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May 15, 2026

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

Dear Registrar:

**Re: FortisBC Energy Inc. (FEI)**  
**Application for the Review of FEI's Mains Extension Policy (Application)**

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FEI writes to submit the attached Application, pursuant to British Columbia Utilities Commission (BCUC) Letter L-11-25 dated June 17, 2025 regarding FEI's mains extension policy. In Letter L-11-25, the BCUC directed FEI to file an application for the review of its terms and conditions, extension policies and the parts of the tariff governing customer connections. By Letter L-24-25, dated August 25, 2025, the BCUC granted FEI's extension request to file its Application on May 15, 2026.

If further information is required, please contact the undersigned.

Sincerely,

**FORTISBC ENERGY INC.**

***Original signed:***

Sarah Walsh

Attachments

cc (email only): Registered interveners in the following proceedings:

- FEI 2015 System Extension Application;
- FEI 2020 System Extension Fund Application; and
- FEI 2022 Long-Term Gas Resource Plan proceedings.



**FORTISBC ENERGY INC.**

**2026 Main Extensions and Connection  
Policies Review**

**May 15, 2026**

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# 1. INTRODUCTION AND OVERVIEW

## 1.1 INTRODUCTION

British Columbia Utilities Commission (BCUC) Letter L-11-25 directed FortisBC Energy Inc. (FEI) to file an application for the review of its terms and conditions, extension policies and parts of its tariff governing customer connections (collectively, MX and Connection Policies). In accordance with the BCUC's direction, FEI files this Mains Extension (MX) and Connection Policies Review Application (Application) pursuant to sections 28, 29, 30 and 59 to 61 of the *Utilities Commission Act* (UCA).

The BCUC has consistently articulated the purpose of the MX and Connection Policies as achieving fairness between new and existing customers. As part of this Application, FEI has reviewed its MX and Connection Policies, updated its Rate Impact Analysis (RIA) using nine years of data, and sought input from stakeholders. The analysis supports maintaining the essential features of the MX and Connection Policies, but that some recalibration is appropriate to achieve a fairer balance between new and existing customers. In particular, the RIA results show that, despite the BCUC's previous adjustments to the MX and Connection Policies to reduce the extent to which new customers are subsidizing existing customers, the current parameters are still resulting in new customer bearing a disproportionate share of connection costs.

In this Application, FEI proposes to:

1. Recalibrate one parameter of the test applicable to new main extensions (MX Test), in addition to its typical input updates;
2. Make two parameter changes to the Service Line Cost Allowance (SLCA) applied to infill customers; and
3. Expand the eligibility of the System Extension Fund (SEF) (currently open to residential customers only) to small commercial customers, without changing the total funding available.

FEI respectfully submits that its proposals, which align with the BCUC's past commentary and rate design principles, are just and reasonable and should be approved. Future reviews of the data, including updated RIAs, will allow FEI and the BCUC to ensure that the adjusted MX and Connection Policies remain appropriately calibrated to treat customers equitably.

## 1.2 OVERVIEW

### 1.2.1 Current MX and Connection Policies and Regulatory History (Section 2)

The BCUC-approved MX and Connection Policies form part of FEI's General Terms and Conditions and govern how new customers connect to the gas system. The key components are:

- 1       1. The **MX Test** is used for all decisions to extend FEI's distribution system to connect new  
2       customers. Broadly speaking, the MX Test is an economic planning tool. It uses a  
3       Discounted Cash Flow (DCF) calculation and a set of reasonable assumptions about costs  
4       and potential revenues to calculate a Profitability Index (PI). The PI for an individual project  
5       is compared against a BCUC-determined PI threshold (currently 0.8) to determine whether  
6       a main extension to FEI's distribution system can proceed without a Contribution in Aid of  
7       Construction (CIAC) from the customer(s) wishing to connect. The BCUC has also  
8       determined that the extensions in aggregate in a year must exceed a specified aggregate  
9       PI (currently 1.1).
  
- 10       2. The **SLCA** operates in a similar way for new "infill" customers connecting to pre-existing  
11       mains. The SLCA represents the maximum allowance FEI will provide to each single  
12       family residential or small commercial infill customer connecting to an existing main. The  
13       SLCA is derived using the MX Test methodology, applied to yield a PI of 1.0. It similarly  
14       serves as a financial evaluation tool to determine whether the connection should proceed  
15       with or without a CIAC and the amount of any necessary CIAC. The SLCA is used in place  
16       of a connection charge/fee, meaning the CIAC is the only amount payable by the new infill  
17       customer for the service connection apart from a \$15 application processing fee.
  
- 18       3. The **SEF** is a BCUC-approved fund of \$1 million annually that can be used to offset a  
19       CIAC under the MX Test for qualifying residential customers. In effect, the SEF makes it  
20       easier for remote residential customers to access the system, as a means of promoting  
21       equitable access regardless of location. Eligibility is currently limited to residential  
22       customers.

23       The MX and Connection Policies in place today are the product of a number of BCUC decisions  
24       dating back to 1993. The BCUC has consistently recognized that the purpose of the MX and  
25       Connection Policies is to promote fair and equitable treatment among customers. In particular,  
26       they are intended to fairly allocate the cost of attaching a new customer between new and existing  
27       customers.

28       The last major review of the MX Test and Connection Policies concluded with Order G-147-16 on  
29       September 16, 2016 (2016 Decision). The BCUC approved changes to certain inputs and  
30       parameters of the MX Test and the SLCA, recognizing that the previously approved parameters  
31       and inputs were not sufficiently reflecting the benefits that new customers provide over time in  
32       terms of lowering rates for existing customers. The approved changes included extending the  
33       DCF term from 20 to 40 years to reflect the expected life of the installed assets, adding a sliding  
34       scale overhead rate for connections over \$25 thousand to reflect the non-linear relationship  
35       between connection size and overhead costs, and updating the SLCA inputs annually.

36       As part of the 2016 Decision, the BCUC also approved the SEF as a pilot. FEI could provide  
37       funding to offset a maximum of 50 percent of the CIAC for prospective residential customers, to  
38       a maximum of \$1 million per year in aggregate. On December 18, 2020, by Order G-338-20 (2020  
39       SEF Decision), the BCUC approved the SEF on a permanent basis effective January 1, 2021.  
40       The BCUC changed the parameters of the SEF to allow FEI to offset a maximum of 95 percent

1 of the CIAC for prospective residential customers, making it more affordable for qualifying remote  
2 customers to connect. The 2020 SEF Decision reflected the BCUC’s longstanding focus on  
3 balancing the interests of new and existing customers: “The Panel agrees with FEI that the pilot  
4 ‘proved out the value of the SEF’ and the evidence demonstrates that the 95 percent funding level  
5 will enhance the effectiveness of the program, without unduly burdening non-participating  
6 ratepayers.”<sup>1</sup>

### 7 **1.2.2 Rate Impact Analysis (Section 3)**

8 The RIA was endorsed by the BCUC in the 2016 Decision as a means of assessing how the MX  
9 and Connection Policies are functioning in light of their rate design purpose of treating new and  
10 existing customers equitably. The BCUC recognized that the PI is a prospective economic  
11 planning tool based on reasonable forecasts and assumptions, whereas the RIA allows for a  
12 point-in-time analysis based on actual consumption and cost data. The RIA assesses whether  
13 new customer connections (both infill customers and those added on new mains) made during a  
14 particular period have thus far had the effect of increasing or decreasing delivery rates for existing  
15 customers. In essence, the RIA provides a point-in-time indication of whether the MX and  
16 Connection Policies are reasonably allocating the costs of new mains and connections between  
17 new and existing customers.

18 The original 2015 RIA was based on main extensions and connections installed from 2008 to  
19 2014. The RIA showed that the MX Test and SLCA were causing delivery rates for existing  
20 customers to decrease, suggesting that new customers had been cross-subsidizing existing  
21 customers. The RIA results informed the BCUC’s downward adjustment of the individual PI  
22 threshold in the MX Test and other changes, which directionally reduced the share of the cost of  
23 new connections and mains borne by new customers. Despite those changes, the second RIA  
24 conducted in 2020 indicated that new customers were continuing to disproportionately bear the  
25 costs of new connections and mains. The BCUC’s 2020 SEF Decision thus made the SEF  
26 permanent and facilitated access to that funding.

27 The RIA included in the current Application is based on main extensions and connections installed  
28 during the nine-year period from 2017 to 2025. It thus reflects all of the BCUC’s prior changes in  
29 2016 and 2020 to reduce the extent to which new customers are cross-subsidizing existing  
30 customers. These RIA results, summarized in the following table from Section 3.4, show that there  
31 continues to be a downward impact on customer delivery rates as a result of the new customers  
32 added over the most recent nine-year period. That is, the 2016 and 2020 recalibrations to the MX  
33 and Connection Policies have proved insufficient to achieve the intended equitable balance. FEI’s  
34 proposed adjustments to the MX and Connection Policies in this Application seek to advance that  
35 rate design purpose.

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<sup>1</sup> Decision and Order G-338-20, p. 16.

**Table 1-1: FEI Rate Impact Analysis Shows New Customer Connections Lower Delivery Rates**

	2008-2014 7 Years	2015-2019 5 Years	2017-2025 9 Years
Average Cost per GJ with Growth	\$ 4.16	\$ 4.17	\$ 6.72
Average Cost per GJ without Growth	\$ 4.22	\$ 4.21	\$ 6.83
Rate Impact per GJ	\$ (0.06)	\$ (0.04)	\$ (0.12)
Percentage Rate Impact	-1.40%	-1.10%	-1.72%

### 1.2.3 MX Test Review and Proposals (Section 4)

Section 4 addresses the framework, parameters and inputs of the MX Test, with a specific focus on the issues that the BCUC identified in Letter L-11-25. FEI is proposing to maintain the essential elements of the MX Test (maintain the existing DCF term, and maintain the use of aggregate and individual PIs), while implementing updates and a parameter adjustment to improve the performance of the MX Test in achieving its rate design objective.

The following table summarizes the key MX Test parameters and FEI’s proposals.

**Table 1-2: FEI’s Proposals on MX Test Parameters**

MX Test Parameter	FEI’s Proposal
DCF Term	No change. Maintain at 40 years.
Aggregate PI Threshold	No change. Maintain at 1.1.
Individual PI Threshold	Change from 0.8 to 0.6.
Sliding Scale Overhead Rate	No change to parameters. Update inputs as done in previous applications.

The essential framework of FEI’s MX Test – a DCF calculation and an individual and aggregate PI – has been in place for many years as a means of assessing whether potential new customers should provide a CIAC. The BCUC has reviewed the use of an MX Test multiple times, and the framework accords with the BCUC’s Utility System Extension Test Guidelines (Guidelines).<sup>2</sup> FEI’s MX Test also aligns with generally accepted regulatory principles and is typical of practices used throughout North America. The MX Test continues to serve as an effective means of fairly apportioning the costs of new connections between new and existing customers to avoid undue discrimination. It is easy for FEI to implement and is presented in FEI’s General Terms & Conditions (GT&Cs) in a way that customers can understand.

With respect to the DCF term, the same rationale that the BCUC applied in the 2016 Decision when it increased the term to 40 years remains valid today.<sup>3</sup> Moreover, the 40-year DCF term still

<sup>2</sup> Available online at: [https://docs.bcuc.com/documents/Guidelines/2007/DOC\\_15386\\_1996\\_Utility\\_System\\_Extension\\_Test\\_Guidelines.pdf](https://docs.bcuc.com/documents/Guidelines/2007/DOC_15386_1996_Utility_System_Extension_Test_Guidelines.pdf).

<sup>3</sup> 2016 Decision, p. 35. “The Panel agrees with FEI that changing the DCF term from 20 years to 40 years may better recognize the expected benefits associated with new mains and notes that 40 years is likely a long enough period to consider the potential full impact of a new main extension.”

1 reflects the average service life of the new mains and associated assets. FEI's analysis also  
2 shows that shortening the term while holding all other factors constant would have a very  
3 significant negative impact on new customers while generating very little delivery rate benefit for  
4 existing customers. This disproportionate impact would run counter to the RIA results indicating  
5 that new customers are already contributing more than their incremental cost.

6 FEI's proposals for the MX Test are as follows:

- 7 1. **Adjust Individual PI while Maintaining Aggregate PI:** Recalibrate the individual MX  
8 Test PI from 0.8 to 0.6 to improve fairness between new and existing customers. FEI  
9 proposes to maintain the aggregate PI at 1.1 so that the main extensions added in a given  
10 year, on aggregate, must still be expected to generate a net benefit (a PI of 1.0 is break-  
11 even) based on reasonable forecasts of costs and revenues over the evaluation horizon.  
12
- 13 2. **Update Sliding Scale Overhead Inputs:** Update the sliding scale overhead inputs in the  
14 MX Test, as was done in 2020, to reflect the latest overhead information.

15 FEI has analyzed the combined effects to the aggregate PI (net of CIAC) and the RIA results,  
16 respectively, if the proposed changes were applied to the MX Test data from 2017 to 2025. The  
17 analysis indicates that the proposed changes would collectively have a minor impact on the  
18 aggregate PI and would result in only a minor increase to delivery rates.

#### 19 **1.2.4 SLCA Review and Proposals (Section 5)**

20 As discussed in Section 5, the SLCA continues to serve its intended rate design purpose, such  
21 that this longstanding approach should be largely maintained. FEI proposes two changes to the  
22 determination of the SLCA that will improve its performance:

- 23 1. **Remove the last step of the SLCA calculation:** In certain circumstances, the final step  
24 in the SLCA calculation can produce an invalid result in which a new infill customer would  
25 never have to contribute to the cost of their connection. When this issue has arisen in the  
26 past, it has necessitated a work-around. FEI therefore proposes to remove the final step  
27 in the SLCA calculation, which provided an effective solution when the issue arose  
28 between 2019 and 2023. This proposal maintains the logic underlying the SLCA and also  
29 has the benefit of simplifying the SLCA calculation and making the results more stable  
30 from year to year.  
31
- 32 2. **Reduce the SLCA target PI to 0.8:** FEI is proposing to recalibrate the SLCA by lowering  
33 the target PI from 1.0 to 0.8, as the BCUC approved in 2007 for the MX Test. This change  
34 will promote a more equitable balance between new and existing infill customers, as the  
35 RIA results indicate that new infill customers are contributing more than their incremental  
36 cost.

- 1 The first SLCA proposal (other things being equal) imposes greater costs on new infill customers.
- 2 The second proposal will result in lower costs for new infill customers. FEI’s analysis indicates
- 3 their collective impact on delivery rates will be minor, at 0.03 percent.

#### 4 **1.2.5 SEF Review and Proposals (Section 6)**

5 The SEF serves an important rate design purpose. The BCUC recognized in the 2020 SEF  
6 Decision that facilitating remote customer access to the gas system is consistent with the long-  
7 standing “postage stamp” rate structure, which seeks to treat customers in a particular rate class  
8 equally throughout FEI’s service area despite the varying cost to serve individual customers. The  
9 annual cost of the SEF is \$1 million, which the BCUC previously characterized as “minimal and  
10 not unduly discriminatory”<sup>4</sup>. The RIA results discussed in Section 3, which show existing  
11 customers are benefitting from new additions, account for all recipients of SEF funding to date.  
12 FEI is proposing to extend SEF program eligibility to small commercial customers (in addition to  
13 residential customers), without increasing the annual funding envelope. This proposal will  
14 optimize the SEF funding and improve equity for another group of customers that can face similar  
15 barriers to connection.

#### 16 **1.2.6 Cumulative Impact of All Proposals (Section 7)**

17 FEI has analyzed the expected impact of its proposals, individually and collectively. The analysis  
18 includes impacts on CIACs, the SLCA, and delivery rates. The impact of changes to each MX  
19 Test and SLCA input or parameter are described in Sections 4.7 and 5.4, respectively. The  
20 cumulative impact of all proposals is discussed in Section 7. FEI performed this analysis by  
21 applying the proposed parameters to actual data. The analysis indicates that these proposals will  
22 collectively provide a material benefit to new customers by reducing an individual customer’s  
23 required CIAC. At the same time, these proposals are expected to have only a minor impact on  
24 delivery rates for existing customers – estimated at 0.06 percent. Thus, the proposals will promote  
25 fairness between new and existing customers.

26 **Table 1-3: Estimated Cumulative Rate Impact if all Proposed Changes Applied (Based on 2017 to**  
27 **2025 RIA Results)**

2017-2025 RIA	Current	Combined Impact of Proposed MX Test Changes	Combined Impact of Proposed SLCA Changes	Total Impact
Average Cost per GJ with Growth	\$ 6.715	\$ 6.715	\$ 6.715	\$ 6.715
Average Cost per GJ without Growth	\$ 6.833	\$ 6.831	\$ 6.830	\$ 6.828
Rate Impact per GJ	\$ (0.118)	\$ (0.116)	\$ (0.115)	\$ (0.113)
Percentage Rate Impact	-1.72%	-1.69%	-1.69%	-1.66%
Change in Percentage Rate Impact from Current	0.00%	0.03%	0.03%	0.06%

<sup>4</sup> 2020 SEF Decision, p. 9.

## 1.2.7 Stakeholder Engagement (Section 8)

FEI's stakeholder engagement on the MX and Connection Policies involved a diverse group of stakeholders and provided meaningful opportunities to participate. A number of themes emerged during stakeholder engagement. Stakeholders generally agreed that the MX and Connection Policies remain sound, and that the MX and Connection Policies should be calibrated so as to treat new and existing customers fairly. FEI recognizes that there is a diversity of views among participating stakeholders about whether, as a public policy matter, it should be easier or harder for new customers to connect to the system. For instance, participating chambers of commerce, development industry organizations and First Nations emphasized reducing barriers to access in the interest of, for example, affordability, economic development, access to housing, and access to energy in remote communities. One stakeholder expressed reticence about reducing barriers, emphasizing greenhouse gas (GHG) emissions.

FEI submits that, ultimately, the MX and Connection Policies should be evaluated against how they achieve their long-recognized rate design purpose of treating new and existing customers equitably. The proposals in this Application will advance that objective, based on the best available information.

## 1.2.8 Additional Information Requested in Letter L-11-25 (Section 9)

Section 9 provides additional information requested by the BCUC in Letter L-11-25, including:

- FEI explains that the next Residential End Use Study (REUS) will be conducted in summer 2026, with findings available in spring 2027.
- In response to the BCUC's request for an analysis of the new customer connections in 2024, FEI discusses how each MX Test uses a distinct set of assumptions that are relevant to the test being performed at the time. The natural gas usage for a particular MX Test is based on the natural gas appliances that are expected to be attached and their related consumption, consistent with local building codes, city bylaws, and a municipality's level of adoption of step code.
- FEI provides the requested analysis of the actual annual consumption of new customer connections for each connection year from 2014 to 2024, including a breakdown of the number of new customers who consume the following quantity of gas annually: 0-20 GJ; 20-60 GJ; 60-70 GJ; 70-90 GJ; and greater than 90 GJ. Overall, the analysis indicates that while total annual additions have declined since 2018, the distribution of consumption across the five consumption bands remains relatively stable. Most new customers continue to consume between 20 and 60 GJ per year, while overall cohort groups have declined as improvements in building envelopes, appliance efficiency and municipal bylaw restrictions have reduced gas use and adoption.

1 **1.3 APPROVALS SOUGHT**

2 In this Application, FEI is seeking approval pursuant to sections 28, 29, 30 and 59 to 61 of the  
3 UCA to:

- 4 1. Continue using the MX Test as previously approved, with the following changes:
  - 5 a. Lower the required PI threshold for individual main extensions from 0.8 to 0.6, as  
6 discussed in Section 4.3; and
  - 7 b. Update the sliding scale overhead rate, as discussed in Section 4.4.
- 8 2. Continue determining the SLCA as previously approved, with the following changes:
  - 9 a. Eliminate the final step in the SLCA calculation method, as discussed in Section  
10 5.2; and
  - 11 b. Lower the PI threshold from 1.0 to 0.8 when calculating the SLCA, as discussed in  
12 Section 5.3.
- 13 3. Expand SEF eligibility to include small commercial customers without increasing the  
14 overall SEF funding envelope, as discussed in Section 6.
- 15 4. File an updated RIA within 7 years of the BCUC's decision on this Application.

16 A draft Final Order is provided as Appendix I-2.

17 **1.4 PROPOSED REGULATORY PROCESS**

18 FEI proposes a written public hearing process with one round of information requests (IRs) as an  
19 appropriate and efficient review process for this Application. This process recognizes that: (1) the  
20 essential elements of the MX and Connection Policies have been in place for many years; (2)  
21 FEI's proposed changes are limited and are primarily driven by updated information; and (3) FEI's  
22 stakeholder engagement has facilitated understanding of the MX and Connection Policies and  
23 the RIA results.

24 The following table sets out a proposed regulatory timetable for the review of the Application. A  
25 draft procedural order is provided in Appendix I-1.

1

**Table 1-4: Proposed Regulatory Timetable**

Action	Date (2026)
FEI public notice of Application	Wednesday, June 17
FEI confirmation of compliance with public notice requirements	Monday, June 22
Intervener registration deadline	Monday, June 29
FEI confirmation of compliance with social media reminder posts	Thursday, July 2
BCUC decision on intervener registrations	Thursday, July 9
BCUC Information Request (IR) No. 1	Thursday, July 23
Intervener IR No. 1	Thursday, July 30
FEI Responses to BCUC and Intervener IR No. 1	Thursday, August 27
Deadline for submitting letters of comment	Thursday, September 10
FEI Final Argument	Thursday, September 24
Intervener Final Argument	Tuesday, October 13
FEI Reply Argument	Thursday, October 29

2 **1.5 CONCORDANCE WITH LETTER L-11-25**

3 Table 1-5 below provides a summary of the reporting requirements of Letter L-11-25, and where  
4 in this Application the information is presented.

5 **Table 1-5: Letter L-11-25 Compliance Reporting Requirements**

Reference	Compliance Reporting Requirement	Application Section
Letter L-11-25, p. 1	<p><b>Jurisdictional Scan</b> For similar gas utilities in North America, a jurisdictional scan of:</p> <ul style="list-style-type: none"> <li>• system extension policies;</li> <li>• connection fees; and</li> <li>• connection cost allowances.</li> </ul>	<p>Section 4.1.3 (discussion re: system extension)</p> <p>Section 5.5 (discussion re: connection fees and cost allowances)</p> <p>Appendix C (jurisdictional scan)</p>

Reference	Compliance Reporting Requirement	Application Section
<p>Letter L-11-25, p. 2</p>	<p><b>System Extension Text</b></p> <ul style="list-style-type: none"> <li>• An assessment of the variability and trends of each of the inputs to the profitability index calculation for each year from 2014 to 2024;</li> <li>• Minimum and average [FEI interprets “average” as meaning “aggregate”] profitability index values for each year from 2014 to 2024;</li> <li>• An analysis of alternative approaches to calculating the customer contribution to a mains extensions including, but not limited to: <ul style="list-style-type: none"> <li>○ alternate discounted cash flow terms;</li> <li>○ minimum profitability index of 1.0 for each mains extension;</li> <li>○ a mechanism where FEI contributes a set amount towards each mains extension, either in dollars or metres of pipe, with the balance recovered from the customer;</li> <li>○ inclusion of the marginal cost of serving all new load from renewable gases (e.g., Renewable Natural Gas, Hydrogen) compared to conventional natural gas to meet government low-carbon policies; and</li> <li>○ including for each alternative: rate impact, expected average Contribution in Aid of Construction (CIAC), percentage of projects requiring a CIAC, number of projects requiring a CIAC.</li> </ul> </li> </ul>	<p>Appendix D (discussion re PI inputs variability and trends 2014-2024)</p> <p>Section 4.3 (discussion re PI values for years 2014-2024 and increasing /decreasing the PI)</p> <p>Section 4.2 (discussion re alternate DCF terms)</p> <p>Section 4.6 (discussion re dollar or footage allowance)</p> <p>Section 4.5 (discussion re marginal cost of serving new load from renewable gases)</p>
<p>Letter L-11-25, p. 2</p>	<p><b>System Extension Fund</b></p> <ul style="list-style-type: none"> <li>• An analysis of the benefits and costs of the system extension fund; and</li> <li>• An updated system extension fund rate impact analysis dated 2024 or later.</li> </ul>	<p>Section 6 and Appendix E</p>
<p>Letter L-11-25, p. 2</p>	<p><b>Connection Charges</b></p> <ul style="list-style-type: none"> <li>• An explanation of FEI’s current connection/application charges; and</li> <li>• An analysis of alternate approaches to determining the connection charges, such as a connection fee based on a connection pipe length, e.g., Pacific Northern Gas’ connection fee of \$450 for the first 21 metres of underground pipe, or a connection fee based on service capacity.</li> </ul>	<p>Section 2.2.2 (SLCA is in lieu of a connection charge)</p> <p>Section 2.2.4 (application fee)</p> <p>Section 5.5 (alternative approaches)</p>

Reference	Compliance Reporting Requirement	Application Section
Letter L-11-25, p. 2	<p><b>Service Line Cost Allowance</b></p> <p>An analysis of the Service Line Cost Allowance (SLCA), including:</p> <ul style="list-style-type: none"> <li>• SLCA changes for the period 2019 to 2024 and a discussion of the reasons driving these changes;</li> <li>• An analysis of actual costs to connect new residential customers for the period 2019 to 2024; and</li> <li>• A discussion of the rationale for an SLCA.</li> </ul>	Section 5.1
Letter L-11-25, p. 2	<p><b>Customer Demand</b></p> <ul style="list-style-type: none"> <li>• An updated Residential End Use Survey, if available;</li> <li>• For new customer connections in 2024, an analysis of the range of anticipated annual customer consumption, explaining all assumptions made regarding customer uses, appliance efficiencies, building codes and other relevant factors, such as city bylaws; and</li> <li>• An analysis of the actual annual consumption of new customer connections for each connection year from 2014 to 2024, including a breakdown of the number of new customers who consume the following quantity of gas annually: 0-20GJ; 20-60GJ; 60-70GJ; 70-90GJ; greater than 90GJ.</li> </ul>	Section 9
Letter L-11-25, p. 3	<p><b>Proposed System Extension Policy</b></p> <p>A proposal for general terms and conditions, system extension policies and tariff parts governing customer connections, with rationale, and including a blackline version where applicable</p>	<p>Section 4 (MX Test proposals)</p> <p>Section 5 (SLCA proposals)</p> <p>Section 6 (SEF proposals)</p> <p>Appendix H (GT&amp;C blackline)</p>
Letter L-11-25, p. 3	<p><b>Regulatory Review</b></p> <p>A proposal for an appropriate and efficient regulatory process for review of the application.<sup>5</sup></p>	Section 1.4

1

<sup>5</sup> In Letter L-24-25 granting FEI's request to extend the Application filing deadline to May 15, 2026, the BCUC requested that FEI propose an efficient regulatory process to facilitate a timely review of the Application.

## 1    2.    BACKGROUND

2    The following section sets out the BCUC’s articulation of the purpose of the MX and Connection  
3    Policies, their key elements as currently approved, and the long regulatory history culminating in  
4    those MX and Connection Policies.

5    The MX Test and SLCA date back to the 1990s. The purpose and general design of the MX Test  
6    and SLCA have remained consistent, with the BCUC approving updates and changes to specific  
7    parameters to improve fairness as between new and existing customers. This Application  
8    provides an opportunity to make further updates and adjustments to the MX and Connection  
9    Policies to improve how they meet rate design principles.

10   This section is organized as follows:

- 11        • **Section 2.1:** The BCUC has articulated the purpose of the MX and Connection Policies  
12        as treating new and existing customers equitably.
- 13        • **Section 2.2:** The currently approved MX and Connection Policies consist of three rate  
14        structures: the MX Test, SLCA and the SEF. FEI sets out the parameters of each structure.
- 15        • **Section 2.3:** A series of BCUC decisions have maintained the purpose and central  
16        elements of the MX and Connection Policies, with updates to inputs and refinements to  
17        specific parameters. The BCUC approved changes in 2008 and 2016, and approved the  
18        SEF, to make the MX and Connection Policies fairer for new customers.

### 19    2.1    *THE RATE DESIGN PURPOSE OF FEI’S SYSTEM EXTENSION AND* 20        *CUSTOMER CONNECTION POLICIES*

21    The BCUC has consistently determined that the purpose of the MX and Connection Policies is to  
22    treat new and existing customers equitably, finding that the MX and Connection Policies are rate  
23    design constructs intended to promote traditional utility rate design principles.

24    In the 2016 Decision, the BCUC accepted that:<sup>6</sup>

25                ...the purpose and design of the MX Test, SLCA and CIAC is to ensure a fair and  
26                efficient method of making connections and the fair treatment of customers. In the  
27                Panel’s view, these criteria should have sufficient checks and balances in place to  
28                enable the fair treatment of new and existing customers, ensuring that existing  
29                customers are not adversely affected by an extension of the system.

30    The BCUC’s articulation of the purpose in the 2016 Decision was consistent with the BCUC’s  
31    Decision and Order G-152-07 on the FEI (then Terasen Gas (Vancouver Island) Inc. and Terasen  
32    Gas Inc.) 2007 System Extension and Customer Connection Policies Review (2007 Decision).  
33    The BCUC had determined that the primary purpose of extension and connection policies is:<sup>7</sup>

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<sup>6</sup> Decision and Order G-147-16, p. 7.

<sup>7</sup> Decision and Order G-152-07, p. 19.

1           ...to promote fair and equitable treatment of customers and, more specifically, to  
2           ensure that existing customers are not adversely affected by the addition of a new  
3           customer or customers.

4           The SEF, which is the third component of FEI's MX and Connection Policies, has a similar rate  
5           design purpose. The SEF, being a fund available to offset a portion of a CIAC for a new residential  
6           customer, promotes equity among customers in two ways. First, it promotes equity between  
7           homeowners facing high CIACs to connect to the gas system due to distance from an existing  
8           main, and homeowners who do not need to pay a CIAC to connect due to their close proximity to  
9           an existing gas main. Second, as a tool ultimately aimed at reducing the connection cost burden  
10          for new customers, it complements the other elements of the rate design to improve equity  
11          between new and existing customers. In the 2020 SEF Decision, the BCUC stated:<sup>8</sup>

12           ...the SEF program does promote equitable access among residential ratepayers.  
13           The data provided by FEI clearly highlights the disparity in average connection  
14           costs faced by ratepayers, most notably between urban and rural ratepayers. The  
15           SEF can help reduce the cost and eliminate a financial barrier for residential  
16           ratepayers facing a higher connection cost than those ratepayers who are closer  
17           to existing gas mains.

18          And:

19           Ensuring such equitable access to service is desirable in ratemaking and should  
20           be weighed with other rate design principles... ...Further, the SEF's objective of  
21           providing equitable access is consistent with setting postage stamp rates which is  
22           an important consideration in setting utility rates in British Columbia.

23          The AUC (and its predecessor) and the OEB have made similar statements. The AUC's  
24          predecessor stated, for instance:<sup>9</sup>

25           The Board considers that customer contributions are suitable in circumstances  
26           where service to a customer may impose costs on other customers for which they  
27           should not be responsible. An appropriate contribution policy therefore provides a  
28           suitable balance to an unlimited obligation to serve by imposing economic  
29           discipline on siting decisions. It transfers the economic burden of connection of  
30           new customers from the utility and its existing customers to the new customer. In  
31           other words, it exerts some of the discipline of the utility's economics on the  
32           economic decision-making of the customer.

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<sup>8</sup> Decision and Order G-338-20, p. 7.

<sup>9</sup> Decision 2000-01: ESBI Alberta Ltd., 1999/2000 General Rate Application Phase I and Phase II, Application No. 990005, File Nos. 1803-1, 1803-3, February 2, 2000.

1 The OEB, in originally setting Enbridge Gas Distribution’s main extension policy, indicated that it  
2 was “to ensure no undue cross subsidy or rate impacts result from distribution system  
3 expansion”.<sup>10</sup>

4 Thus, the MX and Connection Policies should be evaluated against rate design principles (e.g.,  
5 fair apportionment of costs, avoidance of undue discrimination, ease of understanding and  
6 implementation), rather than being approached as tools to advance particular public policy goals  
7 such as energy affordability, promoting economic development and housing, or reducing GHG  
8 emissions. In the case of GHG emissions, the MX and Connection Policies only become relevant  
9 for potential customers that already meet regulations and laws in place to promote reduction in  
10 GHG emissions. For instance, new customers must first meet the BC Building Code requirements,  
11 including: (a) the Energy Step Code, which sets performance targets for the energy efficiency of  
12 building envelopes and mechanical systems; and (b) the Zero Carbon Step Code, which limits  
13 the carbon intensity of new buildings, including space and water heating systems. The inputs in  
14 the MX and Connection Policies reflect permitted consumption as well as trends in natural gas  
15 use over time.

## 16 **2.2 FEI’S CURRENT SYSTEM EXTENSION CONSTRUCTS**

17 The following section provides an overview of the parameters of the current MX Test, the SLCA  
18 and the SEF, which are reflected in the General Terms and Conditions of FEI’s Tariff.<sup>11</sup> More  
19 details on the various components of the MX Test are available in the MX Test Technical Guide,  
20 which was provided to participants of the workshops held on January 14 and 22, 2026 and is  
21 included as Appendix A.

### 22 **2.2.1 MX Test Description**

23 The MX Test, which is reflected in Section 12 of FEI’s GT&Cs, establishes the appropriate level  
24 of investment FEI will make on behalf of a customer or customers wishing to attach to FEI’s  
25 distribution system, and subsequently the amount, if any, of a contribution (CIAC) to be paid by  
26 the connecting customer(s). This serves to ensure that the interests of existing and new  
27 customers are balanced.

28 All applications for main extensions by residential and commercial customers (Rate Schedules  
29 (RS) 1 and 2), service connections for large commercial customers (RS 3), and connection to a  
30 service header, including vertical subdivisions, are subject to FEI’s MX Test.

31 The MX Test is a discounted cashflow (DCF) analysis that considers the prospective revenues  
32 and costs associated with a planned main extension over a 40-year period by calculating the ratio  
33 of net present values (i.e., Profitability Index or PI) between the:

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<sup>10</sup> EBO-188, Appendix B. As discussed in Appendix C to this Application, the OEB later changed its approach for climate policy reasons, but this was effectively reversed by the Ontario provincial government.

<sup>11</sup> [https://www.cdn.fortisbc.com/libraries/docs/default-source/about-us-documents/regulatory-affairs-documents/gas-utility/fortisbc\\_generaltermsandconditions.pdf](https://www.cdn.fortisbc.com/libraries/docs/default-source/about-us-documents/regulatory-affairs-documents/gas-utility/fortisbc_generaltermsandconditions.pdf).

- 1 1. Estimated net cash inflows over 40 years associated with the forecast of new attaching  
2 customers over a 5-year period (or a 10-year period in circumstances where a foreseeable  
3 build-out of customer attachments is longer than 5 years); and
- 4 2. Capital costs of attaching customers over a 5-year period (or a 10-year period in  
5 circumstances as noted above) of the main extension.

6 The discount rate used for the MX Test is based on FEI's pre-tax weighted average cost of capital  
7 (WACC) and is inflation adjusted. The MX Test formula is set out below:

$$8 \quad PI = \frac{NPV(\text{Delivery Margin} + \text{Application Fees} - \text{O\&M} - \text{System Improvement Cost} - \text{Municipal \& Property Tax} - \text{Income Tax})}{NPV(\text{Capital Costs of Mains, Services, and Meters} + \text{Overhead} + \text{Working Capital})}$$

9 The currently approved PI threshold for each individual MX Test is 0.8. If the result of the MX Test  
10 (i.e., PI) is less than the approved PI threshold, a financial contribution is required from the  
11 customer(s). Specifically, if an individual PI is 0.8 or greater, then a system extension can proceed  
12 without the need for a customer contribution. If the PI is less than 0.8, then a customer contribution  
13 is required to bring the PI up to the 0.8 threshold for the system extension to proceed. The PI of  
14 all main extensions completed on an annual basis is required to have an aggregate PI of 1.1.

15 The total required CIAC will be paid by the customer(s) connecting at the time a main extension  
16 is being built, and FEI will collect contributions from all customers connecting during the first five  
17 years after the main extension is built. As additional contributions are received by customers  
18 connecting to the main extension, partial refunds are made to those customers who had  
19 previously contributed; therefore, at the end of the fifth year, all customers will have paid an equal  
20 contribution, after reconciliation and refunds. In instances where refunds are granted to customers  
21 who have contributed, the main is referred to as a "contributory main."

22 The following sections further describe each component of the MX Test.

### 23 **2.2.1.1 NPV of Net Cash Inflows**

24 The components factored into the calculation of the NPV of cash inflows include: Delivery Margin;  
25 Application Fees; Operations and Maintenance (O&M) Costs; System Improvement (SI) Costs;  
26 Municipal and Property Tax; and Income Tax.

27 Each component is briefly discussed below. Please refer to the MX Test Technical Guide  
28 (Appendix A, Section 2.1) for more detailed information.

#### 29 **2.2.1.1.1 DELIVERY MARGIN**

30 The annual delivery margin is calculated as follows:

$$31 \quad \text{Delivery Margin} = ((\text{FEI Basic Charge} \times \text{Number of Customers} \times 365) + (\text{FEI} \\ 32 \quad \text{Delivery Charge} \times \text{Number of Customers} \times \text{Consumption per Customer})).$$

1 **Basic and Delivery Charges**

2 The basic and delivery charges for each rate schedule used for the MX Test are based on the  
3 approved delivery rates effective on January 1 of each year.

4 **Number of Customer Attachments**

5 The forecast of customer attachments to a main extension is based on discussions with the  
6 developer or the customer requiring the main extension. The number of customer attachments is  
7 different for each main extension. In some cases, there might only be one customer wishing to  
8 attach, while in other cases, such as with a developer, there may be many customers attaching  
9 to the same main extension over several years depending on the developer's plans and municipal  
10 approvals. While the typical MX Test uses a customer attachments forecast period of 5 years, in  
11 circumstances where it can be reasonably demonstrated that there is evidence for growth  
12 exceeding 5 years, a 10-year forecast period may be used.

13 **Consumption Per Customer**

14 The consumption per customer is a credit for the volume of gas to be consumed by each new  
15 customer attaching to the new main extension on a per-installed appliance basis. The average  
16 consumption per appliance used for the MX Test at this time is largely based on FEI's 2017  
17 Residential End Use Study (REUS) with a few exceptions as noted in the MX Test Technical  
18 Guide (Appendix A, Section 2.1.1.3).

19 The consumption per customer reflects a credit that each new customer receives for gas  
20 consumed by the appliance(s) being installed in their home (volume credit). The volume credit is  
21 not intended to be a forecast of a specific customer's usage or an expectation that the new  
22 customers will use a specific volume of gas in their appliances. Similarly, existing customers are  
23 not required to use specific volumes of gas per appliance, and it is not reasonably possible to  
24 measure actual per appliance consumption given that each customer is unique, the number of  
25 occupants in a premises varies, and they may use an appliance or appliances differently  
26 compared to another customer. As such, the volume credit treats new and existing customers  
27 similarly and in a fair manner by using the REUS to derive the consumption credit. The most  
28 recent appliance credit values are set out below.

1 **Table 2-1: Appliance Use Credits for MX Test**

MX Test Appliance Consumption	2025 (GJ/yr)
Barbeque	0.7
Boiler	51.7
Clothes Dryer	1.8
Fireplace - Décor	16.5
Fireplace - Heating	16.0
Furnace (primary)	51.7
Furnace (secondary)	23.3
Hot Tub	21.3
Hot Water Tank	25.1
Pool	39.3
Range/Cooktop	5.2
Wall Heater	7.1

2  
3 FEI notes that there is a more recent REUS than the one currently being used in the MX Test.  
4 The 2022 REUS, finalized in March 2023, was affected by changes in consumption patterns  
5 during the COVID-19 pandemic, yielding results that skewed upward (i.e., it showed increased  
6 use rates per customer), likely due to customers remaining at home and using heat during the  
7 day. The results deviated significantly from previously established downward trends. Using this  
8 unreliable data would have made it easier (less costly) for customers to connect when compared  
9 to prior years, all else equal. Therefore, FEI has maintained the 2017 REUS for the 2025 MX Test  
10 parameters. The next REUS is being undertaken in 2026 and the results will be available in Spring  
11 2027. This topic is discussed further in Section 9.1.

12 **2.2.1.1.2 APPLICATION FEE**

13 The current Application Fee per new customer attachment is \$15.<sup>12</sup>

14 **2.2.1.1.3 OPERATIONS AND MAINTENANCE (O&M) COST**

15 The O&M input to the MX Test is intended to capture the incremental O&M due to each new  
16 customer attaching to FEI's distribution system. The O&M input to the MX Test is determined by  
17 multiplying the O&M per customer by the number of customer attachments (as discussed above  
18 under Number of Customer Attachments).

19 The O&M per customer is updated annually based on FEI's most recent actual Gross O&M<sup>13</sup> for  
20 activities that are directly impacted by the number of new customer attachments. These O&M  
21 activities include distribution operation, distribution corrective maintenance, account service,

<sup>12</sup> Approved in the FEI 2016 Rate Design Application Decision and Order G-135-18, p. 46.

<sup>13</sup> For example, the O&M input for the 2026 MX Test, which was set at the end of 2025, is based on FEI's 2024 Actual Gross O&M.

1 customer service, customer billing, meter reading, credit and collections, and bad debt  
2 management.

#### 3 **2.2.1.1.4 SYSTEM IMPROVEMENT (SI) COSTS**

4 The SI Cost input to the MX Test serves as a proxy for the incremental system improvement costs  
5 associated with growth not attributable to any specific customer. As part of the MX Test, the SI  
6 Cost is calculated as:

$$7 \quad SI = \text{Number of Customer Attachments} \times \text{Consumption per Customer} \times \text{SI Charge per GJ}$$

8 System Improvements are planned annually to meet capacity constraints in certain areas of the  
9 gas system based on a forecast of growth in distribution system capacity requirements. System  
10 Improvement requirements can be caused by increases in consumption by existing customers  
11 and increases in consumption driven by the addition of customers. The current method of  
12 determining the SI Charge was originally developed in 1994 as a proxy so that a notional amount  
13 for System Improvement costs could be considered within the MX Test.

14 The SI Charge per GJ is updated on an annual basis.

#### 15 **2.2.1.1.5 MUNICIPAL AND PROPERTY TAX**

16 Municipal tax is derived based on 1 percent of FEI's forecast revenue requirement (i.e., 2026  
17 forecast for the 2026 MX Test) in accordance with section 644 of the *Local Government Act*.<sup>14</sup>

18 Property tax is calculated by multiplying the cost of the mains and services associated with the  
19 main extension by FEI's average property tax rate for distribution system assets, which is updated  
20 annually. The 2025 actual average property tax rate for FEI's distribution system (used in the  
21 2026 MX Test) is 1.61 percent.

#### 22 **2.2.1.1.6 INCOME TAX**

23 Details of the income tax calculation are provided in the MX Test Technical Guide (Appendix A,  
24 Section 2.1.6).

### 25 **2.2.1.2 NPV of Capital Costs**

26 The components factored into the calculation of the NPV of capital costs include: capital costs of  
27 the mains, services, and meters associated with the main extension; overhead; and cash working  
28 capital.

29 The formula for the NPV of cash outflows is:

$$30 \quad \text{NPV of Capital Costs} = \text{Mains, Services \& Meters} + \text{Overhead} + \text{Cash Working Capital}$$

31 Each component is further described below.

---

<sup>14</sup> [https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/r15001\\_16#section644](https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/r15001_16#section644).

1 **2.2.1.2.1 CAPITAL COSTS OF MAINS, SERVICES, AND METERS**

2 The estimated cost to install mains, services, and meters is dependent on the individual  
3 circumstances of the customer/developer. These circumstances include, for example, the number  
4 of dwellings or businesses, the distance of the main extension required, and any potential  
5 encumbrances impacting the cost estimate.

6 For simple projects such as residential homes, small townhouse complexes, or small commercial  
7 businesses, FEI uses a Geographic Code pricing model (i.e., geo pricing) to estimate the capital  
8 costs of mains (i.e., Polyethylene (PE) pipe less than 60 mm) and service lines (i.e., less than 50  
9 metres). In general, the geo pricing is updated on an annual basis for each year's MX Test and is  
10 described in detail in the MX Test Technical Guide (Appendix A, Section 2.2.1).

11 For complex projects and large developments that require large PE pipe (i.e., 88 to 114 mm or  
12 168 mm) or steel pipe, FEI uses manual estimates to derive capital cost estimates based on FEI's  
13 expertise and information on construction costs for mains and services in conjunction with  
14 information provided directly by the customer/developer.

15 For meters (including meters and regulators), the capital cost estimates used in the MX Test will  
16 be based on the current unit costs for each type of meter assembly, which is updated annually.

17 **2.2.1.2.2 OVERHEAD**

18 The overhead is a proxy for the incremental general costs that are incurred to install main  
19 extensions but cannot be associated with any particular main extension project. Examples of  
20 these general costs include administrative duties, right of way management, and government  
21 fees. For the purpose of the MX Test, overhead is calculated by multiplying the costs of mains,  
22 services, and meters by the overhead rate, which is updated annually.

23 The overhead rate is a combination of direct and indirect overhead related to capital additions.  
24 For direct overhead, which reflects planning costs for main extensions that have not been charged  
25 to a specific project, the direct overhead rate is set based on a three-year weighted average of  
26 actual planning costs divided by the actual mains and services additions (i.e., the 2026 MX Test  
27 would be based on the weighted average of 2022 to 2024). For indirect overhead, which reflects  
28 a portion of FEI's general overhead, the indirect overhead rate is calculated using three steps,  
29 described in detail in the MX Test Technical Guide (Appendix A, Section 2.2.2).

30 For main extensions where capital costs are estimated to be less than \$25,000, an annual fixed  
31 overhead rate is used in the MX Test which is equal to the sum of the direct overhead percentage  
32 and the indirect overhead percentage described above. For the 2026 MX Test, the annual fixed  
33 overhead rate is 17.38 percent.

34 For main extensions where capital costs are forecast to be greater than \$25,000, a sliding scale  
35 based on an exponentially declining curve is applied as approved by the BCUC.<sup>15</sup> The purpose  
36 of the sliding scale is to estimate the overhead costs for larger projects more accurately since

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<sup>15</sup> Decision and Order G-147-16, p. 40.

1 overhead costs do not have a linear relationship to the direct capital cost of a main extension. As  
2 direct project costs get higher, the overhead cost is smaller in percentage terms of the direct  
3 project cost. For more details regarding the sliding scale formula and how it is calculated, please  
4 refer to the MX Test Technical Guide (Appendix A, Section 2.2.2).

#### 5 **2.2.1.2.3 WORKING CAPITAL**

6 The cash working capital input is calculated as follows:

7 
$$\text{Working Capital} = (\text{Mains, Services \& Meter} + \text{Overhead}) \times \text{Cash Working Capital Rate}$$

8 The cash working capital rate is updated annually and is calculated based on FEI's 2026 forecast  
9 cash working capital divided by FEI's 2026 forecast of plant in service as approved in the Annual  
10 Review for 2025-2026 Delivery Rates Decision and Order G-287-25.<sup>16</sup> The cash working capital  
11 rate for the 2026 MX Test is 0.14 percent.

### 12 **2.2.2 SLCA Description**

13 The SLCA, which is reflected in Section 10 of FEI's GT&Cs, represents the maximum allowance  
14 each infill customer receives when connecting to an existing main.

15 The SLCA is applicable to a single-family dwelling<sup>17</sup> or a small commercial customer.<sup>18</sup> If the cost  
16 to connect the individual infill customer (i.e., the service line between the main and the meter set)  
17 exceeds the SLCA,<sup>19</sup> then the customer must pay for the installation costs above the SLCA. This  
18 serves to ensure that the interests of existing and new customers are balanced.

19 The SLCA is determined by applying a proxy MX Test, where the PI equals 1.0, to the average  
20 residential customer connections to determine a target service line cost. The proxy MX Test is  
21 calculated using a combination of average actual residential consumption, meter and mains cost  
22 data. Actual service line cost data from the previous year is reviewed to determine the maximum  
23 amount, or cut-off point, in the data that would result in an average service line cost equal to the  
24 Target Service Line Cost. Conceptually, the SLCA represents a value where, for the average new  
25 residential connections, the expected revenue would equal the expected cost to install a service  
26 line and meter. However, in practice, based on actuals from 2017 to 2025, the revenue from new  
27 connections in aggregate has been outweighing the costs to connect these new customers as  
28 demonstrated through the RIA discussed in Section 3.4 below.

29 The following figure illustrates the steps to determine the SLCA.

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<sup>16</sup> FEI's 2026 Forecast Cash Working Capital = \$13.881 million, and FEI's 2026 Forecast Ending Plant In Service = \$9,912.359 million.

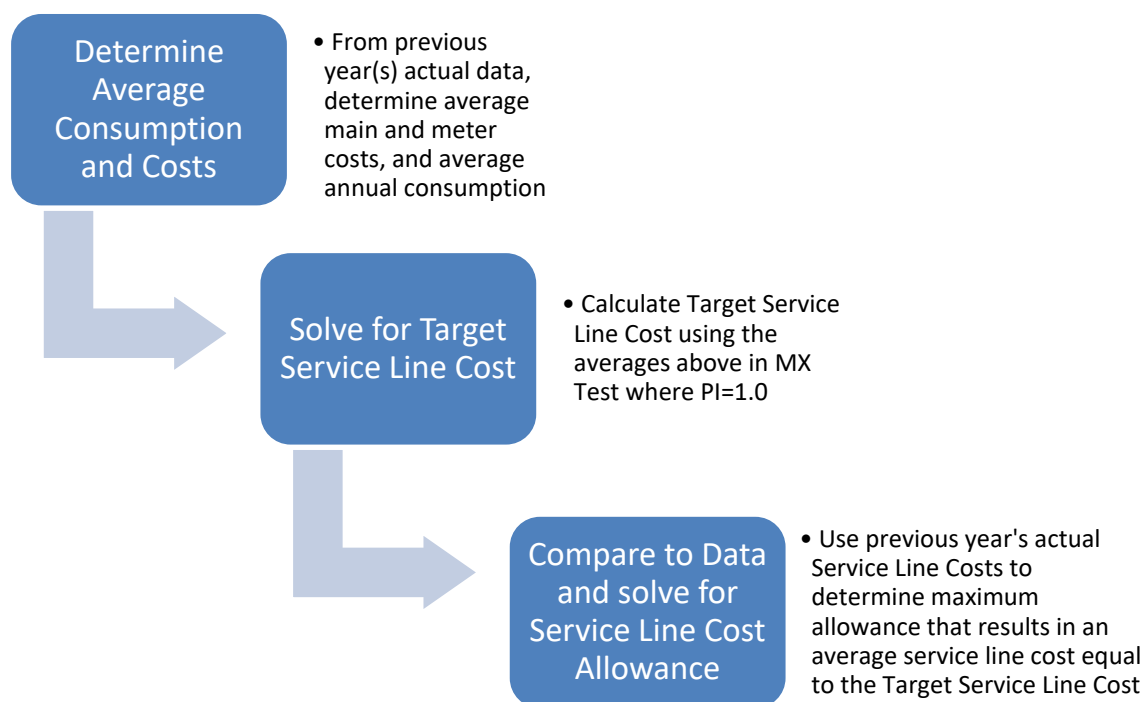
<sup>17</sup> For residential dwellings as part of a duplex, the SLCA would be double the SLCA amount applicable to a single-family dwelling.

<sup>18</sup> Referred to as "Other than a duplex" in FEI's Standard Fees and Charges Schedule.

<sup>19</sup> Or the distance from the front of the Customer's building to the meter exceeds 1.5 metres in accordance with Section 10 of FEI's General Terms and Conditions.

1

**Figure 2-1: Current SLCA Methodology<sup>20</sup>**



2

3 The SLCA is updated annually using actual data. The SLCA for 2026 is \$3,955 (\$7,910 for a  
4 duplex). The detailed description and steps for calculating the SLCA each year are described in  
5 the MX Test Technical Guide (Appendix A, Section 2.3).

### 6 **2.2.3 System Extension Fund Description**

7 As explained in Section 2.2.1, the MX Test is used to determine the PI of an extension and, if the  
8 PI is below the minimum threshold of 0.8, it also calculates the CIAC a customer must provide to  
9 connect to the system. At times, the CIAC is prohibitively large such that a customer wanting to  
10 connect to the gas system cannot afford to do so. This typically occurs in the case of customers  
11 who are in low density areas at greater distances from a main. The SEF (Section 12.11 of the  
12 GT&Cs) is in place to reduce the disparity in access to the gas system associated with a  
13 customer's specific location relative to the gas system.

14 The SEF has been in place since 2017 as a fund of \$1 million annually. From 2017 to 2020 the  
15 fund operated as a pilot. In 2020, the BCUC approved the SEF on a permanent basis, effective  
16 January 2, 2021. The BCUC also increased the amount of SEF funding available to an individual  
17 customer to offset the customer's CIAC. The details of the current SEF are as follows:

<sup>20</sup> A similar diagram in the 2015 Application showed the third step as two distinct steps ("Compare to Actual Service Line Cost Data" and "Solve for Maximum SLCA"); however, in practice they have always been performed together and are interrelated. The modification to the presentation is for clarity only and does not represent any actual change to the current SLCA methodology.

- 1 • The SEF provides \$1 million of annual funding;
- 2 • The SEF only applies to residential customers;
- 3 • The residential customer applying for the SEF must meet the following requirements:
  - 4 ○ The customer must be located within FEI's Mainland or Vancouver Island Service
  - 5 Area;
  - 6 ○ The customer's premises must be a separately metered single-family dwelling or
  - 7 townhouse that is the customer's principal residence and is occupied for the
  - 8 majority of the year; and
  - 9 ○ The result of the economic test for the main extension must indicate a PI of greater
  - 10 than 0.2 and less than 0.8, indicating that a CIAC is required by the customer; and
- 11 • The maximum SEF available to a customer is 95 percent of the required CIAC (i.e., that
- 12 would achieve a profitability index of 0.8), up to a maximum of \$10,000 per customer.

#### 13 **2.2.4 New Customer Application Fee (\$15 Processing Fee)**

14 Section 5 of FEI's GT&Cs provides for a \$15 new customer application fee (Application Charge);  
15 this Application Charge is unrelated to the MX and Connection Policies discussed in this  
16 Application. It is a purely administrative fee, intended to recover the administration costs  
17 associated with initiating service to a new customer. It does not cover any of the capital costs to  
18 connect a customer.

19 As part of its decision on FEI's 2016 Rate Design Application, the BCUC approved a reduction in  
20 the Application Charge from \$25 to \$15.<sup>21</sup> FEI is not proposing any change to the Application  
21 Charge as part of this Application.

### 22 **2.3 REGULATORY HISTORY OF MX AND CONNECTION POLICIES**

23 FEI provides below an overview of the long regulatory history culminating in the current MX Test.  
24 There has been a high degree of continuity in its purpose and central elements, with periodic  
25 refinements made to improve on their ability to achieve their overall rate design purpose of  
26 balancing the interests of new and existing customers.

#### 27 **2.3.1 1993 Phase B Rate Design Application and Decision and Order G-101-93**

28 In 1988, with the expansion of the Company following the acquisition of the Lower Mainland  
29 natural gas assets from the British Columbia Hydro and Power Authority (BC Hydro), there were  
30 four different geographically based divisions<sup>22</sup> and three separate system connection policies and  
31 main extension tests (BC Gas MX Tests). The three separate BC Gas MX Tests were disparate  
32 in design and methodology, which resulted in customers being treated differently when seeking

<sup>21</sup> Decision and Order G-135-18, p. 46.

<sup>22</sup> Divisions included Lower Mainland, Inland, Columbia and Fort Nelson.

1 to attach to the Company's distribution system simply due to their geographic location. In 1993,  
2 FEI (then BC Gas Utility Ltd.) filed its Phase B Rate Design Application which sought approval to,  
3 among other things, consolidate its Lower Mainland, Inland and Columbia Divisions and to  
4 address two concerns related to the BC Gas MX Tests that had been expressed by the BCUC in  
5 its 1992 Revenue Requirement Decision and Order G-63-92:<sup>23</sup>

6           A major issue is that if the test is not reasonable, existing customers may end up  
7           subsidizing the new customers. Another issue is whether the Utility has  
8           consistently applied the test.

9 In designing a main extension policy and MX Test to address the BCUC's concerns, FEI aimed  
10 to balance the interests of new customers with the interests of existing customers. The Company  
11 thus sought to design an MX Test that was able to capture both the costs and future benefit of a  
12 main extension based on the life of the particular asset being installed. FEI considered that it was  
13 important to reflect the fact that although a main extension required up-front investment, it would  
14 continue to generate benefits for the life of the assets.

