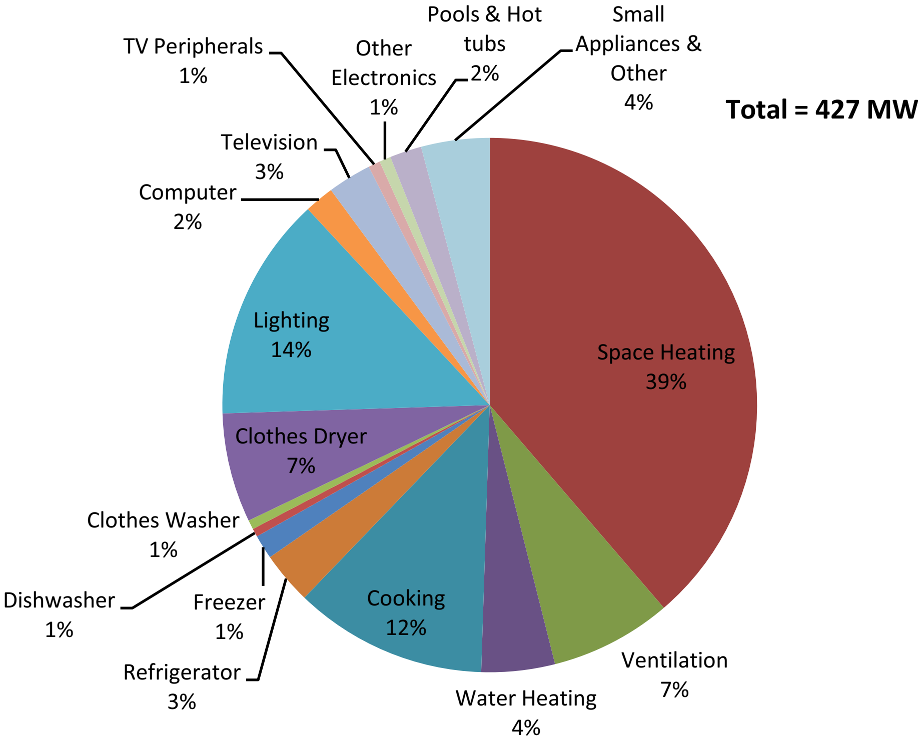
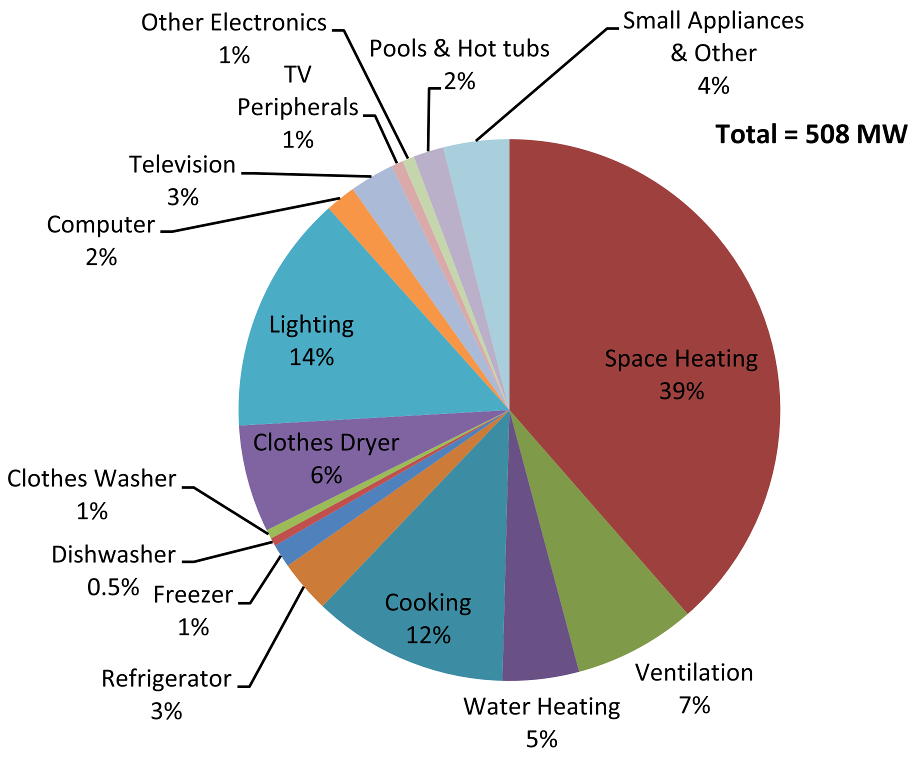


Figure 11 shows the forecast 2030 winter peak demand breakdown from the end-use model.

Figure 11
2030 Winter Peak Demand - Residential



Summer Peak Methodology

The summer peak demand forecast is estimated using the following inputs:

- FortisBC energy consumption by end use, and
- Summer peak load factor by end-use from statewide California load factors[3]

Load factors were adjusted to account for differences in weather between FortisBC and California based on population-weighted cooling degree days and maximum temperature. Load factors are applied to kWh consumption to produce kW demand. See calculation below for an example of how load factors are applied to energy to produce peak demand estimates.

$$\frac{kW_{peak}}{kWh_{annual}} \times kWh_{annual} = kW_{peak}$$

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[3] Brown, Richard E. and Jonathan G. Koomey. "Electricity Use in California: Past Trends and Present Usage Patterns." Berkeley, CA: May 2002. Available at: <http://enduse.lbl.gov/info/LBNL-47992.pdf>

2008 Base Results

Figure 12 illustrates the breakdown of summer peak demand. The 2008 residential peak summer demand is estimated at 271 MW.

Figure 12
2008 Summer Peak Demand - Residential

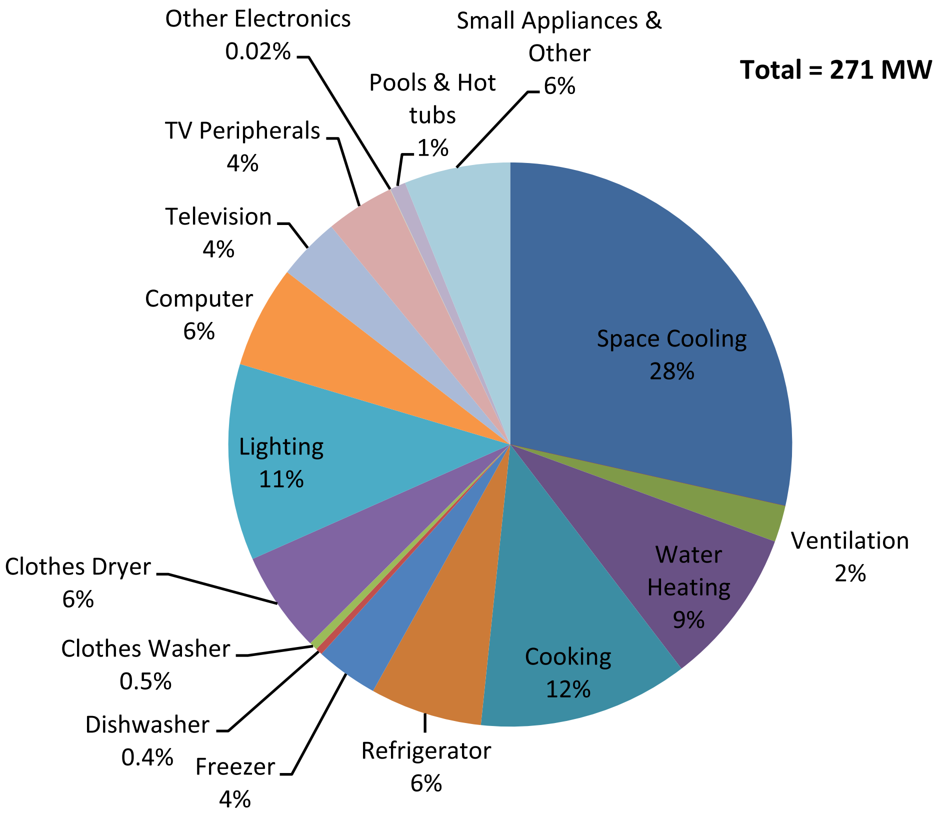
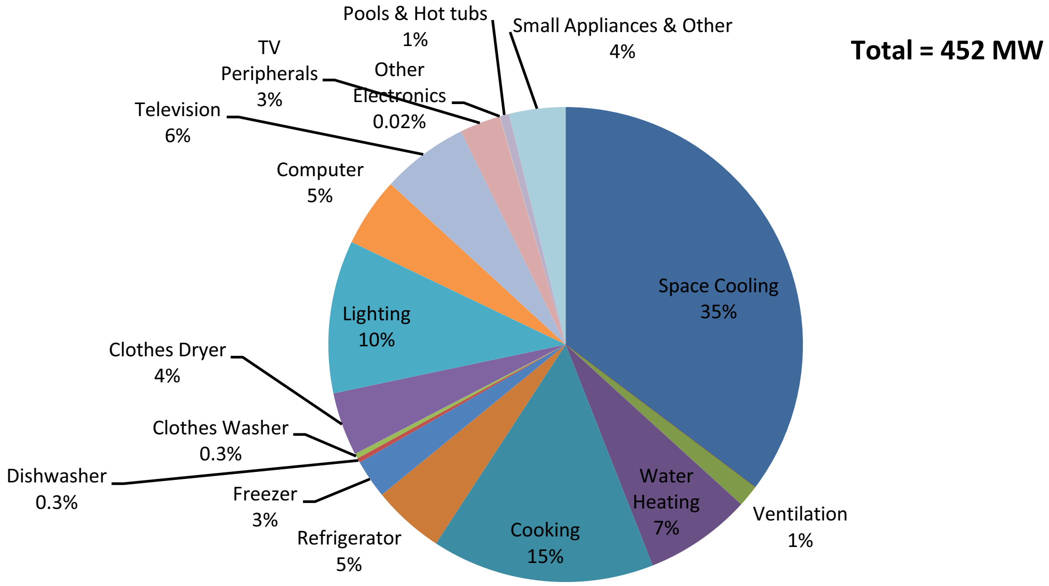


Figure 13 illustrates the forecast 2030 summer peak break down by end-use. Average annual growth in summer peak demand is 2.6%. The large growth rate can be attributed to significant growth in the penetration rate of air conditioning units and central AC.

Figure 13
2030 Summer Peak Breakdown by End-Use – Residential



Commercial End-Use Forecast - Energy

Methodology

The end-use forecast for commercial buildings was calculated according to the following steps:

1. Estimate the share of commercial buildings for each commercial building type (i.e. restaurant, office, retail etc) from FortisBC survey data;
2. Estimate the average square footage for each building type and benchmark against FortisBC survey data;
3. Utilize publicly available sources such as BC Hydro's conservation potential study (2007), FortisBC survey results, and the Northwest Power and Conservation Council for end-use intensity data (EUI data) in kWh/square foot;
4. Using the known number of commercial customers, estimate the number of customer per building so that the number of buildings can be estimated
5. Calibrate the number of buildings so that total end-use consumption matches weather adjusted 2008 load;
   a. EUI data is multiplied by estimated square foot data calculated using the number of buildings (calibrated) and average square footage by building type
6. Compare average customer use from end-use forecast model with average commercial consumption (actual or forecast data);
7. Forecast commercial square footage through 2030 by building type;

8. Forecast EUI for each end-use by building type;
9. Apply EUI to forecast of commercial floor space.

The equation form of this methodology is shown below:

$$\{2008\ \text{Load}\}_{\text{W.A.}} = \sum_{s=1}^{n=segments} \text{Buildings} \times \left(\%\ \frac{\text{Buildings}}{\text{Segment}}\right) \text{x} \left(\frac{\text{SqFt}}{\text{Building}}\right) \text{x(EUI)}$$

The 2008 weather adjusted load is equal to the sum of the load in each of the commercial building segments. The key calibration variable is the number of buildings per customer.

Assumptions

FortisBC survey data was used to estimate the share of buildings that are restaurants, offices, hospitals, etc. To estimate the breakdown of buildings the Commercial End Use Survey report is used.[4] Buildings were categorized as shown in Figure 14 below. The following assumptions were made to calculate the breakdown of buildings in Figure 14 below.

- Medium and light industrial buildings are excluded
- Other includes theatres, auditoriums, churches, museums, community and recreation centers and other buildings not in the major categories
- Mixed use commercial buildings were split between offices, retail, and restaurants based on the building function designated in the survey (i.e. personal services, retail trade, eating and drinking establishments etc)
- Three customers from industrial rate class schedules are included in commercial. These include UBC Okanagan, Selkirk College, and Trail Community Health (hospital).

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[4] FortisBC Inc. *2009 Commercial End-Use Study*. Discovery Research. August 2009. Page 17.

Figure 14
Commercial Building Breakdown, Number of Buildings

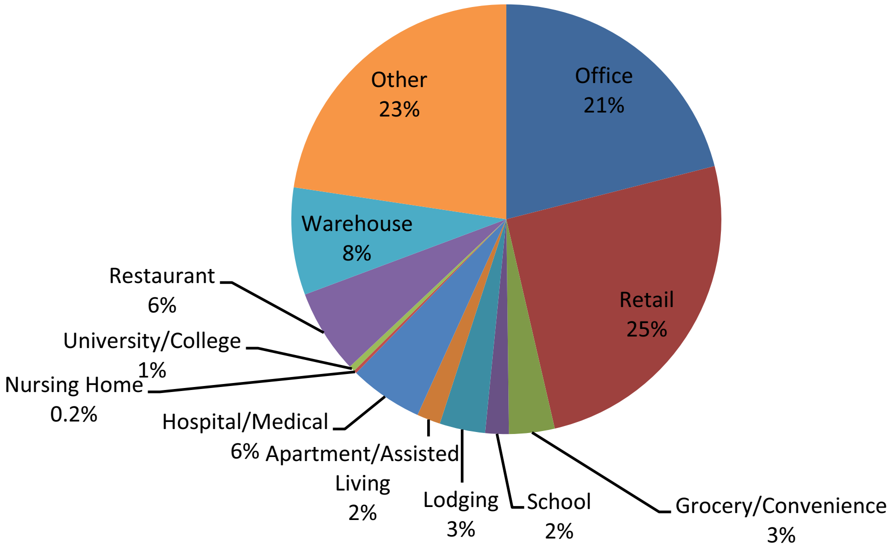

Table 4 defines the building types used in the analysis.

Table 4
Commercial Building Definitions

Building Category	Square Feet
Large Office	>100,000
Medium Office	50,000 to 100,000
Small Office	<50,000
Retail:	
Large Non-Food Retail	>100,000
Medium Non-Food Retail	50,000 to 100,000
Small Non-Food Retail	<50,000
Large Hotel	>100,000
Medium Hotel/Motel	50,000 to 100,000
Large School	>50,000
Medium School	25,000 to 50,000

EUI Data

The end-use forecast uses primarily EUI data from BC Hydro's 2007 study. The BC Hydro data corresponds to buildings in BC Hydro's "Southern Interior," or the climate zone most similar to FortisBC's climate. EUI data from the Northwest Power and Conservation Council was also considered but ultimately not incorporated since BC Hydro data is considered to better represent FortisBC data given that both territories are located in Canada and in similar climate zones. The table below shows FortisBC and BC Hydro EUI data by building type. Data from the NWPCC is also included for reference. The resulting average use per building is 192,017 kWh per year. Average use per customer is approximately 60,000 kWh per year.[5]

Table 5 compares EUI data by commercial building type.

Table 5
Building EUI Data, Annual kWh/Square Foot

	FortisBC End-Use Model	BC Hydro Southern Interior	NWPCC*
Large Office	22.0	22.0	16.4
Medium Office	18.5	18.5	15.4
Small Office	15.1	15.1	14.0
Large Retail	26.9	26.9	30.9
Medium Retail	24.5	24.5	15.2
Small Retail	18.9	18.9	12.9
Large Hotel	19.8	19.8	19.9
Medium Hotel/Motel	16.7	16.7	19.9
Large School	11.1	11.1	8.4
Medium School	8.7	8.7	8.4
Grocery/Convenience	58.3	58.3	53.7
Apartment/Assisted Living	13.4	13.4	19.9
Medical	27.7	27.7	17.8
Hospital	24.3	24.3	24.7
Nursing Home	13.4	13.4	19.9
University/College	17.7	17.7	17.9
Restaurant	66.1	66.1	41.6
Warehouse/Wholesale	16.4	16.4	5.8
Other	15.4	15.4	15.8

*For comparison purposes only.

Model Calibration

The next step is to calibrate the total number of commercial buildings so that the resulting total consumption matches the 2008 weather adjusted load. Then, the share of buildings can be applied to the total number of buildings for which FortisBC provides service. FortisBC has a total of 16,419 general service customers including both direct and indirect customers. However, many of these customers share buildings with one or more other customers or are not associated with buildings at all (such as railroad crossings). Since the total number of buildings is unknown, the commercial end-use forecast (total MWh) is calibrated to weather-adjusted 2008 actual energy consumption using the number of buildings variable. This methodology relies on accurate EUI data.

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[5] FortisBC general service customers consumed an average of 59,000 kWh per year, lower than the forecast suggests. The difference could be attributed to wholesale general service customers having higher average use.

Table 6 shows the results of model calibration in terms of the number of buildings and square footage. In segments where the number of buildings is known the model uses fixed values; for the unknown segments, the number of building is estimated based on the *Commercial End-Use Survey*.

Table 6
FortisBC Commercial Building Square Footage

Building Type	**Share of Buildings**	**Number of Buildings**	**Average Square Feet**	**Total Square Feet**
Large Office	0.0%	5	NA	490,000
Medium Office	0.8%	41	50,000	2,068,492
Small Office	20.2%	1,089	4,000	4,355,504
Large Non-Food Retail	0.0%	-	NA	-
Medium Non-Food Retail	0.0%	5	NA	350,000
Small Non-Food Retail	25.4%	1,369	9,314	12,746,742
Large Hotel	0.0%	-	NA	-
Medium Hotel/Motel	3.4%	185	8,540	1,580,422
Large School	0.0%	-	NA	-
Medium School	1.8%	96	7,000	668,608
Grocery/Convenience	3.4%	185	9,300	1,721,069
Apartment/Assisted Living	1.8%	96	6,819	651,320
Medical	5.5%	298	6,000	1,790,915
Hospital	0.1%	14	88,500	1,540,000
Nursing Home	0.2%	12	5,800	69,249
University/College	0.4%	24	8,000	191,031
Restaurant/Tavern	6.3%	342	4,544	1,552,986
Warehouse/Wholesale	8.1%	436	9,339	4,069,836
Other	22.6%	1,221	14,200	17,335,456
Total	**100%**	**5,397**		**51,181,629**

Some of the above categories have sub categories by building size (Office, Non-Food Retail, Hotels etc.) FortisBC's customer surveys were used to determine what share of buildings fit into the size bins (shown in Table 4). According to the survey, the great majority of buildings are small to medium sized and less than 5% of all buildings with more than 50,000 square feet.

Results

EUI data (Table 5) is combined with commercial floor space data (Table 6) to produce kWh consumption by end use for each building type. Summed across building types, Figure 15 illustrates the kWh consumption by end-use for all building types. Total consumption is estimated at 1,033 GWh for 2008.

Figure 15
Commercial End Use Consumption, Base Year 2008

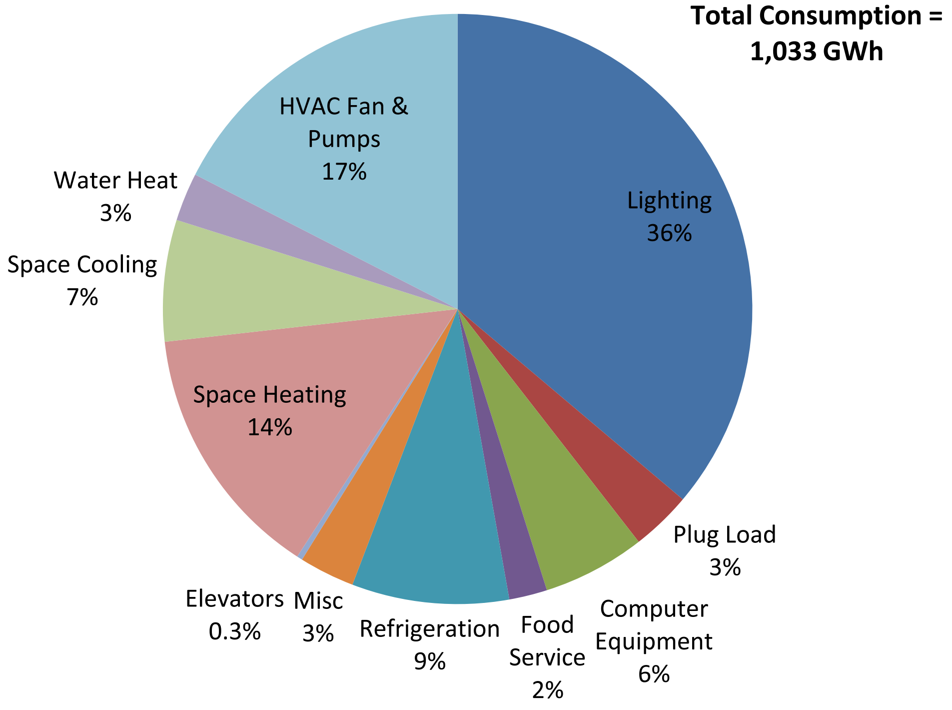
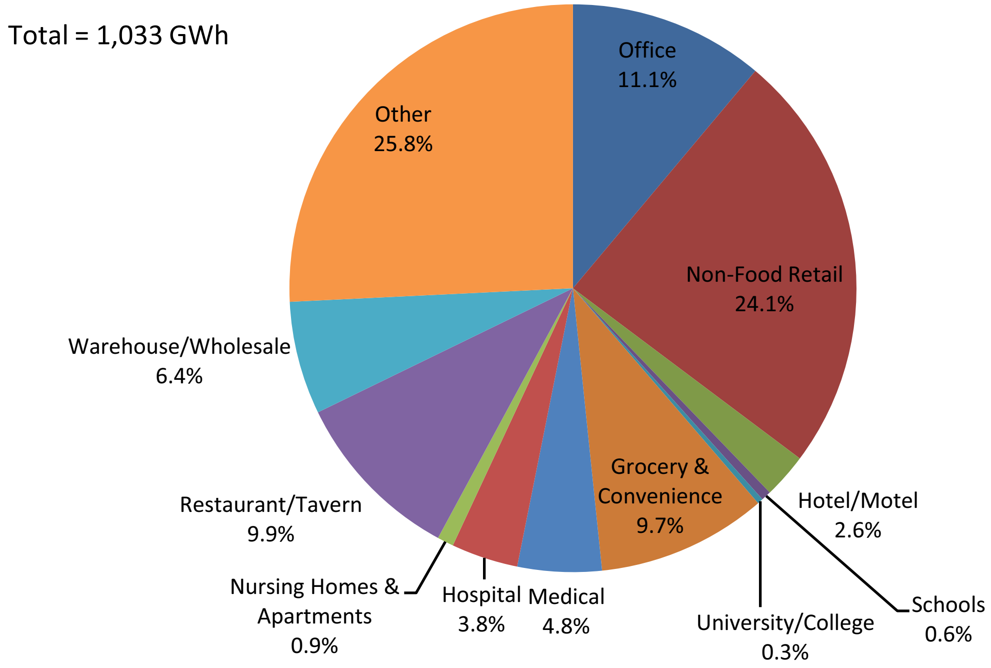


Figure 16 illustrates energy consumption by building type.

Figure 16
2008 Base Year End-Use Consumption by Building Type - Commercial



The total estimated use for 2008 is 1,033 GWh, or equal to 2008 weather-adjusted loads for commercial customers (plus the load from three commercial buildings classified under the industrial rate class).

Forecast

Average annual growth rates for building square footage were assigned by building type. Table 7 summarizes the growth rate assumptions which are based mainly on floor space growth rates in the Pacific Northwest as well as growth rates in BC Hydro's study.

Table 7
Building Growth Rates, Square Footage

Building Type	Building Growth Rates
Large Office	1.9%
Medium Office	1.3%
Small Office	1.7%
Large Retail	0.8%
Medium Retail	1.8%
Small Retail	1.8%
Large Hotel	1.3%
Medium Hotel/Motel	1.8%
Large School	0.9%
Medium School	1.2%
Grocery/Convenience	1.4%
Apartment/Assisted Living	2.6%
Medical	1.9%
Hospital	1.9%
Nursing Home	3.0%
University/College	1.3%
Restaurant	1.7%
Warehouse/Wholesale	3.2%
Other	1.9%

Table 8 compares the FortisBC forecast with the energy consumption estimated using end-use consumption and growth in commercial building square footage. Because the FortisBC load forecast does not separate commercial customers from other classes within the wholesale forecast, the 2008 commercial consumption from wholesale customers (Summerland, Nelson, Penticton, Kelowna, and Grand Forks) is projected at growth rates consistent with total wholesale sales growth.

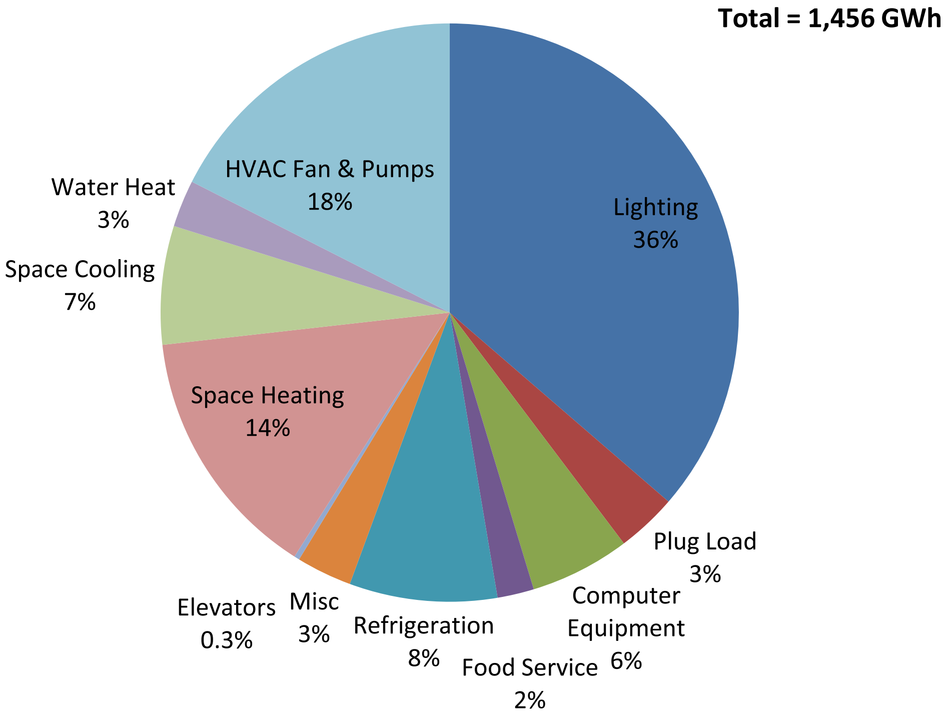
Table 8
Commercial Forecast Comparison - Energy

	FortisBC Load Forecast* MWh	End-Use Model MWh	% Difference
2008	1,033,440	1,033,440	0.0%
2009	1,036,928	1,036,896	0.0%
2010	1,061,161	1,060,909	0.0%
2011	1,086,944	1,086,469	0.0%
2012	1,114,152	1,113,455	-0.1%
2013	1,142,168	1,141,257	-0.1%
2014	1,166,264	1,165,182	-0.1%
2015	1,185,649	1,184,439	-0.1%
2016	1,203,756	1,202,432	-0.1%
2017	1,221,483	1,220,055	-0.1%
2018	1,239,774	1,238,246	-0.1%
2019	1,259,034	1,257,407	-0.1%
2020	1,278,251	1,276,533	-0.1%
2021	1,297,397	1,295,596	-0.1%
2022	1,316,781	1,314,905	-0.1%
2023	1,336,408	1,334,462	-0.1%
2024	1,355,875	1,353,869	-0.1%
2025	1,374,790	1,372,733	-0.1%
2026	1,393,482	1,391,384	-0.2%
2027	1,399,314	1,397,204	-0.2%
2028	1,419,208	1,417,064	-0.2%
2029	1,438,894	1,436,724	-0.2%
2030	1,458,361	1,456,175	-0.1%

*Excludes new DSM.

Figure 17 shows 2030 end-use consumption for the commercial sector.

Figure 17
2030 End-Use Consumption - Commercial



The EUI data for the buildings was forecasted to remain the same over the period. The EUI data were not adjusted to include energy efficiency or code changes. Change in future EUI or EUI for new buildings is accounted for in the conservation potential estimates. Energy efficiency potential due to code changes is later separated from potential available through utility programs.

Commercial End-Use Forecast – Demand

Methodology

The end-use forecast for energy was used together with load factors to estimate peak demand consumption for both the winter peak and the summer peak. The winter peak estimate is calculated by applying BC Hydro demand (kW) by end-use to FortisBC energy consumption across building types. The summer peak utilizes load factors from the Northwest Power and Conservation Council with some adjustments to account for FortisBC climate and other characteristics.

Winter Peak Demand

Figure 18 illustrates the breakdown of FortisBC winter peak by end-use. The winter peak usually occurs around the 6 p.m. hour in either December or January, depending on weather.

Using load factors and normalized annual energy, total commercial winter peak demand (normal) is estimated at 225 MW for 2008.

Figure 18
2008 Winter Peak Demand – Commercial

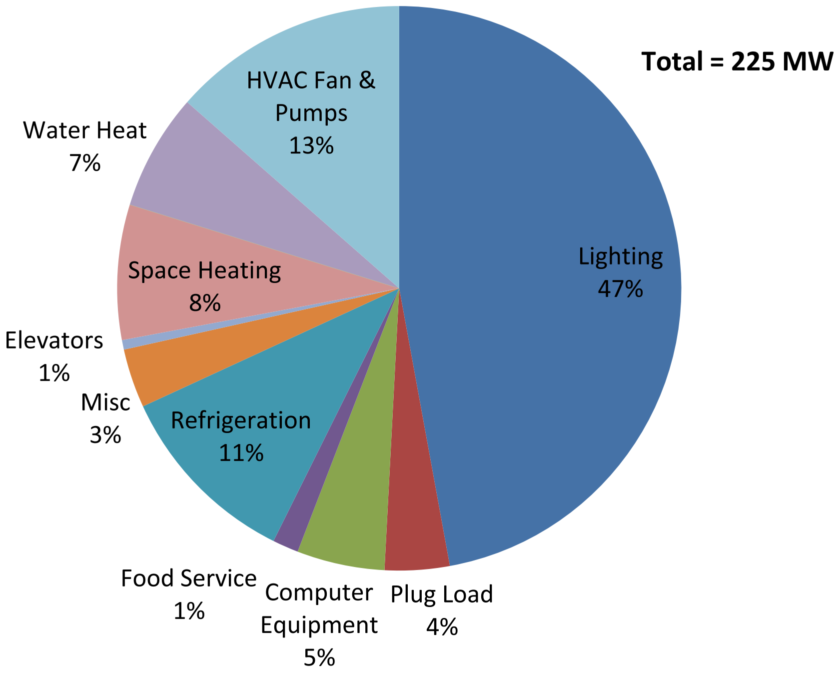
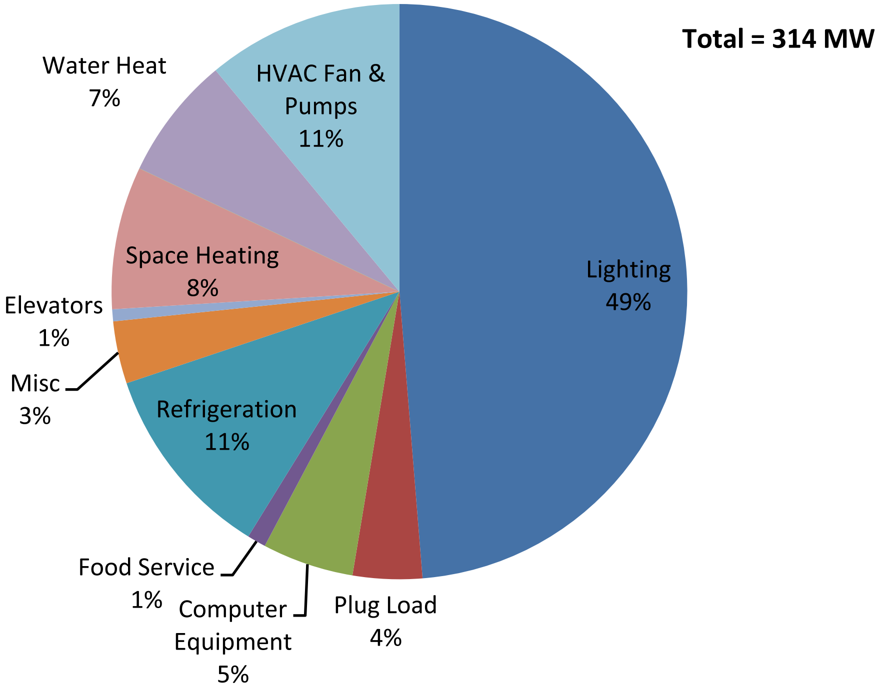


Figure 19 shows the forecasted winter peak breakdown in 2030. Average annual growth in peak demand is 1.8%. Because floor space growth rates varies across building types (See Table 7), the 2030 winter peak demand is slightly different from the 2008 winter peak demand profile.