15 By its Decision and Order G-101-93 (1993 Decision), the BCUC approved the DCF-based MX  
16 Test, including a minimum ratio of 1.0 for each proposed main extension, a revenue forecast  
17 calculation based on the 33-year depreciation life of meters, and the inclusion of full overheads  
18 in the main extension cost projections.<sup>24</sup> The approved changes to the MX Test were reflected in  
19 the Company's tariff effective January 1, 1994. In the 1993 Decision, the BCUC also expressed  
20 that a consistent set of evaluative criteria should be generally applied to the Company's  
21 investments and directed FEI to align the MX Test more explicitly with the criteria applied in its  
22 Integrated Resource Plan (IRP).<sup>25</sup> Refinements to the MX Test, however, were not made until  
23 after the BCUC's 1996 generic proceeding on utility tests for approving system extensions, which  
24 is discussed in the next section.

### 25 **2.3.2 1996 BCUC Generic Review on Utility System Extension Tests and** 26 **Decision and Order G-80-96**

27 In response to several applications from separate utilities regarding issues related to system  
28 extensions, on June 9, 1995 by Order G-50-95, the BCUC initiated a generic hearing to review  
29 the main extension policy and economic tests of the six largest natural gas and electrical  
30 distribution utilities in BC.<sup>26</sup> The purpose of the generic proceeding was to look broadly at the  
31 system extension policies of the various utilities to determine the extent to which the system  
32 extension policies could be better aligned, made more consistent, and improve fairness and  
33 efficiency.<sup>27</sup> The proceeding explored a number of approaches under which a system extension  
34 could be evaluated and the appropriate methods and time periods for which required contributions

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<sup>23</sup> Decision and Order G-63-92, p. 32.

<sup>24</sup> Decision and Order G-101-93, p. 30.

<sup>25</sup> Decision and Order G-101-93, p. 29.

<sup>26</sup> BC Hydro, West Kootenay Power Ltd., BC Gas Utility Ltd., Centra Gas British Columbia Inc., Princeton Light and Power Company Ltd., and Pacific Northern Gas Ltd. were directed by the BCUC to participate in the proceeding.

<sup>27</sup> BCUC Utility System Extension Test Guidelines (Guidelines), p.1.

1 could be required. The proceeding also contemplated the various inputs to the MX Test that could  
2 be required and how they would be applied. The proceeding concluded with the BCUC's Phase  
3 II Reconsideration Decision and Order G-80-96, dated August 13, 1996, (1996 Phase II  
4 Reconsideration Decision)<sup>28</sup> and the subsequent issuance of the BCUC's Utility System Extension  
5 Test Guidelines, dated September 5, 1996 (Guidelines).<sup>29</sup> The purpose of the Guidelines was to  
6 provide a degree of consistency and assistance to utilities with regard to the approach to the  
7 design of system extension tests by individual utilities. The Guidelines remain in effect today.

8 The 1996 Phase II Reconsideration Decision and the Guidelines reaffirmed the DCF method as  
9 the appropriate approach to evaluate the economic viability of proposed main extensions. Today,  
10 the DCF approach continues to serve as the methodology used to determine the economic  
11 viability of main extensions for FEI. FEI discusses the Guidelines further in Section 4.1.

### 12 **2.3.3 1996 Rate Design Application, Revised System Extension Test Letter L-** 13 **46-96 and SLCA Decision and Order G-104-96**

14 On June 7, 1996, as part of the Company's 1996 Rate Design Application, it sought approval of  
15 an SLCA to serve new residential and small commercial customers connecting to existing mains  
16 (referred to as "infill" customers).<sup>30</sup> On October 7, 1996, the BCUC issued its Decision and Order  
17 G-98-96 on the 1996 Rate Design Application, deferring the Company's SLCA proposal to a  
18 separate public hearing.

19 On October 3, 1996, FEI filed a revised SLCA application and on October 7, 1996, the BCUC  
20 issued Order G-104-96 with the related Decision following on October 18, 1996 (1996 SLCA  
21 Decision). The 1996 SLCA Decision approved the proposed \$1,100 SLCA and a service line  
22 installation fee (SLIF) of \$215, in addition to the proposed application fee of \$85, applicable to  
23 infill customers. A new customer wanting to connect to an existing main was therefore required  
24 to pay a standard single service connection fee of \$300, in addition to any costs incurred that  
25 exceeded the \$1,100 SLCA threshold.

26 On August 30, 1996, in response to the BCUC's Phase II Reconsideration Decision,<sup>31</sup> the  
27 Company filed a System Extension Test Submission that included proposals for revisions to

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<sup>28</sup> Decision and Order G-80-96 is the Phase II Reconsideration Decision for the Generic Review of Utility System Extension Tests that superseded the initial Utility System Extension Test Decision and Order G-19-96. The BCUC's authority to issue directions on a utility's generic system extension test in the manner that it did in Order G-19-96 was challenged by several interveners. This resulted in the Phase II Reconsideration Decision which replaced Order G-19-96 with Order G-80-96 and rescinded Order G-19-96, concluding that it would issue voluntary guidelines and not directions with respect to utility system extension tests.

<sup>29</sup> Available online at:

[https://docs.bcuc.com/documents/Guidelines/2007/DOC\\_15386\\_1996\\_UTILITY\\_SYSTEM\\_EXTENSION\\_TEST\\_GUIDELINES.pdf](https://docs.bcuc.com/documents/Guidelines/2007/DOC_15386_1996_UTILITY_SYSTEM_EXTENSION_TEST_GUIDELINES.pdf)

<sup>30</sup> While the MX Test can be used to determine if any contribution is required from customers wishing to connect to new mains, the SLCA was intended to determine if any contribution is required from infill customers wishing to connect services from existing mains (i.e., where only a service line is required), and the application of a comprehensive MX Test is administratively impractical.

<sup>31</sup> Decision and Order G-80-96, p. 6, the BCUC stated that "...utilities may wish to ask the Commission for review and commentary on their individual System Extension Tests so as to reduce regulatory uncertainty."

1 certain parameters of the MX Test. On November 5, 1996, by Letter L-46-96, the BCUC found  
2 FEI's proposals to generally be in accordance with the Guidelines. The approved changes  
3 included a reduction to the revenue forecast timeframe for the MX Test to match the IRP planning  
4 timeframe of 20 years, the use of the SLCA amount in the MX Test to cap the cost of expected  
5 service lines, and the incorporation of the SLIF and application fee. The changes to the MX Test  
6 became effective on January 1, 1997.

### 7 **2.3.4 2007 System Extension and Customer Connection Policy Review** 8 **Decision and Order G-152-07**

9 On December 6, 2007, the BCUC issued its Decision and Order G-152-07 (2007 Decision) on  
10 FEI's comprehensive review of its system extension and customer connection policies.<sup>32</sup> In the  
11 2007 Decision, the BCUC stated the following:<sup>33</sup>

12         The Commission Panel is of the opinion that the primary purpose of extension and  
13 connection policies is to promote fair and equitable treatment of customers and,  
14 more specifically, to ensure that existing customers are not adversely affected by  
15 the addition of a new customer or customers.

16 The BCUC also approved, among other things, adjustments to some of the parameters of FEI's  
17 MX and Connection Policies:

- 18         • The elimination of the SLIF and an increase to the SLCA for single family dwellings and  
19 duplexes to \$1,535 and \$3,070, respectively.
- 20         • Approval of the use of energy credits.<sup>34</sup>
- 21         • Changing from a single PI threshold of 1.0 for all mains extensions to using both: (i) an  
22 aggregate PI threshold of 1.1; and (ii) an individual main extension PI threshold of 0.8.  
23 This was intended to achieve a better balance of interests between new and existing  
24 customers. In the 2007 Decision, the Panel summarized the proposal as follows:<sup>35</sup>

25         Terasen states that, under the current test, each individual main extension  
26 must have a PI of 1.0 or above to be considered economic, while those that  
27 have a PI of less than one must pay a contribution sufficient such that the  
28 PI is equal to 1.0. Terasen states that its analysis suggests that the PI of  
29 all extensions when considered in aggregate is much higher than 1.0, and  
30 that, by requiring every MX Test to have a PI equal to or above 1.0, on  
31 average new customers are paying more than their fair share of costs.

---

<sup>32</sup> By Order G-160-06, p. 11, the BCUC directed FEI to conduct a comprehensive review of its system extension and customer connection policies, including the MX Test by the end of the second quarter of 2007, for implementation in 2008.

<sup>33</sup> Decision and Order G-152-07, p. 19.

<sup>34</sup> Energy Credits are usage credits embedded in the test for customers that are installing high efficiency appliances. Credits are applied so that the customer is not penalized, by way of a lower PI and increased potential of a CIAC, in the test for gas usage that is lower than average due to the customer's decision to use high efficiency appliances.

<sup>35</sup> 2007 Decision, p. 31.

1 Terasen states that if the Companies were to aggregate main extensions  
2 on an annual basis such that the aggregate PI was above 1.0, a better  
3 balance of interests between new and existing customers would occur.  
4 Terasen states that the aggregated or system-wide approach for the target  
5 PI is consistent with BC Hydro's proposed system extension test in its 2007  
6 Rate Design Application and similar to the practice of gas utilities (such as  
7 Enbridge) in Ontario which employ a threshold PI of 0.8 for individual main  
8 extensions and must maintain a system-wide PI of 1.0.

9 The Panel then determined:<sup>36</sup>

10 The Commission Panel notes that one of Terasen's stated objectives for  
11 system extensions tests and policies is to promote fair and equitable  
12 treatment of customers and avoid undue discrimination, and notes that  
13 Terasen is effectively broadening the scope of the policy to ensure that the  
14 addition of a full year's cohort of customers does not adversely affect the  
15 customers in existence at the beginning of that year. The Commission  
16 Panel finds such a proposal to be in the public interest and to conform with  
17 its Guidelines and approves the proposal to establish a new threshold PI  
18 of 0.80 for individual main extensions, and to establish an aggregate PI of  
19 1.10 as the threshold for all main extensions completed on an annual basis.

- 20 • Discontinuing the use of the SLCA as an input in the MX Test. The removal of the SLCA  
21 allows the full benefits of an MX Test to offset the cost of the extension, including the cost  
22 of the main, service line(s) and meter(s), taken as a whole. Main extension requests with  
23 relatively low mains cost could use any savings to offset high service line costs. Prior to  
24 this change, the cost of the service lines in the MX Test were compared directly to the  
25 SLCA, and where the cost exceeded the SLCA the connecting customer(s) were required  
26 to pay a CIAC to cover the residual service line(s) cost.

### 27 **2.3.5 2016 Decision**

28 FEI's 2015 System Extension Application (2015 Application) was a comprehensive review. As in  
29 this current Application, FEI filed evidence regarding the history of the MX Test, its purpose, and  
30 the practices of other utilities. The BCUC's 2016 Decision reiterated the purpose, endorsed the  
31 continued use of the MX Test and the SLCA as rate constructs, and accepted certain parameter  
32 modifications to ensure the fair treatment of new and existing customers. The 2016 Decision put  
33 in place the current parameters of the MX Test and SLCA, discussed in Section 2.2.

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<sup>36</sup> 2007 Decision, p. 36.

1 The BCUC also accepted the RIA<sup>37</sup>, which was developed by EES Consulting, as a means of  
2 evaluating whether the MX Test and the SLCA were achieving their intended purpose. The  
3 BCUC’s determinations regarding the RIA are discussed in Section 3.1.

#### 4 **2.3.6 2020 SEF Decision**

5 As previously discussed, on December 18, 2020, the BCUC issued the 2020 SEF Decision. The  
6 2020 SEF Decision approved the SEF on a permanent basis effective January 1, 2021, and set  
7 the SEF funding level at 95 percent of the CIAC to a maximum of \$10,000 per customer.<sup>38</sup> The  
8 BCUC stated in that regard:<sup>39</sup>

9         The Panel agrees with FEI that the pilot “proved out the value of the SEF” and the  
10         evidence demonstrates that the 95 percent funding level will enhance the  
11         effectiveness of the program, without unduly burdening non-participating  
12         ratepayers. Considering the regulatory framework and rate design principles  
13         discussed in Section 2, the SEF represents an appropriate balance between  
14         competing rate design principles and is consistent with postage stamp rates. The  
15         SEF will not impose an excessive cost burden on non-participating ratepayers and  
16         there will likely be benefits from increased throughput on the FEI system.

17 The MX and Connection Policies, and reporting requirements, have remained unchanged since  
18 2020.

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<sup>37</sup> As discussed in Section 3, the RIA uses the actual cost and consumption data from completed main and service line extensions within a specific period of time to determine the impact on existing customers of adding new customers to the system. It provides a reasonable assessment of the functioning of the system extension policies and the MX Test.

<sup>38</sup> Decision and Order G-338-20, p. 16.

<sup>39</sup> Decision and Order G-338-20, p. 16.

### 3. RATE IMPACT ANALYSIS: PURPOSE, METHODOLOGY AND RESULTS

In the 2016 Decision, the BCUC endorsed the RIA as a means of assessing how the MX and Connection Policies are functioning in light of their rate design purpose of treating new and existing customers equitably. The RIA included with this Application is the third RIA. The original 2015 RIA, which was based on seven years of data, showed that the MX Test and SLCA were causing delivery rates for existing customers to decrease. This supported the BCUC's downward adjustment in the individual PI and other changes that reduced the share of the cost of new connections and mains borne by new customers.

The 2020 RIA update indicated that, despite changes approved in the 2016 Decision, new customers were still disproportionately bearing the costs of new connections and mains. The 2020 SEF Decision thus made the SEF permanent and facilitated access to that funding.

The RIA in the current Application is based on the main extensions and connections installed during the nine-year period from 2017 to 2025. These updated RIA results show that there continues to be a downward impact on customer delivery rates due to new mains and connections. The updated RIA results therefore indicate that the 2016 and 2020 recalibrations to the MX and Connection Policies, while directionally appropriate, have been insufficient to achieve the intended equitable balance. FEI's proposed adjustments to the MX and Connection Policies in this Application seek to advance that rate design purpose.

This section is organized as follows:

- **Section 3.1:** The BCUC has previously found that the RIA is an “acceptable snapshot” of how MX and Connection Policies are affecting delivery rates.
- **Section 3.2:** The RIA methodology, which was developed by external experts, is a point-in-time analysis that involves quantifying the actual impacts to delivery rates associated with the costs of mains, services and meters from adding new customers over a past period. The methodology has remained consistent since the BCUC first reviewed it in 2015, allowing the results to be compared.
- **Section 3.3:** The 2015 and 2020 RIAs showed that new customers were having a favourable impact on delivery rates for existing customers.
- **Section 3.4:** The latest RIA, based on main extensions and infill connections installed in the nine years from 2017 to 2025, shows that the addition of new customers continues to reduce delivery rates for existing customers.

#### 3.1 *BCUC ACCEPTED THE RIA FOR ASSESSING HOW NEW CUSTOMERS ARE AFFECTING DELIVERY RATES*

As described in Section 2.2, the MX Test is a forward looking (forecast-based) tool that is not suited to a retrospective assessment of the rate impacts of adding new customers. By contrast,

1 the RIA uses the actual cost and consumption data from completed main and service line  
2 extensions within a specific period to determine how the addition of these customers has affected  
3 delivery rates paid by existing customers. The BCUC accepted the RIA in the 2016 Decision and  
4 the RIA has subsequently been updated in 2020 and in this Application.

5 The BCUC stated in the 2016 Decision:

6 The Panel finds the use of MX Test results, as reported in accordance with the  
7 Commission reporting requirements, is not an appropriate mechanism to evaluate  
8 the economic impact of main extensions on ratepayers. The Panel accepts that a  
9 final evaluation of the impact of a main extension can only occur at the end of the  
10 useful life of the main, whereas the Modified MX Test<sup>[40]</sup> does not account for  
11 activity which may occur after the first five years of an extension. As FEI points  
12 out, the main extension will continue to generate benefits for its service life and  
13 customers may continue to join the system after the fifth year. (pp. 10-11)

14 ...

15 The Panel accepts the use of the rate impact analysis, modified to include an  
16 estimate of sustainment and other capital, as an appropriate mechanism to  
17 evaluate the economic impact of main extensions and infill customers on existing  
18 ratepayers. The Panel notes the RIA uses new customer additions resulting from  
19 extensions after application of the MX Test or the SLCA and qualifies a reasonable  
20 estimate of actual incremental revenue and cost impacts associated with this  
21 growth over a period of time. This quantification provides an acceptable snapshot  
22 of how the growth in customers has impacted rates over multiple years, without  
23 the need to wait until the end of the mains' life (i.e. 50 years) to do an actual  
24 assessment and without the requirement to make further detailed forecasts about  
25 the expected future rate impacts. (p. 17)

26 The RIA provides a point-in-time view on how the MX and Connection Policies are functioning,  
27 rather than a full assessment of whether FEI's system extensions and connections are economic.  
28 As the BCUC recognized in the 2016 Decision, the latter can only be determined by an analysis  
29 performed when a material portion of the economic life of the main has passed (potentially more  
30 than 50 years). However, the RIA is an effective method to evaluate whether the incremental load  
31 that has already materialized in FEI's system from new connections over the last nine years has  
32 outweighed the incremental rate impacts caused by the costs required to enable the new  
33 incremental load.

### 34 **3.2 THE RIA METHODOLOGY**

35 The RIA methodology involves quantifying the actual impacts to delivery rates associated with  
36 the costs of mains, services and meters from adding new customers over a past period. The

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<sup>40</sup> The reference to "Modified" meant modified by FEI's proposed changes to the MX Test in its 2015 Application.

1 methodology has remained consistent since the BCUC first accepted it in the 2016 Decision,  
2 allowing the results to be compared.

3 The RIA methodology is designed to determine how multiple years of system extension activity  
4 impacts the average cost per gigajoule (GJ) to the existing customers, and whether the capital  
5 costs incurred from the addition of new customers are offset by the spreading of the utility's fixed  
6 costs over a higher volume of sales that these new customers contribute. Broadly speaking, the  
7 calculation starts with a point-in-time view of the utility as it is setting delivery rates for the  
8 upcoming year, then removes the capital costs and load growth associated with new customer  
9 growth over the past few years, to determine the impact if the customer growth had not occurred.  
10 This average cost per GJ is compared with the current average cost per GJ to analyze the impact  
11 of customer growth on delivery rates.

12 More specifically, the RIA methodology:

- 13 1. Employs the same factors that are used to determine FEI's revenue requirements using  
14 the actual costs and gas consumption forecast for 2026;
- 15 2. Isolates the historic growth and total incremental capital costs associated with new  
16 customers for a specific time period, in this case 2017 through 2025;
- 17 3. Determines the change in annual gas consumption before and after customer additions  
18 and the total sales with and without the new customers; and
- 19 4. Holds constant all other factors and calculates the costs and benefits with and without the  
20 growth to determine if the growth itself would lead to a rate increase for existing customers.

### 21 **3.3 2015 AND 2020 RIA SHOWED EXISTING CUSTOMERS BENEFITTING AT** 22 **EXPENSE OF NEW CUSTOMERS AND PROMPTED RECALIBRATION**

23 FEI has submitted two prior RIAs to the BCUC, one in 2015 and one in 2020. Both analyses  
24 showed that new customers were having a favourable impact on delivery rates for existing  
25 customers. These RIA results, which suggest that new customers are subsidizing existing  
26 customers, were a factor in the BCUC's decision to recalibrate the MX Test and introduce the  
27 SEF.

28 **First RIA (2015):** In the 2015 Application, FEI provided an RIA covering the installations  
29 completed during the seven-year period from 2008 to 2014. This period represents system  
30 extension activities that occurred prior to any updates being made to FEI's system extension test.  
31 In its 2016 Decision the BCUC stated:<sup>41</sup>

32 ...the Panel finds the FEI rate impact analysis prepared by EES Consulting, for the  
33 period from 2008 to 2014, demonstrates existing customers are benefiting from

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<sup>41</sup> Decision and Order G-147-16, p. 17.

1 new customers added as a result of the application of FEI's mains extension test  
2 and customer connection policies.

3 As noted in Section 2.3.5, the 2016 Decision approved a number of changes to the MX and  
4 Connection Policies that were anticipated to have the effect of restoring a more equitable balance  
5 between new and existing customers. In order to assess these changes, the BCUC also directed  
6 FEI "to file an updated rate impact analysis by June 30, 2020, incorporating the results to the end  
7 of 2019."<sup>42</sup>

8 **Second RIA (2020):** Per the directive from the 2016 Decision, FEI updated its RIA and submitted  
9 a report to the BCUC on June 29, 2020 (2020 RIA Report). The 2020 RIA Report provided two  
10 versions of the RIA covering two different time periods:

- 11 • The first analysis included data on installations occurring from 2015 to 2019, representing  
12 the entire period between when FEI submitted its first RIA and the 2020 update to the RIA.  
13 The RIA for 2015 to 2019 evaluated a mix of the old and the new MX Test and Connection  
14 Policies, given that changes to the MX Test and Connection Policies were approved on  
15 September 16, 2016, and implemented in October 2016.
- 16 • The second analysis included data from only the latest installations occurring from 2017  
17 to 2019. It thus represented the period after FEI had implemented the adjustments to the  
18 MX Test and Connection Policies approved in the 2016 Decision.

19 The results of the 2020 RIAs showed that, despite the approved parameter changes in 2016, new  
20 customers to that point were lowering delivery rates for other customers. In other words, the  
21 parameters approved in the 2016 Decision still left new customers bearing a disproportionate  
22 share of the cost of new extensions and connections.

### 23 **3.4 CURRENT RIA INDICATES THAT, DESPITE PRIOR CHANGES, NEW** 24 **CUSTOMERS ARE STILL REDUCING DELIVERY RATES**

25 The RIA for this Application uses data covering the nine-year period from the start of 2017 through  
26 the end of 2025. This data set shows the effect of the MX Test parameters since they were last  
27 updated. The results show that, despite the BCUC approving adjustments in 2016 and 2020 that  
28 reduced the cost burden on new customers when connecting, existing customers are still  
29 benefiting disproportionately compared to new customers.

30 The detailed results of FEI's updated RIA, as well as the 2015 and 2020 RIAs, are provided in  
31 tabular format in Appendix B. The following table summarizes the results.

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<sup>42</sup> Decision and Order G-147-16, p. 18.

1 **Table 3-1: FEI Rate Impact Analysis Shows New Customers Connections Lower Delivery Rates**

	2008-2014 7 Years	2015-2019 5 Years	2017-2025 9 Years
Average Cost per GJ with Growth	\$ 4.16	\$ 4.17	\$ 6.72
Average Cost per GJ without Growth	\$ 4.22	\$ 4.21	\$ 6.83
Rate Impact per GJ	\$ (0.06)	\$ (0.04)	\$ (0.12)
Percentage Rate Impact	-1.40%	-1.10%	-1.72%

2  
 3 As shown in the above table, the updated RIA for the period of 2017 through 2025 indicates that  
 4 savings associated with the actual growth that occurred during that nine-year period more than  
 5 offsets the incremental costs associated with adding new customers. Customer growth over this  
 6 period led to a delivery rate savings of 1.72 percent for existing customers, compared to the  
 7 average cost without growth. The 12 cents per GJ delivery rate savings in the current RIA is  
 8 approximately double what it had been in the first iteration of the RIA (6 cents per GJ).

9 As described in Section 3.1, the RIA looks at a relatively short portion of the economic life of the  
 10 assets and therefore tends to understate the benefits to existing customers. It does not include  
 11 all the load and customer attachments likely to occur over the useful life of the assets. The mains,  
 12 services and meters in this analysis are, on average, only 4.5 years old and may not have had  
 13 time to realize the load growth expected to occur over the initial 5- or 10-year forecasting periods,  
 14 with the unrealized load growth over the assets' entire service life further contributing to the  
 15 understatement of benefits. Given this context, it is notable that the RIA shows that new customer  
 16 connections are already putting downward pressure on rates relatively early in the life of long-  
 17 lived assets. The benefit to existing customers is occurring earlier than may have been expected,  
 18 suggesting that new customers are bearing a disproportionate share of the costs to connect.

19 In summary, the latest RIA results suggest that there remains potential for further updates to the  
 20 MX Test to better achieve the intended purpose of balancing the interests of new and existing  
 21 customers.

## 4. MX TEST REVIEW AND PROPOSALS

This section addresses the framework, parameters and inputs of the MX Test, with a specific focus on the issues that the BCUC identified in Letter L-11-25. FEI is proposing to maintain the essential elements of the MX Test (maintain the existing DCF term, and maintain the use of the aggregate and individual PIs), while updating the sliding-scale overhead inputs in the same manner as prior updates and recalibrating the individual PI threshold to improve the fairness of the MX Test.

The following table summarizes the key MX Test parameters and FEI’s proposals.

**Table 4-1: FEI’s Proposals on MX Test Parameters**

MX Test Parameter	FEI’s Proposal
DCF Term	No change. Maintain at 40 years.
Aggregate PI Threshold	No change. Maintain at 1.1.
Individual PI Threshold	Change from 0.8 to 0.6.
Sliding Scale Overhead Rate	No change to parameters. Update inputs as done in previous applications.

The section is organized as follows:

- Section 4.1:** An MX Test based on a DCF calculation, and an individual and aggregate PI, continues to serve as a practical and effective means of assessing whether potential new customers should provide a CIAC.
- Section 4.2:** FEI has assessed alternative DCF terms for the MX Test, as directed in Letter L-11-25. The analysis supports the continued use of a 40-year term.
- Section 4.3:** FEI proposes to change the individual MX Test PI to 0.6 (from 0.8) and maintain the aggregate PI of 1.1. FEI believes this is an appropriate response to the RIA results indicating existing customers are continuing to benefit at the expense of new customers.
- Section 4.4:** FEI proposes to update the sliding-scale overhead formula in the MX Test to reflect the latest information. FEI has followed the same approach used in previous applications to evaluate the sliding scale overhead formula for this update.
- Section 4.5:** Letter L-11-25 directed FEI to analyze the potential “inclusion of the marginal cost of serving all new load from renewable gases (e.g. Renewable Natural Gas, Hydrogen) compared to conventional natural gas to meet government low-carbon policies”. There are several reasons why commodity costs – both conventional gas and renewable gases – should continue to be excluded from the MX Test, which FEI describes in this section.
- Section 4.6:** At the BCUC’s direction, FEI has considered alternatives to the MX Test itself, i.e., replacing the MX Test with another methodology for determining new customer

1 contributions for main extensions. None of these alternatives are superior to the long-  
2 standing MX Test currently in place.

- 3 • **Section 4.7:** FEI's proposals in respect of the MX Test parameters have only a minor  
4 impact on customer delivery rates when all other parameters such as total capital costs  
5 (before CIAC) and the incremental load from new customer connections remain the same.

#### 6 **4.1 USING A DCF TEST, AND INDIVIDUAL AND AGGREGATE PIS REMAINS** 7 **APPROPRIATE**

8 As discussed in Section 2.2, the framework of FEI's MX Test – a DCF calculation and an individual  
9 and aggregate PI – has been in place for many years as a means of assessing whether potential  
10 new customers should provide a CIAC. The BCUC has reviewed the use of an MX Test multiple  
11 times, and the framework accords with the BCUC's Guidelines. FEI's MX Test also aligns with  
12 generally accepted regulatory principles and is typical of practices used throughout North  
13 America. The MX Test continues to serve as an effective means of fairly apportioning the costs  
14 of new connections between new and existing customers to avoid undue discrimination. It is easy  
15 for FEI to implement and is presented in FEI's GT&Cs in a way that customers can understand.

##### 16 **4.1.1 BCUC Decisions and Guidelines Support the DCF Test and Use of PI**

17 As noted in Section 2.3.2, the BCUC Guidelines support the use of the DCF Test, with the BCUC  
18 reasoning:<sup>43</sup>

19 The Commission believes that the adoption of a DCF type test or its equivalent  
20 (such as NPVRR) by all of the Utilities, whether gas or electric, would result in  
21 increased inter-utility consistency and improved decision making with respect to  
22 utility investment in system extensions.

23 The BCUC reaffirmed the appropriateness of a DCF-based MX Test and PI in the 2016 Decision:<sup>44</sup>

24 The Panel finds it appropriate for FEI to continue to use its existing system  
25 extension and customer connection methodologies, including its use of a  
26 discounted cash flow analysis and profitability index. The Panel notes there was  
27 no disagreement among the parties and FEI's existing policies are consistent with  
28 Commission Guidelines and findings of EES'<sup>45</sup> survey of practices by other  
29 utilities.

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<sup>43</sup> Utility System Extension Test Guidelines, p. 11.

[https://docs.bcuc.com/documents/Guidelines/2007/DOC\\_15386\\_1996\\_Utility\\_System\\_Extension\\_Test\\_Guidelines.pdf](https://docs.bcuc.com/documents/Guidelines/2007/DOC_15386_1996_Utility_System_Extension_Test_Guidelines.pdf)

<sup>44</sup> 2016 Decision, p. 8.

<sup>45</sup> FEI retained expert EES Consulting in the preparation of the 2015 Application.

## 1 4.1.2 MX Test Reflects Accepted Regulatory Principles

2 The MX Test is an exercise in rate design and reflects established rate design principles.

3 The BCUC has previously recognized<sup>46</sup> that the following eight rate design principles identified by  
4 Dr. James Bonbright in his seminal work, *Principles of Public Utility Rates*,<sup>47</sup> form an appropriate  
5 foundation to guide its evaluation of cost allocation and rate design proposals:

- 6 • Principle 1: Recovering the Cost of Service; the aggregate of all customer rates and  
7 revenues must be sufficient to recover the utility's total cost of service.
- 8 • Principle 2: Fair apportionment of costs among customers.
- 9 • Principle 3: Price signals that encourage efficient use and discourage inefficient use.
- 10 • Principle 4: Customer understanding and acceptance.
- 11 • Principle 5: Practical and cost-effective to implement.
- 12 • Principle 6: Rate stability.
- 13 • Principle 7: Revenue stability.
- 14 • Principle 8: Avoidance of undue discrimination.

15 In its Decision and Order G-135-18 on FEI's 2016 Rate Design Application, the BCUC noted that  
16 there is generally no hierarchy among the Bonbright principles because the relevance and weight  
17 given to principles varies with the circumstances and context of a given regulatory application. In  
18 that context, the BCUC gave weight to the principles related to the fair apportionment of costs  
19 and the avoidance of undue discrimination.<sup>48</sup>

20 The BCUC applied these rate design principles to FEI's MX and Connection Policies in the 2020  
21 SEF Decision, and referred to the principle of customer understanding and acceptance in the  
22 most recent extension policy proceeding for BC Hydro.<sup>49</sup>

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<sup>46</sup> Order G-4-18 regarding the FEI 2016 Rate Design Application, Appendix A, p. 5: "The Panel is guided by the rate design principles identified by Dr. James C. Bonbright and discussed by FEI on page 5-2 of the Application and by Elenchus on pages 6 to 8 of its COSA Report. The Panel notes there is generally no hierarchy for the Bonbright principles as the relevance and weight given to principles vary with the circumstance and context of a regulatory application. The Panel considers it appropriate that the principles surrounding fairness and the avoidance of undue discrimination are given weight when reviewing the Two Key Topics in this Decision."

<sup>47</sup> *The Principles of Public Utility Rates*, James C. Bonbright, Albert L. Danielsen, David R. Kamerschen (Second Edition, 1988) Public Utilities Reports, pp 383-384.

<sup>48</sup> Decision and Order G-135-18, p. 5.

<sup>49</sup> Decision and Order G-59-25, pp. i, 13 and 21, regarding BC Hydro's Distribution Extension Policy proceeding, the BCUC referred to the Bonbright principle of customer understanding and acceptance to assess and approve BC Hydro's proposed changes.

1 **4.1.2.1 The MX Test Is Intended to Fairly Apportion Costs and Avoid Undue**  
2 **Discrimination**

3 The rate design principles of fair apportionment of costs and avoidance of undue discrimination  
4 are important in the context of the MX and Connection Policies. As noted in Section 2.1, the BCUC  
5 has determined that the primary purpose of extension and connection policies is:<sup>50</sup>

6 ...to promote fair and equitable treatment of customers and, more specifically, to  
7 ensure that existing customers are not adversely affected by the addition of a new  
8 customer or customers.

9 There are various ways in which the MX Test promotes the principles of fair apportionment of  
10 costs and avoidance of undue discrimination:

- 11 • **The PI is a means of evaluating the fair allocation of costs between new and existing**  
12 **customers:** The MX Test operates as an economic test, using a net present value (NPV)  
13 model to compare the costs of connecting new customers with their potential expected  
14 revenues.
- 15 • **Separate individual and aggregate PI targets is key for both fair allocation between**  
16 **new and existing customers and equitable treatment regardless of location:** The  
17 application of a profitability threshold of 1.0 (i.e., a floor of 1.0) to all individual projects  
18 would lead to over-recovery from new customers on an aggregate level since every project  
19 below this threshold (or floor) would have to pay a contribution to achieve the PI target (or  
20 floor), while projects with PIs above 1.0 are not eligible for credit funding to get back to a  
21 ratio of 1.0. Further, application of a PI floor of 1.0 on an individual project basis (for  
22 example when the incremental costs for a customer connection are calculated based on  
23 the site-specific cost schedules) is misaligned with the postage stamp rate design principle  
24 that informs FEI's rate design. This well-established regulatory principle contemplates that  
25 all customers in the same rate class are treated equally and charged a common rate  
26 regardless of their geographic location and differing individual cost of service. FEI's MX  
27 Test, as with tests in certain other Canadian jurisdictions, mitigates this misalignment with  
28 a bifurcated PI target:
  - 29 ○ **Aggregate Level:** An aggregate PI target of 1.0 (in FEI's case, 1.1) provides a  
30 reasonable expectation that adding new customers is not expected to be  
31 detrimental to existing customers based on current information.
  - 32 ○ **Individual Project Level:** An individual PI threshold (i.e., floor) that is lower than  
33 the aggregate target provides flexibility to account for unique circumstances and  
34 prevents the undue exclusion of new connections.
- 35 • **MX Test is based on incremental costs of the main extension:** FEI's past and current  
36 extension policies are based on incremental, versus rolled-in,<sup>51</sup> cost pricing. New

<sup>50</sup> Decision and Order G-152-07, p. 19.

<sup>51</sup> With rolled-in pricing, all costs are placed into rate base with no customer contributions and costs are shared among all customers.

1 customers pay for the incremental cost associated with main extensions, with the  
2 incremental cost determined by the cost inputs in the MX Test. The SLCA performs a  
3 similar function for infill customer service lines.

- 4 • **Costs and revenues are considered over the same DCF term aligned with useful**  
5 **life:** The assumptions used in the MX Test to calculate the incremental costs and expected  
6 revenues should be consistent so as to not violate the “matching principle” of utility  
7 ratemaking.<sup>52</sup> Under FEI’s existing and proposed DCF analysis, the expected revenues  
8 are calculated based on existing approved delivery rates which are set based on FEI’s  
9 embedded cost of service. As such, the cost data used in the profitability analysis should  
10 also be based on current incremental costs. The matching principle should apply to all  
11 elements of the test. For instance, the DCF term (also referred to as the revenue horizon)  
12 should generally align with the useful life of the asset assumptions used to calculate the  
13 expected revenues. It would not be appropriate for the delivery rates used to estimate  
14 expected revenues to be based on depreciation rates that assume long-term system use  
15 when the DCF term reflects a much shorter time period. As discussed in Section 4.2, the  
16 current 40-year DCF term generally aligns with the useful life of the applicable assets as  
17 reflected in FEI’s rates.
- 18 • **MX Test excludes commodity costs:** The MX Test (like the SLCA) allocates costs  
19 caused by providing a physical connection to the gas system. The costs of providing a  
20 physical connection include all the capital, materials and labour required to provide the  
21 connection, and are incurred at the time that the physical connection is provided. As  
22 discussed further in Section 4.5, the MX Test excludes commodity costs because FEI has  
23 an unbundled rate structure, which means that commodity costs are not caused by a new  
24 connection.

#### 25 **4.1.2.2 The MX Test Is Practical to Implement and Easy to Understand**

26 The MX Test is practical to implement, as FEI routinely performs DCF calculations. A DCF  
27 calculation is straightforward for FEI to administer. From the perspective of customers using the  
28 tariff, the DCF calculation has been reduced to a simple concept – the PI – with transparent cost  
29 and revenue inputs. FEI expects that the longstanding use of the MX Test has contributed to  
30 customer understanding, particularly for developers that bring forward successive projects.

#### 31 **4.1.3 MX Test Framework Is Aligned with Practices in Other Canadian** 32 **Jurisdictions**

33 In Letter L-11-25, the BCUC directed FEI to conduct a jurisdictional scan of similar natural gas  
34 utilities in North America that covers system extension policies, connection fees, and connection  
35 cost allowances. FEI completed that North American jurisdictional scan, which is provided in

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<sup>52</sup> The matching principle in utility ratemaking requires that a utility’s revenues derived from rates must match its total cost of service or total revenue requirement approved by the regulator.

1 Appendix C to this Application. This section focuses on system extension policies, while Section  
2 5.5 addresses policies applicable to infill customer connections to existing mains.

3 FEI reviewed the system extension policies of the major Canadian natural gas utilities in the  
4 following four provinces:

- 5 • **Alberta:** ATCO Gas (ATCO);
- 6 • **Ontario:** Enbridge Gas Distribution (EGD);
- 7 • **Quebec:** Énergir; and
- 8 • **British Columbia:** Pacific Northern Gas (PNG).

9 As shown in the table below, FEI’s MX Test is generally in-line with other Canadian natural gas  
10 utilities, with variations occurring in specific elements among the utilities due to company-specific  
11 factors such as the utility’s operating environment, customer profile, regulatory history, and/or the  
12 utility’s financial condition.

13 **Table 4-2: Canadian Jurisdictional Comparison of System Extension Policies**

Item	ATCO Gas (Alberta)	Énergir (Quebec)	Enbridge Gas Distribution (Ontario)	PNG (BC)
<b>Main Extension Policy</b>	Free except for extensions longer than 50m that are not in a municipality with a franchise agreement <sup>53</sup>	DCF	DCF	DCF
<b>DCF Term</b>	N/A	Residential and Commercial: 20 years, Industrial: 40 years	Max 40 years; Large Volume customers: 20 years	20 years
<b>Profitability Index (PI)</b>	N/A	Project level: 1.00 Portfolio level: 1.30	Project level: 1.00 (EGD may authorize exceptions down to 0.80) Portfolio level: 1.00	Project level: 1.00
<b>System Improvement / Reinforcement Costs</b>	Recovered from all customers in delivery rates; not included in MX analysis	System reinforcement costs are ordinarily only considered at the portfolio level analysis	System reinforcement costs are considered in test	Recovered from all customers through delivery rates; not included in MX analysis

14

<sup>53</sup> ATCO uses a revenue multiplier approach for main extensions above 50 meters that are outside municipalities with a franchise agreement with ATCO Gas. The revenue multiplier approach requires the applicant to pay the company the amount, if any, by which the total estimated cost of the extension exceeds the amount the company estimates it will receive from the applicant during the first three years of service.

1 With regard to US gas utilities, although some states such as New York and Florida have  
2 regulations or legislation that explicitly direct utilities to structure line extension policies in a certain  
3 way, most states have no statewide policy and leave it up to the utilities to create their own  
4 extension policies, leading to the potential use of different extension policies in the same  
5 jurisdiction.

6 The table below provides a summary of four different methods used in the US for calculating the  
7 main extension allowances: (1) NPV model (i.e., DCF model); (ii) footage allowance; (iii) dollar  
8 allowance; and (iv) revenue/margin multiplier. FEI notes that, as discussed further in Appendix C,  
9 the DCF analysis is implicitly the basis of the footage allowance, dollar allowance and  
10 revenue/margin multiplier approaches.

11 **Table 4-3: Snapshot of System Extension Approaches in the US**

Approach	Description	States	Utilities
NPV (DCF) Method	On an NPV basis, if expected future revenues of a new customer equal or exceed the expected costs to connect that customer, the utility may grant a line extension allowance (LEA) that either offsets the required incremental investment in its entirety or provides an amount such that an NPV value of zero is achieved. If expected costs exceed expected revenues, then the customer must make a financial contribution to make the extension financially feasible and to prevent existing customers from subsidizing new customers.	Alabama, Arkansas, Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, Michigan, Minnesota, Nebraska, Nevada, New Hampshire, North Carolina, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Virginia, Washington, Wyoming	34 utilities
Footage Allowance	Conceptually, there is some cost for mains hooking up customers embedded in existing rates. A footage allowance estimates the value of the basic level of service which operates as an offset to costs based on the distance from the main. If the customer is located farther from the distribution main than the distance covered by the footage allowance, the customer must pay the additional cost of construction.	Arkansas, Georgia, Indiana, Kansas, Louisiana, Mississippi, Missouri, New Hampshire, North Carolina, Ohio, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Vermont, Wisconsin	46 utilities
Dollar Allowance	Dollar allowance follows a similar approach without the use of distance as a factor. The construction allowance is capped at a fixed dollar amount, and the customer must pay the costs that are above the fixed cap.	Colorado, Kansas, Maine, Montana, Oregon, Washington, Wyoming	10 utilities
Revenue/Margin Multiplier	Instead of performing an NPV study for each new customer, a utility may choose to provide an allowance that equals a multiple of annual expected non-fuel	Alaska, Hawaii, Idaho, Indiana, Louisiana, Maine, Missouri, Nevada, New Jersey, New	28 utilities

Approach	Description	States	Utilities
	base distribution margin revenues. Under this approach, the customer's revenue stream is estimated based on customer class usage characteristics or the specific appliances.	Mexico, North Dakota, Oregon, South Dakota, Wisconsin	

1  
2 FEI draws the following high-level conclusions from the jurisdictional review, particularly in respect  
3 of system extension policies:

- 4 • **Common rate design purpose:** Like FEI's MX Test, other gas utility system extension  
5 policies are rooted in well-accepted rate design principles, including cost causation,  
6 avoidance of undue discrimination and ease of understanding and implementation. In all  
7 cases, these policies strive to balance the interests of existing and new customers.
- 8 • **DCF analysis:** The DCF model (also known as the NPV model), similar to the one used  
9 by FEI, is a common approach for assessing the economic profitability of the extension  
10 projects and determining an appropriate main extension and/or service line allowance for  
11 new customer connections. The revenue and cost inputs and parameters used in the DCF  
12 model vary among utilities due to company-specific factors such as the utility's operating  
13 environment, customer profile, regulatory history, and/or the utility's financial condition.
- 14 • **DCF term:** The DCF term (also referred to as time/revenue horizon) used in the  
15 profitability assessment analysis ranges and may vary based on customer segments. The  
16 40-year revenue horizon used in FEI's MX Test is within the range used by other Canadian  
17 utilities, which is typically 20 to 40 years. The longer DCF terms generally align with the  
18 useful life of the associated assets, while the shorter terms may reflect the useful life of  
19 appliances or the planning periods in long-term resource plans. ATCO's approach of  
20 providing main extensions without any customer contribution would, in practice, be the  
21 equivalent of assuming an unlimited DCF term.
- 22 • **Use of PI:** PI is a common measure for DCF-based tests in Canada. The Régie has  
23 indicated that, as a concept, "the PI measure is easier to understand, both for the sales  
24 department and for the customers targeted by a network extension project."<sup>54</sup>
- 25 • **Aggregate and individual PI value:** FEI's aggregate PI threshold (1.1) falls between the  
26 aggregate PIs used by Energir (1.3) and EGD (1.0). The PI threshold used in the DCF  
27 analysis for assessing an individual project is generally 1.0, which is what FEI's individual  
28 PI threshold was prior to the 2007 Decision when the BCUC changed the individual PI to  
29 0.8 with the intention to achieve a better balance of interests between new and existing  
30 customers, as previously discussed in Section 2.3.4. ATCO's approach of providing free

<sup>54</sup> D-2018-080, Para 283. "La Régie retient que l'IP est une mesure de la rentabilité d'un projet équivalente à la comparaison entre le TRI et le CCP. Elle note également que le CCP étant modifié à chacun des dossiers tarifaires, cela peut rendre plus difficile le suivi du seuil de rentabilité à atteindre pour un projet donné. En conséquence, la Régie convient que la mesure de l'IP est plus facile à comprendre, tant pour le service des ventes que pour les clients visés par un projet d'extension de réseau."

1 extensions in most locations is the equivalent of using an individual PI threshold of zero.  
2 An issue with requiring every individual project to achieve a PI of at least 1.0 is that this  
3 necessarily results in the aggregate PI being higher than 1.0, meaning that new customers  
4 are required to create a benefit for existing customers.

- 5 • **System improvement / reinforcement costs:** There is no universally accepted approach  
6 for addressing system improvement / reinforcement costs (i.e., the costs associated with  
7 system upgrades that occur while the new main extension is installed) in the system  
8 extension policies. In some cases, these costs are excluded from the test and recovered  
9 from all customers in revenue requirements. The costs may alternatively be considered  
10 as part of the aggregate profitability analysis but excluded from the project level profitability  
11 analysis or considered at both aggregate and project level analysis. FEI includes system  
12 reinforcement costs, known as the SI Charge, in its individual project level MX Tests.  
13 Including an SI Charge in FEI's MX Test means that new customers are contributing to  
14 system upgrades that occur while the new main extension is being installed.

15 Overall, in FEI's view, the survey results show no reason to depart from FEI's longstanding  
16 approach of using a DCF-based MX Test with a 40-year DCF term and separate aggregate and  
17 individual PI thresholds.

## 18 **4.2 40-YEAR DCF TERM REMAINS APPROPRIATE**

19 FEI described in Section 2.2.1 that the current MX Test applies a 40-year time horizon to  
20 determine the discounted cash flow of revenues. Letter L-11-25 directed FEI to assess alternative  
21 DCF terms, and to provide for each option the "rate impact, expected average CIAC, percentage  
22 of projects requiring a CIAC, number of projects requiring a CIAC". This section describes FEI's  
23 assessment and explains why the existing 40-year term remains appropriate.

24 The same rationale that the BCUC applied in the 2016 Decision when it increased the term to 40  
25 years remains valid today:<sup>55</sup>

### 26 **The Panel approves FEI's proposal to extend the DCF period to 40 years.**

27 The Panel agrees with FEI that changing the DCF term from 20 years to 40 years  
28 may better recognize the expected benefits associated with new mains and notes  
29 that 40 years is likely a long enough period to consider the potential full impact of  
30 a new main extension. [Emphasis in original]

31 As discussed below, the 40-year DCF term continues to be appropriate because it closely reflects  
32 the weighted average service life of the assets associated with new connections, including new  
33 distribution mains, services, meters, and related assets, in accordance with FEI's most recently  
34 approved depreciation study.<sup>56</sup> Additionally, FEI's analysis shows that shortening the term while  
35 holding all other factors constant would have a very significant negative impact on new customers

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<sup>55</sup> 2016 Decision, p. 35.

<sup>56</sup> Approved in the FortisBC 2025-2027 Rate Setting Framework Decision and Order G-69-25.

1 while generating very little delivery rate benefit for existing customers. This disproportionate  
2 impact would run counter to the RIA results indicating that new customers are already contributing  
3 more than their incremental cost. If the DCF term is changed, it must be accompanied by offsetting  
4 changes in the delivery rate assumptions in the MX Test to reflect the different period of capital  
5 recovery.

#### 6 **4.2.1 Implications of Different DCF Terms for CIAC Required from New** 7 **Customers**

8 FEI's analysis, discussed below, shows that shortening the term (all else equal) would have a  
9 very significant negative impact on new customers.

10 Using the 2025 MX Test data, Table 4-4 below illustrates the impact of using alternative DCF term  
11 lengths on the MX Test to: (1) the number and percentage of projects requiring a CIAC; and (2)  
12 the CIAC requirement amounts. The 2025 MX Test data included 413 projects that were  
13 associated with main extensions completed in the 2025 calendar year. The data also  
14 encompassed all customer types, including residential, commercial, and industrial customers.  
15 The analysis assumes no change to the other parameters of the MX Test and makes no  
16 assumption about the customer's or developer's decision whether to continue with the project or  
17 not given the change in the CIAC amount required due to the change in the DCF term. The  
18 analysis simply provides an illustration of, all else equal, the impact (increase or decrease) on the  
19 CIAC requirement if the length of the DCF term is changed.

20 **Table 4-4: Illustration of Changes in CIAC Requirements (Aggregate, Average, and Highest) Under**  
21 **Alternative DCF Terms (Based on 2025 Data)**

DCF Term (Years)	Projects Requiring CIAC	Percentage of Projects Requiring CIAC	Aggregate CIAC Requirement (\$)	Average CIAC Requirement (\$)	Highest CIAC Requirement (\$)
60	62	15%	\$ 686,902	\$ 11,079	\$ 87,867
50	67	17%	\$ 794,492	\$ 11,858	\$ 94,032
40	71	18%	\$ 980,532	\$ 13,810	\$ 102,294
30	112	28%	\$ 1,612,649	\$ 14,399	\$ 113,406
20	173	43%	\$ 4,242,401	\$ 24,523	\$ 638,129

22  
23 As shown in Table 4-4 above, shorter DCF terms (i.e., 30- or 20-year terms) will materially  
24 increase the number of projects requiring a CIAC, as well as the amount of CIAC requirement for  
25 each project. For example, approximately 18 percent of the projects from the 2025 data require a  
26 CIAC under a 40-year DCF term, compared with 43 percent under a 20-year DCF term. The  
27 aggregate CIAC requirement also increases to \$4.242 million under a 20-year DCF term, which  
28 is more than four times the aggregate CIAC requirement under the current 40-year DCF term (i.e.,  
29 an increase of approximately 333 percent).

30 The analysis also shows that the highest amount of CIAC from a single project in 2025 increases  
31 significantly from approximately \$0.102 million to \$0.638 million under a 20-year term. This occurs

1 because the shorter DCF term significantly reduces the NPV of the cash inflows (i.e., the delivery  
2 margin) of each individual project, resulting in more projects falling below the PI threshold of 0.8.

3 Table 4-5 below provides the amount that the CIAC requirements (in dollars) of all projects from  
4 the 2025 MX Test data would increase or decrease when assuming different DCF terms, to further  
5 illustrate how customers or developers could be impacted by such a change.

6 **Table 4-5: Range of the Increase/Decrease to CIAC Requirements at Different DCF Terms**  
7 **Compared to Current 40 Years (Based on 2025 Data)**

Ranges of CIAC Requirement <i>Increase</i> (\$)	DCF 20 Years	DCF 30 Years
\$0 - \$5,000	89	82
\$5,000 - \$10,000	31	16
\$10,000 - \$50,000	38	12
\$50,000 - \$100,000	9	2
\$100,000 - \$200,000	5	-
> \$200,000	1	-
Total	173	112
Ranges of CIAC Requirement <i>Decrease</i> (\$)	DCF 50 Years	DCF 60 Years
\$0 - \$(5,000)	65	58
\$(5,000) - \$(10,000)	3	8
\$(10,000) - \$(50,000)	3	5
\$(50,000) - \$(100,000)	-	-
\$(100,000) - \$(200,000)	-	-
> \$(200,000)	-	-
Total	71	71

8  
9 Table 4-5 above shows, for instance, that changing the DCF term from 40 years to 20 years in  
10 2025 would have significantly increased the CIAC requirement for a significant number of projects.  
11 A total of 84 projects would have experienced an increase in their CIAC requirement of at least  
12 \$5,000. The largest increase in a CIAC would have been more than \$200,000.

### 13 **4.2.2 Implications of Different DCF Terms for RIA Results**

14 Table 4-6 below provides the changes to the 2017-2025 RIA results (discussed in Section 3.4)  
15 resulting from the changes in the aggregate CIAC amount from 2017 to 2025 under DCF terms  
16 of 20 years to 60 years. FEI notes the purpose of the analysis is to demonstrate the impact on  
17 customer rates if the aggregate CIAC amount increases or decreases due to changing the DCF  
18 term under the MX Test. The analysis assumes all projects that proceeded to construction when

1 evaluated under the 2025 MX Test (with the current 40-year DCF term) would still have proceeded  
2 regardless of how much the CIAC amount increased.<sup>57</sup>

3 **Table 4-6: Estimated Rate Impacts Due to New Customers Connections if DCF Term of the MX**  
4 **Test is Changed (Based on 2017-2025 RIA Results)**

2017-2025 RIA	DCF Term				
	60 Years	50 Years	40 Years	30 Years	20 Years
Average Cost per GJ with Growth	\$ 6.715	\$ 6.715	\$ 6.715	\$ 6.715	\$ 6.715
Average Cost per GJ without Growth	\$ 6.829	\$ 6.831	\$ 6.833	\$ 6.835	\$ 6.846
Rate Impact per GJ	\$ (0.114)	\$ (0.115)	\$ (0.118)	\$ (0.120)	\$ (0.131)
Percentage Rate Impact	-1.67%	-1.69%	-1.72%	-1.76%	-1.91%
Change in Percentage Rate Impact from 40 years	0.05%	0.03%	0.00%	-0.04%	-0.19%

5  
6 As shown in Table 4-6 above, all else equal, changing the DCF term of the MX Test has a minor  
7 impact on delivery rates using the MX Test data from 2017 to 2025. The impact on delivery rates  
8 ranged from an increase of 0.05 percent (extending from 40 years to 60 years) to a decrease of  
9 0.19 percent (shortening from 40 years to 20 years).

10 The reason for the minor impact on delivery rates in this analysis is that changing the DCF term  
11 in the MX Test only changes the total CIAC required, and the total aggregate amount of CIAC is  
12 small (averages approximately 3 percent) when compared to the total aggregate direct costs of  
13 main extensions from 2017 to 2025. Thus, increases or decreases in the total CIAC resulting from  
14 changing the DCF term would have a small impact on delivery rates, as other parameters such  
15 as the actual costs of the project and the incremental load from the new customer connections  
16 would remain the same regardless of the DCF term.

17 Thus, a shorter DCF term would achieve only minor delivery rate benefits for existing customers  
18 at significant cost to new customers (via a higher CIAC) to the individual customers or developers  
19 wishing to connect to FEI's system. As discussed below, FEI views this as a disproportionate  
20 approach.

### 21 **4.2.3 Reasons Why the Current 40-Year DCF Term Remains Appropriate**

22 FEI outlines below several reasons why a DCF term of 40 years remains appropriate.

- 23 1. **40 years still reflects the expected service life:** As noted above, the BCUC's rationale  
24 for increasing the DCF term to 40 years in the 2016 Decision (p. 35) was that it "may better  
25 recognize the expected benefits associated with new mains and notes that 40 years is  
26 likely a long enough period to consider the potential full impact of a new main extension."  
27 This remains true. The 40-year term continues to be a reasonable approximation of the  
28 expected service life of FEI's underlying mains, meters, regulators and service lines  
29 infrastructure. In accordance with FEI's most recent approved depreciation study, the

<sup>57</sup> The assumption that all else remains equal provides a consistent basis to compare the rate impacts across all DCF terms. However, FEI notes that it is not possible to predict whether customers or developers would or would not proceed under different DCF terms that, for example, would have resulted in a significant increase in CIAC.

1 weighted average depreciation for FEI's mains, meters, regulators and service lines is  
2 approximately 2.25 percent or approximately a 44-year expected service life (i.e., 1/2.25  
3 percent).<sup>58</sup> A DCF term of 40 years is therefore consistent with FEI's currently approved  
4 depreciation study. Further, FEI's delivery rates, which are an input to the MX Test, are  
5 set based on the approved depreciation study. Therefore, if a shorter DCF term is used,  
6 the MX Test would no longer reflect the expected recovery from new customers through  
7 FEI's rates, which are set by expecting the assets (i.e., the mains and service lines  
8 installed) will continue to generate revenues throughout their service life.

- 9
- 10 2. **A shorter DCF term would cause disproportionate customer impacts:** FEI's analysis  
11 discussed above shows that shortening the DCF term, in isolation, would have a very  
12 significant negative impact on new customers while generating very little delivery rate  
13 benefit for existing customers. Shortening the DCF term would increase the cost burden  
14 on new customers; it will materially increase the number of projects requiring a CIAC, as  
15 well as the amount of CIAC requirement for each project. A significant number of new  
16 customers could expect to see increases in their CIAC requirement of more than \$5,000  
17 with the highest increase expected to be more than \$200,000 (see Table 4-5 above). FEI  
18 considers that such an adjustment would be disproportionate and unfair to new customers.
- 19
- 20 3. **A shorter term is not supported by the RIA results:** The RIA results in Section 3 show  
21 that new customers are already contributing more than their incremental cost. Shortening  
22 the DCF term would further exacerbate this result.
- 23
- 24 4. **A 50- or 60-year term is not justified:** While extending the DCF term could, all things  
25 equal, lower the connection costs to new customers and directionally move the RIA results  
26 closer to equilibrium, it would be misaligned with the assets' expected service lives and  
27 have only a minor impact on delivery rates. As explained above, 40 years approximates  
28 the expected service life – approximately 44 years based on the weighted average of FEI's  
29 mains, meters, regulators, and service lines depreciation rates. Further, as observed  
30 above, extending the DCF term to 50 or 60 years would only have a minor impact on the  
31 CIAC requirement of each project and therefore have only a minor impact on customer  
32 delivery rates.