Figure 19
2030 Winter Peak Demand – Commercial



The figure below shows the 2008 winter peak demand by end-use and customer type. Lighting is excluded in Figure 20 due to the large amount of consumption; however, lighting consumption by building type is shown in the subsequent figure. Figure 20 shows that the building types that contribute most to peak demand are small office, small retail, grocery, and other (see Table 9).

Figure 20
2008 Commercial Winter Peak Demand by Building Type and End-Use Excluding Lighting

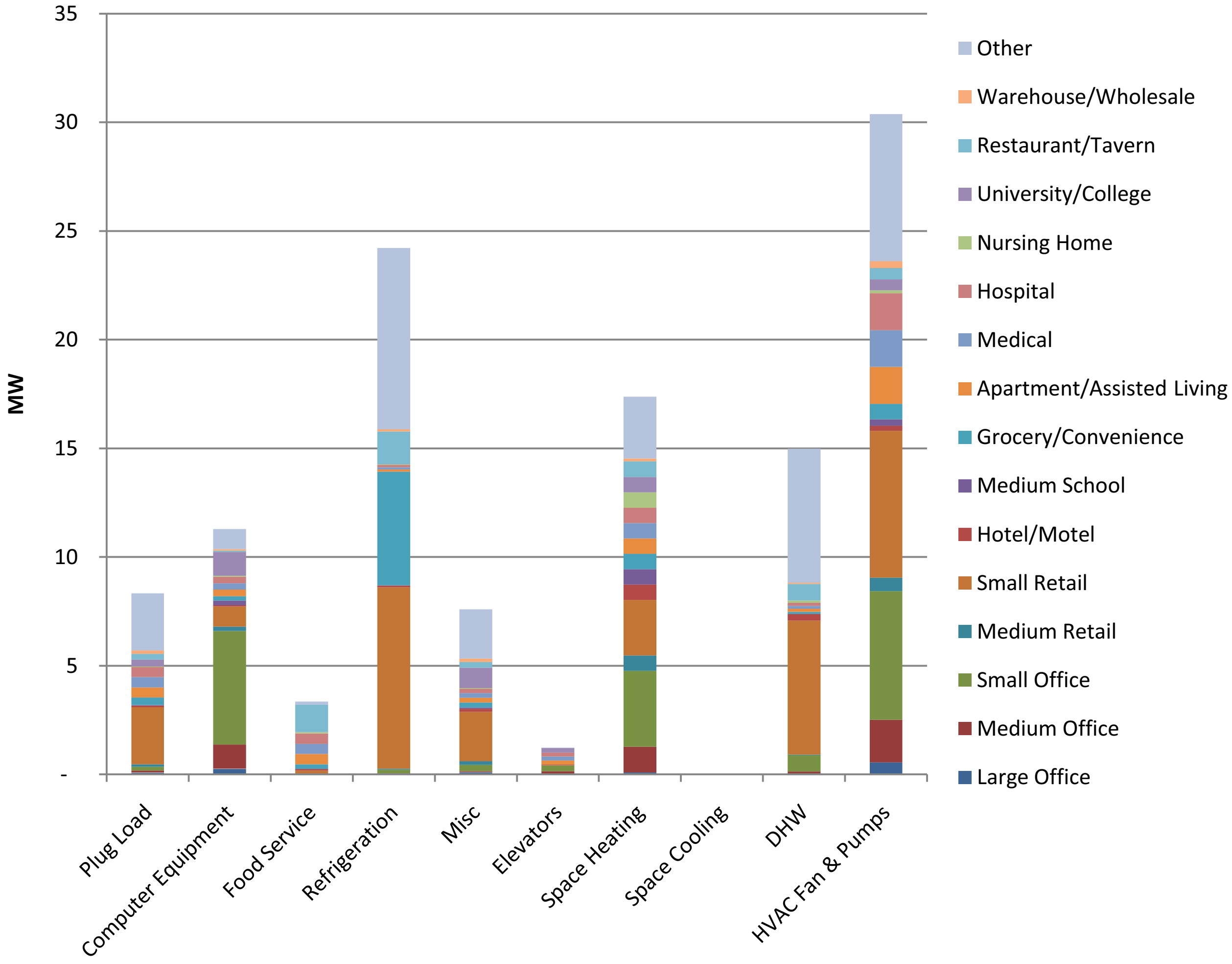
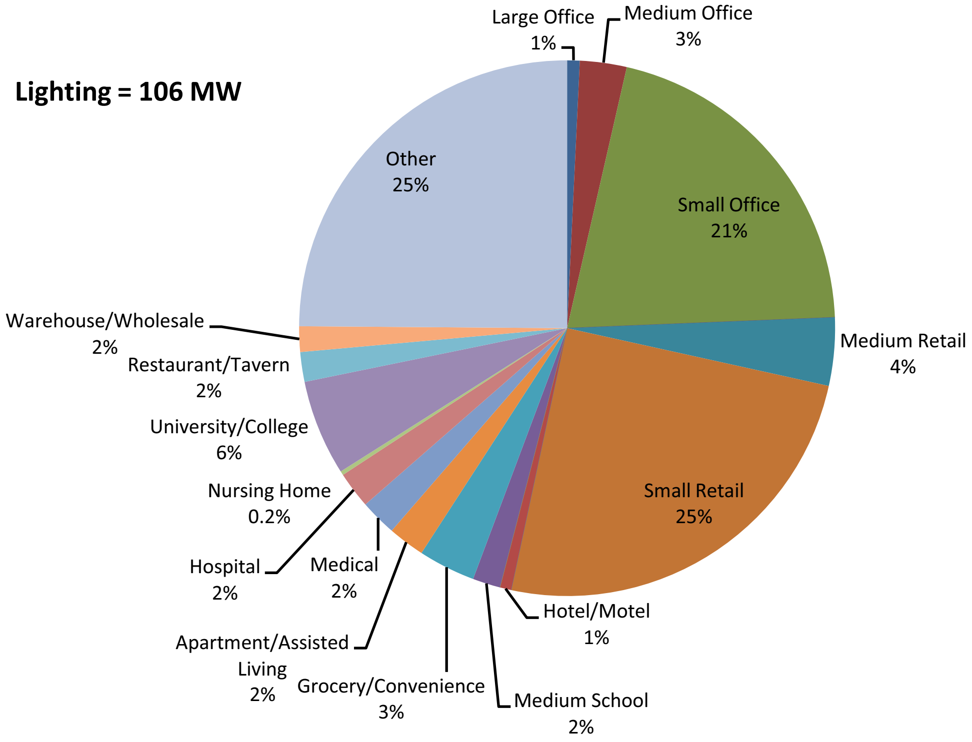


Table 9
2008 Commercial Winter Peak Demand, Top Four Building Types

	2008 Peak Demand, kW
Other	56
Small Retail	56
Small Office	38
Grocery/Convenience	11
All Commercial Buildings	225

Figure 21 shows that small office, small retail, and other building types contribute most significantly toward winter peak in terms of lighting consumption.

Figure 21
2008 Winter Commercial Peak Demand by Building Type – Lighting Only



Summer Peak Demand

Figure 22 illustrates the breakdown of FortisBC summer peak by end-use. The summer peak usually occurs in the late afternoon/early evening (around 5 P.M.) on July or August day, depending on weather. Total commercial summer peak demand is estimated at 193 MW for 2008.

Figure 22
2008 Summer Peak Demand - Commercial

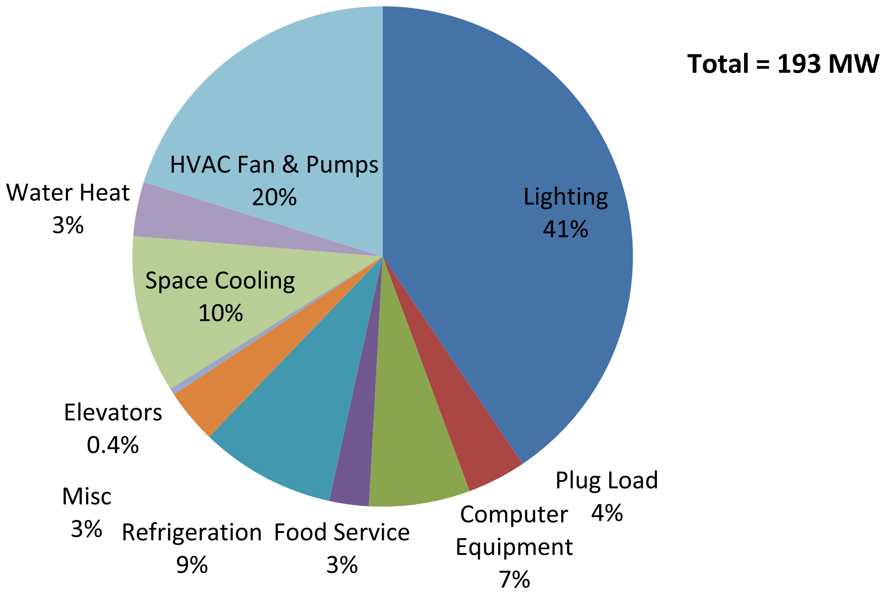


Figure 23 illustrates the forecasted summer peak demand for 2030. The average annual growth rate in peak demand is 1.4%.

Figure 23
2030 Summer Peak Demand - Commercial

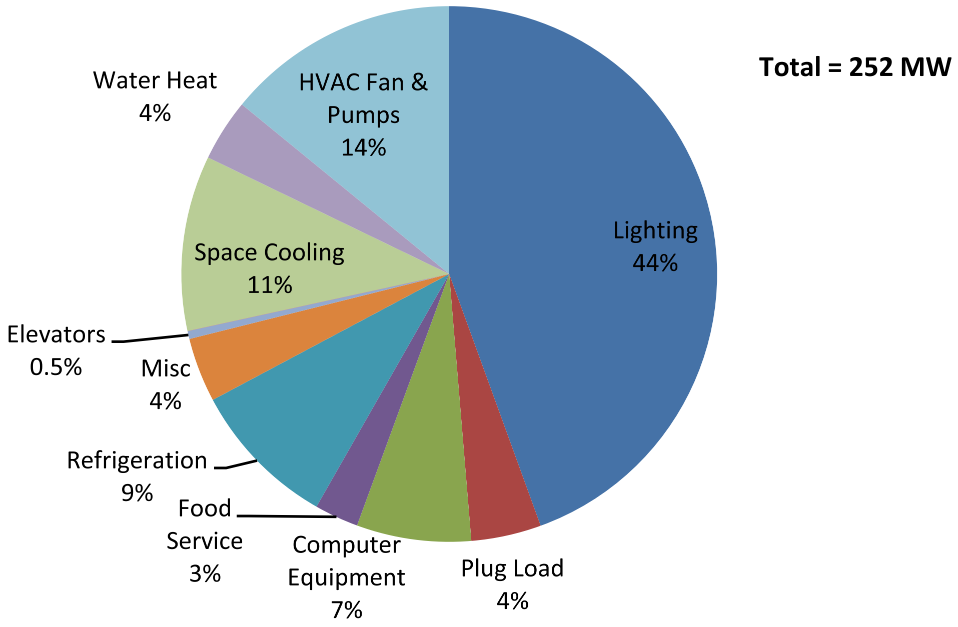


Figure 24 shows the 2008 summer peak demand by end-use and building type. Lighting is excluded in Figure 24 due to the large amount of consumption; however, lighting consumption by building type is shown in the subsequent figure. Figure 24 shows that the building types that contribute most to peak demand are small retail, grocery, restaurants, and other (see Table 10).

Figure 24
2008 Commercial Summer Peak Demand – by Building Type and End-Use Excluding Lighting

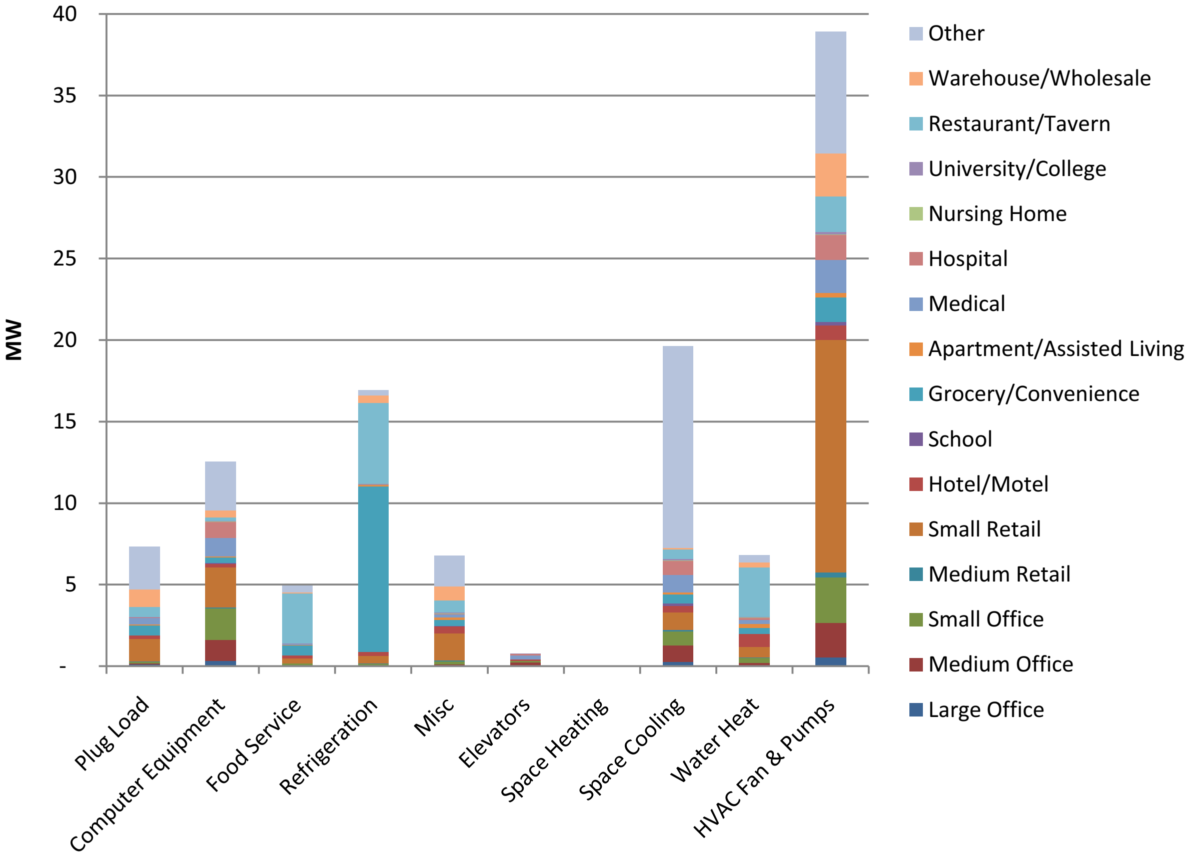
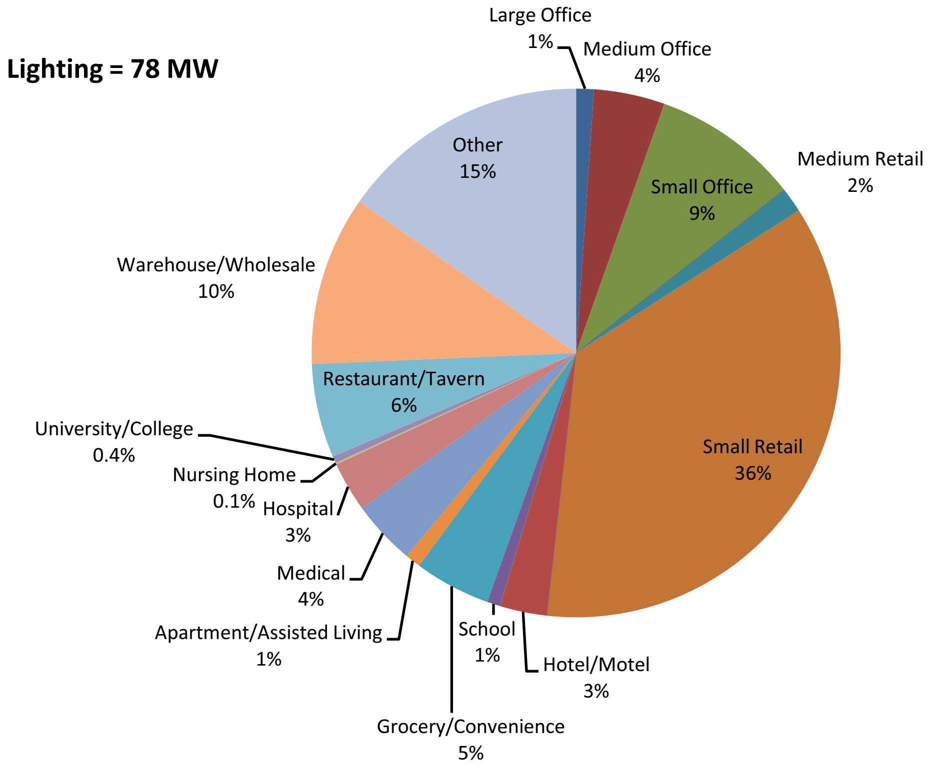


Table 10
2008 Commercial Summer Peak Demand, Top Four Building Types

	2008 Peak Demand, kW
Small Retail	50
Other	40
Restaurant/Tavern	20
Grocery/Convenience	18
All Commercial Buildings	193

Figure 25 shows that small retail, warehouse/wholesale, and other building types contribute most significantly toward summer peak in terms of lighting consumption.

Figure 25
2008 Summer Commercial Peak Demand by Building Type - Lighting



Industrial End-Use Forecast

Methodology

The base year for industrial sector consumption is calculated using the 2009 energy forecast for rate schedules 30, 31, and 33 and the Tolko sawmill (wholesale customer). As mentioned in the Commercial End-Use Forecast section, three customers were removed from the industrial rate class for conservation modeling purposes: UBC Okanagan, Selkirk College, and Trail Community Health. Some industrial customers are net metered; self-generation is not included in this forecast nor is it included in the FortisBC system forecast.

Customer consumption is grouped into classes according to the North America Industry Classification System (NAICS). Table 11 shows the industrial processes and annual kWh consumption for these customers.

Table 11
Industrial Sector Retail Sales by Segment, 2008

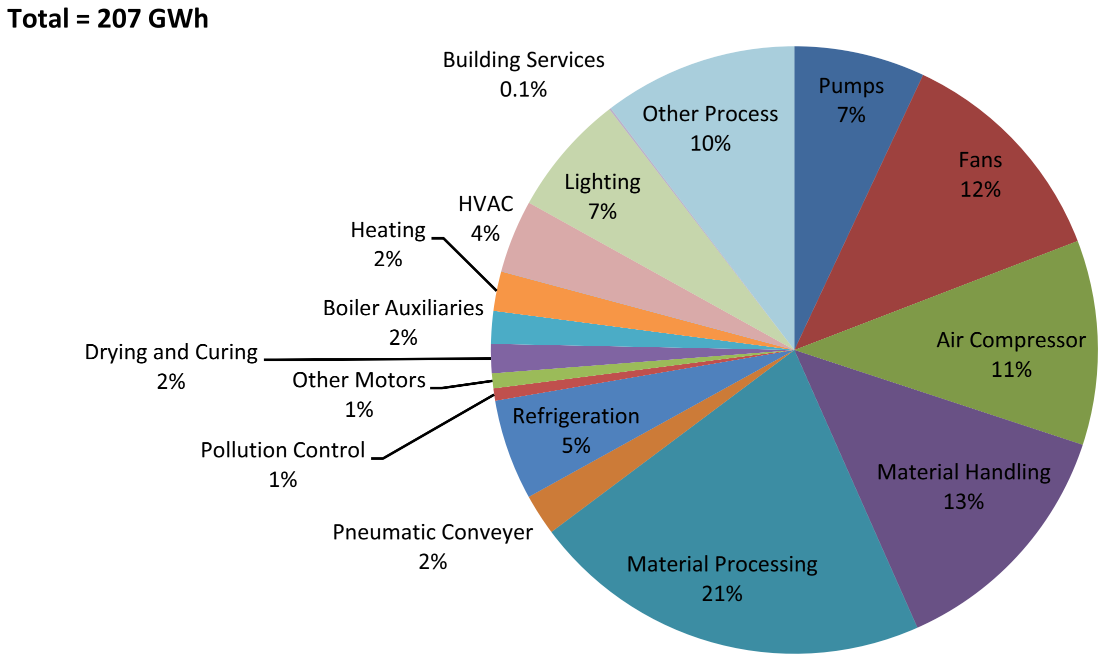
Industrial Process	Energy Consumption kWh
Wood products	90,054,330
Building Materials	53,000,000
Pulp and Paper	16,500,000
Food and Beverage	13,873,300
Miscellaneous	9,857,231
Mining	9,120,800
Fruit packers and storage	8,724,298
Other Manufacturing	3,621,000
Contractors & Construction	2,717,664
Total	207,468,623

Consumption within each industrial process was disaggregated into end-use by applying percentages from sources such as the BC Hydro Conservation Potential Assessment and the Northwest Power and Conservation Council. The result is a top-down methodology for classifying energy consumption by end-use.

2008 Industrial End-Use Consumption

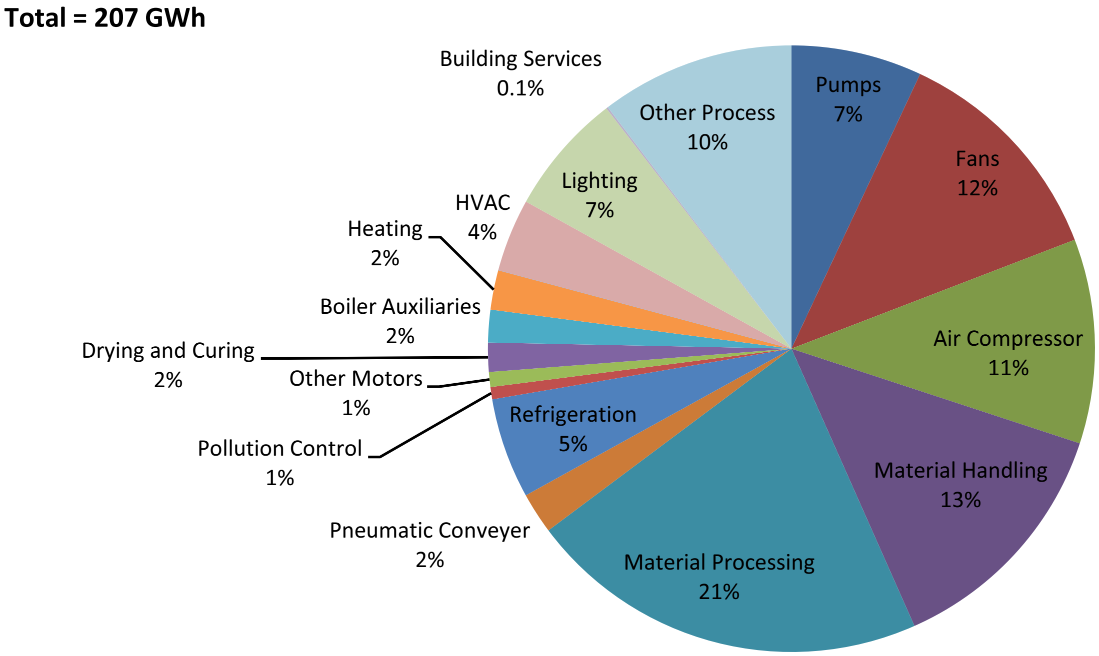
Using the methodology above, total sector consumption is split into several end-use categories. Figure 26 below shows the resulting break down for the base year. Total consumption is 207 GWh.

Figure 26
2008 End-Use Consumption - Industrial



Industrial loads are expected to remain flat over the planning period. Therefore the 2030 end-use breakdown will be identical as the 2008 break-down in terms of share and total consumption. See Figure 27.

Figure 27
2030 End-Use Consumption - Industrial



Peak Demand Forecasts

Winter and summer coincident peak demand for the industrial sector is estimated based on historical load factors by customer from FortisBC billing data as well as load factors for industries in California and British Columbia (BC Hydro). The methodology for forecasting peak demand by end use was first to calculate load factors for each type of industry (sawmill, pulp, manufacturing, etc). These load factors are applied to each end-use by industry. In cases where more details were known, such as refrigeration in food and beverage industries, specific load factors were used by end-use. The resulting summer and winter peak demand breakdowns are given in Figures 28 and 29. Since a 0% growth is assumed for the energy forecast, the 2030 peak demand breakdowns will be identical to Figures 28 and 29, and therefore are excluded from the report.

Figure 28
Industrial Winter Peak Demand

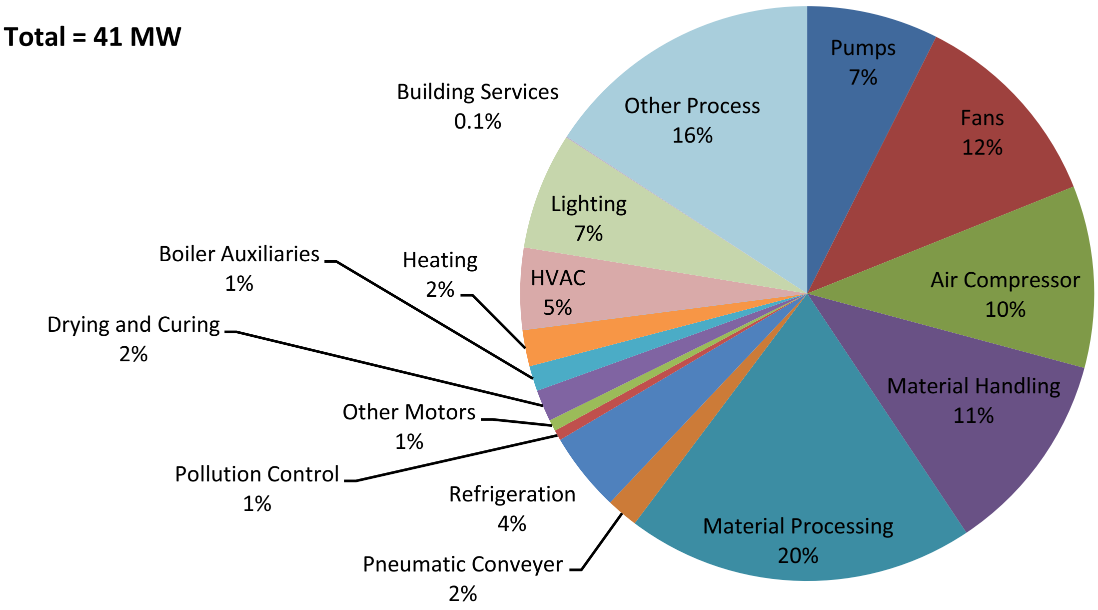
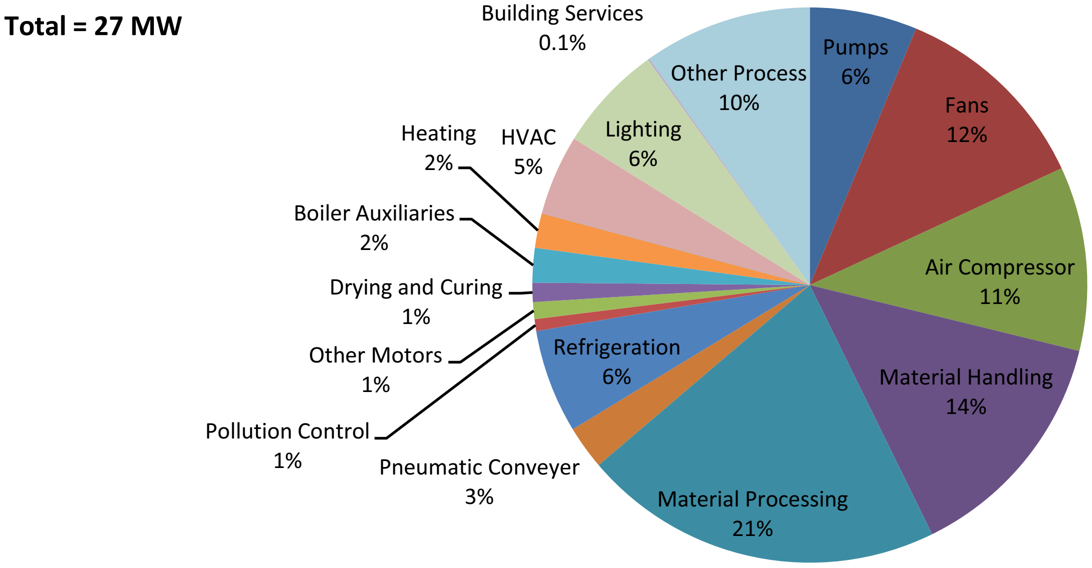


Figure 29
Industrial Summer Peak Demand



Total System

This section aggregates all sectors to compare the end-use forecasting models with the load data provided by FortisBC and its wholesale customers. First, Table 12 compares energy forecasts by sector. Irrigation and lighting sector consumption was not broken down due to lack of data. The end-use forecast model was calibrated to match normalized load data; therefore, there are no material differences in base year consumption.

Table 12
End-Use Model Comparison for 2008
(MWh)

	Residential	Commercial	Industrial	Lighting	Irrigation	Total
2008 Loads Provided by Utilities	1,719,530	1,033,440	207,469	13,538	52,071	3,026,047
2008 End-Use Model	1,719,530	1,033,440	207,469	13,538	52,071	3,026,047
% Difference	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Table 13 below compares the summer and winter peak demand forecasts. Load factors for Irrigation and lighting customers are assumed to produce the total peak. It was assumed that there is no irrigation during the winter peak and an 87% load factor for summer is used. It is assumed that lighting is not part of the summer peak demand.

Table 13
End-Use Model Comparison for 2008 (MW)

	Residential	Commercial	Industrial	Lighting	Irrigation	Total
Winter Peak						
Weather Adjusted Actual						701
2008 End-Use Model	427	225	47	3	4	706
% Difference						-0.7%
Summer Peak						
Weather Adjusted Actual						560
2008 End-Use Model	271	193	34	0	45	543
% Difference						3.0%

Residential Energy Savings Potential

Introduction

This section begins with a brief description of residential customer housing characteristics and appliance saturations. Next, energy efficiency measures are described followed by potential estimates calculated using the methodology described in the "Methodology" section. A couple of fuel switching measures, customer-owned renewable energy, and low-income measures are also addressed. The conservation potential results are presented as supply curves, tables, and compared to the end-use forecast.

Residential Customer Characteristics

FortisBC provides electric service directly to 95,282 customers and indirectly to an additional 42,373 customers through its wholesale customers. In 2009, FortisBC conducted a customer survey of both direct and indirect residential customers within their service territory. The surveys defined building characteristics and appliance saturations, type and age. These results are provided at an aggregate level as well as by sub region including West Kootenay, South Okanagan, and Central Okanagan.

Table 14 summarizes the key building characteristics for all FortisBC customers. Heat type, furnace age, insulation, window, and door characteristics were also defined for these buildings.

Table 14
Residential Building Characteristics

	Single Family	Mobile, Other	Apartment Condo	Duplex, Row, Townhouse
Building Type	**69%**	**8%**	**13%**	**11%**
Electric Heat	31%	27%	80%	42%
Gas Heat	57%	47%	18%	57%
Other Heat	12%	26%	2%	1%
Own Home	95%	92%	65%	82%
Before 1950	12%	0%	2%	1%
1950-1975	25%	25%	5%	14%
1976-1985	18%	31%	10%	19%
1986-1995	21%	21%	23%	28%
1996-2009	24%	22%	53%	32%
Full Basement	60%	2%	11%	46%
Partial Basement	12%	1%	2%	8%
Crawlspace	20%	26%	3%	27%
No Basement	8%	71%	85%	19%
Average Size (Sq Ft)	2,250	981	1,187	1,688

Table 15 summarizes key appliance saturations for FortisBC residential customers. The survey also identified the average age for the major appliances; these are shown below when provided for the main appliance.

Table 15
Residential Appliance Saturation

Cooking and Food	Share	Average Age, Years	Electronics	Share
Refrigerator Auto Defrost	90%	7.3	DVD	75%
Chest Freezer	52%	12.6	VCR	52%
Upright Freezer (not part of fridge)	21%	6.9	Digital Cable or Satellite TV	47%
Refrigerator Manual Defrost	20%	8.6	CRT TV <32 inches	61%
Microwave	87%		CRT TV >32 inches	24%
Electric Range (cook top + oven)	81%		LCD Flat Screen TV	38%
Electric Cook Top	11%	9.0	Laser Printer	15%
Gas Range (cook top + oven)	11%		Plasma flat screen TV	13%
Separate Electric Oven	10%		Rear projection TV	7%
Gas Cook Top	5%		Desktop Computer	69%
Cleaning			Inkjet printer	65%
Electric Clothes Dryer	92%	7.8	Laptop computer	49%
Automatic Dishwasher	82%	7.0	Fax	19%
Clothes Washer (top load)	64%	9.5	Audio entertainment video games	24%
Clothes Washer (front load)	35%	3.6	Surround System	32%
Gas Dryer	2%	8.7	Other	2%
Water Heating			**Miscellaneous**	
Gas Water Heater	50%	6.9	Jetted Bathtub	11%
Electric Water Heater	49%	6.6	Hot Tub (outdoor)	11%
AC			Swimming Pool (outdoor)	7%
Central Air Conditioning	50%	N/A	Indoor hot tub	2%
Window AC	16%		Separate workshop	18%
Portable AC	7%		Electric Car Block Heater	21%

Energy Efficiency Measures

Several measures for each end-use were analyzed to model energy efficiency potential. Measures were included where the data available supported cost and savings values. Many "non-traditional" measures such as shade trees or clothes lines have little solid basis for either cost or savings and so were excluded from this analysis. Future CPA work may include data collected from the many pilot programs currently being implemented in North America that seek to verify "non-traditional" measure cost and savings values. Non-traditional measures and/or new technologies may be viable and integral parts of program offerings, but because they are difficult to quantify, they are not used in this potential assessment. The table below summarizes the types of technology-based measures included in the analysis. While few categories are provided in the table, several permutations of each measure within these categories exist. There are over a hundred individual measures considered in the residential sector only.

Table 16
Residential Energy Efficiency Measure Categories

- Appliances
    - Refrigerator and Freezer Recycling
    - Clothes Washers and Dryers
    - Dishwashers
    - Refrigerators and Freezers
    - Ovens and Ranges
    - Microwave
- Lighting
    - CFLs
    - LEDs
- Electronics
    - Televisions
    - Computers and Monitors
    - Set Top Boxes
    - TV Peripherals
- New Home Whole House Measure
- Electric Thermal Storage (ETS)
- Domestic Hot Water
    - Tank Upgrades
    - Low-Flow Showerheads
    - Low-Flow Faucet Aerators
    - Heat Pump Water Heater
- Heating and Cooling
    - Heat Pump Upgrades
    - Heat Pump Conversions
    - Window and Portable Air Conditioning Upgrades
    - Electric Thermostats
    - ECM on Furnace Fans
    - Geothermal Heat Pumps
- Weatherization
    - Windows
    - Air Sealing
    - Insulation

Heat pump conversions are measures that take into account the incremental cost and energy savings from switching from some other electric heat source (like baseboard or forced air furnace) to heat pumps. Conversely, heat pump upgrade measures take into account the incremental cost and savings from upgrading from a less efficient heat pump to a more efficient model.

Electric Thermal Storage

Electric Thermal Storage (ETS) is a peak demand reduction measure evaluated alongside the energy efficiency resources in this section. Although there are no energy savings related to ETS, peak demand savings are evaluated assuming that ETS can be implemented with time-of-use rates (TOU) or some other customer incentive so that remote control or smart metering is not required. ETS is described in more detail below.

Thermal Storage, Room

Thermal storage systems heat enclosed ceramic bricks to as high as 1,650 degrees C during off-peak hours and slowly release the heat as needed during on-peak periods. While thermal storage has little or no energy benefits, it has the potential to shift almost the entire heating load to off-peak hours. If a unit is working exactly as installed, 100% of heating load can be curtailed during morning and evening winter peak. In practice, overrides and minimal on-peak usage make a 90% peak reduction possible. Lifetimes are 15-18 years and costs can be quite expensive ($5,000-$6,000 per house. A typical house would need three or four units ($1500 each). Steffes is the primary vendor in the region. Hayes Creek Electric reports good consumer acceptance of the technology and few problems, despite low participation in a Princeton, BC based program.

Thermal Storage, Central

Central thermal storage units are similar in savings and life to central systems. When applicable, they have a slightly lower cost. However, central thermal storage units also come with other retrofit concerns in addition to the substantial cost. Often houses require re-wiring and structural modifications to handle the weight of the units. Central thermal storage units require ducts through the house and are generally applicable to larger homes and new construction.

Emerging Technologies

Some emerging technology measures are included in the potential estimates. Measures such as heat pump water heaters and ductless heat pumps, which are not yet main stream but have equipment available in the market, have been included in the main potential assessment. In addition, whole house measures for new single family homes are included. These are known as EnerGuide80 and Energuide90[6] measures and include significant weatherization, energy efficient heating types and water heating. British Columbia plans to adopt EnerGuide80 standards as building codes by 2014.

EnerGuide90 homes are known as “near net zero” homes in British Columbia. While the technologies for these homes are available, programs for net zero homes are not yet mature. Net zero homes can be built for $10,000 to $30,000 more than the cost of a conventional home which can be recovered through savings on energy bills and increased value of the home. Currently, there are 1,697 homes in the southwestern United States, and at least fifteen demonstration projects are underway in Canada through CMHC.[7] EnerGuide90 homes are included in potential

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[6] EnerGuide90 homes are also known as “near net zero” homes in British Columbia. Though these homes consume significantly less energy than standard or older homes; they do not attain net zero electricity consumption on an annual basis.

[7] http://www.netzeroliving.ca/#what_is_a_net_zero_homeHC's EQuilibrium initiative.

estimates; however, due to the emerging nature of the programs, achievability rates are set conservatively for this measure group (65 percent).

In addition to the emerging technology measures included in this analysis, there are a variety of technologies/measures that are undergoing research and development, and others that have yet to be identified that may come to fruition during the 20-year timeframe of this study.

- Phase change materials – building materials that store thermal energy during the day and release during the night
- Vacuum panel insulation – panels that achieve insulating levels up to 7 times greater than existing materials
- Green roofs – roofing systems capable of growing plants; primarily for multifamily apartment buildings
- Vacuum panel windows – two glass panels with a partial vacuum in between
- Integrated PV windows – windows that incorporate photovoltaic cells in the window
- Advanced LED lighting – LED's are included in the potential estimates in a limited manner, but significant advances could result in the displacement of CFLs
- Fiber optic lighting and light pipes – day lighting is distributed throughout buildings through fiber optic cable
- Solar absorption cooling – gas-fired absorption chillers are widely available, but these cooling systems use solar energy as the heat source.
- Evaporative cooling – evaporative cooling is becoming more widely available in hot, dry climates and may eventually have some application in FortisBC service area
- Home Automation (optimized home energy use) – Home Automation fully integrated with the smart grid will help to optimize energy consumption and peak demand beyond individual measure savings
- On-site generation (e.g., waste to energy, widespread PV, wind, fuel cell) – to obtain true net zero energy consumption, some on-site generation will likely be required.

At this point these measures/technologies are either unproven or too costly to be implemented as cost-effective conservation. However, it is likely that development will continue and some or all will be tested, verified, and included in future potential assessments.

Fuel Switching

In addition to the energy efficiency measures, one fuel switching measure category was analyzed in the residential sector. Due to the large share of demand from cooking during peak times, electric savings from the conversion of electric ranges (oven and stove top) to gas-fuelled ranges is examined. Also conversions from electric to gas-fuelled clothes dryers are analyzed. Approximately 92 percent of residential clothes dryers are electric. While these electric savings are quantified in this report, government policies preclude the electric utility from offering programs in this area.

Customer-Owned Renewable Energy

Several customer-owned renewable energy technologies were assessed for this conservation potential study. Customer-owned renewable energy measures include:

- Solar (photovoltaic);
- Wind turbines; and
- Solar hot water heating.

Micro hydro resources are sometimes included under the "customer-owned renewable energy" category. However, these resources are most commonly found as a supply-side resource rather than a demand side measure. Costs and annual generation for these projects vary significantly by site. In their study, BC Hydro notes that the main components of a micro hydro system include the pipeline, turbine, generator and controls. Generator costs vary from $2,000 to $3,000 per kW for small systems, but some systems are more complex and therefore cost more. The costs for installing pipelines and controllers are highly location dependent. Large components of micro hydro costs are site-specific, and this study does not attempt to develop a cost for these projects (similarly treated in the BC Hydro DSM study).

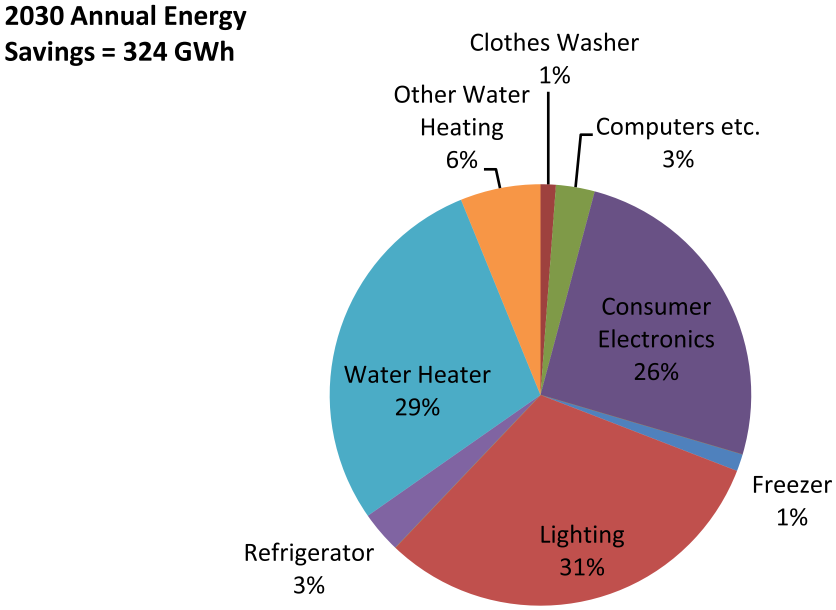
Potential Estimates

As described in the methodology section, end-use load forecast data and energy efficiency measures are combined to produce estimates of energy efficiency. In this analysis, energy efficiency potential is presented separately from the electric savings from fuel switching measures. The total economic and achievable potential is 479 GWh annually by 2030 or energy savings of 21 percent of 2030 forecasted residential load. In this section, economic and achievable potential are discussed followed by program achievable potential.

Appliances

Figure 30 illustrates the breakdown of economic and achievable energy efficiency potential for appliance measures. It is estimated that a total of 324 GWh of energy can be saved annually by 2030 through these measures. The potential estimates include measures that apply to both new and existing construction. Fuel switching measure potential is not included in the chart below but is discussed later in this section. The measure categories are described in further detail below.

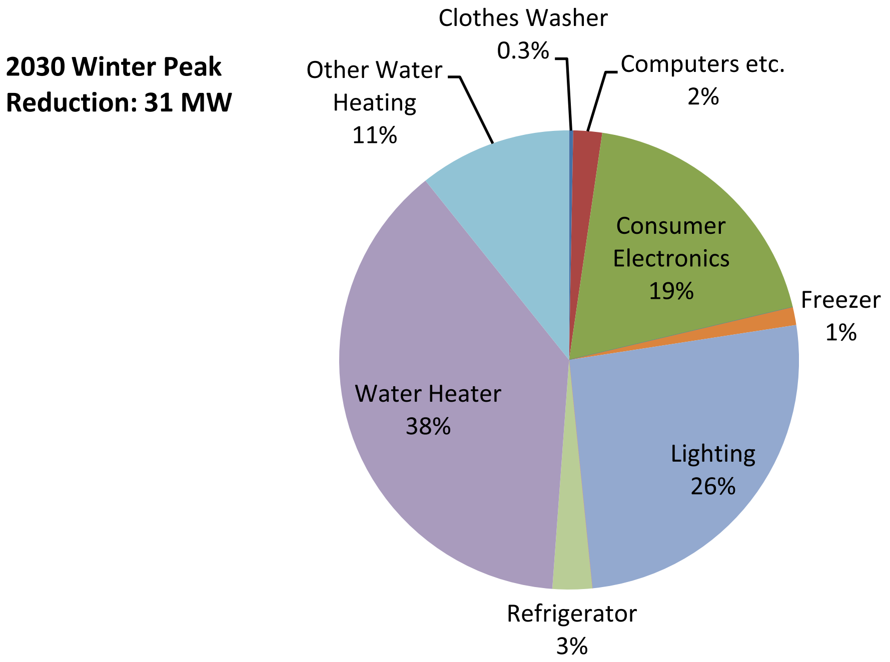
Figure 30
2030 Achievable Energy Savings Potential – Appliances



- **Clothes Washer** – Savings potential for 3 Tiers of clothes washer efficiency are applied to applicable units. The efficiency levels are: Tier 1is MEF (Modified Energy Factor) 2.0 to 2.19; Tier 2 is MEF 2.2 to 2.45; and Tier 3 is MEF 2.46 or greater.
- **Clothes Dryer** – Applies to electric clothes driers. Minimum efficiency level is EF (Energy Factor) 3.15. Due to high costs relative to energy savings, this measure does not pass TRC test, so it is excluded from chart above.
- **Computers** – Includes residential desktop computers and monitors.
- **Consumer Electronics** – Includes Energy Star Televisions and Set-Top Boxes.
- **Cooking** includes efficient microwave ovens and convection ovens. These measures do not pass the TRC so are not included in the chart above.
- **Dishwasher** measures have a minimum efficiency rating of EF 72. Does not pass TRC.
- **Freezers and Refrigerator** categories include both Energy Star rated appliance upgrades as well as retirement or recycling of old appliances.
- **Lighting** includes compact fluorescent light bulbs and fixtures.
- **Water Heaters** include upgraded efficiency as well as heat pump water heaters.
- **LED Lighting** – applies to whole house (new construction). Does not pass TRC.
- **Other Water Heating** measures include low-flow shower heads, bathroom and kitchen faucet aerators, and wastewater heat recovery systems in 2-storey, single family homes.

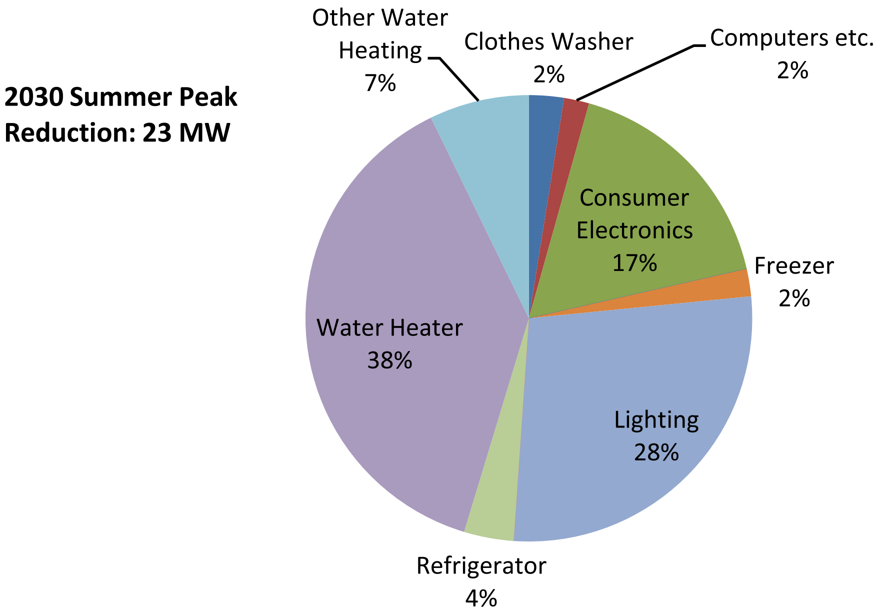
Winter peak reduction from these energy efficiency measures are shown in Figure 31. Peak energy savings are derived according to the timing of energy savings by measure.

Figure 31
Winter Peak Savings from Appliance Energy Efficiency Measures
Achievable Potential



Summer peak reduction from these energy efficiency measures are shown in Figure 32.

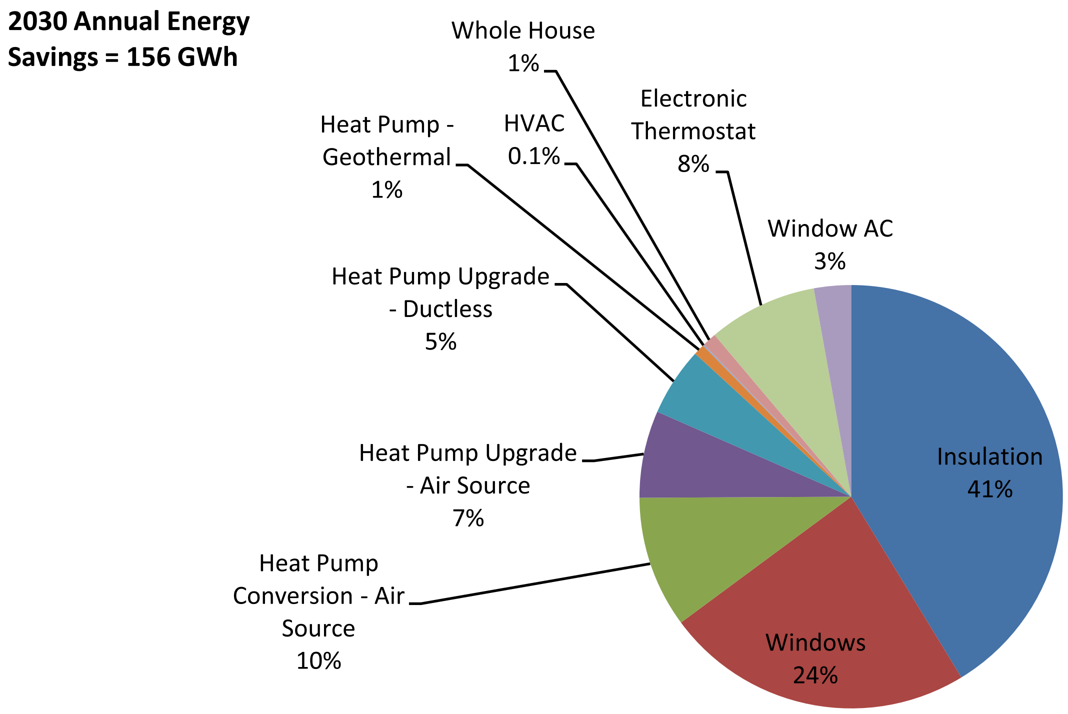
Figure 32
Summer Peak Savings from Appliance Energy Efficiency Measures Achievable Potential



Space Conditioning

Figure 33 illustrates economic and achievable energy efficiency potential that is available annually by 2030. These space conditioning measures apply to electrically heated homes. The measure categories are described in more detail below.

Figure 33
2030 Achievable Potential from
Space Conditioning Energy Efficiency Measures



- **Insulation** – upgrades attic insulation to RSI-6.7, RSI-5.3, RSI-5.8 (R38, R30, R33) for single family, apartments and row, and manufactured houses respectively. Floor insulation is upgraded to RSI-5.3 (R30) for each building type and Wall insulation is upgraded to RSI 1.9 (R11).
- **Windows** – include upgrading single pane, double pane wood or aluminum frame to Energy Star rated windows. Also, an upgrade from U-Factor 1.7 to U-Factor 1.4 W/m^2 (0.30 to 0.25 Btu/h•ft^2•°F) windows in new and existing construction is included.
- **Heat Pump Conversion – Air Source** includes conversions from electric forced air furnace to heat pumps with ratings of HSPF 8.5/ SEER 14 or higher.
- **Heat Pump Upgrade – Air Source** applies to existing buildings with heat pumps of lower efficiency.
- **Heat Pump Upgrade – Ductless** applies to all housing types with baseboard or zonal heat.
- **Geothermal Heat Pumps** (ground source) - are cost-effective for existing single family homes.

- **HVAC** measures include ECM on furnace fans in homes with forced air furnaces, regardless of heating fuel, and air sealing in electrically heated homes.

Figure 34 shows the breakdown of winter peak savings potential from space conditioning energy efficiency measures.

Figure 34
Winter Peak Savings from Space Conditioning Energy Efficiency Measures Achievable Potential

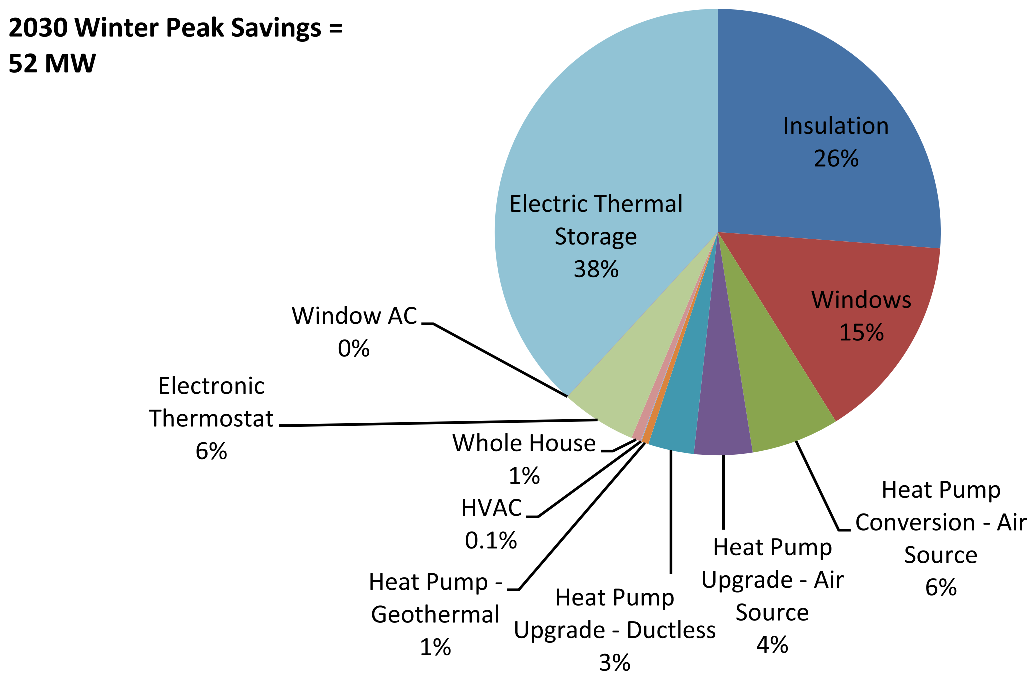
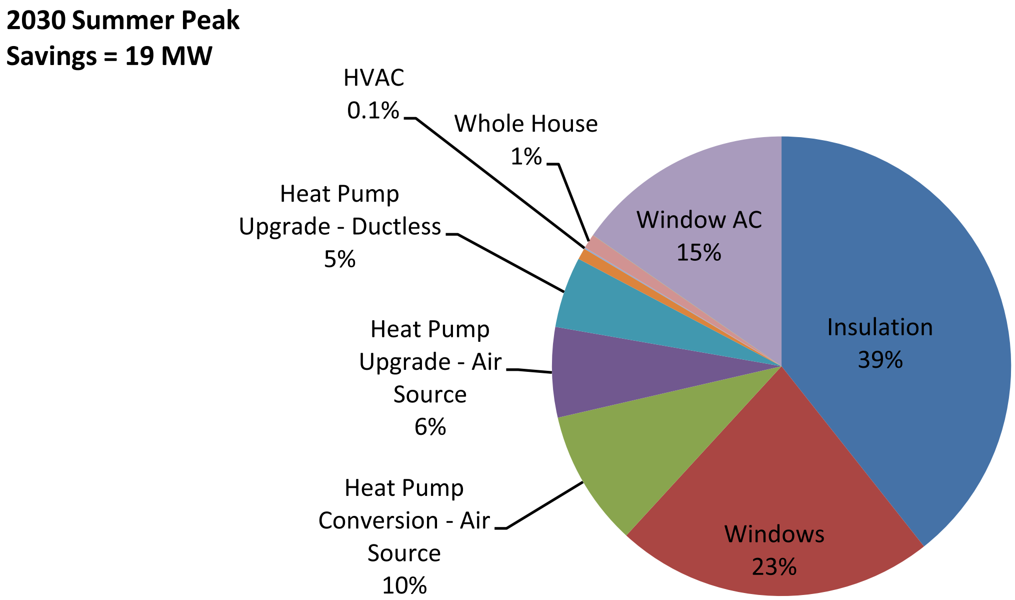


Figure 35 shows the breakdown of summer peak savings potential from space conditioning energy efficiency measures.

Figure 35
Summer Peak Savings from Space Conditioning Energy Efficiency Measures
Achievable Potential



A few other energy saving measures not quantified in this report include awnings and shade trees. Awnings and shade trees can reduce summer air conditioning load while maintaining the benefit of winter solar gain. These measures are difficult to quantify for a variety of reasons, in part because they can significantly interact with behaviour measures such as closing window blinds.

Low-Income Potential

The British Columbia Ministry of Energy, Mines and Petroleum Resources ("Ministry") amended the Public Utilities Commission Act (Bill 15-2008) to require public utilities to estimate cost-effective demand side resources (DSM) as part of their long term resource plan and to provide a plan to acquire those resources as a first priority over supply-side options. Under this mandate, the Ministry requires that residential energy efficiency measures be evaluated using several scenarios such as measure-by-measure TRC tests, grouped measure TRC tests, and low-income TRC tests. This last evaluation criterion allows low-income DSM programs to value additional benefit not accounted for in energy savings alone. As mandated by the government of British Columbia, an additional benefit of 30 percent is to be added to measures to evaluate cost-effectiveness for low income program measures.

According to Statistics Canada, 16.5 percent or approximately 27,000 households[8] in the FortisBC service territory are below the Low-Income Cut-Off (LICO). For this study, most of the residential measures analyzed pass the TRC test without the added benefit for low-income. No additional measures become cost effective when low income benefits are added to the TRC test.

Low-Income Programs

According to work prepared by FortisBC, low-income households have some key characteristics that suggest potential opportunities for energy efficiency improvements. Low-income customers that live in single family homes have a higher level of energy intensity per square foot than customers living in the same housing type who are not low-income, even though low-income customers' total consumption is, on average, less than that of non-low-income customers. In addition, specific product and end use comparisons highlight additional opportunities for improving energy efficiency in the homes of low-income customers. In addition, FortisBC found that CFL penetration in low-income houses is lower than the average penetration for the entire service territory. These characteristics indicate that there are significant barriers to energy efficiency adoption for low-income families. FortisBC is currently working on program design and mechanisms to address low-income barriers.

Fuel Switching

The electric range fuel switching measures analyzed in this analysis are cost effective in both new and existing construction. In existing buildings, the incremental capital cost is the installation of a gas line to the appliance, approximately $600.[9] In new homes, the incremental cost to install a gas line is estimated at $200. Incremental capital costs for gas ranges are $130[10].

In addition to fuel switching in cooking appliances, measures for fuel switching to natural gas dryers are also included in the analysis. According to FortisBC's customer survey, 92 percent of clothes dryers are electric. Gas line installation costs in new and existing homes is assumed to be the same as for the cooking appliance fuel switching measures discussed above. Incremental capital costs for gas clothes dryers are $93[11].

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[8] Statistics Canada. "BC Progress Board Performance Indicator #22 Low Income Cut-Offs (LICO)." 2006.

[9] Terasen Gas estimates installation of gas lines to be in the $200 to $1,000 range. $600 is used as the average.

[10] FortisBC staff

[11] FortisBC staff

Table 17 summarizes electric energy savings potential for the two fuel switching measures discussed above.

Table 17
Fuel Switching Electric Savings Potential

Fuel Switching	Energy Savings GWh	Winter Peak Demand Savings MW	Summer Peak Demand Savings MW
Electric Range, New	10.3	12.0	11.3
Electric Range, Existing	5.8	6.8	6.4
Electric Clothes Dryer, New	4.9	7.3	4.1
Electric Clothes Dryer, Existing	38.8	8.2	4.7
Total	**59.9**	**34.2**	**26.5**

Customer-Owned Renewable Energy

Cost and savings data for renewable energy measures were primarily obtained from the BC Hydro study; however, the NWPCC data base was used to benchmark the cost and savings data.

Technical potential for solar is calculated assuming that 30 percent of single family and row houses and 45 percent of apartment buildings are applicable for solar PV and solar water heating (based on BC Hydro Southern Interior Climate zone). The availability of wind resources is expected to be low. The BC Hydro study assumes an achievability rate of 0.1 percent for residential customer-owned wind generation, and this rate is applied to FortisBC homes as well. Lastly, 45 percent of homes with electric water heaters are assumed to applicable for solar water heat.

At current costs, none of the above technologies are cost-effective. However, a second scenario was analyzed assuming cost declines estimated in the BC Hydro study. BC Hydro estimated that costs would decrease to 42 percent of their current level by 2013, 21 percent the current level by 2018, and 11 percent of the current level by 2023. Using this declining cost structure and ramp rates to define achievability, economic potential is estimated and shown in the last column of the Table 18. Once a measure is cost effective, the ramp rate begins at 1% of technical potential per year and escalates to 5 or 10 percent of technical potential annually. The effective achievability rates are between 25 and 50 percent depending on when the measure becomes cost-effective.

Table 18
Residential Customer-Owned Renewable Energy
$2009

	Annual Generation kWh	Capital Cost	Installation Cost	Annual O&M	Life	TRC BC Ratio	Technical Potential MWh	Economic Potential* MWh	Year Technology Becomes Cost-Effective
Residential 3 kW PV, Detached	3,300	$27,999	$6,461	$194	20	0.14	133,678	66,839	2023
Residential 15 kW PV, Apt	16,500	$83,997	$19,384	$582	20	0.24	152,136	76,068	2018
Residential Wind, 400 W	700	$1,185	$969	$0	15	0.44	95	80	2013
Solar Hot Water 5 m^3 collector	2,200	$5,923	$0	$1	20	0.6	84,522	71,843	2013

*Assumes decreasing cost trend

Costs

TRC measure costs, utility costs, and participant costs are calculated for the economic and achievable potential. For the utility cost calculation, it is assumed that utility incentives are 60% of the incremental measure cost and that program administration costs are 20% of the full incremental measure cost. Participants incur OM&R costs/benefits. Table 19 summarizes TRC costs as well as compares a weighted average of the TRC levelized cost with savings potential. All cost and savings potential data in the table are for economic and achievable quantities of energy efficiency potential obtainable over a 20-year period.