### 33 **4.3 DATA SUPPORTS LOWERING THE REQUIRED PI THRESHOLD FOR** 34 **INDIVIDUAL MAIN EXTENSIONS WHILE MAINTAINING AGGREGATE PI**

35 In Letter L-11-25, the BCUC requested data on the minimum and average PI values for each year  
36 from 2014 to 2024, and an analysis assuming that the individual PI threshold was increased from  
37 0.8 to 1.0. FEI has provided the requested analysis in this section, but the data does not support

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<sup>58</sup> Calculated based on the 2026 Approved plant-in-service and depreciation rates of the following distribution assets:  
47300 Service (2.11%), 47400 House Regulators (4.35%), 47402 Meters/Regulators Installation (4.55%), 47500  
Mains (1.42%), 47710 Measuring & Regulating Equipment (2.66%), and 47810 Meters (5% for AMI meters – all new  
connections going forward will be installation with AMI meters).

1 increasing the individual PI. Rather, as discussed below, the data supports reducing the individual  
2 PI threshold from 0.8 to 0.6 while maintaining an aggregate PI of 1.1. As explained below:

- 3 • The aggregate PI in a given year has always trended above its required threshold of 1.1,  
4 which is an indication that FEI's system extension activities for that year were expected to  
5 generate revenues that exceed their costs over time;
- 6 • The latest RIA shows that the MX Test is resulting in new customers bearing a  
7 disproportionate share of the cost of new extensions and connections;
- 8 • Increasing the individual PI would cause disproportionate impacts – it would add a material  
9 burden on each new customer, while providing only a minor benefit to existing customers;  
10 and
- 11 • FEI's proposed change is directionally appropriate and incremental. The proposed  
12 change: (1) moves the aggregate PI toward the approved aggregate threshold of 1.1; (2)  
13 moves the RIA results toward zero, reducing the extent to which new customers are cross-  
14 subsidizing existing customers; and (3) does so in a measured way that is expected to  
15 maintain the aggregate PI well above 1.1 and have only minor impacts on delivery rates  
16 for existing customers (0.03 percent).

### 17 **4.3.1 Aggregate PI is Well Above the 1.1 Aggregate Threshold**

18 The 2007 Decision approved a minimum aggregate threshold PI of 1.1 for all main extensions in  
19 a given year (along with reducing the individual PI to 0.8).<sup>59</sup> FEI calculates the aggregate PI by  
20 taking the sum of all forecast revenues and dividing by the sum of all forecast costs associated  
21 with all the main extensions completed in the year.<sup>60</sup> The aggregate PI for all projects provides  
22 insight into whether FEI's total system extension activities in a given year can be reasonably  
23 expected to recover their costs.

24 Figure 4-1 below provides the annual aggregate PI values with and without CIAC for each year  
25 from 2014 to 2025. FEI notes that the annual aggregate PIs without CIAC were reported in FEI's  
26 annual MX Reports in accordance with the 2016 Decision, while the annual aggregate PIs with  
27 CIAC reflect the performance of the MX Test from 2014 to 2025 associated with FEI's estimated  
28 costs only (i.e., main extension costs net of CIAC paid by customers).

29 As Figure 4-1 shows, the annual aggregate PI from 2014 to 2025 is well above the minimum  
30 aggregate threshold of 1.1 and was relatively stable during this period. The elevated aggregate  
31 PI observed in 2017 is attributable to the Tsawwassen Mills mall development, which is  
32 considered an outlier, as indicated by the relatively consistent PI results in the other years. The  
33 results displayed in the figure demonstrate that when considered in aggregate, FEI's system

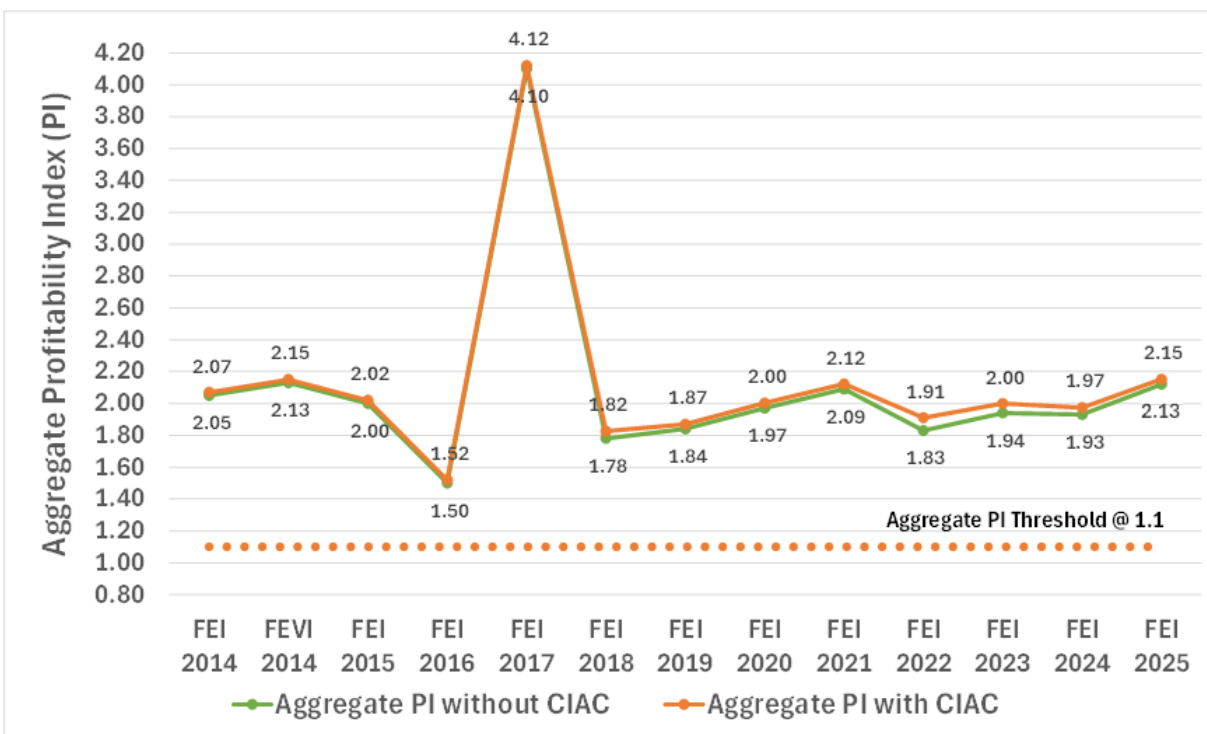
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<sup>59</sup> Decision and Order G-152-07, p. 36.

<sup>60</sup> This approach to measuring the average PI is preferable to a simple average of individual project PI values, which does not account for the relative size or total cost of each project.

1 extension activities are expected to generate revenues that exceed their costs over time, to the  
2 benefit of existing customers.

3 **Figure 4-1: Annual Aggregate PI Values and Minimum Threshold 2014-2025**



4  
5 While the figure above shows the aggregate PI with and without CIAC, it is not logical to consider  
6 any final MX Test PI without taking into account the CIAC received from the customer. Therefore,  
7 in Table 4-7 below, FEI provides the minimum and aggregate PI scores, including CIAC received,  
8 for all main extensions completed from 2014 through 2025.

9 **Table 4-7: Minimum and Aggregate PI Values 2014-2025**

Year	Company	Minimum Individual PI	Aggregate PI with CIAC
2025	FEI	0.80	2.15
2024	FEI	0.80	1.97
2023	FEI	0.80	2.00
2022	FEI	0.80	1.91
2021	FEI	0.80	2.12
2020	FEI	0.80	2.00
2019	FEI	0.80	1.87
2018	FEI	0.80	1.82
2017	FEI	0.80	4.12
2016	FEI	0.80	1.52

Year	Company	Minimum Individual PI	Aggregate PI with CIAC
2015	FEI	0.80	2.02
2014 <sup>61</sup>	FEI	0.80	2.07
	FEVI	0.80	2.15

1  
2 The minimum individual PI is 0.8 in all years because, if the MX Test calculated PI is below 0.8,  
3 then a CIAC is required to achieve a PI of 0.8 before the project can proceed. If a CIAC is required  
4 and the customer elects not to pay it, then the project does not proceed. As a result, the minimum  
5 PI for any project must necessarily be 0.8 and no project in any year could have a PI score of less  
6 than 0.8 (i.e., 0.8 is the floor).

### 7 **4.3.2 RIA Shows Existing Customers Benefitting from New Customers**

8 As described in Section 3, the current iteration of the RIA demonstrates that existing customers  
9 are benefiting from system extensions at the expense of new customers. This result has been  
10 achieved despite the fact that the RIA tends to understate the lifetime benefits of investments in  
11 system extensions due to the relatively short time frame that is considered by RIAs. In effect,  
12 FEI's current system extension policies are, other things being equal, recovering a  
13 disproportionate share of costs from new customers and causing rates to be lower for existing  
14 customers. The individual PI threshold is a key determinant of this RIA result and thus changing  
15 the individual threshold is a "lever" which can be used to recalibrate the MX Test and achieve a  
16 balance between new and existing customers. Given the results of the RIA, FEI believes that it  
17 would be appropriate to reduce, not increase, the PI threshold for individual projects.

### 18 **4.3.3 Analysis of Changing the Individual PI Upwards or Downwards**

19 In this section, FEI examines the effect (all else equal) of changing the individual PI threshold in  
20 the MX Test in terms of: (i) its rate impact; (ii) the expected average CIAC; (iii) the percentage of  
21 projects requiring a CIAC; and (iv) the number of projects requiring a CIAC. FEI has also  
22 expanded the directed analysis to consider setting the individual PI threshold in the MX Test to a  
23 range of values from 0.5 to 1.1. As discussed further below, the analysis demonstrates:

- 24 • Increasing the individual PI threshold in the MX Test would result in an unfair  
25 apportionment of costs between new and existing customers (Bonbright Principle 2). It  
26 would also have disproportionate impacts, unduly adding a material burden onto each  
27 new customer while resulting in only a minor delivery rate benefit to existing customers  
28 (Bonbright Principle 8).

29

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<sup>61</sup> By Order G-21-14, FEI was approved to amalgamate FortisBC Energy Inc. (FEI), FortisBC Energy (Vancouver Island) Inc. (FEVI) and FortisBC Energy (Whistler) Inc. (FEW), and to adopt common rates for natural gas delivery and supply. Common rates took effect January 1, 2015.

- Lowering the individual PI threshold, by contrast, improves the fair apportionment of costs amongst new and existing customers. It is unlikely to reduce the aggregate PI below 1.1.

#### 4.3.3.1 Summary of Sensitivity Analysis Results: Individual PIs of 0.5 to 1.1

Table 4-8 below illustrates how changing the minimum PI thresholds for individual projects would impact the number and percentage of main extension projects requiring a CIAC, the aggregate CIAC amount, the average amount for projects that require a CIAC, and the highest amount of CIAC from a single project. The table uses the 2025 MX Test data, representing 413 projects encompassing all customer types associated with main extensions completed in 2025. The analysis assumes no change to the other parameters of the MX Test. It makes no assumption about the customer's or developer's decision whether to continue with the project given the change in the CIAC amount required due to the change in the minimum PI threshold. The analysis simply provides an illustration of, all else equal, the impact (increase or decrease) on the CIAC requirement under the MX Test if the minimum PI threshold is changed.

**Table 4-8: Illustration of Changes in Main Extension CIAC Requirement (Aggregate, Average, and Highest) Under Alternative Minimum Individual PI Thresholds (Based on 2025 Data)**

Individual PI Threshold	Projects Requiring CIAC	Percentage of Projects Requiring CIAC	Aggregate CIAC Requirement (\$)	Average CIAC Requirement (\$)	Highest CIAC Requirement (\$)
0.5	31	8%	\$ 254,242	\$ 8,201	\$ 39,757
0.6	43	11%	\$ 393,650	\$ 9,155	\$ 57,819
0.7	64	16%	\$ 624,157	\$ 9,752	\$ 80,057
0.8	71	18%	\$ 980,532	\$ 13,810	\$ 102,294
0.9	109	27%	\$ 1,663,705	\$ 15,263	\$ 124,532
1.0	136	34%	\$ 2,938,454	\$ 21,606	\$ 301,974
1.1	155	39%	\$ 4,713,589	\$ 30,410	\$ 671,579

Table 4-8 above shows that increasing the minimum PI threshold in the MX Test would have a significant impact on the CIAC requirement for each main extension project. For example, if the minimum PI threshold is increased from the current threshold of 0.8 to 1.0, the number of main extension projects in 2025 requiring a CIAC would nearly double (from 71 projects to 136 projects). The aggregate CIAC requirement would also increase substantially, from approximately \$0.981 million to \$2.938 million, which is an increase of nearly three times (or an increase of approximately 200 percent). The highest amount of CIAC from a single main extension project in 2025 would also triple from approximately \$0.102 million to \$0.302 million.

The analysis also shows that reducing the minimum PI threshold would be similarly impactful but in the opposite direction. For example, if the minimum PI threshold is reduced from the current threshold of 0.8 to 0.6, the aggregate CIAC requirement would be reduced by approximately 60 percent, from \$0.981 million to \$0.394 million, and the highest amount of CIAC from a single project in 2025 would be reduced by approximately 43 percent (from \$0.102 million to \$0.058 million).

1 Table 4-9 below shows how the 2017-2025 RIA results (as discussed in Section 3.4) would  
2 change as a result of using different individual minimum PI thresholds ranging from 0.5 to 1.1.  
3 FEI notes the analysis is only for demonstrating the impact on customer rates if the aggregate  
4 CIAC amount were to increase or decrease by changing the minimum PI threshold under the MX  
5 Test. It assumes all projects from the 2025 MX Test that proceeded with the current minimum PI  
6 threshold of 0.8 would continue to proceed regardless of the amount of CIAC required.

7 **Table 4-9: Estimated Rate Impacts Due to New Customers Connections if the Minimum Individual**  
8 **PI Threshold of the MX Test is Changed (Based on 2017-2025 RIA Results)**

2017-2025 RIA	Minimum Individual PI Threshold						
	0.5	0.6	0.7	0.8	0.9	1.0	1.1
Average Cost per GJ with Growth	\$ 6.715	\$ 6.715	\$ 6.715	\$ 6.715	\$ 6.715	\$ 6.715	\$ 6.715
Average Cost per GJ without Growth	\$ 6.830	\$ 6.831	\$ 6.832	\$ 6.833	\$ 6.835	\$ 6.838	\$ 6.842
Rate Impact per GJ	\$ (0.115)	\$ (0.116)	\$ (0.116)	\$ (0.118)	\$ (0.120)	\$ (0.122)	\$ (0.127)
Percentage Rate Impact	-1.68%	-1.69%	-1.70%	-1.72%	-1.75%	-1.79%	-1.85%
Change in Percentage Rate Impact from PI @ 0.8	0.04%	0.03%	0.02%	0.00%	-0.03%	-0.07%	-0.13%

9  
10 Increasing the minimum PI threshold for individual projects under the MX Test would increase the  
11 aggregate CIAC (assuming all projects still proceed), which in turn would increase the benefits  
12 that existing customers receive from new customer connections. Conversely, reducing the  
13 minimum PI threshold would decrease the aggregate CIAC, which in turn would reduce the  
14 benefits that existing customers receive from new customer connections.

15 However, since the majority of the MX Tests from 2017 to 2025 had an individual PI greater than  
16 1.0 (i.e., expected revenue outweighed the expected costs), all else equal, changing the individual  
17 minimum PI threshold of the MX Test would only have a minor impact on customer rates (ranging  
18 from an increase of 0.04 percent to a decrease of 0.13 percent). As explained previously, the total  
19 aggregate CIAC requirement is only a small percentage of total aggregate direct project costs;  
20 therefore, changing the CIAC requirement on a small subset of projects (due to changing the  
21 minimum individual PI threshold) will only have a minor impact on customer rates. This highlights  
22 the disproportionate impact that increasing the individual PI would have on potential new  
23 customers.

24 **4.3.3.2 Increasing the Minimum Individual PI Threshold to 1.0 Would Impose**  
25 **Significant Additional Burden on New Customers**

26 Table 4-10 below provides the range of increase in CIAC requirements (in dollars) of all projects  
27 from the 2025 MX Test data under an increased individual PI threshold of 1.0 to further illustrate  
28 the significant impacts on new customers. A significant number of projects in 2025 would  
29 experience an increase in the CIAC of more than \$5,000, with the highest increase in CIAC  
30 requirement at more than \$200,000. The increase in CIAC under an individual PI of 1.0 is  
31 sufficiently large that it would likely result in some customers/developers not proceeding with their

1 projects; some projects could become uneconomic from the perspective of customers or  
2 developers due to construction costs or other financial limitations.<sup>62</sup>

3 **Table 4-10: Range of CIAC Requirements Increase/Decrease if the Minimum PI Threshold**  
4 **increases to 1.0 from the Current threshold of 0.8 (Based on 2025 Data)**

Ranges of CIAC Requirement <i>Increase (\$)</i>	PI Threshold @ 1.0 (Compared to PI @ 0.8)
\$0 - \$5,000	60
\$5,000 - \$10,000	37
\$10,000 - \$50,000	30
\$50,000 - \$100,000	6
\$100,000 - \$200,000	2
> \$200,000	1
Total	136

5  
6 Given the potential for the CIAC to render a project uneconomic, it should not be assumed that  
7 the greater CIAC requirements would necessarily translate into FEI collecting more CIAC dollars.

8 FEI considers that increasing the cost burden on new customers in this way would be  
9 inappropriate, as new customers already bear a disproportionate amount of the cost of new  
10 connections. The aggregate PI has historically been well-above the required value of 1.1 (see  
11 Section 4.3.1). Furthermore, the RIA results (as set out in Section 3) demonstrate how new  
12 customers have already been reducing delivery rates for existing customers. Accordingly,  
13 increasing the minimum individual PI threshold would be contrary to the intended purpose of FEI's  
14 MX and Connection Policies (as described in Section 2.1).

15 **4.3.3.3 Reducing the Minimum Individual PI Threshold to 0.6 is Directionally**  
16 **Appropriate**

17 Rather than increasing the minimum individual PI threshold, FEI is proposing to reduce the  
18 threshold to 0.6 (from 0.8) to improve fairness for new customers. This proposed change is  
19 appropriate because it: (1) moves the aggregate PI toward the approved aggregate threshold of  
20 1.1; (2) moves the RIA results toward zero, reducing the extent to which new customers are cross-  
21 subsidizing existing customers; and (3) does so in a measured way that is expected to maintain  
22 the aggregate PI well above 1.1 and have only minor impacts on delivery rates for existing  
23 customers (0.03 percent).

24 Table 4-11 below is based on historical MX Test results from 2017 to 2025. It shows that, all else  
25 equal, reducing the minimum individual PI threshold to 0.6 would modestly reduce the aggregate  
26 PI (after CIAC) for all years from 2017 to 2025. The aggregate PI would remain well-above the  
27 aggregate PI requirement of 1.1. This is consistent with the 2017-2025 RIA results in Table 4-9

<sup>62</sup> A financial model used to estimate project feasibility would normally include assumptions related to land costs, construction costs, financing and expected returns.

1 above which shows that the impact to delivery rates will only increase slightly (by approximately  
2 0.03 percent) when compared to the current threshold of 0.8.

3 **Table 4-11: Comparison of 2017 to 2025 Aggregate PI between Minimum Individual PI Threshold**  
4 **of 0.8 and 0.6**

Aggregate PI (net of CIAC)		
Year	Minimum Individual PI	Minimum Individual PI
	Threshold = 0.8 (Current)	Threshold = 0.6 (Proposed)
2017	4.12	4.09
2018	1.82	1.81
2019	1.87	1.86
2020	2.00	1.99
2021	2.12	2.11
2022	1.91	1.89
2023	2.00	1.97
2024	1.97	1.95
2025	2.15	2.14

5  
6 The above analysis is only based on historical MX Test data (i.e., projects that were evaluated  
7 and proceeded), and it is reasonable to expect that additional projects (i.e., projects that never  
8 underwent the MX Test or projects that failed the MX Test previously) might have proceeded had  
9 the individual minimum PI threshold been lowered to 0.6. As a result, it is reasonable to expect  
10 that the inclusion of those projects would reduce the aggregate PI (net of CIAC) more than is  
11 indicated in Table 4-11 above.

12 Although it is impossible to know exactly how many new projects would have proceeded under a  
13 lower 0.6 threshold, it is possible to demonstrate mathematically that there is a very low likelihood  
14 that additional projects could ever cause the aggregate PI to fall below 1.1.

15 The following calculation mathematically determines the theoretical number of additional projects  
16 all with an individual PI of 0.6 (i.e., those just meeting the threshold of the MX Test without needing  
17 a CIAC) that could cause the overall aggregate PI to decrease to 1.1. Based on the average cost  
18 of the projects from the 2025 MX Test data, it would require an additional 833 projects (all of which  
19 were just meeting a minimum PI threshold of 0.6) in order to cause the overall aggregate PI to  
20 decrease from 2.14 to 1.1. Considering there were only 413 actual projects from the 2025 MX  
21 Test data, such an outcome is highly unlikely. As such, even if the individual minimum PI threshold  
22 is reduced from 0.8 to 0.6, the likelihood of the aggregate PI being reduced to 1.1 is very small.

1           1. Calculation of the 2025 Aggregate PI if the individual minimum threshold is 0.6:

$$\begin{aligned}
 \text{Aggregate PI}_{\text{Individual Threshold @ 0.6}} &= \frac{\text{NPV}(\text{Rev}_{2025}) + \text{CIAC}_{2025}}{\text{NPV}(\text{Cost}_{2025})} \\
 &= \frac{\$90.518 \text{ million} + \$0.394 \text{ million}}{\$42.512 \text{ million}} \\
 &= 2.14 \text{ (As shown in Table 4-11 above for 2025)}
 \end{aligned}$$

5           where,

- 6           •  $\text{NPV}(\text{Rev}_{2025}) + \text{CIAC}_{2025}$  = NPV of total 2025 project revenue plus CIAC calculated
- 7           based on a minimum individual PI threshold of 0.6 = \$90.518 million + \$0.394
- 8           million = \$90.912 million; and
- 9           •  $\text{NPV}(\text{Cost}_{2025})$  = NPV of total 2025 project costs = \$42.512 million.

10          2. Using the average project costs from the 2025 MX Test data and assuming all additional  
 11          projects would have an individual PI of 0.6, then the new aggregate PI will be:

$$\begin{aligned}
 \text{Aggregate PI}_{\text{New}} &= \frac{\text{NPV}(\text{Rev}_{2025}) + \text{CIAC}_{2025} + \text{Additional Projects}_{\text{PI @ 0.6}} \times \text{NPV}(\text{Rev}_{\text{Add}})}{\text{NPV}(\text{Cost}_{2025}) + \text{Additional Projects}_{\text{PI @ 0.6}} \times \text{NPV}(\text{Cost}_{\text{Add}})} \\
 1.1 &= \frac{\$90.518 \text{ million} + \$0.394 \text{ million} + \text{Additional Projects}_{\text{PI @ 0.6}} \times \text{NPV}(\text{Rev}_{\text{Add}})}{\$42.512 \text{ million} + \text{Additional Projects}_{\text{PI @ 0.6}} \times \text{NPV}(\text{Cost}_{\text{Add}})}
 \end{aligned}$$

15          where,

- 16          •  $\text{Aggregate PI}_{\text{New}} = 1.1$ ;
- 17          •  $\text{NPV}(\text{Cost}_{\text{Add}})$  = NPV of Average Project Cost from all 2025 Main Extensions, which
- 18          is equal to \$0.106 million; and
- 19          •  $\text{NPV}(\text{Rev}_{\text{Add}})$  = NPV revenue of each additional project. Assuming each project just
- 20          meeting a minimum PI threshold of 0.6, then this equal to  $0.6 \times \text{NPV}(\text{Cost}_{\text{Add}})$ .

21          3. Solve for the number of additional projects, each with individual PI of 0.6, that would result  
 22          in the new aggregate PI equals 1.1:

1

2 Additional Projects<sub>PI @ 0.6</sub> =  $\frac{\$90.518 \text{ million} + \$0.394 \text{ million} - 1.1 \times \$42.512 \text{ million}}{1.1 \times \text{NPV}(\text{Cost}_{\text{Add}}) - \text{NPV}(\text{Rev}_{\text{Add}})}$

3 =  $\frac{\$90.518 \text{ million} + \$0.394 \text{ million} - 1.1 \times \$42.512 \text{ million}}{1.1 \times \text{NPV}(\text{Cost}_{\text{Add}}) - 0.6 \times \text{NPV}(\text{Cost}_{\text{Add}})}$

4 =  $\frac{\$90.518 \text{ million} + \$0.394 \text{ million} - 1.1 \times \$42.512 \text{ million}}{(1.1 - 0.6) \times \$0.106 \text{ million}}$

5 = 833 Additional Projects, each with PI @ 0.6

6 **4.4 SLIDING SCALE OVERHEAD RATE SHOULD BE UPDATED TO REFLECT NEW**  
7 **DATA**

8 The MX Test includes a sliding-scale formula for estimating the overhead costs in the MX Test if  
9 the capital cost of each individual main extension exceeds \$25,000. The sliding scale overhead  
10 formula was first approved in the 2016 Decision and is based on an exponentially declining fit  
11 using actual overhead costs. The initial iteration approved in the 2016 Decision was based on  
12 data from 2008 to 2014. The fact that the formula is based on an exponentially declining fit of  
13 actual data across multiple years means that, unlike the other inputs in the MX Test, it is not  
14 necessary to update the formula every year. The sliding scale was next updated in 2020 to reflect  
15 actual data from 2015 to 2019. FEI is proposing to update the sliding scale formula again following  
16 the same approach and using actual data from 2020 to 2024. This change has minimal impact on  
17 the CIAC requirements, aggregate PI, or RIA.

18 **4.4.1 The Update Uses the Same Methodology as Previous Updates**

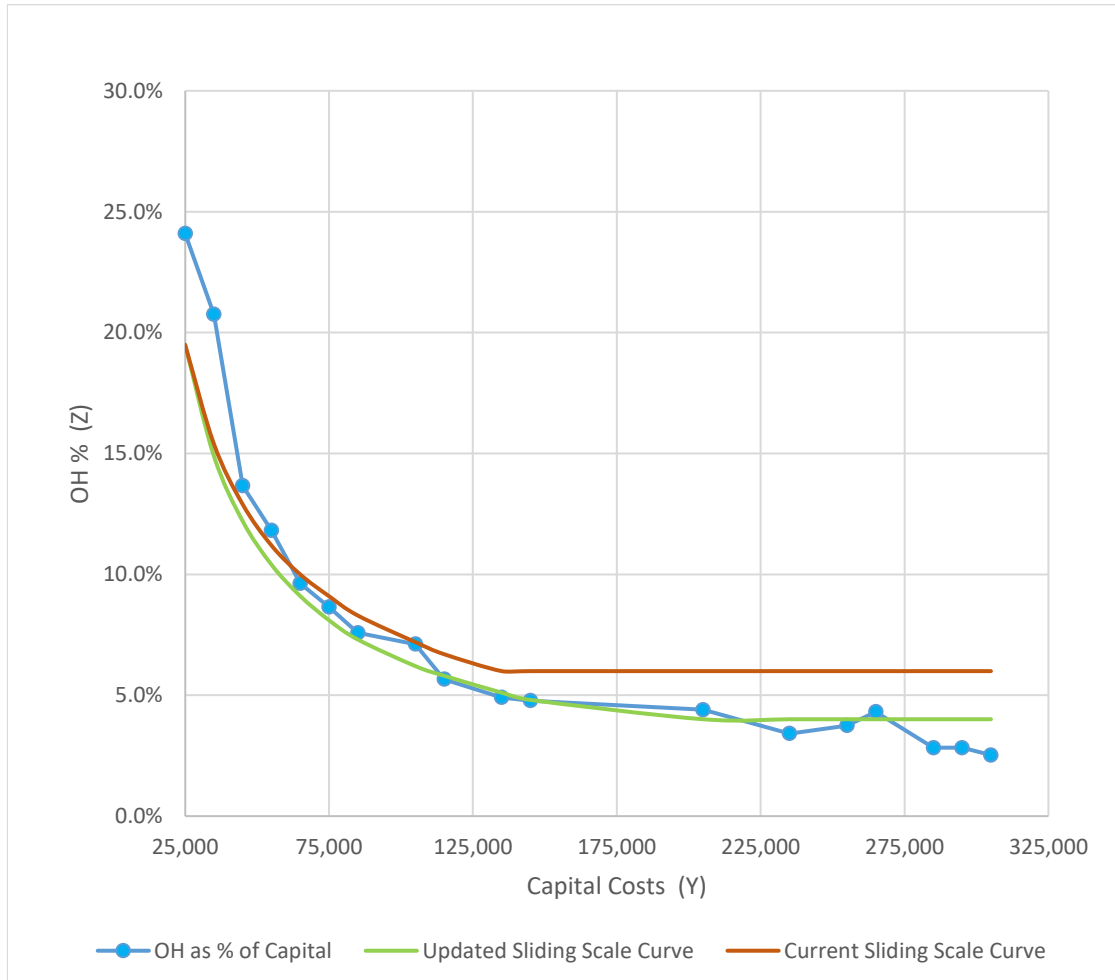
19 In past applications, FEI provided a figure to show the relationship of the actual overhead rate for  
20 projects with capital costs over \$25,000, and the sliding-scale formula overhead rate, to  
21 demonstrate whether the sliding-scale formula generates a curve similar to the actual data. FEI  
22 applied the same approach to update the figure below. Specifically:

- 23 1. FEI first calculated the overhead costs as a percentage of capital costs for all projects  
24 completed during the 2020 to 2024 period with capital costs over \$25,000.
- 25 2. FEI then applied the sliding-scale formula and updated the parameters in that formula to  
26 get the best fitting curve that generates the lowest standard error. The parameters in the  
27 sliding-scale formula that have been updated are the floor rate and the slope.

28 The sliding-scale formula is demonstrated in Figure 4-2 below. The overhead costs as a  
29 percentage of capital costs are graphed in a scatter plot (solid blue line with markers) and are  
30 compared to the current sliding scale overhead formula (solid red line) and the updated sliding

1 scale overhead formula (solid green line). This graph is prepared with the actual data from the  
 2 2020 to 2024 period.

3 **Figure 4-2: Overhead as a Percentage of Capital Cost & Sliding Scale Overhead Formula**



4  
 5 As shown in Figure 4-2, actual overhead as a percentage of total capital cost (solid blue line with  
 6 markers) follows an exponentially decreasing slope. The actual data is best represented by the  
 7 solid green line, where the sliding scale formula has been updated with a 4 percent floor and  
 8 a -0.8 exponent. For comparison, the solid red line shows the current sliding scale formula, which  
 9 has a 6 percent floor and -0.7 exponent.

10 Figure 4-2 demonstrates that the approved sliding-scale overhead formula works as intended to  
 11 calculate an overhead rate for larger projects. The graph shows that the actual overhead rate  
 12 follows the same trend as the sliding-scale overhead formula would calculate. The actual data  
 13 from 2020 to 2024 still supports the sliding-scale formula over a five-year period, with some of the  
 14 variables (the floor rate and the slope) requiring an update. Therefore, the updated sliding-scale  
 15 overhead formula would be as follows:

16 Main Extension Capital Cost of \$25,000 or less:

- 1       • The MX Test will use the annual fixed overhead rate.

2 Main Extension Capital Cost greater than \$25,000:

- 3       • The MX Test will calculate the overhead rate as set out in the formula below.

$$Z = \text{Greater of } \left( \frac{X}{25,000^{-0.8}} \times Y^{-0.8} \right) \text{ OR } 4\%$$

4

5               Where:

6               X = Annual fixed overhead rate

7               Y = Capital cost of project (before overheads applied)

8               Z = Overhead rate used for this project in MX Test

#### 9       **4.4.2 Proposed Update Has Minimal Impacts on CIAC, Aggregate PI or RIA**

10 Consistent with previous MX Test applications, FEI is proposing to update the sliding-scale  
11 overhead formula in the MX Test to reflect the latest information. This proposed update has an  
12 immaterial impact on the aggregate PI, the CIAC requirement or the RIA results. Using the 2025  
13 MX Test data, if the updated sliding scale formula were applied, the aggregate PI would have  
14 changed from 2.15 to 2.18, and the aggregate CIAC requirement would change from  
15 approximately \$0.980 million to approximately \$0.950 million. If the proposed update to the sliding  
16 scale formula was applied to the MX Tests from 2017 to 2025, the RIA result would have only  
17 changed by approximately 0.001 percent.

#### 18       **4.5 MX TEST SHOULD CONTINUE TO EXCLUDE COMMODITY COSTS**

19 In Letter L-11-25, the BCUC directed FEI to analyze the potential “inclusion of the marginal cost  
20 of serving all new load from renewable gases (e.g. Renewable Natural Gas, Hydrogen) compared  
21 to conventional natural gas to meet government low-carbon policies”. FEI has performed the  
22 BCUC-requested analysis below. The mathematical result of including commodity costs in the  
23 MX Test would be to make it much easier for new customers to connect, to the point where most  
24 new customers could end up paying no CIAC at all. Irrespective of these results, there are several  
25 rate design reasons why including RNG costs in the MX Test would be unreasonable.

#### 26       **4.5.1 Including Renewable Gas or Other Commodity Costs in the MX Test is** 27               **Not Supported by Rate Design Principles**

28 The inclusion of renewable gas in the MX Test or SLCA would be inconsistent with FEI’s rate  
29 structure and rate design principles. FEI is not aware of any natural gas utility that includes its  
30 commodity costs (conventional or renewable natural gas) in its MX test calculations.

1 **4.5.1.1 Incorporating Commodity Costs, Whether Conventional or Renewable**  
2 **Gas, Is Inconsistent with FEI's Unbundled Rate Structure**

3 FEI's MX and Connection Policies are designed to recover from new customers an appropriate  
4 portion of the costs of providing a physical connection to the gas system. The costs of providing  
5 a physical connection include all the capital, materials and labour required to provide the  
6 connection, and are incurred at the time that the physical connection is provided. FEI's unbundled  
7 rate structure means that the recovery of infrastructure-related costs occurs through the basic,  
8 demand and delivery charges, whereas all commodity costs (both midstream (MCRA) and cost  
9 of gas (CCRA)) are recovered through separate charges. Accordingly, commodity costs are  
10 excluded from the MX Test, irrespective of the type of commodity.

11 **4.5.1.2 Incorporating Commodity Costs, Whether Conventional or Renewable**  
12 **Gas, Is Inconsistent with Cost Causation**

13 Excluding commodity costs from the MX Test and SLCA is consistent with cost causation. The  
14 MX Test and SLCA include costs that are incurred as a result of (i.e., are caused by) the decision  
15 to initiate a main extension or service line connection and a forecast of revenues that recover  
16 those costs. A new main extension or service line would enable the use of the commodity;  
17 however, it does not cause the commodity to be procured or consumed. Instead, commodity costs  
18 are caused by the decision to consume the commodity. They are incurred when a customer uses  
19 the commodity at some time in the future and can be avoided when a customer consumes less  
20 natural gas or leaves the system either by discontinuing service or removing their connection.  
21 This same logic applies regardless of whether the commodity is natural gas or low carbon gases  
22 such as RNG or hydrogen.<sup>63</sup> The costs of a main extension or service line are no different if the  
23 customer uses conventional gas or a low carbon gas.

24 **4.5.1.3 Incorporating Renewable Gas Costs Is Inconsistent with the Established**  
25 **Use of Marginal Costs**

26 The marginal cost methodology, as noted by the BCUC in Letter L-11-25, is intended to reflect  
27 the cost of serving one additional unit using least cost system optimization under existing  
28 obligations. RNG is more expensive than conventional natural gas, is supply constrained, is  
29 contractually limited, and is capped in the *Greenhouse Gas Reductions (Clean Energy)*  
30 *Regulation* (GGRR). RNG cannot be considered marginal if it would not be selected in a least  
31 cost solution absent legislative mandates. Its cost reflects policy preference, not marginal cost  
32 economics.

33 **4.5.1.4 Recovering Renewable Gas Costs from Only New Customers Would Be**  
34 **Unduly Discriminatory**

35 Applying RNG costs to only new connections would impose higher costs on a narrow subset of  
36 customers to satisfy system wide environmental objectives of reducing GHGs. The environmental

---

<sup>63</sup> Due to the fact that FEI produces RNG (has invested in production infrastructure) and that the RNG market is less liquid, the ability to avoid the cost of RNG is slightly less than the ability to avoid the conventional natural gas.

1 benefits of RNG accrue system-wide and should not be attributable exclusively to new customer  
2 load. Therefore, RNG costs should be spread broadly, which FEI does by way of its Storage and  
3 Transport (S&T) RNG Rider.

#### 4 **4.5.2 Including Commodity Costs in the MX Test Would Reduce CIACs**

5 If commodity costs were incorporated in the denominator (costs) of the MX Test, then the MX  
6 Test would also need to include the recovery of commodity costs (revenues) in the numerator.  
7 Regardless of whether conventional gas costs or RNG were considered in the MX Test, the effect  
8 of including these costs is that all PI scores would tend towards 1.0. If an MX Test's PI score is  
9 below 1.0, adding the commodity cost into the denominator (incremental cost) and numerator  
10 (incremental revenue) would increase the PI score. Conversely, if an MX Test's PI score was  
11 initially above 1.0, these added commodity costs and revenues would decrease the PI score. This  
12 is demonstrated in Table 4-12 below using the results of two of FEI's 2025 MX Tests to show how  
13 the PI tends towards 1.0 when commodity costs are added into the MX Test.

14 **Table 4-12: Effect on PI and CIAC of Adding Commodity into MX Test (\$)**

		Existing (w/o Commodity)		Total (w/ Commodity)			
MX Test Example 1	PV Cash Inflow	\$	48,029	\$	19,172	\$	67,201
	PV Cash Outflow	\$	62,199	\$	19,172	\$	81,371
	<b>PI</b>		<b>0.77</b>		<b>1.00</b>		<b>0.83</b>
	<b>CIAC Required to Achieve PI of 0.8</b>	<b>\$</b>	<b>1,730</b>	<b>Not Required</b>		<b>Not Required</b>	
MX Test Example 2	PV Cash Inflow	\$	400,786	\$	124,146	\$	524,932
	PV Cash Outflow	\$	232,689	\$	124,146	\$	356,835
	<b>PI</b>		<b>1.72</b>		<b>1.00</b>		<b>1.47</b>
	<b>CIAC Required to Achieve PI of 0.8</b>		<b>Not Required</b>		<b>Not Required</b>		<b>Not Required</b>

15  
16 Essentially, introducing commodity costs in the MX Test would result in new customers that would  
17 have been required to provide a CIAC contributing less towards a main extension. This is because  
18 if an existing MX Test has a PI score below the minimum individual threshold of 0.8, then adding  
19 commodity costs to both costs and revenues would increase the PI score. This reduces the CIAC  
20 requirement, or potentially eliminates the need for a CIAC altogether if the PI score increases to  
21 above 0.8. Using the actual 2025 MX Tests, when the commodity cost<sup>64</sup> is added, the required  
22 CIACs decreased from \$0.98 million to \$0.61 million. Further, if FEI used the cost of RNG in the  
23 MX Test instead of conventional gas, almost all of the 2025 MX Test CIACs would be reduced to  
24 zero dollars.

<sup>64</sup> FEI used \$2.00 per GJ as a commodity cost.

## 4.6 *DOLLAR OR FOOTAGE ALLOWANCE ALTERNATIVES TO THE MX TEST WOULD NOT ADD VALUE*

Section 4.1 discussed why the MX Test remains an appropriate rate structure for addressing the fundamental ratemaking purpose of promoting equity among customers. At the BCUC's direction, FEI has considered as an alternative to the existing MX Test: "a mechanism where FEI contributes a set amount towards each mains extension, either in dollars or metres of pipe, with the balance recovered from the customer."

For completeness, FEI has considered two MX Allowance Alternatives, one expressed in dollars (MX Dollar Allowance Alternative) and one expressed in length of pipe (MX Footage Allowance Alternative). While all of the major Canadian gas utilities (with the exception of ATCO) included in FEI's jurisdictional review use the DCF methodology for main extensions, these alternative approaches are commonly used to determine the service line connection allowances for in-fill customers. For instance, the MX Dollar Allowance Alternative would be similar in concept to FEI's SLCA only applied to main extensions instead of in-fill customers. The MX Footage Allowance Alternative is similar to what Enbridge Gas Distribution uses for its service line connections allowance. As discussed below, introducing either of these approaches would introduce complexity without commensurate value.

### 4.6.1 Description of the MX Dollar Allowance Alternative

FEI could determine an MX Dollar Allowance through the current MX Test methodology, using the average residential and small commercial consumption volumes, and solving for a corresponding target average cost for the installation of mains, service lines and meters required to complete a main extension request. The target average cost would then need to be compared to the costs from actual main extension projects from the previous year to determine the maximum allowable cost. The maximum allowable cost represents the maximum amount that FEI could invest per main extension with the expectation that the actual average cost of all installed main extensions would equal the target average cost. The result would be expressed as the allowable dollar amount and could be updated annually as with the SLCA. In cases where multiple premises wish to connect to the same main extension, the cost allowances would be additive. In situations where the estimated cost of the main extension requests exceeds the cost allowance, a CIAC would be required for the main extension to proceed. The required PI threshold would be per the BCUC-approved value for main extension projects.

FEI would develop MX Dollar Allowances for both residential and small commercial customers separately, as this would provide small commercial customers with the full benefit of their forecast gas loads, while ensuring that residential main extension requests are not credited with excess value. As discussed in Section 4.6.3 below, this approach could not be used for large commercial or industrial loads; FEI would need to continue using the existing methodology for those additions.

Due to the limitations of FEI's information systems, FEI is unable to complete a detailed analysis of this alternative to the MX Test, including the impact on the CIAC requirement and the rate

1 impact. This is because FEI's information system for keeping all records of MX Tests was not set  
2 up to readily extract the number and type of customers attaching to each individual main extension  
3 project. This information can only be extracted manually, which would be challenging and overly  
4 burdensome given there were 400 to 1,000 MX Tests completed each year from 2017 to 2025.  
5 Without this information, FEI cannot determine, for example, each customer's share of a given  
6 main extension's cost.

7 FEI also notes that, given the limitations of its MX Test information system, it would be unable to  
8 implement an MX Dollar Allowance alternative to the MX Test at this time. FEI would have to incur  
9 costs to upgrade/modify the existing system in order to properly apply the MX Dollar Allowance  
10 to each connecting customer.

#### 11 **4.6.2 Description of the MX Footage Allowance Alternative**

12 The allowance could also be expressed in terms of an allowable footage that would be free of  
13 charge. The MX Footage Allowance would be in reference to the distance between the point of  
14 connection to an existing main, and the inlet of the gas meter located at the customer's premise.  
15 The allowable length would be determined in the same manner as described above for the MX  
16 Dollar Allowance, with one additional step at the end of the process. The additional step would  
17 involve converting the MX Dollar Allowance into a length allowance by dividing the cost allowance  
18 by FEI's average total main extension cost per meter. As with the MX Dollar Allowance described  
19 above, any required length in addition to the MX Footage Allowance would be subject to a CIAC  
20 calculated as a per meter charge on the excess. The MX Footage Allowance could be updated  
21 every year and be based on FEI's average per meter cost to install mains, plus FEI's average per  
22 meter cost to install service lines and meters for residential or small commercial customers.

23 Similar to the MX Dollar Allowance, the current limitations of FEI's information systems do not  
24 allow FEI to readily export the total footage between each point of connection (including service  
25 lines) to the existing main for each MX Test without going through a manual extraction process.  
26 As such, FEI is unable to provide a detailed analysis of this alternative in terms of the CIAC  
27 requirement and rate impact. Given the limitations of the existing MX Test information system,  
28 FEI would need to incur costs to upgrade/modify the existing system in order to properly apply  
29 the MX Footage Allowance to each connecting customer.

#### 30 **4.6.3 FEI's Assessment of the MX Allowance Alternatives**

31 FEI believes customers will see the greatest value in retaining the existing MX Test, versus  
32 introducing either the MX Dollar or Footage Allowance Alternatives. FEI's rationale is as follows:

- 33 • First, introducing either approach would not eliminate the need for the MX Test. These  
34 methodologies both rely on the type of calculation inherent in the existing MX Test.  
35 Moreover, the two MX Allowance Alternatives could only be available to customers  
36 requesting service under either RS 1 (Residential) or RS 2 (Small Commercial). This is  
37 because large volume commercial and industrial customers have greater variability in their  
38 annual gas consumption and associated main, service line and meter requirements. As a

1 result, it is not possible to develop a main extension allowance (in dollars or footage) that  
2 could reasonably act as a proxy for the costs incurred for all larger volume customer main  
3 extension requests. This adds complexity to the analysis, since main extensions can  
4 include new attachments from various customer classes. In cases where large commercial  
5 or industrial customers attach to the same extension as small commercial or residential  
6 customers, for accuracy and reasonableness, FEI would need to need to continue to use  
7 its existing MX Test for these large commercial or industrial customers, resulting in two  
8 connection cost mechanisms operating in parallel to evaluate a single main extension.  
9 This would likely create customer confusion and reduce customers' ease of  
10 understanding.

11 • Second, switching from the MX Test to the MX Dollar Allowance Alternative would not lead  
12 to any appreciable administrative efficiencies for FEI. Customers need to know up front if  
13 a CIAC is required and, if so, the amount of the CIAC. While the allowance is known, FEI  
14 would still have to forecast the cost of the installation to which the allowance would then  
15 be applied. The result of this calculation, when compared to the MX Dollar Allowance,  
16 determines the amount of CIAC. The work required to estimate the cost of the installation  
17 would be the same as how the process works today to perform the MX Test.

18 • Third, in the case of an MX Footage Allowance, FEI would not do any work to estimate  
19 the cost of a main extension project. Extension requests would be evaluated only in terms  
20 of the estimated extension length versus the length allowance. In this case, the evaluation  
21 would not account for site-specific conditions that could result in abnormally high  
22 installation costs (e.g., excess rock, stream or river crossings, archaeological findings,  
23 significant asphalt or concrete work, expensive permitting, or off-hours work  
24 requirements).

25 • Fourth, adopting either an MX Dollar Allowance or MX Footage Allowance would  
26 complicate the use of the SEF. The MX Allowance Alternatives do not require FEI to run  
27 full MX Tests for individual main extension projects for residential or small commercial  
28 customers. Since FEI would not perform individual MX Tests, it would not know the PI  
29 score for each main extension request; therefore, FEI would have no basis on which to  
30 award SEF (CIAC) support to individual main extension requests. While FEI could run  
31 individual MX Tests to resolve this problem, this would be an additional step that would  
32 defeat the purpose of an MX Dollar Allowance or MX Footage Allowance in the first place.

33 • Finally, as highlighted above, although FEI collects information on the number of  
34 customers, types of customers, and the length of connections estimated at the time of the  
35 MX Test, the system was never set up to apply an MX Dollar Allowance or an MX Footage  
36 Allowance based on this information. FEI would therefore have to incur additional costs to  
37 upgrade/modify its existing software system to enable the implementation of either an MX  
38 Dollar Allowance or an MX Footage Allowance.

1 Based on the points above, FEI does not consider that either the MX Dollar Allowance or the MX  
2 Footage Allowance offers sufficient incremental value to warrant switching from the current well-  
3 functioning MX Test.

#### 4 **4.7 IMPACT OF ALL MX TEST PROPOSALS**

5 As set out in the above sections, FEI is proposing the following changes to the MX Test:

- 6 1. Lower the PI threshold for individual MX Tests from 0.8 to 0.6; and
- 7 2. Update the sliding scale overhead formula to reflect recent actual overhead costs.

8 Using the 2025 MX Test data for illustration, Table 4-13 below shows the combined effect of FEI's  
9 proposed changes to the 2025 aggregate PI (net of CIAC), the number of projects requiring CIAC,  
10 and the aggregate CIAC requirement.

11 **Table 4-13: Illustration of Changes in Aggregate PI and CIAC Requirements (Aggregate, Average,  
12 and Highest) Under the Combined Proposed Changes (Based on 2025 Data)**

	Aggregate PI (net of CIAC)	Projects Requiring CIAC	Percentage of Projects Requiring CIAC	Aggregate CIAC Requirement (\$)	Average CIAC Requirement (\$)	Highest CIAC Requirement (\$)
Current	2.15	71	18%	\$ 980,532	\$ 13,810	\$ 102,294
Incremental Change:						
1) Lower Individual PI Threshold to 0.6	(0.01)	(28)	-7%	\$ (586,882)	\$ (4,656)	\$ (44,476)
2) Update Overhead Sliding Scale Formula	0.03	(1)	0%	\$ (6,440)	\$ 65	\$ (2,517)
<b>Proposed (Combined)</b>	<b>2.17</b>	<b>42</b>	<b>10%</b>	<b>\$ 387,210</b>	<b>\$ 9,219</b>	<b>\$ 55,301</b>

13  
14 Tables 4-14 and 4-15 below also provide the combined effects to the aggregate PI (net of CIAC)  
15 and the RIA results, respectively, if the combined proposed changes were applied to the MX Test  
16 data from 2017 to 2025. The analysis assumes all projects from the 2017 to 2025 MX Tests data  
17 proceeded regardless of the changes to their individual CIAC requirement, without assuming  
18 additional projects would have gone ahead if the proposed changes were in place at those times.

19 FEI notes that as discussed in Sections 4.3.3.3 and 4.4.2 above, although both changes will  
20 ultimately reduce the overall CIAC requirement, the proposal for reducing the individual PI  
21 threshold will reduce the aggregate PI while the update to the overhead sliding scale formula will  
22 increase the aggregate PI (reduce the overall costs in the denominator of the calculation of the  
23 PI). As such, depending on the mix of the projects each year, the aggregate PI could increase or  
24 decrease slightly.<sup>65</sup> However, regardless of the mix of the projects, the proposed changes would  
25 collectively only have a minor impact on the aggregate PI and on delivery rates, as shown in the  
26 tables below.

<sup>65</sup> For example, if a particular year had more projects with costs over \$25,000 (e.g., 2025), then the impact on the aggregate PI due to the changes to the overhead sliding scale (which only impacts projects with costs over \$25,000) would be bigger than those years where there were fewer projects over \$25,000.

1 **Table 4-14: Combined Impact of Proposed Changes to the Aggregate PI from 2017 to 2025**

Year	Combined Impact	
	Current	Proposed
2017	4.20	4.17
2018	1.82	1.81
2019	1.87	1.86
2020	2.00	1.98
2021	2.12	2.13
2022	1.91	1.91
2023	2.00	2.00
2024	1.97	1.98
2025	2.15	2.17

2  
 3 **Table 4-15: Estimated Combined Rate Impacts due to Proposed Changes to MX Test (Based on**  
 4 **2017-2025 RIA Results)**

2017-2025 RIA	Combined Impact	
	Current	Proposed
Average Cost per GJ with Growth	\$ 6.715	\$ 6.715
Average Cost per GJ without Growth	\$ 6.833	\$ 6.831
Rate Impact per GJ	\$ (0.118)	\$ (0.116)
Percentage Rate Impact	-1.72%	-1.69%
Change in Percentage Rate Impact from Current	0.00%	0.03%

5  
 6 FEI provides annual reporting on the individual and aggregate PI such that the BCUC will be able  
 7 to monitor performance. FEI is also proposing to file an updated RIA seven years after a decision  
 8 on this Application.

## 1 5. SERVICE LINE COST ALLOWANCE REVIEW

2 This section addresses the SLCA with a specific focus on the issues that the BCUC identified in  
3 Letter L-11-25. As described in Section 2.2.2, the SLCA represents the maximum allowance FEI  
4 will extend to each single family residential or small commercial “infill” customer connecting to an  
5 existing main. The SLCA is derived using the MX Test methodology and similarly serves as a  
6 financial evaluation tool to determine whether the customer should provide a CIAC. It uses actual  
7 average cost and consumption data from the previous year. Conceptually, the current SLCA  
8 represents a value where the average revenue from new residential connections will equal the  
9 average cost to install a service line and meter, plus an allocated average mains cost (i.e., yield  
10 a PI ratio of 1.0).

11  
12 The SLCA continues to serve its intended rate design purpose, such that this longstanding  
13 approach should be largely maintained. FEI proposes two changes to the determination of the  
14 SLCA that will improve its performance:

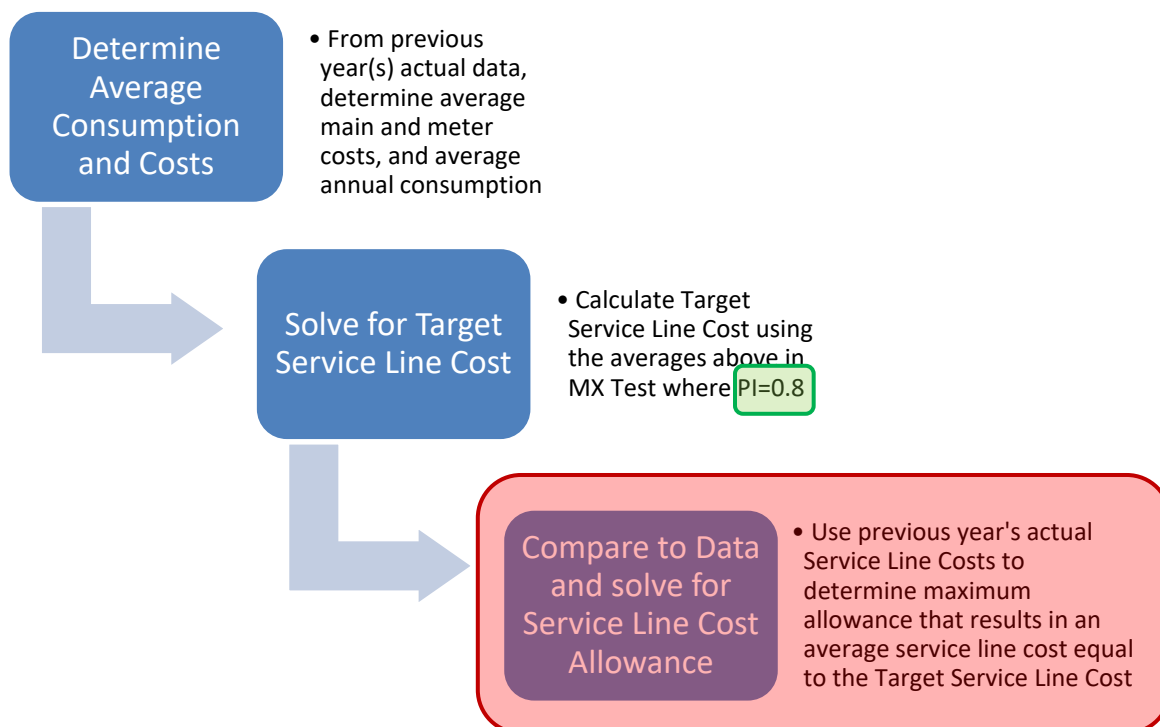
15 1. **Remove the final step of the SLCA calculation:** While the logic behind the SLCA  
16 methodology remains sound, the final step of the calculation has often yielded invalid  
17 results, requiring a work-around. Setting the SLCA at the Target Service Line Cost (which  
18 is the result of the first two calculation steps) is an easy fix and was used successfully as  
19 a work-around in the years 2019 to 2023 when this issue previously arose. Making this  
20 methodological change permanent will avoid the need for a work-around, simplify the  
21 SLCA calculation, and make the results more stable from year to year.

22 2. **Lower the SLCA target PI by 0.2 (from 1.0 to 0.8):** Changing the PI target in the SLCA  
23 has a similar directional impact as in the MX Test. This proposal to reduce the SLCA target  
24 PI will help to address the results of the RIA that indicate new customers are bearing a  
25 disproportionate share of the main and connection costs.

26 The following figure, which is based on Figure 2-1 in Section 2.2.2, shows FEI’s proposed  
27 changes to the SLCA methodology in red.

1

Figure 5-1: SLCA Proposals



2

3 This section is organized as follows:

- 4 • **Section 5.1:** As required by Letter L-11-25, FEI provides 2019 to 2024 information on the  
5 SLCA and a discussion of the rationale for an SLCA. The SLCA has proven to be a  
6 practical and efficient means of determining the CIAC for infill customers and only  
7 refinements are required.
- 8 • **Section 5.2:** FEI's proposal to remove the final step of the SLCA calculation, so as to set  
9 the SLCA at the Target Service Line Cost, is a reasonable and straightforward means of  
10 addressing the calculation issue.
- 11 • **Section 5.3:** Reducing the PI threshold by 0.2 (from 1.0 to 0.8) is warranted. The fact that  
12 the SLCA threshold PI has remained at 1.0, rather than being reduced in 2007 along with  
13 the individual PI threshold in the MX Test, has likely contributed to the RIA results showing  
14 over-collection of costs from new customers.
- 15 • **Section 5.4:** The cumulative impact of the two SLCA proposals will directionally be to shift  
16 costs from new infill customers to existing customers, though the impact on delivery rates  
17 is expected to be minor.
- 18 • **Section 5.5:** The BCUC has requested an analysis of alternatives to the SLCA. FEI's  
19 assessment is that replacing the SLCA with another approach, while feasible, would add  
20 complexity without benefit. Charging a fee to all connecting customers would exacerbate

1 the current issue, evident from the RIA results, that new customers are bearing a  
2 disproportionate share of connection costs.