Table 19
Residential 20-Year Achievable Energy Efficiency Savings and Cost Summary
2009 Dollars

	Ramp Rate	Total Measure Cost ($1000s)	Winter Peak Savings MW	Summer Peak Savings MW	Average TRC Levelized Cost $/MWh	Weighted B/C Ratio	Savings Potential MWh
Appliances Total		**$86,352**	**31**	**23**	**$44.04**	**10.98**	**324**
Lighting	CFL Code Change	$19,797	7.9	6.2	$28.34	6.41	101.1
Water Heater	EmergTech	$41,910	11.7	8.6	$45.01	3.05	92.5
Consumer Electronics	Electronics	$0	5.8	3.9	$52.81	12.62	82.3
Other Water Heating	20YearEven	$1,288	3.3	1.6	$7.23	75.17	19.9
Refrigerator	20YearEven	$6,728	0.9	0.8	$58.70	3.76	10.3
Computers etc.	EmergTech	$3,624	0.6	0.4	$79.97	2.84	9.6
Freezer	15YearEven	$1,759	0.4	0.4	$49.13	3.28	4.2
Clothes Washer	15YearEven	$11,246	0.1	0.6	$305.41	2.81	3.8
Clothes Dryer	20YearEven	$0	0.0	0.0	$0.00	0.00	0.0
Cooking	20YearEven	$0	0.0	0.0	$0.00	0.00	0.0
Dishwasher	20YearEven	$0	0.0	0.0	$0.00	0.00	0.0
Lighting LED	EmergTech	$0	0.0	0.0	$0.00	0.00	0.0
Space Conditioning Total		**$168,311**	**52**	**19**	**$61.19**	**1.95**	**156**
Insulation	20YearEven	$43,982	13.5	7.6	$40.80	2.22	64.3
Windows	20YearEven	$34,967	7.7	4.3	$35.15	2.06	36.7
Heat Pump Conversion - Air Source	20YearEven	$19,039	3.3	1.8	$105.28	1.31	15.7
HVAC	20YearEven	$215	0.0	0.0	$126.98	1.43	13.0
Heat Pump Upgrade - Air Source	20YearEven	$7,197	2.2	1.2	$60.16	2.27	10.4
Heat Pump Upgrade - Ductless	EmergTech	$11,430	1.7	1.0	$121.35	1.22	8.2
Whole House	EnerGuide90	$4,357	0.4	0.2	$98.70	1.31	4.4
Electronic Thermostat	20YearEven	$10,404	2.8	0.0	$79.71	1.72	1.7
Heat Pump - Geothermal	EmergTech	$1,554	0.3	0.2	$101.84	1.71	1.3
Window AC	2011 Code Change	$582	0.0	2.9	$17.95	7.92	0.2
Electric Thermal Storage	20YearEven	$34,585	19.7	0.0	NA	1.23	0.0
Fuel Switching		**$46,327**	**13**	**9**	**$305.04**	**1.06**	**16**
Electric to Gas Clothes Dryer	NA	$24,287	6.6	3.8	$280.42	1.06	9.0
Electric to Gas Range	NA	$22,039	6.0	5.7	$337.72	1.07	6.8
Total		**300,989**	**95**	**51**	**$57.73**	**7.83**	**495**

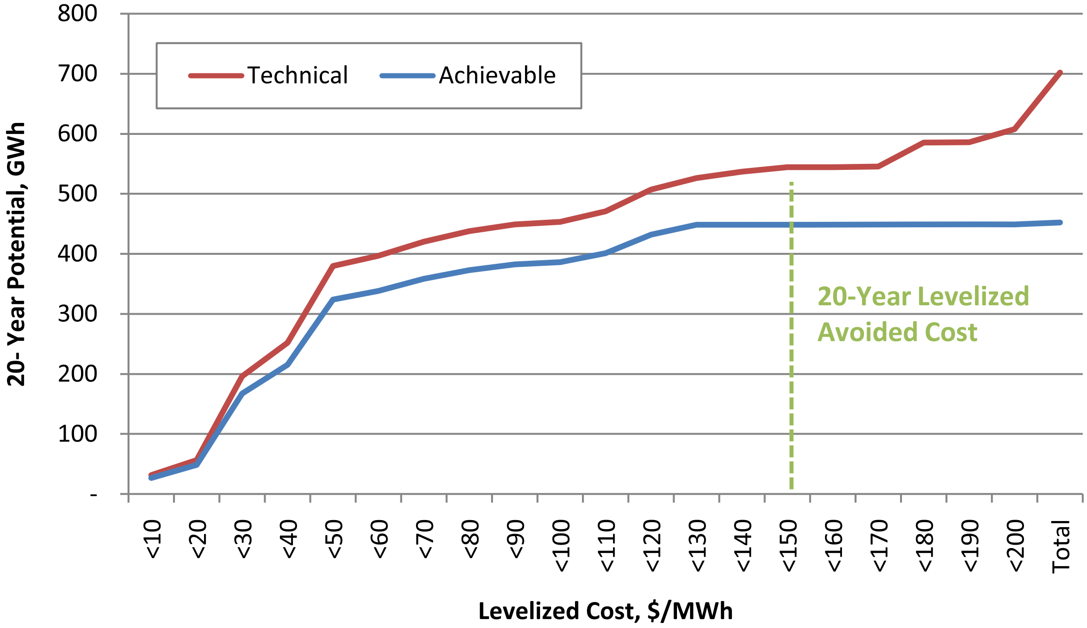
The definition of each column heading is listed below:

- **Ramp Rate** – reference to ramp rate used in estimating program achievable potential, discussed later.
- **Total Measure Cost** – incremental capital costs, O&M, replacement costs, and program administration costs. Costs are in thousands.
- **Winter Peak Savings –** MW peak savings associated with energy efficiency measure
- **Summer Peak Savings –** MW peak savings associated with energy efficiency measure
- **Average TRC Levelized Cost** – weighted average of levelized costs in measure category (weighted by share of measure category savings).
- **Weighted Benefit-Cost Ratio** – benefit-cost ratio for category weighted by the share of measure category savings.
- **Savings Potential** – Economic and achievable savings potential. Includes potential achieved through codes and standards.

Supply Curves

Energy efficiency resources are often summarized as supply curves. The supply curves in the figure below show how much energy efficiency (MWh) is available at different price levels. The x-axis shows measure levelized costs. These costs can be compared to supply side resources; however, unlike supply-side resources, the total quantity of the resource may not be available immediately. The curves in Figure 36 show the 20-year technical potential as well as the achievable potential. Note that the achievable potential in the figure includes potential that might be achieved through code and standard changes.

Figure 36
Residential Energy Efficiency Supply Curves



Program Achievable Potential

The previous section defined energy efficiency potential that is both economic and achievable through utility programs, codes, and standards. This section of the memo identifies potential that is both economic and achievable through utility programs only. Or, energy efficiency potential that is expected to be achieved through known code changes and product standards is not included in the following estimates.

In order to define utility program achievable potential, or "Program Achievable Potential," ramp rates are assigned by measure category to approximate the amount of energy efficiency potential that could be reasonably obtained through utility program efforts over the planning period. Figure 37 shows the Program Achievable Potential cumulatively by measure category and does not include fuel switching measures. The ramp rates used for program achievable potential can be found in Appendix D. Please reference Table 18 for measure category and applicable ramp rate names.

Figure 37
Residential Program Achievable Potential

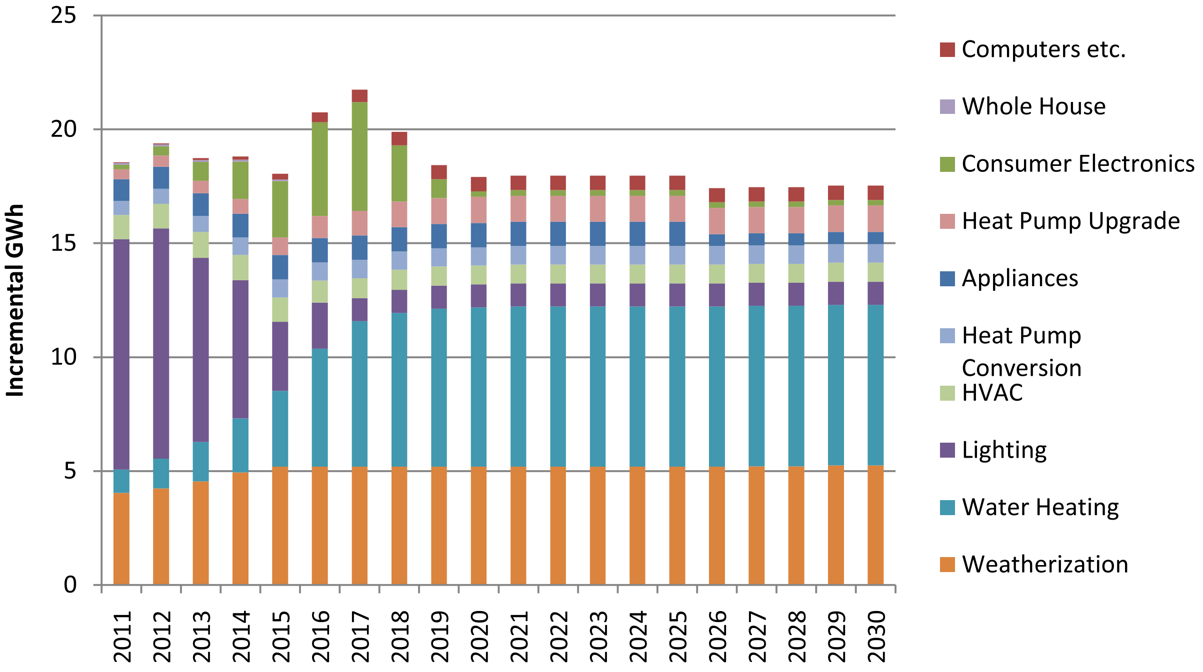


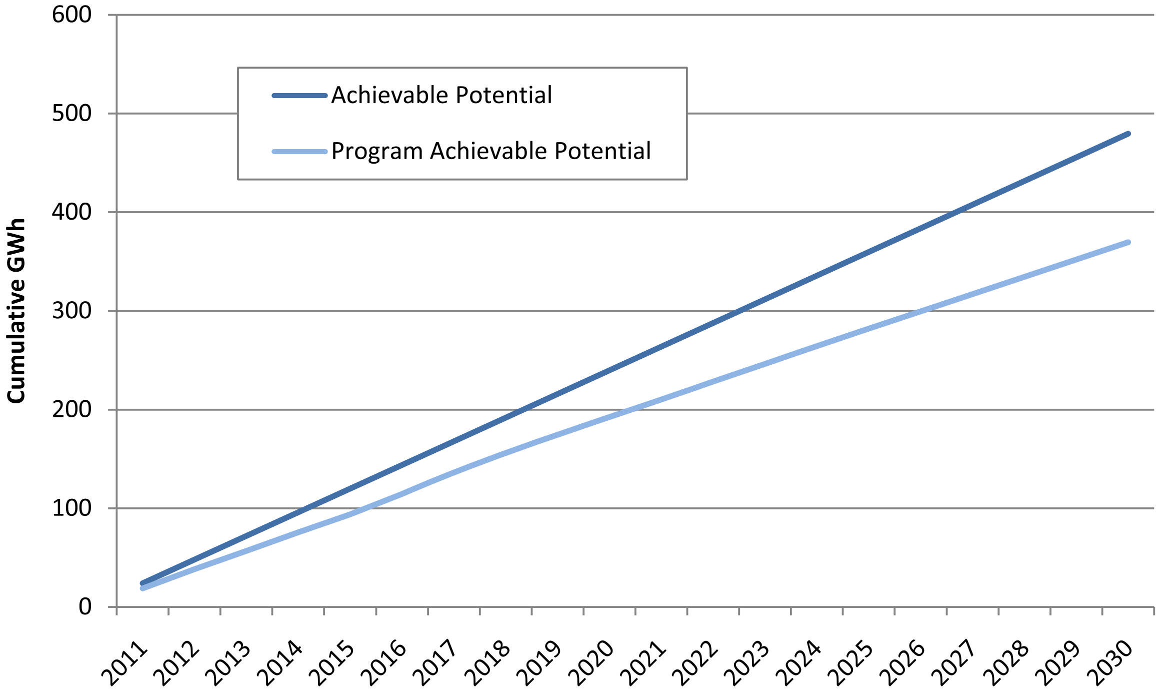
Table 20 shows measure category ramp rates and the associated larger measure category in Figure 37. The ramp rates dictate the pace (over time) that energy efficiency can be achieved. The infrastructure (e.g., availability of contractors) and cost (e.g., first cost, incentive levels) can affect the ramp rate, especially related to new technologies or measures that may take longer to become accepted in the marketplace.

Table 20
Measure Ramp Rates

Measure Category	Ramp Rate	Category in Figure 37
Lighting	CFL Code Change	Lighting
Water Heater	EmergTech	Water Heating
Consumer Electronics	Electronics	Consumer Electronics
Other Water Heating	20 Year	Water Heating
Refrigerator	20 Year	Appliances
Computers etc.	EmergTech	Computers etc.
Freezer	15 Year	Appliances
Clothes Washer	15 Year	Appliances
Dishwasher	20 Year	Appliances
Windows	20 Year	Weatherization
Insulation	20 Year	Weatherization
Heat Pump Conversion - Air Source	20 Year	Heat Pump Conversion
HVAC	20 Year	HVAC
Window AC	2011 Code Change	HVAC
Furnace Fan	2011 Code Change	HVAC
Heat Pump Upgrade - Air Source	20 Year	Heat Pump Upgrade
Heat Pump Upgrade - Ductless	EmergTech	Heat Pump Upgrade
Whole House	EnerGuide90/80	Whole House
Electronic Thermostat	20 Year	HVAC

Figure 38 compares Program Achievable Potential with total Achievable potential.[12] The difference between the curves in Figure 38 is the potential achieved through codes and standards for new building lighting. Figure 38 does not include savings from fuel switching. The residential code changes expected to occur during the 2011 – 2030 timeframe will result in an estimated 121 GWh of energy efficiency. See Appendix A for more information on residential code and standard changes.

Figure 38
Ramped Achievable[13] vs. Program Achievable Potential



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[12] Note that all energy efficiency potential referenced in these paragraphs is cost-effective, or economic.

[13] Includes potential achieved through codes and standards and uses a constant ramp rate of 5 percent annually.

Summary

The following three tables compare the energy efficiency potential estimates with the end-use load forecast for the year 2030. The potential in the table below is both economic and achievable. Additional columns show the total savings potential including fuel switching measures.

Table 21
Comparison of End-Use Model and Achievable Energy Efficiency Potential (MWh)

End-Use	End-Use Model 2030 MWh	Total Achievable Potential	Total Potential as % of 2030 Forecast
Energy Efficiency			
Space Conditioning & Ventilation	675,066	153,995	23%
Water Heater	213,607	112,375	53%
Lighting	330,840	101,104	31%
Consumer Electronics	238,031	82,276	35%
Refrigerator	144,015	10,306	7%
Computers etc.	149,560	9,622	6%
Freezer	71,560	4,228	6%
Clothes Dryer	103,092	3,797	4%
Whole House Measures		1,679	NA
Dishwasher	7,377	0	0%
Clothes Washer	8,764	0	0%
Misc	134,833	0	0%
Total Energy Efficiency	**2,076,746**	**479,381**	**23%**
Fuel Switching			
Cooking	170,465	8,976	9%
Clothes Dryer	103,092	6,764	4%
Total Fuel Switching	**273,557**	**15,740**	**6%**
Total	**2,247,212**	**495,121**	**22%**

Table 22 compares estimated winter peak demand reduction to the disaggregated forecast from the end-use model.

Table 22
Comparison of End-Use Model and Achievable Winter Peak Savings Potential (MW)

End-Use	End-Use Model 2030 Winter MW	Total Achievable Potential	Total Potential as % of 2030 Forecast
Energy Efficiency			
Space Conditioning & Ventilation	233.0	51.2*	22%
Water Heater	23.2	15.0	65%
Lighting	72.6	7.9	11%
Consumer Electronics	20.7	5.8	28%
Refrigerator	15.9	0.9	5%
Computers etc.	9.2	0.6	7%
Freezer	7.1	0.4	6%
Clothes Dryer	32.5	0.1	0%
Dishwasher	2.5	0	0%
Whole House Measures		0	NA
Clothes Washer	2.8	-	0%
Misc	29.2	-	0%
Total Energy Efficiency MWh	**416**	**82**	**20%**
Fuel Switching			
Cooking	59.5	12.6	20%
Clothes Dryer	33	7	21%
Total Fuel Switching	**92**	**19**	**21%**
Total	**508**	**102**	**21%**

*Includes approximately 20 MW of electric thermal storage

Table 23 compares estimated summer peak demand reduction to the disaggregated forecast from the end-use model.

Table 23
Comparison of End-Use Model and Achievable Summer Peak Savings Potential (MW)

End-Use	End-Use Model 2030 Summer MW	Total Achievable Potential	Total Potential as % of 2030 Forecast
Energy Efficiency			
Space Conditioning & Ventilation	166.3	19.0	11%
Water Heater	32.9	10.2	31%
Lighting	47.0	6.2	13%
Consumer Electronics	39.5	3.9	10%
Refrigerator	22.2	0.8	4%
Clothes Dryer	19.5	0.6	3%
Freezer	11.9	0.5	4%
Computers etc.	21.3	0.4	2%
Whole House Measures		0.3	NA
Dishwasher	1.4	0	0%
Clothes Washer	1.6	0	0%
Misc	20.2	-	0%
Total Energy Efficiency	**384**	**42**	11%
Fuel Switching			
Cooking	68.7	9.4	19%
Clothes Dryer	19.5	4	14%
Total Fuel Switching	**88**	**13**	**15%**
Total	**452**	**55**	**12%**

Table 24 illustrates the 1, 5, 10, and 20 year energy efficiency potential that is achievable through utility programs.

Table 24
Residential Program Achievable Energy Efficiency Potential
GWh

Measure Category	Year 1	Year 5	Year 10	Year 20
Weatherization	4.0	23.0	48.9	101.0
Water Heating	1.0	9.8	42.0	112.4
Lighting	10.1	37.4	43.5	53.6
Consumer Electronics	0.2	5.6	18.0	20.4
Heat Pump Upgrade	0.4	2.9	8.3	19.8
Appliances	0.9	5.0	10.3	18.3
HVAC	1.1	5.4	9.8	18.2
Heat Pump Conversion	0.6	3.6	7.6	15.7
Computers etc.	0.02	0.5	3.4	9.6
Whole House	0.1	0.4	0.4	0.4
Total	**19**	**94**	**192**	**369**

Commercial Energy Efficiency Savings Potential

Introduction

FortisBC commercial customers consume approximately 34 percent of total load (both direct and indirect customers). This section of the report estimates the amount of energy efficiency potential available through these commercial customers. First customer characteristics are summarized using the end-use forecast developed in a previous section and the FortisBC Commercial Customer Survey completed in August 2009. Next, energy efficiency measures are defined followed by a summary of savings potential compared to the end-use load forecast.

Commercial Customer Characteristics

Figure 39 summarizes the distribution of building types for FortisBC commercial customers. Building type, heat type, and average building size are the key parameters used to define FortisBC's commercial sector. These parameters are developed and forecasted in the End-Use Consumption Forecast section.

Figure 39
Commercial Building Breakdown, Number of Buildings

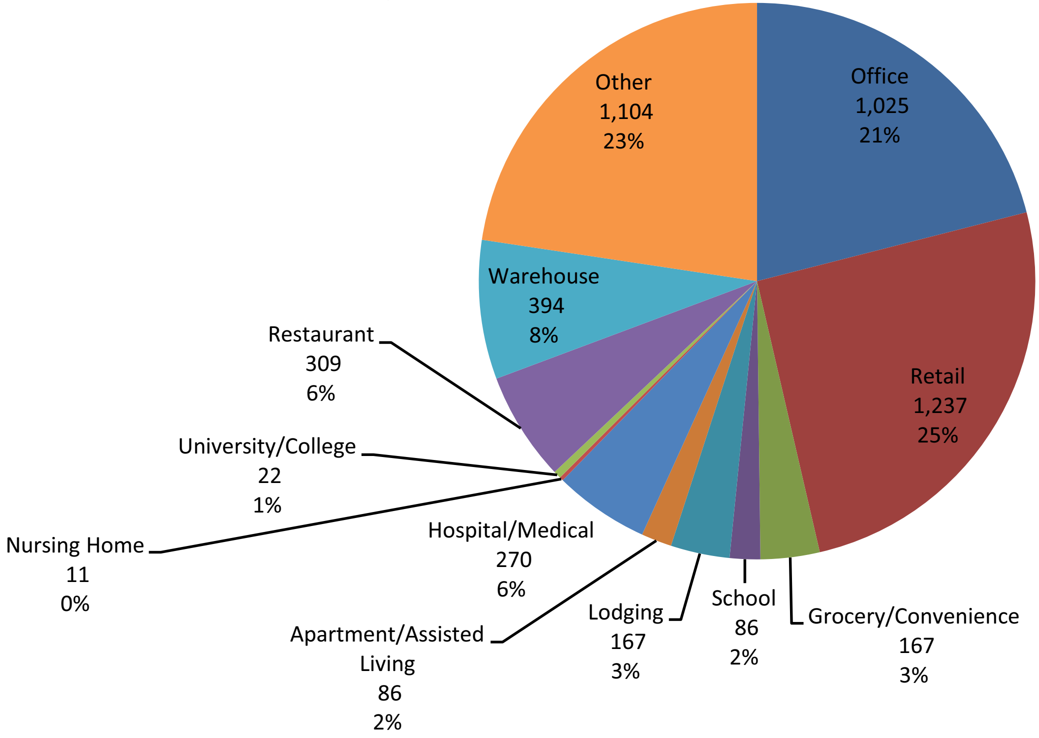


Table 25 illustrates the lighting types for commercial floor space. The percent share is of commercial square footage for each building type. Compact fluorescent lights (CFLs) are installed in up to 30 percent of commercial floor space for some building types.

Table 25
Commercial Building Lighting Characteristics

Building Type	No lighting	Linear fluorescent	Incandescent	CFL	Halogen, Quartz	High Pressure Sodium	Mercury Vapour	Metal Halide	Other
Large Office	1%	74%	16%	7%	2%	0%	0%	0%	0%
Medium Office	1%	74%	16%	7%	2%	0%	0%	0%	0%
Small Office	1%	74%	16%	7%	2%	0%	0%	0%	0%
Large Non-Food Retail	2%	65%	9%	6%	10%	2%	0%	5%	1%
Medium Non-Food Retail	2%	65%	9%	6%	10%	2%	0%	5%	1%
Small Non-Food Retail	2%	65%	9%	6%	10%	2%	0%	5%	1%
Large Hotel	1%	34%	27%	30%	6%	1%	0%	3%	0%
Medium Hotel/Motel	1%	34%	27%	30%	6%	1%	0%	3%	0%
Large School	1%	63%	23%	8%	4%	1%	0%	0%	0%
Medium School	1%	63%	23%	8%	4%	1%	0%	0%	0%
Grocery/Convenience	1%	34%	27%	30%	6%	1%	0%	3%	0%
Apartment/Assisted Living	1%	34%	27%	30%	6%	1%	0%	3%	0%
Medical	1%	63%	23%	8%	4%	1%	0%	0%	0%
Hospital	1%	63%	23%	8%	4%	1%	0%	0%	0%
Nursing Home	1%	34%	27%	30%	6%	1%	0%	3%	0%
University/College	1%	63%	23%	8%	4%	1%	0%	0%	0%
Restaurant/Tavern	1%	34%	27%	30%	6%	1%	0%	3%	0%
Warehouse/Wholesale	1%	62%	16%	4%	6%	3%	1%	9%	0%
Other	1%	74%	16%	7%	2%	0%	0%	0%	0%

Table 26 summarizes heating fuel shares among commercial buildings. Many of these buildings have more than one heating fuel and most are primarily heated by utility gas. These data are from the customer surveys completed in 2009.

Table 26
Commercial Building Heat Types

Building Type	Electricity	Natural Gas	Other	Natural Gas plus Supplemental fuel
Large Office	15%	79%	2%	81%
Medium Office	15%	79%	2%	81%
Small Office	15%	79%	2%	81%
Large Non-Food Retail	7%	81%	11%	92%
Medium Non-Food Retail	7%	81%	11%	92%
Small Non-Food Retail	7%	81%	11%	92%
Large Hotel	44%	38%	16%	54%
Medium Hotel/Motel	44%	38%	16%	54%
Large School	25%	65%	8%	73%
Medium School	25%	65%	8%	73%
Grocery/Convenience	25%	65%	8%	73%
Apartment/Assisted Living	25%	65%	8%	73%
Medical	25%	65%	8%	73%
Hospital	25%	65%	8%	73%
Nursing Home	25%	65%	8%	73%
University/College	25%	65%	8%	73%
Restaurant/Tavern	25%	65%	8%	73%
Warehouse/Wholesale	26%	62%	10%	72%
Other	35%	58%	4%	62%

Energy Efficiency Measures

Several measures for each end-use were analyzed to model energy efficiency potential. The table below summarizes the types of technology-based measures included in the analysis. While few categories are provided in the table, several permutations of each measure within these categories exist. In total, there are over 1,300 individual measures in the commercial sector.

Table 27
Commercial Energy Efficiency Measure Categories

Commercial Refrigeration
Grocery Store Measures
Pre-Rinse Spray Valve
Cooking
Premium HVAC Equipment
Demand Control Ventilation
ECM Motors in Variable Air Volume HVAC Systems
Continuous Optimization HVAC
Package Roof Top Optimization & Repair
Municipal Wastewater Treatment
Water Treatment
Existing Building Lighting Upgrades
New Building Lighting Upgrades
Lighting Controls
Parking Lighting
LED Street Lighting
Window Upgrades
Roof Insulation Upgrades
Network PC Power Management
Computer Servers

Emerging Technologies

Many of the emerging technologies identified in the Residential section also will have application in the commercial sector. These measures include advanced windows, green roofs, efficient lighting, solar air conditioning, on-site generation, and advanced controls (integrated with Smart Grid). However, the major advancements in the commercial sector are likely to come from the following general areas:

- Net zero or whole building measures,
- Efficient lighting, including LEDs, fibre optics,
- On-site generation; and
- Advanced controls.

Customer-Owned Renewable Energy

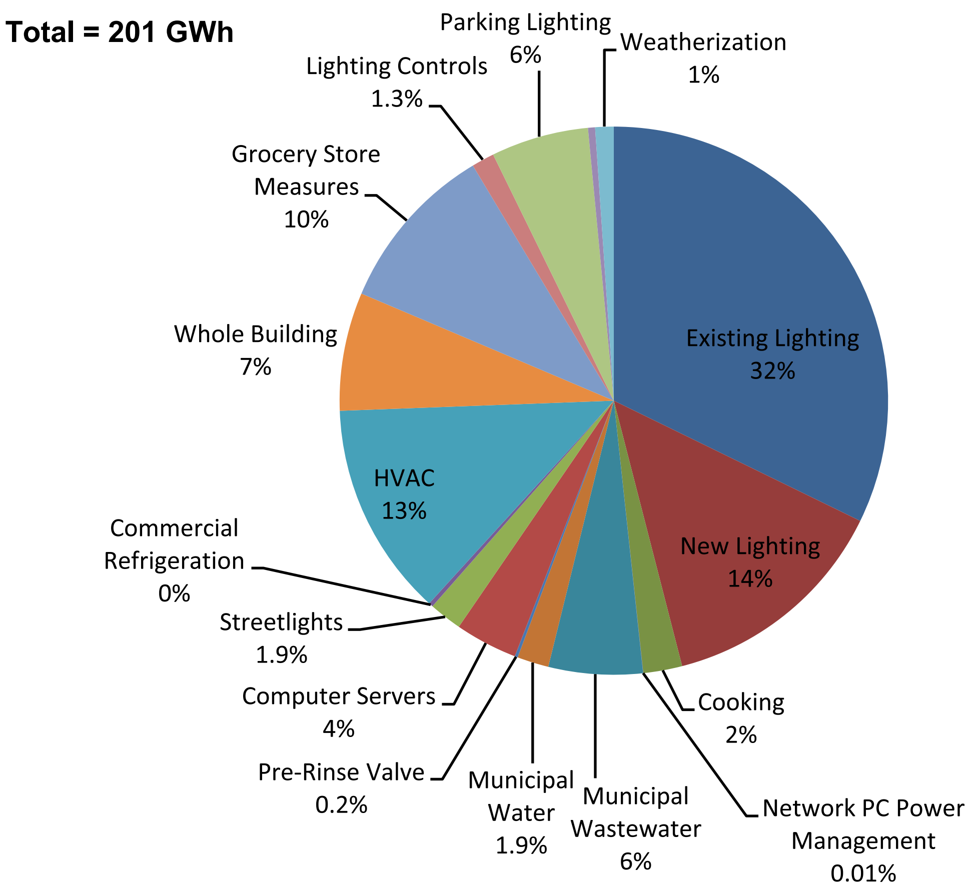
Solar PV on new and existing buildings is analyzed in this study. The measure data is from the BC Hydro 2007 study. Solar PV in commercial applications is generally sized at 100 kW. The Southern Interior of British Columbia has medium to high solar resources or approximately 4 kWh/m^2/day. The energy savings for renewable energies are reported separately from savings from energy efficiency measures. As reported in the Residential section, potential estimates for micro-hydro systems are not included.

Potential Estimates

As described in the methodology section, end-use load forecast data and energy efficiency measures are combined to produce estimates of energy efficiency. In this analysis, energy efficiency potential is presented separately from the electric savings from fuel switching measures. The total achievable potential is 201 GWh annually by 2030 or energy savings of 14% of 2030 forecasted commercial load. In this section, economic and achievable potential are discussed followed by program achievable potential.

Figure 40 illustrates the breakdown of energy efficiency potential that is both economic and achievable. The potential estimates include measures that apply to both new and existing construction. The measure categories are described in further detail below.

Figure 40
2030 Achievable Energy Savings Potential – Commercial

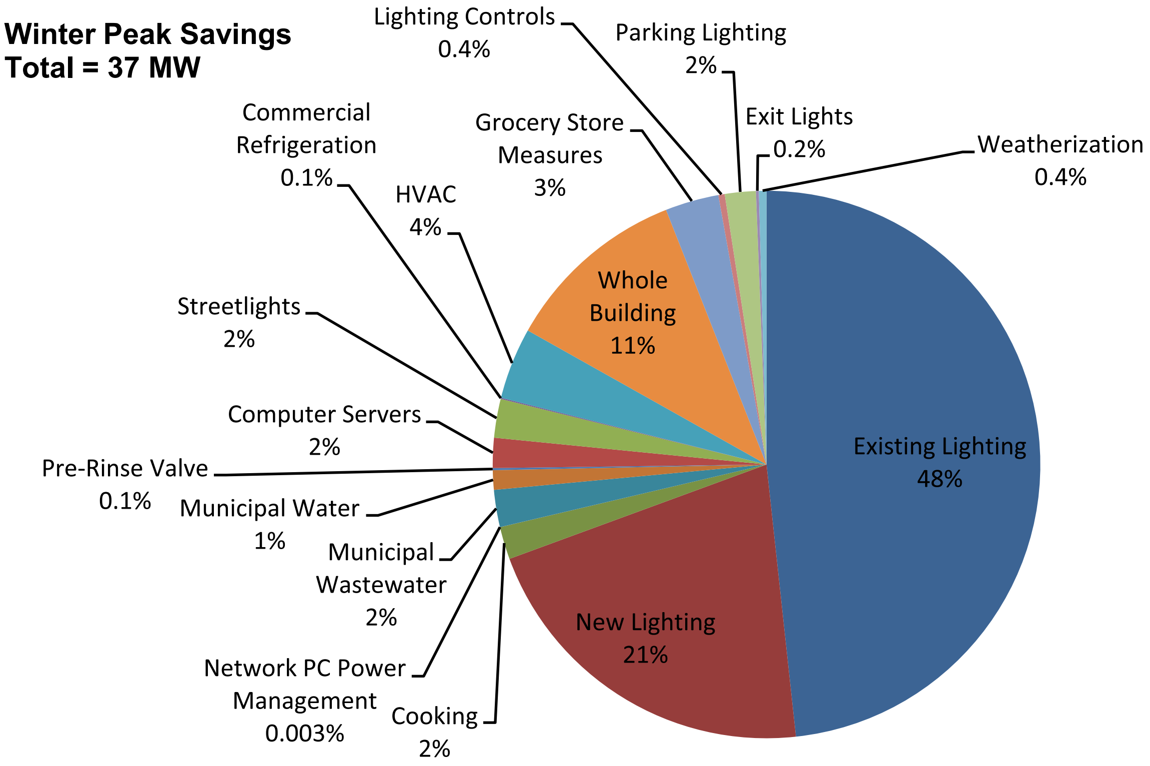


- Lighting – New and retrofit lighting for building interiors and exteriors
- Cooking – Hot food holding cabinet, steamers, and ovens.
- Network PC Power Management – Includes residential desktop computers and monitors.
- Municipal Water – optimization based on design capacity calculated as a rate per population. Includes both wastewater treatment and drinking water treatment.
- Pre-Rinse Spray Valve – includes high-efficiency, low-flow spray valves for food service applications.
- Computer Servers – applies to number of units calculated as a rate based on employment.
- Streetlights – street and roadway lighting.
- Commercial Refrigeration – applies to specific freezers, refrigerators, and ice-makers that are not included in the grocery store measure category.
- HVAC – includes premium HVAC equipment, controls commission HVAC, ECM on VAV boxes, package roof top optimization and repair, and demand control ventilation.
- Grocery Store Measures – refrigeration, fan, case lighting, compressors, visicoolers, compressors, anti-sweat controls, and motors.

- Weatherization – includes roof insulation and window upgrades
- Lighting Controls
- Parking Lighting
- Exit Lights

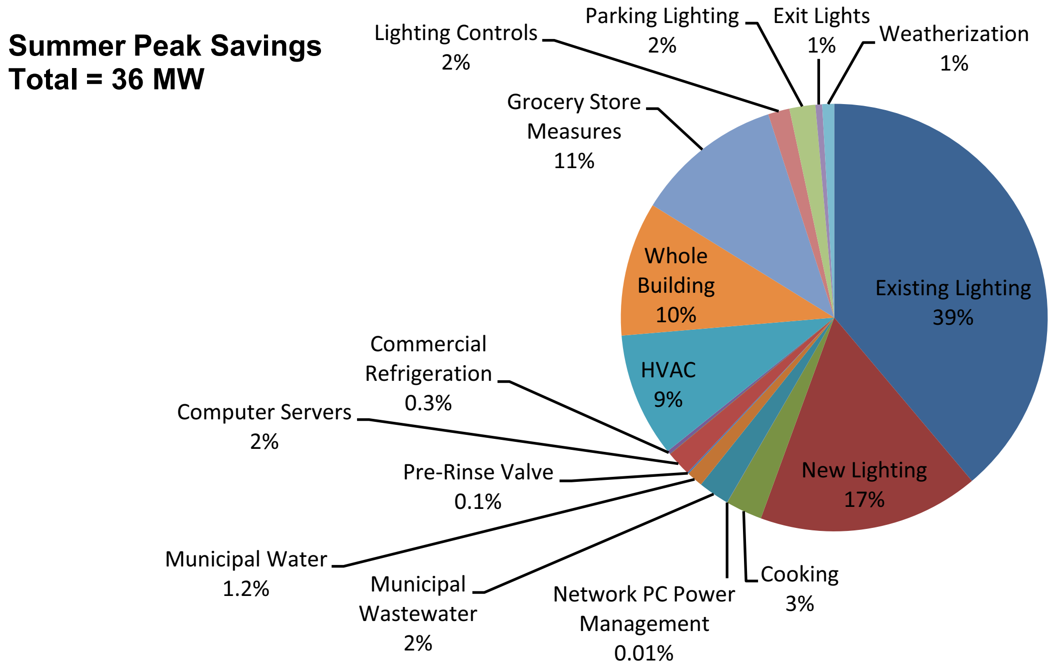
Winter peak reduction from these energy efficiency measures is shown in Figure 41.