### 3 **5.1 SLCA INFORMATION AND ANALYSIS REQUESTED BY THE BCUC**

4 This section provides the information on the SLCA that was requested by the BCUC in Letter L-  
5 11-25. Specifically:

- 6 • SLCA changes for the period 2019 to 2024 and a discussion of the reasons driving these  
7 changes (see Section 5.1.1);
- 8 • An analysis of actual costs to connect new residential customers for the period 2019 to  
9 2024 (see Section 5.1.2); and
- 10 • A discussion of the rationale for an SLCA (see Section 5.1.3).

#### 11 **5.1.1 SLCA Changes for the Period 2019 to 2025**

12 Table 5-1 below sets out the SLCA for the period 2019 to 2025. The annual changes in the SLCA  
13 are driven by variations in the inputs to the MX Test used to determine the SLCA from year to  
14 year. FEI is required to update the inputs annually, which ensures that the SLCA, and  
15 consequently the CIAC determination, is based on the most currently available information. This  
16 helps to promote equity between new and existing customers.

17 **Table 5-1: SLCA Changes from 2019 to 2025**

Year	SLCA
2019	\$ 2,414
2020	\$ 2,915
2021	\$ 3,080
2022	\$ 3,325
2023	\$ 3,925
2024	\$ 3,312
2025	\$ 3,875

18  
19 Summary tables showing the annual inputs to the MX Test are provided in Appendix D. While  
20 nearly all the inputs to the MX Test have experienced changes over the years, the key inputs are  
21 described below.

22 The following inputs have affected the revenue side of the MX Test used to set the annual SLCA:

- 23 1. Average Consumption per Customer: The average gas consumption used in the  
24 determination of the SLCA has experienced a progressive decline over the 2019 to 2025  
25 period. This trend can be seen in the tables in Section 3.2 of Appendix D. Declining  
26 average consumption per customer reduces the revenue side of the MX Test equation  
27 and puts downward pressure on the resulting SLCA.

1 2. Delivery Charge: In contrast to the declining average consumption per customer, FEI's  
2 delivery charge has experienced increases. This trend can be seen in Section 3.1 of  
3 Appendix D. An increasing delivery charge will tend to increase the revenue side of the  
4 MX Test equation, causing an increase to the resulting SLCA. The drivers of the annual  
5 delivery rate changes are discussed in detail in each of FEI's revenue requirement  
6 applications (i.e., the Annual Review processes during the 2014 to 2025 period).

7 3. System Improvement (SI) Charge: The SI Charge has experienced significant variability  
8 during the 2014 to 2025 period, as shown in Table 10 of Appendix D. The SI Charge acts  
9 as a reduction to revenues in the MX Test. Decreases to the SI Charge will therefore have  
10 the effect of increasing net revenues (increasing the SLCA), while increases to the SI  
11 Charge decrease the SLCA. The variations in the SI Charge are primarily driven by  
12 changes in FEI's forecast of system improvement expenditures as well as changes in  
13 FEI's forecast growth in its peak day demand. Please refer to Section 3.5 of Appendix D  
14 for a discussion on how these two factors change over time in the calculation of the SI  
15 Charge.

16 4. Discount Rate: The discount rate used in the MX Test has generally declined since 2019,  
17 with slight increases occurring in 2024 and 2025. The annual discount rate is shown in  
18 Table 1 of Appendix D. As set out in Section 2 of Appendix D, FEI's discount rate used in  
19 the MX Test is inflation adjusted. Lower discount rates will tend to increase the revenue  
20 side of the MX Test equation, causing an increase to the resulting SLCA. This is due to  
21 the revenue side of the DCF analysis being less discounted as the rate is reduced.

22 The cost side of the MX Test used to set the annual SLCA has been affected primarily by the  
23 following input:

24 1. Mains and Meters: In recent years the cost to install mains and meters has increased with  
25 the overall inflationary costs experienced in British Columbia. The increased costs reduce  
26 the net benefits of the calculation and put downward pressure on the resulting SLCA.

### 27 **5.1.2 Actual Costs to Provide Service Connections to New Residential** 28 **Customers for 2019 to 2025**

29 Table 5-2 below summarizes the actual costs to provide service connections to new residential  
30 customers for 2019 through 2025. FEI has also included the actual costs to provide service  
31 connections to small commercial customers for the same period. The data presented below is  
32 based on the total cost of providing new service lines and meters for premises that are eligible to  
33 receive gas service under RS 1 and 2, specifically:<sup>66 67</sup>

<sup>66</sup> FEI RS 1 Residential Service, available at: [rateschedule\\_1.pdf](#).

<sup>67</sup> FE RS 2 Small Commercial Service, available at: [rateschedule\\_2.pdf](#).

- 1 • single-family residences, separately metered single-family townhouses, rowhouses,  
2 condominiums, duplexes and apartments and single metered apartment blocks with four  
3 or less apartments; and
- 4 • customers with a normalized annual consumption at one premises of less than 2,000 GJ  
5 of firm gas, for use in approved appliances in commercial, institutional or small industrial  
6 operations.

7 The data presented in the table below shows the average total costs for all new service lines (both  
8 on-main service lines covered by the SLCA and service lines associated with main extension  
9 projects). FEI’s database does not distinguish between the two scenarios and therefore does not  
10 allow FEI to provide the average total costs for new service line installations covered by the SLCA  
11 only. The data presented in the table below is therefore not directly comparable to the SLCA table  
12 above, which applies only to on-main service line installations.

13 **Table 5-2: Actual Gross<sup>68</sup> Connection Costs for New Residential and Small Commercial**  
14 **Customers from 2019 to 2025**

Year	Residential Average Cost	Small Commercial Average Cost
2025	\$4,038	\$6,683
2024	\$3,677	\$4,803
2023	\$3,564	\$4,054
2022	\$3,070	\$4,624
2021	\$2,697	\$4,565
2020	\$2,489	\$3,735
2019	\$2,356	\$3,752

15

16 As the data in Table 5-2 above shows, while the cost to provide new connections has increased  
17 from 2019 to 2025, the year-over-year increases have not been steady or predictable. Costs grew  
18 most rapidly for residential connections in 2022 and 2023 during and immediately after the  
19 COVID-19 pandemic, which FEI believes is generally consistent with cost increases experienced  
20 throughout BC during this period. As FEI noted in the 2023 Main Extension Report:<sup>69</sup>

21 The increase in capital expenditure is primarily attributable to high inflationary  
22 [pressures] that continued into 2023...

23 Higher inflationary pressure in construction costs has a direct impact on the cost  
24 of materials provided by FEI (such as pipes, meters and asphalt) as they are  
25 subject to market rates. Furthermore, as identified in FEI’s Annual Review for 2023  
26 Delivery Rates, one contributor to the inflationary increases was the new Mains  
27 and Service (M&S) construction contracts that were put in place in 2022. The new

<sup>68</sup> Gross Connection Cost is before any CIAC from a customer.

<sup>69</sup> 2023 Main Extension Report, p. 11.

1 contractor pricing reflected the inflationary pressure that was experienced by the  
2 contractors at that time with the full impact of the increase occurring in 2023.

3 ...FEI continued to experience increasing municipal building and permitting  
4 requirements which resulted in higher construction costs. Examples of additional  
5 costs incurred by FEI included night shift work imposed by a municipality with  
6 restrictions on day shift hours, additional costs for redesigning alignment due to  
7 local municipality requests to reserve space for future possible city utilities,  
8 additional costs due to requirements by the local municipality for full lane paving  
9 (as opposed to re-paving trench widths), greater asphalt thicknesses, and  
10 additional soil contamination testing and disposal.

11 These costs drivers also impact the services line installations and meter  
12 installations, albeit to a lesser extent.

13 Costs for residential connections have continued to increase since 2023, due largely to the same  
14 factors identified in 2023, albeit at a reduced rate.

15 From 2019 to 2024, the average small commercial connection cost increased at an annual rate  
16 of approximately 4.2 percent. When 2025 is included, the annual rate rises to approximately 10.6  
17 percent. The increase in 2025 is largely explained by the combined effects of some higher cost  
18 service line installations in tandem with a significant drop – from an average of 438 connections  
19 per year from 2019-2023, to 350 in 2024 and then to 269 in 2025 – in the number of RS 2 service  
20 lines installed. With fewer projects, the average cost becomes more sensitive to higher cost  
21 projects and year-over-year variability.

### 22 **5.1.3 The SLCA Is a Practical and Efficient Means of Allocating Infill Customer** 23 **Costs**

24 The SLCA has been in use since 1996. The SLCA continues to serve its intended rate design  
25 purpose, such that this longstanding approach should be largely maintained. The SLCA has  
26 proven to be a practical and efficient means of apportioning the costs associated with connecting  
27 infill customers between the connecting customer (via a CIAC) and customers generally (via  
28 delivery rates).

29 The SLCA methodology advances multiple rate design principles:

- 30 • **Fair apportionment of costs / avoidance of undue discrimination (Bonbright**  
31 **Principles 2 and 8):** The SLCA is a means of allocating costs associated with connecting  
32 infill customers between the requesting customer (through a CIAC) and existing customers  
33 (through delivery rates). The SLCA is based on the MX Test methodology. The annual  
34 update process, based on actual data, allows the SLCA to respond dynamically to shifting  
35 costs and customer demand patterns.
- 36 • **Practical and cost-effective to implement (Bonbright Principle 5):** The SLCA  
37 methodology relies on actual customer data, and is based on the same basic calculations

1 used in the MX Test. The long history of using the SLCA facilitates its administration year-  
2 over-year.

- 3 • **Customer understanding and acceptance (Bonbright Principle 4):** The SLCA is easy  
4 to understand, as it produces a simple dollar allowance that FEI will contribute towards  
5 new in-fill customer connections. The dollar allowance is published in the Table of Charges  
6 in FEI's GT&Cs. The SLCA methodology has been unchanged since its approval in 1996.  
7 It has been reviewed in subsequent proceedings, including the 2007 and 2015 System  
8 Extension Applications, where the recommended changes were related to updating the  
9 input values rather than the methodology itself.

10 While FEI proposes to maintain the current SLCA methodology, FEI is proposing to remove the  
11 final step of the calculation, as described in the following section.

## 12 **5.2 ELIMINATING THE FINAL CALCULATION STEP MAINTAINS THE SLCA LOGIC,** 13 **SIMPLIFIES THE CALCULATION AND YIELDS MORE STABLE RESULTS**

14 FEI is proposing to set the SLCA based on the Target Service Line Cost, which essentially means  
15 using actual average cost and consumption information from the prior year to solve for the SLCA  
16 that will produce the desired PI. As described below, this means removing the final step of the  
17 SLCA calculation. While the logic behind the SLCA methodology remains sound, the final step  
18 can produce the invalid result that new infill customers would never have to contribute to a  
19 connection in those years. When this has arisen in the past, FEI has performed various work-  
20 arrounds in order to ensure that new infill customers would appropriately be required to contribute  
21 to connections. Removing the final step will avoid this issue in the future, while maintaining the  
22 logic of the SLCA, further simplifying the calculation, and making the results more stable from  
23 year to year.

### 24 **5.2.1 Summary of SLCA Methodology Steps**

25 The SLCA methodology is described in Section 2.2.2 (as well as the MX Test Technical Guide in  
26 Appendix A). The first and second steps of the SLCA methodology involve determining a Target  
27 Service Line Cost, which represents an amount that will result in a target PI (currently 1.0) when  
28 using the average residential consumption in the prior year, as well as the average cost of mains  
29 and meters from the prior year, as inputs to the MX Test.

30 Once the Target Service Line Cost is determined, the final step involves taking the actual service  
31 line cost data (before contribution) from the most recent year and determining the maximum  
32 amount that FEI can provide (i.e., the maximum allowance) such that the average service line  
33 cost (after contribution<sup>70</sup>) would equal the Target Service Line Cost. Conceptually, the final step  
34 represents a check using the actual service line cost data from most recent year.

---

<sup>70</sup> Based on the average of actual service line costs from two years prior. E.g., the 2025 SLCA was set at the end of 2024, thus the most recent year's actuals were from 2023.

## 5.2.2 Circumstances in Which the Final Step Can Produce an Invalid Result

The calculation issue with the final step has occurred when the actual average service line cost (before contribution) from all relevant service lines installed in the most recent year (the data set) is less than the calculated Target Service Line Cost. Since the actual average (before contribution) is less than the target amount, FEI cannot, based on the data, select a maximum allowance such that the average service line cost (after contribution) would be expected to equal to the calculated Target Service Line Cost.

Table 5-3 below provides a simplified example to illustrate the working of the final step of the SLCA methodology and demonstrate the invalid result that the final step would yield when the actual average (before contribution) is less than the target amount.

**Table 5-3: Demonstration of Invalid Result when Actual Average Less than Target**

Line	Particular	Reference	Actual Cost		Actual Cost (After CIAC)
			(Before CIAC)	CIAC Required	
			(a)	(b)	(c) = (a) - (b)
<b>When Average &gt; Target</b>					
1	Service Line 1	Actual	\$ 3,450.0	\$ 125.0	\$ 3,325.0
2	Service Line 2	Actual	\$ 3,550.0	\$ 225.0	\$ 3,325.0
3	Service Line 3	Actual	\$ 3,250.0	\$ -	\$ 3,250.0
4	Average	Average of Line 2 to 4	\$ 3,416.7		\$ 3,300.0
5					↓
6	Target Service Line Cost	Calculated via Proxy MX Test for a PI = 1.0	\$ 3,300.0		\$ 3,300.0
7	Max Allowance	Excel Solver for Average (After CIAC) equals the Target Amount	\$ 3,325.0		
<b>When Average &lt; Target</b>					
8	Service Line 1	Actual	\$ 3,000.0	\$ (176.7)	\$ 3,176.7
9	Service Line 2	Actual	\$ 3,250.0	\$ (176.7)	\$ 3,426.7
10	Service Line 3	Actual	\$ 3,120.0	\$ (176.7)	\$ 3,296.7
11	Average	Average of Line 10 to 12	\$ 3,123.3		\$ 3,300.0
12					↓
13	Target Service Line Cost	Calculated via Proxy MX Test for a PI = 1.0	\$ 3,300.0		\$ 3,300.0
14	Max Allowance	Excel Solver for Average (After CIAC) equals the Target Amount	\$ (176.7)		

It can be seen that when the average of actual service line costs (from most recent year's actuals) is less than the target service line costs (determined by a proxy MX Test with PI equal to 1.0), the final step of the SLCA methodology would mathematically return a negative allowance number which would be invalid and illogical to apply as an SLCA for new infill customers.

Table 5-4 below shows that from 2019 to 2025, the final step would only result in a valid maximum allowance (i.e., SLCA) for two out of the seven years (i.e., 2024 and 2025). FEI also notes that in cases where the average service line cost (before contribution) is slightly higher than the Target Service Line Cost, such as in 2021, the final step would yield an elevated maximum allowance of \$10,999, which would have essentially meant that all service lines in 2021 would be free of charge for all new connections.

1

**Table 5-4: SLCA Calculation from 2019 to 2025**

SLCA	Reference	2019	2020	2021	2022	2023	2024	2025
Average Annual Consumption (GJ)	7-year Average of Actual	72.0	68.6	66.6	66.4	65.7	65.8	64.9
Target Service Line Cost	Calculated via Proxy MX Test each year with PI = 1.0	\$ 2,414	\$ 2,915	\$ 3,080	\$ 3,325	\$ 3,925	\$ 2,654	\$ 3,051
Average Service Line Cost ( <i>Before Contribution</i> )	Average of Actuals before Contribution (from two years prior)	\$ 2,163	\$ 2,695	\$ 3,129	\$ 3,216	\$ 3,431	\$ 3,709	\$ 4,533
Average Service Line less than Target Service Line Cost?	Yea/No	Yes	Yes	No	Yes	Yes	No	No
Mathematically Calculated Maximum Allowance	Calculated by solving for the max allowance that would make the average service line cost ( <i>after contribution</i> ) equal to the target service line cost. Negative number means no valid allowance possible	\$ (252)	\$ (219)	\$ 10,999	\$ (109)	\$ (495)	\$ 3,312	\$ 3,875

2

3 When there are many relatively low-cost service lines installed in the previous year, the average  
 4 service line cost will likely be lower than the Target Service Line Cost determined by the MX Test  
 5 for a PI of 1.0, and the final step of the SLCA methodology will most likely produce an invalid  
 6 result. Conversely, when there are a higher number of relatively higher cost service lines installed,  
 7 the final step of the SLCA methodology will return a mathematically valid result. Essentially, based  
 8 on historical data, it would have been inappropriate for FEI to use the result from the final step of  
 9 the SLCA methodology without making ad-hoc adjustments, as discussed below.

10 **5.2.3 Previous Work-Arounds Have Ensured New Customers Make**  
 11 **Reasonable Contributions to the Cost of Connections**

12 FEI has used different work-arounds when the final step of the SLCA methodology has yielded  
 13 unreasonable results. The specific work-arounds have evolved over time, but all of them were  
 14 intended to yield a reasonable SLCA amount.

15 FEI highlighted the potential issue posed by the final step in the SLCA calculation in its 2007  
 16 Application:<sup>71</sup>

17 The companies have reviewed TGI's 2006 actual cost data to determine the  
 18 maximum allowance, or SLCA, based on the same methodology used in the 1996  
 19 application. This was done again by applying the current MX test to a single proxy  
 20 customer based on current inputs and 2006 normalized annual consumption of a  
 21 residential customer of 96.9 GJs.

22 As provided in Schedule 2 of Appendix 3, in 2006 TGI's average direct cost of new  
 23 main installation per customer service was \$620. When input into the current MX  
 24 test, this resulted in a target service line cost of \$1,170 to provide a PI of 1.0.  
 25 Schedule 3 in Appendix 3 provides a summary of all 2006 service line costs for

<sup>71</sup> 2007 Application, p. 14.

1 Rate 1 and Rate 2 Customers and shows that the average cost per service line  
2 prior to the consideration of any contributions was \$1,161. Since the average cost  
3 is less than the target rate of \$1,170, none of the 2006 service lines would have to  
4 be excluded to bring the average cost down to the target level. The maximum  
5 allowance based on this set of data would therefore be in excess of \$3,500.

6 In 2007, the difficulty of an unsolvable final step was resolved by the work-around of calculating  
7 the SLCA based on an average residential consumption that was less than that of the 2006  
8 normalized annual consumption of a residential customer of 96.9 GJ. Using 80 GJ in the SLCA  
9 analysis reduced the Target Service Line Cost enough that the final step of the SLCA calculation  
10 could be completed and produce a reasonable SLCA value.

11 In 2015, the issue of an unsolvable final step was again resolved by a work-around of adopting a  
12 lower average annual consumption value than the normalized average annual consumption of  
13 residential customers for the most recent year. In 2015, FEI proposed to use the actual normalized  
14 average annual consumption for customers that had attached from 2008 to 2014. In other words,  
15 FEI proposed using the average annual consumption of new residential customer attachments,  
16 instead of the average annual consumption of all residential customers.<sup>72</sup> New residential  
17 customer attachments used on average less natural gas than existing residential customers, and  
18 the difference was sufficient to make the final step in the SLCA calculation solvable.

19 The final step of the SLCA methodology was not able to yield a reasonable amount of maximum  
20 allowance in certain years between 2017 and 2023 due to the average service line cost being  
21 less than the calculated Target Service Line Cost. Given that FEI had already changed to use the  
22 actual normalized consumption for new residential customer attachments following the 2016  
23 Decision, it was not reasonable for FEI to further reduce consumption to address this issue. As a  
24 result, FEI used an alternative work-around by setting the SLCA equal to the Target Service Line  
25 Cost.

26 FEI notes that due to the significant increase in the average installed service line cost in recent  
27 years, the final step of the SLCA calculation yielded valid results in 2024 and 2025 (as shown in  
28 Table 5-4 above).

#### 29 **5.2.4 Eliminating the Final Step in the Methodology is a Simple Fix and** 30 **Preferable to Work-Arounds**

31 The issue discussed above has the potential to reoccur, and FEI cannot know in advance if the  
32 issue will be encountered. Rather than continuing to rely on work-arounds as has been necessary  
33 for many years, FEI has determined that the issue can be effectively resolved by eliminating the  
34 last step of the SLCA methodology. The effect of the change is that the SLCA will be set to match  
35 the Target Service Line Cost. That is, the SLCA would be the amount that will result in a PI of 1.0  
36 when using the average residential consumption as well as the average costs of mains and meters

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<sup>72</sup> Exhibit B-3, BCUC IR1 30.1.

1 as inputs to each year’s MX Test. This will simplify the SLCA calculation and make the results  
2 more stable and predictable year-over-year.

3 Table 5-5 below provides a comparison of the SLCA from 2019 to 2025 with and without the final  
4 step applied. It also includes a comparison to the approved SLCA amount from 2019 to 2025.

5 **Table 5-5: Comparison of SLCA from 2019 to 2025 between 1) Approved, 2) With the Final Step**  
6 **Applied, and 3) Without the Final Step Applied**

	SLCA	SLCA with	SLCA without
Year	Approved	Final Step Applied	Final Step Applied
2019	\$ 2,414	\$ (252)	\$ 2,414
2020	\$ 2,915	\$ (219)	\$ 2,915
2021	\$ 3,080	\$ 10,999	\$ 3,080
2022	\$ 3,325	\$ (109)	\$ 3,325
2023	\$ 3,925	\$ (495)	\$ 3,925
2024	\$ 3,312	\$ 3,312	\$ 2,654
2025	\$ 3,875	\$ 3,875	\$ 3,051

7  
8 Overall, FEI believes that the SLCA continues to serve its intended rate design purpose and  
9 advances a number of rate design principles (as discussed in Section 5.1.3). The SLCA enables  
10 FEI to efficiently review updated cost and consumption data and to produce an updated SLCA  
11 every year, which is easy for FEI to administer. The proposed removal of the final step ensures  
12 that the fundamental purpose and approach of the SLCA is maintained, while eliminating an  
13 aspect of the methodology that has yielded invalid results under certain circumstances.

14 **5.3 REDUCING THE SLCA THRESHOLD PI WILL HELP ACHIEVE A MORE**  
15 **EQUITABLE OUTCOME**

16 The RIA results indicating new customers are bearing a disproportionate share of the costs to  
17 connect (see Section 3) include infill customers that are subject to the SLCA. As described below,  
18 the fact that the SLCA threshold PI has remained at 1.0, rather than being reduced in 2016 along  
19 with the MX Test threshold PI, is likely contributing to these RIA results. FEI thus proposes to  
20 reduce the PI threshold by 0.2 (from 1.0 to 0.8) to promote a more equitable balance between  
21 new and existing customers.

22 **5.3.1 The Higher SLCA PI Threshold of 1.0 Is Contributing to the RIA Results**  
23 **Showing Cross-Subsidization of Existing Customers**

24 The SLCA amount is determined using the MX Test, modified to solve for a Target Service Line  
25 Cost (capital amount), instead of the PI, for an average residential customer. When the MX Test  
26 is used to evaluate a main extension request, the test uses forecast costs and revenues as inputs  
27 and solves for a PI score. The PI must be at least 0.8 for a main extension to proceed without a  
28 CIAC. When determining the SLCA, FEI uses the same MX Test but uses a PI of 1.0 as an input

1 (along with average residential gas consumption, meter costs, etc.), to solve for a Target Service  
2 Line Cost. In other words, when determining the SLCA, the ratio of the costs to the revenues of  
3 the average service line connection must equal 1.0. Because the SLCA test solves for capital  
4 costs where the PI equals 1.0, the SLCA calculation is more onerous for a new customer than  
5 when the test is used for evaluating a main extension (where the required PI is lower at 0.8).

### 6 **5.3.2 The Same Logic that Supported a Decreased MX Test PI Supports** 7 **Reduction in SLCA PI**

8 In 2016, FEI proposed (and the BCUC approved) changes to the MX Test in response to the RIA  
9 results suggesting that new customers were over-contributing under the MX and Connection  
10 Policies. FEI had not proposed changes in the SLCA methodology at that time; however, the  
11 same logic that supported the reduction of the individual PI threshold for the MX Test applies to  
12 the SLCA as well. With the latest RIA results showing that the imbalance has persisted (versus  
13 being addressed by the 2016 Decision changes), it is reasonable to revisit the PI threshold used  
14 in the SLCA.

15 FEI is proposing to lower the SLCA PI threshold by 0.2, from 1.0 to 0.8, rather than match the  
16 same PI of 0.6 as proposed for the MX Test. The intent is to move incrementally, recognizing that  
17 the various proposals will all have implications for the RIA results. The impact of changing the  
18 SLCA PI threshold from 1.0 to 0.8, on its own and collectively with other proposals affecting the  
19 SLCA, is illustrated in Table 5-6 below.

## 20 **5.4 IMPACT OF ALL SLCA PROPOSALS**

21 Table 5-6 below provides the historical SLCA amounts back to 2019 alongside the recalculated  
22 SLCA amounts for the same period, highlighting the cumulative effects of FEI's proposed  
23 changes. The table shows the following:

- 24 1. Removing the final step of the SLCA calculation (other things being equal) reduces the  
25 SLCA, thereby making it more costly (i.e., increase contribution requirement) for infill  
26 customers to connect.  
27
- 28 2. Reducing the PI to 0.8 increases the SLCA.

29 The cumulative impact of the proposals on the SLCA is in the right-hand column (i.e., 1 + 2).  
30 Based on the most recent year's data (2025), the SLCA would have been higher by \$1,545.

1 **Table 5-6: Historical vs Updated SLCA Amounts**

Year	SLCA Approved	1) SLCA without Final Step Applied (Proposed)	1) + 2) SLCA w/o Final Step and w/ PI Adjustment to 0.8
2019	\$ 2,414	\$ 2,414	\$ 3,486
2020	\$ 2,915	\$ 2,915	\$ 3,989
2021	\$ 3,080	\$ 3,080	\$ 4,370
2022	\$ 3,325	\$ 3,325	\$ 4,640
2023	\$ 3,925	\$ 3,925	\$ 5,392
2024	\$ 3,312	\$ 2,654	\$ 3,972
2025	\$ 3,875	\$ 3,051	\$ 4,596

2  
3 Table 5-7 below provides the combined effects on the RIA results if the proposed changes to the  
4 SLCA were applied from 2017 to 2025. The results demonstrate that although the directional  
5 impact of the proposed changes, other things equal, will be to shift costs from new infill customers  
6 to existing customers, the impact on delivery rates would be minor – approximately 0.03 percent  
7 based on the RIA results from 2017 to 2025. As previously explained in Section 4, since the  
8 aggregate CIAC is only approximately 3 percent of the total capital costs of all projects, any  
9 changes to the aggregate CIAC requirement would only have a minor impact on delivery rates  
10 when all other parameters such as the actual capital costs of each project as well as the  
11 incremental load of the new customer connections remain the same.

12 **Table 5-7: Estimated Combined Rate Impacts Due to Proposed Changes to SLCA (Based on 2017**  
13 **to 2025 RIA Results)**

2017-2025 RIA	Combined Impact of SLCA Changes	
	Current	Proposed
Average Cost per GJ with Growth	\$ 6.715	\$ 6.715
Average Cost per GJ without Growth	\$ 6.833	\$ 6.830
Rate Impact per GJ	\$ (0.118)	\$ (0.115)
Percentage Rate Impact	-1.72%	-1.69%
Change in Percentage Rate Impact from Current	0.00%	0.03%

14  
15 The next RIA will provide further insights on whether the changes proposed to the MX and  
16 Connection Policies in this Application have succeeded in balancing the interests of new and  
17 existing customers.

18 **5.5 JURISDICTIONAL REVIEW AND ANALYSIS OF ALTERNATIVE INFILL**  
19 **CUSTOMER CONNECTION POLICIES**

20 The BCUC has requested a jurisdictional review of connection policies, as well as “An analysis of  
21 alternate approaches to determining the connection charges, such as a connection fee based on  
22 a connection pipe length, e.g. Pacific Northern Gas’ connection fee of \$450 for the first 21 metres  
23 of underground pipe, or a connection fee based on service capacity.”

1 This section provides the requested analysis. As discussed below, FEI’s allowance approach is  
 2 similar to approaches used at other utilities, with an alternative approach being a mandatory fixed  
 3 fee for all customers in addition to any variable charges based on length of pipe or volume of  
 4 demand. Allowances and fees are, ultimately, different ways to accomplish the same purpose –  
 5 recover an appropriate share of connection costs from a connecting infill customer. FEI’s  
 6 assessment is that replacing the longstanding SLCA approach, while feasible, adds unnecessary  
 7 complexity and would lead to greater inequity between new and existing customers.

8 **5.5.1 Jurisdictional Survey on Connection Allowances and Fees**

9 As requested in BCUC Letter L-11-25, Table 5-8 below summarizes the results of the jurisdictional  
 10 comparison with Canadian gas utilities specifically as it relates to service line connection  
 11 allowances and fees. For comparison, FEI provides a cost allowance towards new customer  
 12 connections as determined by the results of (1) individual MX Tests for main extensions and  
 13 service line connections for large volume customers, or (2) the SLCA for single family residential  
 14 and small commercial customers. These allowances determine whether a connecting customer  
 15 must pay a CIAC for a new service line connection.

16 **Table 5-8: Jurisdictional Comparison of Service Line Connection Allowances and Fees**

ATCO	Energir	EGD	PNG
Mandatory connection fee for all customers. Amount varies based on location, service line diameter and footage as well as the work season (summer/winter)	\$300 connection fee if the annual volume is less than 10,950 m <sup>3</sup> ; for non-standard connections \$50 per m or determined on a case-by-case basis	Allowance of 20 m at no cost; customer pays \$170.06 per metre for services beyond 20 m in length	\$450 fee (plus tax) for up to 21 m of pipe, beyond 21 m additional \$10 per metre; for services requiring 66 mm pipe actual costs are collected

17  
 18 FEI’s review of customer connection policies at other Canadian gas utilities indicates that:

- 19 • As with FEI’s SLCA, other surveyed Canadian utilities typically allow for the potential  
 20 customers with standard pipe diameter specifications to attach to the system at a modest  
 21 extra cost (Energir, PNG) or no extra cost (EGD) if their footage/volume is not more/less  
 22 than certain pre-defined threshold.
- 23 • FEI’s approach of providing an allowance to an infill customer while recovering any excess  
 24 cost from the customer is also used at EGD. FEI’s allowance is expressed in dollars, while  
 25 EGD converts the contribution to a length; the effect is the same. In contrast, ATCO<sup>73</sup> and  
 26 PNG apply mandatory connection fees to all customers. Energir’s high annual volume  
 27 requirement makes its volume-based approach more comparable to ATCO’s and PNG’s  
 28 mandatory connection fee models since most residential and small commercial customers

<sup>73</sup> The majority of ATCO customers pay no fees for their main extension costs.

- 1 do not meet the specified annual forecast volume threshold of 10,950 m<sup>3</sup> (approximately  
2 405 GJ per year).
- 3 • The service line cost allowance and connection fees can vary based on multiple factors,  
4 including the working season, customers' location, expected annual volumes, service line  
5 diameter and/or footage.
- 6 For further discussion on policies related to infill customer connections, please see Appendix C.  
7 In the next section, FEI explains why it is more appropriate to retain its current approach.

### 8 **5.5.2 Fee Based Structures Would Be Inefficient and Undermine Equitable** 9 **Treatment of FEI's New and Existing Customers**

10 FEI's assessment is that replacing the SLCA approach with a connection fee, while feasible, is  
11 unnecessary and undesirable. Using the long history and data to refine the current SLCA, as  
12 proposed, is preferable to moving to an entirely new approach. The SLCA is based on sound  
13 logic, and the calculation issue that can arise with the final step can be easily rectified by  
14 eliminating that step. Moreover, adopting a fee-based structure would run counter to the objective  
15 of treating new and existing customers equitably. Under the existing approach, some customers  
16 do not need to pay a CIAC because the cost is less than the allowance. By contrast, a fee-based  
17 model (e.g., PNG's fixed connection fee) charges a fee to every new customer. This would  
18 compound the current issue highlighted by the RIA (see Section 3) that new customers are  
19 subsidizing the delivery rates paid by existing customers. The connection fees collected would  
20 need to be credited back to new connections to avoid making this situation worse.

## 6. SYSTEM EXTENSION FUND REVIEW

As described in Section 2.2.3, the SEF partially offsets CIACs that prevent or deter homeowners who are in low density areas from connecting to the natural gas system. The SEF has been in place since 2017. From 2017 to 2020 the fund operated as a pilot; however, the 2020 SEF Decision approved the SEF on a permanent basis.<sup>74</sup> This section addresses the BCUC’s requests in Letter L-11-25 to provide: (1) an analysis of the benefits and costs of the SEF; and (2) an updated SEF-specific RIA (SEF RIA) dated 2024 or later. This section also presents a proposal to allow small commercial customers to access the existing funding. The SEF continues to promote equity among customers at a reasonable cost, and making the funding available to small commercial customers will enhance that equity.

The section is organized as follows:

- **Section 6.1:** The SEF, since its inception, has helped over 1,300 homeowners access the system.
- **Section 6.2:** The benefit of the SEF is that it promotes equity among customers, as the BCUC articulated in the 2020 SEF Decision.
- **Section 6.3:** The annual cost of the SEF is \$1 million, which the BCUC previously characterized as “minimal and not unduly discriminatory”. The SEF RIA indicates that the customers added under the SEF thus far have resulted in only a 0.21 percent impact on delivery rates for existing customers.
- **Section 6.4:** FEI’s proposal to allow small commercial customers to participate in the program will extend the benefits of the SEF to small commercial customers that face high costs to connect due to their location.

### 6.1 REPORT ON THE SEF UPTAKE TO DATE

Table 6-1 shows the results of the SEF from its launch in 2017 through to the end of 2025. Since the launch of the SEF, 1,317 premises have been connected to the gas system, at a total cost, in the form of reduced CIAC recoveries, of \$4,677,554.

**Table 6-1: SEF Program Summary Results 2017 through 2025**

	<u>Total</u>	
<b>System Extension Fund</b>	Number of Application Received	1,317
	Number of Approved SEF Requests	1,317
	Value of Approved SEF Requests	\$ 4,677,554
	Number of Denied SEF Requests	-

<sup>74</sup> Decision and Order G-338-20, p. 16.

1 **6.2 BENEFITS OF THE SYSTEM EXTENSION FUND: PROMOTING EQUITY**

2 The BCUC articulated the benefits of the SEF in the 2020 SEF Decision, in which it approved the  
3 SEF as a permanent program. The BCUC made the following findings that are equally valid today:

- 4 • The SEF program promotes equitable access among residential ratepayers;
- 5 • The rate impact on non-participating ratepayers related to the SEF is minimal and is not  
6 unduly discriminatory; and
- 7 • Setting the SEF funding level at 95 percent of the CIAC results in greater equity among  
8 residential ratepayers and based on an analysis of the pilot data this funding level will  
9 enable FEI to manage the annual spending level within the annual \$1 million cap for a  
10 reasonable period.

11 The BCUC stated in part<sup>75</sup>:

12 The Panel finds the SEF program does promote equitable access among  
13 residential ratepayers. The data provided by FEI clearly highlights the disparity in  
14 average connection costs faced by ratepayers, most notably between urban and  
15 rural ratepayers. The SEF can help reduce the cost and eliminate a financial barrier  
16 for residential ratepayers facing a higher connection cost than those ratepayers  
17 who are closer to existing gas mains.

18 Ensuring such equitable access to service is desirable in ratemaking and should  
19 be weighed with other rate design principles. As BCOAPO points out, facilitating  
20 reasonable access to energy services is appropriate, especially when doing so  
21 comes at little cost to non-participating ratepayers. Further, the SEF's objective of  
22 providing equitable access is consistent with setting postage stamp rates which is  
23 an important consideration in setting utility rates in British Columbia.

24 While the Panel agrees with BCSEA that evidence of material economic and social  
25 benefits to remote communities could be a consideration in determining if  
26 continuing the SEF is in the public interest, it is only one factor that may be  
27 considered and the lack of such evidence does not mean there are not inherent  
28 economic benefits.

29 FEI agrees with the BCUC's determinations regarding the SEF's rate design purpose, and the  
30 considerations that informed the BCUC's evaluation. The SEF promotes more equitable access  
31 to the gas system among homeowners throughout FEI's service territory, especially new  
32 customers in lower density areas compared to those in urban areas. This approach is consistent  
33 with postage stamp rates, making service more cost effective for new customers in areas where  
34 there is a higher-than-average cost to connect.

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<sup>75</sup> 2020 SEF Decision, p. 7.

### 6.3 SEF RIA QUANTIFIES DELIVERY RATE IMPACTS TO DATE

The BCUC-approved annual SEF funding envelope included in FEI’s revenue requirements is \$1 million. However, the SEF RIA is a better indication of the overall impacts on delivery rates for existing customers, as it accounts for the costs and offsetting revenues over time that are associated with customers added using the SEF. As discussed below, the SEF RIA confirms that the cost of the SEF to non-participating customers has been minor to date, and the SEF connections could result in a net benefit to non-participating customers over time.

The SEF RIA is based on the data from all SEF participants from the inception of the pilot program in 2017 through the end of 2025, as summarized in Table 6-1 above. The following table provides an overall summary of the more detailed results of the SEF RIA provided in Appendix E.

**Table 6-2: SEF Rate Impact Analysis**

	2017-2025 9 Years
Average Cost per GJ with Growth	\$6.72
Average Cost per GJ without Growth	\$6.70
Rate Impact per GJ	\$ (0.014)
Percentage of Rate Impact	0.21%

The new connections that occurred under the SEF have led to a cumulative increase in FEI’s delivery rates of 0.21 percent or 1.4 cents per GJ to existing customers, compared to what the rate would have been had the SEF not existed and had the customer connections under the SEF not occurred. Based on an average residential customer’s annual gas consumption of approximately 90 GJ per year, this equates to approximately \$1.26 annually.

While the costs of the SEF have exceeded the associated revenues at this time, RIAs are a point-in-time analysis and look at a relatively short portion of the economic life of the gas system assets. As described in Section 3.1, the RIAs do not include all the load and customer attachments that occur over the useful life of the assets. In the context of system extensions that occurred under the SEF, a 9-year period is relatively short compared to the expected service lives of gas distribution assets. The mains, services and meters in the SEF RIA are, on average, only 4.5 years old and more load growth may occur over their full service life. It is therefore notable that the SEF RIA results show only a minor upward pressure on delivery rates. The SEF expenditures to date may ultimately result in some modest downward pressure on rates over time.

Further, the SEF expenditures and the SEF RIA are a subcomponent of the larger RIA discussed in Section 3, which shows that FEI’s delivery rates would have been 1.72 percent higher if there were no new connections from 2017 to 2025. Were the SEF attachments, revenue and costs excluded from the overall RIA results, the downward impact on rates for existing customers would have been even greater.

## 6.4 FEI PROPOSES TO EXPAND SEF AVAILABILITY TO SMALL COMMERCIAL CUSTOMERS

FEI proposes to allow small commercial customers to participate in the SEF, without increasing the overall SEF funding. FEI's proposal will promote equity among small commercial customers, consistent with FEI's postage stamp rate design. It will ultimately help to treat new and existing customers equitably.

The SEF is currently available to residential customers whose premises is in FEI's service territory. The residential customer's premises must be a separately metered single-family dwelling or townhouse, and it must be the customer's principal residence, occupied for the majority of the year. Also, the result of the economic test for the main extension must indicate a PI of greater than 0.2 and less than the individual PI threshold (currently 0.8, but proposed as 0.6) indicating that a CIAC is required.

The SEF has been limited to residential applications primarily because it was modeled on BC Hydro's Uneconomic Extension Assistance Program, which is not available to commercial enterprises. In response to CEC IR1 47.4 in the 2015 System Extension Application proceeding, FEI stated the following:<sup>76</sup>

...In general, residences are more likely to be located in less densely populated area, compared to commercial establishments. Because of the distance the main needs to be extended to serve these customers, the CIAC often becomes cost prohibitive.

...many large commercial and industrial customers have high energy requirements and given the large volume of consumption of these customers, a CIAC is often not required, as such they would not need access to the SEF funds.

However, the Company is not opposed to making the SEF available to commercial customers.

After experiencing several years of strong performance, participation rates in the SEF and the financial relief it provides to customers have decreased in recent years. FEI believes that this is consistent with the decline in new connections it has experienced generally during approximately the same time frame. For example, in 2025 the SEF provided only \$316 thousand in CIAC relief to eligible participants out of its total annual funding limit of \$1 million. In contrast, in both 2021 and 2022 the SEF provided \$939 thousand and \$875 thousand of relief, respectively. With the decline in participation from eligible residential customers there remains unused funding available within the approved \$1 million total funding envelope at the end of each year.

Expanding the eligibility of the SEF to include small commercial customers is an opportunity to increase participation rates in the SEF and contribute to the SEF's original objective of promoting

<sup>76</sup> Exhibit B-6: [https://docs.bcuc.com/documents/proceedings/2015/doc\\_44744\\_b-6\\_fei-cec-ir1-response.pdf](https://docs.bcuc.com/documents/proceedings/2015/doc_44744_b-6_fei-cec-ir1-response.pdf)

1 equity among customers. Small commercial customers are those who meet the eligibility to  
2 receive service under Rate Schedule 2 as described below:<sup>77</sup>

3 Customers with a normalized annual consumption at one premises of less than  
4 2,000 GJ of firm gas, for use in approved appliances in commercial, institutional or  
5 small industrial operations.

6 FEI proposes the fund would be offered to Small Commercial customers on the same terms  
7 currently offered to residential customers, modified only as necessary to reflect the different  
8 nature of the premises. Specifically, under Section 12.11 of the GT&C's, the Customer would  
9 need to meet the following eligibility requirements (wording as per Section 12.11, with proposed  
10 additions underlined):

11 (a) The Customer's Premises<sup>78</sup> must be located within FortisBC Energy's Mainland and  
12 Vancouver Island Service Area;

13 (b) The Customer's Premises must be either

14 (i) A separately metered single-family dwelling or townhouse, that is the  
15 Customer's principal residence and is occupied for the majority of the  
16 year; or

17 (ii) a separately metered commercial building or commercial suite eligible  
18 for service under Rate Schedule 2, that is the Customer's place of  
19 business, and which is occupied and open for business the majority of  
20 the year; and

21 (c) The result of the economic test for the Main Extension must indicate a Profitability  
22 Index of greater than 0.2 and less than 0.6 ~~0.8~~, indicating that a contribution in aid of  
23 construction is required by the Customer.

24 FEI notes that should its proposal to update the PI threshold to 0.6 in individual MX Tests be  
25 approved, then the upper PI limit for eligibility under the SEF will likewise need to be set to 0.6 for  
26 both residential and commercial participants. FEI does not see a need to adjust the lower PI limit  
27 of 0.2.

28 FEI expects that this proposal to update to the SEF to allow participation from small commercial  
29 customers will help achieve fairer access to the gas system for new customer connections.

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<sup>77</sup> FEI Rate Schedule 2, Small Commercial Service.

<sup>78</sup> Adding the word "Premises" will provide additional clarity given that a commercial entity may have various premises and a corporate head office located elsewhere.

## 7. CUMULATIVE IMPACT OF ALL PROPOSALS

FEI has analyzed the expected impact of its proposals, individually and collectively. The impact of the proposed updates to the MX Test and the SLCA calculation are described in Sections 4.7 and 5.4, respectively. As shown in Table 7-1 below, FEI estimates that the aggregate CIAC from 2017 to 2025 would have been reduced by approximately 39 percent if all proposed updates and refinements to the MX Test and SLCA (other things being equal) were applied.

**Table 7-1: Cumulative Impact on Aggregate CIAC from 2017 to 2025 if All Proposed Changes Applied**

	2017-2025 Actual	Combined Impact of Proposed MX Test Changes	Combined Impact of Proposed SLCA Changes	Total Impact on CIAC
Aggregate CIAC	\$ 16,689,444	(2,992,295)	(3,552,534)	(6,544,830)
Percentage Change		-18%	-21%	-39%

From the perspective of each new customer, the proposed updates and refinements are significant; the reduction of the CIAC requirement would make new attachments more affordable. However, the cumulative impact to existing customers through delivery rates is minor, as shown in Table 7-2 below, based on the actuals from the 2017-2025 RIA. Ultimately, the analysis indicates that the proposed updates and refinements will directionally promote fairness between new and existing customers.

**Table 7-2: Estimated Cumulative Rate Impact if All Proposed Changes Applied (Based on 2017 to 2025 RIA Results)**

2017-2025 RIA	Current	Combined Impact of Proposed MX Test Changes	Combined Impact of Proposed SLCA Changes	Total Impact
Average Cost per GJ with Growth	\$ 6.715	\$ 6.715	\$ 6.715	\$ 6.715
Average Cost per GJ without Growth	\$ 6.833	\$ 6.831	\$ 6.830	\$ 6.828
Rate Impact per GJ	\$ (0.118)	\$ (0.116)	\$ (0.115)	\$ (0.113)
Percentage Rate Impact	-1.72%	-1.69%	-1.69%	-1.66%
Change in Percentage Rate Impact from Current	0.00%	0.03%	0.03%	0.06%

## 1 8. STAKEHOLDER ENGAGEMENT

### 2 8.1 INTRODUCTION

3 This section provides an overview of FEI's engagement process in preparing this Application, the  
4 feedback received, and how that feedback is reflected in the Application. It is organized as follows:

- 5 • **Section 8.2:** FEI's stakeholder engagement on the MX and Connection Policies involved  
6 a diverse group of stakeholders and provided meaningful opportunities to participate.  
7 Participants expressed satisfaction with FEI's engagement approach.
- 8 • **Section 8.3:** Various themes emerged during stakeholder engagement. Notably,  
9 stakeholders generally agreed that the MX and Connection Policies remain sound, and  
10 that the MX and Connection Policies should be calibrated so as to treat new and existing  
11 customers fairly. Some stakeholders also expressed non-rate design policy objectives for  
12 making it easier (e.g., energy affordability, energy choice, economic development) or  
13 harder (e.g., limiting GHG emissions) for new customers to connect to the system.
- 14 • **Section 8.4:** FEI's proposals, consistent with the stakeholder feedback, are focused on  
15 updating inputs and calibrating the parameters of the MX and Connection Policies. FEI  
16 acknowledges the diversity of public policy views; however, FEI submits that the MX and  
17 Connection Policies should be evaluated against how they achieve their long-recognized  
18 rate design purpose of treating new and existing customers equitably.

### 19 8.2 STAKEHOLDER ENGAGEMENT OBJECTIVES AND APPROACH

20 As discussed below, FEI's stakeholder engagement on the MX and Connection Policies involved  
21 a diverse group of stakeholders and provided meaningful opportunities to participate. Participants  
22 included regular interveners, Indigenous groups, representatives from the building and  
23 construction industry, regional districts, and local chambers of commerce. FEI gathered feedback  
24 through engagement workshops, post workshop surveys and individual meetings. Participants  
25 expressed satisfaction with the content of the workshop and the individual meetings.

#### 26 8.2.1 FEI's Stakeholder Engagement Objectives

27 In undertaking engagement with stakeholders regarding the MX Test and Connection Policies,  
28 FEI was guided by the following approach:

- 29 • Align engagement materials for different stakeholders to promote a structured and  
30 balanced dialogue;
- 31 • Enable feedback, whether oral or written, that allows adequate expression and  
32 consideration of views;
- 33 • Provide reasonable opportunity for stakeholders and interested parties to provide  
34 feedback; and

- 1 • Seek participation to encompass stakeholders who do not typically participate in
- 2 regulatory proceedings.

### 3 **8.2.2 Two Well-Attended Workshops and Questionnaire**

4 FEI conducted two workshops, one on January 14, 2026, and a second on January 22, 2026. As  
5 discussed below, BCUC staff, interveners, and representatives of the building and construction  
6 sector participated in the workshops. The workshops, and follow-up questionnaires, provided a  
7 venue to educate participants and solicit their feedback on the MX and Connection Policies. The  
8 table below shows the list of stakeholders who attended the workshops.

9 **Table 8-1: Participants in FEI’s System Extension Review Workshops**

Stakeholder	
1	BCUC Staff
2	Active Support Against Poverty, Disability Alliance BC, Tenants Resource and Advisory Centre, and Together Against Poverty Society
3	B.C. Sustainable Energy Association & Sierra Club B.C.
4	Commercial Energy Consumers of British Columbia
5	Residential Consumer Intervener Association
6	MoveUP
7	Pacific Northern Gas
8	Canadian Home Builders Association BC
9	Homebuilders Association Vancouver
10	Canadian Home Builders Association Fraser Valley
11	Canadian Home Builders Association Northern BC
12	Canadian Home Builders Association Central Okanagan
13	Canadian Home Builders Association Sea to Sky
14	Canadian Home Builders Association Central Interior
15	Urban Development Institute
16	Independent Contractors and Businesses Association
17	Vancouver Island Construction Association
18	Beedie
19	Wanson
20	Intracorp Homes
21	Cheam Enterprises (Cheam First Nation)
22	Emil Anderson Properties
23	Silverado Land Corporation
24	Wesbild

10

1 The same content was presented at both workshops, and FEI included an additional slide for the  
2 second workshop summarizing the feedback from the first workshop. A copy of the slide deck  
3 presented at the second workshop is included as Appendix G.

4 FEI explained the current MX and Connection Policies, how builder/developers apply the MX Test  
5 to their projects, an evaluation of the MX and Connection Policies, and a review of the results.  
6 The workshops were an opportunity for participants to ask questions, explore issues and express  
7 their views. FEI did not propose any changes to the current MX and Connection Policies in the  
8 workshops; rather, FEI solicited stakeholder perspectives and comments using the questions  
9 outlined below:

- 10 • What has been working well for you?
- 11 • What could be better?
- 12 • What should we keep in mind going forward?

13 After each workshop, FEI sent a copy of the slide deck and survey with these same three  
14 questions to the workshop participants. FEI also provided interveners and BCUC staff with a  
15 document providing more technical detail beyond the content covered in the workshops (see  
16 Appendix A).

17 Throughout the workshop, stakeholders were engaged and committed to the review and spoke  
18 to a range of issues. The comments received through the workshops and in the post-workshop  
19 follow-up survey are summarized into themes in Section 8.3 below.

### 20 **8.2.3 Additional One-on-One Engagement**

21 FEI also arranged supplemental one-on-one meetings with intervener groups, Indigenous groups,  
22 regional districts, and local chambers of commerce.

#### 23 **8.2.3.1 Follow-Up Meetings with Intervenors**

24 FEI held one-on-one sessions with CEC, COSCO, BCSEA and RCIA following the workshops.  
25 MoveUP was offered, but did not require, a follow-up session. The individual meetings involved  
26 providing a more in-depth review of the MX Test and Connection Policies. In addition, the following  
27 questions were posed to intervenors during these one-on-one sessions:

- 28 • What is working well for those you represent?
- 29 • Are there ways that the system extension test can be modified to better meet the needs  
30 of those you represent?
- 31 • What are the top issues/topics facing those you represent to consider for how the system  
32 extension test operates?
- 33 • How well do you consider that the MX Test balances the intended purpose of balancing  
34 the needs of new and existing customers?

- 1       • Are there any other changes to the test that you think would better balance the needs of  
2       new and existing customers?

### 3       **8.2.3.2 Indigenous Engagement**

4       FEI contacted various First Nations and First Nations organizations that had previously expressed  
5       interest in the topic of connection policies. FEI invited them to participate in the workshops and  
6       through one-on-one meetings. Cheam Enterprises (the economic development corporation of  
7       Cheam First Nation) participated in a workshop. Three other Indigenous groups (First Nations  
8       Natural Gas Alliance, Chawathil First Nation and Okanagan Indian Band) accepted the offer to  
9       participate in discussions outside of the workshop.

### 10      **8.2.3.3 Local Chambers of Commerce and Regional Districts**

11      FEI also hosted one-on-one sessions with municipal Boards of Trade. The following accepted  
12      FEI's offer to participate:

- 13      • Campbell River and District Chamber of Commerce  
14      • Surrey and White Rock Board of Trade  
15      • Regional District of Central Okanagan  
16      • Regional District of Okanagan Similkameen  
17      • Victoria Chamber of Commerce

## 18      **8.3 FEEDBACK FROM STAKEHOLDER CONSULTATION**

19      Various themes emerged during stakeholder engagement. Notably, stakeholders generally  
20      agreed that the MX and Connection Policies remain sound, and that the MX and Connection  
21      Policies should be calibrated so as to treat new and existing customers fairly. Some stakeholders  
22      also expressed non-rate design policy objectives for making it easier (e.g., energy affordability,  
23      energy choice, facilitating development) or harder (e.g., limiting GHG emissions) for new  
24      customers to connect to the system.

### 25      **8.3.1 MX Test Fundamentals Remain Sound**

26      Participants in workshops as well as individual engagement sessions largely supported the  
27      current MX and Connection Policies. Participants noted that the MX and Connection Policies  
28      largely work well “as is”. Some participants noted that they had been involved in the recent BC  
29      Hydro system extension test proceeding and had been advocating for substantive changes,  
30      whereas their feeling was that FEI's MX Test was for the most part working well.

### 1 **8.3.2 Opportunity to Make the Test Fairer to New Customers**

2 Participants in the workshops and individual meetings suggested that the MX Test and  
3 Connection Policies should be modified to make the test fairer to better meet the needs of new  
4 customers. Changing the test so that there was a rebalancing of interests between new and  
5 existing customers was suggested. Options discussed included: a longer period of recovery of  
6 costs and a lower PI threshold. In addition, one stakeholder commented on making the test fairer  
7 for commercial customers, for example by expanding eligibility of the SEF to include commercial  
8 customers.

### 9 **8.3.3 Government Policies Raised by Stakeholders**

10 Stakeholders noted government policy considerations, as described below. Many stakeholders  
11 suggested the MX Test and Connection Policies should facilitate connections to promote  
12 economic development, access to housing, affordability, and access to energy in remote  
13 communities. Conversely, one stakeholder raised how facilitating connections would impact GHG  
14 emissions.

#### 15 ***8.3.3.1 Economic Development***

16 Builders and developers, First Nations, and business advocacy groups emphasized access to the  
17 natural gas system for attracting investment, lowering costs, and growing the economy. Similarly,  
18 the local chambers of commerce unanimously stated that access to natural gas helps to further  
19 economic development in their region. They do not want to see costs increase to access natural  
20 gas as they are currently facing hard times and an increase in costs will further create a barrier  
21 for growth in their region.

#### 22 ***8.3.3.2 Access to Housing***

23 Other stakeholders in the housing industry similarly stated that facilitating connection to the gas  
24 system advances provincial housing policy imperatives by helping proponents of new  
25 developments manage costs more effectively and meet customer housing needs. Stakeholders  
26 explained that costs for housing and new construction have increased significantly, often making  
27 new construction unaffordable to buyers. Relying on only one energy source reduces options, can  
28 add to costs and can also increase timelines. Some stakeholders also noted that with BC Hydro  
29 facing system constraints, natural gas provides the needed energy options and greater certainty.  
30 Restricting energy choices will only worsen housing affordability.

#### 31 ***8.3.3.3 Affordability***

32 A common theme from stakeholders was that the costs to connect should not increase. Builders  
33 and developers are experiencing a cost of delivery crisis. Increasing the cost of connecting to the  
34 gas system would increase project costs, making it more difficult to build and sell housing.

1 **8.3.3.4 Access to Energy in More Remote Communities**

2 First Nations and Indigenous organizations highlighted that communities without access to  
3 diverse energy sources see lower potential for investment and development. For example, having  
4 to rely on electricity, wood and propane for heating was seen as less desirable than also having  
5 access to natural gas. For the First Nations and Indigenous organizations engaged, the lack of  
6 access to the FEI system widened the inequity they face in terms of developing their lands,  
7 attracting investment, and growing the economy in their region or for their members. Ensuring  
8 that there was a mechanism to attach new communities or developments further from the existing  
9 gas system was seen as an important aspect of the MX Test and Connection Policies.

10 **8.3.3.5 GHG Emissions Policies**

11 One stakeholder noted that if material changes to the MX Test and Connection Policies are being  
12 considered, then long-term emissions reduction policies and targets should be explored. They  
13 were interested in addressing climate change and a reduction of GHG emissions and expressed  
14 concern that the MX Test does not factor in policy.

15 **8.3.4 Potential to Improve the Connection Process**

16 While not specific to the rate design itself, representatives of the construction industry see room  
17 for improvement in FEI's customer connection process and communication. They recommended  
18 that the communication between FEI and BC Hydro be improved and indicated that improved  
19 collaboration with the FEI team for permitting and approvals would be beneficial.

20 **8.4 INCORPORATING STAKEHOLDER FEEDBACK INTO THE PROPOSAL**

21 FEI acknowledges the diversity of views. FEI has reviewed the comments and feedback gathered  
22 through engagement with stakeholders, assessed it within the context of the MX Test  
23 methodology, parameters and inputs, and identified how these could be incorporated into this  
24 Application where consistent with the long-recognized rate design purpose of MX and Connection  
25 Policies to treat new and existing customers equitably. FEI's proposals, consistent with the  
26 stakeholder feedback, are focused on updating inputs and calibrating the parameters of the MX  
27 and Connection Policies.

## 9. CUSTOMER DEMAND INFORMATION REQUESTED BY BCUC

This section provides additional information requested by the BCUC in Letter L-11-25, and is organized as follows:

- **Section 9.1:** The BCUC requested an updated Residential End Use Study (REUS). FEI discusses the status of the REUS and its use in the MX Test.
- **Section 9.2:** The BCUC has requested for new customer connections in 2024, an analysis of the range of anticipated annual customer consumption, explaining all assumptions made regarding customer uses, appliance efficiencies, building codes and other relevant factors, such as city bylaws. FEI discusses how each MX Test uses a forecast of customer additions and consumption specific to each test.
- **Section 9.3:** FEI provides the analysis of the actual annual consumption of new customer connections for each connection year from 2014 to 2024, including a breakdown of the number of new customers who consume the following quantity of gas annually: 0-20 GJ; 20-60 GJ; 60-70 GJ; 70-90 GJ; greater than 90 GJ, as requested by the BCUC.

### 9.1 *BCUC HAS APPROVED THE USE OF REUS CUSTOMER CONSUMPTION DATA FOR THE MX TEST AND CONNECTION POLICIES*

The REUS is conducted by FEI generally once every four years, in conjunction with its Demand Side Management (DSM) applications, to provide a comprehensive understanding of the factors that influence residential natural gas and electricity consumption. The study collects detailed information on appliance ownership and efficiency, fuel sources for heating and water heating, dwelling characteristics, renovation activity, and energy-related behaviours. This information is used to estimate typical energy consumption for major end-uses and to track trends over time. The REUS provides information to support forecasting and program planning, as well as being used in the MX and Connection Policies.

The most recent iteration of the REUS is provided in Appendix F. The most recent REUS was conducted between June and August 2022, with energy consumption analysis based on data from a period that overlapped with the COVID-19 pandemic. During this time, many households experienced prolonged at-home occupancy due to remote work and study arrangements. These shifts temporarily altered daily energy-use patterns, particularly for heating, as homes were occupied more consistently throughout the day than under typical pre-pandemic conditions. Simply put, consumption increased during COVID-19 because people left the heat on all day while they were home.

As a result, certain 2022 consumption estimates reflected conditions specific to the pandemic period rather than historical, downward, long-run trends. These circumstances were unique to that timeframe and are important contextual factors when interpreting the results. FEI has therefore not used the end use consumption values from the most recent REUS as indicated in the response to BCUC IR1 1.4 pertaining to FEI's 2024 Main Extension Annual Report:

1 FEI therefore determined that it would not be appropriate to rely on the 2022 REUS  
2 values as the values would have unreasonably inflated the benefits side of the  
3 equation in FEI's main extension test and would have yielded an overly generous  
4 profitability index score. The impact of an overly generous profitability index score  
5 is that the customer contributions would be set too low for projects or in some  
6 cases would have led to installations occurring without any customer contribution  
7 when one would normally be required.

8 The next REUS will be conducted in summer 2026, with findings available in spring 2027,  
9 continuing the established four-year study cycle.

## 10 **9.2 REQUESTED ANALYSIS FOR NEW CUSTOMER CONNECTIONS IN 2024**

11 The MX Test does not use a common set of assumptions to determine a new customer's  
12 anticipated annual consumption. For each MX Test, FEI uses consumption credits based on  
13 information on expected appliance installations from the developer and anticipated appliance  
14 consumption provided by the REUS. The appliance consumption values used in the MX Test are  
15 provided in Section 3.2 of Appendix D.

16 REUS data has been used in the MX Test since approximately 2004. In the 2016 Decision<sup>79</sup>, the  
17 BCUC reaffirmed the use of an appliance consumption average derived from the REUS in the MX  
18 Test. The BCUC noted that this approach aligns with practices used by other utilities and  
19 inherently reflects evolving appliance efficiencies and building code requirements:

20 **The Panel accepts FEI's continued use of the previously approved**  
21 **residential consumption methodology in its MX Test based on using an**  
22 **appliance consumption average derived from the Residential End Use**  
23 **Survey for all existing customers.** In addition to this practice being consistent  
24 with past decisions, the Panel places weight on the June 30, 2015 EES Survey of  
25 Practices of Other Utilities which indicates FEI's practice is consistent with the  
26 practice of other utilities. EES also points out that periodic updates to the REUS  
27 will reflect reduced usage by customers over time. [bold in original]

28 The MX Test, as designed, is responsive to changes in customer demand over time, including  
29 changes associated with regulations related to efficiency and GHG emissions. The natural gas  
30 appliances that a customer(s) is planning to use is constrained by building code, city bylaws, and  
31 a municipality's level of adoption of step code, in which the customer connection will occur.  
32 Therefore, the usage of natural gas in the MX Test is the result after all relevant restrictions have  
33 been considered.

---

<sup>79</sup> Decision and Order G-147-16, p. 23.

1 **9.3 CUSTOMER CONSUMPTION 2014-2024 BY BCUC-DETERMINED COHORTS**

2 FEI reviewed the actual annual consumption of new residential customer connections for each  
3 connection year from 2014 through 2024. The analysis placed residential customers into five  
4 cohorts based on annual consumption: 0–20 GJ, 20–60 GJ, 60–70 GJ, 70–90 GJ and greater  
5 than 90 GJ. Table 9-1 provides the residential customer counts in each band, Table 9-2 provides  
6 the percentage of residential customers in each band, Table 9-3 provides the average use per  
7 residential customer, and Figure 9-1 illustrates the year-over-year trends.

8 **Table 9-1: Customers by Actual Annual Consumption Cohort 2014 - 2024**

Count of New Customers Based on Annual Consumption						
Year	0-20GJ	20-60GJ	60-70GJ	60-70GJ	> 90GJ	Total
2024	2,125	2,211	277	396	1,239	6,248
2023	1,877	3,005	482	683	1,830	7,877
2022	1,791	3,661	582	890	1,934	8,858
2021	2,876	5,065	898	1,245	2,648	12,732
2020	2,412	4,480	843	1,267	2,672	11,674
2019	2,441	4,475	847	1,197	2,831	11,791
2018	3,087	5,956	1,076	1,658	3,634	15,411
2017	2,647	5,474	1,023	1,477	3,076	13,697
2016	2,032	4,467	854	1,269	2,918	11,540
2015	2,283	4,581	789	1,125	2,614	11,392
2014	1,759	3,867	645	929	1,901	9,101

9 **Table 9-2: Percent of Customers by Actual Annual Consumption Cohort 2014 - 2024**

Percent of New Customers Based on Annual Consumption						
Year	0-20GJ	20-60GJ	60-70GJ	60-70GJ	> 90GJ	Total
2024	34%	35%	4%	6%	20%	100%
2023	24%	38%	6%	9%	23%	100%
2022	20%	41%	7%	10%	22%	100%
2021	23%	40%	7%	10%	21%	100%
2020	21%	38%	7%	11%	23%	100%
2019	21%	38%	7%	10%	24%	100%
2018	20%	39%	7%	11%	24%	100%
2017	19%	40%	7%	11%	22%	100%
2016	18%	39%	7%	11%	25%	100%
2015	20%	40%	7%	10%	23%	100%
2014	19%	42%	7%	10%	21%	100%

10

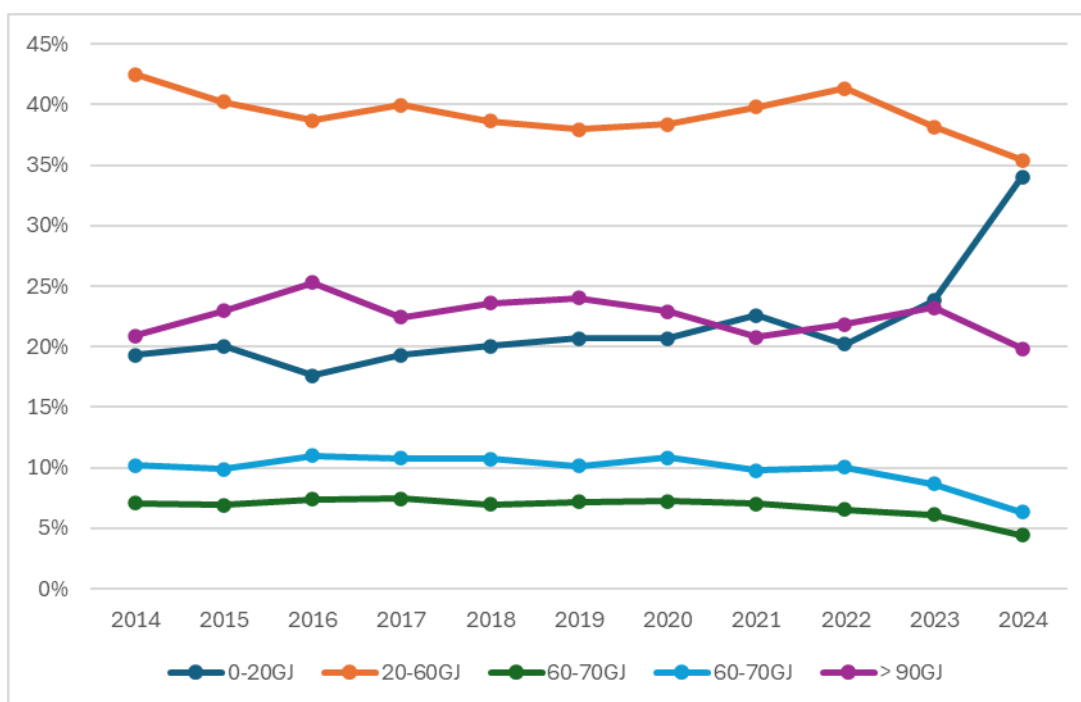
1

**Table 9-3: Average Use Per Customer Cohort 2014 - 2024**

Year	Average Use Per Customer (GJ) <sup>80</sup>
2024	54.6
2023	64.3
2022	63.5
2021	58.0
2020	60.4
2019	66.3
2018	66.6
2017	67.1
2016	68.3
2015	69.2
2014	70.7

2

**Figure 9-1: Percent of Customers by Actual Annual Consumption Cohort 2014-2024**



3

4 Over the observed period, the 20–60 GJ band consistently represents the largest share of new  
 5 customers. The greater than 90 GJ and 0–20 GJ cohorts represent the next largest groups, while  
 6 the 60–70 GJ and 70–90 GJ bands represent smaller but stable segments. Total new customer

<sup>80</sup> The use per customer (UPC) values were calculated by averaging annual consumption while excluding the customer's first year of usage. For example, for customers that attached in 2014, FEI has 12 years of consumption data. The 2014 consumption year is omitted because it may not reflect a full year of normalized usage or typical customer behaviour. FEI therefore calculated the 2014 UPC by averaging consumption from 2015–2025.

1 additions peaked in 2018 and declined gradually thereafter. With the exception of 2024, the  
2 relative distribution across consumption bands remained broadly consistent over this timeframe.

3 At a cohort level:

- 4 • Customers in the 0–20 GJ band, typically characterized by smaller homes, condos, or  
5 dwellings in carbon-restricted jurisdictions using gas for lifestyle applications (i.e.,  
6 cooktops and fireplaces), grew from 1,759 customers in 2014 to 3,087 in 2018 before  
7 declining to 2,125 in 2024.
- 8 • The 20–60 GJ cohort remains the largest group throughout the period, rising from 3,867  
9 customers in 2014 to a peak of 5,956 in 2018 and then gradually decreasing to 2,211 in  
10 2024. This group reflects typical usage for townhomes and smaller multifamily  
11 developments (i.e., duplexes) with space or hot water heating loads supplemented by  
12 lifestyle appliances.
- 13 • The 60–70 GJ cohort, generally associated with single-family homes using gas for both  
14 space and water heating, is smaller than the two lower use groups. It increased from 645  
15 customers in 2014 to 1,076 in 2018 before falling to 277 in 2024.
- 16 • Customers in the 70–90 GJ band, often larger homes or those with higher heating  
17 requirements, rose from 929 in 2014 to 1,658 in 2018 and then declined to 396 in 2024.
- 18 • The cohort consuming more than 90 GJ annually, the second-largest group in most years,  
19 increased from 1,901 customers in 2014 to 3,634 in 2018 before steadily decreasing to  
20 1,239 in 2024. Premises consuming more than 90 GJ annually typically include large  
21 single-family homes as well as multifamily buildings that require gas but under a single  
22 house meter (e.g., low-rise and high-rise condominiums).

23 Consistent with the macro level trends, the decline in new customers across all cohorts appears  
24 to be the cumulative result of improvements in building envelope performance, appliance  
25 efficiency and municipal bylaw restrictions.

26 New customer additions grew steadily across all consumption cohorts from 2014 through 2017,  
27 peaking in 2018 where every cohort reached its highest level. Between 2019 and 2021, new  
28 customer counts declined from the peak but continued to demonstrate steady customer growth  
29 year over year. The period from 2022 to 2024 shows a more pronounced reduction in new  
30 customers, accompanied by growth in the 0-20 GJ cohort. This outcome is consistent with  
31 ongoing building and appliance efficiency improvements, updated building codes and stricter  
32 municipal bylaw requirements.

33 Overall, the analysis indicates that while total annual additions have declined since 2018, the  
34 distribution of consumption across the five bands remains relatively stable. Most new customers  
35 continue to consume between 20 and 60 GJ per year, while overall cohort groups have declined  
36 as improvements in building envelopes and appliance efficiency have occurred and as municipal  
37 bylaw restrictions have reduced gas use and adoption.

## 1 **10. CONCLUSION**

2 Despite the adjustments approved by the BCUC following the previous review of the MX and  
3 Connection Policies to rebalance them, the current parameters are still resulting in over-recovery  
4 of costs from new customers to the benefit of existing customers. FEI's analysis indicates that the  
5 proposed updates and refinements will promote fairness as between new and existing customers,  
6 though the combined impact will be minor in practice. Overall, the MX and Connection Policies,  
7 including the updated inputs and recalibrated parameters, align with the BCUC's past  
8 commentary and rate design principles. FEI respectfully submits that its proposals are just and  
9 reasonable and should be approved.

**Appendix A**

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**FEI MX TEST TECHNICAL GUIDE**



**FORTISBC ENERGY INC.**

## **2026 System Extension Application**

**Workshop: Main Extension (MX) Test  
Discussion Guide**

**January 22, 2026**

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## 1. INTRODUCTION

FortisBC Energy Inc. (FEI or the Company) is holding two identical workshops, on January 14 and January 22, 2026, as part of the review directed by the British Columbia Utilities Commission (BCUC) of FEI's terms and conditions, extension policies and parts of the tariff governing customer connections (System Extension and Connection Policies or Policies).<sup>1</sup>

The System Extension and Connection Policies set the rules as well as the terms and conditions for how new customers connect to the gas system. The Policies also establish the economic test (i.e., the Main Extension (MX) Test) to determine whether a main extension to FEI's distribution system can proceed without a contribution in aid of construction (CIAC)<sup>2</sup> from the customer(s) wishing to connect to FEI's distribution system. The workshops are intended to provide stakeholders with information on how the Policies and the MX Test are currently functioning, as well as any proposed changes.

The purpose of this discussion guide is to provide stakeholders with background information on how the MX Test currently works and how FEI determines whether each main extension is economic using the approved MX Test formula. In the following sections, FEI describes the components and input parameters of the MX Test formula as well as the methodology to determine each year's Service Line Cost Allowance (SLCA) for infill customers<sup>3</sup> connecting to an existing main and the amount of CIAC required for each main extension.

## 2. THE MX TEST FORMULA

The purpose of the MX Test is to assess whether a main extension is economic and to establish the appropriate level of investment FEI will make on behalf of a customer or customers wishing to attach to FEI's distribution system. The current design and input parameters for the MX Test were approved by the BCUC in its Decision and Order G-147-16 regarding FEI's 2015 System Extension Application (2015 System Extension Decision).

The MX Test is a discounted cashflow (DCF) analysis that considers the revenues and costs associated with a planned main extension over a 40-year period by calculating the ratio of net present values (i.e., Profitability Index or PI) between:

- The estimated net cash inflows over 40 years; and
- The capital costs of attaching customers in the first 5 years (or 10 years in circumstances where a build-out of customer attachments of longer than 5 years is foreseeable) of the main extension.

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<sup>1</sup> Letters L-11-25 and L-24-25.

<sup>2</sup> A CIAC is a monetary remittance to FEI which reduces FEI's cost to construct a gas main.

<sup>3</sup> New residential and small commercial customers connecting to existing mains.

1 The discount rate used for the MX Test is based on FEI's pre-tax weighted average cost of capital  
2 (WACC) and is inflation adjusted. The MX Test formula is shown as follows:

$$3 \quad \text{PI} = \frac{\text{NPV}(\text{Delivery Margin} + \text{Application Fees} - \text{O\&M} - \text{System Improvement Cost} - \text{Municipal \& Property Tax} - \text{Income Tax})}{\text{NPV}(\text{Capital Costs of Mains, Services, and Meters} + \text{Overhead} + \text{Working Capital})}$$

4 The currently approved PI threshold is 0.8. If the result of the MX Test (i.e., PI) is less than the  
5 approved PI threshold, a financial contribution is required from the customer(s). Specifically, if an  
6 individual PI is 0.8 or greater, a system extension can proceed without the need for a customer  
7 contribution, whereas if the PI is less than 0.8, a customer contribution is required to bring the PI  
8 up to the 0.8 threshold for the system extension to proceed. The PI of all main extensions  
9 completed on an annual basis is required to have an aggregate PI of 1.1.

10 The following sections further describe each component of the above formula.

## 11 **2.1 NPV OF NET CASH INFLOWS**

12 The components that are factored into the calculation of the NPV of cash inflows include:

- 13 • Delivery Margin;
- 14 • Application Fee;
- 15 • Operating and Maintenance (O&M) Costs;
- 16 • System Improvement (SI) Costs;
- 17 • Municipal and Property Tax; and
- 18 • Income Tax.

19 Each component is further described below.

### 20 **2.1.1 Delivery Margin**

21 The delivery margin estimated to be recovered from the customer(s) of the main extension is  
22 calculated as follows:

$$23 \quad \text{Delivery Margin} = (\text{FEI's Basic Charge} \times \text{Number of Customer Attachments}) + \\ 24 \quad (\text{FEI's Delivery Charge} \times \text{Number of Customer Attachments} \times \text{Consumption of Customer})$$

#### 25 **2.1.1.1 FEI's Basic and Delivery Charges**

26 The basic and delivery charges of each rate schedule used for the MX Test are based on the  
27 approved delivery rates effective on January 1<sup>st</sup> of each year. For example, Table 2-1 below sets  
28 out the approved 2026 basic and delivery charges that are applicable to the 2026 MX Test. The

1 basic and delivery charges for each rate schedule used for the MX Test are updated annually  
 2 based on the approved basic and delivery charges.

3 **Table 2-1: Basic and Delivery Charges Applicable to the 2026 MX Test**

Rate Schedule	Basic Charge (\$/yr)	Delivery Charge (\$/GJ)
	<b>2026</b>	
Rate Schedule 1	\$ 149.20	\$ 8.257
Rate Schedule 2	\$ 517.83	\$ 5.665
Rate Schedule 3/23	\$ 1,585.00	\$ 5.165
Rate Schedule 4	\$ 5,268.00	\$ 2.647
Rate Schedule 5/25	\$ 5,628.00	\$ 1.352
Rate Schedule 6	\$ 732.00	\$ 4.862
Rate Schedule 7/27	\$ 10,560.00	\$ 2.199
Rate Schedule 22	\$ 43,968.00	\$ 1.355

4

5 **2.1.1.2 Number of Customer Attachments**

6 The forecast of customer attachments to a main extension is based on discussions with the  
 7 developer or the customer requiring the main extension. The number of customer attachments is  
 8 different for each main extension. In some cases, there might only be one customer wishing to  
 9 attach, while in other cases, such as with a developer, there may be many customers attaching  
 10 to the same main extension over several years depending on the developer’s plans and municipal  
 11 approvals. As part of the 2015 System Extension Decision, FEI was approved to use a 10-year  
 12 forecast period for customer attachments in the MX Test in circumstances where it can be  
 13 reasonably demonstrated that there is a longer-term municipality-accepted plan or other evidence  
 14 for growth exceeding five years. FEI notes that using a forecast period that is longer than five  
 15 years would be limited to developers and municipalities on a case-by-case basis with supporting  
 16 information such as:

- 17
- Municipal Official Community plans;
  - 18 • Zoning plans;
  - 19 • Discussions with municipal city planners;
  - 20 • Evidence of commercial commitments having been made to developers; and
  - 21 • The various options available to FEI to install a main(s) to serve the area.

22 **2.1.1.3 Consumption per Customer**

23 The consumption per customer reflects the forecast of gas to be consumed by each new customer  
 24 attaching to the new main extension on a per-installed appliance basis. The average consumption  
 25 per appliance used for the MX Test, as shown in Table 2-2 below, is largely based on FEI’s 2017

1 Residential End Use Study (REUS)<sup>4</sup> except for hot tubs and hot water heaters. For hot tubs, the  
2 average consumption is based on the 2012 REUS, while for hot water heaters, the average  
3 consumption is based on residential water heating studies completed in 2014 by FEI, the City of  
4 Vancouver, and the Natural Gas Technology Centre.

5 **Table 2-2: Consumption Use per Appliance for MX Test**

MX Test Appliance Consumption	GJ per Year
Barbeque	0.70
Boiler	51.70
Clothes Dryer	1.80
Fireplace - Décor	16.50
Fireplace - Heating	16.00
Furnace (Primary)	51.70
Furnace (Secondary)	23.30
Hot Tub	21.30
Hot Water Tank	25.10
Pool	39.30
Range/Cooktop	5.20
Wall Heater	7.10

6  
7 In the case of residential customers, the number and type of appliances to be installed will be  
8 based on information provided by the customer or the developer. For example, if a  
9 builder/developer intends to install a furnace and a gas cooktop in each home of a 12-unit  
10 residential complex over the 5- or 10-year customer attachment forecast, then the aggregate  
11 consumption used in the MX Test would be:

12 
$$12 \text{ homes} \times (1 \text{ furnace/home} \times 51.7 \text{ GJ/yr} + 1 \text{ cooktop/home} \times 5.20 \text{ GJ/yr}) = 682.8 \text{ GJ/yr}$$

13 For commercial and industrial customers, consumption is evaluated on a case-by-case basis in  
14 accordance with the specific business needs and/or operational requirements, as well as the  
15 specific equipment/appliances to be installed by each customer.

## 16 **2.1.2 Application Fees**

17 The current Application Fee per new customer attachment is \$15.<sup>5</sup>

## 18 **2.1.3 Operations and Maintenance (O&M) Cost**

19 The O&M input to the MX Test is intended to capture the incremental O&M due to each new  
20 customer attaching to FEI's distribution system. The O&M input to the MX Test is determined by

---

<sup>4</sup> The 2022 REUS was completed in 2023 and was based on end-use consumption data influenced by the COVID-19 pandemic; as such, the results significantly deviated from the established end-use trend. Due to these significant deviations, FEI has continued to use the 2017 REUS for consumption data per appliance.

<sup>5</sup> Approved in the FEI 2016 Rate Design Application Decision and Order G-135-18, p. 46.

1 multiplying the O&M per customer by the number of customer attachments (as discussed in  
2 Section 2.1.1.2 above).

3 The O&M per customer is updated annually based on FEI's most recent actual Gross O&M<sup>6</sup> for  
4 activities that are directly impacted by the number of new customer attachments. These O&M  
5 activities include distribution operation, distribution corrective maintenance, account service,  
6 customer service, customer billing, meter reading, credit and collections, and bad debt  
7 management. Table 2-3 below shows the O&M per customer input applicable to the 2026 MX  
8 Test.

9 **Table 2-3: O&M per Customer Input Applicable to the 2026 MX Test**

MX Test O&M Input	\$/Customer
	2026
Residential	\$ 67.00
Commercial	\$ 70.00

10

#### 11 **2.1.4 System Improvement (SI) Cost**

12 The SI Cost input to the MX Test serves as a proxy for the incremental system improvement costs  
13 associated with growth not attributable to any specific customer. As part of the MX Test, the SI  
14 Cost is calculated as:

15 
$$\text{SI} = \text{Number of Customer Attachments} \times \text{Consumption per Customer} \times \text{SI Charge per GJ}$$

16 The SI Charge per GJ is updated on an annual basis and is calculated based on the:

- 17 • Forecast increase of FEI's peak day demand<sup>7</sup> over a 5-year period (i.e., 2026 to 2030 for  
18 the 2026 MX Test) as presented in FEI's Annual Contracting Plan (ACP), which is filed  
19 with the BCUC for approval each year.
- 20 • Forecast of FEI's Total System Improvement Costs over a 5-year period (i.e., 2026 to  
21 2030 for the 2026 MX Test), which includes distribution system projects expected to be  
22 required to increase the existing system capacity with additional mains in order to meet  
23 the increasing customer peak demand. These costs are driven primarily by customer  
24 additions that necessitate improvement to the system capacity to maintain reliable service  
25 to existing and new customers.
- 26 • Five-year Average Forecast Load Factor of FEI's system based on FEI's most recent ACP.  
27 The load factor, which equals to annual consumption divided by peak day demand over  
28 365 days, is used to convert the SI Charge from \$ per peak day demand (i.e., \$/peak GJ)  
29 to \$ per annual consumption (i.e., \$/GJ).

---

<sup>6</sup> For example, the O&M input for the 2026 MX Test, which was set at the end of 2025, is based on FEI's 2024 Actual Gross O&M.

<sup>7</sup> FEI must construct its gas distribution system to serve peak demand. Since the predominant use of gas on FEI's system is for space and water heating, FEI's system peak occurs during cold, winter temperatures.

- 1 • Financing Costs (or Carrying Costs) for the investment associated with the system  
2 improvement, which is calculated based on FEI's approved Weighted Average Cost of  
3 Capital (WACC) (on a per \$1,000 investment basis) and updated on an annual basis.

4 Table 2-4 below provides an illustration of the calculation for the SI Charge used in the 2026 MX  
5 Test.

6 **Table 2-4: SI Charge Calculation for the 2026 MX Test**

Line	Particular	2026 MX Test	Reference
1	5-Year Forecast Increase of FEI's Peak Day Demand (TJs)	46.0	FEI's 2025/2026 ACP
2	5-Year Forecast of FEI's Total System Improvement (\$000s)	\$ 54,947	Forecast 2026-2030
3	Investment Cost per GJ of Peak Capacity (\$/Peak GJ)	\$ 1,194.49	Line 2 / Line 1
4	5-Year Average Forecast Load Factor	0.332	FEI's 2025/2026 ACP
5	Investment Cost per Annual GJ (\$/GJ)	\$ 9.86	Line 3 / (Line 4 x 365 days)
6	Financing Cost per \$1,000 of Investment	\$ 78.57	G-287-25
7	<b>Levelized SI Charge (\$/GJ)</b>	<b>\$ 0.774</b>	<b>Line 5 x Line 6 / 1,000</b>

### 8 **2.1.5 Municipal and Property Tax**

9 Municipal tax is derived based on 1 percent of FEI's forecast revenue requirement (i.e., 2026  
10 forecast for the 2026 MX Test) in accordance with section 644 of the *Local Government Act*.<sup>8</sup>

11 Property tax is calculated by multiplying the cost of the mains and services associated with the  
12 main extension by FEI's average property tax rate for distribution system assets, which is updated  
13 annually. The 2025 actual average property tax rate for FEI's distribution system (used in the  
14 2026 MX Test) is 1.61 percent.

### 15 **2.1.6 Income Tax**

16 The income tax in the MX Test is calculated as follows:

17 
$$\text{Income Tax} = (\text{Income after Municipal \& Property Tax} - \text{CCA}) \times \text{Income Tax Rate}$$

18 Where,

19 
$$\text{Income after Municipal \& Property Tax} = \text{Delivery Margin} + \text{Application Fees} - \text{O\&M} - \text{SI}$$
  
20 
$$- \text{Municipal \& Property Tax};$$

21 Delivery Margin = See Section 2.1.1 above;

22 Application Fees = See Section 2.1.2 above;

23 O&M = See Section 2.1.3 above;

24 SI = See Section 2.1.4 above;

<sup>8</sup> [https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/r15001\\_16#section644](https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/r15001_16#section644).

- 1 Municipal & Property Tax = See Section 2.1.5 above;
- 2 CCA = Capital Cost Allowance (Class 51 for Mains, Services, and Meters); and
- 3 FEI's Income Tax Rate = 27 percent.<sup>9</sup>

## 4 **2.2 NPV OF CAPITAL COSTS**

5 The components factored into the calculation of the NPV of capital costs include the following:

- 6 • Capital costs of the Mains, Services, and Meters associated with the main extension;
- 7 • Overhead; and
- 8 • Cash Working Capital.

9 The formula for the NPV of cash outflows is:

10 
$$\text{NPV of Capital Costs} = \text{Mains, Services \& Meters} + \text{Overhead} + \text{Cash Working Capital}$$

11 Each component is further described below.

### 12 **2.2.1 Capital Costs of Mains, Services, and Meters**

13 The estimated cost to install mains, services, and meters is dependent on the individual  
14 circumstances of the customer/developer. These circumstances include, for example, the number  
15 of dwellings or businesses, the distance of the main extension required, and any potential  
16 encumbrances impacting the cost estimate.

17 For simple projects such as residential homes, small townhouse complexes, or small commercial  
18 businesses, FEI uses a Geographic Code pricing model (i.e., geo pricing) to estimate the capital  
19 costs of mains (i.e., Polyethylene (PE) pipe less than 60 mm) and service lines (i.e., less than 50  
20 metres). In general, the geo pricing is updated on an annual basis for each year's MX Test as  
21 follows:

- 22 1) Collect the actual costs and length data of all completed mains and services (excluding  
23 projects that fall under the manual estimate criteria such as large PE or steel mains or  
24 transmission mains) from the two previous years. FEI uses the recent actual main  
25 extensions from two previous years for the geo pricing to ensure the current costs for  
26 material, labour, etc. are reflected in the MX Test.
- 27 2) The actual costs and length data are grouped by geographic zone.

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<sup>9</sup> Updated annually with changes in tax legislation.

1           3) A regression analysis is performed to determine the relationship between the actual cost  
2           and the length in each zone. FEI uses a minimum of two years to ensure enough data  
3           points for each geographic zone to perform a linear regression.

4           4) The resulting output from the regression analysis provides a cost per metre (\$/m) for mains  
5           as well as service lines in each geographic zone.

6           5) The geo pricing is updated annually and implemented on January 1st for each year's MX  
7           Test.

8           For complex projects and large developments that require large PE pipe (i.e., 88 to 114 mm or  
9           168 mm) or steel pipe, FEI uses manual estimates to derive capital cost estimates based on FEI's  
10          expertise and information on construction costs for mains and services in conjunction with  
11          information provided directly by the customer/developer.

12          For meters (including meters and regulators), the capital cost estimates used in the MX Test will  
13          be based on the current unit costs for each type of meter assembly, which is updated annually.

## 14          **2.2.2 Overhead**

15          The overhead is a proxy for the incremental general costs that are incurred to install main  
16          extensions but cannot be associated with any particular main extension project. Example of these  
17          general costs include administrative duties, right of way management, and government fees. For  
18          the purpose of the MX Test, overhead is calculated by multiplying the costs of mains, services,  
19          and meters by the overhead rate, which is updated annually.

20          The overhead rate is a combination of direct and indirect overhead related to capital additions.  
21          For direct overhead, which reflects planning costs for main extensions that have not been charged  
22          to a specific project, the direct overhead rate is set based on a three-year weighted average of  
23          actual planning costs divided by the actual mains and services additions (i.e., 2026 MX Test would  
24          be based on the weighted average of 2022 to 2024). For indirect overhead, which reflects a  
25          portion of FEI's general overhead, the indirect overhead rate is calculated using the following  
26          steps:

27               1) Divide FEI's total capitalized overhead that is allocated to the assets related to services,  
28               mains, house regulators, and meters by the capital additions in those same categories to  
29               calculate a percentage.

30               2) Determine an incremental percent of indirect overhead applicable to mains extensions by  
31               using the most recent capitalized overhead study and the overhead capitalized pool  
32               represented by the O&M activities of Distribution Operations. The Distribution Operations  
33               portion represents the portion that is directly attributable (incremental) to mains  
34               extensions.

35               3) Apply the percentage calculated in Step 2) to the percentage determined in Step 1).

1 For main extensions where capital costs are estimated to be less than \$25,000, an annual fixed  
2 overhead rate is used in the MX Test which is equal to the sum of the direct overhead percentage  
3 and the indirect overhead percentage described above. For the 2026 MX Test, the annual fixed  
4 overhead rate is 17.38 percent.

5 For main extensions where capital costs are forecast to be greater than \$25,000, a sliding scale  
6 based on an exponentially declining curve is applied as approved in the 2015 System Extension  
7 Decision.<sup>10</sup> The purpose of the sliding scale is to estimate the overhead costs for larger projects  
8 more accurately since overhead costs do not have a linear relationship to the direct capital cost  
9 of a main extension. As direct project costs get higher, the overhead cost is smaller in percentage  
10 terms of the direct project cost.

11 The sliding scale formula was first developed in the 2015 System Extension Application using  
12 actual data from 2008 to 2014 which demonstrated an exponentially declining relationship  
13 between the overhead costs and direct capital costs of main extensions. The sliding scale formula  
14 was later updated in the 2020 Rate Impact Analysis Report as a compliance filing to the 2015  
15 System Extension Decision using actual data from 2015 to 2019. This formula continues to be  
16 used and is shown below:<sup>11</sup>

17 
$$Z = \text{Greater of } \left( \frac{X}{25,000^{-0.7}} \times Y^{-0.7} \right) \text{ AND } 6\%$$

18 Where,

19 X = Annual fixed overhead rate;

20 Y = Capital cost of the Project (before overheads applied);

21 Z = Overhead rate to be used for the Project in the MX Test; and

22 Overhead Rate Floor = 6 percent.

23 A 6 percent overhead rate floor is used so that projects with high capital costs continue to attract  
24 an overhead amount at least as large as projects with low capital costs. Due to the nature of the  
25 exponentially declining overhead rate, applying the sliding scale formula, without a rate floor, to  
26 projects with significant capital expenditures results in a lower overhead amount (in dollars) than  
27 projects with low capital expenditures. As such, for the purpose of the MX Test, an overhead rate  
28 floor of 6 percent ensures the overhead applied (in dollars) for larger projects continues to be  
29 higher than for smaller projects even though the overhead rate, in percentage terms, is smaller.

---

<sup>10</sup> 2015 System Extension Decision, p. 40.

<sup>11</sup> Compliance Filing to Order G-147-16: 2020 MX Test Rate Impact Analysis Report, dated June 29, 2020, Section 4.2, p. 11.

### 1 **2.2.3 Working Capital**

2 The cash working capital input is calculated as follows:

3 
$$\text{Working Capital} = (\text{Mains, Services \& Meter} + \text{Overhead}) \times \text{Cash Working Capital Rate}$$

4 The cash working capital rate is updated annually and is calculated based on FEI's 2026 forecast  
5 cash working capital divided by FEI's 2026 forecast of plant in service as approved in the FEI  
6 Annual Review for 2025-2026 Delivery Rates Decision and Order G-287-25.<sup>12</sup> The cash working  
7 capital rate for the 2026 MX Test is 0.14 percent.

### 8 **2.3 SERVICE LINE COST ALLOWANCE (SLCA)**

9 The SLCA represents the maximum allowance each infill customer receives when connecting to  
10 an existing main. The SLCA is applicable to a single-family dwelling<sup>13</sup> or a small commercial  
11 customer.<sup>14</sup> If the cost to connect the individual infill customer (i.e., the service line between the  
12 Main and the Meter set) exceeds the SLCA,<sup>15</sup> then the customer would have to pay for the  
13 installation costs above the SLCA.

14 The SLCA is updated annually using actual data based on the methodology approved in the 2015  
15 System Extension Decision.<sup>16</sup> The steps for calculating the SLCA each year are described below:

- 16 1) Determine the Average Annual Consumption in GJ based on a 7-year average (i.e., 2026  
17 will be based on actuals from 2018 to 2024) and the Average Main Cost based on all  
18 actual main extensions from the most recent year (i.e., 2026 will be based on actuals from  
19 2024).
- 20 2) Solve for a Target Service Line Cost by completing a proxy MX Test (i.e., the formula as  
21 shown in Section 2 above) with a PI of 1.0 using the Average Annual Consumption in GJ  
22 and Average Main Cost from Step 1. All other inputs to the proxy MX Test will be set in  
23 accordance with the methodology as described in Sections 2.1 and 2.2 (i.e., the 2026  
24 SLCA will be based on inputs set for the 2026 MX Test). The Target Service Line Cost  
25 represents the cost of installing an average service line such that the revenue from an  
26 average new customer would be sufficient to offset the capital cost to attach it over a 40-  
27 year period in a DCF analysis.
- 28 3) Determine the Average Service Line Cost based on all actual service line installations  
29 from the most recent year (i.e., 2026 will be based on actuals from 2024).

---

<sup>12</sup> FEI's 2026 Forecast Cash Working Capital = \$13.881 million, and FEI's 2026 Forecast Ending Plant In Service = \$9,912.359 million.

<sup>13</sup> For residential dwellings as part of a duplex, the SLCA would be double the SLCA amount applicable to a single-family dwelling.

<sup>14</sup> Referred to as "Other than a duplex" in FEI's Standard Fees and Charges Schedule.

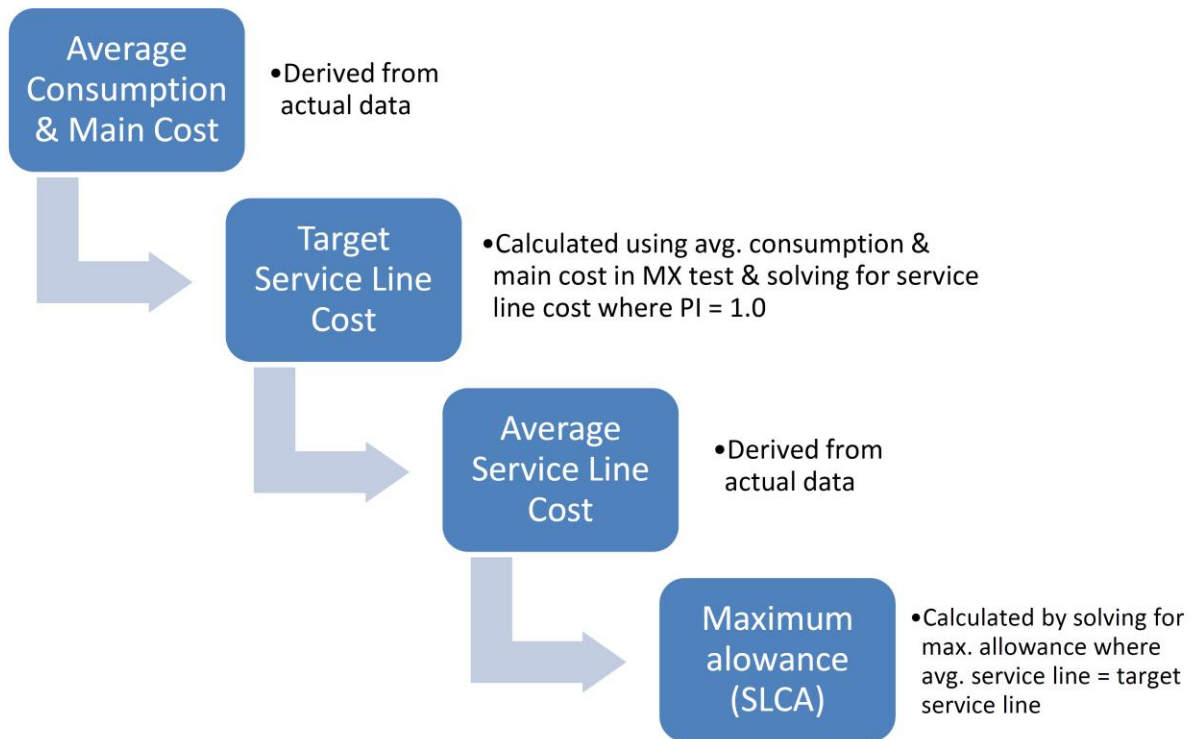
<sup>15</sup> Or the distance from the front of the Customer's building to the meter exceeds 1.5 metres in accordance with Section 10 of FEI's General Terms and Conditions.

<sup>16</sup> 2015 System Extension Decision, p. 46.

1 4) Using all actual service line installations from the most recent year, solve for the maximum  
 2 allowance (i.e., SLCA) such that the Average Service Line Cost from Step 3 would be  
 3 reduced to equal to the Target Service Line Cost from Step 2.

4 Figure 2-1 below provides a simplified depiction of the steps to determine the SLCA each year.

5 **Figure 2-1: SLCA Methodology**



6  
 7 The SLCA for 2026 is \$3,955 (\$7,910 for a duplex). Table 2-5 provides a summary of the inputs  
 8 and the resulting SLCA for 2026.

9 **Table 2-5: 2026 SLCA Calculation**

SLCA Input Variable	Reference	Amount
Average Annual Consumption (GJ)	7-year Average Actual Data (2018 - 2024)	63.6
Average Main Cost	Average of 2024 Actuals	\$ 2,676
Target Service Line Cost	Calculated via Proxy MX Test with PI = 1.0	\$ 3,242
Average Service Line Cost	Average of 2024 Actuals (before contribution)	\$ 5,159
Maximum Allowance (2026 SLCA)	Calculated by solving for the maximum allowance that would equate the target service line cost and average service line cost	\$ 3,955

10

1 **2.4 CONTRIBUTION IN AID OF CONSTRUCTION (CIAC)**

2 As approved by the 2015 System Extension Decision and reflected in Section 12 of FEI's General  
3 Terms and Conditions, if the MX Test result indicates a PI of less than 0.8, then the main extension  
4 may proceed provided that the shortfall in revenue is eliminated by the CIAC paid by the  
5 customer(s) to be served by the main extension (i.e., the difference between the PI from the MX  
6 Test to a PI of 0.8).

7 The total required CIAC will be paid by the customer(s) connecting at the time a main extension  
8 is being built, and FEI will collect contributions from all customers connecting during the first five  
9 years after the main extension is built. As additional contributions are received by customers  
10 connecting to the main extension, partial refunds are made to those customers who had  
11 previously contributed; therefore, at the end of the fifth year, all customers will have paid an equal  
12 contribution, after reconciliation and refunds. In instances where refunds are granted to customers  
13 who have contributed, the main is referred to as a "contributory main."

14 The CIAC is an upfront cost to be borne in full by the customer(s) at the time of the construction  
15 of the main extension.

**Appendix B**

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**RATE IMPACT ANALYSIS RESULTS**

## APPENDIX B: RATE IMPACT ANALYSIS RESULTS

The original 2008-2014 RIA results filed in the 2015 System Extension Application are shown in Table 1. The 2008-2014 RIA results show an average savings per GJ of 1.4 percent or 6 cent per GJ for existing customers, from the system extension activities during this seven-year period.

**Table 1: FEI Rate Impact Analysis for the Period of 2008-2014**

		2015 With Growth	2015 Without Growth	2008-2014 Growth Amount
<p><b>This section uses existing actual delivery costs and looks at the impact on revenue requirements without the addition of capital for the new customers added in the past 7 years. (2008 to 2014).</b></p>	<i>a</i> 2008-14 Meters/Regulators			\$16,026,762
	<i>b</i> 2008-14 Services (Company Paid)			\$119,082,263
	<i>c</i> 2008-14 Mains (Company Paid)			\$58,435,929
	<i>d</i> 2008-2014 SJ and Internal Costs			\$7,228,180
	<i>e</i> Rate Base	\$3,656,399,000	\$3,455,625,867	\$200,773,133
	<i>f</i> Return, Depreciation, Taxes	\$522,883,000	\$495,129,045	\$27,753,955
	<i>g</i> Multiplier for Return, Depreciation, Taxes	13.8%	13.8%	13.8%
	<i>h</i> O&M Expenses	\$238,093,000	\$227,622,688	\$10,470,312
	<i>i</i> 50% of Customer Growth Rate			4.4%
	<i>j</i> Other Revenues/Expenses	-\$3,942,000	-\$3,942,000	\$0
	<i>k</i> Offsetting Bypass Revenues	-\$29,802,000	-\$29,802,000	\$0
	<i>l</i> Total Revenue Requirement (exc. Cost of Gas)	\$757,034,000	\$718,809,732	\$38,224,268
	<i>m</i> <b>Net Revenue Requirement (exc. Cost of Gas)</b>	<b>\$727,232,000</b>	<b>\$689,007,732</b>	<b>\$38,224,268</b>
<p><b>This section determines the usage associated with and without customers added to the system in the past 7 years.</b></p>	<i>n</i> Customers	970,399	885,051	85,348
	<i>o</i> Percent Growth in Customers			8.8%
	<i>p</i> Average GJ/Cust	180	184	134
	<i>q</i> <b>Total GJ</b>	<b>174,623,400</b>	<b>163,169,382</b>	<b>11,454,018</b>
	<p><b>This section calculates the rate impact without the new customers added from 2008 to 2014.</b></p>	<i>r</i> Cost per GJ (exc. Cost of Gas)	\$4.16	\$4.22
<i>s</i> Percent Difference				-1.4%
<i>t</i> \$ Difference per Customer (Rate Impact per Customer/Year)				-\$10.45

1 The results of the 2015-2019 RIA are shown in Table 2. It shows an average savings of 1.06  
2 percent or 4.5 cents per GJ for existing customers, from the system extension activities during  
3 this five-year period.

4 **Table 2: FEI Rate Impact Analysis for the Period of 2015-2019**

		2020 With Growth	2020 Without Growth	2015-2019 Growth Amount
<p><b>This section uses existing actual delivery costs and looks at the impact on revenue requirements without the addition of capital for the new customers added in the past 7 years. (2008 to 2014).</b></p>	<i>a</i> 2008-14 Meters/Regulators			\$19,278,548
	<i>b</i> 2008-14 Services (Company Paid)			\$161,315,320
	<i>c</i> 2008-14 Mains (Company Paid)			\$89,989,334
	<i>d</i> 2008-2014 SJ and Internal Costs			\$13,566,732
	<i>e</i> Rate Base	\$5,138,254,000	\$4,854,104,066	\$284,149,934
	<i>f</i> Return, Depreciation, Taxes	\$701,163,000	\$662,388,074	\$38,774,926
	<i>g</i> Multiplier for Return, Depreciation, Taxes	13.6%	13.6%	13.6%
	<i>h</i> O&M Expenses	\$257,395,000	\$246,024,413	\$11,370,587
	<i>i</i> 50% of Customer Growth Rate			4.4%
	<i>j</i> Other Revenues/Expenses	-\$67,878,000	-\$67,878,000	
	<i>k</i> Offsetting Bypass Revenues	-\$61,242,000	-\$61,242,000	\$0
	<i>l</i> Total Revenue Requirement (exc. Cost of Gas)	\$890,680,000	\$840,534,487	\$50,145,513
	<i>m</i> <b>Net Revenue Requirement (exc. Cost of Gas)</b>	<b>\$829,438,000</b>	<b>\$779,292,487</b>	<b>\$50,145,513</b>
<p><b>This section determines the usage associated with and without customers added to the system in the past 7 years.</b></p>	<i>n</i> Customers	1,047,693	955,128	92,565
	<i>o</i> Percent Growth in Customers			8.8%
	<i>p</i> Average GJ/Cust	190	194	151
	<i>q</i> <b>Total GJ</b>	<b>198,991,900</b>	<b>184,979,162</b>	<b>14,012,738</b>
<p><b>This section calculates the rate impact without the new customers added from 2008 to 2014.</b></p>	<i>r</i> <b>Cost per GJ (exc. Cost of Gas)</b>	<b>\$4.17</b>	<b>\$4.21</b>	<b>-\$0.045</b>
	<i>s</i> <b>Percent Difference</b>			<b>-1.06%</b>
	<i>t</i> <b>\$ Difference per Customer (Rate Impact per Customer/Year)</b>			<b>-\$8.48</b>

5

1 The results of the 2017-2019 RIA are shown in Table 3. It show a moderate average cost per GJ  
 2 increase of 0.73 percent or 3 cents per GJ for existing customers, from the system extension  
 3 activities during this three-year period.

4 **Table 3: FEI Rate Impact Analysis for the Period of 2017-2019**

		2020 With Growth	2020 Without Growth	2017-2019 Growth Amount	
<p><b>This section uses existing actual delivery costs and looks at the impact on revenue requirements without the addition of capital for the new customers added in the past 7 years. (2008 to 2014).</b></p>	<i>a</i>	2008-14 Meters/Regulators		\$12,652,956	
	<i>b</i>	2008-14 Services (Company Paid)		\$114,522,424	
	<i>c</i>	2008-14 Mains (Company Paid)		\$64,403,378	
	<i>d</i>	2008-2014 SJ and Internal Costs		\$8,574,181	
	<i>e</i>	Rate Base	\$5,138,254,000	\$4,938,101,062	\$200,152,938
	<i>f</i>	Return, Depreciation, Taxes	\$701,163,000	\$673,850,252	\$27,312,748
	<i>g</i>	Multiplier for Return, Depreciation, Taxes	13.6%	13.6%	13.6%
	<i>h</i>	O&M Expenses	\$257,395,000	\$251,269,145	\$6,125,855
	<i>i</i>	50% of Customer Growth Rate			2.4%
	<i>j</i>	Other Revenues/Expenses	-\$67,878,000	-\$67,878,000	
	<i>k</i>	Offsetting Bypass Revenues	-\$61,242,000	-\$61,242,000	\$0
	<i>l</i>	Total Revenue Requirement (exc. Cost of Gas)	\$890,680,000	\$857,241,397	\$33,438,603
	<i>m</i>	<b>Net Revenue Requirement (exc. Cost of Gas)</b>	<b>\$829,438,000</b>	<b>\$795,999,397</b>	<b>\$33,438,603</b>
<p><b>This section determines the usage associated with and without customers added to the system in the past 7 years.</b></p>	<i>n</i>	Customers	1,047,693	997,824	49,869
	<i>o</i>	Percent Growth in Customers			4.8%
	<i>p</i>	Average GJ/Cust	190	193	133
	<i>q</i>	<b>Total GJ</b>	<b>198,991,900</b>	<b>192,362,168</b>	<b>6,629,732</b>
	<p><b>This section calculates the rate impact without the new customers added from 2008 to 2014.</b></p>	<i>r</i>	Cost per GJ (exc. Cost of Gas)	\$4.17	\$4.14
<i>s</i>		Percent Difference			<b>0.73%</b>
<i>t</i>		<b>\$ Difference per Customer (Rate Impact per Customer/Year)</b>			<b>\$5.73</b>

5

1 The results of the 2017-2025 RIA are shown in Table 4. It shows an average savings of  
2 1.72 percent or 12 cents per GJ for existing customers, from the system extension activities during  
3 this nine-year period.

4 **Table 4: FEI Rate Impact Analysis for the Period of 2017-2025**

		2026 With Growth	2026 Without Growth	2017-2025 Growth Amount	
This section uses existing actual delivery costs and looks at the impact on revenue requirements without the addition of capital for the new customers added in the past 9 years. (2017 to 2025).	a	2017-2025 Meters/Regulators		\$38,144,807	
	b	2017-2025 Services (Company Paid)		\$383,482,818	
	c	2017-2025 Mains (Company Paid)		\$221,425,912	
	d	2017-2025 SJ and Internal Costs		\$31,632,632	
	e	DP System Improvements (SI)		\$61,854,995	
	f	Rate Base	\$6,838,150,000	\$6,101,608,836	\$736,541,164
	g	Return, Depreciation, Taxes	\$1,088,489,000	\$999,382,424	\$89,106,576
	h	Multiplier for Return, Depreciation, Taxes	12.1%	12.1%	12.1%
	i	O&M Expenses	\$347,243,000	\$298,416,642	\$48,826,358
	j	100% of Customer Growth Rate			14.1%
	k	Other Revenues/Expenses	-\$48,013,000	-\$44,995,989	-\$3,017,011
l	Offsetting Bypass Revenues	-\$27,321,000	-\$27,321,000	\$0	
m	Total Revenue Requirement (exc. Cost of Gas)	\$1,387,719,000	\$1,252,803,077	\$134,915,923	
n	<b>Net Revenue Requirement (exc. Cost of Gas)</b>	<b>\$1,360,398,000</b>	<b>\$1,225,482,077</b>	<b>\$134,915,923</b>	
This section determines the usage associated with and without customers added to the system in the past 9 years.	o	Customers	1,114,347	957,657	156,690
	p	Percent Growth in Customers			14.1%
	q	Average GJ/Cust	182	187	148
	r	<b>Total GJ</b>	<b>202,584,800</b>	<b>179,354,324</b>	<b>23,230,476</b>
This section calculates the rate impact without the new customers added from 2017 to 2025.	s	Cost per GJ (exc. Cost of Gas)	\$6.72	\$6.83	-\$0.12
	t	Percent Difference			-1.72%
	u	\$ Difference per Original Customer (Rate Impact per Customer per Year)			-\$21.37

5

**Appendix C**

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**JURISDICTIONAL SCAN**



# **FEI 2026 Main Extensions and Connection Policies Review**

## **Appendix C Jurisdictional Scan**

**May 15, 2026**

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## 1. INTRODUCTION

By Letter L-11-25 dated June 17, 2025, the British Columbia Utilities Commission (BCUC) directed FortisBC Energy Inc. (FEI) to file "...an application for the review of its terms and conditions, extension policies and the parts of the tariff governing customer connections." This appendix addresses the BCUC's specific direction for FEI to include a jurisdictional scan of similar natural gas utilities in North America that covers system extension policies, connection fees and connection cost allowances.

This appendix first examines the main extension and service line connection policies of major Canadian natural gas utilities across the following four provinces:

- **Alberta:** ATCO Gas (ATCO);
- **Ontario:** Enbridge Gas Distribution (EGD);
- **Quebec:** Énergir; and
- **British Columbia:** Pacific Northern Gas (PNG).

The final section of this appendix also includes a description of various system extension methodologies adopted by the natural gas utilities in the US.

FEI's jurisdictional scan generally relies on publicly available information, which includes regulatory filings available on the regulators' websites, as well as terms and conditions and tariffs posted on utilities' websites. In some cases, the system extension policies have been in place for many years and have not been addressed comprehensively in regulatory filings. In these cases, the policies may be less defined and lack details.

At a high level, the utility system extension and connection policies reviewed in this study are rooted in well-accepted rate design principles, including cost causation and avoiding undue discrimination and strive to balance the interests of existing and new customers. The jurisdictional scan also indicates:

- **Main extensions:** With respect to new main extensions, the Discounted Cash Flow (DCF) model (also referred to as the Net Present Value (NPV) approach) is a common approach used by Canadian utilities to test the economic feasibility of the main extensions and determine an appropriate main extension for new customers. Although the inputs and parameters of the test may vary depending on the jurisdiction and the specific circumstances of each utility, the commonly used DCF model is similar to the one used by FEI. The DCF model is also used by a number of US utilities, although other approaches, such as footage or fixed dollar allowances, or revenue/margin multiplier approaches are also widely used.

- 1       • **Infill customers:** With respect to infill customers, utilities typically use service line cost  
2       allowances or fees to recover an appropriate share of connection costs from a connecting  
3       infill customer. The service line cost allowances and connection fees can vary based on  
4       multiple factors including the working season, customers' location and expected annual  
5       volume, service line diameter and/or footage. These policies often allow for the potential  
6       customers with standard pipe diameter specifications to attach to the system at little or no  
7       extra cost if their footage/volume is not more/less than certain pre-defined threshold.
- 8       FEI's existing policies can thus be said to be broadly consistent with practices elsewhere, though  
9       specific elements inevitably vary among utilities due to company-specific factors such as the  
10      utility's operating environment, customer profile, regulatory history, and/or the utility's financial  
11      condition.

## 1    2.    ALBERTA – ATCO GAS DISTRIBUTION

### 2    2.1    BACKGROUND AND DEVELOPMENT

3    The Alberta Utilities Commission (AUC) and its predecessors have long taken the position that  
4    the system extension policy (also referred to as customer contribution policy in the AUC's  
5    decisions) should be considered as an economic test to ensure that existing customers are not  
6    unduly harmed by the utility's obligation to serve new customers:<sup>1</sup>

7            The Board considers that customer contributions are suitable in circumstances  
8            where service to a customer may impose costs on other customers for which they  
9            should not be responsible. An appropriate contribution policy therefore provides a  
10           suitable balance to an unlimited obligation to serve by imposing economic  
11           discipline on siting decisions. It transfers the economic burden of connection of  
12           new customers from the utility and its existing customers to the new customer. In  
13           other words, it exerts some of the discipline of the utility's economics on the  
14           economic decision-making of the customer.