Figure 41
Winter Peak Savings from Commercial Energy Efficiency Measures Achievable



Summer peak reduction from these energy efficiency measures is shown in Figure 42.

Figure 42
Summer Peak Savings from Commercial Energy Efficiency Measures Achievable



Customer-Owned Renewable Energy

Cost and savings data for renewable energy measures were primarily obtained from the BC Hydro study. Technical potential is calculated assuming that 30% existing commercial buildings have appropriate installation sites and 45% of new construction buildings have appropriate installation sites. The result is that 1,600 existing buildings and 1,300 new buildings might be appropriate for commercial PV units.

Commercial PV units do not pass the TRC at current costs; however, similar to residential, a second scenario is analyzed where costs are decreased over the planning period (consistent with cost decreases from the BC Hydro study). Costs are estimated at 42 percent of their current levels by 2013, 21 percent the current level by 2018, and 11 percent current levels by 2023. Solar PV is cost effective by 2018; therefore, achievable potential is ramped up from 1 percent annually to 8 percent over the remainder of the period. A total of 1,418 units are installed over the period 2018 through 2030. Table 28 summarizes the measure data and results of the analysis.

Table 28
Commercial Customer-Owned Renewable Energy

	Annual Generation kWh	Capital Cost	Installation Cost	Annual O&M	Life	TRC BC Ratio	Technical Potential MWh	Achievable Potential(1) MWh
Commercial PV Unit, 100 kW New and Existing Buildings	118,000	$430,756	$215,378	$6,461	20	0.26	341,439	167,305

(1) Achievable Potential is economic and achievable based on decreasing cost scenario.

Costs

TRC measure costs, utility costs, and participant costs are calculated for the economic and achievable potential. For the utility cost calculation, a proxy for utility incentives of 60% of the incremental measure cost is used and program administration costs of 20% of the incremental measure cost are assumed. Participants incur O&M costs/benefits. Table 29 summarizes these costs as well as compares a weighted average of the levelized cost with savings potential. All cost and savings potential data in the table are for economic and achievable quantities of energy efficiency potential.

Table 29
Cost Summary, $2009

Measure Category	Ramp Rate	Total Measure Cost ($1000s)	Winter Peak Savings MW	Summer Peak Savings MW	Average TRC Levelized Cost $/MWh	Weighted Benefit-Cost Ratio	Achievable Savings Potential MWh
Existing Lighting	15YearEven	$14,802	17.92	13.43	$22.59	4.05	64,776
New Lighting	New Lighting - Program	$9,481	7.84	5.79	$2.55	4.98	27,666
HVAC	HVAC - Code Change	$17,352	1.57	3.25	$68.17	3.32	25,443
Grocery Store Measures	20YearEven	$4,788	1.17	3.87	$36.67	5.49	20,135
Whole Building	20YearEven	$13,663	4.04	3.51	$87.83	2.45	14,028
Parking Lighting	20YearEven	$5,949	0.68	0.68	$82.10	2.10	11,554
Municipal Wastewater	15YearEven	$7,085	0.81	0.81	$6.60	2.33	11,153
Computer Servers	20YearEven	$1,763	0.66	0.66	$15.97	2.41	7,401
Cooking	20YearEven	$2,185	0.71	0.96	$4.93	4.04	4,606
Streetlights	20YearEven	$5,140	0.85	0.00	$8.09	1.11	3,898
Municipal Water	15YearEven	$3,920	0.43	0.43	$12.82	1.00	3,739
Lighting Controls	20YearEven	$775	0.14	0.56	$32.22	6.48	2,687
Weatherization	20YearEven	$1,862	0.17	0.31	$75.67	2.99	2,189
Exit Lights	10YearEven	$995	0.06	0.18	$141.90	1.09	839
Commercial Refrigeration	20YearEven	$608	0.02	0.10	$12.75	95.94	505
Pre-Rinse Valve	5YearEven	$75	0.04	0.04	$9.53	3.23	354
Network PC Power Management	20YearEven	$5	0.00	0.00	$9.84	4.18	23
Total		**$90,449**	**37.1**	**34.6**	**$34.14**	**3.97**	**200,995**
Solar PV, Customer Renewable(1)		**$44,918**			**$722.37**	**1.25(2)**	**167,305**

(1) Potential estimates and benefit-cost ratio assumes decreasing costs over planning period.
(2) Average benefit-cost ratio over planning period. Solar PV for commercial buildings is cost-effective beginning in 2018

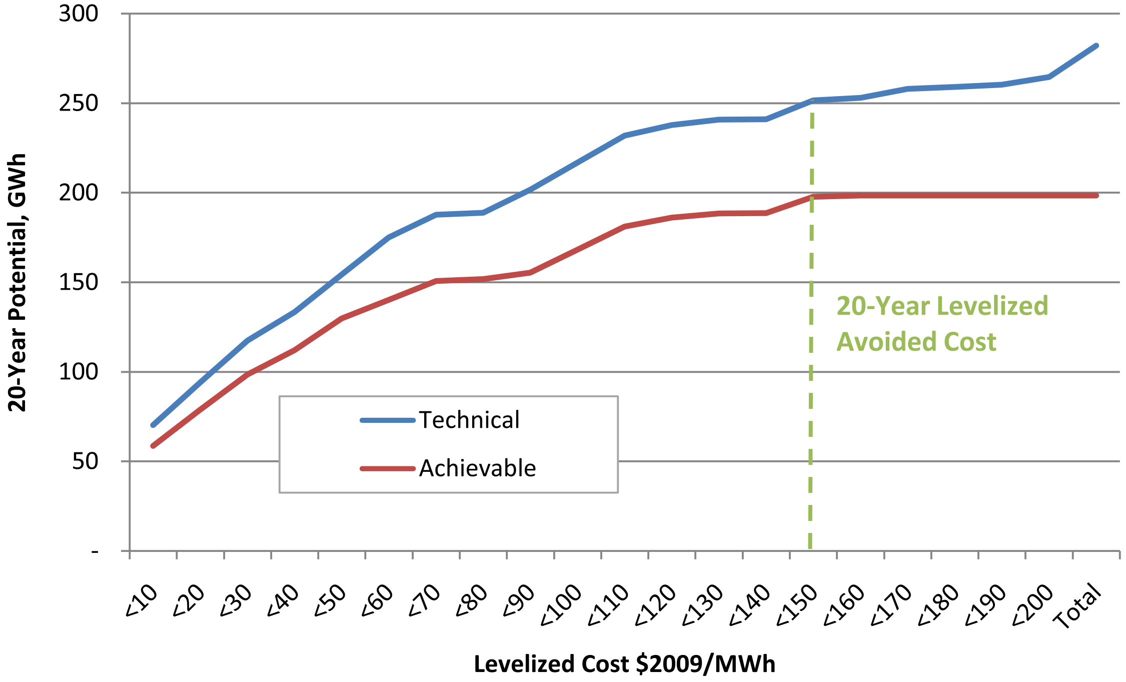
- **Ramp Rate** – reference to ramp rate used in estimating program achievable potential, discussed later.
- **Total Measure Cost** – incremental capital costs, O&M, replacement costs, and program administration costs. Costs are in thousands.
- **Winter Peak Savings –** MW peak savings associated with energy efficiency measure.

- **Summer Peak Savings –** MW peak savings associated with energy efficiency measure.
- **Average TRC Levelized Cost** – weighted average of levelized costs in measure category (weighted by share of measure category savings).
- **Weighted Benefit-Cost Ratio** – benefit-cost ratio for category weighted by the share of measure category savings.
- **Savings Potential** – Economic and achievable savings potential. Includes potential achieved through codes and standards.

Supply Curves

Energy efficiency resources are often summarized as supply curves. The supply curves in the figure below show how much energy efficiency (GWh) is available at different price levels. The x-axis shows measure levelized costs. These costs can be compared to supply side resources; however, unlike supply-side resources, the total quantity of the resource may not be available immediately. The curves in Figure 43 show the 20-year technical potential as well as the economic potential that can be reasonably obtained during that time period. Note that the economic and achievable potential in the figure includes potential that might be achieved through code and standard changes.

Figure 43
Commercial Energy Efficiency Supply Curves

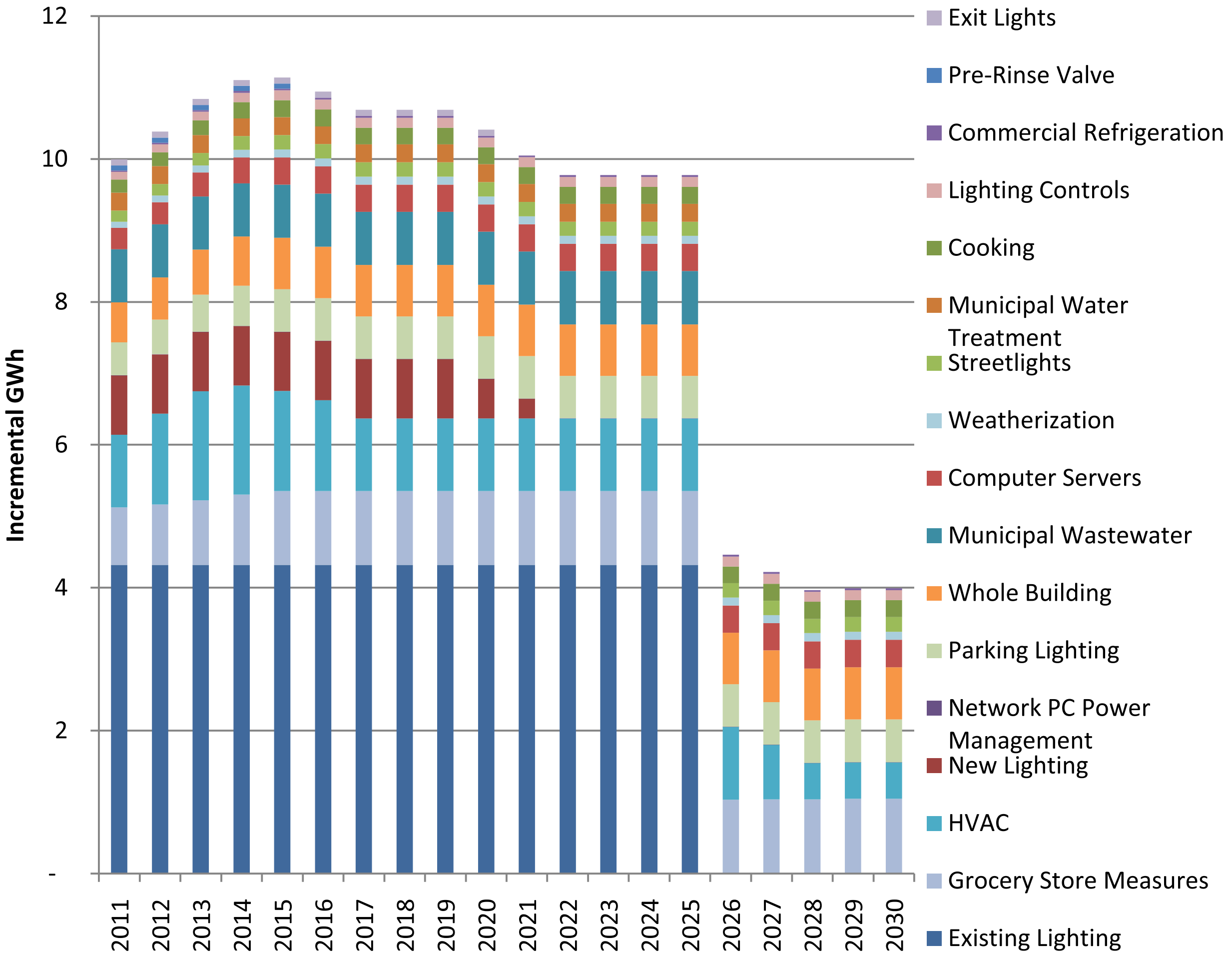


Program Achievable Potential

The previous section defined energy efficiency potential that is both economic and achievable through utility programs, codes, and standards. This section of the memo identifies potential that is both economic and achievable through utility programs only. Or, energy efficiency potential that is expected to be achieved through known code changes and product standards is not included in the following estimates.

In order to define utility program achievable potential, or "Program Achievable Potential," ramp rates are assigned by measure category to approximate the amount of energy efficiency potential that could be reasonably obtained through utility program efforts over the planning period. Figure 44 shows the Program Achievable Potential cumulatively by measure category.

Figure 44
Commercial Program Achievable Potential[14]



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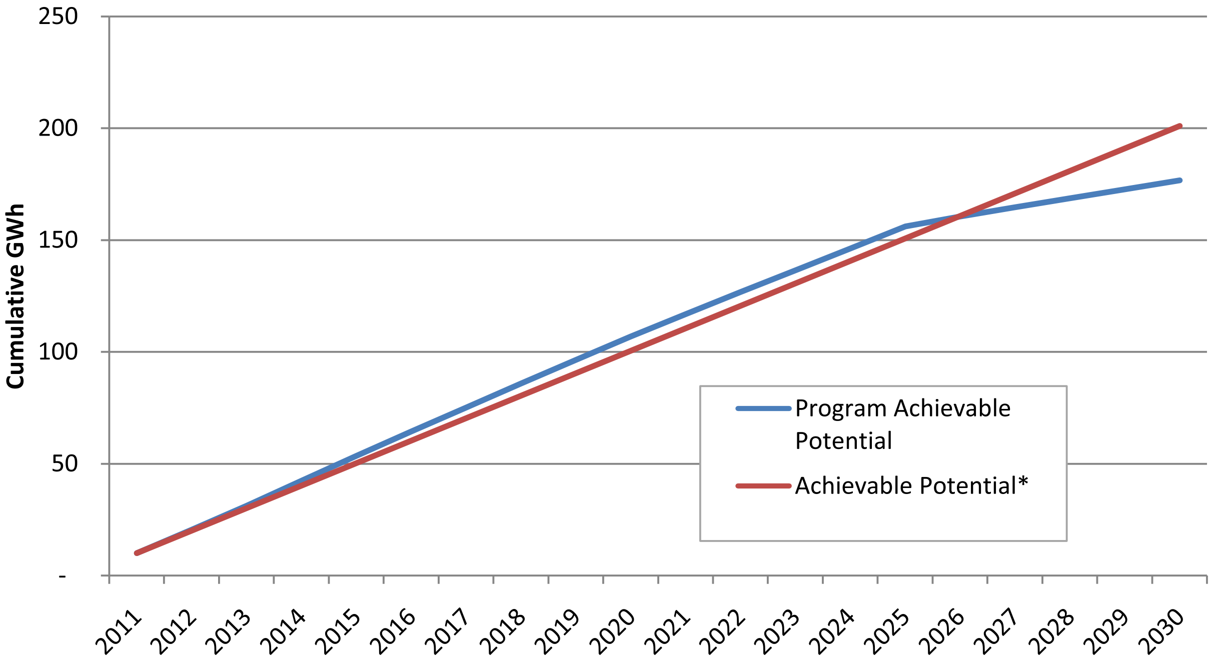
[14] Excludes savings potential achieved through codes and standards.

Figure 45 compares Program Achievable Potential with total Achievable potential.[15] The difference between the curves in the out years (Figure 45) is the potential achieved through codes and standards for new building lighting and HVAC. Program Achievable Potential is higher than Achievable Potential for the first 15 years due to aggressive ramp rates for commercial lighting. The commercial code changes expected to occur during the 2011 – 2030 timeframe will result in an estimated 24 GWh of energy efficiency. See Appendix A for more details on code changes in the commercial sector.

Figure 45
Achievable vs. Program Achievable Potential



*Includes efficiency from codes and standards.

Summary

The following three tables compare the energy efficiency potential estimates with the end-use load forecast for the year 2030. When customer-owned renewable energy is added to the energy efficiency savings potential, FortisBC could achieve a 25 percent savings from their forecasted 2030 consumption in the commercial sector. Overall, energy efficiency potential can be used to meet 46 percent of load growth within the commercial sector.

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[15] Note that all energy efficiency potential referenced in these paragraphs is cost-effective, or economic.

Table 30 compares the achievable energy efficiency potential to the forecast of 2030 load from the end-use model. The miscellaneous category includes municipal water and wastewater measures.

Table 30
Comparison End-Use Forecast with Conservation Potential Estimates

End-Use	End-Use Model 2030 Load MWh	Energy Efficiency Achievable Potential MWh	Percent of 2030 Load
Lighting	529,139	107,522	20%
HVAC	558,372	27,632	5%
Refrigeration	120,347	20,640	17%
Misc	45,224	14,892	33%
Whole Building		14,028	NA
Computer Equipment	81,467	7,424	9%
Food Service	29,816	4,606	15%
Streetlights	13,538	3,898	29%
Water Heat	38,333	354	1%
Elevators	4,374		0%
Plug Load	49,103		0%
Total	1,469,713	200,995	14%
Solar PV, Customer Renewable(1)		167,305	
Total	1,469,713	368,300	25%

(1) Assumes decreasing costs as noted in this section.

Table 31 illustrates the breakdown for winter peak savings. The energy efficiency potential estimated provides 12 percent winter peak savings.

Table 31
Comparison End-Use Forecast with Conservation Potential Estimates, 2030 Winter Peak

End-Use	End-Use Model Winter Peak MW	Energy Efficiency Achievable Potential Winter MW	% of 2030 Load
Lighting	153	26.6	17%
Whole Building		4.0	NA
HVAC	60	1.7	4%
Refrigeration	35	1.2	3%
Misc	11	1.2	11%
Streetlights	3	0.8	32%
Computer Equipment	16	0.7	4%
Food Service	3	0.7	22%
Water Heat	22	0.04	0%
Plug Load	12		0%
Elevators	2		0%
Total	316	37.1	12%

Table 32 illustrates the breakdown of summer peak savings. The energy efficiency potential estimated provides 14 percent summer peak savings.

Table 32
Comparison End-Use Forecast with Conservation Potential Estimates, 2030
Summer Peak

End-Use	End-Use Model Summer Peak MW	Energy Efficiency Achievable Potential Summer MW	% of 2030 Peak Demand
Lighting	111	20.6	19%
Refrigeration	23	4.0	17%
HVAC	63	3.6	7%
Whole Building		3.5	NA
Misc	10	1.2	13%
Food Service	7	1.0	14%
Computer Equipment	18	0.7	4%
Plug Load	11		0%
Water Heat	10	0.0	0%
Elevators	1		0%
Streetlights	0	0.0	0%
Total	252	34.6	14%

Table 33 illustrates the 1, 5, 10, and 20 year energy efficiency potential that is achievable through utility programs.

Table 33
Commercial Program Achievable Energy Efficiency Potential
GWh

Measure Category	1 Year	5 Year	10 Year	20 Year
Lighting	6.0	30.3	60.8	92.1
HVAC	1.0	6.7	12.1	20.5
Grocery Store Measures	0.8	4.6	9.8	20.1
Municipal	1.0	5.0	9.9	14.9
Whole Building	0.6	3.2	6.8	14.0
Computer Servers	0.3	1.7	3.6	7.4
Cooking	0.2	1.0	2.2	4.6
Weatherization	0.1	0.5	1.1	2.2
Commercial Refrigeration	0.02	0.1	0.2	0.5
Pre-Rinse Valve	0.07	0.4	0.4	0.4
Network PC Power Management	0.001	0.01	0.01	0.02
Total	**10.0**	**53.5**	**106.9**	**176.7**

Industrial Energy Efficiency Savings Potential

Introduction

This section describes the methodology, data, and energy efficiency measures used to estimate energy efficiency potential in the industrial sector. The methodology for potential estimation is a top-down approach, rather than the bottom-up approach used in the commercial and residential sectors. The results of the analysis are given as supply curves and detailed tables.

Industrial Customer Characteristics

The end-use model segments industrial load by both sector (paper, mining, fruit packing, etc) and end-use within those sectors (fans, pump, motors, etc). Consumption within each industrial process is disaggregated by applying percentages from sources such as the BC Hydro Conservation Potential Assessment and the Northwest Power and Conservation Council. The result is a top-down methodology for classifying energy consumption by end-use.

The base year for industrial sector consumption is calculated using the 2009 energy forecast for rate schedules 30, 31, and 33 and the Tolko sawmill (wholesale customer). Three customers were removed from the industrial rate class for conservation modeling purposes: UBC Okanagan, Selkirk College, and Trail Community Health. Net energy consumption was available only. Some industrial customers are net metered; self-generation is not included in this forecast nor is it included in the FortisBC system forecast.

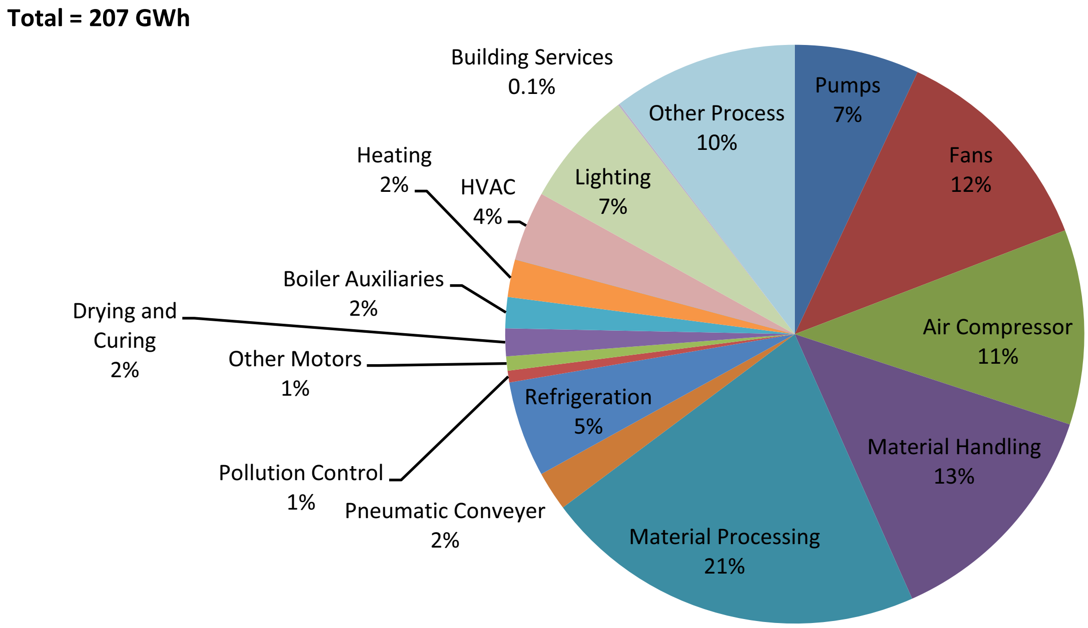
Customer consumption is grouped into classes according to the North America Industry Classification System (NAICS). Table 34 illustrates the industrial processes and annual kWh consumption for these customers. Note that the pulp and paper load is the net conservation of a major manufacture in the FortisBC service territory.

Table 34
Industrial Sector Consumption by Process, 2008

Industrial Process	**Energy Consumption GWh**
Wood products	90.1
Building Materials	53.0
Pulp and Paper and Paper	16.5
Food and Beverage	13.9
Miscellaneous	9.9
Mining	9.1
Fruit packers and storage	8.7
Other Manufacturing	3.6
Contractors & Construction	2.7
Total	207

Figure 46 shows the resulting break down of industrial electricity consumption for the base year. Total industrial consumption is 207 GWh and is expected to remain flat over the planning period. Therefore the 2030 end-use breakdown will be identical as the 2008 break-down in terms of share and total consumption.

Figure 46
Industrial End-Uses



Energy Benefits

The avoided cost of electricity is the dollar value per MWh, of the conserved electricity, and accounts for the benefit value in cost effectiveness tests. These energy benefits are based on the cost of a generating resource, a forecast of market prices or an integrated resource planning process. As mandated by the British Columbia Ministry of Energy, BC Hydro's avoided costs are used to value energy, peak demand, and transmission and distribution savings.

Modeling Methodology

The methodology used to calculate industrial potential differs from the approach in the residential and commercial sectors. There are two general analytical approaches to estimating conservation potential: a bottom-up approach, and a top-down approach.

The bottom-up approach is the method used in the residential and commercial sectors. The key factor is the number of kWh saved annually from the installation of an individual energy efficient measure. The savings from each measure is multiplied by the total number of expected installations over the life of the program. Each individual total measure savings is then summed and aggregated to total potential.

The top-down approach starts with the load forecast over the study period. These load forecasts are then disaggregated by end-use. Energy savings by measure, end-use, program, or sector are then expressed as a percent of the total energy consumption. For example, pumps are a common component of manufacturing and industrial operations whose improved performance has the potential to save energy. With improved pumps, a certain percentage of the disaggregated pump load can be saved. Savings from each end-use is summed and aggregated to total potential.

Energy Efficiency Measures

There are several classes of industrial measures: cross-industry systems, industry-specific processes and whole plant optimization.

Cross-Industry

Cross-industry measures are improvements of common industrial components found in most manufacturing and industrial settings. These are widespread equipment like fans, pumps, motors, lighting, etc. Cross-industry measures are listed in Table 35 followed by a brief description of major improvements in each measure type.

Table 35
Cross-Industry Measures

Measure Type	Conservation Measure
Belts	Synchronous Belts
Compressed Air	Air Compressor Demand Reduction Air Compressor Equipment Air Compressor Optimization
Lighting	High Bay Lighting 1-Shift, 2-Shift, or 3-Shift Efficient Lighting 1-Shift, 2-Shift, or 3-Shift Lighting Controls
Motors	Motors: Rewind 20-50 HP, 51-100 HP, 101-200 HP
Fans	Efficient Centrifugal Fan Fan Energy Management Fan Equipment Upgrade Fan System Optimization
Pumps	Pump Energy Management Pump Equipment Upgrade Pump System Optimization
Transformers	Transformers-Retrofit

- **Belts** - V-Belts are commonly used to drive industrial processes. By replacing the pulley sheaves with synchronous belt pulleys and installing synchronous belts onto the end use (e.g., fans or pumps), an efficiency gain of 3%-5% can be achieved from reduced slippage and friction.[16]

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[16] Northwest Power and Conservation Council. *System Optimization Measures Guide*. 6th Power Plan. March 23, 2009

- **Compressed Air** - The primary measure is retrofit of air compressors. Modern models have built-in adjustable speed drive (ASD) can achieve 40% savings over conventional fixed speed compressors. Additionally, better distribution systems and end-use improvements (use blowers in place of compressors) also contribute to savings.

- **Lighting** - In lighting, there are two main categories of measure savings: major lighting retrofits and replacement of high bay lighting. Lighting retrofits are most applicable to pulp and paper subsector and involves replacing low-efficiency mercury vapor lighting and installation of lighting control. These tend to be in large and older facilities. Replacement of high bay lighting includes changing metal halide bulbs with fluorescent T5 high-output lighting.

- **Motors** - Motors efficiency improvement is fairly straightforward and is already occurring in the FortisBC service territory. There are several difference classes of motors separated by horsepower, but each replaces standard efficiency motors with premium-efficiency motors.

- **Fans** - Savings from industrial fans come from the optimization of fan operation and retrofit with more efficient models. Operation and maintenance improvements include changing filters, maintaining belts (tension, alignment), repair duct leaks, lube bearings and maintain dampers. Additionally, fan retrofits include more efficient timers, adjustable speed drives, and low friction ducts. [17]

- **Pumps** - Pump savings come from both retrofit of pumps in addition to improved operation and maintenance of those currently in operation. New equipment includes replacement of pump at time of major repair or shutdown, proper sizing of trim impeller and control valve. Better maintenance includes coupling alignment, lubrication, seal maintenance, and vibration analysis.

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[17] Northwest Power and Conservation Council. *System Optimization Measures Guide*. 6th Power Plan. March 23, 2009

Industry-Specific

Industry-specific processes are improvements of specialized manufacturing components or processes. Like cross-industry measures, it is an improvement of a single technology or process. Common examples are refrigeration in the food service and fruit storage industries and material handling performance improvements. Cross-industry measures are show in Table 36.

Table 36
Industry-Specific Measures

Measure Industry	Conservation Measure
Hi-Tech	Clean Room: Change Filter Strategy
Hi-Tech	Clean Room: Clean Room HVAC
Hi-Tech	Clean Room: Chiller Optimize
Food Processing	Food: Cooling and Storage
Food Storage	Food: Refrigeration Storage Tune-up
Food Storage	Fruit Storage Refer Retrofit
Food Storage	CA Retrofit -- CO2 Scrub
Food Storage	CA Retrofit -- Membrane
Food Storage	Fruit Storage Tune-up
Material Handling	Material Handling2
Material Handling	Material Handling VFD2
Mining Process	Grinding Optimization, Improved Flotation Cells
Paper	Paper: Efficient Pulp Screen
Paper	Paper: Premium Fan
Paper	Paper: Material Handling
Paper	Paper: Large Material Handling
Paper	Paper: Premium Control Large Material
Wood	Wood: Replace Pneumatic Conveyor

Whole plant optimization measures are improvement of whole systems rather than discrete equipment upgrades used in cross-industry systems and industry-specific processes. This accounts for interactive effects in industrial technologies. Such measures require a much more tailored approach that includes: demand-side assessment; proper design, sizing, and/or reconfigurations to match supply to demand; system "commissioning;" sustainable O&M; and supporting management practices.[18] The savings and approach to plant optimization is categorized in a tiered system based the review of numerous case studies and regional program data: Plant Energy Management (First Tier), Energy Project Management (Second Tier), Integrated Plant Energy Management (Third Tier).

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[18] Northwest Power and Conservation Council. *System Optimization Measures Guide*. 6th Power Plan. March 23, 2009

Estimating Technical Potential

The technical potential is the sum of savings from all industrial measures and each industrial sub-sector. It represents the amount of energy efficiency potential that is available regardless of cost or other constraints such as willingness to adopt measures.

Estimating the technical potential begins with determining the amount of energy consumed for each end-use (e.g. pumps, fans, motors, etc) in each industrial subsector (paper, wood, mining, etc). Data for this step was calculated in the end-use model. For example, in the wood products industry, 11% of load (10,266,194 kWh/yr) is used for drying fans. Table 37 illustrates an example of end-uses for wood manufacturing. All other industries (mining, construction, fruit packing, etc) have a different associated top-down savings percentage for each component of disaggregated load. An applicability value determines the amount of the end-use load eligible for measure savings. The applicability value is highly dependent on the measure and the industrial sector. For example, certain motors sizes are only applicable to select industries.

Table 37
End-Use Disaggregation Example, Wood Products

	Share	GWh
Drying Fans	11%	10.3
Air Compressor	13%	12.0
Material Handling	23%	20.7
Material Processing	29%	26.1
Pneumatic Conveyor	5%	4.5
Pollution Control	1%	0.9
Boiler Auxiliaries	4%	3.6
Heating	3%	2.7
HVAC	2%	2.1
Lighting	6%	5.6
Other Process	2%	1.5
Total		**90**

Estimating Achievable Potential

Achievable efficiency is the amount of energy savings potential that is achievable and cost-effective. To find cost-effectiveness potential, energy efficiency measures must pass economic screening. In British Columbia, economic potential is defined using a total resource cost (TRC) test to screen measures for cost effectiveness (discussed in more detail in the "Methodology" section of the report). All of the measures discussed in this section pass the TRC. Therefore the "Achievable" potential in this section means that the potential is both economic (cost-effective) and achievable. Previous conservation by FortisBC will also be addressed.

Potential Estimates

As described in the methodology section, end-use load forecast data and energy efficiency measures are combined to produce estimates of energy efficiency. Energy efficiency potential accounts for previous industrial conservation by FortisBC using saturation factors.

Technical Potential

The total technical potential is 35.2 GWh by 2030 or energy savings of 17% of 2030 forecasted load. Table 38 illustrates savings by industrial sector. The wood industry has the largest potential savings, but fruit and pulp industries have a large potential as a percentage of their load.

Table 38
Summary of Energy Efficiency Potential – Technical

		Energy Efficiency	
Sub-Sector	**2030 GWh from End-Use Model**	**Technical Potential GWh**	**Total Potential as % of 2030 Forecast**
Pulp and Paper	17	5	29%
Mining	9	1	12%
Food & Beverage Manufacturing	14	4	27%
Wood Products	90	15	17%
Fruit Packers and Storage	9	3	34%
Miscellaneous Manufacturing	69	7	11%
Total MWh	207	35	17%

Figure 47 illustrates technical potential by measure group. Cross-industry systems have the largest technical potential, with the most savings coming primarily via fans, lighting, and compressed air measures.