15    More recently, the AUC reaffirmed the findings above:<sup>2</sup>

16            In Decision 2000-01, the Commission's predecessor, the Alberta Energy and  
17            Utilities Board stated —an appropriate contribution policy ... provides a suitable  
18            balance to an unlimited obligation to service by imposing economic discipline on  
19            siting decisions. The Commission agrees.

20    The AUC further states that the system extension policies should strike an appropriate balance  
21    between the interests of new and existing customers, while not providing preferential treatment  
22    to existing customers by allocating costs that benefit all customers only to new customers:<sup>3</sup>

23            The Board considers that customer contributions should relate only to the local  
24            connection costs of the system expansion. The deep system costs of expansion  
25            are properly the responsibility of all customers, form part of the utility's revenue  
26            requirement and should be recovered from all customers through rates.

27    In other words, the AUC considers that costs, such as those for system reinforcements or  
28    improvements, should be ordinarily recovered from all customers and not be part of the main  
29    extension test considerations.

---

<sup>1</sup> Decision 2000-01: ESBI Alberta Ltd., 1999/2000 General Rate Application Phase I and Phase II, Application No. 990005, File Nos. 1803-1, 1803-3, February 2, 2000.

<sup>2</sup> AUC Decision 2012-237, p. 182-183.

<sup>3</sup> Decision 2000-01: ESBI Alberta Ltd., 1999/2000 General Rate Application Phase I and Phase II, Application No. 990005, File Nos. 1803-1, 1803-3, February 2, 2000.

1 As discussed below, ATCO’s system extension policy reflects these findings.

2 **2.2 ATCO’S SYSTEM EXTENSION POLICY**

3 ATCO’s main extension policy is based largely on a principle of non-discriminatory access to  
 4 service. The table below provides a snapshot of ATCO’s main extension policies, which vary  
 5 depending on the location and the footage size of the pipe.

6 **Table 1: ATCO Gas’ Main Extension Policy**

Location Criterion	Footage Criterion	Extension Policy
Within a municipality with a franchise agreement with ATCO (assuming the municipality extended or will extend the sewage/water service)	N/A	No charge to the customer for main extensions (other than non-discretionary charges)
Outside municipalities with franchise agreement with ATCO	Up to 50 metres of pipe	No charge (other than non-discretionary charges)
	Greater than 50 metres	ATCO uses a “revenue multiplier” approach to calculate the allowance and potential customer contribution

7

8 **2.2.1 Free Extensions Within Most Municipalities and Otherwise First 50**  
 9 **Metres Free**

10 ATCO’s terms and conditions state that if an applicant’s premise is within a municipality which  
 11 has a franchise agreement with ATCO, then it will extend the main at no charge, other than those  
 12 payable under the applicable rate schedule, and non-discretionary charges discussed below. This  
 13 is based on the condition that the municipality must have extended or will extend the water and  
 14 sewer services to the applicant as well.

15 If the customer is not within a municipality which has a franchise agreement with ATCO, but the  
 16 main extension (excluding the service line) does not exceed 50 metres in length and an easement  
 17 or right of way satisfactory to the utility is provided, then ATCO will provide the extension at no  
 18 charge. If the extension is greater than 50 metres, ATCO applies a revenue multiplier approach  
 19 to calculate the allowance and potential customer contribution. Under this approach, the applicant  
 20 must pay the difference between the total estimated costs, and the total revenue that ATCO  
 21 expects to receive from the customer for the first three years. There is a “non-discretionary  
 22 charge” for service lines on a customer’s property.

23 **2.2.2 ATCO’s “Three-Times Net Revenue” Approach Applies in Remaining**  
 24 **Circumstances**

25 As discussed above, ATCO employs a revenue multiplier approach in circumstances where an  
 26 extension is not free, i.e., outside municipalities with a franchise agreement and longer than 50

1 metres). The revenue multiplier approach requires the applicant to pay the company the amount,  
 2 if any, by which the total estimated cost of the extension exceeds the amount the company  
 3 estimates it will receive from the applicant during the first three years of service.

4 ATCO periodically reviews its system extension costs to make sure the “three-times net revenue”  
 5 is still representative of the company’s investment. The methodology utilizes forecast total  
 6 connection costs (based on an average of historical construction costs), applicable government  
 7 grants, existing customer contributions under the non-discretionary charges discussed below and  
 8 ATCO’s investment.

9 For example, as shown in the table below, ATCO reviewed the three-times net revenue approach  
 10 for urban residential customers in 2014 based on 2012 actual data.<sup>4</sup>

11 **Table 2: ATCO’s Assessment of “Three-Times Net Revenue” Approach for Urban Residential**  
 12 **Customers**

Total Urban Main Extensions Costs (\$000)	\$ 17,027
Total Urban Services Costs (\$000)	\$ 26,152
Total Regulator Cost (\$000)	\$ 514
Total Reg & Meter Set Installation Cost (\$000)	<u>\$ 4,905</u>
Total Customer Construction Costs (\$000)	\$ 48,598
Total Customer Contributions (\$000)	\$ 19,186
Total Number of Customers	17,982
Average Customer Construction Costs	\$2,703
Average Customer Contribution (Schedule C Charges)	<u>\$1,067</u>
Average Company Investment	\$1,636
Typical Yearly Customer Revenue	<u>\$ 506</u>
Average Company Investment Expressed as "Times Net Revenue"	3.2

13  
 14 As shown in Table 2, ATCO’s analysis considers all the “local” costs of construction including the  
 15 main extension, service line, regulator as well as meter installation costs but does not include any  
 16 system improvement costs. The average customer contribution (the non-discretionary charges)  
 17 is then deducted from the average construction costs to get to the average company investment.  
 18 The average company investment should be approximately at three-times the annual net revenue.

19 **2.2.3 Non-Discretionary Charges for Service Lines on Customer Property**

20 ATCO’s terms and conditions include a list of “non-discretionary charges” (also referred to as  
 21 customer contribution) for the portion of service line connections from the boundary of the  
 22 applicant’s property, which abuts the street or the right of way in which the distribution main is  
 23 located, to the meter.

---

<sup>4</sup> ATCO’s response to AUC’s Information Request AUC-AG-12 dated February 2014; Application No. 1609962, ID. 2854.

1 For the connections in municipalities which have a franchise agreement with ATCO, specific  
 2 charges vary based on the service line diameter, season (summer or winter conditions) and  
 3 location with current approved service line charges. For example, as shown in Table 3 below,  
 4 ATCO’s North service territory has service line charges ranging from \$1,047 to \$1,814.

5 **Table 3: Pipe Installation Charges for ATCO Gas (North)<sup>5</sup>**

**1.1 Pipe Installation:**

<b>ATCO Gas (North)</b>		
<b>Service Line Diameter</b>	<b>Summer</b>	<b>Winter</b>
15.9 mm or 26 mm (up to and including 15 metres)	\$1,047	\$1,350
Linear charge for length over 15 metres	\$58/metre	\$78/metre
42.2 mm or 60.3 mm (up to 15 metres)	\$1,390	\$1,814
Linear charge for length over 15 metres	\$82/metre	\$107/metre
Greater than 60 mm	Contract Price	Contract Price
Credit for provision of service line trench in 4-party installation	\$48	\$245

6  
 7 Customers in municipalities which do not have a franchise agreement with ATCO and rural areas  
 8 may have to pay higher non-discretionary charges.

9 Since the AUC’s first-generation Performance-based Rate-setting (PBR) decision, these charges  
 10 are mechanically escalated by the approved indexing formula on an annual basis.<sup>6</sup>

<sup>5</sup> ATCO Gas’ Term and Conditions; Schedule of non-discretionary charges.

<sup>6</sup> AUC Decision 2012-237, page 183.

## 1    3.    ONTARIO – ENBRIDGE GAS DISTRIBUTION

### 2    3.1    BACKGROUND AND DEVELOPMENT

3    EGD’s existing system extension policy can be traced back to the OEB’s 1998 decision (E.B.O  
4    188) in which the OEB issued “guidelines for assessing and reporting on natural gas distribution  
5    system expansion in Ontario”.<sup>7</sup>

6    The guidelines included the use of a DCF analysis and the introduction of a portfolio approach,  
7    as opposed to the previously used project-by-project approach. The OEB rationalized this change  
8    in approach as “provid[ing] the utilities a greater degree of flexibility in determining which projects  
9    to undertake, while the Board retains overall regulatory control to ensure no undue cross subsidy  
10    or rate impacts result from distribution system expansion”.<sup>8</sup> Further, the guidelines established  
11    the parameters for the costs and revenues, which are the inputs to the DCF analysis.

12    In December 2023, as part of the phase one of EGD’s revenue requirement proceeding (EB-  
13    2022-0200), the OEB determined that it would enforce a no allowance policy for small volume  
14    customer connections – which represented a shift away from the established practice based on  
15    cost causation and rate design principles. Under this new approach, new customers would pay  
16    all the costs of a new main and/or service line connection up front, imposing a significant financial  
17    hindrance to gas system extensions.

18    In May 2024, in response to the OEB’s decision, the Government of Ontario passed the *Keeping*  
19    *Ontario Energy Cost Down Act, 2024*<sup>9</sup> which effectively reversed the OEB’s decision by giving the  
20    provincial government the authority to set energy policy, including, among other things, resetting  
21    the 40-year DCF term and other elements of EGD’s system extension test. The government’s  
22    authority to set the revenue horizon will expire by January 1, 2029, after which the exclusive  
23    authority to determine a revenue horizon will be returned to the OEB. Nevertheless, the  
24    government of Ontario’s “Natural Gas Policy Statement” published in June 2025 as part of  
25    Ontario’s “Integrated Energy Plan”, provides further clarity on the key principles that the OEB  
26    should consider in any future assessment of the system extension policies:<sup>10</sup>

27            The legislation also includes authority to require the OEB to hold a new hearing in  
28            the future to revisit the revenue horizon. Work to develop that new policy should  
29            ensure a broad range of stakeholders are consulted on the appropriate revenue  
30            horizon for natural gas distribution infrastructure, and how that horizon should  
31            evolve over time as the customer driven demand for natural gas changes. This  
32            should be done with regard to the following policy principles:

---

<sup>7</sup> <https://www.oeb.ca/documents/cases/Xo188/decision.pdf>.

<sup>8</sup> EBO-188, Appendix B.

<sup>9</sup> S.O. 2024, c. 10.

<sup>10</sup> Ontario’s Integrated Plan, June 2025; page 99.

- 1           • Does not introduce barriers to Ontario’s plan to build more homes faster;
- 2           • Considers more alignment of cost allocation and recovery policies between
- 3           natural gas and electricity connections, including the revenue horizon and
- 4           the way capital contributions are charged to customers;
- 5           • Considers impacts on electricity system capability to support electric
- 6           heating options and how this may impact timelines for fuel switching; and
- 7           • Considers appropriate customer protections.

8   As such, any future system extension policy set by OEB should consider these key principles.

9   **3.2 EGD’S SYSTEM EXTENSION POLICY**

10 In accordance with the OEB guidelines set by E.B.O 188, and similar to the approach used by  
 11 FEI, EGD evaluates the NPV of forecast project revenues (operating cash flows) and capital costs  
 12 using a DCF analysis.

13 The output of the DCF analysis is the Profitability Index (PI), which measures the value of a  
 14 project’s revenues against the project’s costs. A PI of 1.0 or greater indicates a project’s revenues  
 15 over its life cycle will be equal to or greater than the costs, on a present value basis, and validates  
 16 that a project is economically feasible.

17 As previously discussed, EGD uses a portfolio approach to manage its system expansion  
 18 activities to ensure the required profitability standards are achieved at both the project level and  
 19 the portfolio level. The OEB explains the benefit of this approach as follows:<sup>11</sup>

20           The Board also believes that if the utilities are allowed to assess the financial  
 21           viability of all potential customers as a group [using a portfolio approach] more  
 22           marginal customers could be served as a result of assessing the cost of serving  
 23           them together with more financially viable customers.

24 The portfolio approach consists of two distinct analyses: (i) Investment Portfolio and (ii) Rolling  
 25 Project Portfolio. As discussed in the Table 4 below, the main difference between the two analyses  
 26 relates to how each treats infill customers.

27                           **Table 4: EGD’s Portfolio Approach and Minimum PI Thresholds<sup>12</sup>**

Portfolio Type	Description
Investment Portfolio	Under this approach, EGD evaluates the costs and revenues associated with all new customers forecast to attach in a particular test year including new customers attaching to existing mains (infills). The Investment Portfolio is planned to achieve a PI of 1.0 or greater.

<sup>11</sup> E.B.O 188; page 7, para 2.11.

<sup>12</sup> EB-2022-0200; Exhibit 1, Tab 15, Schedule 1, Attachment 1, page 5.

Portfolio Type	Description
Rolling Project Portfolio (RPP)	RPP provides an ongoing method of determining the financial feasibility of system expansion projects over a rolling 12-month basis. The RPP includes all future customer attachments, revenues, and costs based on the life cycle of each project, however it excludes the costs and revenues associated with new customers attaching to existing mains built prior to the last 12-month period (infill customers). EGD maintains a PI of greater than or equal to 1.0 for its RPP; however, it may authorize exceptions, subject to a PI no lower than 0.8, as stipulated in E.B.O. 188.

1 The following sections discuss the key inputs to the DCF analysis used in EGD’s portfolio  
 2 approach in more detail.

### 3 **3.2.1 Inputs to the Revenue Calculation in DCF**

4 The key inputs for estimating project revenues (operating cash inflows) include a forecast of new  
 5 customers, and their estimated annual gas consumption and/or demand over the project revenue  
 6 horizon. Using these forecasts and OEB-approved natural gas distribution rates (i.e., delivery  
 7 rates), EGD estimates project revenues for use in the DCF analysis of the project.

8 Pursuant to E.B.O 188, the maximum customer attachment forecast period for a project is 10  
 9 years.<sup>13</sup> Customer consumption estimates depend on several factors, such as: the type of  
 10 customer, construction type, square footage, and number and type of appliances. For most  
 11 residential customers, gas usage is estimated based on historical averages by customer type  
 12 (e.g., single, semi-detached, townhouse, bungalow). Load estimation for non-residential  
 13 customers is made using historical knowledge, and/or estimates provided by customers or HVAC  
 14 contractors. For large volume commercial or industrial customers, detailed equipment lists with  
 15 connected load and hours of operation are used to estimate maximum hourly demand, contract  
 16 demand and annual consumption.<sup>14</sup>

17 The revenue forecast used in the analysis is net of cost of gas and other storage and mid-stream  
 18 charges.

### 19 **3.2.2 Inputs to the Capital Cost Estimation in DCF**

20 The inputs to the cash outflows analysis include all the direct and indirect costs for attaching  
 21 forecast customers.

22 Direct cost includes costs of distribution mains, services, customer stations, new distribution  
 23 stations, land and land rights. When a main is upsized in anticipation of future growth potential,  
 24 the feasibility assessment uses the cost of the minimum project design required to meet the  
 25 customer’s load requirements.<sup>15</sup>

<sup>13</sup> EBO 188; para. 3.2.1, page 13.

<sup>14</sup> EB-2022-0200; Exhibit 1, Tab 15, Schedule 1, Attachment 1, page 6.

<sup>15</sup> Ibid; page 7.

1 Indirect costs include an allowance for incremental overheads and Normalized System  
2 Reinforcement Costs (NSRC), which are considered in both portfolio analyses. NSRC represents  
3 a method of socializing reinforcement costs to new customers. NSRC are further categorized into  
4 “special” reinforcement costs, which are those associated with specific major reinforcements of  
5 the system and are amortized over a period of 10 to 20 years, and “normal” reinforcement, which  
6 are the residual of the total identified reinforcement costs after the special reinforcement costs  
7 are deducted. The historical average for the special and normal reinforcement costs are then  
8 used as the normalized amount to be included in the portfolio analysis as a percentage of the  
9 total capital expenditures in the year.<sup>16</sup>

### 10 **3.2.3 DCF Term**

11 The DCF term, also referred to as time horizon or revenue horizon, is the time period used to  
12 estimate future cash flows in a DCF analysis and impacts the results of both the operating cash  
13 inflows and the cash outflows DCF analyses. EGD’s revenue horizon continues to be set based  
14 on the E.B.O 188, by virtue of the Act effectively reversing the OEB’s changes to the E.B.O 188  
15 approach. Pursuant to E.B.O. 188, the maximum customer time horizon is 40 years from the in-  
16 service date of the initial main for residential and small commercial customers. For large volume  
17 customers (LVC) the maximum revenue horizon is 20 years from the customer’s initial service. A  
18 project-specific revenue horizon is used when the project life cycle is determined to be shorter  
19 than the prescribed time horizons.

### 20 **3.2.4 Residential Service Line and Connection Charges**

21 EGD uses the extra length rule for new residential customers (infills) connecting to existing mains.  
22 The rule allows EGD to attach residential infill customers at no cost to a maximum of 20 metres.  
23 Beyond 20 metres, customers pay an Extra Length Charge (ELC) per metre (currently at \$170.06  
24 per metre beyond 20 metres). The length of the service line for applying this rule will be measured  
25 from the customer’s property line to the location where the gas meter is installed. In addition, new  
26 customers shall pay a New Account Charge (currently at \$26.74 per new account) for covering  
27 the administrative costs associated with establishing a new customer account and activating  
28 billing information.<sup>17</sup>

## 29 **3.3 CONTRIBUTION COLLECTION POLICIES**

30 When a customer contribution is required to get to the minimum PI threshold, EGD applies the  
31 following guidelines to allocate Contribution in Aid of Construction (CIAC) between customers  
32 served by a new project:<sup>18</sup>

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<sup>16</sup> EBO 188; paragraphs 2.3.7 and 2.3.8, pages 10-11.

<sup>17</sup> Enbridge Gas Inc Rate Handbook; Rate Rider G (Service Charges); Link: <https://www.enbridgegas.com/-/media/Extranet-Pages/ontario/business-and-industrial/Commercial-and-Industrial/Large-Volume-Rates-and-Services/EGD-Rates/rate-handbook.pdf?rev=5bd2bbe0a1da40828c4f1451df56c7c1>.

<sup>18</sup> EB-2022-0200; Exhibit 1, Tab 15, Schedule 1, Attachment 1, Page 9, Section 5.2.

- 1 • When a CIAC is required for a project that serves more than one general service  
2 residential and small commercial customers, the CIAC is allocated between the customers  
3 based on the annual consumption forecast.
- 4 • When the project serves more than one LVC, the CIAC will be allocated between the  
5 customers based on their forecast peak hourly demand.
- 6 • If the project serves a mix of general service and one or more LVCs, the CIAC will be  
7 allocated between customers based on forecast peak hourly demand.

8 The customers can opt to pay the CIAC upfront in one lump sum payment. However, in some  
9 cases, due to factors such as increased costs that results from the longer distances to existing  
10 pipelines and/or the smaller number of customers served, the CIAC can be significant and hinder  
11 customers' ability to connect to the gas system. In these cases, and depending on the project  
12 specifications, the customer can choose to pay the required amount over several years via one  
13 of the following two surcharges: System Expansion Surcharge (SES) or Temporary Connection  
14 Surcharge (TCS).

15 The SES and TCS apply to both existing homes and businesses converting to natural gas, as  
16 well as customers attaching to a new construction project. Use of the SES and TCS surcharge  
17 provides a predictable rate and consistent approach for customers to provide contribution to  
18 expansion projects. The SES is applicable to projects with more than 50 customers while the TCS  
19 is for smaller projects with less than 50 customers. In both cases, a temporary volumetric rate as  
20 set out in applicable rate schedules (currently \$0.23 per cubic metre for both surcharges<sup>19</sup>) will be  
21 used as an alternative to a CIAC to achieve a PI of 1.0. The SES and TCS term will be based on  
22 the number of years it takes for the project to achieve a PI of 1.0 to a maximum of 40 years. The  
23 SES and TCS is applied to the property such that if a new owner takes possession, they will  
24 assume payment of the SES or TCS for the balance of the applicable term.

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<sup>19</sup> Enbridge Gas Inc Rate Handbook; Rate Rider I (System Expansion and Temporary Connection Surcharges).

## 1 4. QUEBEC – ÉNERGIR

### 2 4.1 BACKGROUND AND DEVELOPMENT

3 The Régie de l'énergie (Régie) recognizes that economically viable system extensions benefit  
4 existing customers through spreading the fixed costs among a larger customer base. Accordingly,  
5 it has consistently sought to enhance the accuracy of the inputs, for both revenue and cost  
6 estimation, used in the economic feasibility assessments of system extension projects to improve  
7 the accuracy of the analysis and the likelihood of profitable extension projects:<sup>20</sup>

8 The Régie must strike the right balance between the risks inherent in any  
9 expansion project, in terms of implementation costs and anticipated revenues, and  
10 the opportunities for network expansion and growth in delivered volumes, which  
11 can generate real price reductions in the more or less short term. It must calibrate  
12 the parameters used in the methodology for assessing the profitability of network  
13 expansion projects based on this desired balance and its assessment of market  
14 prospects that could affect natural gas distribution in the long term. [unofficial  
15 translation]

16 In recent years, Énergir has applied for and received approval from the Régie for a series of  
17 modifications to its system extension policies:

- 18 • The first set of system extension policy changes, which were approved by the Régie in  
19 2018 (Decision D-2018-080), authorized Énergir to adopt the DCF approach in place of  
20 the Internal Rate of Return (IRR) method. This decision also established minimum  
21 profitability thresholds at both the project and portfolio levels, approved refinements to  
22 revenue and cost inputs to improve their accuracy, and introduced elements (increased  
23 aggregate PI and adjustments to consumption forecasts used in the test) to account for  
24 the increased policy uncertainty.
- 25 • The second set of system extension policy changes, which were approved by the Régie  
26 in 2023 (Decision D-2023-018), authorized Énergir to reduce the DCF term for the  
27 residential and small commercial segments (i.e., the building sector). This more restrictive  
28 policy modification did not apply to system extensions for industrial and large commercial  
29 customers, which represent the majority of the company's volumes and revenues.<sup>21</sup>
- 30 • Most recently, in its 2025–2026 Revenue Requirement Decision (Decision D-2025-105),  
31 the Régie approved Energir's requests for certain refinements to the DCF term (removing  
32 the consumption thresholds criteria and hybrid heating exceptions) used in its profitability  
33 analysis while denying its request to provide preferential treatment to customers that

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<sup>20</sup> D-2018-080; Para. 67.

<sup>21</sup> In 2024, the industrial sector constituted 63% and 36% of Energir's volumes and revenues, respectively, while the residential sector only represented 10% and 20% of its sold volumes and revenues.

1 commit to its RNG offering. In this decision, the Régie further commented that it intends  
2 to continue its review of the method for evaluating the profitability of network expansion  
3 projects in a future proceeding.

4 The following sections provide a detailed overview of the evolution of Énergir's system extension  
5 policy since 2018, as well as a description of the current policy framework.

#### 6 **4.2 ENERGI'R'S SYSTEM EXTENSION POLICY**

7 Consistent with the methodologies employed by FEI and EGD, in 2018, the Régie approved the  
8 adoption of a DCF analysis combined with a portfolio-based approach to evaluate the profitability  
9 of proposed system extension projects:<sup>22</sup>

10 The Régie maintains that the PI is a measure of a project's profitability equivalent  
11 to the comparison between the IRR and the WACC. It also notes that since the  
12 WACC is modified for each rate case, this can make it more difficult to monitor the  
13 profitability threshold to be achieved for a given project. Consequently, the Régie  
14 agrees that the PI measure is easier to understand, both for the sales department  
15 and for the customers targeted by a network extension project.

16 [unofficial translation]

17 The Régie further set the minimum profitability threshold for individual project and portfolio levels  
18 at 1 and 1.3, respectively. Specifically, the Régie stated that a higher approved aggregate PI can  
19 act as a "buffer" to account for the future uncertainties given the long revenue horizon  
20 assumption:<sup>23</sup>

21 ... taking into account the uncertainty associated with the natural gas market in  
22 Quebec in the medium and long term discussed previously and taking into account

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<sup>22</sup> D-2018-080, Para 283. "La Régie retient que l'IP est une mesure de la rentabilité d'un projet équivalente à la comparaison entre le TRI et le CCP. Elle note également que le CCP étant modifié à chacun des dossiers tarifaires, cela peut rendre plus difficile le suivi du seuil de rentabilité à atteindre pour un projet donné. En conséquence, la Régie convient que la mesure de l'IP est plus facile à comprendre, tant pour le service des ventes que pour les clients visés par un projet d'extension de réseau."

<sup>23</sup> D-2018-080, Para 333-336. "Cependant, tenant compte de l'incertitude associée au marché du gaz naturel au Québec à moyen et long termes discutée précédemment et tenant compte de la période d'évaluation fixée à 40 ans, la Régie considère plus prudent de hausser le seuil minimal de l'IP du portefeuille. Dans la mesure où l'IP du portefeuille constitue un seuil à atteindre et non une cible, et considérant que le Distributeur présente habituellement en dossier tarifaire un portefeuille de projets dont la rentabilité a priori est bien supérieure au seuil minimal de rentabilité, la Régie considère que l'augmentation du seuil minimal de l'IP du portefeuille n'impose pas de contrainte insurmontable au Distributeur à court et moyen termes. Toutefois, un seuil minimal d'IP plus élevé permettra de déclencher plus rapidement des signaux d'alerte en cas de diminution significative de la rentabilité du portefeuille de projets. En effet, le cas échéant, la Régie pourra réévaluer les paramètres d'incertitude plus rapidement. Elle sera en mesure de réagir, sans restreindre, pour l'instant, la marge de manoeuvre du Distributeur. En conséquence, la Régie fixe le seuil minimal de rentabilité globale du portefeuille de projets d'extension de réseau inférieurs au seuil à un IP de 1,3, tous marchés confondus."

1 the evaluation period set at 40 years, the Régie considers it more prudent to raise  
2 the minimum threshold of the portfolio PI.

3 Since the portfolio's profitability index (PI) represents a threshold to be reached  
4 rather than a target and considering that the Distributor typically submits a portfolio  
5 of projects in its rate application whose expected profitability is well above the  
6 minimum threshold, the Régie considers that raising the minimum PI threshold  
7 does not impose an insurmountable constraint on the Distributor in the short or  
8 medium term.

9 However, a higher minimum PI threshold will allow for quicker warning signals in  
10 the event of a significant decline in the profitability of the project portfolio. In such  
11 cases, the Régie will be able to reassess the uncertainty parameters more  
12 promptly. It will be able to respond without, for now, limiting the Distributor's  
13 flexibility.

14 Consequently, the Régie sets the minimum overall profitability threshold for the  
15 network extension project portfolio below the threshold at a PI of 1.3, across all  
16 markets.

17 [unofficial translation]

18 The key inputs to Energir's DCF test are discussed in the sections below.

#### 19 **4.2.1 Inputs to the Revenue Calculation in DCF**

20 Under Energir's approach, the project's expected revenues are forecast based on customers'  
21 contractual commitments. These contractual commitments are ordinarily valid for five years and  
22 can be in the form of a volume commitment (in the case of end-use customers) or commitment  
23 for the connection to the distribution network of a certain number of doors (in the case of  
24 developers). The Régie agreed that this approach enhances the precision of revenue inputs and  
25 reduces the risk of revenue shortfalls during the initial years of a system extension.

26 Additionally, pointing to Energir's recurring challenges in customer retention and declining  
27 volumes in residential and commercial sectors, the Régie concluded that it is prudent to further  
28 mitigate the risk of revenue shortfall over the longer term and directed Energir to apply a negative  
29 15 percent adjustment to its volume forecasts for its residential and commercial customers:<sup>24</sup>

30 Based on the data submitted by Énergir, in order to take into account all the factors  
31 influencing the expected downward growth in volumes from network extension  
32 projects, the Régie considers that it is appropriate to apply an adjustment rate of -

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<sup>24</sup> D-2018-080, Para 333-336. "Sur la base des données mises en preuve par Énergir, afin de tenir compte de l'ensemble des facteurs influençant à la baisse la croissance des volumes attendue des projets d'extension de réseau, la Régie juge qu'il y a lieu d'appliquer aux prévisions de ventes associées aux projets d'extension de réseau un taux d'ajustement de - 15 %, pour chacun des marchés résidentiel et commercial."

1 15% to the sales forecasts associated with network extension projects for each of  
2 the residential and commercial markets.

3 [unofficial translation]

#### 4 **4.2.2 Inputs to the Cost Calculation in DCF**

5 System extension costs are divided into direct and indirect costs. The direct project costs  
6 associated with main and service line attachments are included and amortized according to the  
7 approved depreciation rate in the DCF analysis. With regard to indirect costs, the Régie  
8 recognized that some categories of indirect costs, such as overhead expenses and/or system  
9 reinforcement costs, cannot be readily allocated to individual projects. Therefore, these costs are  
10 ordinarily not included in the project level DCF analysis and only considered in the aggregated PI  
11 analysis. In the following sections, the Régie's determinations regarding the overhead and system  
12 reinforcement costs are discussed in more detail.

##### 13 **4.2.2.1 Corporate Overhead Costs**

14 The Régie agreed with Energir that corporate overhead costs are not directly correlated with the  
15 number of expansion projects completed or the number of new customers and are mainly  
16 influenced by factors such as salary inflation and benefits. As such, the Régie determined that for  
17 the projects below the \$1.5 million threshold, corporate overhead expenses should not be  
18 considered on a project-by-project basis and only be reflected at the aggregated PI analysis.<sup>25</sup>

19 With respect to corporate overhead costs attributable to projects above the \$1.5 million threshold,  
20 the Régie approved a rate of 14.53 percent to be applied to the first \$1.5 million of the project  
21 costs and a rate of 2 percent to the amount of the project costs in excess of \$1.5 million. This is  
22 similar in concept to the sliding scale overhead rate that FEI applies to projects with capital costs  
23 that exceed \$25,000.

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<sup>25</sup> D-2018-080, Para 152-153.: La Régie considère qu'attribuer précisément les FGC, soit les frais découlant des activités administratives d'Énergir qui soutiennent la réalisation de chaque projet, aux fins de l'évaluation de la rentabilité refléterait davantage l'imputation réelle des coûts aux projets qui les causent. Cependant, dans le contexte observé de faible variation des FGC dans le temps, présentant peu de corrélation avec la croissance du niveau des investissements et considérant l'incapacité logistique actuelle d'Énergir de déterminer les réels efforts dédiés à chaque projet au sein de l'entreprise, la proposition d'Énergir de considérer les FGC uniquement dans l'évaluation de la rentabilité globale du Plan de développement global, apparaît raisonnable.

Par conséquent, la Régie accueille la proposition d'Énergir de tenir compte de la totalité des FGC projetés dans l'évaluation de la rentabilité globale du Plan de développement des projets d'extension de réseau correspondants aux investissements inférieurs au seuil.

#### 1 **4.2.2.2 System Reinforcement Costs**

2 In its 2018 decision, the Régie determined that system improvement costs, including the  
3 preventive maintenance costs associated with system reinforcement will only be considered in  
4 assessing the aggregate profitability of the system extension projects:<sup>26</sup>

5 An investment in system reinforcement may be required to serve new or potential  
6 future customers, or to accommodate additional load for existing customers. Since  
7 it is rarely possible to precisely identify the beneficiaries of a specific reinforcement  
8 project and the impact this investment has on network capacity, the Régie  
9 considers it reasonable and equitable that Reinforcement costs be considered only  
10 at the portfolio level.

11 Consequently, the Régie accepts Énergir's proposal to continue to consider the  
12 required investment amounts for Distribution System Reinforcement in assessing  
13 the overall profitability of the Development Plan for investments below the  
14 threshold.

15 [unofficial translation]

#### 16 **4.2.3 DCF Term**

17 In recent years, the Régie and Energir have both evolved their positions regarding an appropriate  
18 time horizon to be applied to the DCF analysis several times. In 2018, the Régie agreed with  
19 Energir that choosing a time horizon that reflects the average useful life of the assets in the  
20 projects is appropriate:<sup>27</sup>

21 The Régie considers that there is a certain advantage in terms of simplicity in  
22 maintaining the current time horizon, insofar as it reflects the average useful life of  
23 the assets in the projects. It also considers it preferable to maintain the evaluation  
24 period at 40 years and instead make adjustments to other parameters whose risk  
25 mitigation effects are more easily identifiable and quantifiable. [unofficial  
26 translation]

27 In 2023, Energir sought and received approval from the Régie for changing the DCF term for  
28 certain target groups of residential and commercial customers to better align the company's

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<sup>26</sup> D-2018-080, Para 191-192. Un investissement en Renforcement peut être requis pour desservir de nouveaux clients ou de futurs clients potentiels, ou encore, pour satisfaire un ajout de charge chez des clients existants. Comme il est rarement possible d'identifier précisément les bénéficiaires d'un Renforcement et l'impact que cet investissement a sur la capacité du réseau, la Régie juge raisonnable et équitable que les coûts de Renforcement soient pris en compte uniquement au niveau du portefeuille.

Par conséquent, la Régie accueille la proposition d'Énergir de continuer à considérer les montants d'investissement requis en Renforcement du réseau de distribution dans l'évaluation de la rentabilité globale du Plan de développement des investissements inférieurs au seuil.

<sup>27</sup> D-2018-080, Para 93-94. "La Régie juge qu'il y a un certain avantage de simplicité à conserver l'horizon d'analyse actuel, dans la mesure où il reflète la durée de vie utile moyenne des actifs mis en place dans les projets. Elle juge également préférable de maintenir la période d'évaluation à 40 ans et d'apporter plutôt des ajustements à d'autres paramètres dont les effets de mitigation des risques sont plus facilement identifiables et quantifiables."

1 system extension policies with its new focus on dual-fuel heating systems and the promotion of  
2 RNG consumption. Under this approach, the time horizon applied to the DCF analysis varied  
3 based on the customer segment (industrial customers were not impacted), the estimated  
4 consumption level, type of heating equipment (commitment to hybrid systems) and the type of  
5 natural gas purchased (renewable or conventional).

6 For customers in the selected target groups (i.e., residential connection with less than 20 doors,  
7 commercial customer with less than 15,000 m<sup>3</sup> annual consumption and institutional customers  
8 with less than 500,000 m<sup>3</sup> per year consumption) that opt out of Energir's hybrid heating offerings  
9 and/or RNG offering (minimum 5 year commitment), the DCF term was reduced to 20 years to  
10 reflect the average useful life of the appliances.

11 For customers that are not in the selected target groups (i.e., industrial customers and those  
12 consuming above the above-mentioned thresholds) or customers in the selected target groups  
13 that choose hybrid heating and/or RNG, the DCF term remained at 40 years to reflect the average  
14 useful life of the assets in the projects. This was specifically designed to promote Energir's hybrid-  
15 heating program in the residential and small commercial building sectors and increasing the share  
16 of RNG in its gas supply portfolio while minimizing the impact on its revenues by excluding large  
17 commercial and industrial customers from these changes.

18 More recently, in its 2025-2026 revenue requirement application (R-4287-2024), Energir again  
19 sought approval for new changes to the DCF terms used in its system extension assessment  
20 under which Energir proposed to remove the consumption threshold criteria so that for all  
21 customer segments (with exception of industrial customers), irrespective of their consumption  
22 levels, the DCF term shall be set at 20 years unless the customer can commit to a 5-year RNG  
23 contract (even if the customers opt for the hybrid heating offering). In its decision, the Régie  
24 approved Energir's request to remove the consumption thresholds and apply the same 20-year  
25 DCF term to all customer segments (excluding industrial customers); however, it rejected  
26 Energir's request to use different DCF terms depending on whether RNG or conventional natural  
27 gas is used, preferring that the extension test remain fuel-agnostic:<sup>28</sup>

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<sup>28</sup> D-2025-105, Para 112-115: En ce qui a trait aux différents services de fourniture, la Régie est d'avis que l'analyse de rentabilité doit refléter la meilleure estimation possible des revenus futurs des projets d'investissements tout en tenant compte du risque associé à ces revenus. Cette analyse ne doit pas avoir pour objectif de favoriser une source de fourniture par rapport à une autre. Ainsi, la Régie juge que toute modification des paramètres de l'analyse de rentabilité doit plutôt résulter d'un changement dans le risque d'affaires associé aux différents types de raccordement.

La Régie comprend de la preuve d'Énergir que sa proposition repose notamment sur l'hypothèse selon laquelle les clients ayant accepté un engagement de consommation de GSR pendant 5 ans présentent, selon Énergir, un risque moins élevé que les clients consommant du GNT. La position d'Énergir repose aussi sur l'hypothèse à l'effet que l'option GNT ne sera plus disponible dans 20 ans et, conséquemment, qu'il serait imprudent de considérer des revenus sur 40 ans. Or, la Régie n'est pas convaincue par ces arguments qui ne sont pas étayés par une preuve probante. De plus, elle juge qu'il est prématuré à ce stade de conclure que la mise en place éventuelle de diverses réglementations rendra incertain l'avenir du GNT, de telle sorte qu'on ne puisse prévoir des revenus au-delà de 20 ans pour les nouveaux raccordements au GNT.

En conséquence, la Régie accueille partiellement la demande d'Énergir quant aux ajustements à apporter à la méthode d'évaluation de la rentabilité des projets d'extension de réseau. Elle rejette les modifications visant une exigence de consommation de 100 % de GSR d'une durée minimale de 5 ans aux fins de bénéficier d'une projection des volumes et des revenus sur 40 ans.

1 This analysis must not aim to favour one source of supply over another. Therefore,  
2 the Régie considers that any modification of the parameters of the business case  
3 analysis must instead result from a change in the business risk associated with the  
4 different types of connection. The Régie understands from Énergir's evidence that  
5 its proposal is based, in particular, on the assumption that customers who have  
6 agreed to a 5-year RNG consumption commitment present, according to Énergir,  
7 a lower risk than customers consuming natural gas. Énergir's position is also  
8 based on the assumption that the natural gas option will no longer be available in  
9 20 years and, consequently, that it would be imprudent to consider revenues over  
10 40 years. However, the Board is not convinced by these arguments, which are not  
11 supported by conclusive evidence. Furthermore, it considers it premature at this  
12 stage to conclude that the eventual implementation of various regulations will make  
13 the future of natural gas uncertain, such that revenues cannot be projected beyond  
14 20 years for new natural gas connections. Accordingly, the Board partially grants  
15 Énergir's request regarding adjustments to the method for assessing the  
16 profitability of network expansion projects. It rejects the amendments requiring 100  
17 percent RNG consumption for a minimum of 5 years in order to benefit from a 40-  
18 year projection of volumes and revenues. It approves, as of this decision, the  
19 elimination of the market segment application caps, as shown in the following  
20 table.

21 **Table [5]: Énergir's currently approved DCF Terms**

Market Segment	DCF Terms
Residential	20 Years
Commercial	
Institutional	
Industrial	40 Years

22

23 [unofficial translation]

24 Additionally, in its decision, the Régie stated that given certain questions regarding Énergir's  
25 system extension test remain unanswered, it intends to continue its review of the methodology  
26 for assessing the profitability of network expansion projects in a future proceeding.

#### 27 **4.2.4 Service Line Connection Charges**

28 Énergir's terms and conditions require applicants under general distribution service rate schedule  
29 (Rate D1) whose projected annual volume is less than 10,950 m<sup>3</sup> to pay a \$300 connection  
30 charge. The service connection charge is payable in a single payment or, if the applicant is a

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Elle approuve, à compter de la présente décision, l'abolition des plafonds d'application des segments de marché, comme présenté au tableau suivant.

- 1 customer of the distributor, over a period of 24 months or, at the customer's request, in a single
- 2 payment.<sup>29</sup>
  
- 3 For non-standard connections (when the connection point is located more than 3 metres from the
- 4 building or when the length of the pipe between the property line and the connection point exceeds
- 5 50 linear metres), an additional \$50 dollar per metre charge or a case-by-case cost estimation
- 6 may apply.

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<sup>29</sup> Energir's Conditions of Service and Tariff; Section 4.3.

## 1    **5.    BRITISH COLUMBIA – PACIFIC NORTHERN GAS (PNG)**

### 2    **5.1    BACKGROUND AND DEVELOPMENT**

3    PNG operates under two distinct service areas: PNG-West (PNG) and PNG-Northeast (PNG-NE)  
4    As highlighted in PNG's Gas Sales Tariff, the origins of the existing system extension policy for  
5    both service areas can be traced back to the BCUC's 1996 generic hearing on system extension  
6    policies and the subsequent issuance of the voluntary system extension policy guidelines (1996  
7    System Extension Guidelines):<sup>30</sup>

8            All applications to extend the Gas distribution system to one or more new  
9            Customers will be subject to a financial analysis conducted by Pacific Northern  
10           Gas in general accordance with "Utility System Extension Test Guidelines" issued  
11           by the British Columbia Utilities Commission on September 5, 1996.

12    In its 2001 revenue requirement application, PNG-NE proposed implementation of the 1996  
13    System Extension Guidelines, which was subsequently approved by the BCUC. Similarly, as part  
14    of the PNG's 2001 revenue requirement proceeding, the BCUC approved PNG's proposal to  
15    amend certain elements of its extension test to align with its 1996 System Extension Guidelines.  
16    These amendments generally resulted in a reduction to the maximum allowable company  
17    contribution toward extension costs, thereby increasing the required customer contribution.

18    Since these amendments, the extension policies for the two service areas have remained largely  
19    unchanged. The only material revisions occurred in 2011, when PNG and PNG-NE sought and  
20    received BCUC approval to harmonize their General Terms and Conditions of Service with  
21    respect to service line connection charges.

### 22    **5.2    MAIN EXTENSION POLICY**

23    As discussed in PNG's 2001 revenue requirement decision, PNG's main extension policy is based  
24    on well-established cost allocation and rate design principles (including fair apportionment of cost  
25    and ease of administration) with the main objective to determine the maximum amount that can  
26    be invested in a proposed extension without adding costs to existing customers.<sup>31</sup> To achieve this  
27    objective, PNG conducts an NPV analysis under which the present value of margin requirements  
28    to install and operate the main extension will be compared with the present value of the projected  
29    margin using the current rates by customer class and the estimated number of customers to be  
30    served.

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<sup>30</sup> PNG's Gas Sales Tariff, Section 12.1.

<sup>31</sup> BCUC Order G-51-01; PNG 2001 Revenue Requirement Decision, Section 2.7.4.

1 PNG's system extension policy has been in place for many years and has not been addressed  
2 comprehensively in recent regulatory filings.<sup>32</sup> PNG's tariff indicates that cost inputs for the NPV  
3 analysis are estimated based on the forecast customer additions during the first year of the  
4 operation of the main extension:<sup>33</sup>

5       The cost of installing a Main Extension will be estimated by Pacific Northern Gas,  
6       taking account of local installation conditions and current cost factors for materials  
7       and services required to complete the installation. Customer connections during  
8       the first year of operation of the Main Extension will be forecast by the Pacific  
9       Northern Gas based on its previous experience with customer connections to Main  
10       Extensions in similar market situations. The Company will bear all costs of  
11       installation of a Main Extension provided the Main Extension Test indicates that  
12       the present value of costs related to installation and operation of the Main  
13       Extension does not exceed the present value of projected margin from potential  
14       Customers who would receive service from the Main Extension.

15 PNG does not include the system improvement costs as an input in its DCF analysis and typically  
16 recovers these costs from all customers as part of the revenue requirement. Given recent rate  
17 pressures, PNG has been considering how to treat significant system improvement costs for  
18 potential new large volume customers. Options for the future include seeking to recover some or  
19 all of these costs through backstopping arrangements or long-term transportation/sales  
20 agreements that would be subject to BCUC review and approval. This would still be outside the  
21 main extension test, though the underlying analysis of the amount to be recovered would align  
22 with the MX test modelling.

23 The time horizon assumed in the NPV calculation is set at 20 years, to be consistent with the time  
24 horizon used in the integrated resource planning, and the horizon has not changed for more than  
25 25 years.

26 If PNG's analysis indicates a negative NPV, the main extension project may proceed provided  
27 that the shortfall in revenue is eliminated by CIACs from the customers connecting at the time the  
28 main is built. PNG would collect contributions from all customers connecting during the first five  
29 years after the project is built. As additional contributions are received from new customers  
30 connecting to the main, partial refunds will be made to those who had previously made  
31 contributions. At the end of the fifth year, all customers will have paid an equal contribution, after  
32 reconciliation and refunds.

### 33 **5.3 SERVICE LINE CONNECTION CHARGES**

34 According to PNG's and PNG-NE's consolidated Gas Sales Tariff, the standard fee for service  
35 line connection costs is set at \$450 plus tax for services requiring up to 42 mm diameter pipe and

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<sup>32</sup> PNG has not filed any recent "system extension" application and minor changes are often reviewed as part of other regulatory proceedings.

<sup>33</sup> PNG's Gas Sales Tariff, Section 12.4.

1 up to 21 metres of service line.<sup>34</sup> For installations in excess of 21 metres, an extra metres charge  
2 of \$10 per metre will apply. For services requiring 60 mm diameter pipe or greater, the utilities will  
3 provide the customer with the estimated cost prior to installation and the connection charge will  
4 be set at the actual cost to install the new service line. In addition, the new customers pay a \$30  
5 application fee for each new installation.

### 6 **5.3.1 Historical Background and Linkage to FEI's Approach**

7 Following the closure of the Methanex plant in 2000, PNG experienced significant liquidity issues  
8 and did not have sufficient funds to construct new services unless the customer was prepared to  
9 pay the cost.<sup>35</sup> Therefore, in its 2001 revenue requirement application, PNG applied to increase  
10 its service connection charge to collect the full average cost of a service line, regulator and meter,  
11 at the time estimated to be around \$1,000 dollars. Given the mentioned financial difficulties, the  
12 BCUC approved this request and directed PNG to consider a similar approach to the one used  
13 by FEI (then BC Gas) in future applications as its financial conditions improve over time.<sup>36</sup>

14 In the present circumstances, the Commission directs PNG to charge new  
15 customers the estimated full cost of each service connection. The proposal is  
16 generally fair to new and existing customers and it minimizes the Utility's financial  
17 exposure to new customers.

18 As the finances of PNG improve, the Commission will request that the Utility  
19 consider an approach such as that of BC Gas (which charges a lower standard fee  
20 for most service connections and a surcharge once the estimated cost exceeds a  
21 certain limit that is higher than the standard fee) which is preferable in its trade-off  
22 between fairness and administrative ease.

23 In December 2010, PNG and PNG-NE filed an application with the BCUC for a Consolidated Gas  
24 Sales Tariff to harmonize the general terms and conditions of service that apply to gas sales  
25 customers in all service areas. In this proceeding, PNG reported improved financial conditions  
26 and proposed to reduce the service line connection charge in its service area to align with the  
27 standard fee applied in PNG's other service area. By Order G-127-11, the BCUC approved this  
28 proposal noting that reducing the new service line connection charge from \$1,000 to \$450 can  
29 likely benefit existing customers and is directionally consistent with FEI's approach.<sup>37</sup>

30 The Commission Panel is of the view that a reduction in the price of the new service  
31 line cost is likely to make the prospect of choosing natural gas as an energy source  
32 more attractive to potential customers. This, in turn, will likely lead to additional  
33 system throughput and provide existing customers the benefit of lower delivery  
34 costs. Further, the Panel notes that the position taken by PNG with respect to new  
35 service line costs is directionally in line with the current terms at FortisBC Energy

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<sup>34</sup> This fee includes all necessary equipment such as the riser, meter stop, regulator, and gas meter.

<sup>35</sup> BCUC Order G-51-01; PNG 2001 Revenue Requirement Decision, pages 46-47.

<sup>36</sup> Ibid.

<sup>37</sup> BCUC Order G-127-11; Appendix A, page 5.

1           Inc. Presently FortisBC Energy Inc. has no additional charge for most customers  
2           connecting to the main line as long as certain conditions are met and cost  
3           allowances are not exceeded. Therefore, the practice of collecting less than the  
4           full costs associated with providing connection services is not incongruent with  
5           industry practice and, where applied, is likely to result in a lowering of delivery  
6           costs related to increased throughput. Accordingly, the Panel accepts that the  
7           potential benefits to existing ratepayers and new ratepayers are sufficient to  
8           override concerns regarding the fairness to existing ratepayers of sharing in some  
9           of the costs of new connections. The Commission Panel has determined that  
10          harmonizing the connection fee rate to \$450 for all service areas is in the public  
11          interest.

## 6. SYSTEM EXTENSION POLICIES IN THE UNITED STATES

This section provides a high-level overview of natural gas utilities' main extension policies across the US based on a 2024 report published by the American Gas Association (AGA) titled "The Current State of Natural Gas Line Extension Policies" (AGA Report).<sup>38</sup> This report, which was prepared by researchers from Illinois University with assistance from Concentric Energy Advisors, offers insight into the regulatory frameworks, cost recovery mechanisms and policy rationales underpinning line extension practices in the US.

A review of the AGA Report indicates that, traditionally, the system extension policies in the US are based on well-established cost allocation and rate design principles:<sup>39</sup>

While line extension policies vary among gas utilities, traditionally, the guiding principle is to ensure that extending service to new customers benefits existing customers through spreading fixed costs among a larger customer base. Line extension policies were designed to ensure that this beneficial cost-spreading effect occurs without cross-subsidies from existing customers to new customers, while allowing the utility to provide a level of investment commensurate with the incremental revenues from the new customers. Those wishing to change these policies typically claim that any cost of a main extension not directly paid by new customers is a cross-subsidy from existing customers to new customers. (See e.g., Dammel, 2022, p. 7). While not always clearly delineated, presumably that would only apply if the rates paid by new customers are not compensatory and increase the overall revenue requirement.

### 6.1 EXTENSION COST ALLOWANCE CALCULATION METHODOLOGIES

The survey of gas utilities in the US indicates that although some states such as New York and Florida have regulations or legislation that explicitly direct utilities to structure line extension policies in a certain way, most states have no statewide policy and leave it up to the utilities to create their own extension policies, leading to the potential use of different extension policies in the same jurisdiction.

The table below provides a synopsis of four different methods used in the US for calculating the main extension allowances: NPV model (i.e., DCF model), footage allowance, dollar allowance and revenue/margin multiplier. As discussed below, the NPV (DCF) approach that is used by FEI and all of the other Canadian utilities reviewed is also common in the US. Moreover, a DCF analysis is implicitly the basis of the footage allowance, dollar allowance and revenue/margin multiplier approaches as well. As the AGA Report notes, a DCF analysis "is either used explicitly

<sup>38</sup> <https://www.aga.org/research-policy/resource-library/the-current-state-of-natural-gas-utility-line-extension-policies/>.

<sup>39</sup> AGA Report, pages 30-31.

1 to calculate the level of allowance for each customer or performed at a system level to support  
2 more simplistic approaches”.<sup>40</sup>

3 **Table 6: Snapshot of System Extension Approaches in the US**

Approach	Description <sup>41</sup>	States	Utilities
NPV (DCF) Method	On an NPV basis, if expected future revenues of a new customer equal or exceed the expected costs to connect that customer, the utility may grant a line extension allowance (LEA) that either offsets the required incremental investment in its entirety or provides an amount such that an NPV value of zero is achieved. If expected costs exceed expected revenues, then the customer must make a financial contribution to make the extension financially feasible and to prevent existing customers from subsidizing new customers.	Alabama, Arkansas, Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, Michigan, Minnesota, Nebraska, Nevada, New Hampshire, North Carolina, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Virginia, Washington, Wyoming	34 utilities
Footage Allowance	Conceptually, there is some cost for mains hooking up customers embedded in existing rates. A footage allowance estimates the value of the basic level of service which operates as an offset to costs based on the distance from the main. If the customer is located farther from the distribution main than the distance covered by the footage allowance, the customer must pay the additional cost of construction.	Arkansas, Georgia, Indiana, Kansas, Louisiana, Mississippi, Missouri, New Hampshire, North Carolina, Ohio, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Vermont, Wisconsin	46 utilities
Dollar Allowance	Dollar allowance follows a similar approach without the use of distance as a factor. The construction allowance is capped at a fixed dollar amount, and the customer must pay the costs that are above the fixed cap.	Colorado, Kansas, Maine, Montana, Oregon, Washington, Wyoming	10 utilities
Revenue/Margin Multiplier	Instead of performing an NPV study for each new customer, a utility may choose to provide an allowance that equals a multiple of annual expected non-fuel base distribution margin revenues. Under this approach, the customer’s revenue stream is estimated based on customer class usage characteristics or the specific appliances.	Alaska, Hawaii, Idaho, Indiana, Louisiana, Maine, Missouri, Nevada, New Jersey, New Mexico, North Dakota, Oregon, South Dakota, Wisconsin	28 utilities

<sup>40</sup> AGA Report, page 32.

<sup>41</sup> Ibid.

1 As shown, footage allowance and NPV/DCF are the most common methodologies for determining  
2 the appropriate extension allowance, followed by the revenue/margin multiplier approach and  
3 dollar allowance model.

4 Currently, California and Colorado are the only two jurisdictions with an established statewide “no  
5 allowance” tariff (except in limited circumstances) applied to all natural gas utilities,<sup>42</sup> although  
6 other jurisdictions with more restrictive gas legislation and policies such as New York,<sup>43</sup> Oregon<sup>44</sup>  
7 and Washington<sup>45</sup> have also started to phase out gas line extension allowances. As indicated in  
8 the footnotes in this paragraph, the majority of these jurisdictions have legislation specifically  
9 authorizing or initiating these steps.

10 In some cases, these restrictive policies have led to ongoing legal challenges by natural  
11 gas/customer choice proponents. For instance, in the November 2024 general elections,  
12 Washington voters approved Initiative 2066, which sought to prohibit state and local governments  
13 from restricting gas use or penalizing its installation in buildings which could have challenged  
14 restrictive system extension policies. However, in March 2025, a state Superior Court judge  
15 overturned this initiative, ruling that the initiative was too broad and improperly combined multiple  
16 unrelated subjects, which could confuse voters. As of October 2025, the case is pending before  
17 the Washington Supreme Court, which will decide the final constitutional validity of Initiative 2066.  
18 This initiative and the ensuing legal challenges highlight the increased polarization of the energy  
19 policy in the US and the struggle to balance competing objectives and interests.

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<sup>42</sup> In California, the state regulator ordered an end to LEAs for gas infrastructure in 2022 and gas LEAs terminated in 2023. In Colorado, the state legislature passed a legislation to end gas LEAs in 2023 with utility tariffs implementing the phase-out filed in first half of 2024.

<sup>43</sup> New York governor signed a bill to end gas LEAs in December 2025 with policy going into effect in one year.

<sup>44</sup> The regulator directed Avista Corp and Northwest Gas to phase out gas LEAs, eliminating them completely in 2027. NorthWest Natural has appealed the order while Avista’s phase-out is proceeding.

<sup>45</sup> In March 2024, the Washington State legislator passed House Bill 1589 to eliminate gas incentives and rebates. As a result of this legislation, the regulator directed Avista Corp, Puget Sound Energy Inc. (PSE) and Cascade Natural Gas Corp to end gas LEAs in a series of rate case orders. Avista and PSE implemented the phase-out in 2025 while Cascade is terminating its policy in 2027.

1 **7. CONCLUSION**

2 The review of system extension policies in Canada indicates that regulators in other provinces  
3 have articulated similar rate design objectives to the BCUC for system extension and connection  
4 policies. The DCF analysis, like the analysis used by FEI, is the typical approach used in Canada  
5 for assessing the profitability of system extension projects. The revenue and cost inputs and  
6 parameters used in the DCF models may vary depending on the regulatory history and the specific  
7 circumstances of each utility. The DCF model is also used by a number of US utilities, although  
8 other simpler approaches, such as footage or fixed dollar allowances or revenue/margin multiplier  
9 methods are also widely used in the US. As with extension policies, service line connection  
10 allowances and fees typically vary based on factors such as connection location, footage and size  
11 of the pipe, and/or estimated consumption levels.

**Appendix D**

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**MAIN EXTENSION INPUTS 2014-2025**



# **FEI 2026 Main Extensions and Connection Policies Review**

## **Appendix D**

### **Main Extension Inputs 2014-2025**

**May 15, 2026**

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1 **1. INTRODUCTION**

2 By Letter L-11-25 dated June 17, 2025, the British Columbia Utilities Commission (BCUC)  
3 directed FortisBC Energy Inc. (FEI) to file an application for the review of its system extension  
4 policies and its terms and conditions pertaining to customer connections. The BCUC directed that  
5 the application includes, in respect of the Main Extension (MX) Test:

- 6 • An assessment of the variability and trends of each of the inputs to the Profitability Index  
7 (PI) calculation for each year from 2014 to 2025

8 In accordance with the BCUC's directive, this appendix assesses the historical MX Test inputs for  
9 the years 2014 to 2025, which include:

- 10 • Discount rate used in NPV calculation;
- 11 • Inputs for net cash inflows calculation:
- 12 ○ Basic and Delivery Charge;
- 13 ○ Consumption per Customer;
- 14 ○ Application Fees;
- 15 ○ Operations and Maintenance (O&M) Costs;
- 16 ○ System Improvement (SI) Charge;
- 17 ○ Municipal Tax Rates;
- 18 ○ Property Tax Rates; and
- 19 ○ Income Tax Rates.
- 20 • Inputs for net cash outflows calculation:
- 21 ○ Main, Services, and Meter Costs;
- 22 ○ Overhead Rates; and
- 23 ○ Working Capital Rates.