Figure 47
Technical Potential by Measure Category

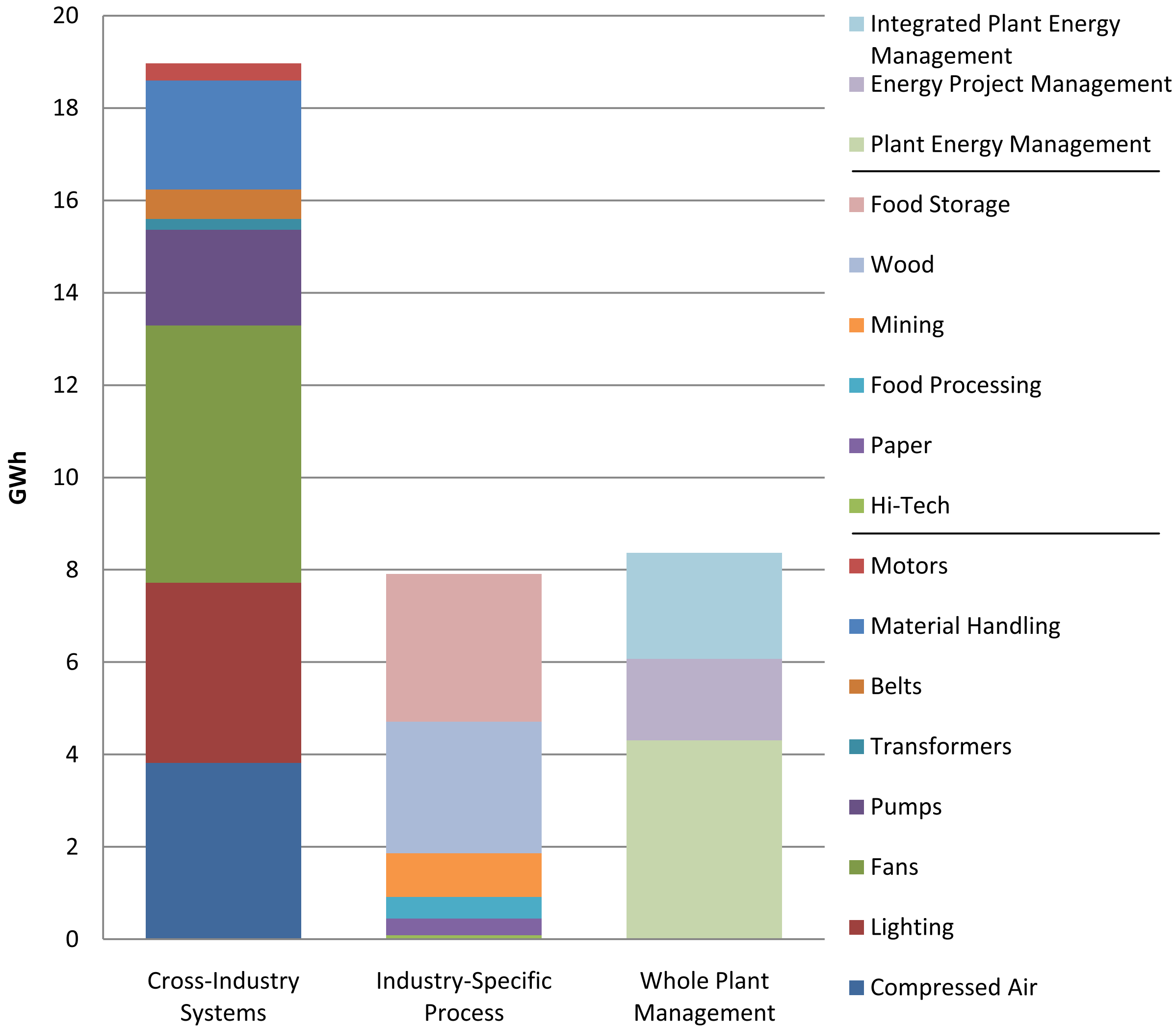


Table 39 illustrates industrial energy efficiency savings potential by end-use.

Table 39
Summary of Energy Efficiency Potential Technical

Measure Group	Measure Type	Potential Savings GWh
Cross-Industry Systems	Compressed Air	3.8
Cross-Industry Systems	Lighting	3.9
Cross-Industry Systems	Fans	5.6
Cross-Industry Systems	Pumps	2.1
Cross-Industry Systems	Transformers	0.2
Cross-Industry Systems	Belts	0.6
Cross-Industry Systems	Material Handling	2.4
Cross-Industry Systems	Motors	0.4
Industry-Specific Process	Hi-Tech	0.1
Industry-Specific Process	Paper	0.4
Industry-Specific Process	Food Processing	0.5
Industry-Specific Process	Mining	0.9
Industry-Specific Process	Wood	2.9
Industry-Specific Process	Food Storage	3.2
Whole Plant	Plant Energy Management	4.3
Whole Plant	Energy Project Management	1.8
Whole Plant	Integrated Plant Energy Management	2.3

Achievable Potential

Using achievability factors, technical potential results are adjusted to realistic levels of conservation over the 20 year study period. Achievability percentages for most measures are 85%.

FortisBC has achieved notable energy saving from industrial measure over the past six years. Conservation by category is shown in Table 40. However, data for past industrial efficiency improvement is built into the top-down savings estimates. For example, in the wood sub-sector, one-third of process equipment is assumed to be upgraded to adjustable speed drive control prior to assessment of potential. Similarly, synchronous belts are assumed to be installed on about 20% of large motors. FortisBC conservation achievements are in line with improvements in the region, so there is no further reduction in the potential due to past conservation.

Table 40
Summary of Past Industrial Conservation
GWh

	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**Total**
Motors	0.00	0.00	0.00	0.00	0.01	0.00	0.01
Pumps & Fans	0.67	0.57	0.97	0.00	0.09	0.00	2.32
Industrial Efficiencies	1.13	0.00	0.39	1.92	1.66	3.08	8.19
Compressors	0.23	0.50	0.69	0.52	0.39	0.21	2.54

Therefore, total achievable potential is 27.8 GWh by 2030 or energy savings of 13% of 2030 forecasted load. Table 41 illustrates savings by industrial sector. Again, the wood industry comprises the largest potential savings. Ramp rates are used distribute the savings potential over the 20-year period.

Table 41
Summary of Achievable Energy Efficiency Potential

		Energy Efficiency	
Sub-Sector	2030 GWh from End-Use Model	Total Achievable Potential GWh	Total Potential as % of 2030 Forecast
Pulp and Paper	17	3	21%
Mining	9	1	10%
Food & Beverage Manufacturing	14	3	20%
Wood Products	90	12	14%
Fruit Packers and Storage	9	3	30%
Miscellaneous Manufacturing	69	6	8%
Total MWh	207	27.8	13%

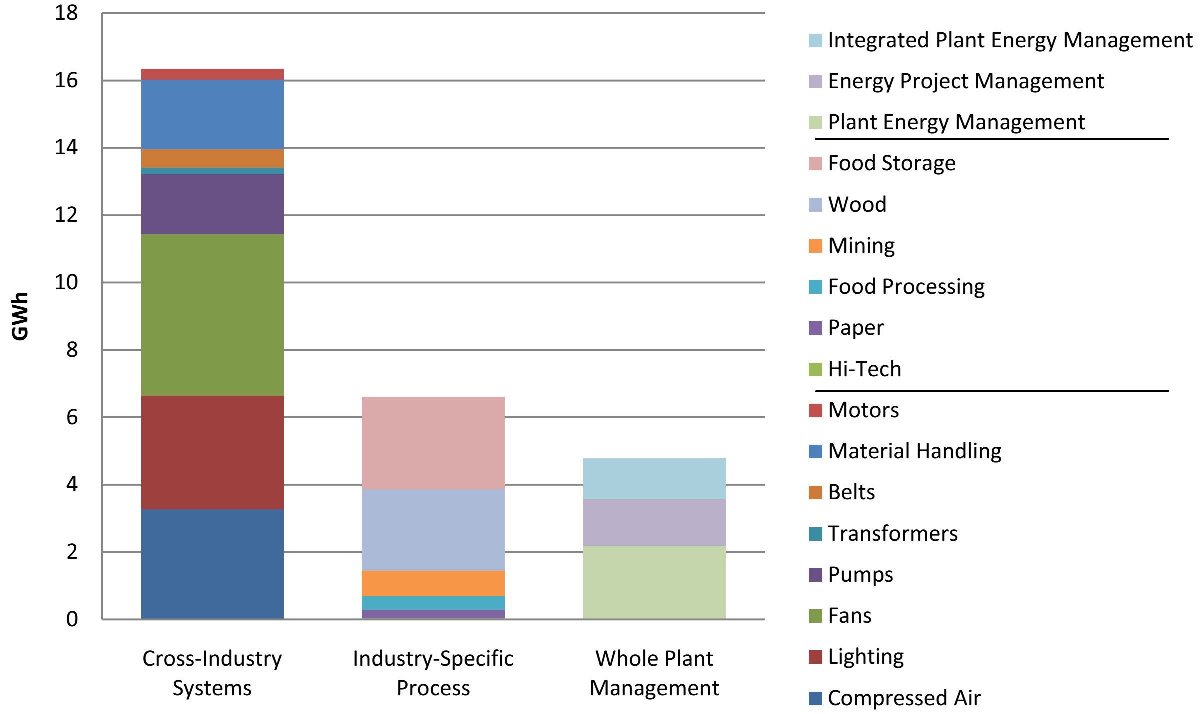
The cumulative achievable potential for 1, 5, 10 and 20 year periods are shown in Table 42. Ramp rates by year are listed in Appendix D.

Table 42
Achievable Potential - Adjusted by Year Using Ramp Rates
GWh

			Year			
		Ramp Rate	**1**	**5**	**10**	**20**
Cross-Industry Systems	Fans	10YearEven	0.25	1.25	2.49	4.80
Cross-Industry Systems	Lighting	New Measure Fast	0.10	1.01	2.69	3.37
Cross-Industry Systems	Compressed Air	10YearEven	0.28	1.52	3.16	3.28
Industry-Specific Process	Food Storage	10YearEven	0.27	1.37	2.74	2.74
Industry-Specific Process	Wood	New Measure Medium	0.04	0.36	1.05	2.43
Whole Plant	Plant Energy Management	New Measure Medium	0.03	0.33	0.95	2.19
Cross-Industry Systems	Material Handling	New Measure Medium	0.03	0.31	0.90	2.07
Cross-Industry Systems	Pumps	20YearEven	0.09	0.44	0.89	1.78
Whole Plant	Energy Project Management	New Measure Medium	0.02	0.21	0.60	1.37
Whole Plant	Integrated Plant Energy Management	New Measure Medium	0.02	0.18	0.53	1.22
Industry-Specific Process	Mining Process	20YearEven	0.04	0.19	0.38	0.75
Cross-Industry Systems	Belts	10YearEven	0.05	0.27	0.54	0.54
Industry-Specific Process	Food Processing	10YearEven	0.04	0.20	0.41	0.41
Cross-Industry Systems	Motors	New Measure Medium	0.00	0.05	0.13	0.31
Industry-Specific Process	Paper	20YearEven	0.01	0.06	0.12	0.25
Cross-Industry Systems	Transformers	20YearEven	0.01	0.05	0.10	0.20
Industry-Specific Process	Hi-Tech	10YearEven	0.00	0.02	0.03	0.03
Total (GWh)			**1.3**	**7.8**	**17.7**	**27.7**

Achievable potential by measure group is shown in Figure 48.

Figure 48
Industrial Achievable Potential by End-Use



Peak Demand Reduction

Tables 43 and 44 summarize winter and summer peak demand reduction potential provided by the energy efficiency measures analyzed in this section. Approximately 10 percent winter peak reduction can be achieved through the energy efficiency measures identified as cost-effective.

Table 43
Comparison Industrial End-Use Forecast with Winter Peak Reduction Estimates

	2030 Winter Peak from End-Use Model MW	Energy Efficiency Achievable Potential Winter MW	Percent of 2030 Load
Pulp and Paper	8.6	0.55	6.5%
Mining	4.2	0.42	10.0%
Food and Beverage	1.6	0.33	20.3%
Wood Products	14.6	1.89	13.0%
Fruit packers and storage	1.6	0.49	29.9%
Miscellaneous Manufacturing	16.4	0.91	5.5%
Total	**47.0**	**4.59**	**9.8%**

Table 44
Comparison Industrial End-Use Forecast with Summer Peak Reduction Estimates

	2030 Summer Peak from End-Use Model MW	Energy Efficiency Achievable Potential Summer MW	Percent of 2030 Load
Pulp and Paper	9.9	0.55	5.6%
Mining	1.5	0.16	11.1%
Food and Beverage	2.5	0.60	24.4%
Wood Products	13.3	1.95	14.7%
Fruit packers and storage	1.0	0.41	39.8%
Miscellaneous Manufacturing	6.0	0.94	15.5%
Total	**34.2**	**4.62**	**13.5%**

Summary

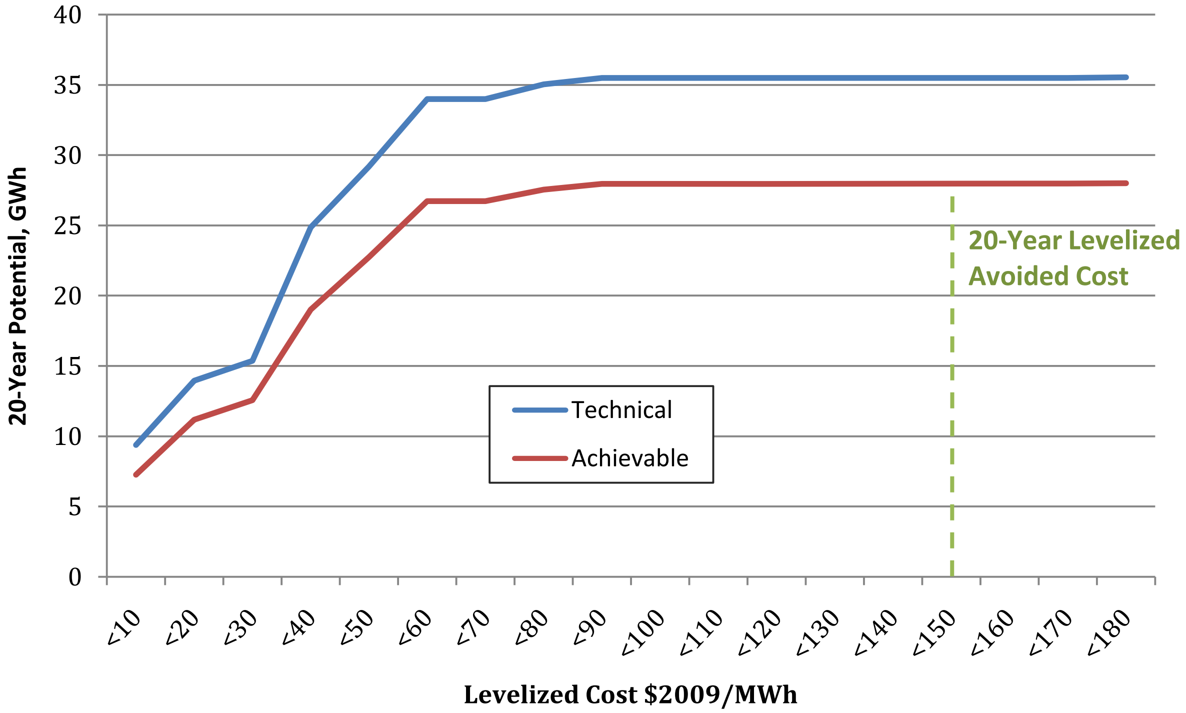
Table 45 compares achievable and technical potential to the end-use load forecast for the year 2030. Achievable potential ranges from 8% to 30% of industrial load based on manufacturing sector. A bulk of the savings comes from measures with low levelized cost of $0.03-$0.04/kWh.

Table 45
Summary of Energy Efficiency Potential

		Technical		Achievable	
Sub-Sector	2030 GWh from End-Use Model	Total Technical Potential GWh	Total Potential as % of 2030 Forecast	Total Achievable Potential GWh	Total Potential as % of 2030 Forecast
Pulp and Paper	16.50	4.8	29%	3.5	21%
Mining	9.12	1.1	12%	0.9	10%
Food & Beverage Manufacturing	13.87	3.8	27%	2.7	20%
Wood Products	90.05	15.1	17%	12.2	14%
Fruit Packers and Storage	8.72	3.0	34%	2.6	30%
Miscellaneous Manufacturing	69.20	7.4	11%	5.9	8%
Total	**207.47**	**35.2**	**17%**	**27.7**	**13%**

Figure 49 illustrates the supply curve of levelized cost and savings for all industrial measures.

Figure 49
Supply Curve – Industrial



Irrigated Agriculture Energy Efficiency Potential

Specific industrial processes and technology are required for savings in the agricultural sector. There are three main categories of potential measures: irrigation hardware, irrigation scheduling and milk production. Currently, FortisBC has a designated rate class for irrigation consumption, all of which are direct customers. Load is not segmented for dairy production, so it is assumed that FortisBC does not have applicable dairy farms for agricultural measures. Also, irrigation scheduling measures are applicable to large field crops, while irrigation load in FortisBC is associated with fruit, apple and grape production.[19]

Therefore, improved irrigation hardware, such as the conversion to low-pressure delivery systems and improved pumps, are measures in the agricultural sector. Table 46 shows measure savings, cost and life for applicable measures from the NWPCC *6th Power Plan*.

Table 46
Irrigation Hardware Measures

Measure Name	Incremental Capital Cost ($/unit)	Measure Life (yr)	Savings per Applicable Acre (kWh/yr)	Applicable Acres
Convert High Pressure Center Pivot to Low Pressure System	$58	10	504	20%
Convert Medium Pressure Center Pivot to Low Pressure System	$22	10	336	15%
Pump, Nozzle & Gasket Replacement Average Well	$111	10	412	11%
Pump, Nozzle & Gasket Replacement Deep Well	$134	10	765	19%

An estimation of irrigation potential from hardware improvement is possible using a bottom-up approach as in the residential and commercial sector calculations. Irrigation consumption is 52,071 MWh/yr and remains flat over the study period. Assuming 1,400 kWh/yr for each acre, 37,193 acres of agricultural land is irrigated in the FortisBC service territory. Using the irrigated acres and applicability factors in Table 42, technical potential is 12,716 MWh. To be consistent with the NWPCC, an applicability factor of 85% is used to calculate achievable potential of 10,809 MWh. Results for irrigation are show in Table 47.

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[19] *2006 Agriculture Community Profiles: Kelowna*. Statistics Canada. www.statcan.gc.ca

Table 47
Irrigation Savings

	2030 Consumption (MWh)	2030 Technical Potential (MWh)	Achievable %	2030 Achievable Potential (MWh)
Irrigation	52,071	12,716	85%	10,809

Demand Response Savings Potential

Introduction

Demand response measures cycle, or shut down, building equipment during peak load events in order to reduce system peak and the need for new capacity. Options for demand response include direct load control, dynamic real-time pricing, time-of use pricing, payment for reductions, and demand buyback. Table 48 compares each method of demand response and its applicable sectors (residential, commercial, and industrial). The focus of this section of the report is on estimating the potential of the direct load control portion of demand response.

Table 48
Demand Response Methods

		Description	Residential	Small & Medium Commercial	Large Commercial	Industrial
Curtailment Based	Interruptible Load	Utility signs agreement with larger customers to reduce their load at peak periods				X
	Direct Load Control	Utility controlled curtailment of household appliances and HVAC equipment using installed communications gateway	X	X		
	Contractual Demand Response	Payment to selected larger industrial customers to reduce load at select periods			X	X
Price Based	Time of Use (TOU) Pricing	Adjust power price for different times of day and year. Periods are pre-determined	X			
	Dynamic Real Time Pricing	Dynamically adjust power price as demand increases.	X	X	X	X
	Critical Peak Pricing	TOU Rates that correspond to extreme peak hours. Prices reflect the power of generating or purchasing electricity at peak times.	X	X	X	X

Demand response is an area of significant uncertainty because of relatively limited experience in large-scale programs. However, direct load control has more predictability and reliability from the utilities perspective when compared to other forms of demand response. Direct load control is not a new idea, but it is gaining momentum due to better technology and successful pilot programs. Other utilities in the region, namely BC Hydro, have quantified the savings for demand specific conservation measures.

Therefore, direct load control is the focus of demand response estimates. Relevant concepts, case studies and pertinent technology information are included in this report. The FortisBC direct load control potential can be estimated using customer survey data and regional data sources for measures performance.

Technology and Communication Equipment

At its simplest, direct load control is a method of demand response that utilizes a control device to briefly curtail major appliances or space conditioning units – namely hot water heaters and space conditioning units. Curtailments are intended to shave peak demand for utilities, with a limited, if any, effect on consumers.

Direct load control requires both specific technology and management from a utility's operations department. The system relies on controller switches that interrupts customers' electrical load to specific devices during peak load events. These events are called curtailments and usually last 1-3 hours (less if cycling HVAC equipment).

There are several main components to a direct load control system and these are descibed below:

- An electronically-controlled power switch (often 30A) which is used to switch power ON or OFF to the managed load. This can control the device directly, like a water heater or baseboard heating unit, or a central control device like a thermostat.
- A modem for communication with a server capable of initiating and controlling curtailments from a remote location. In the past, these have opperated on radio frequencies, but recent units operate on cell (SMS), wireless and WiMAX networks.
- Non-volatile memory which contains device identity, load scheduling and load-tracking information.

The FortisBC Advanced Metering Infrastructure (AMI) will be the core to any future load control or demand response progam.

Programs and Data Sources

Direct load control technology is relatively new when compared to energy efficiency measures. As such, the data sources for savings, cost saturation and achievability are not as well established. Organizations in the Northwestern United States and British Columbia have attempted to reduce the uncertainly around predicting load control potential. There are several recent pilot programs or potential studies in the Northwest. The most prominent being the

Powershift Program on the Olympic Peninsula in Washington State and the Goodwatts program in Ashland, Oregon. A brief summary of each program is presented in Appendix E.

Most large-scale load control programs have focused on the curtailment of summer cooling load. There are limited programs in winter peaking service territories that are not pilot programs. Therefore, we focused on several potential studies that included data for winter peaking systems.

Data for this potential study are predominantly based on recent potential studies from BC Hydro *(2007 Conservation Potential Review)*, the Northwest Power and Conservation Council *(6th Power Plan)* and PacifiCorp *(Demand Response Proxy Supply Curves)*. These sources were referenced for cost, savings, lifetime, applicability and achievability values.

Methodology

The demand reduction potential from direct load control technology was calculated according to the following steps:

1. Calculate peak winter and summer demand in end-use forecast;
2. Estimate the share of residential and commercial buildings applicable to direct load control (i.e. electric heat, etc) from FortisBC survey data;
3. Select direct load control measures applicable to FortisBC service territory from data sources;
4. Determine the peak demand savings per residential or commercial unit;
5. Compile cost data, exclusive of program costs and AMI meters, as requested by FortisBC;
6. Combine savings and building data to calculate technical potential;
7. Determine initial achievability percentages for each measure;
8. Calculate 5-year achievable potential for direct load control measures and compare with total demand;
9. Forecast achievability percentages for full 20 year study period and calculate savings;

The equation form of this methodology is shown below:

$$\{\text{Annual Demand Reduction}\} = \begin{pmatrix} \#\ \text{Applicable} \\ \text{Buildings} \end{pmatrix} \text{x} \left(\frac{\text{kW Saving}}{\text{Building}}\right) \text{x}(\text{Achievability }\%)$$

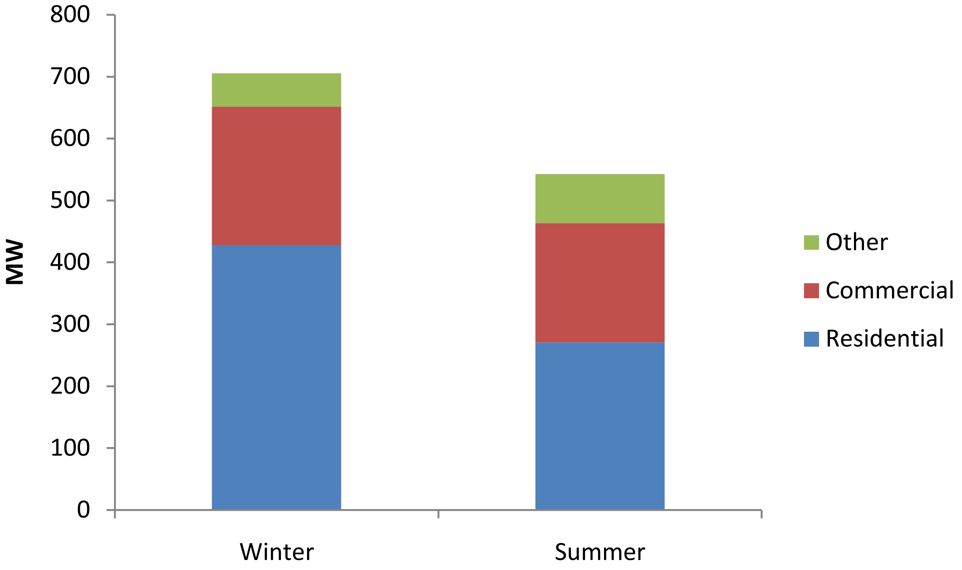
FortisBC Peak Loads

The FortisBC total system winter peak in 2008 was 706 MW and total summer system peak was 560 MW. These peaks are weather-adjusted values. These values will change as the end-use model is modified.

In the Residential Sector, coincident peak load in 2008 was 405 MW in the winter and 219 MW in the summer (see Figure 50). The largest contributor to coincident peak is space heating.

In the Commercial Sector, coincident peak load in 2008 was 225 MW in the winter and 193 MW in the summer (see Figure 50). The largest contributor to commercial peak is lighting.

Figure 50
FortisBC Winter and Summer Coincident Peak, 2008



Direct Load Control - Residential

Measures

All direct load control measures are a curtailment of certain aspects of a home's load at peak periods. The primary candidates for load control are those that have the largest relative contribution to residential peak load and can be curtailed without significant inconvenience to homeowners. Unlike energy efficiency measures, such as weatherization, windows or HVAC upgrades, load control relies on a device to control a major appliance or thermostat, rather than replacing it the appliance itself. Therefore, the communications installed in residential homes drive measure performance and determine future upgrades to the communications protocol and curtailments. The cost of AMI meter installation, operation and maintenance were excluded from this analysis as requested by FortisBC. It is possible to implement direct load control measures without advanced meters. However, in the case of two-way communication units, like those installed on thermostats, AMI is required.

Cost for each measure includes the technology, installation and maintenance over the technology life. To compare measures, the total cost is annualized per or expected savings.

The following DLC measures in Table 49 are included in this study.

Table 49
Residential Direct Load Control Measures

	Description	Winter	Summer
Central Heating	Cycling or setbacks controlled via a central thermostat capable of commutating with grid operators. 2-way communications gives feedback from on-site AMI meters.	X	
Baseboard Heating	Utility controlled switches connected directly to heating units or heating equipment circuits.	X	
Water Heating	Curtailment of water heats using switches installed on water heater or water heater circuit	X	
Air Conditioning Control - Cooling	Curtailment or setbacks of central air-condition units capable of communicating with grid operators.		X

Load control includes three distinct classes of measures: winter space conditioning, hot water heating and summer cooling.

Winter Space Conditioning Measures

Central Heating

Although both thermostat and switch controlled devices reduce heating load during peak periods, they have different performance, cost and applicability. Thermostat controllers shave on average, approximately 30%, of peak heating load at a cost of $40-$50/kW-yr. These are average savings per unit and applicable to homes with central heating. While all heating units might not be on at the same time, savings percentages represent expected peak savings used for annual technical potential. The 30% value accounts for performance, customer overrides, communication failures, and is based on data from pilot program experience. Lifetime is expected to be 10-15 years which is consistent with the life of a conventional thermostat.

Baseboard Heat

Switch-based units are control devices installed directly on baseboard heating equipment or circuits rather than on a central thermostat. They are applicable to homes with zonal electric heat. These devices are generally less sophisticated than thermostat-based controllers. Switch units are less expensive, but are often damaged or not re-configured when heating units are replaced. On average, 15-20% of peak zonal heating load can be controlled at a cost of $28-$35/kW-year.

Thermal Storage

Although is it not a direct load control measure, electric thermal storage units (ETS) have the potential to shave peak demand. This potential is address in the residential and commercial potential sections and is not included in demand response potential.

Water Heating Measures

Water Heating

Water heaters can be curtailed using switches similar to those used for baseboard heating. Heating elements are cycled or turned off during peak curtailment periods by grid operators. This is a very reliable method for peak reduction representing approximately a 0.4 kW per unit savings. While this value may seem low, this is a program level estimate. FortisBC winter and summer daily peak load periods in the late afternoon do not align well with peak water heater usage. During some curtailment events, water heating units might not be running, and therefore will not realize savings. In morning peaking systems, water heater curtailments are more effective and align well with the sharp morning peak in water heater consumption. Also, water heater use is similar year round and does not respond dramatically to outside temperature. Therefore, savings are consistent throughout

Summer Cooling Measures

Air Condition Control - Cooling

Technology for summer cooling curtailments is similar to central heating thermostats for winter heating. The central thermostat controls setbacks and cycling of central AC units based on curtailment commands from utility operators. BC Hydro's conservation potential study does not include an estimate of summer peak savings from cooling measures. However, the PacifiCorp study does include cost and savings information for cooling direct load control and is shown in Table 48.

Table 50 has a range for costs and savings for each measure. Savings are in kW per residential unit and annual cost averages over the life of the measure. For consistency and depth, values in Table 50 are based primarily on BC Hydro's potential study. However, values are in agreement with savings and cost from the PacifiCorp and NWPCC studies. For example, central thermostat controls have a savings of 1.5 kW/unit in the PacifiCorp study and $60-$100/kW-yr cost in the NWPCC study.

Table 50
Cost and Savings Data for Residential Direct Load Control Measures

	Peak Reduction Low *kW/SFD*	Peak Reduction High *kW/SFD*	Cost Low *$/kW/Yr (1)*	Cost High *$/kW/Yr (1)*
Winter				
Baseboard Heating	0.74	0.92	$28.00	$35.00
Central Heating	1.2	1.5	$40.00	$50.00
Water Heating	0.4	0.4	$49.00	$55.00
Summer				
Water Heating	0.4	0.4	$49.00	$55.00
Air Conditioning Control - Cooling	1.5	1.5	$64.90	$64.90

(1) This is an annualized cost of technology and installation per kilowatt of expected annual demand savings from curtailments.

Other DLC Measures

Other DLC measures include non-essential lighting and pool/spa heating; these measures were included only in the BC Hydro study. Therefore, we have included some information here for reference; potential estimates are not included. Costs in Table 51 are incremental and are based on existing communications infrastructure.

Table 51
Secondary Residential DLC Measures

	Peak Reduction Low *kW/unit*	Peak Reduction High *kW/unit*	Cost Low *$/kW/Yr*	Cost High *$/kW/Yr*
Lighting				
Non-essential Lighting, 1-way switch-based control	0.234	0.234	34	34
Pools and Spas				
Pool/Spa, 1-way switch-based control	0.5	0.5	61	61

Technical Potential

Technical potential is the amount of energy efficiency potential that is available regardless of cost or other constraints such as willingness to adopt measures. It represents the theoretical maximum amount of peak load reduction if these constraints are not considered.

The main component for determining technical potential is the housing stock characteristics in FortisBC's service territory. In the *2009 Residential Customer End-Use Study*, FortisBC compiled a list of residential characteristics such as heat type, water heating fuel, central thermostats usage, etc. Dwelling saturations and the total number applicable building are shown in Table 52. There are several assumptions used to generate saturation percentages. These are described below.

For heating controls, 38% of homes are currently heated with electric heat and are eligible for load control. Of homes heated by electricity, half (19%) are assumed to have central thermostats and are applicable to thermostat based load control. The remainder of the electrically heated homes (19%) is known to have baseboard heat and applicable to switch-based devices. Water heater controls are applicable to homes with electric hot water heating, which, from the end-use study is 49% of all housing units. Again, while all water heat units are not on at the same time, savings are assumed on an annual per unit basis. For summer cooling, utility load control measures are applicable to units with central AC units and central thermostats. From the survey data, this saturation is 32%.

Given savings values from Tables 50, the technical potential of direct load control measures in the FortisBC service territory was estimated. The technical potential assumes that all homes that can have a particular technology installed will participate and achieve the savings associated with the measure. For example, all homes with electric heat and central programmable thermostats are assumed to participate in load control programs. In effect, there is no cap on the saturation or participation in direct load control measures in the applicable population. These assumptions allow for the estimation of the total potential resulting in the theoretical maximum reduction in peak load from direct load control programs (see Table 52).