## 2. DISCOUNT RATE USED IN NPV CALCULATION 2014-2025

The discount rate used to derive the present value in the MX Test formula is based on FEI's approved weighted average cost of capital (WACC) and is inflation adjusted.<sup>1</sup> Please refer to Table 1 below for FEI's approved WACC, the inflation factor, and the resulting discount rate used from 2014 to 2025.

**Table 1: FEI's Pre-Tax WACC, Inflation Factor, and Discount Rates from 2014 to 2025**

Year	Company	WACC	Inflation Factor	Discount Rate
2025	FEI	6.90%	3.86%	2.93%
2024	FEI	6.94%	3.91%	2.91%
2023	FEI	6.93%	3.93%	2.21%
2022	FEI	6.18%	3.32%	2.77%
2021	FEI	6.25%	3.36%	2.80%
2020	FEI	6.31%	2.79%	3.42%
2019	FEI	6.50%	2.00%	4.42%
2018	FEI	6.44%	2.00%	4.36%
2017	FEI	6.70%	2.00%	4.61%
2016	FEI	6.90%	2.00%	4.81%
2015	FEI	7.02%	1.30%	4.90%
2014	FEI	7.30%	2.00%	4.50%
	FEVI	6.94%	2.00%	4.40%

As FEI's WACC increases, the discount rate increases, and vice versa. Conversely, when inflation increases, it reduces the discount rate (and vice versa). The general trends regarding FEI's approved WACC and the inflation factor (as shown in Table 1 above) are summarized as follows:

- FEI's approved WACC was lower between 2018 and 2022 than other years primarily due to lower interest rates for both long-term and short-term debt over this period. However, FEI's approved WACC started to increase in 2023 primarily due to the approved increase in FEI's equity thickness and ROE in 2023 to 45 percent and 9.65 percent, respectively, as part of the BCUC's Decision and Order G-236-23 on Stage 1 of the Generic Cost of Capital (GCOC) proceeding.
- The inflation factor was relatively stable from 2014 to 2020. Starting in 2021, however, significant increases began to occur, primarily triggered by global market events such as the COVID-19 pandemic and subsequent supply chain disruptions.

The combined trend of FEI's approved WACC and the inflation factor from 2014 to 2025 resulted in the inflation-adjusted discount rates being generally lower post-2020 than pre-2020.

<sup>1</sup> Inflation-adjusted discount rate calculated as  $(1 + \text{pre-Tax WACC}) / (1 + \text{Inflation}) - 1$ .

### 3. INPUTS FOR NPV OF NET CASH INFLOWS

#### 3.1 BASIC AND DELIVERY CHARGES 2014-2025

The basic and delivery charges used to determine the Delivery Margin in the MX Test are updated annually as of January 1<sup>st</sup> based on the rates approved by the BCUC as part of FEI's Annual Review processes. Please refer to Tables 2 to 4 for the basic and delivery charges of Rate Schedules (RS) 1, 2, and 3 as inputs to MX Test from 2014 to 2025.

**Table 2: Rate Schedule 1 Basic and Delivery Charge from 2014 to 2025**

Year	Company	Basic Charge (Annual)	Delivery Charge (\$/GJ)
2025	FEI	\$149.20	\$7.33
2024	FEI	\$149.20	\$6.63
2023	FEI	\$149.20	\$6.01
2022	FEI	\$149.20	\$5.46
2021	FEI	\$149.20	\$4.92
2020	FEI	\$149.20	\$4.50
2019	FEI	\$149.20	\$4.38
2018	FEI	\$141.99	\$4.37
2017	FEI	\$142.08	\$4.43
2016	FEI	\$142.08	\$4.43
2015	FEI	\$142.08	\$4.22
2014	FEI	\$142.08	\$3.62
	FEVI	\$126.00	\$8.10

**Table 3: Rate Schedule 2 Basic and Delivery Charge from 2014 to 2025**

Year	Company	Basic Charge (Annual)	Delivery Charge (\$/GJ)
2025	FEI	\$517.85	\$4.99
2024	FEI	\$346.44	\$5.02
2023	FEI	\$346.44	\$4.57
2022	FEI	\$346.44	\$4.17
2021	FEI	\$346.44	\$3.77
2020	FEI	\$346.44	\$3.47
2019	FEI	\$346.44	\$3.38
2018	FEI	\$297.88	\$3.52
2017	FEI	\$298.08	\$3.56
2016	FEI	\$298.08	\$3.56
2015	FEI	\$298.08	\$3.41
2014	FEI	\$298.08	\$2.94
	FEVI	\$113.40	\$10.72

1

**Table 4: Rate Schedule 3 Basic and Delivery Charge from 2014 to 2025**

Year	Company	Basic Charge (Annual)	Delivery Charge (\$/GJ)
2025	FEI	\$1,585.00	\$4.65
2024	FEI	\$1,749.36	\$4.24
2023	FEI	\$1,749.36	\$3.89
2022	FEI	\$1,749.36	\$3.58
2021	FEI	\$1,749.36	\$3.28
2020	FEI	\$1,749.36	\$3.05
2019	FEI	\$1,749.36	\$2.98
2018	FEI	\$1,589.14	\$2.94
2017	FEI	\$1,590.23	\$2.97
2016	FEI	\$1,590.23	\$2.97
2015	FEI	\$1,590.23	\$2.85
2014	FEI	\$1,590.23	\$2.47
	FEVI	\$402.36	\$10.23

2

3 As shown in Tables 2 to 4 above, FEI’s delivery rates for RS 1, 2, and 3 have generally been  
 4 increasing since 2014 (except for customers in Vancouver Island in 2014 prior to the  
 5 amalgamation and implementation of common rates between FEI and FEVI on January 1, 2015).  
 6 The specific drivers of the delivery rate changes were described in detail in FEI’s Annual Review  
 7 proceedings. In general, as the delivery rates increase, the NPV of the net cash inflows in the MX  
 8 Test would increase, therefore increasing the PI of the MX Test.

9 **3.2 CONSUMPTION PER CUSTOMER 2014-2025**

10 The average consumption per customer by appliance type for residential and small commercial  
 11 customers is based on the most recently available Residential End Use Study (REUS) at the time  
 12 of each year’s MX Test.

13 Please refer to Table 5 below for the consumption per customer by appliance type used for the  
 14 2014 MX Test which was based on the 2008 REUS, Table 6 for the 2015 to 2019 MX Tests which  
 15 were based on the 2014 REUS, and Table 7 for the 2020 to 2025 MX Tests which were based  
 16 on the 2017 REUS, with the exception of the hot water heaters and hot tub inputs. The hot tub  
 17 value has been retained from the 2012 REUS because the 2017 REUS produced a negative  
 18 result. The 2017 REUS produced a hot water heater variance of approximately 21 percent  
 19 compared to the 2012 REUS. As a result, FEI used an alternate value derived from an aggregate  
 20 analysis of three residential water heating studies conducted by the City of Vancouver, the Natural  
 21 Gas Technology Centre and FortisBC.

1 **Table 5: Average Consumption per Customer by Appliance Type for 2014 MX Test (2008 REUS)**

Appliance	2014 (GJ/year)		
	Lower Mainland	Interior	Vancouver Island
Barbeque	3.1	3.1	3.1
Boiler	62.0	51.6	43.0
Clothes Dryer	4.2	3.6	3.4
Fireplace – Décor	18.3	15.9	16.1
Fireplace – Heating	21.4	19.8	19.7
Furnace (primary)	62.0	51.6	43.0
Furnace (secondary)	18.1	39.3	19.9
Hot Tub	19.5	19.5	19.5
Hot Water Tank	20.4	18.8	18.8
Pool	38.5	38.5	38.5
Range/Cooktop	5.6	5.1	4.7
Wall Heater	7.1	7.1	7.1

2

3 **Table 6: Average Consumption per Customer by Appliance Type for 2015-2019 MX Test (2014**  
 4 **REUS)**

Appliance	2015 – 2019 (GJ/year)
Barbeque	3.1
Boiler	52.4
Clothes Dryer	3.9
Fireplace – Décor	17.7
Fireplace – Heating	14.6
Furnace (primary)	52.4
Furnace (secondary)	24.5
Hot Tub	21.3
Hot Water Tank	26.3
Pool	43.1
Range/Cooktop	12.5
Wall Heater	7.1

5

1 **Table 7: Average Consumption per Customer by Appliance Type for 2020-2025 MX Test (2017**  
 2 **REUS)**

Appliance	2020 – 2025 (GJ/year)
Barbeque	0.7
Boiler	51.7
Clothes Dryer	1.8
Fireplace – Décor	16.5
Fireplace – Heating	16.0
Furnace (primary)	51.7
Furnace (secondary)	23.3
Hot Tub	21.3
Hot Water Tank	25.1
Pool	39.3
Range/Cooktop	5.2
Wall Heater	7.1

3  
 4 The average consumption by appliance type has generally been declining slowly with each  
 5 iteration of the REUS. This is expected given the demand side management (DSM) activities as  
 6 well as improvement in technology over time which helped to reduce the average consumption of  
 7 each appliance type. As the average consumption use by appliance type reduces, it reduces the  
 8 net cash inflow of each project under the MX Test.

9 For large volume commercial and industrial customers, FEI’s Planners work directly with the  
 10 project developer’s design consultant or mechanical contractor to determine the estimated gas  
 11 load, taking into account the project design, intended end uses, operating hours and expected  
 12 appliances to be installed. This estimated gas load is then used in the MX Test as the consumption  
 13 included in the MX Test instead of using the average consumption use from the REUS. The  
 14 consumption per customer for larger commercial and industrial customers is highly variable and  
 15 specific to each project. FEI’s data system also does not allow FEI to export the consumption per  
 16 customer inputs for all main extensions that occurred at the request of larger volume customers.  
 17 FEI therefore cannot provide a summary of the consumption per customer for these customers.

18 **3.3 APPLICATION FEES 2014-2025**

19 The Application Fee is an administration charge meant to cover the cost to set up a new customer  
 20 account in FEI’s billing system. The total application fee of each MX Test is derived by multiplying  
 21 the application fee per customer by the number of customers of each main extension project.  
 22 Please refer to Table 8 below for FEI’s Application Fee from 2014 to 2025. FEI notes that the  
 23 Application Fee was updated to \$15 per customer effective November 1, 2018, approved by  
 24 Decision and Order G-135-18 as part of FEI’s 2016 Rate Design Application.

1

**Table 8: Application Fee Values from 2014 to 2025**

Year	Company	Application Fee
2025	FEI	\$15.00
2024	FEI	\$15.00
2023	FEI	\$15.00
2022	FEI	\$15.00
2021	FEI	\$15.00
2020	FEI	\$15.00
2019	FEI	\$15.00
2018	FEI	\$25.00
2017	FEI	\$25.00
2016	FEI	\$25.00
2015	FEI	\$25.00
2014	FEI	\$25.00
	FEVI	\$25.00

2 **3.4 OPERATIONS AND MAINTENANCE (O&M) INPUTS 2014-2025**

3 The O&M input to the MX Test is intended to capture the incremental O&M required to connect a  
4 new customer to FEI's distribution system, derived by multiplying the O&M per customer by the  
5 number of customers connecting to a main extension.

6 The O&M per customer is updated annually based on FEI's most recent actual gross O&M (i.e.,  
7 actuals from two years prior)<sup>2</sup> for activities that are directly impacted by the number of new  
8 customer attachments. These O&M activities include distribution operation, distribution corrective  
9 maintenance, account service, customer service, customer billing, meter reading, credit and  
10 collections, and bad debt management. Table 9 below shows the O&M per customer input used  
11 in the MX Test from 2014 to 2025.

12 **Table 9: O&M per Customer Input Applicable to MX Tests from 2014 to 2025**

Year	Company	Residential \$/Customer	Commercial \$/Customer
2025	FEI	\$65.00	\$68.00
2024	FEI	\$65.00	\$69.00
2023	FEI	\$64.00	\$68.00
2022	FEI	\$59.00	\$63.00
2021	FEI	\$61.00	\$64.00
2020	FEI	\$59.00	\$62.00
2019	FEI	\$63.00	\$67.00

<sup>2</sup> For example, the O&M input for the 2025 MX Test, which was set at the end of 2024, was based on FEI's 2023 Actual Gross O&M.

Year	Company	Residential \$/Customer	Commercial \$/Customer
2018	FEI	\$56.00	\$67.00
2017	FEI	\$64.00	\$67.00
2016	FEI	\$64.00	\$67.00
2015	FEI	\$77.00	\$81.00
2014	FEI	\$79.00	\$82.00
	FEVI	\$58.00	\$82.00

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2 As noted above, the O&M per customer is updated annually based on FEI's most recent actual  
3 gross O&M (i.e., actuals from two years prior). The decrease in O&M per customer in 2016  
4 compared to 2015 was the result of the re-setting of FEI's base O&M as part of the 2014-2019  
5 Performance Based Ratemaking (PBR) Plan. As a result of the 2014-2019 PBR Plan decision,  
6 FEI's actual gross O&M was reduced by approximately \$7.9 million, therefore resulting in the step  
7 reduction of O&M per customer seen in 2016 (which was based on 2014 actual gross O&M).

8 For the 2016 to 2025 MX Tests, although FEI's gross O&M had generally increased over this  
9 period, the impact on O&M per customer was mostly offset by the steady increase of customer  
10 counts in the denominator of the calculation (in the case of 2018, 2020, and 2022, the increase  
11 in customer counts entirely offset the increase in actual gross O&M, resulting in an overall  
12 decrease in O&M per customer). Given the increase in both the actual gross O&M in the  
13 nominator and customer counts in the denominator over time, the O&M per customer has  
14 remained relatively stable, ranging between \$56 and \$65 for residential customers and within \$62  
15 and \$67 for commercial customers.

### 16 **3.5 SYSTEM IMPROVEMENT (SI) CHARGES 2014-2025**

17 The SI Charge is a per gigajoule (GJ) charge and is a proxy for the incremental system  
18 improvement costs associated with growth that is not attributable to a specific customer. The SI  
19 formula is as follows:

20 
$$SI = \text{Number of Customers} \times \text{Consumption per Customer} \times \text{SI Charge per GJ}$$

21 The SI Charge per GJ is updated annually. Table 10 below provides the SI charge per GJ used  
22 in the MX Tests from 2014 to 2025.

23 **Table 10: SI Charge from 2014 to 2025**

Year	Company	SI Charge (\$/GJ)
2025	FEI	\$1.04
2024	FEI	\$1.43
2023	FEI	\$0.59
2022	FEI	\$0.36

Year	Company	SI Charge (\$/GJ)
2021	FEI	\$0.09
2020	FEI	\$0.14
2019	FEI	\$0.15
2018	FEI	\$0.15
2017	FEI	\$0.21
2016	FEI	\$0.21
2015	FEI	\$0.24
2014	FEI	\$0.24
	FEVI	\$0.40

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The variations in the SI Charge are primarily driven by two factors:

1. The 5-year forecast of SI expenditures; and
2. The 5-year forecast growth of FEI's peak-day demand.

The 5-year forecast growth of peak-day demand used in each year's MX Test represents the total forecast increase of FEI's peak-day demand over a 5-year period, which is based on FEI's Annual Contracting Plan (ACP) filed with the BCUC for acceptance each year.

The 5-year forecast of SI expenditures represent the forecast projects required over a 5-year period to increase the existing distribution system capacity in order to meet the increasing customer peak demand.

As the 5-year forecast of SI expenditures increases (the nominator of the calculation), the SI Charge will increase. Conversely, if the 5-year forecast growth of FEI's peak day demand increases (the denominator of the calculation), the SI Charge will decrease.

Table 11 below shows the 5-year forecast growth of peak day demand and the 5-year forecast SI expenditures used to determine the SI Charge of each MX Test from 2014 to 2025.

**Table 11: 5-Year Forecast of SI Expenditures and 5-Year Forecast Growth of Peak-day Demand Used to Determine SI Charge from 2014 to 2025**

Year	Company	5-Year Forecast of FEI's System Improvement (\$000s)	5-Year Forecast Growth of Peak Day Demand (TJs)
2025	FEI	\$74,321	46.000
2024	FEI	\$57,620	27.000
2023	FEI	\$62,287	67.000
2022	FEI	\$40,724	71.000
2021	FEI	\$14,160	104.000
2020	FEI	\$15,228	76.581

Year	Company	5-Year Forecast of FEI's System Improvement (\$000s)	5-Year Forecast Growth of Peak Day Demand (TJs)
2019	FEI	\$14,268	65.570
2018	FEI	\$13,235	61.958
2017	FEI	\$12,991	49.968
2016	FEI	\$11,658	49.968
2015	FEI	\$12,015	47.443
2014	FEI	\$10,670	40.340
	FEVI	\$4,634	9.233

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2 As shown in the above table, both the 5-year forecast growth of peak day demand and the 5-year  
3 forecast of SI expenditures have been steadily increasing from 2014 to 2020, resulting in the SI  
4 Charge remaining relatively stable in these years (i.e., the 5-year forecast growth of peak day  
5 demand generally increased slightly faster than the 5-year forecast of SI expenditures, resulting  
6 in the SI Charge being slightly lower in 2018, 2019 and 2020 compared to the years from 2014 to  
7 2017). However, since 2020, the 5-year forecast growth of peak day demand has declined while  
8 the 5-year forecast of SI expenditures has increased significantly. This has resulted in the SI  
9 Charge increasing significantly since 2020.

10 For the 5-year forecast growth of peak day demand, FEI is unable to identify with certainty the  
11 specific reasons behind the reduced rate of growth in peak demand from its accepted ACP, as  
12 circumstances are expected to vary among different customers and customer types. However,  
13 FEI believes the general decline from 2021 is likely attributable to a combination of stricter building  
14 codes, installation of more energy-efficient projects and economic conditions. FEI also notes that  
15 the increase in the 5-year forecast growth of peak day demand used in the 2025 MX Test is  
16 primarily due to the increasing trend of transportation service customers returning to FEI's  
17 bundled service.

18 The increase in the 5-year forecast of SI expenditures in recent years was previously explained  
19 in FEI's 2025-2027 Rate Setting Framework (RSF) Application which was approved by the BCUC  
20 in Decision and Order G-69-25. System improvements are projects required to increase the  
21 existing distribution system capacity with additional mains to meet the increasing customer peak  
22 demand. These costs are driven primarily by customer additions that necessitate improvement to  
23 the system capacity to maintain reliable service to existing and new customers. However, there  
24 is often a lag between when the new customers are connected and when the increased capacity  
25 is needed (e.g., the load changes are not expected until future years even though the new  
26 customers were connected in the current year). As a result of the lag between when customers  
27 are connected and when the distribution system reaches capacity, FEI experienced large  
28 increases in SI expenditures from 2023 to 2025 primarily due to the higher number of new  
29 customer attachments that occurred in 2020 and 2021.

1 **3.6 MUNICIPAL TAX RATES 2014-2025**

2 The municipal tax input is derived based on 1 percent of FEI’s forecast revenue in accordance  
 3 with section 644 of the *Local Government Act*.<sup>3</sup> However, since the 1 percent is applied to FEI’s  
 4 forecast revenue which includes commodity costs while the MX Test accounts for delivery margin  
 5 only (excludes commodity costs), the 1 percent is adjusted annually based on the ratio of FEI’s  
 6 approved revenue requirement and delivery margin by rate schedule for each year’s MX Test.  
 7 For example, FEI’s approved revenue requirement and delivery margin in 2025 for RS 1 was  
 8 \$1,025 million and \$750 million, respectively. As such, the 1 percent applied to FEI’s RS 1 revenue  
 9 requirement was prorated to 1.37 percent (i.e., \$1,025 million / \$750 million).

10 Please refer to Tables 12, 13, and 14 below for the municipal tax rates, prorated to be based on  
 11 the delivery margin of RS 1, 2, and 3, respectively, for the MX Tests from 2014 to 2025. FEI notes  
 12 that due to the fact that the municipal in lieu rates were adjusted based on the ratio between FEI’s  
 13 revenue requirement and delivery margin, for the years when the commodity costs were higher,  
 14 the prorated municipal in lieu rate by delivery margin were higher (e.g., the commodity costs in  
 15 2023 were higher than 2022 and 2024, resulting a higher municipal in lieu rate used in the 2023  
 16 MX Test).

17 **Table 12: Rate Schedule 1 Municipal In Lieu Rate 2014-2025**

Year	Company	In Lieu Rate
2025	FEI	1.37%
2024	FEI	1.56%
2023	FEI	1.95%
2022	FEI	1.59%
2021	FEI	1.51%
2020	FEI	1.49%
2019	FEI	1.44%
2018	FEI	1.53%
2017	FEI	1.39%
2016	FEI	1.66%
2015	FEI	1.88%
2014	FEI	1.84%
	FEVI	1.57%

18 **Table 13: Rate Schedule 2 Municipal In Lieu Rate 2014-2025**

Year	Company	In Lieu Rate
2025	FEI	1.51%
2024	FEI	1.78%
2023	FEI	2.32%
2022	FEI	1.81%

<sup>3</sup> [https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/r15001\\_16#section644](https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/r15001_16#section644).

Year	Company	In Lieu Rate
2021	FEI	1.71%
2020	FEI	1.67%
2019	FEI	1.62%
2018	FEI	1.72%
2017	FEI	1.54%
2016	FEI	1.91%
2015	FEI	2.21%
2014	FEI	2.15%
	FEVI	1.53%

1 **Table 14: Rate Schedule 3 Municipal In Lieu Rate 2014-2025**

Year	Company	In Lieu Rate
2025	FEI	1.58%
2024	FEI	1.84%
2023	FEI	2.44%
2022	FEI	1.86%
2021	FEI	1.72%
2020	FEI	1.67%
2019	FEI	1.52%
2018	FEI	1.59%
2017	FEI	1.44%
2016	FEI	1.76%
2015	FEI	2.03%
2014	FEI	1.92%
	FEVI	1.80%

2 **3.7 PROPERTY TAX RATES 2014-2025**

3 Property tax is calculated by multiplying the cost for mains and services associated with the main  
 4 extension by FEI's average property tax rate for distribution system assets, which is updated  
 5 annually. Table 15 provides the average property tax rates used in the MX Tests from 2014 to  
 6 2025.

7 **Table 15: Property Tax Rates from 2014 to 2025**

Year	Company	Property Tax Rate
2025	FEI	1.63%
2024	FEI	1.66%
2023	FEI	1.68%
2022	FEI	1.73%

Year	Company	Property Tax Rate
2021	FEI	1.80%
2020	FEI	1.82%
2019	FEI	1.79%
2018	FEI	1.81%
2017	FEI	1.83%
2016	FEI	1.85%
2015	FEI	1.86%
2014	FEI	1.91%
	FEVI	1.88%

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2 FEI notes that property tax rates are recalculated annually as each taxing authority establishes  
3 its budget each year with the corresponding tax rates derived from BC Assessment’s annual  
4 valuation of properties within that jurisdiction. As shown in the table above, the property tax rates  
5 have generally declined over time due to the assessed property values increasing at a faster pace  
6 than local government budget requirements.

7 **3.8 INCOME TAX RATES 2014-2025**

8 Table 16 below provides FEI’s income tax rates from 2014 to 2025, which were used in each  
9 year’s MX Test. In 2018, FEI’s income tax rate changed from 26 percent to 27 percent in  
10 accordance with tax legislation.

11

**Table 16: Income Tax Rate 2014-2025**

Year	Company	Income Tax Rate
2025	FEI	27.00%
2024	FEI	27.00%
2023	FEI	27.00%
2022	FEI	27.00%
2021	FEI	27.00%
2020	FEI	27.00%
2019	FEI	27.00%
2018	FEI	27.00%
2017	FEI	26.00%
2016	FEI	26.00%
2015	FEI	26.00%
2014	FEI	26.00%
	FEVI	26.00%

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1 Table 17 below provides the rate of Capital Cost Allowance (CCA) used for the calculation of  
2 income tax deduction. The rate is based on CCA Class 51 for Mains, Services, and Meters. The  
3 CCA rate used has remained at 6 percent from 2014 to 2025.

4

**Table 17: CCA Rate 2014-2025**

Year	Company	CCA Rate
2025	FEI	6.00%
2024	FEI	6.00%
2023	FEI	6.00%
2022	FEI	6.00%
2021	FEI	6.00%
2020	FEI	6.00%
2019	FEI	6.00%
2018	FEI	6.00%
2017	FEI	6.00%
2016	FEI	6.00%
2015	FEI	6.00%
2014	FEI	6.00%
	FEVI	6.00%

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## 4. INPUTS FOR NPV OF NET CASH OUTFLOWS

### 4.1 MAIN, SERVICES, AND METER COST INPUTS 2014-2025

The estimated cost to install mains, services and meters is dependent on, and specific to, the individual circumstances of each main extension project. Factors such as the length of a required main extension, the number of dwellings or businesses, the total gas load, and any potential encumbrances, impact the estimated mains, service lines and meters cost included in the MX Test. FEI uses a combination of a Geographic Code pricing (geo pricing) and manual estimates to derive cost estimates. For simpler and lower cost projects, geo pricing is used. Geo costs are based on the average actual cost in a particular region applied to the specific conditions of each MX Test. For larger, costlier main extension projects, FEI uses manual pricing to estimate the costs of mains, services and meters. Manual pricing or estimating refers to a cost estimate prepared by FEI's planning department. This is completed without the use of geo prices, based on the planner's knowledge and experience, and in consultation with service providers for any required outside expertise.

Table 18 below provides FEI's geo pricing inputs for estimated main costs.

**Table 18: Geo Pricing Main Inputs 2014-2025 (\$/metre)**

Zone	Year											
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Vancouver & Richmond	\$56	\$61	\$83	\$77	\$77	\$76	\$78	\$90	\$107	\$120	\$128	\$185
North Shore & Squamish	\$61	\$75	\$77	\$79	\$73	\$65	\$71	\$74	\$74	\$120	\$130	\$130
North of Fraser River	\$53	\$52	\$54	\$50	\$54	\$56	\$60	\$65	\$70	\$89	\$109	\$115
South of Fraser River	\$44	\$43	\$45	\$49	\$50	\$52	\$58	\$62	\$68	\$86	\$98	\$120
Interior North	\$34	\$40	\$46	\$47	\$43	\$43	\$45	\$46	\$49	\$57	\$63	\$65
Interior South	\$34	\$36	\$39	\$40	\$38	\$39	\$42	\$49	\$53	\$67	\$72	\$76
Vancouver Island	\$50	\$52	\$66	\$71	\$74	\$75	\$74	\$75	\$75	\$80	\$90	\$110
Whistler	\$105	\$90	\$102	\$104	\$102	\$103	\$111	\$125	\$133	\$205	\$205	\$215

Table 19 provides the geo pricing inputs for estimated service lines costs. FEI notes that prior to 2022, the cost estimate for all services lines included with main extensions was manually estimated by FEI Planners.

1 **Table 19: Geo Pricing Service Line Inputs 2022-2025 (Fixed Price per Service Line)**

Zone	Year				Year			
	2022	2023	2024	2025	2022	2023	2024	2025
	Simple				Complex			
Vancouver & Richmond	\$3,135	\$3,029	\$4,355	\$4,768	\$3,631	\$4,300	\$5,645	\$6,385
North Shore & Squamish	\$2,927	\$3,212	\$4,061	\$5,097	\$3,647	\$4,261	\$5,879	\$7,030
North of Fraser River	\$2,473	\$2,575	\$4,019	\$4,002	\$2,987	\$4,240	\$5,369	\$6,337
South of Fraser River	\$2,351	\$2,445	\$3,237	\$3,497	\$2,774	\$4,674	\$5,714	\$6,598
Interior North	\$1,431	\$1,506	\$1,778	\$2,045	\$2,632	\$2,795	\$3,200	\$3,648
Interior South	\$1,590	\$1,777	\$2,145	\$2,417	\$2,530	\$3,060	\$4,128	\$4,257
Vancouver Island	\$2,140	\$2,502	\$3,188	\$3,548	\$3,424	\$4,221	\$5,543	\$6,083
Whistler	\$3,354	\$3,006	\$3,905	\$4,206	\$3,933	\$3,806	\$4,704	\$4,515

2 Simple pricing applies when the entire service line path is free of landscaping and hard surfaces  
3 and no road crossing is required. This would be typical for new residential developments such as  
4 subdivisions, strata projects and townhomes. Complex pricing applies when existing landscaping  
5 or hard surfaces will be disturbed or when the installation requires a road crossing. New single-  
6 family homes built on existing streets or conversion projects where driveways, lawns or roadways  
7 may be impacted would characterize when complex pricing would be used.

8 Tables 20 and 21 below provide the estimated meter and regulator cost inputs for Residential and  
9 Small Commercial customers and for Large Commercial and Industrial customers, respectively.

1

**Table 20: Residential and Small Commercial Meter and Regulator Cost Inputs 2014-2025<sup>4</sup>**

		Meter and Regulator Costs Combined											
Meter Series	kPa	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
200	1.75	\$108	\$118	\$130	\$134	\$135	\$136	\$144	\$152	\$191	\$217	\$261	\$270
400		\$214	\$238	\$253	\$244	\$287	\$265	\$283	\$298	\$352	\$390	\$447	\$463
Sonix 425											\$299	\$314	\$332
630		\$1,362	\$1,396	\$1,611	\$1,611	\$1,626	\$1,716	\$1,793	\$1,855	\$2,298	\$2,433	\$2,650	\$2,743
1000		\$1,574	\$1,599	\$1,716	\$1,716	\$1,736	\$1,788	\$1,833	\$2,002	\$2,490	\$2,618	\$2,687	\$2,889
3M & PTZ		\$3,554	\$3,354	\$3,525	\$3,525	\$3,826	\$3,633	\$3,975	\$4,140	\$5,370	\$5,944	\$6,033	\$6,139
200	2.7	\$136	\$144	\$159	\$163	\$167	\$169	\$178	\$186	\$228	\$260	\$310	\$335
400		\$224	\$248	\$264	\$254	\$293	\$271	\$288	\$305	\$358	\$388	\$446	\$473
1000		\$1,799	\$1,621	\$1,863	\$1,968	\$1,992	\$2,059	\$2,117	\$2,297	\$2,490	\$2,818	\$2,887	\$3,089
3M & PTZ		\$3,354	\$3,354	\$3,525	\$3,525	\$3,826	\$3,633	\$3,975	\$4,140	\$5,670	\$5,944	\$6,033	\$6,139
200	14	\$128	\$138	\$151	\$153	\$158	\$160	\$173	\$183	\$226	\$266	\$309	\$319
400		\$220	\$248	\$263	\$252	\$291	\$270	\$287	\$306	\$362	\$404	\$459	\$475
Sonix 425											\$347	\$362	\$381
630		\$1,362	\$1,396	\$1,611	\$1,611	\$1,626	\$1,716	\$1,793	\$1,855	\$3,017	\$3,267	\$3,669	\$3,746
1000		\$1,699	\$1,599	\$1,716	\$1,716	\$1,736	\$1,788	\$1,833	\$2,002	\$3,209	\$3,452	\$3,706	\$3,892
3M & PTZ		\$3,354	\$3,354	\$3,525	\$3,602	\$3,904	\$3,716	\$4,062	\$4,230	\$4,999	\$5,289	\$5,658	\$5,712
5M & PTZ		\$4,404	\$4,404	\$4,698	\$4,876	\$5,194	\$5,066	\$5,579	\$5,692	\$7,773	\$8,184	\$8,845	\$8,938

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<sup>4</sup> The Sonix 425 series meter is a new offering beginning in 2023.

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**Table 21: Large Commercial and Industrial Meter and Regulator Cost Inputs 2014-2025**

Meter Series	kPa	Meter and Regulator Costs Combined											
		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
400	35	\$1,124	\$1,148	\$1,272	\$1,262	\$1,317	\$1,357	\$1,433	\$1,499	\$2,663	\$3,349	\$3,802	\$3,953
630		\$1,362	\$1,396	\$1,611	\$1,611	\$1,626	\$1,716	\$1,793	\$1,855	\$3,548	\$3,758	\$4,353	\$4,504
1000		\$1,699	\$1,599	\$1,716	\$1,836	\$1,858	\$1,917	\$1,968	\$2,142	\$3,740	\$3,943	\$4,390	\$4,650
3M & PTZ		\$3,354	\$3,354	\$3,525	\$3,645	\$3,948	\$3,762	\$4,111	\$4,281	\$5,535	\$5,771	\$6,267	\$6,460
5M & PTZ		\$4,404	\$4,404	\$4,698	\$4,901	\$5,219	\$5,093	\$5,608	\$5,722	\$7,773	\$8,236	\$9,027	\$9,043
7M & PTZ		\$4,691	\$4,691	\$4,939	\$5,198	\$5,525	\$5,390	\$5,914	\$6,028	\$8,079	\$8,542	\$9,283	\$9,358
11M & PTZ		\$6,455	\$6,455	\$6,015	\$7,118	\$7,476	\$7,443	\$8,068	\$8,261	\$9,816	\$10,388	\$11,180	\$11,230
3M ID	ID 35	\$12,617	\$12,617	\$13,697	\$14,648	\$14,311	\$14,755	\$16,485	\$10,595	\$10,696	\$16,190	\$17,575	\$19,597
5M ID		\$14,797	\$15,797	\$17,237	\$18,341	\$18,308	\$18,884	\$20,933	\$17,460	\$17,632	\$20,971	\$23,347	\$25,105
7M ID		\$16,995	\$20,995	\$23,035	\$24,268	\$19,354	\$19,741	\$21,927	\$22,704	\$22,948	\$21,706	\$24,146	\$25,969
11M ID		\$22,140	\$30,140	\$33,260	\$34,497	\$33,422	\$34,518	\$37,494	\$38,800	\$39,281	\$36,668	\$39,456	\$42,053
16M ID		\$28,393	\$33,393	\$36,873	\$38,163	\$37,443	\$39,064	\$42,610	\$44,436	\$44,986	\$44,829	\$49,125	\$52,471
23M ID		\$31,594	\$33,955	\$37,435	\$39,399	\$37,665	\$39,585	\$42,682	\$44,884	\$45,434	\$44,249	\$48,481	\$52,754
3M ID	ID 70	\$14,617	\$14,617	\$14,617	\$15,651	\$15,275	\$15,777	\$17,558	\$18,135	\$18,324	\$17,027	\$19,273	\$20,900
5M ID		\$17,797	\$17,797	\$17,797	\$19,141	\$21,165	\$21,912	\$24,113	\$24,977	\$25,262	\$23,677	\$27,218	\$28,388
7M ID		\$19,995	\$19,995	\$19,995	\$21,468	\$21,711	\$22,239	\$24,550	\$25,406	\$25,691	\$24,112	\$27,708	\$28,928
11M ID		\$26,140	\$26,140	\$26,140	\$28,007	\$32,422	\$33,458	\$36,381	\$37,653	\$38,117	\$40,369	\$46,938	\$50,003
16M ID		\$28,393	\$28,393	\$28,393	\$30,313	\$35,443	\$36,944	\$40,384	\$42,144	\$42,660	\$45,666	\$50,198	\$52,175
23M ID		\$31,594	\$29,955	\$29,955	\$31,834	\$35,665	\$37,465	\$40,456	\$42,592	\$43,108	\$49,086	\$53,674	\$56,658
1000	ID Line	\$4,835	\$4,835	\$5,015	\$5,890	\$5,915	\$6,017	\$7,307	\$7,345	\$7,374	\$7,673	\$5,695	\$5,900
3M ID		\$5,917	\$5,917	\$6,193	\$6,731	\$6,926	\$6,927	\$8,266	\$8,535	\$8,580	\$8,941	\$9,237	\$10,780
5M ID		\$6,997	\$6,997	\$7,381	\$7,946	\$8,246	\$8,218	\$9,734	\$10,126	\$10,188	\$10,624	\$11,013	\$12,670
7M ID		\$8,995	\$8,995	\$9,595	\$10,289	\$8,792	\$8,545	\$10,171	\$10,555	\$10,617	\$11,059	\$11,503	\$13,210
11M ID		\$11,540	\$11,540	\$12,428	\$13,126	\$17,622	\$17,770	\$19,909	\$20,552	\$20,760	\$21,698	\$22,489	\$24,760
16M ID		\$20,393	\$20,393	\$22,313	\$23,064	\$18,173	\$18,638	\$21,163	\$22,204	\$22,421	\$23,403	\$24,348	\$26,774
23M ID		\$26,594	\$24,955	\$27,355	\$28,065	\$18,895	\$19,689	\$21,791	\$23,220	\$23,445	\$23,428	\$24,327	\$27,711
4" Turbine		\$32,499	\$32,499	\$35,139	\$34,948	\$35,360	\$36,545	\$39,616	\$41,983	\$42,005	\$44,541	\$45,953	\$48,404
6" Turbine		\$39,509	\$39,509	\$42,869	\$42,860	\$43,402	\$45,124	\$49,183	\$51,264	\$51,338	\$54,400	\$56,139	\$58,986
8" Turbine		\$52,266	\$52,266	\$56,466	\$59,825	\$56,168	\$58,869	\$62,770	\$66,370	\$66,312	\$70,405	\$72,752	\$75,925

2

1 The estimated costs of mains, service lines and meters as inputs to the MX Test have all  
2 experienced increases over the period from 2014-2025. This is consistent with the discussion  
3 provided in Section 5.1.2 of the Application.

#### 4 **4.2 OVERHEAD RATES 2014-2025**

5 Overhead is a proxy for the incremental general costs that are incurred to install main extensions  
6 but cannot be associated with any particular main extension project. Table 22 below provides the  
7 overhead rates used in MX Tests from 2024 to 2025.

8 **Table 22: Overhead Rates Used in MX Test from 2014 to 2025**

Year	Company	Overhead Rate
2025	FEI	17.08%
2024	FEI	19.03%
2023	FEI	19.27%
2022	FEI	19.76%
2021	FEI	18.74%
2020	FEI	20.87%
2019	FEI	24.28%
2018	FEI	25.00%
2017	FEI	24.23%
2016	FEI	25.53%
2015	FEI	23.29%
2014	FEI	26.30%
	FEVI	26.30%

9

10 The trends in the overhead rates generally have four distinct periods from 2014 to 2025:

- 11 1) 2014;
- 12 2) 2015 to 2019;
- 13 3) 2020 to 2024; and
- 14 4) 2025.

15 These four periods generally coincided with when FEI completed new capitalization studies  
16 (which the indirect overhead portion would be based on). For example, the 2014 MX Test was  
17 based on the 2009 capitalization study, the 2015 to 2019 MX Tests were based on the 2013  
18 capitalization study which was approved as part of FEI's 2014-2019 PBR Plan, the 2020 to 2024  
19 MX Tests were based on the 2019 capitalization study which was approved as part of FEI's 2020-  
20 2024 MRP, and the 2025 MX Test was based on the 2024 capitalization study which was  
21 approved as part of FEI's 2025-2027 RSF. In each of these capitalization studies, the

1 capitalization rate for the operation department<sup>5</sup> was reduced, which led to the step reduction in  
 2 overhead rates in 2015, 2020, and 2025.

3 **4.3 WORKING CAPITAL INPUTS 2014-2025**

4 The cash working capital reflects the carrying costs due to the timing difference between the cash  
 5 expended by FEI and the revenues that are received by FEI through rates. The working capital  
 6 rate used in the MX Test is determined based on the ratio of FEI’s approved cash working capital  
 7 forecast and FEI’s approved forecast of plant-in-service. Both are reviewed and approved by the  
 8 BCUC as part of FEI’s Annual Reviews. Table 23 below provides the working capital rate used  
 9 for MX Tests from 2014 to 2025. The working capital rate has remained steady in the range of  
 10 0.2 percent to 0.3 percent in recent years.

11 **Table 23: Working Capital Rate 2014-2025**

Year	Company	Working Capital Rate
2025	FEI	0.33%
2024	FEI	0.30%
2023	FEI	0.22%
2022	FEI	0.23%
2021	FEI	0.22%
2020	FEI	0.24%
2019	FEI	0.25%
2018	FEI	0.21%
2017	FEI	0.20%
2016	FEI	0.50%
2015	FEI	0.50%
2014	FEI	0.50%
	FEVI	0.50%

12

---

<sup>5</sup> Instead of using the overall company overhead capitalization, the gross O&M and capitalization of the operation department in the capitalization study was used to determine the indirect overhead rate used in the MX Test.

**Appendix E**

---

**SEF RATE IMPACT ANALYSIS RESULTS**

1 **APPENDIX E: SEF RATE IMPACT ANALYSIS RESULTS**

2 **Table 1: FEI SEF Rate Impact Analysis for the Period of 2017-2025**

		2026 With Growth	2026 Without Growth	2017-2025 Growth Amount
<p>This section uses existing actual delivery costs and looks at the impact on revenue requirements without the addition of capital for the new customers added in the past 9 years. (2017 to 2025).</p>	<i>a</i> 2017-2025 Meters/Regulators			\$60,358
	<i>b</i> 2017-2025 Services (Company Paid)			\$4,378,434
	<i>c</i> 2017-2025 Mains (Company Paid)			\$20,023,826
	<i>d</i> 2017-2025 SJ and Internal Costs			\$240,641
	<i>e</i> DP System Improvements (SI)			\$470,554
	<i>f</i> Rate Base	\$6,838,150,000	\$6,812,976,187	\$25,173,813
	<i>g</i> Return, Depreciation, Taxes	\$1,088,489,000	\$1,085,443,478	\$3,045,522
	<i>h</i> Multiplier for Return, Depreciation, Taxes	12.1%	12.1%	12.1%
	<i>i</i> O&M Expenses	\$347,243,000	\$346,867,715	\$375,285
	<i>j</i> 100% of Customer Growth Rate			0.1%
	<i>k</i> Other Revenues/Expenses	-\$48,013,000	-\$47,991,875	-\$21,125
	<i>l</i> Offsetting Bypass Revenues	-\$27,321,000	-\$27,321,000	\$0
	<i>m</i> Total Revenue Requirement (exc. Cost of Gas)	\$1,387,719,000	\$1,384,319,318	\$3,399,682
	<i>n</i> <b>Net Revenue Requirement (exc. Cost of Gas)</b>	<b>\$1,360,398,000</b>	<b>\$1,356,998,318</b>	<b>\$3,399,682</b>
<p>This section determines the usage associated with and without customers added to the system in the past 9 years.</p>	<i>o</i> Customers	1,102,932	1,101,740	1,192
	<i>p</i> Percent Growth in Customers			0.1%
	<i>q</i> Average GJ/Cust	184	184	66
	<i>r</i> <b>Total GJ</b>	<b>202,584,800</b>	<b>202,505,878</b>	<b>78,922</b>
<p>This section calculates the rate impact without the new customers added from 2017 to 2025.</p>	<i>s</i> Cost per GJ (exc. Cost of Gas)	\$6.72	\$6.70	\$0.01
	<i>t</i> Percent Difference			0.21%
	<i>u</i> \$ Difference per Original Customer (Rate Impact per Customer per Year)			\$2.60

3

**Appendix F**

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**FEI 2022 RESIDENTIAL END-USE STUDY**

# FEI 2022 Residential End-Use Study

**Prepared for:**

FortisBC Energy Inc.  
Surrey, BC

**April 30, 2023**



**SAMPSON RESEARCH INC.**

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### **Disclaimer**

Any opinions expressed in this report are the responsibility of the author, Sampson Research, and do not necessarily represent the views of FortisBC Energy Inc. or FortisBC Inc.

### **Printing**

This document is formatted for double-sided printing to save paper. Blank pages are inserted where necessary to preserve proper formatting.

### **Currency Units**

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



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# ABBREVIATIONS AND ACRONYMS

<b>AFUE</b>	Average Fuel Utilization Efficiency
<b>ASHP</b>	Air Source Heat Pump
<b>BBQ</b>	Barbeque
<b>CDA</b>	Conditional Demand Analysis
<b>CDD</b>	Cooling Degree Day
<b>DK</b>	Don't Know
<b>DSM</b>	Demand-Side Management
<b>DWH</b>	Domestic Water Heater
<b>ECM</b>	Energy Conservation Measure
<b>FAF</b>	Forced Air Furnace
<b>FBC</b>	FortisBC Inc. (Electric)
<b>FEI</b>	FortisBC Energy Inc. (Gas)
<b>Gas</b>	Natural gas and/or piped propane
<b>GJ</b>	Gigajoule
<b>HDD</b>	Heating Degree Day
<b>HEC</b>	Household Energy Consumption
<b>INT</b>	Interior region including Kootenay and Columbia
<b>kWh</b>	Kilowatt-Hour
<b>LM</b>	Lower Mainland / Fraser Valley
<b>NA</b>	Not applicable
<b>NR</b>	Non-response
<b>REUS</b>	Residential End-Use Study
<b>SFD</b>	Single Family Detached
<b>SH</b>	Space Heating
<b>SST</b>	Shared Services Territory
<b>UEC</b>	Unit Energy Consumption
<b>VI</b>	Vancouver Island / Sunshine Coast



# 1 EXECUTIVE SUMMARY

This report summarizes the findings from a Residential End-Use Study (REUS) conducted of FortisBC Energy Inc. (FEI) natural gas residential customers in the summer of 2022. The study included an online survey (hardcopy version available on request) of 4,792 residential gas customers, randomly selected from FEI's three regions (Lower Mainland/Fraser Valley, Interior, and Vancouver Island/Sunshine Coast). The survey was conducted jointly with FortisBC's electric division, FortisBC Inc. (FBC). This allowed one survey to gather detailed dwelling, occupant, and energy end-use information for both residential electric and natural gas customers of FortisBC in the Shared Service Territory (SST). Survey results for electric customers of FortisBC are published in a separate report.

The survey gathered detailed information on space heating and domestic hot water equipment; fireplaces, gas cooking and other gas appliances; dwelling characteristics; household occupant characteristics; and renovations and activities directly or indirectly influencing residential consumption of natural gas. The survey also explored interest in energy-saving programs and services under consideration by FortisBC.

Data from the survey was analyzed at the overall utility level, by region, and, depending upon the topic, by the five main dwelling types (single-family detached, semi-detached, townhouses, apartments, and mobile / manufactured homes) and by dwelling vintage (period of construction). The margin of error for findings at the utility level is plus or minus 1.7%, 19 times out of 20. Margins of error for regional results varied, depending on the region, from plus or minus 2.1% to 2.9%.

A conditional demand analysis (CDA) was conducted using data from the 2022 REUS survey, gas consumption records of survey respondents, and regional weather data. The analysis produced utility and regional level estimates of weather-normalized unit energy consumption (UEC or GJ/year) for major gas end-uses (primary and secondary space heating, domestic water heating, fireplaces, cooking, etc.). Comparisons of UEC estimates were made with those generated from conditional demand analyses conducted for FEI's 2017 and 2012 residential end-use studies.

## 1.1 FEI Survey Highlights

Survey highlights from FEI's 2022 REUS are summarized below by topic area. Readers are directed to the respective section(s) in the main report for a detailed presentation and discussion of results by region, dwelling type, dwelling vintage and other criteria.

### 1.1.1 Customer Characteristics

- On average, there are 2.7 persons per residential dwelling in FEI's service area. The majority (60%) of homes have one or two occupants.

## Executive Summary

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- More than half (56%) of dwellings are home to a senior (individuals aged 65 years or older). One-in-five (20%) dwellings are home to children (persons aged 18 years or younger).
- Three-in-ten (30%) dwellings have one or more persons working either part-time or full-time from home. Six-in-ten (60%) indicated the number of days worked from home increased during the past two years.

### 1.1.2 Dwelling Characteristics

- Single-family detached (SFD) dwellings are the single, most common dwelling type among FEI residential gas customers, accounting for eight-in-ten (82%) of all dwelling types in 2022. The next most common dwelling types include row / townhouses (9%), semi-detached (duplexes, triplexes, etc.) (4%) and mobile and other manufactured homes (mobile) (3%). The mix of dwelling types is relatively unchanged over the last four REUS surveys.
- Median home sizes (square feet) vary by dwelling type and vintage. The median size of SFDs in new construction has increased over time, with the median size of single-family detached dwellings constructed since 2005 being 2,700 ft<sup>2</sup> compared to 2,000 ft<sup>2</sup> for SFDs constructed before 1950.
- The proportion of homes with basements that are fully finished (versus unfinished or partly finished) has increased over the past four surveys, from 57% in 2008 to 66% in 2022. The proportion of dwellings with a fully finished basement is highest in the Lower Mainland / Fraser Valley region.
- Respondents living in older homes are much more likely to say their home is sometimes or always drafty compared to those in newer homes. The proportion of respondents indicating their home is drafty (either sometimes or always drafty) has declined steadily over FEI's last three REUS surveys, suggesting that actions taken to improve the efficiency of the building envelope for existing dwellings (e.g., upgrading windows, exterior doors, and insulation, draft sealing, etc.) combined with improvements in building envelope efficiency in new construction are having a positive effect.
- The share of double pane windows with low-E coatings represents 21% of all windows, unchanged from 2017. Regionally, penetration of double pane low-E windows is lowest in the Lower Mainland / Fraser Valley region (17%) compared to Vancouver Island (24%) and the Interior (27%).

### 1.1.3 Energy-Related Renovation Activities – Past and Planned

- Nearly two-thirds (64%) of FEI residential customers completed one or more energy-related improvements to their homes in the last five years. The top three renovations included installing energy-efficient windows, installing weather stripping or caulking, and installing low-flow showerheads.
- Equal proportions (23%) of dwellings have upgraded some or all of their windows and/or some or all exterior doors in the last five years.

- One-quarter (26%) of respondents intend to complete at least one energy-related renovation to their home in the next two years. The most frequently intended renovations include installing energy-efficient windows, installing weather stripping or caulking, and improving insulation in walls, attics, basements, or crawlspaces. Five percent (5%) indicated they are intending to install an air source heat pump in the next two years.

### 1.1.4 Space Heating

- Natural gas is used by 96% of FEI residential customers either as the main or secondary (supplementary) fuel for heating their homes, statistically unchanged since 2008. Use of natural gas as the *main* space heating fuel in new construction, in a slow decline since the mid-1970s, appears to have stabilized in dwellings constructed since 2015.
- Two-thirds (66%) of dwellings use more than one method to heat their home. The top three *main* methods of space heating are forced air furnaces (FAFs) (68% of FEI homes), air source heat pumps (6%), and hot water boilers (6%). The most popular *secondary* (supplemental) methods include fireplaces or heater stoves (35% of respondents), wired-in electric baseboards (18%), and portable electric space heaters (17%).
- The incidence (penetration) of natural gas forced air furnaces is now 72%, down from 79% in 2008. While sample sizes are small, data on installations of gas forced air furnaces in new residential construction (dwellings constructed since 2015), suggest this long-term trend may have ended. Over half (53%) of all gas forced air furnaces are high-efficiency models.
- Combined space and water heating systems, queried for the first time in 2022, are popular in new construction, installed in 13% of dwellings constructed since 2015.
- Overall, 27% of respondents to the 2022 REUS indicated their home uses either an air or ground source heat pump. Somewhat less than one-quarter (23%) have a ducted air source unit, 4% have a ductless (mini-split) heat pump, and 2% have a ground source (geothermal) unit. Penetration of ducted heat pumps does not significantly vary by region but penetration of ductless models is significantly higher on Vancouver Island. The penetration of heat pumps in 2017 was estimated at 9%. However, the 2017 REUS used a less reliable methodology to estimate heat pump penetration than the 2022 REUS.

### 1.1.5 Domestic Water Heating

- Three-quarters (76%) of dwellings used natural gas for DWH in 2022, statistically unchanged from 2017. These data suggest the shift away from natural gas to electricity for residential domestic water heaters observed since 2008, may have stabilized.
- Eight-in-ten (81%) FEI residential customers have a conventional storage tank, down from 86% in 2017 and 91% in 2012. The decline is attributed to the increased penetration of on-demand units

## Executive Summary

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(up from 4% in 2012 to 12% in 2022) and combined space and water heating systems (up from 1% in 2012 to 3% in 2022).

- Penetration of heat pump water heaters remained unchanged from 2017 at less than 2%.
- One-in-ten (10%) FEI residential customers have their water heater located in an unheated space (typically an unheated basement or crawlspace).

### 1.1.6 Fireplaces and Heating Stoves

- Overall, 83% of FEI residential customers have at least one fireplace or heater stove (any fuel). Penetration of fireplaces and heater stoves is highest on Vancouver Island (90%) and lowest in the Interior (71%).
- Gas heater-type fireplaces / heater stoves are present in 46% of FEI customer dwellings, statistically unchanged from 2017. Inefficient decorative gas fireplaces are found in 18% of dwellings, also unchanged from 2017.
- Use of fireplaces and heating stoves to supplement the home's main space heating system varies by fireplace / stove type, fireplace fuel, dwelling type, and region.

### 1.1.7 Appliances

- Gas ranges (gas cook top and oven), dual fuel ranges (gas cook top, electric oven), and gas cook tops continue to be popular in new construction, displacing traditional electric ranges (electric cook top and ovens). Electric induction ranges, queried for the first time in 2022, are installed in 6% of dwellings.
- The movement away from electric to gas cooking appliances is most apparent for homes constructed since 2005. These newer homes are much more likely than their older counterparts to have a gas range (gas cook top and gas oven), gas cook top, or a dual fuel range (gas cook top and electric oven). Newer homes are also much more likely to have a piped natural gas barbeque (e.g., 50% of homes constructed since 2015). The growing popularity of induction ranges is one exception to this trend; present in 12% of homes built since 2015.
- More than half (56%) of homes in 2021 had a front-loading (horizontal axis) clothes washer compared to one-quarter (27%) in 2008. Top-loading clothes washers have seen their share of the FEI residential customer base decline commensurately over the same period. The proportion of customers with gas clothes dryers (5%) is unchanged from previous survey years. Heat pump clothes dryers, queried for the first time in the 2022 REUS, have a penetration rate of less than one percent.
- Fifteen percent (15%) of households have at least one appliance or device that can be monitored and controlled remotely from either inside or outside the home using a smart phone, tablet or computer. The top three wirelessly connected appliances or devices in the home include security

systems and thermostats (7% of REUS respondents for each), smart speakers and smart plugs/electrical outlets (6% for each), and lighting (5%). Penetration rates for connected appliances such as clothes washers, dishwashers, and fridges were typically less than 2%.

- Penetration of heat recovery ventilators (HRVs) HRV units in 2022 is 6%, up from 2% in 2008. Energy recovery ventilators (ERVs), queried for the first time in the 2022 REUS, have a penetration rate of less than 2%. Penetration rates for HRVs and ERVs are highest in dwellings constructed since 2015 (31% and 8%, respectively).

### 1.1.8 Pools and Hot Tubs

- Five percent (5%) of FEI gas customers have a swimming pool for their exclusive use, 11% have a hot tub/Jacuzzi, and 2% have a sauna.
- The most common fuel for heated swimming pools is natural gas (41% of pools). Only 7% of hot tubs and 4% percent of saunas use natural gas.

### 1.1.9 Behaviours

The 2022 REUS queried the frequency at which households completed a number of different energy-conserving space heating and water heating behaviours.

- Space heating behaviours with the greatest room for improvement are draft proofing, closing vents or turning down thermostats in unused rooms, and closing window coverings to keep the heat in during the winter.
- Behaviours impacting domestic water heating that have the greatest potential for improvement include turning off the water while washing hands and turning off the water heater when away for more than a few days.
- One-half (48%) of respondents to the 2022 REUS are making either “somewhat more” or “much more” of an effort to conserve energy compared to two years ago. A majority of the remaining respondents indicated they are making about the same effort as they did two years ago.

### 1.1.10 Products and Services

- In the last five years, 20% of FEI residential customers participated in a FortisBC energy conservation program, 8% in a BC Hydro program, and 4% in a federal, provincial or municipal conservation program.
- Presented with a broad range of potential energy conservation programs and initiatives, survey respondents expressed the most interest in a furnace or heat pump tune-up program, a program to purchase an electric vehicle, and a do-it-yourself home energy audit.