Table 52
Residential Direct Load Control Technical Potential

	Dwelling Saturation	Applicable Count	Savings (MW)
Total Number Homes		***137,655***	
Winter			
Baseboard Heating	19%	26,154	19.4
Central Heating	19%	26,154	31.4
Water Heating	49%	67,451	27.0
Summer			
Water Heating	49%	67,451	27.0
Air Conditioning Control - Cooling	32%	44,050	66.1

Achievable Potential

Achievable potential is usually calculated as the portion of technical potential that is cost effective and achievable. For reference, BC Hydro uses $179/kW-yr (in 2009 dollars) as the avoided capacity cost. Therefore, using this value, the direct load control measures included in this study are all cost effective. Avoided demand cost for FortisBC are $189/kW-year (2010 dollars) based on a blended value of BC Hydro's avoided capacity and FortisBC blended capacity. All measure costs are well below the $189/kW-yr threshold even when program costs are included. Direct load control programs are hinged on achievability rates rather than the selection of cost effective measures.

The achievability rates used in this study are based on BC Hydro's study and are shown in Table 53. The low achievability rates can be assumed if Time of Use (TOU) pricing structure is optional while the high achievability case can be assumed when TOU pricing is mandatory.

Table 53
Achievability Rates for Residential Direct Load Control Measures

Measure Name	Low Achievability	High Achievability
Baseboard Heating	10%	20%
Central Heating	10%	20%
Water Heating	10%	20%
Water Heating	10%	20%
Air Conditioning Control - Cooling	5.%	15%

The achievability rates were then applied to the technical potential to obtain the range of achievable potential for direct load control. A table demand savings and incremental cost is shown in Table 54. There are two columns for potential savings, one for high and low achievability, respectively. Again, these represent optional and mandatory TOU pricing. The two values show a range of savings based on how aggressive FortisBC is in implementing new programs. There large and steady increases in demand savings from roughly $30/kW-yr to $60/kW-yr. This corresponds with space and water heating measures.

Table 54
Achievable Peak Savings for Residential DLC Measures

	Cost	Savings (MW)	
	$/kW/Yr	**Low Achievability**	**High Achievability**
Winter			
Baseboard Heating	31.5	1.9	3.9
Central Heating	45.0	3.1	6.3
Water Heating	52.0	2.7	5.4
	Total	7.7	15.6
Summer			
Water Heating	52.0	2.7	5.4
Air Conditioning Control - Cooling	64.9	3.3	9.9
	Total	6.0	15.3

Direct Load Control – Commercial

Small to medium sized commercial buildings are largely similar to residential buildings in their function and potential for direct load control technology. Therefore, the commercial sector is modeled in the same way as residential potential, but only the largest commercial buildings are excluded (i.e. large office building with energy management systems). Savings and cost values for commercial sector measures are slightly different from in the residential measure data, and are also based on BC Hydro's potential study.

Because lighting comprises the largest percentage of commercial demand, utility control of non-essential lighting is the primary measure in commercial buildings. The required technology is similar to switch-based heating measures, except installed on lighting circuits. Savings are 10% of total lighting demand. In addition to air conditioning, lighting and refrigeration can also be curtailed to reduce demand in the summer.

Table 55 shows savings and cost for commercial measures.

Table 55
Secondary Residential DLC Measures

	Peak Reduction Low *kW/SFD*	**Peak Reduction High** *kW/SFD*	**Cost Low** *$/kW/Yr (1)*	**Cost High** *$/kW/Yr (1)*
Winter				
Baseboard Heating	0.64	0.87	$32.00	$44.00
Non Essential Lighting	0.85	1.26	$31.00	$46.00
Refrigeration Load Control	2.6	2.9	$38.00	$44.00
Central Heating	1.07	1.43	$45.00	$60.00
Summer				
Non Essential Lighting	0.85	1.26	$21.00	$32.00
Refrigeration Load Control	2.6	2.9	$38.00	$44.00
Air Conditioning Control - Cooling	1.5	1.5	$64.90	$64.90

(1)This is an annualized cost of technology and installation per kilowatt of expected annual demand savings from curtailments.

Technical Potential

From the *2009 Commercial Customer End-Use Study*, 13% of commercial buildings are heated solely by electricity in the FortisBC Service territory. Similar allocations between different heating measures resulted in an even split for each thermostat and switch-based measures heating.

Lighting is a distinctly different measure in the commercial sector. Non-essential lighting has the potential to be controlled in 100% of buildings. Conversely, curtailment of refrigeration load is only applicable to commercial kitchens and retail, which comprise 1% of total commercial buildings.

Saturation rates and applicable buildings (out of 7,002 total small/medium commercial buildings) are shown in Table 56.

Table 56
Commercial Direct Load Control Technical Potential

	Saturation	Applicable Count	Savings (MW)
Total Number Buildings		***7,002***	
Winter			
Baseboard Heating	6.5%	455	0.29
Non Essential Lighting	100.0%	7002	5.95
Refrigeration Load Control	1.0%	70	0.18
Central Heating	6.5%	455	0.49
Summer			
Non Essential Lighting	100.0%	7002	5.95
Refrigeration Load Control	1.0%	70	0.18
Air Conditioning Control - Cooling	12.0%	840	1.26

Economic Potential

Due to the low measure cost relative to avoided demand rates, all measures are assumed to be cost effective similar to the methodology presented for the residential sector. See previous discussion on Economic Potential.

Achievable Potential

A range of achievability factors are used for each measure based on BC Hydro information. See Table 57. In the commercial sector, the difference between high and low achievability is often threefold due to the inherent variability from a smaller stock of buildings.

Table 57
Achievability Rates for Commercial Direct Load Control Measures

Measure Name	Low Achievability	High Achievability
Central Heating, 2-Way Thermostat-Based	5.0%	15.0%
Zonal Heating, Switch-Based	5.0%	15.0%
Non Essential lighting, 1-Way Switch-Based	5.0%	15.0%
Air Conditioning Control - Cooling	5%	15%
Refrigeration Load Control	20%	30%

Achievable savings are shown for winter and summer peak periods, respectively, in Table 58. There is a range of low and high achievability factors. Commercial lighting and cooling are the two largest relative contributors to commercial demand reduction potential.

Table 58
Achievable Peak Energy Savings, Commercial Direct Load Control

	Cost	Savings (MW)	
	$/kW/Yr	**Low Achievability**	**High Achievability**
Winter			
Non Essential Lighting	38.0	0.01	0.04
Baseboard Heating	38.5	0.30	0.89
Refrigeration Load Control	41.0	0.04	0.05
Central Heating	52.5	0.02	0.08
	Total	0.37	1.06
Summer			
Non Essential Lighting	26.5	0.30	0.89
Refrigeration Load Control	41.0	0.04	0.05
Air Conditioning Control - Cooling	64.9	0.06	0.19
	Total	0.4	1.1

Direct Load Control – Industrial

While small and mid-sized commercial buildings can benefit from more widget based load control options like water heater and furnace controls, larger building and industrial buildings require a more tailored approach. Irrigation scheduling, standby generation and commercial/industrial programs are also viable options, but require specific technology and commissioning to meet the specific needs of the building function. These programs tend to have higher upfront and administrative costs. However, if designed well, larger building curtailments can provide significant reductions in peak demand, and, therefore, significantly reduce the need for capacity infrastructure. While specific buildings and industries in the FortisBC service territory were not modeled for direct load control, commercial and industrial settings could be a cost effective solution for capacity constraints in the future. These programs require careful selection of buildings and a comprehensive knowledge of larger building energy management.

There are a limited number of programs in the region especially in winter peaking systems. The most notable is Northwest Open Automated Demand Response Program run by Seattle City Light. Seattle City Light found that 0.57 W/ft2, or roughly 14% the building's peak demand was possible to curtail during events from of lighting and HVAC measures. The Seattle Open ADR program is the first of its kind in the region and gives an idea of what is possible in the large commercial sector. However, a tailored and process based engineering analysis is required before pursuing a similar program.

Conclusions

While direct load control is a new area of demand side management relative to energy efficiency, direct load control can provide resources to meet peak demand. Direct space conditioning and water heating control, in addition to commercial lighting are viable options now and for new demand response programs. These measures alone result in roughly 8.1 – 16.7 MW of winter peak and 6.4 – 16.4 MW of summer peak load reduction potential for under $189/kW-yr. They provide system reliability at a low first cost and are relatively simple to install, in line with voluntary programs. FortisBC might also consider implementing other direct load control measures such as residential lighting and plug loads as incremental measures.

In total, an estimated 3.6%-5.3% reduction in winter peak demand (of which 1.4-2.9% is from DLC measures) is possible by 2015. Total summer peak reduction is 3.6%-5.5%. There is variability in the range of savings based on high and low achievability rates. These estimates exclude expensive thermal storage measures and are consistent with studies from other utilities, which are shown in Table 59.

Table 59
Comparison of Demand Response Forecasts Across Utilities

Utility	Target Year	Forecasted Demand Response as Percent of Peak Load
BC Hydro[20]	2011 (5 Year)	2.30%
BC Hydro	2016 (10 Year)	4.60%
PacifiCorp	2009	5.10%
Idaho Power	2013	8.10%
Portland General Electric	2012	4.10%
New York ISO	2009	5.90%
PJM	2008	3.20%
California ISO	2011	6.50%

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[20] Values are average savings for direct load control (capacity specific) measures from the *2007 Conservation Potential Review*.

Savings are forecasted out for the full 20 year study scope in Table 60. This analysis assumes that, as programs become more developed, participation will increases from better marketing and consumer acceptance. Conservative achievability rates were used and derived from the lower end of those in the BC Hydro study.

Table 60
20-Year Forecasted Direct Load Control Savings

	Achievability Percent				Annual Savings (MW)			
	5 Year	**10 Year**	**15 Year**	**20 Year**	**5 Year**	**10 Year**	**15 Year**	**20 Year**
Residential								
Winter								
Baseboard Heating	10%	23%	30%	33%	1.94	4.45	5.81	6.44
Central Heating	10%	23%	30%	33%	3.14	7.22	9.42	10.45
Water Heating	10%	23%	30%	33%	2.70	6.21	8.09	8.98
Summer								
Water Heating	10%	23%	30%	33%	2.70	6.21	8.09	8.98
Air Conditioning Control - Cooling	5%	10%	23%	30%	3.30	6.61	15.20	19.82
Commercial								
Winter								
Baseboard Heating	5%	11%	14%	15%	0.01	0.03	0.04	0.04
Non Essential Lighting	5%	11%	14%	15%	0.30	0.63	0.83	0.89
Refrigeration Load Control	20%	46%	60%	67%	0.04	0.08	0.11	0.12
Central Heating	5%	11%	14%	15%	0.02	0.05	0.07	0.07
Summer								
Non Essential Lighting	5%	11%	14%	15%	0.30	0.63	0.83	0.89
Refrigeration Load Control	20%	46%	60%	67%	0.04	0.08	0.11	0.12
Air Conditioning Control - Cooling	5%	10%	23%	30%	0.06	0.13	0.29	0.38
				Total Winter	10.1	22.5	30.1	34.7
				Total Summer	6.4	13.7	24.5	30.2

Energy Savings

Additionally, while direct load control measures are designed to shave peak demand, there is a minimal amount of associated energy savings. The total number and length of curtailment events will alter the amount of savings. To estimate this, 35 winter and 17 summer curtailment events were assumed. Each event is 2 hours long. This is consistent with pilot study results from the Goodwatts Program in The City of Ashland. Table 61 shows energy savings for both high and low achievability. Assuming conservative achievability, peak demand measures have 942 MW of associated energy savings in the FortisBC service territory. Note that all measures with the exception of water heating have energy benefits. For hot water heaters, the load is shifted to off-peak hours, but the total energy consumption is the same using direct load control.

Table 61
Energy Savings from Peak Demand Measures

	Peak Reduction kW/unit	Units Low Achievability	Units High Achievability	Savings (MWh) Low Achievability	Savings (MWh) High Achievability
Residential					
Winter					
Baseboard Heating	0.74	2615	5231	139.4	278.7
Central Heating	1.2	2615	5231	226.0	451.9
Summer					
Air Conditioning Control – Cooling	1.5	2202	6607	112.3	337.0
Commercial					
Winter					
Baseboard Heating	0.64	23	68	1.0	3.1
Non Essential Lighting	0.85	350	1050	21.4	64.3
Refrigeration Load Control	2.6	14	21	2.6	3.9
Central Heating	1.07	23	73	1.8	5.6
Summer					
Non Essential Lighting	0.85	350	1050	10.1	30.4
Refrigeration Load Control	2.6	14	21	1.2	1.9
Air Conditioning Control – Cooling	1.5	42	126	2.1	6.4
			Total Summer	***517.9***	***1,183.2***

Behaviour Conservation Savings

Introduction

Behavioural measures or programs are those where energy or peak demand savings are based on customers changing their patterns of energy consumption. Behavioural measures are reviewed in this study; however, it is recommended that FortisBC conduct more thorough studies before implementing these programs.

Behavioural Measures

Behavioural programs might include a combination of education, awareness campaigns, or incentives regarding things like turning the thermostat down at night or unplugging small appliances when not in use. Table 62 (from the BC Hydro 2006 study) summarizes behavioural measures applicable in the residential sector. Among these, BC Hydro found that behaviours related to computers, domestic hot water use, lighting, and space heating showed the greatest potential for energy savings.

Table 62
Residential Behavioural Measures

Space Heating and Cooling
- Turning down the temperature at night or day
- Heating only occupied parts of the building
- Maintain draft proofing
- Install storm windows
- Covering windows when using the AC
- Increasing temperature when using the AC

Lighting
- Select low-watt bulbs, reduce lumens
- Using only necessary safety lighting
- Turning off lights when leaving the room

Water Heating
- Turn off or down water heater when away
- Lower water temperature

Small Appliances
- Unplug charger power supplies

Refrigeration and Freezers
- Maintain proper temperature
- Defrost freezer more frequently

Appliances
- Air dry dishes in dishwasher
- Minimize hot and warm water washing
- Use temperature/moisture sensor in dryer

Computers and Peripherals
- Activate power management features
- Shutting of PC and/or monitor when not in use

TV and Entertainment
- Turning off TV when not in use
- Unplug TV regularly and when away
- Unplug entertainment system regularly

Table 63 (from the BC Hydro 2006 study) summarizes behavioural measures applicable in the commercial sector. Among these, BC Hydro found that behaviours relating to lighting showed the greatest potential for energy savings.

Table 63
Commercial Behavioural Measures

Space Heating and Cooling
- Adjusting heat up in summer
- Adjusting heat down in winter
- Using shades/blinds in summer
- Using shades/blinds in winter
- Using natural ventilation
- Keeping doors closed

Lighting
- Making use of daylighting
- Turning off task lights when not in use
- Using task lights instead of ambient lighting
- Reducing or eliminating unnecessary lighting

Refrigeration and Freezers
- Maintaining proper temperature

Plug Loads
- Activating power management features
- Shutting off PC and monitor when not in use
- Shutting off monitor when not in use
- Switching off computer power bar when not in use
- Shutting off idle equipment

Whole Building
- Taking stairs rather than the elevator
- Changing hours of activity

BC Hydro found that approximately 11 percent of energy could be saved through behavioural measures among the residential sector and 3.8 percent of energy in the commercial sector. The percentage of savings assumes base load prior to any DSM implementation or additional programs.

Clotheslines are another behaviour measure that might save clothes drying energy consumption for FortisBC customers during warm months. This measure was not specifically included in the potential estimates; however, the Ontario Power Authority quantified clothesline savings at 225 kWh per year at a cost of approximately $85 and a life of 10 years. Using these cost and savings data, clotheslines are cost-effective using the TRC test.

FortisBC Results

Results of a similar analysis for FortisBC, using data obtained from the BC Hydro 2006 study, show a potential savings of 12 percent of base load in the residential sector and 5.3 percent of base load in the commercial sector from behavioural measures (Tables 64 and 65).

Table 64
Behavioural Programs - Residential Energy Savings
Unbundled Technical Potential

	Base Year Consumption *(GWh/yr)*	Behaviour Measure	Unused Energy Services *(% of Base Year)*	Unbundled Potential *(GWh/yr)*
Space Heating	370	Temperature setback - over night	3%	10
	370	Temperature setback - daytime	2%	7
	370	Heat only occupied parts of house	1%	3
	370	Maintain weatherproofing	2%	8
	370	Install storm windows	1%	4
		Sub-Total	9%	33
Air Conditioning	123	Close windows and blinds	4%	5
	123	Increase temperature 3 deg. C	10%	12
		Sub-Total	14%	17
Lighting	234	Low wattage incandescent bulbs	2%	5
	234	Only necessary outdoor lighting	2%	5
	234	Turn off lights when no one in room	10%	23
		Sub-Total	14%	33
DHW	168	Turn off DHW when on vacation	1%	1
	168	Reduce temperature of DHW	1%	2
	168	Minimize hot and warm wash	27%	45
		Sub-Total	29%	48
Refrigeration	112	Maintain proper refrigerator temp.	3%	4
	62	Maintain proper freezer temp.	3%	2
	62	Defrost freezer more frequently	1%	1
		Sub-Total	10%	6
Appliances	6	Air dry dishes in dishwasher	18%	1
	88	Use sensor for clothes dryer	1%	1
	0	Brick chargers	3%	0
		Sub-Total	2%	2
Computers	118	Activate power management	29%	34
	118	Shut off PC and monitor	6%	7
	118	Shut off monitor	3%	3
		Sub-Total	37%	44
TV & Entertainment	62	Turn off TV when no-one watching	15%	9
	62	Unplug TV regularly	19%	12
	62	Unplug TV when on vacation	1%	1
	9	Unplug stereo regularly	31%	3
	9	Unplug stereo when on vacation	2%	0
		Sub-Total	35%	25
Residential Total	**1,720**		**12%**	**207**

Table 65
Behavioural Programs - Commercial Energy Savings
Unbundled Technical Potential

	Base Year Consumption *(GWh/yr)*	Behaviour Measure	Unused Energy Services *(% of Base Year)*	Unbundled Potential *(GWh/yr)*
Lighting	374	Make use of daylighting	2.3%	8.6
	374	Turn off task lights	0.4%	1.5
	374	Use task instead of ambient light	3.8%	14.2
	374	Reduce unnecessary lights	0.8%	3.0
		Sub-Total:	7.3%	27.3
HVAC	69	Adjust heat up in summer	0.6%	0.4
	145	Adjust heat down in winter	0.7%	1.0
	69	Use shades/blinds - summer	1.1%	0.8
	145	Use shades/blinds - winter	1.6%	2.3
	69	Use natural ventilation - summer	4.4%	3.0
	145	Keep doors closed - winter	1.1%	1.6
	69	Keep doors closed - summer	0.4%	0.3
		Sub-Total	4.4%	9.4
Plug Loads	34	Activate Power Management	44.7%	15.3
	34	Turn off PC and monitor	4.3%	1.5
	34	Turn off monitor only	1.4%	0.5
		Sub-Total	50.4%	17.2
Whole Building	89	Refrigerator	0.6%	0.5
	3	Elevator	0.9%	0.0
		Sub-Total	0.6%	0.6
Commercial Total	**1,033**		**5.3%**	**54.5**
Commercial and Residential Unbundled Total Technical Potential				**262**

Achievable Potential

The technical potential for behavior measures is significant. However, when the achievability factors are applied the potential is reduced to fewer than 50 percent of the technical potential. The BC Hydro 2007 Conservation Potential Review included detailed surveys and analysis of behavior achievability factors. Table 66 shows the achievability rates and subsequent achievable potential by sector.

Table 66
Behavioural Programs Achievable Potential (Unbundled)

	Technical Potential, GWh	Achievable Percent	Achievable Potential, GWh
Residential	207	40%	82
Commercial	54	63%	34
Total	262		116

Programs

While utility pilot program results are limited, several recent programs examples will help illustrate the potential energy savings of these approaches:

- Hydro One and NSTAR installed PowerCost Monitor devices. The average savings resulting from these units in addition to findings from in-home display studies in both Nevada and Florida, suggest that average savings of 3% to 7% with a midpoint of around 5% are likely to be achieved for participants of these kinds of direct feedback programs. It is important to note, these programs did not make use of a control group. These savings were achieved with a motivated population.

- Electricity use reports developed by Positive Energy (rebranded OPower Inc.) offer neighbour comparisons to help motivate SMUD's customers (Sacramento Municipal Utility District) to make changes to energy use, lowering demand by 2% in a broad non-targeted population. The concept of this program is that individuals are motivated by their perceptions of what other people do and find acceptable.

  Connexus Energy is wrapping up a 12 month pilot program for 40,000 customers, reporting a two to three percent reduction in energy consumption. The utility is pleased with the results and intends to continue the program for the next several years. About two percent have opted out of the program.

  Xcel Energy Inc. is currently implementing a three year pilot study targeting 35,000 gas and electric customers. The reports are mailed to customers and compare a customer's combined electric and gas use from the previous month to 100 neighbours in similar-size homes. The report provides a second comparison against the most efficient neighbours. Each household is provided a ranking among the 100 neighbours with those in the top 20 receiving positive feedback.

- BC Hydro has found the use of personal commitments, incentives, and online information tools to be an effective means to drive behavior changes. The utility has enrolled more than 60,000 customers in the first few months of this effort.

Costs

Cost data for behavioural programs is limited and unreliable. However a couple cost points were identified from early results of pilot programs. These costs range from $0.03 per first year-kWh for Positive Energy (OPower) programs (from SMUD) to $0.30 per first year-kWh for PowerCost monitor technologies. When levelized[21], these costs represent a range of approximately $20/MWh to $80/MWh, well under the cost-effectiveness limit. Another cost consideration is the life of these programs. It may become increasingly costly to continually make programs such as Positive Energy new and exciting as time passes and customers tire of participating. Because costs are uncertain, a range of cost estimates are included for FortisBC behavioural program potential. These 20-year total costs are provided in Table 67 below. If the potential were distributed evenly over the planning period, this would represent an annual cost range of $147,000 to $2 million.

Table 67
Behavioural Potential Total Cost Estimates

	Potential, GWh	Low Cost Estimate	High Cost Estimate
Residential	82	$2,460,000	$24,600,000
Commercial	34	$1,020,000	$16,345,485
Total	116	$3,480,000	$40,945,485

Summary

The pilot programs described above will provide important cost data for future behavioural program analyses. Overall, the above analysis concludes that FortisBC could save approximately 116 GWh in the residential and commercial sectors through behavioural programs.

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[21] Assuming a discount rate of 5% and 2 and 4 year measure lives, respectively

Conservation and Risk

Conservation resources have generally been known as low-risk resources. The risks that apply to energy efficiency resources are those associated with utility investment in capital that is not owned or maintained by the utility. “Risk” in terms of energy efficiency refers to the likelihood that the predicted savings will be achieved over the life of the measure. Risk components of conservation resources include:

1. Failure of measure before end of useful life
2. Removal or early replacement
3. Actual energy savings are less than estimated

Risks 1 and 2 above are often considered when evaluating measure savings. In the Northwest US, the Northwest Power and Conservation Council discounts measure savings to account for early removal, failure, or modified use patterns. In addition, risk premiums may be added to measure costs when evaluating cost-effectiveness from a total resource cost perspective. Programs that are mature and are based on trusted technologies present the least amount of risk while programs based on emerging technologies present significantly greater risk.

Risk 3 above is an issue of contention in many areas. Actual savings values vary across house types, climate, and interactions with other measures. Savings estimates for CFLs are a good example of how different regions or planning agencies assign savings values for energy efficiency measures. Based on a dated (2004) M&E report, FortisBC’s assigns an nominal savings value of 87 kWh for a CFL in their service territory. On the other hand, BC Hydro uses a savings value of 63 kWh per year. Lastly, the Bonneville Power Administration (BPA) currently gives a credit of 33 kWh per CFL to their wholesale customers. The 33 kWh per CFL value includes factors for take-back, space conditioning interaction, and removal. All three of these entities are located in similar climate zones with similar housing characteristics and yet the savings value for CFLs varies from 33 to 87 kWh per year. In order to address this risk, the more conservative savings values are used in this study.

Energy efficiency resources are generally viewed as risk mitigation strategies rather than viewed for their inherent risk. Energy efficiency resources are used to mitigate risks such as increasing generation or power purchase costs, limited transmission and distribution systems, fuel price volatility, and increasing costs due to possible climate change legislation. Energy efficiency is a clean, localized resource strategy that reduces a utility’s dependence on fossil fuels, transmission resources, and costly new resources or market power price variations.

Combined CDM Potential Summary

Table 68 summarizes the energy efficiency savings potential for all sectors. The savings estimates below are for program achievable potential (savings from codes and standards are excluded). Also, savings from fuel switching measures, behavioural measures, and customer-owned renewable projects are reported separately in subsequent tables. Through energy efficiency measures, FortisBC can expect to meet 14.7 percent of the forecasted 2030 load. These estimates indicate that, given the load forecast assumptions, FortisBC could meet 59 percent of load growth with program achievable potential energy efficiency resources across all sectors.

Table 68
Comparison End-Use Forecast with Energy Efficiency Potential Estimates

	2008 Base Year Consumption (GWh)	2030 Forecast Consumption (GWh)	Energy Efficiency Program Achievable Potential (GWh)	% of 2030 Load
Residential	1,720	2,247	369	16.4%
Commercial	1,033	1,456	173	11.9%
Industrial	207	207	28	13.4%
Lighting	14	14	4	28.8%
Irrigation	52	52	11	20.8%
Total	3,026	3,976	585	14.7%

Table 69 illustrates energy efficiency potential summarized above in five-year increments. Note that street lighting potential is included in the commercial sector potential

Table 69
Program Achievable Potential, MWh

	2011	2015	2020	2025	2030
Residential	19	94	192	281	369
Commercial(1)	10	53	107	142	177
Industrial	1	8	18	23	28
Irrigation	1	3	5	8	11
Total	**30**	**158**	**322**	**453**	**585**

(1) Includes street lighting potential

Figure 51 illustrates the potential given in the tables above. The majority of the potential is from the residential sector, which is not surprising since residential customers consume 57 percent of total load.

Figure 51
Summary of Energy Efficiency Potential 20-Year Program Achievable Potential

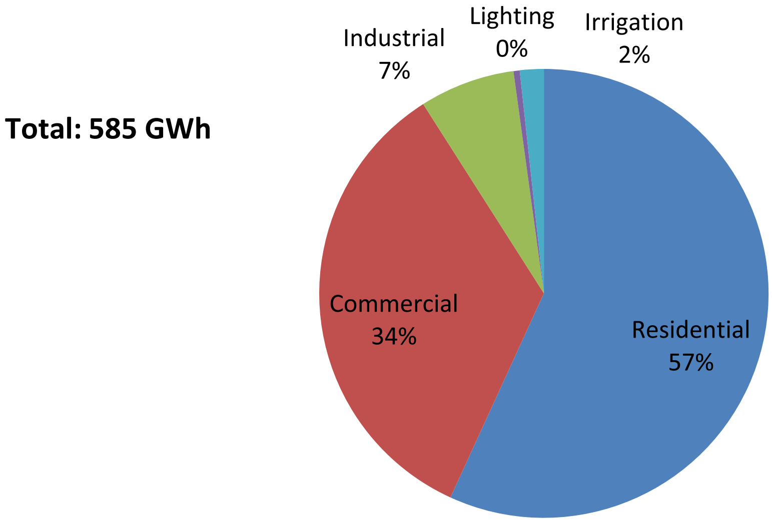
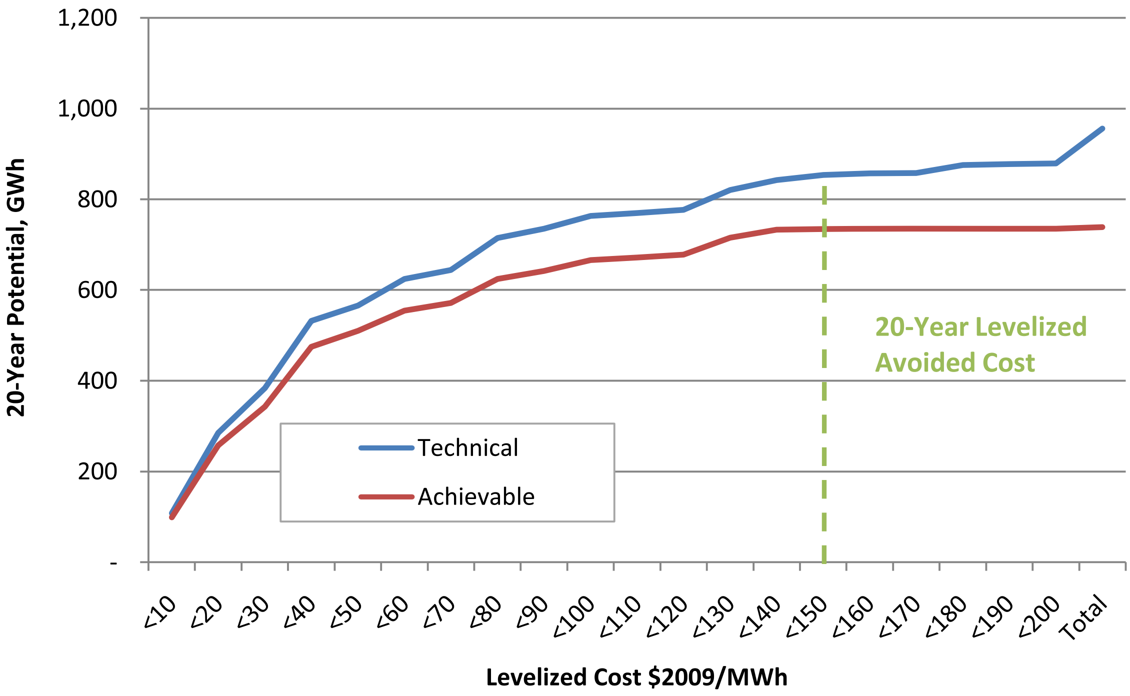


Figure 52 illustrates the supply curve for energy efficiency potential across all sectors.

Figure 52
Energy Efficiency Supply Curve – All Sectors



Demand savings potential is summarized in Table 70 below. Peak demand savings from energy efficiency measures and demand response measures are separated. Overall, approximately 16.2 percent of 2030 winter peak demand can be saved through a combination of energy efficiency and demand response programs.

Table 70
Total Demand Savings Potential, MW

	Energy Efficiency	Demand Response	Total
Winter	124	35	159
Summer	81	30	111

FortisBC Naturally Occurring Conservation

Naturally occurring conservation refers to the amount of conservation that would be achieved in absence of utility programs. This includes:

1. Efficiency gains from the turnover of older equipment to current standard equipment (with higher efficiency);
2. The adoption of high-efficiency equipment due to natural market forces; and
3. Market effects that include national or provincial government programs, past utility programs or marketing efforts, or equipment vendor efforts.

With regard to the FortisBC conservation potential assessment, the amount of naturally occurring conservation is accounted for in two ways. The first is in the load forecast. Since the end-use load forecast was calibrated to the system forecast, in includes a basic level of naturally occurring conservation, based on past experience. Second, some of the energy efficiency measure savings values are adjusted for market saturation and turnover rates for equipment that is naturally replaced over the planning period.

While it is difficult to quantify naturally occurring conservation, a few organizations have attempted it. The published data indicate that a range of between 6 and 10 percent of achievable potential is naturally occurring. For FortisBC, this amounts to approximately 1.2 percent of 2030 load.

Given the assumption that naturally occurring conservation is 1.2 percent of 2030 load, FortisBC might expect to meet 56.5 percent of load growth with DSM resources through 2030.[22]

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[22] Naturally occurring conservation = 1.2 percent of 2030 load = 48 GWh. Load Growth = 950 GWh. Program achievable conservation potential = 585 GWh. Percent of load met with utility program conservation = (585-48)/950 = 56.5%

Behavioural Measure Scenarios

The table below summarizes different levels of program planning to achieve behavioural potential. The scenarios are developed based on average behavioural measure costs and the percent of annual DSM budget allocated to those programs. Budget percents are 2.5, 5, and 10 percent for the low, medium, and high scenarios respectively.

Table 71
Behavioural Measure Scenarios

	Savings			Costs	
Behavioural	**MWh**	**Winter MW**	**Summer MW**	**Annual Cost**	**First Year $/kWh**
Low	497	0.00	0.00	$82,016	$0.17
Medium	2,175	0.00	0.00	$358,799	$0.17
High	10,678	0.00	0.00	$1,761,897	$0.17

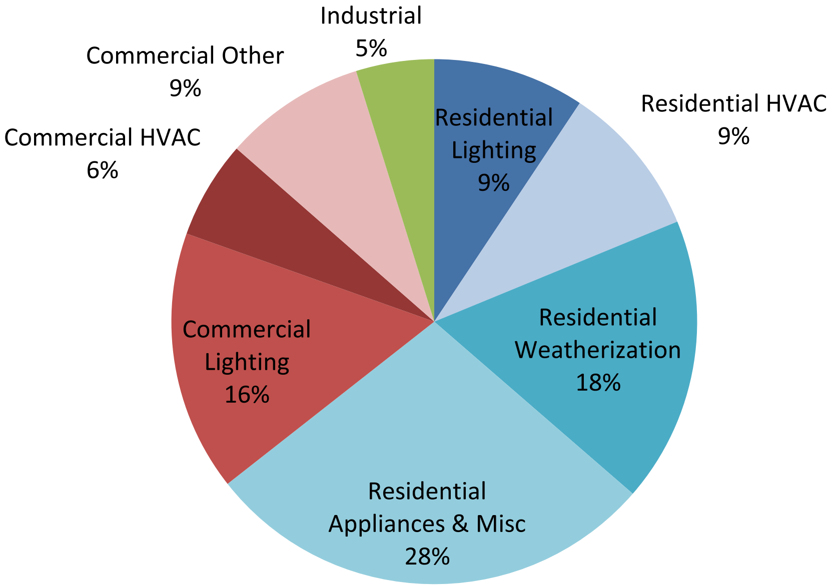
Program Implications

This conservation and demand potential assessment provides information and data for resource planning. In addition, the results can assist with DSM planning efforts. This section highlights some of the DSM program opportunities available to FortisBC

Energy Efficiency

The overall approach to energy efficiency in the FortisBC service territory can be assisted by looking at the significant categories of energy efficiency. Figure 59 summarizes the energy efficiency potential by major categories across all sectors. Over half of the energy efficiency potential is in the residential sector and only a small portion (5 percent) in the industrial sector, with the remaining 31 percent is in the commercial sector.

Figure 53
Energy Efficiency Achievable Potential Summary



Residential

Residential Weatherization

Windows, insulation and air sealing measures make up the largest category in the residential sector. These are traditional utility programs and should continue. The end-use survey indicated there are plenty of un-weatherized homes in the service territory.

Residential Lighting

There is still time to acquire significant savings through lighting programs before code changes dictate efficient lighting beginning in 2012. After 2012, savings potential will be achieved under codes and standards rather than utility programs. Standard (spiral) CFLs phased out at the end of 2009. Only specialty CFLs (3-way, dimmable, reflector) types are now eligible for incentive. After 2012, new lighting measures will be available that will focus on CFL specialty bulbs not included in the new standard and LED applications.

Residential HVAC (Heat Pumps)

Heat pumps should also continue to be part of a future program. All electrically heated homes without heat pumps are prime targets for this measure. Even homes with older heat pumps could benefit from a heat pump upgrade. Included in the potential estimates are the ductless heat pumps which are recently being introduced into the North American market. These heat pumps appear to be an excellent choice for homes with existing baseboard heat, and may be good applications for manufactured homes, condos, and row houses.

Residential Water Heating and Appliances

Electric water heating upgrades for electric water heaters continues to be strong measure. Low flow showerheads are another measure that is program-ready. Also included in this study are heat pump water heaters. While this technology has tried and failed in the past, there is renewed interest and numerous pilot studies and research projects are underway with this technology. Three major brands, including GE, have launched HPWH product lines in the past year. FortisBC should strongly consider initiating a pilot program with this technology.

The appliance category includes conservation measures such as Energy Star refrigerators, refrigerator and freezer recycling (decommissioning), efficient clothes washers, and dishwashers. Most of these measures have a relatively low savings per unit, but also offer low-cost incentive opportunities. Aligning with the Energy Star brand is also beneficial to overall consumer education and program marketing.

Commercial

Commercial Lighting

Commercial lighting is a significant portion of the conservation potential representing approximately 19% of the total potential. This category represents a huge number of individual measures and options depending on the building type and lighting technology. FortisBC may wish to streamline commercial lighting projects by developing a program for specific applications such as small office or retail. A significant portion of commercial sector conservation potential is in lighting upgrades and previous efforts have not exhausted these resources. Some utilities find that residential CFL lighting spills over to commercial applications. Allowing for the spillover increases measure saturation though creates difficulty in tracking program effectiveness.

Commercial HVAC

The HVAC category includes variable speed chillers, premium rooftop HVAC systems, HVAC controls, ECM on VAV boxes, packaged roof top optimization and repair, and integrated building design (new construction).

Commercial Other

Grocery store refrigeration measures, computer and office equipment, and stand-alone commercial refrigerators and freezers are part of the other commercial potential.

Industrial

The industrial sector requires personal connections with the large industrial customers resulting in custom energy efficiency projects.

Demand Response

Control Space Heating

Peak demand can be controlled in part through controlling space heating equipment. A variety of measures were analyzed in this report. A comprehensive program could include several options for heating system control:

- *Central Heating Controls*- Central heating can be controlled through one or two-way devices. Through the implementation of smart meters, heating system control becomes relatively easy to accomplish.
- *Zonal Heating Controls*- Switch-based units are control devices installed directly on zonal heating equipment or circuits. These devices do not require meter infrastructure and could be used in areas where the smart meters are not installed.
- *Thermal Storage* - Central thermal storage units require significant investment for purchase and installation of equipment. Room-based thermal storage units are similar in savings and life to central systems, but require several smaller units. A typical house would need four units. Cost is slightly higher and units are generally applicable situations where baseboard heating would be avoided.

Water Heating

Electric water heaters can be curtailed using 1-way switches. Heating elements are cycled or turned off during peak curtailment periods by grid operators. This is a reliable method for peak reduction representing approximately a 0.4 kW per unit savings. Water heater use is similar year round and does not respond dramatically to outside temperature.

Air Condition Control - Cooling

Technology for summer cooling curtailments is similar to central heating thermostats for winter heating. The central thermostat controls setbacks and cycling of central AC units based on curtailment commands from utility operators. A program that implements this measure could be helpful in offsetting FortisBC's growing summer peak.

Other DLC Measures

Other DLC measures include non-essential lighting and pool/spa heating and could be implemented in addition to other programs. For the commercial sector, controlling non-essential lighting could result in significant peak reductions.

Summary

Through their energy efficiency program efforts, FortisBC plans to meet at least 50 percent of forecasted load growth through 2020 with demand-side resources. In order to achieve this goal, FortisBC must reduce forecasted load growth (553 GWh/year) by 277 GWh/year. FortisBC is well on their way to meeting this goal. From 2006 through 2008, average annual energy efficiency achievement was an additional 26 GWh per year. Projecting these savings over the next 10 years would save a total of 263 GWh/year. The potential study shows that 318 GWh of program achievable potential is available to FortisBC by 2020. With the addition of program measures such as ductless heat pumps, Energy Star® appliances, and streamlined program design for commercial lighting, FortisBC is on track to meet 50 percent of load growth with DSM through 2020. This program achievable potential is based on current codes and standards in place and known to be implemented during the study period. The Provincial and Federal governments are on track to accelerate the adoption of energy efficiency codes and standards. As these codes and standards are adopted, a larger portion of the achievable savings would realized through this avenue.

In addition to utility programs, Fortis BC will continue to promote Province-wide programs such as LiveSmartBC, investigate demand response programs, time-of-use rates, behavioural programs, and emerging technologies.

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Appendix A – Codes and Standards

A significant number of new code changes have been enacted between 2008 and 2010 for both residential and commercial buildings. The code changes that take effect after 2010 impact the portion of the potential that will be achieved through programs. For residential, significant energy efficiency will be achieved through the General Service Lamps code change in 2012 which will effectively require most light bulbs to have the efficiency of a CFL or better. In addition, it is expected that new efficiency standards will significantly impact consumer electronics, including televisions and standby power equipment. Other near-term residential code impacts include furnace fan motors and room and portable air conditioners.

The known residential code changes expected to occur during the 2011 – 2030 timeframe will result in an estimated 121 GWh of energy efficiency. The Province of British Columbia or the Federal government may adopt more aggressive energy efficiency codes and standards, in which case more of the achievable savings potential would be attributed to code changes. See Table A1 for current code details.

Table A1
Residential Code Changes (National and BC)

End-Use Technology	New Code Effective Date
Recent Changes	
Ceiling Fans	2008
Refrigerators and Freezers	2008
Windows	2009
Building Code	2010
Clothes Washers	2010
Dishwashers	2010
Electric Storage Water Heaters	2010
Residential Dishwashers	2010
Torchieres	2010
Near-Term Changes	
Lighting (General Service Lamps)	January 1, 2012 (high lumen) December 31, 2012 (low lumen)
General Service Electric Motors	January 1, 2011
Room and Portable Air Conditioners	January 1, 2011
Small Motors (Furnace Fans)	January 1, 2011
Consumer Electronics, Including Standby Power	January 1, 2011 (for standby) TBD for TVs, etc.

For the Commercial sector, recent changes have been made to codes impacting commercial clothes washers, ice-cube makers, and large motors. In the near term, changes will impact HID lamps and ballasts, large air conditioners, and package terminal air conditioners.

The commercial code changed expected to occur during the 2011 – 2030 timeframe will result in an estimated 26 GWh of energy efficiency. See Table A2 below for code change details.

Table A2
Commercial Code Changes (National and BC)

End-Use Technology	**New Code Effective Date**
Recent Changes	
Commercial Clothes Washers	2008
Ice-Cube Makers	2008
Large Motors	2010
Near-Term Changes	
HID Lamps and Ballasts	2012
Large Air Conditioners	2012
Package Terminal Air Conditioners	2012

Appendix B – Cost-Effectiveness in British Columbia

Introduction

The British Columbia Ministry of Energy, Mines and Petroleum Resources ("Ministry") amended the Public Utilities Commission Act (Bill 15-2008) to require public utilities to estimate cost-effective demand side resources (DSM) as part of their long term resource plan and to provide a plan to acquire those resources as a first priority over supply-side options. This memo summarizes how the Ministry expects utilities to estimate cost-effectiveness.

Long-Term Resource Plan

Section 44.1, Long-term resource and conservation planning, of the Public Utilities Act[23] requires that a public utility's Long-Term Resource Plan (LTAP) must include all the following:

> (a) an estimate of the demand for energy the public utility would expect to serve if the public utility does not take new demand-side measures during the period addressed by the plan;
>
> (b) a plan of how the public utility intends to reduce the demand referred to in paragraph (a) by taking cost-effective demand-side measures;
>
> (c) an estimate of the demand for energy that the public utility expects to serve after it has taken cost-effective demand-side measures;
>
> (d) a description of the facilities that the public utility intends to construct or extend in order to serve the estimated demand referred to in paragraph (c);
>
> (e) information regarding the energy purchases from other persons that the public utility intends to make in order to serve the estimated demand referred to in paragraph (c);
>
> (f) an explanation of why the demand for energy to be served by the facilities referred to in paragraph (d) and the purchases referred to in paragraph (e) are not planned to be replaced by demand-side measures; and
>
> (g) any other information required by the commission.

---

[23] Utilities Commission Act [RSBC 1996] Chapter 473. Current to September 9, 2009 available online at: http://www.bclaws.ca/Recon/document/freeside/--%20U%20--/Utilities%20Commission%20Act%20%20RSBC%201996%20%20c.%20473/00_96473_01.xml#section44.1

Demand-Side Resources

Cost-effective measures to be examined include rate, measure, action or program measures. The DSM evaluations must be approved by the British Columbia Utilities Commission (BCUC). In order for the BCUC to consider a portfolio of DSM programs complete, that portfolio must include:

- *Low-Income Programs* – Low-income households are defined by Statistics Canada's Low-Income Cut-Offs (LICO) for a particular year
- *Rental Programs* – Programs may target either tenant and or landlord. The focus must be on the accommodation rather than the residents (emphasis on technology).
- *Education Programs* – Includes funding of the development of education program regarding energy efficiency and conservation.
- *Post-Secondary Programs* – Includes funding of programs such as the integration of energy efficiency into a business or MBA program curriculum and trades training.

Cost-Effectiveness

The cost effectiveness of each measure may be calculated either at the individual level, in a bundle with other measures, or at a portfolio level.

Low-Income

Low income DSM programs have additional benefits that are not accounted for in energy savings such as fewer shutoff/reconnect costs, fewer rearranges, and less bad debt to be written off. Therefore, 30 percent in additional benefit is to be added to low income program measure cost-effectiveness tests.

Specified DSM and Technology Innovation

- Specified DSM includes the following measures:
  - Education
  - Funding energy efficiency training for manufacturers, sellers, installation tradesmen, brokers, managers of energy efficiency products and buildings.
  - Community engagement programs that assist, cooperate or directly increase stakeholders' awareness of energy efficiency. Stakeholders include first nation, government, or non-profit groups.
- Technology innovation programs including market transformation.

These measures will be evaluated in a group with other measures or as a portfolio to help support the expenditures. The reasoning behind the grouping of measures for the purpose of cost-effectiveness tests is that these measures are supportive and long term rather than immediate or standalone.

Total Resource Cost

Avoided Cost

Bulk electricity purchasers from BC Hydro must use BC Hydro's long-term marginal cost rather than the purchase price of power. This avoided cost requirement for bulk purchasers increases the amount of DSM that is cost-effective.

Summary

It appears the British Columbia does not require specific total resource costs and benefits be included in the benefit-cost analysis. In their 2007 study, BC Hydro uses avoided transmission and avoided power costs to evaluate measure cost-effectiveness. BC Hydro escalated their avoided power costs (energy) by 50%. Measure costs are either full or incremental capital costs.

Appendix C – Cost-Effectiveness Tests

Two general screening methods can be used to rank demand and supply options. These are benefit-to-cost ratios and levelized cost. A benefit-to-cost ratio divides resource benefits by resource costs to calculate a ratio. If the ratio is greater than one, the resource is cost-effective; if the ratio is less than one, the resource is not. Levelized costs sum the fixed and variable costs of a resource over its life, taking into account the time value of money, and divide them by the associated output or savings. A cost per unit of output or savings is developed and is usually expressed in a constant dollar year. This levelized cost can then be compared with a fixed generating resource or power contract to determine cost effectiveness.

Several different economic tests are available for evaluating resource options. All of the tests incorporate benefit-to-cost analyses. However, the perspective from which the costs and benefits are evaluated differs among the tests. The five tests are the total resource cost (TRC) test, ratepayer impact measure (RIM) test, participant test, utility cost test, and societal test. The tests are used primarily to evaluate DSM resources.

In the Northwest, the Council uses the TRC as the primary cost test to determine cost effectiveness of DSM options. Using the TRC benefit cost ratio, all DSM measures can be compared with available supply resources. Other tests can then be applied to determine the cost effectiveness from the various perspectives (e.g., utility, ratepayer).

Cost and Benefit Components

Changes in Supply Costs. One of the main benefits of a DSM option is its associated reduction in supply costs. This can occur as a result of a decrease in energy use or as a result of a shift of energy from a more expensive period to a less expensive period. The avoided supply cost is calculated by multiplying the reduction in total net generation by the marginal cost. If energy has been shifted instead of reduced, the resulting increase has to be included on the cost side. The changes in supply cost for periods where energy use increases are costs (increased supply cost), and the changes in supply costs for periods where energy use decreases are benefits (avoided supply cost).

Changes in Revenue and Bills. Another large effect of DSM programs is revenue reduction. Lost revenues are a cost to the utility and tend to increase rates on a per-unit basis. On the other hand, DSM program participants receive equivalent benefits, because their consumption is reduced.

Utility Costs. This category includes all costs of planning, implementing and evaluating a DSM program, except for incentives paid directly to the participant. Also included are those for marketing, administrative, equipment and program monitoring and evaluation.

Participant Costs and Avoided Participant Costs. Participant costs include all out-of-pocket expenses that a participant incurs as a result of participating in the program. These costs are calculated before the participant receives any rebate or incentive payment. If the participant avoids some cost by participating, it is considered a benefit to the participant.

Incentives and Participation Charges. Incentives are any dollar amount that the utility pays directly to the participant. These include rebates, bill reductions, rate discounts and below-market loans. The incentive that a utility pays a dealer or builder is a utility cost unless the incentive is passed through to the participants. A participation charge is the payment by the participant to the utility related to a DSM program.

Tax Credits and Payments by Third Parties. If the participant receives any tax credit for participating, it is accounted for in this benefit category. Any payment made to the participant by a non-utility source (e.g., a manufacturer's rebate) also falls under this account.

Externalities. This category includes any costs or benefits that are external to standard cost-accounting methods. Externalities include effects, both positive and negative, to society.

Overview of the Tests

This section briefly describes the five most commonly used cost-effectiveness tests. Each test represents a different perspective in determining the cost-effectiveness of a program.

Total Resource Cost Test. The TRC test is a measure of the total net expenditures of a DSM program from the perspective of the utility and its ratepayers. The benefits are avoided supply costs, net avoided participant costs and tax credits. The costs include increased supply, net participant costs and utility costs. Since the utility and its ratepayers are considered together by this method, transfer payments between the two are ignored. This test is a measure of the change in the average cost of energy services. The following formula explains the relationships within the TRC method.

$$B_{TRC} = \sum_{t=1}^{N} \frac{UAC_t + TC_t + PAC_t *}{(1+d)^{t-1}}$$

$$C_{TRC} = \sum_{t=1}^{N} \frac{UC_t + PC*_t + UIC_t}{(1+d)^{t-1}}$$

* Participant costs and participant avoided costs in this test are net of free riders.

Utility Cost Test. The utility cost test is a measure of the changes in total costs to the utility from a DSM program. It evaluates the DSM program from the perspective of a utility's total cost. The benefit component is avoided supply costs. The cost components are increased supply costs, incentives, and utility program costs. The test measures the change in the average energy bills across all customers.

The utility cost test is identical to the RIM test, except that the utility's revenue losses are not included as a cost input in the utility cost test, and revenue gains from increased sales are not included as a benefit. The following formula describes the utility cost test calculations.

$$B_{UC} = \sum_{t=1}^{N} \frac{UAC_t}{(1+d)^{t-1}}$$

$$C_{UC} = \sum_{t=1}^{N} \frac{UC_t + INC_t + UIC_t}{(1+d)^{t-1}}$$

Participant Test. The participant test measures the quantifiable benefits and costs to the customer as a result of program participation. Benefits include reductions in customers' utility bills, avoided customer costs, incentives and tax credits. Participant costs include any customer out-of-pocket expenses resulting from participation. The test is a measure for the average customer and ignores free riders. The participant test provides a good indication of the attractiveness of the program to the average non-free rider expected to participate. The participant test calculation is based on the calculation that follows.

$$B_p = \sum_{t=1}^{N} \frac{BR_t + TC_t + INC_t + PAC_t}{(1+d)^{t-1}}$$

$$C_p = \sum_{t=1}^{N} \frac{PC_t + BI_t}{(1+d)^{t-1}}$$

Societal Test. A common variation on the total resource cost test is the societal test. It measures the benefits and costs to all of society (i.e., including other utilities, government agencies, and citizens outside the jurisdiction). The societal test differs from the total resource cost test in three ways. First, a societal discount rate is used to place value on all future benefits and costs, reflecting society's low-risk view of future investments. Second, environmental externalities are included in the benefit-to-cost equations. Third, this test excludes tax credits because they are transfer payments within society. The mathematical equations for the societal test follow.

$$B_S = \sum_{t=1}^{N} \frac{UAC_t + PAC*_t + EB_t}{(1+s)^{t-1}}$$

$$C_S = \sum_{t=1}^{N} \frac{UC_t + PC*_t + UIC_t + EC_t}{(1+s)^{t-1}}$$

* Participant costs and participant avoided costs in this test are net of free riders.

Ratepayer Impact Measure Test. The ratepayer impact measure (RIM) test quantifies the impacts on customers' rates resulting from changing utility revenues and operating costs. It assumes that DSM reduces utility revenues and increases costs and that customer rates must be increased to balance the utility's books.

Benefits considered by the RIM test are avoided supply costs and revenue gains. Costs for the RIM test are increased supply costs, utility program administration, incentives and reduced revenues from energy savings. The calculation of the RIM test is as follows.

$$B_{RIM} = \sum_{t=1}^{N} \frac{UAC_t + RG_t}{(1+r)^{t-1}}$$

$$C_{RIM} = \sum_{t=1}^{N} \frac{UIC_t + RL_t + UC_t + INC_t}{(1+r)^{t-1}}$$

Glossary of Symbols

B_P	Benefit to participants (participants test)
B_{RIM}	Benefits to rate levels or customer bills (ratepayer impact measure test)
BI_t	Bill increases in year t
BR_t	Bill reduction in year t
B_S	Benefits of the program (societal test)
B_{TRC}	Benefits of the program (total resource cost test)
B_{UC}	Benefits of the program (utility cost test)
C_P	Costs to participants (participants test)
C_{RIM}	Costs to rate levels or customer bills (ratepayer impact measure test)
C_S	Cost of the program (societal test)
C_{TRC}	Costs of the program (total resource cost test)
C_{UC}	Costs of the program (utility cost test)
d	Discount rate
EB_t	External benefits to society due to the program in year t
EC_t	External costs to society due to the program in year t
INC_t	Incentives paid to the participant by the sponsoring utility in year t
PAC_t	Participant avoided costs in year t
PC_t	Participant costs in year t
r	Return on investment
RG_t	Revenue gains from increased sales in year t
RL_t	Revenue loss from reduced sales in year t
s	Societal discount rate
TC_t	Tax credits in year t
UAC_t	Utility avoided supply costs in year t
UC_t	Utility program costs in year t
UIC_t	Utility increased supply costs in year t

For additional information regarding these and other cost effectiveness test, refer to the California Standard Practice Manual.[24]

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[24] California Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects. July 2002. http://drrc.lbl.gov/pubs/CA-SPManual-7-02.pdf

Appendix D – Ramp Rates

Table D-1
Ramp Rates

	Year																			
Ramp Type	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Electronics	0.3%	0.5%	1.0%	2.0%	3.0%	5.0%	5.8%	3.0%	1.0%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%
HVAC- Code Change	4.0%	5.0%	6.0%	6.0%	5.5%	5.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	3.0%	2.0%	2.0%	2.0%
EnerGuide80	5.0%	5.0%	5.0%	5.0%	5.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
New Measure Medium	1%	2%	3%	4%	5%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
New Lighting - Code Change	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
New Measure Fast	2%	4%	6%	8%	10%	10%	10%	10%	10%	10%	10%	10%	0%	0%	0%	0%	0%	0%	0%	0%
New Lighting - Program	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	2.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
20YearEven	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
EnerGuide90	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
12YearEven	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CFL Code Change	10%	10.0%	8.0%	6.0%	3.0%	2.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
10YearEven	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
10YearEven, CC 2014	10.0%	10.0%	10.0%	10.0%	10.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2011 Code Change	10.0%	10.0%	10.0%	8.0%	6.0%	4.0%	2.0%	2.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
5YearEven	20.0%	20.0%	20.0%	20.0%	20.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Appendix E – Direct Load Control Case Studies

The pilot programs surveyed for the FortisBC study differ but seem to agree on several key points. First, load control must be carefully planned to coincide with peak demand, otherwise, any demand reduction will not reduce a utility's coincident peak demand. This may seem obvious, but different service territories and climates have different peak periods and can benefit from different load control schedules.

Second, technology is evolving rapidly. These changes present challenges when applying numbers from one utility's potential or pilot study to another area difficult. There are areas of overlap, but understanding exactly the technology used is essential.

Third, customer willingness to participate and remain in load control programs is as important as the technology itself. Retaining participants requires providing feedback to consumers and understanding if they are comfortable with the curtailments. If work is not done to secure participants, customers will drop out of the programs causing estimates of load reduction potential to be inaccurate. An overview of two prominent programs follows.

Direct load control programs can cycle many household appliances and space conditioning units. Most pilot programs have used control devices on several components of residential load. The logic being: if you spend the money to install the infrastructure, it should control all large components of load. Table E1 lists potential energy savings for different components.

Table E1
Potential Load Reduction by End-Use

End Use Load	Average Load Reduction per Event (KW)
Water Heater	0.6 (Winter)
Heat Pump Strip Heat	1.02 (Winter)
Forced Air Strip Heat	0.85 (Winter)
Electric Forced Air Cooling	0.78 (Summer)

Source: Goodwatts and Power Shift

Goodwatts

There are several pilot programs in the Northwest, but the GoodWatts Program is an especially pertinent case study that highlights several key findings and program design. The GoodWatts Program was a demand response pilot program initiated in 2005 and 2006 in Ashland, Oregon. The program was supported by the Bonneville Power Administration. Ninety-two residential customers of Ashland Electric had 2-way communicating meters, programmable thermostats, load control meters for pool pumps and water heaters, and communication technology placed in their home to send signals of curtailment in controlled appliances on event days during the summer and winter periods. Curtailment events were called during the summer periods of 2005 and 2006 (June – September) and the winter 2005 and 2006 (January – March).

Unlike weather-related energy use, the water heater system daily load profile is consistent throughout the year with usage peak between 6:15 a.m. and 8:15 a.m., and a second, but less pronounced peak, between 5:00 p.m. and 7:00 p.m. (Figure 5).

Total residential use, conversely, tends to have a morning peak in the winter (Figure 5) and late afternoon/early evening peak in the summer (Figure 6).

Figure E1
Daily Winter Load

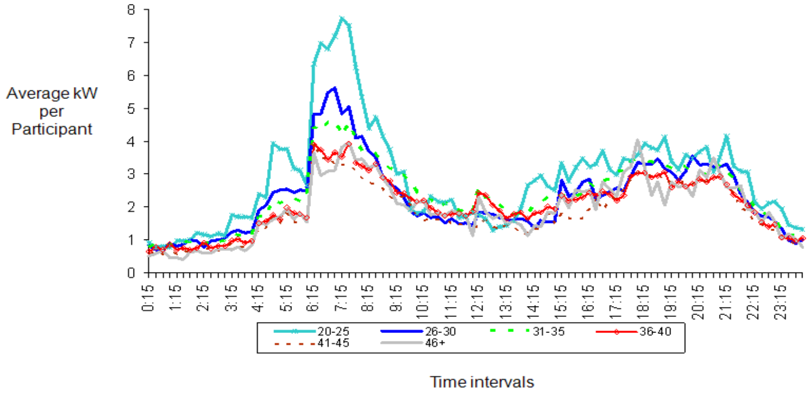
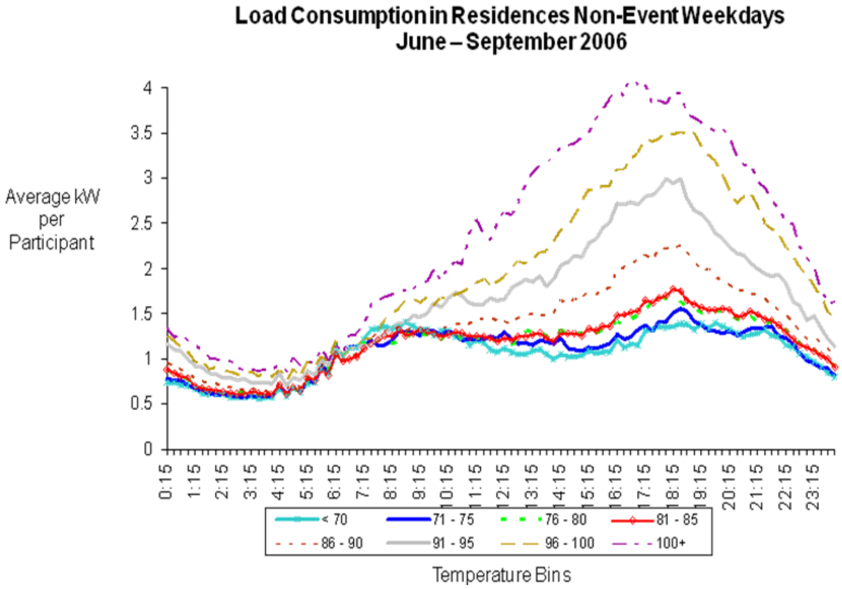


Figure E2
Daily Summer Load

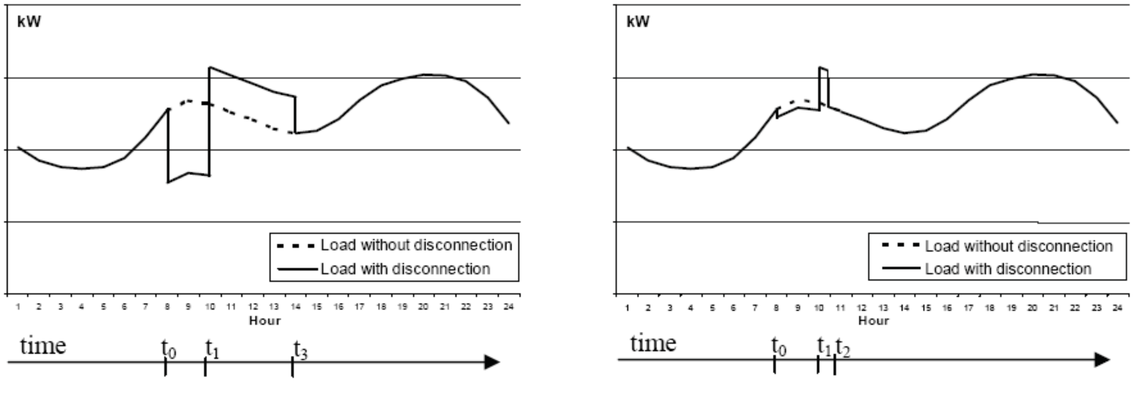


For hot water heater curtailments, load drop is highest when coincident with system peak – as more appliances are in use during that period. Therefore, for winter events where system peak is 6:15 a.m. to 8:30 a.m., curtailing water heaters resulted in observed in load drop of up to 15% on days colder than 30°F (6% on other days). Additionally, GoodWatts results suggest that events duration should be around 2 hours.

The potential savings are also affected by the households targeted for control devices. Figure 7 shows hypothetical household energy consumption from a Norway study. Group (a) is high demand users while Group (b) is low demand users. It is assumed that hot water tanks are the same size across all users. The white area in the bar graphs is the time period where the water heater recovers after use given no interruption. It is assumed that water heaters begin recovery the same instant the hot water is being drawn. The black area, or payback area, is the recovery period given an interruption has occurred.

Figure E3 illustrates that after reconnection, low demand consumers experience a larger peak than otherwise would have occurred. High-demand consumers produce flatter, longer peaks after reconnection occurs.

Figure E3
Water Heater Demand Example



(a) (b)

Source: Ericson, Torgeir. "Direct Load Control of Residential Water Heaters." Discussion Papers No. 479, October 2006. Statistics Norway, Research Department.

These hypothetical load curves are based on consumers that do not anticipate disconnection. This also suggests that the timing of household water consumption is important in determining load shapes. Also, the duration of the disconnection will directly influence the payback demand.

Other Pilot Programs

GridWise

http://gridwise.pnl.gov/docs/pnnl_gridwiseoverview.pdf

The GridWise demonstration program addressed consumer behavior, price-responsive household technology, and dynamic electricity pricing in 112 homes on the Olympic Peninsula. The project combines real-time pricing, smart appliances that respond to pricing signals, and an internet-based event driven software. The average participating household saved 10 percent on their electricity bill over the 1 year period. The results of the Olympic Peninsula Project showed that if all customers were engaged at a similar level as test subjects, about $70 billion of new generation, transmission, and distribution could be avoided over 20 years.

East Kentucky Power Cooperative

http://www.psc.state.ky.us/pscscf/2007%20cases/2007-00553/psc_order_032008.pdf

The East Kentucky Power Cooperative (EKPC) implemented a direct load control demonstration program over a period of 12 months from October 2006 through September 2007. The program involved a total of 386 participants in two service territories. Over the 12 month period, water heater demand reduction averaged to 0.46 kW and 0.59 kW per appliance in the summer and winter months respectively. These appliances were controlled for the 4 hour period of on-peak use.

Norway

http://ideas.repec.org/p/ssb/dispap/479.html

In Norway, 475 households participated over the November 2003 through April 2004 period. The study interrupted water heater service in both morning and evening peaks hours, alternatively. The hour of interruption was varied. The results of the study found that between 0.6 and 0.58 kW per household in the morning hours can be saved while between 0.18 and 0.60 kW can be saved in the afternoon.

Portland General Electric

http://www.nwcouncil.org/energy/dr/library/dr_assessment.pdf

During a 37 day period in January and February 2003, Portland General Electric (PGE) collected data for their water heat direct load control project. The utility remotely turned off electric water heaters for 2 hours each weekday morning in 81 participant households. The average peak demand savings for these months was between 0.65 and 0.69 kW per water heater.

Louisville Gas & Electric

http://www.eon-us.com/rsc/lge/default.asp

GE has partnered with (LG&E) to initiate a new line of smart appliances that use wireless technology and energy conservation meters to help consumers save electricity. These appliances are paired up with smart electric meters that communicate with the appliance. For example, a washing machine may skip a wash cycle or a refrigerator may skip a defrost cycle during peak demand periods. GE plans to spend nearly $1 billion on marketing and development of smart appliances in the next 3 to 5 years. These appliances are expected to cost consumers 5 to 10 percent more than standard GE appliances. As more utilities implement advanced metering and tiered pricing, the market for smart appliances can expand.

Xcel Energy® - Boulder Smart Grid City™

http://smartgridcity.xcelenergy.com/index.asp

The plan is to install over $100 million worth of smart grid technology to improve reliability and cut costs for both consumers and the utility. The project includes direct load control among an expansive smart grid program that includes:

- Online tools for home energy use tracking, planning, and budgeting
- Real-time energy pricing or green power energy price signals allowing users to reduce energy costs or use more green energy
- Advanced smart meters that communicate with home appliances that provide opportunity for energy and cost savings