1.2 Conditional Demand Analysis Highlights

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## 2 INTRODUCTION

This report presents detailed results and analyses from FortisBC's 2022 residential end-use survey (REUS), a comprehensive study of FortisBC Energy Inc. (FEI) residential customers conducted in the summer of 2022. Information from the 2022 REUS is designed to support a broad range of activities and processes for FortisBC's gas and electric divisions, including:

- Revenue requirement, rate design, and other applications to the British Columbia Utilities Commission
- Preparation and updating of long-term resource plans
- Inputs for pricing models and tests for system extensions (mains and services)
- Reviews of conservation potential
- Demand-side management (DSM) opportunity assessments and program designs
- Inputs for load forecast models
- Development of marketing programs and advertising

### 2.1 Research Objectives

Research objectives for the 2022 REUS focused on documenting and advancing the understanding of factors that directly or indirectly influence the consumption of natural gas and electricity by FortisBC's residential customers. Research objectives included:

- Collecting information on appliance end-use stocks including age, efficiency, and usage. End-uses include space heating and cooling, water heating, cooking, refrigeration, dishwashing, laundry, swimming pools, hot tubs, and saunas.
- Determining primary and secondary energy (fuel) sources for space and water heating.
- Determining dwelling characteristics that directly or indirectly influence energy consumption, including building envelope, vintage, floor space, number of stories, tenure, length of residency, ceiling heights, window types, and insulation levels.
- Identifying past and planned energy-related renovation activities.
- Detailing energy-conserving behaviours that affect energy use associated with heating, cooling, laundry, dishwashing, bathing, showering, draft proofing, furnace maintenance, food storage, lighting, and small appliance use.
- Discerning attitudes and beliefs regarding energy conservation and other energy-related issues.
- Assessing interest in potential utility programs and services.
- Performing a conditional demand analysis (CDA) to develop unit energy consumption (UEC) estimates for major gas and electrical appliances and end-uses.

## Introduction

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- Comparing findings with previous residential end-use surveys, where applicable, to assess changes and trends in dwelling composition, penetration and saturation of appliances and other end-uses, appliance and end-use efficiency, renovations, and demographic characteristics.

### 2.2 History of FortisBC REUS Studies

The 2022 REUS is the sixth comprehensive end-use survey of residential gas customers conducted by FortisBC (2022, 2017, 2012) or its predecessor companies Terasen Gas (2008) and BC Gas (2002, 1993). Differences in regional coverage for the surveys have occurred over time, commensurate with expansion in the company's geographic coverage in British Columbia.

The 2022 REUS is the third comprehensive end-use survey conducted jointly by the natural gas (FEI) and electric (FBC) divisions of FortisBC. The combined study provides data to each division about its respective residential customers but also offers a holistic view of customers in the shared services territory (i.e., customers who receive natural gas and electricity services from FortisBC). While a majority of questions on the REUS questionnaire applied to both residential gas and electric customers of FortisBC, the questionnaire for FBC customers was augmented with questions on lighting and electrical end-uses such as entertainment, computer systems, and electric vehicles. The sample size for the combined survey was large enough to ensure adequate regional representation for both divisions.

Topics addressed by FortisBC's residential end-use surveys have evolved over time, reflecting trends in residential end-use equipment, building characteristics, and residential construction. Refinements have been made to the questionnaire in an ongoing effort to improve the accuracy and reliability of the results. While changes in topic coverage and/or question-wording from one survey to the next have sometimes occurred, attention was paid to maintaining consistency and compatibility with past questionnaire designs. This allows FortisBC to monitor trends in residential energy use equipment and behaviours over time.

The 2022 survey is the fifth REUS to include a conditional demand analysis (CDA) of residential gas consumption and the third to include a CDA of residential electricity use. These analyses generate unit-energy consumption (UEC) estimates for the major gas and electrical end-uses in the home.

### 2.3 Report Organization

This report is organized into 14 sections including the executive summary. Following this introduction, the Background and Methodology section addresses the sampling strategy, sample design, questionnaire design, and survey response statistics. The next nine sections address key findings from the 2022 REUS survey, organized by the respective topic areas of the survey instrument. These are:

- Building envelope and renovations
- Space heating
- Domestic hot water
- Fireplaces and heating stoves

- Appliances
- Pools, hot tubs, and saunas
- Energy use behaviours
- Products and services
- Demographics

Findings from the conditional demand analysis, including regional-specific Unit Energy Consumption (UEC) estimates by end-use, are provided in Section 13. A bibliography of referenced research and articles is included in Section 14.

This document includes two appendices. Appendix A includes the 2022 REUS questionnaire. Appendix B presents the background methodology and detailed equations for the conditional demand analysis.

Detailed results for FortisBC's electric customers are published in a separate report.

### **2.4 Using this Report**

This report presents a substantial body of information and data about FortisBC's residential gas customers. Trends are identified through comparisons with past REUS studies and/or using additional information and statistics sourced from third-party sources.

Considerable effort has been made to ensure the data presented are accurate and statistically representative of FortisBC's residential customer base. The quality of the analysis and interpretation of the data depends, in part, on the accuracy of the information provided by survey respondents. The technical nature of many of the questions in the REUS survey invariably means that unintentional misclassifications by survey respondents are possible. Where misclassifications are evident, the report identifies them and discusses any remedies or adjustments applied to the data.

The large volume of information collected by the REUS survey means the primary purpose of this report is as a reference document. Analyses and observations made in the report are intended to further discussion and improve the understanding of factors that influence residential energy consumption.



# 3 BACKGROUND & METHODOLOGY

This section addresses the sample frame and sampling plan for FortisBC’s 2022 residential end-use survey, its questionnaire design and topics, implementation, weighting of results, and survey accuracy. Key definitions and explanatory notes are provided at the end of this section.

## 3.1 Sample Frame and Sampling Plan

The sample frame for the 2022 FEI REUS included all residential (Rate 1 – Residential) households in British Columbia receiving their natural gas service or piped propane service from FortisBC as of March 2022. The sample frame included customers from three regions:

- Lower Mainland / Fraser Valley (LM)
- Interior (Inland and Columbia) (INT)
- Vancouver Island and Sunshine Coast (VI)

As the FEI REUS was conducted jointly with FBC’s REUS, the sample frame, by default, includes gas customers in the shared services territory (SST) of the Interior region who receive their electrical service from FortisBC Inc. (FBC) directly or indirectly via one of the four municipal utilities that resell electricity supplied by FortisBC and participate in FortisBC’s energy efficiency programs.<sup>1</sup> Customers with both gas and electric service provided by FortisBC are counted in the sample frames and survey results for both utilities.

Table 1 summarizes the sample frame for the FEI’s 2022 REUS.

**Table 1: FEI Residential Sample Frame (Customer Counts) as of March 2022**

Region / Business Unit	Customer Counts	Percent Distribution
Lower Mainland / Fraser Valley (LM)	572,000	59.4
Interior (Inland and Columbia) (INT)	262,000	27.2
Vancouver Island / Sunshine Coast (VI)	129,000	13.4
<b>Total (FEI)</b>	<b>963,000</b>	<b>100%</b>

For reference purposes, customer counts for FBC’s electric customers are provided in Table 2.

**Table 2: FBC Residential Sample Frame (Customer Counts) as of March 2022**

Region / Business Unit	FBC Direct	FBC Indirect <sup>1</sup>	FBC Total	Percent Distribution
Kelowna / Central Okanagan (KE)	69,600	--	69,600	43%
South Okanagan (SO)	24,400	22,100	46,500	29%
Kootenay / Kootenay Boundary (KB)	34,500	11,300	45,800	28%
<b>Total (FBC)</b>	<b>128,500</b>	<b>33,400</b>	<b>161,900</b>	<b>100%</b>

<sup>1</sup> Wholesale customers of FBC

<sup>1</sup> These include the municipal electric utilities of Penticton, Summerland, Grand Forks, and Nelson.

## Background & Methodology

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The size and composition of the sample frame for the 2022 REUS was chosen to satisfy the following objectives:

- Reduce the standard errors of point estimates, especially for less common end-uses, building types, and customer sub-groups.
- Accommodate analysis of gas results by FEI region (LM, INT, VI) and electric results by FBC region (KE, SO, KB).
- Ensure the accuracy and reliability of conditional demand analysis estimates of unit energy consumption (UEC) for FEI and its three regions, and FBC at the utility level.

Based on results from previous residential end-use surveys conducted by FEI, the sample size for the 2022 survey was set to 30,000. The majority of residential gas customers included in the sample had a minimum of two years of uninterrupted gas billing history to meet the requirement of the conditional demand analysis (CDA). To ensure the survey captured trends in new residential construction, the sample frame was augmented with FEI customers whose residential properties were constructed (i.e., connected to FortisBC's gas distribution system) in 2021 and the first three months of 2022. While survey results for these customers would be included in the reporting of survey findings, they were excluded from the CDA due to their limited gas consumption histories.

Residential gas customers were randomly selected from FEI's customer accounts for each of the three regions. For customers in the shared services territory (SST), the sample was merged with the random sample of FBC's directly served customers (sample drawn for FBC's REUS) to eliminate any duplicate accounts. The shared services sample was then merged with a third-party (general population) sample of households located in areas serviced by municipal (wholesale) electric utilities (part of the sample drawn for FBC's REUS) to complete the sample frame for the Interior region.

### 3.2 Questionnaire Design and Topics

In addition to satisfying FortisBC's research objectives, the design of the 2022 REUS questionnaire placed considerable emphasis on comparability and consistency with past REUS surveys. Any modifications to questions and/or response categories were made to either improve question performance or accommodate trends in residential construction and end-use equipment options. Explanatory text was used to help respondents correctly identify their space heating equipment, appliances, and household features. In situations where several different models of an end-use appliance are possible (e.g., differing types of domestic water heaters), questions referenced the physical appearance or characteristics of the appliance to assist respondents in correctly classifying their appliances.

Two versions of the REUS questionnaire were developed. Customers identified as having both gas and electric (direct or indirect) service provided by FortisBC received a questionnaire with sections dedicated to electrical end-uses such as lighting, entertainment systems, power control devices, and electric vehicles. Gas-only customers (those whose service address was outside the shared services territory) completed a questionnaire that excluded these dedicated electric-only sections.

Subject areas addressed by the 2022 REUS with comparisons to past FEI and FBC REUS surveys are summarized in Table 3.

**Table 3: REUS Survey Topics – Comparisons to Past REUS Surveys**

Survey Topic Group	FortisBC Energy Inc. (Natural Gas & Piped Propane)				FortisBC Inc. (Electric)			
	FEI 2022	FEI 2017	FEI 2012	FEI 2008	FBC 2022	FBC 2017	FBC 2012	FBC 2009
Dwelling characteristics	◆	◆	◆	◆	◆	◆	◆	◆
Space heating	◆	◆	◆	◆	◆	◆	◆	◆
Fireplaces	◆	◆	◆	◆	◆	◆	◆	◆
Domestic water heating	◆	◆	◆	◆	◆	◆	◆	◆
Appliances	◆	◆	◆	◆	◆	◆	◆	◆
Indoor and outdoor lighting					◆	◆	◆	◆
Other electrical end-uses					◆	◆	◆	◆
Pools and hot tubs	◆	◆	◆	◆	◆	◆	◆	◆
Energy-related renovations	◆	◆	◆	◆	◆	◆	◆	
Energy use behaviours	◆	◆	◆	◆	◆	◆	◆	◆
Products and services	◆	◆	◆	◆	◆	◆	◆	
Energy attitudes & preferences	◆	◆	◆	◆	◆	◆	◆	◆
Demographic & socio-demographics	◆	◆	◆	◆	◆	◆	◆	◆

The 2022 FEI (gas) questionnaire (paper version) is provided in Appendix A.

### 3.3 Survey Implementation

The 2022 FEI residential end-use survey was available online to randomly selected gas customers. Those without an email address were mailed a hardcopy version, accompanied by a self-addressed return envelope. All customers who received their invitation to complete the survey via email were offered the option of having a hardcopy version of the questionnaire mailed to them. Incentives to complete the survey included a chance at winning one of four prepaid VISA cards worth \$1,000. To encourage online responses, respondents completing their survey online had their name entered in the prize draw an additional time, effectively doubling their chances of winning. Each recipient was assigned a unique entry code allowing only one survey to be completed per household. Mustel Group of Vancouver, BC was responsible for implementing the survey, data cleaning, tabulating results, and incentive management.

Survey invitations were emailed / mailed June 20, 2022. Three reminder emails / cards were sent. Recipients of a survey invite had until August 7<sup>th</sup> to complete the survey.

### 3.4 Survey Response

A total of 4,792 valid surveys were received from FEI residential customers, equivalent to a response rate of 16%. Online responses accounted for 92% of all valid responses. Survey response rates by region are summarized in Table 4. The response rate for FEI's 2017 REUS was 22%.

**Table 4: FEI 2022 REUS Survey Response**

Region / Business Unit	Survey Invites <sup>1</sup>	Completed Surveys	Response Rate	Surveys Completed Online
Lower Mainland (LM)	10,500	1,428	14%	92%
Interior (Inland and Columbia) (INT)	14,700	2,257	15%	93%
Vancouver Island / Sunshine Coast (VI)	4,800	1,107	23%	92%
<b>Total (FEI)</b>	<b>30,000</b>	<b>4,792</b>	<b>16%</b>	<b>92%</b>

<sup>1</sup> Includes invites via email and mail

### 3.5 Weighting of Results

Weights were used to restore the relative proportions of the three regions to that of the FEI residential customer base. The weights were calculated using equation (1):

$$W^r = (P^r/P^{FEI}) / (S^r/S^{FEI}) \quad (1)$$

W = weight

P = population (sample frame)

S = survey returns

r = FEI region

FEI = total of all FEI regions

Table 5 presents the weights calculated using this formula and used in analyses of the 2020 REUS data:

**Table 5: FEI 2022 REUS Regional Weights**

FEI Region	Weight
Lower Mainland / Fraser Valley (LM)	1.9928
Interior / Kootenay (INT)	0.5782
Vancouver Island / Sunshine Coast (VI)	0.5792

The application of weights affects results reported at the overall utility (FEI) level only. It does not affect findings at the regional (LM, VI, INT) level.

### 3.6 Accuracy of Survey Estimates

The margin of error (accuracy level) for survey estimates from the 2022 FEI REUS varies by region and the degree of consensus for the question. Table 6 summarizes the accuracy of the survey estimates at the 95% confidence level for a typical range of “yes-no” type questions for each FEI region and the all region utility average (FEI). Margins of error at the utility level for FEI’s 2017, 2012 and 2008 residential end-use surveys are provided for comparison purposes.

At the FEI utility level, a typical question with a “50-50” response (e.g., 50% answering yes, 50% answering no) will have an accuracy of plus or minus 1.7%, 19 times out of 20. The margin of error varies by region, reflecting differing proportions of completed surveys to the sample population. Regardless of region, margins of error decrease as the consensus of the survey estimate increases. For example, the accuracy of a yes-no type question at the FEI utility level with 90% answering “yes” is plus or minus 1.0%, 19 times out of 20 versus 1.7% if 50% answered “yes”.

**Table 6: Accuracy Levels for Proportional Responses by Region (%)  
Percent Plus or Minus at the 95% Confidence Level**

Proportional Response	Accuracy	LM +/-	INT +/-	VI +/-	FEI 2022 +/-	FEI 2017 +/-	FEI 2012 +/-	FEI 2008 +/-
50%		2.6	2.1	2.9	1.7	1.6	2.3	3.2
40% or 60%		2.5	2.0	2.9	1.6	1.6	2.2	3.2
30% or 70%		2.4	1.9	2.7	1.5	1.5	2.1	3.0
20% or 80%		2.1	1.7	2.4	1.3	1.3	1.8	2.6
10% or 90%		1.6	1.2	1.8	1.0	1.0	1.4	1.9
<b>Number of respondents (unweighted)</b>		<b>1,428</b>	<b>2,257</b>	<b>1,107</b>	<b>4,792</b>	<b>5,827</b>	<b>3,441</b>	<b>2,221</b>

### 3.7 Definitions & Explanatory Notes

The following definitions and notes, listed alphabetically, are provided to assist the reader in the interpretation of survey results and to increase readability of the report.

**Conditional Demand Analysis (CDA)** – An econometric method for proportioning natural gas consumption for the home to individual gas end-uses (e.g., space heating, domestic hot water, cooking, etc.). CDA requires data on the penetration and saturation of end-uses by customers, matched to their natural gas consumption data. It is an indirect approach to estimating end-use consumption.<sup>2</sup> Diversity in the penetration, saturation, and usage of end-uses within the sample population is required for the model to isolate the consumption of any particular end-use.

**Data presentation** – Data and statistics are presented in a variety of formats, including tabular, graphical, and within descriptive paragraphs.

**FEI (FortisBC Energy Inc.)** – Includes all residential dwellings in the Lower Mainland / Fraser Valley, Interior, Columbia, and Vancouver Island / Sunshine Coast regions that receive natural gas or piped propane service from FortisBC.

**Footnotes** – Footnotes referenced in the text of the report are found at the bottom of the page. Footnotes pertaining to data in tables are situated immediately below the table in question.

<sup>2</sup> As opposed to the more direct method of metering individual end-uses, a very costly and challenging method for most natural gas end-uses.

## Background & Methodology

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**Natural Gas vs. Piped Propane** – Geographic coverage for the 2022 REUS survey included a small number of customers in Revelstoke who are supplied by piped propane. Unless otherwise stated, all references to “gas” in the report refer to either piped natural gas or piped propane.

**Heating Degree Day (HDD)** - Defined as the difference between a reference value of 18°C and the average outside temperature for that day. The number of HDDs reflects the amount by which the outside temperature falls below 18°C and the length of time below that temperature. The greater the number of HDDs in a month, the colder the month. The number of HDDs provides a good indication of the amount of space heating required to maintain a comfortable indoor temperature.

**Non-Response (NR)** – Sometimes categorized as a missing value, a non-response occurs when a respondent chooses not to answer a question. Non-responses are treated differently from “Don’t Know” (DK) responses. They imply neither uncertainty nor certainty of a response, providing no information from which to extrapolate a response. All calculations in this report, unless stated or otherwise indicated, exclude missing / NR values. This is done to avoid distorting the proportions assigned to the response categories based on those who answered the question.

**Penetration (Incidence)** – The number of households with a particular appliance or end-use divided by the total number of households with or without the appliance or end-use. Typically expressed as a percentage, penetration rates are used to understand the proportion of FEI’s residential customer base with at least one of the appliance or end-use in question. Penetration rates do not provide information on how many of the particular appliance or end-use households have, only the proportion of households that have at least one. By definition, penetration rates cannot exceed 100%.

**Saturation - Population-Based** – The total number of an appliance or end-use divided by the number of households with and without the appliance or end-use. Saturation provides an estimate of the average number of appliances or end-uses per residential customer. At the utility level, saturation estimates are influenced by the number of appliances present in user households and the penetration of the appliance in the general population. For example, the saturation of low-flow showerheads is a function of how many households have a low-flow showerhead and the total number installed across all households. As homes may have more than one appliance or end-use there is no theoretical upper limit on saturation estimates. Population-based saturation estimates are useful for estimating how many appliances (e.g., gas cook tops) are installed across the entire residential customer base.

**Saturation - User-Based** – The total number of appliances or end-uses divided by the number of households with the appliance or end-use. User-based saturation provides an estimate of the average number of a specific end-use or appliance used by customers that have at least one of the appliance or end-use (e.g., average number of fireplaces per household with at least one fireplace).

**Significant Digit Conventions** – Except where otherwise indicated, all data placed in the text of this report have been rounded to the nearest significant digit. To facilitate analyses and calculations by FEI, data presented in tables and figures are expressed to one decimal place, and in some cases (e.g., saturation

rates) two decimal places. This also allows tables to accommodate the occasional small response proportion (i.e., penetrations of less than 1%).

**Uncertainty** – Some survey questions allow respondents to answer “Don’t know” (DK) if they are unsure of their response. Knowing the proportion of respondents answering DK is important to correctly interpret the question’s results. In some cases, it is legitimate to recalculate proportions for the question excluding DK responses (rebasing). Effectively, this recalculation assumes the distribution of the DK responses is proportional to those who provided a response. This implicit “re-proportioning” of DK responses is not valid in cases where the proportionate distribution assumption does not apply. For example, uncertainty regarding the efficiency of an end-use may be proportionately higher for households with older models of the end-use than for those with newer models. In a case such as this, a DK response should be treated as a legitimate response and included in the base for calculating the relative proportions of the other response categories.

**Unit Energy Consumption (UEC)** – The annual energy consumed by an end-use in a given year. UECs for gas utilities are estimated by conditional demand analysis (CDA). The size of a UEC estimate is determined, in part, by the purpose of the end-use (e.g., cooking, space heating, etc.), the efficiency of the end-use equipment, and its usage (occupant behaviours). UECs for some end-uses are weather dependent (i.e., vary with variations in heating degree days). Weather-dependent end-uses include, for example, space heaters and heater-style fireplaces.

**Unweighted Base** – All tables whose data and/or calculations share the same base will have the unweighted base for the statistics indicated. Knowing the size of the unweighted base is useful to help guide comparisons with other data and to understand the relative accuracy of the estimates. The size of the unweighted base may change from question to question depending upon whether the question applied to all respondents (e.g., floor space of the residence) or a subset of the respondents (e.g., those whose residence has a gas forced air furnace).

**Weighted Results** – All utility level results (FEI) are based on weighted data to ensure proportionate representation from the respective regions. The distribution of responses within a region is unaffected by weighting.

### Additional Notes to Tables

**n/a** Not Applicable – Used when data are unavailable for comparison.

-- No responses were received for the particular category or cell.

**0.0\*** Value less than 0.1 or 0.1%

**0.00\*** Value less than 0.01



# 4 DWELLING CHARACTERISTICS

This section provides detail on the characteristics of residential dwellings in FortisBC’s service area including:

- type, size, vintage (period of construction), number of stories, tenure, maintenance fees, and length of residency;
- characteristics and upgrades of the building envelope including insulation, window glazing, window frame materials, exterior doors, and exterior door materials; and
- renovations undertaken during the past five years and planned for the next two years.

## 4.1 Dwelling Characteristics

### 4.1.1 Dwelling Types and Vintages

Single-family detached (SFD) dwellings account for eight out of every ten (82%) dwelling types served by natural gas or piped propane in 2022 (Table 7). The next largest dwelling types include row / townhouses (townhouses) (9%), semi-detached dwellings (4%) and mobile and other manufactured homes (mobile) (3%). Slight variations in the relative distribution of dwelling types are noted over the last four residential end-use surveys.

**Table 7: Residential Dwelling Types by Region (%)**

Dwelling Type	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3441	2217
Single Family Detached	84.3	75.7	83.4	81.8	79.6	81.9	83.0
Semi-Detached	3.3	4.7	6.0	4.0	5.5	5.0	5.0
Row / Townhouse	10.5	5.8	6.9	8.8	9.6	8.4	8.2
Apt / Apt-Style Condo	0.8	4.8	1.7	2.0	2.1	1.2	1.1
Mobile & Other	1.1	9.0	2.1	3.4	3.2	3.6	2.7
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

Regionally, the Lower Mainland has a significantly higher share of townhouses (11%) than the other regions. The share of dwellings represented by mobile and other manufactured dwellings in the Interior (9%) is significantly higher than the other regions.

Table 8 summarizes the distribution of FEI residential gas customers by the vintage of their dwellings (period of construction). Overall, half (51%) of all dwellings were built before 1986, one-quarter (24%) were built between 1950 and 1975 and 12% were built prior to 1950. Approximately three-in-ten (28%) of dwellings were built since 1995. Vancouver Island has the highest proportion of dwellings with natural gas service constructed in the post-1995 period, in part, due to the expansion of natural gas service to Vancouver Island during this period.

## Dwelling Characteristics

**Table 8: Residential Dwelling Stock by Dwelling Vintage (%)**

Period of Construction	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	1428	2257	1107	4792
Before 1950	12.2	8.5	14.9	11.5
1950-1975	24.4	24.2	20.5	23.8
1976-1985	15.9	17.8	9.0	15.5
1986 -1995	19.8	15.5	19.0	18.5
1996 -2005	14.4	15.4	19.6	15.4
2006 – 2015	6.7	8.9	12.2	8.0
2016 or newer	4.3	6.8	3.3	4.8
Age unknown	2.5	2.8	1.5	2.4
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Built prior to 1986</b>	<b>52.5</b>	<b>50.5</b>	<b>44.5</b>	<b>50.9</b>
<b>Built since 1995</b>	<b>25.3</b>	<b>31.2</b>	<b>35.1</b>	<b>28.2</b>

Totals may not sum due to rounding.

Table 9 summarizes the age distribution of the residential dwelling stock by the five dwelling types. The data confirm that the stock of SFD and mobile dwellings with natural gas service is significantly older than the stock of the other three dwelling types. Notably, three-quarters of SFDs (73%) and one-third (64%) of mobile dwellings were constructed before 1996. Between 43% and 61% of semi-detached, row/townhouses, and apts/condos were constructed since 1995 compared to just 25% of SFDs.

**Table 9: Residential Dwelling Types by Dwelling Vintage (%)**

Period of Construction	Single Family Detached	Semi-Detached	Row / Town-house	Apt / Apt-Style Condo	Mobile & Other
<i>Unweighted base</i>	3836	218	358	138	242
Before 1950	13.4	6.8	0.9	9.4	1.2
1950 -1975	26.7	13.6	8.5	3.1	17.6
1976 -1985	16.1	6.3	12.3	2.4	29.5
1986 -1995	17.1	19.9	32.1	18.9	15.7
1996 -2005	13.5	33.3	20.8	27.6	16.9
2006 - 2015	6.7	12.9	14.6	23.4	8.9
2016 or newer	4.4	3.3	7.8	10.3	6.6
Age unknown	2.2	3.9	3.0	4.9	3.6
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>1995 or older</b>	<b>73.3</b>	<b>46.6</b>	<b>53.8</b>	<b>33.8</b>	<b>64.0</b>
<b>1996 or newer</b>	<b>24.6</b>	<b>49.5</b>	<b>43.2</b>	<b>61.4</b>	<b>32.4</b>

Totals may not sum due to rounding.

### 4.1.2 Residency and Tenure

Respondents were asked to describe the relationship to their dwelling and whether some or all of the dwelling was rented to others. The results (Table 10) show that nine-in-ten (90%) survey respondents own and live full-time in their homes. Eight percent (8%) of homes are rented either in part or entirely to someone else. Regionally, the proportion of homes with renters is highest in the Lower Mainland.

**Table 10: Respondent Relationship to Dwelling by Region (%)**

Relationship to Dwelling	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	1428	2257	1107	4792
(Co) own and live full-time at property	89.8	88.8	91.1	89.7
(Co) own and live part-time at property	0.6	2.3	1.0	1.1
Own / live & rent part to others	3.6	2.7	4.0	3.4
Own property but live elsewhere	1.4	1.9	1.3	1.5
Renter who lives at property	4.6	4.4	2.6	4.2
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Dwellings partially or fully rented</b>	<b>8.1</b>	<b>7.1</b>	<b>6.6</b>	<b>7.6</b>

Totals may not sum due to rounding.

Table 11 explores these data by dwelling type. Partially or fully rented premises are significantly more likely to be apts/condos or semi-detached dwellings (24% and 13% respectively) than other dwelling types (between 7% and 9%).

**Table 11: Respondent Relationship to Dwelling by Dwelling Type (%)**

Relationship to Dwelling	Single Family Detached	Semi-Detached	Row / Town-house	Apt / Apt-Style Condo	Mobile & Other
<i>Unweighted base</i>	3836	218	358	138	242
Own and live full-time at property	91.1	81.2	88.0	64.8	85.9
Own and live part-time at property	0.9	1.9	0.8	6.1	3.8
Own / live & rent part to others	3.8	3.4	0.9	2.7	0.7
Own property but live elsewhere	1.2	4.4	2.3	5.2	1.8
Renter who lives at property	3.1	9.1	7.9	21.2	7.8
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Dwellings partially or fully rented</b>	<b>6.8</b>	<b>12.5</b>	<b>8.8</b>	<b>23.9</b>	<b>8.5</b>

Totals may not sum due to rounding.

One-percent (1%) of respondents indicated they reside in a housing cooperative (Table 12). Regional differences are not statistically significant at the 95% confidence level.

**Table 12: Incidence of Housing Co-operatives by Region (%)**

	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	1428	2257	1107	4792
Housing co-operative	1.3	2.0	1.1	1.4

Dwelling types most likely to contain housing cooperatives include row/townhouses, apts/condos, or semi-detached dwellings (Table 13).

**Table 13: Incidence of Housing Co-operatives by Dwelling Type (%)**

	Single Family Detached	Semi-Detached	Row / Town-house	Apt / Apt-Style Condo	Mobile & Other
<i>Unweighted base</i>	3836	218	358	138	242
Housing co-operative	0.4	3.1	8.5	4.9	4.7

## Dwelling Characteristics

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### 4.1.3 Length of Residency / Ownership

Respondents to the 2022 REUS have lived in or owned their current residence for an average of 19.6 years, up from 16.9 years for respondents to the 2017 REUS (Table 14).<sup>3</sup> Lower Mainland customers have resided /owned their homes longer than those living in the Interior or on Vancouver Island (21.8 years versus 16.0 years and 17.7 years, respectively).

**Table 14: Average Length of Residence (Years) by Region**

Length of Residence (years)	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3441	2180
Mean	21.8	16.0	17.7	19.6	16.9	16.5	15.2
Standard Deviation	18.6	9.5	8.4	13.0	12.6	12.4	12.3

The average length of residence / ownership varies by type of dwelling (Table 15). Customers living in SFDs have the longest tenure (average of 20.9 years) compared to customers in semi-detached or row houses / townhouses (14.4 and 14.7 years respectively) and apts/condos (11.5 years).

**Table 15: Average Length of Residence (Years) by Dwelling Type**

Length of Residence (years)	Single Family Detached	Semi-Detached	Row / Town-house	Apt / Apt-Style Condo	Mobile & Other
<i>Unweighted base</i>	3836	218	358	138	242
Mean	20.9	14.4	14.7	11.5	12.5
Standard Deviation	13.3	8.6	11.0	11.1	7.9

## 4.2 Dwelling Sizes

Dwelling size is defined as the total floor area of the dwelling including the basement and any unfinished areas but excluding garages or carports. As the data include a small number of responses considered unrealistically high or low, an outlier analysis was used to remove the bottom 0.5% and top 0.5% of the estimates, ranked from lowest to highest. This eliminated 1% of the sample from floor area calculations.

The average floor area of dwellings in the 2022 REUS was 2,179 square feet and the median is 2,100 square feet (Table 16). At the utility level, differences in average floor space between survey years are not statistically significant at the 95% confidence level.

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<sup>3</sup> Wording of the question regarding length of residency was changed in the 2017 REUS to include the length of residency and/or ownership of the property. Caution is advised when comparing results to those from the 2012 and 2008 surveys.

**Table 16: Dwelling Size (Square Feet) by Region**

Floor Space (ft <sup>2</sup> )	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3273	2044
Mean <sup>1</sup>	2436	2039	2135	2179	2183	2209	2220
Median	2300	2000	2000	2100	2100	2100	1800
Standard Deviation	2264	730	937	1421	1185	1221	806

<sup>1</sup> Mean excludes 0.5% of the largest and 0.5% of the smallest values

Average (mean) and median square footage data by dwelling type are summarized in Table 17. On average, SFDs are the largest dwellings (2,342 ft<sup>2</sup>) and mobile homes the smallest (1,172 ft<sup>2</sup>). The median size for SFD homes is 2,230 ft<sup>2</sup>, compared to 1,600 ft<sup>2</sup> for row/townhouses and 1,150 ft<sup>2</sup> for apts/condos.

**Table 17: Dwelling Size (Square Feet) by Type of Dwelling**

Floor Space (ft <sup>2</sup> )	Single Family Detached	Semi-Detached	Row / Town-house	Apt / Apt-Style Condo	Mobile & Other
<i>Unweighted base</i>	3836	218	358	138	242
Mean <sup>1</sup>	2342	1827	1684	1169	1172
Median	2230	1800	1600	1150	1100
Standard Deviation	1464	632	1343	448	720

<sup>1</sup> Mean excludes 0.5% of the largest and 0.5% of the smallest values

Consistent with trends identified in previous FEI residential end-use studies, the median size of newly constructed SFD dwellings has increased over time (Table 18). For example, the median size of SFDs constructed before 1950 was 2,000 ft<sup>2</sup>. By the mid-1980s, the median size increased to 2,200 ft<sup>2</sup>. The median size of single-family detached dwellings constructed since 2005 is 2,700 ft<sup>2</sup>.

**Table 18: Floor Space of Single Family Detached Dwellings by Dwelling Vintage**

Floor Space (ft <sup>2</sup> )	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 - 2005	2006 - 2015	2016 or Newer	Age Unknown
<i>Unweighted base</i>	530	1121	729	842	770	431	251	114
Mean <sup>1</sup>	2028	2128	2243	2512	2675	2751	2755	1887
Median	2000	2150	2200	2400	2500	2700	2700	1800
Standard Deviation	839	776	736	2834	1037	1108	1532	1050

<sup>1</sup> Mean excludes 0.5% of the largest and 0.5% of the smallest values

#### 4.2.1 Number of Heated Floors (Stories)

Table 19 summarizes the number of heated floors (stories), including heated basements, for residential dwellings in FEI’s service area. The number of heated floors of a residential dwelling influences its space conditioning requirements. As well, multi-story dwellings have different space heating and cooling profiles than their single-story counterparts. Overall, the majority (57%) of homes have two heated floors and 26% have three or more. Eighteen percent (18%) of dwellings have one heated floor.

## Dwelling Characteristics

**Table 19: Number of Heated Floors (Stories) Including Basements by Region (% of Dwellings)**

	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	1428	2257	1107	4792
One floor	11.4	27.4	26.7	17.8
Two floors	56.3	57.0	58.0	56.7
Three floors	31.3	14.2	14.4	24.4
More than three floors	1.0	1.5	0.9	1.1
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

Table 20 summarizes the number of heated floors (stories), including heated basements, by dwelling type. SFDs and semi-detached dwellings are most likely to have two heated floors (61% and 63% respectively), while 44% of row/ townhouses have two heated floors. Apartments and mobile homes are most likely to have only one heated floor.<sup>4</sup>

**Table 20: Number of Heated Floors (Stories) Including Basements by Dwelling Type (% of Dwellings)**

	Single Family Detached	Semi- Detached	Row / Town- house	Apt / Apt-Style Condo	Mobile & Other
<i>Unweighted base</i>	3836	218	358	138	242
One floor	13.3	13.1	16.8	84.9	94.9
Two floors	61.2	62.6	43.5	6.1	4.7
Three floors	24.4	23.6	38.9	2.1	0.4
More than three floors	1.1	0.6	0.9	6.9	--
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

### 4.3 Basements and Crawlspaces

Eight-in-ten (80%) dwellings in FEI's service area have a basement or crawlspace, comparable to proportions recorded in previous surveys (Table 21). Dwellings with crawlspaces are most common on Vancouver Island (36%) compared to the Interior (19%) and Lower Mainland (18%).

**Table 21: Incidence of Basements and Crawlspaces by Region (%)**

	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3441	2108
Full basement	49.6	54.0	35.7	49.0	48.9	49.7	52.0
Partial basement	10.5	9.4	10.6	10.2	11.9	10.3	12.2
Crawlspace	17.7	18.9	36.1	20.5	21.3	20.5	15.0
No basement or crawlspace	22.1	17.7	17.6	20.3	18.0	19.5	20.8
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Basement or crawlspace</b>	<b>77.9</b>	<b>82.3</b>	<b>82.4</b>	<b>79.7</b>	<b>82.0</b>	<b>80.5</b>	<b>79.2</b>

Totals may not sum due to rounding.

<sup>4</sup> While the REUS questionnaire reminded respondents living in apartments and apartment style condominiums to count only the floors (stories) in their unit, the results suggests some counted the total number of floors (stories) in their building.

The incidence of basements and crawlspaces varies by dwelling type. SFDs are the most likely dwelling type to have a basement or crawlspace (86%) compared to semi-detached dwellings (67%), townhouses (58%), apts/condos (16%) (Table 22). Four-in-ten (41%) mobile and other manufactured homes have a basement or crawlspace but the majority of these are crawlspaces only. The data suggest that some respondents living in apts/condos may have incorrectly included spaces that are not part of their unit (e.g., basements in a multi-family dwelling).

**Table 22: Incidence of Basements and Crawlspaces by Dwelling Type (%)**

	Single Family Detached	Semi-Detached	Row / Town-house	Apt / Apt-Style Condo	Mobile & Other
<i>Unweighted base</i>	3836	218	358	138	242
Full basement	54.9	32.1	27.4	10.8	3.5
Partial basement	11.3	7.3	7.1	1.3	0.4
Crawlspace	19.6	27.9	23.4	3.7	36.6
No basement or crawlspace	14.2	32.7	42.1	84.3	59.5
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Basement or crawlspace</b>	<b>85.8</b>	<b>67.3</b>	<b>57.9</b>	<b>15.7</b>	<b>40.5</b>

Totals may not sum due to rounding.

Two-thirds (66%) of basements are completely finished (Table 23). Another 27% are partially finished and the remaining 7% are unfinished. There has been a gradual increase in the proportion of dwellings with a completely finished basement since 2008.

**Table 23: Basement Finishing by Region (%)**

Homes with basements	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	3545	2098	1272
Unfinished	5.5	9.6	9.9	7.2	6.5	7.5	8.9
Partially finished	21.9	33.5	33.8	26.5	31.3	31.4	33.7
Completely finished	72.6	56.8	56.2	66.3	62.3	61.1	57.3
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

Nine-in-ten (89%) respondents living in dwellings with either a full or partial basement indicated they heat their basement during the heating season (Table 24), statistically unchanged over the last three residential end-use surveys. One-third (35%) of crawlspaces are heated during the winter months.

**Table 24: Heating of Basements vs. Crawlspaces by Region (%)**

Basement /Crawlspace Heating	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
Percent of basements heated	88.0	91.7	85.9	88.9	88.2	89.8	81.6
Percent of crawlspaces heated	35.2	32.8	37.8	35.2	41.6	49.2	41.5

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### 4.4 Insulation & Insulation Upgrades

The 2022 REUS queried respondents about the presence of insulation in exterior walls (yes, no, or don't know), and where applicable, attics and basements. They were also asked whether the insulation in had been improved or updated.

#### 4.4.1 Attics

On average, 94% of respondents indicated their dwellings have an attic (Table 25). Nine-in-ten (90%) attics are insulated, 4% are not insulated, and the remaining 6% may or may not be insulated (i.e., the respondent was unsure).

**Table 25: Attic Insulation by Region (%)**

	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	1428	2257	1107	4792
Homes with attic (%)	94.5	91.3	94.7	93.7
<b>Distribution: <sup>1</sup></b>				
Insulated	88.1	91.5	94.5	89.9
Not insulated	4.7	2.4	2.1	3.8
Don't know	7.1	6.1	3.4	6.3
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

<sup>1</sup> Base: Dwellings with attics

Totals may not sum due to rounding.

Table 26 shows the proportions of dwellings with insulated versus un-insulated attics by vintage (period of construction). Some degree of self-reporting error is apparent (e.g., 2% of respondents living in a dwelling with an attic constructed since 2015 indicated it was not insulated – an unlikely scenario).

**Table 26: Attic Insulation by Dwelling Vintage (%)**

	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 - 2005	2006 - 2015	2016 or Newer	Age Un- known
<i>Unweighted base</i>	530	1121	729	842	770	431	251	114
Homes with attics	95.1	94.7	94.3	93.3	93.3	93.8	87.7	89.3
<b>Distribution: <sup>1</sup></b>								
Insulated	85.0	92.2	90.8	89.9	91.5	88.6	91.4	74.3
Not insulated	5.1	3.1	4.7	3.5	3.6	4.1	1.5	5.0
Don't know	9.9	4.7	4.5	6.6	4.9	7.3	7.0	20.7
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

<sup>1</sup> Base: Dwellings with attics

Totals may not sum due to rounding.

Somewhat more than one-third (35%) of respondents living in dwellings that have an insulated attic indicated their attic's insulation has been upgraded sometime in the dwelling's history and 56% indicated it has not (Table 27). Of note, 9% were unsure whether improvements had been made to their attic's insulation. Caution is advised in interpreting results for those dwellings where the attic insulation has not been upgraded. It may mean there is an opportunity to improve insulation levels for these homes but it may also mean the attic is already well insulated (e.g., newer homes).

**Table 27: Attic Insulation Upgrades by Region (%)**

Insulated Attics	LM	INT	VI	2022 FEI
<i>Unweighted base</i> <sup>1</sup>	1188	1876	990	4054
Upgraded	34.7	35.6	34.4	34.9
Not upgraded	56.7	52.7	56.8	55.6
Don't know	8.6	11.8	8.8	9.5
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

<sup>1</sup> Dwellings with insulated attics.  
Totals may not sum due to rounding.

Table 28 explores the incidence of attic insulation upgrades by age of the dwelling (period of construction). The data show older dwellings are more likely to have had their attic insulation upgraded compared to newer dwellings. For example, 65% of dwellings constructed prior to 1950 have had their attic insulation upgraded compared to 23% of dwellings constructed during 1986-1995. This is expected as changes in building codes and construction standards mean newer dwellings will have insulation levels in the attic that are superior to those originally installed in dwellings constructed decades earlier.

**Table 28: Attic Insulation Upgrades by Dwelling Vintage (%)**

Insulated Attics	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 - 2005	2006 - 2015	2016 or Newer	Age Unknown
<i>Unweighted base</i> <sup>1</sup>	439	979	624	720	657	355	206	73
Upgraded	65.0	53.8	42.3	22.7	10.4	4.4	21.9	29.2
Not upgraded	23.9	37.9	46.1	68.1	82.5	87.6	72.1	36.9
Don't know	11.1	8.3	11.6	9.2	7.1	8.0	6.0	33.9
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

<sup>1</sup> Dwellings with insulated attics.  
Totals may not sum due to rounding.

#### 4.4.2 Exterior Walls

Table 29 shows that nine-in-ten (89%) respondents indicated their dwellings' exterior walls are insulated. Three percent (3%) indicated their exterior walls were not insulated and 8% were unsure.

**Table 29: Exterior Wall Insulation by Region (%)**

	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	1428	2257	1107	4792
Insulated	87.2	91.3	90.0	88.7
Not insulated	3.8	2.1	3.1	3.2
Don't know	9.0	6.7	7.0	8.1
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

The incidence of exterior wall insulation varies by dwelling vintage. For example, 14% of respondents living in homes built prior to 1950 indicated their exterior walls are not insulated and another 13% were unsure whether their exterior walls are insulated (Table 30). Despite uncertain responses ranging from 5% to 8% of respondents living in dwellings constructed since the mid-1980s, it is unlikely these homes do not have insulation in their exterior walls.

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**Table 30: Exterior Wall Insulation by Dwelling Vintage (%)**

	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 - 2005	2006 - 2015	2016 or Newer	Age Unknown
<i>Unweighted base</i>	530	1121	729	842	770	431	251	114
Insulated	72.7	87.1	92.2	91.8	93.5	92.1	95.2	78.4
Not insulated	13.9	3.6	2.1	0.5	1.0	0.8	0.3	5.2
Don't know	13.4	9.3	5.7	7.7	5.5	7.1	4.6	16.4
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

Fifteen percent (15%) of respondents indicated the insulation in their home's exterior walls has been improved or upgraded (Table 31). Regional variations are not statistically significant. Twelve percent (12%) of respondents were unsure whether insulation in their exterior walls had been upgraded. The relatively low percentage of dwellings that have had an upgrade to their exterior wall insulation levels likely reflects the difficulty of upgrading exterior wall insulation after the dwelling's construction is complete.

**Table 31: Exterior Wall Insulation Upgrades by Region (%)**

	LM	INT	VI	2022 FEI
<i>Unweighted base</i> <sup>1</sup>	1428	2257	1107	4792
Upgraded	15.2	15.5	16.0	15.4
Not upgraded	74.2	70.9	73.4	73.2
Don't know	10.6	13.6	10.6	11.5
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

<sup>1</sup> Dwellings with insulated exterior walls.

Totals may not sum due to rounding.

The incidence of upgrades to exterior wall insulation levels is higher for older dwellings (Table 32). For example, one-half (50%) of homes built before 1950 have had their exterior wall insulation improved compared to less than 5% of homes built during the 1986-2005 period. Respondents in the newest homes (those constructed since 2015) who indicated their wall insulation has been upgraded may be interpreting this question as referring to insulation options available at the time of their home's construction.

**Table 32: Exterior Wall Insulation Upgrades by Dwelling Vintage (%)**

	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 - 2005	2006 - 2015	2016 or Newer	Age Unknown
<i>Unweighted base</i> <sup>1</sup>	389	996	671	782	727	396	239	93
Upgraded	49.7	24.2	11.4	5.0	4.4	2.7	19.4	14.0
Not upgraded	34.0	62.1	75.5	86.7	87.9	89.5	77.0	43.3
Don't know	16.3	13.7	13.1	8.3	7.6	7.8	3.6	42.7
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

<sup>1</sup> Dwellings with insulated exterior walls.

Totals may not sum due to rounding.

### 4.4.3 Basements

Eighty-five percent (85%) of basements are insulated and 7% are not insulated (Table 33). The remaining respondents were unsure. The incidence of un-insulated basements varies from 5% for Lower Mainland to

10% for the Interior. Basements without insulation can account for approximately 20% of the total heat loss of a house.<sup>5</sup>

**Table 33: Basement Insulation by Region (%)**

	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	1428	2257	1107	4792
Homes with basements	60.1	63.4	46.3	59.2
<b>Distribution: <sup>1</sup></b>				
Insulated	85.6	84.2	86.6	85.3
Not insulated	5.2	9.6	6.9	6.6
Don't know	9.3	6.2	6.5	8.1
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

<sup>1</sup> Base: Dwellings with basements

Totals may not sum due to rounding.

The incidence of un-insulated basements is highest in older dwellings. For example, 17% of basements in homes built prior to 1950 are not insulated (Table 34). In comparison, only 2% of basements in homes constructed since 2015 are not insulated. The proportion of respondents unsure whether their basement is insulated tends to be highest for those living in older homes.

**Table 34: Basement Insulation by Dwelling Vintage (%)**

	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 - 2005	2006 - 2015	2016 or Newer	Age Un- known
<i>Unweighted base</i>	530	1121	729	842	770	431	251	114
Homes with basements	83.5	71.5	55.1	43.7	49.7	52.7	59.4	45.6
<b>Distribution: <sup>1</sup></b>								
Insulated	71.9	83.7	89.2	90.5	92.4	87.8	97.1	68.5
Not insulated	17.0	7.1	4.3	3.4	2.8	2.3	1.5	8.2
Don't know	11.0	9.2	6.5	6.0	4.8	9.9	1.5	23.3
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

<sup>1</sup> Base: Dwellings with basements

Totals may not sum due to rounding.

One-in-three (29%) dwellings have had their basement insulation upgraded or improved (Table 35). Regionally, the proportion varies from 27% of homes in the Interior to 36% of homes on Vancouver Island. Six-in-ten (60%) indicated their basement insulation levels had not been upgraded or improved.

**Table 35: Basement Insulation Upgrades by Region (%)**

<b>Insulated Basements</b>	LM	INT	VI	2022 FEI
<i>Unweighted base <sup>1</sup></i>	730	1200	441	2371
Upgraded	29.3	27.1	35.7	29.4
Not upgraded	59.8	61.7	54.1	59.7
Don't know	10.9	11.2	10.2	10.9
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

<sup>1</sup> Dwellings with insulated basements.

Totals may not sum due to rounding.

<sup>5</sup> Natural Resources Canada (2012)

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Like the relationships between dwelling vintage and upgrades to attic and wall insulation, the older the dwelling the more likely its basement's insulation has been upgraded. (Table 36).

**Table 36: Basement Insulation Upgrades by Dwelling Vintage (%)**

Insulated Basements	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 - 2005	2006 - 2015	2016 or Newer	Age Unknown
<i>Unweighted base</i> <sup>1,2</sup>	301	709	379	319	324	179	126	33
Upgraded	61.4	42.3	27.1	12.2	10.1	3.7	21.4	25.7
Not upgraded	23.0	44.3	62.7	78.4	85.0	89.4	74.4	30.6
Don't know	15.6	13.5	10.2	9.4	4.9	6.9	4.2	43.7

<sup>1</sup> Dwellings with insulated basements

<sup>2</sup> Caution is advised in interpreting data for samples of less than 50. Results are directional only.

Totals may not sum due to rounding.

### 4.4.4 Crawl Spaces

More than half (57%) of crawlspaces are insulated, 30% are not insulated, and 13% may or may not be insulated (Table 37). Regionally, homes with crawlspaces in the Lower Mainland are less likely to be insulated than homes in the Interior or on Vancouver Island. The incidence of un-insulated crawlspaces by dwelling type was relatively consistent across all dwelling types (data not shown).

**Table 37: Crawl Space Insulation by Region (%)**

	LM	INT	VI	2022 FEI	2017 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827
Homes with crawlspaces	17.7	18.9	36.1	20.5	21.3
<b>Distribution:</b> <sup>1</sup>					
Insulated	51.2	61.5	65.3	57.1	55.9
Not insulated	35.7	25.8	22.9	30.2	28.6
Don't know	13.1	12.8	11.8	12.7	15.6
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

<sup>1</sup> Base: Dwellings with crawlspaces

Totals may not sum due to rounding.

Older homes with crawlspaces are less likely than newer homes to have these spaces insulated. For example, somewhat more than four-in-ten (44%) of homes with crawlspaces constructed prior to 1950 do have insulation in the crawl space versus 11% to 24% of homes built since 1996 (Table 38).

**Table 38: Crawl Space Insulation by Dwelling Vintage (%)**

	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 - 2005	2006 - 2015	2016 or Newer	Age Unknown
<i>Unweighted base</i>	530	1121	729	842	770	431	251	114
Homes with crawlspaces	10.4	12.7	20.2	33.6	25.2	22.7	11.5	28.8
<b>Distribution:</b> <sup>1</sup>								
Insulated	52.2	45.3	61.4	54.8	61.7	67.4	81.6	45.4
Not insulated	43.8	46.3	28.0	29.2	23.5	24.7	10.9	23.0
Don't know	4.0	8.4	10.6	16.0	14.8	7.9	7.5	31.6
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

<sup>1</sup> Base: Dwellings with crawlspaces

Totals may not sum due to rounding.

Overall, two-in-ten (21%) of dwellings with crawlspaces have had the insulation in these spaces upgraded or improved sometime during the life of the dwelling (Table 39).

**Table 39: Crawl Space Insulation Upgrades by Region (%)**

Insulated Crawl Spaces	LM	INT	VI	2022 FEI
<i>Unweighted base</i> <sup>1</sup>	140	270	271	681
Upgraded	21.0	22.4	18.6	20.7
Not upgraded	73.7	68.3	75.6	72.7
Don't know	5.4	9.4	5.9	6.5
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

<sup>1</sup> Dwellings with insulated crawlspaces.  
Totals may not sum due to rounding.

#### 4.4.5 Heated Garages / Workshops

Two-thirds (67%) of FEI customers indicated their home has a heated garage or workshop, significantly higher than the proportion recorded in 2017 (55%). These spaces can be part of the dwelling (i.e., workshop in the basement), situated as an attached structure (e.g., attached garage) or situated as a standalone detached structure (e.g., detached workshop/garage). While it is possible that the increased incidence of heated garages/workshops reflects changes to the stock of dwellings in FEI’s service area during the last five years (i.e., via retrofits or new construction), misinterpretation of the question by survey respondents cannot be ruled out.

Four-in-ten (39%) heated garages / workshops are insulated and one-half (51%) are not insulated. The survey did not query the methods of heating nor how much these spaces were used during the winter months.

**Table 40: Heated Garage / Workshop Insulation by Region (%)**

	LM	INT	VI	2022 FEI	2017 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827
Homes with heated garages / workshops	68.6	63.0	68.4	67.0	54.7
<b>Distribution:</b> <sup>1</sup>					
Insulated	32.6	49.8	44.5	38.6	48.7
Not insulated	55.9	40.7	46.0	50.6	40.3
Don't know	11.5	9.4	9.5	10.7	11.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

<sup>1</sup> Base: Dwellings with heated garages / workshops  
Totals may not sum due to rounding.

One-quarter (27%) of respondents with garages and workshops that are both insulated and heated indicated the insulation has been upgraded. The majority (66%) indicated it has not been upgraded and 7% were unsure (Table 41).

**Table 41: Heated Garage / Workshop Insulation Upgrades by Region (%)**

Insulated Heated Garages and Workshops	LM	INT	VI	2022 FEI
<i>Unweighted base</i> <sup>1</sup>	319	708	337	1364
Upgraded	26.2	28.6	24.7	26.7
Not upgraded	67.9	62.6	68.8	66.3
Don't know	5.9	8.9	6.4	7.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

<sup>1</sup> Heated garages and workshops that are insulated  
Totals may not sum due to rounding.

### 4.5 Draft Proofing Effectiveness

Approximately four-in-ten (38%) respondents to the 2022 REUS indicated their homes are “sometimes drafty” or “always drafty” (Table 42). The proportion of homes sometimes or always drafty varied from a high of 41% for Lower Mainland customers to a low of 31% for Vancouver Island customers.

**Table 42: Draftiness of the Home by Region (%)**

	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3441	2182 <sup>1</sup>
Not at all drafty	58.7	67.2	69.2	62.4	56.8	51.6	55.6
Sometimes drafty	36.4	30.1	28.7	33.7	38.9	43.5	41.1
Always drafty	4.9	2.7	2.2	3.9	4.2	4.9	3.3
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Sometimes or always drafty</b>	<b>41.3</b>	<b>32.8</b>	<b>30.8</b>	<b>37.6</b>	<b>43.2</b>	<b>48.4</b>	<b>44.4</b>

<sup>1</sup> Rebased to exclude DK responses  
Totals may not sum due to rounding.

At the utility level, the proportion of respondents indicating their home is sometimes or always drafty has declined steadily over the last three residential surveys, suggesting that actions taken to improve the efficiency of the building envelop for existing dwellings (e.g., upgrading windows, exterior doors, and insulation, draft sealing, etc.) combined with improvements in building envelope efficiency in new construction are having a positive effect.

Respondents living in older homes are much more likely to say their home is sometimes or always drafty compared to those in newer homes (Table 43).

**Table 43: Draftiness of the Home by Dwelling Vintage (%)**

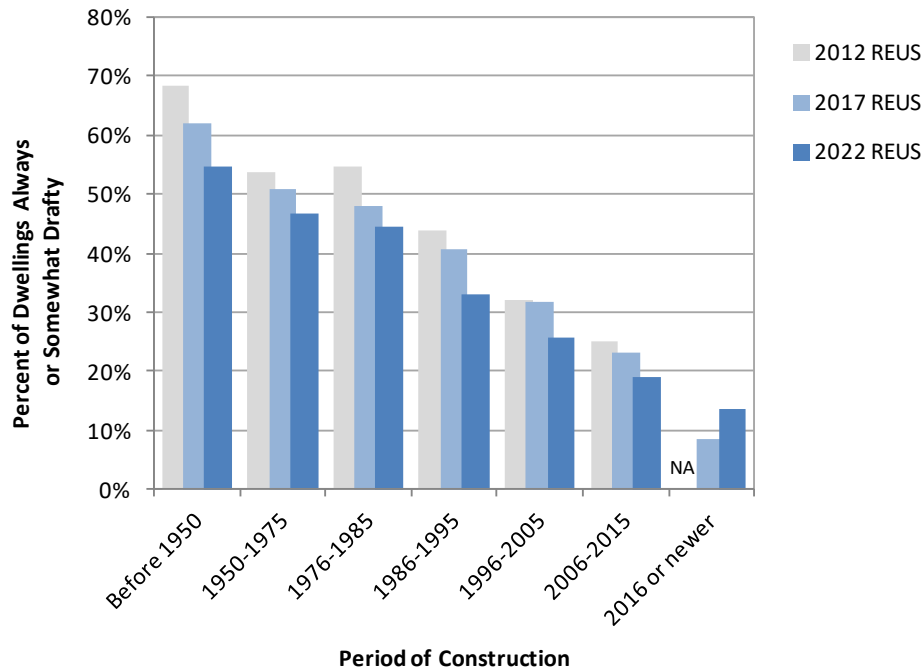
	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 - 2005	2006 - 2015	2016 or Newer	Age Unknown
<i>Unweighted base</i>	530	1121	729	842	770	431	251	114
Not at all drafty	45.4	53.2	55.5	67.0	74.5	81.1	86.3	55.3
Sometimes drafty	45.8	43.1	40.1	30.2	23.8	16.2	10.2	35.8
Always drafty	8.7	3.6	4.4	2.7	1.8	2.7	3.6	8.9
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Sometimes or always drafty</b>	<b>54.6</b>	<b>46.8</b>	<b>44.5</b>	<b>33.0</b>	<b>25.5</b>	<b>18.9</b>	<b>13.7</b>	<b>44.7</b>

Totals may not sum due to rounding.

For example, more than half (55%) of respondents living in a home built before 1950 indicated their home was sometimes or always drafty compared to 14% of respondents in homes constructed since 2015.

Like that observed at the utility level, a comparison of data from FortisBC’s last three residential end-use studies show that the draftiness of residential dwellings, for the majority of vintages, has been steadily declining over time (Figure 1).

**Figure 1: Percent of Dwellings Somewhat or Always Drafty by Dwelling Vintage**



## 4.6 Windows and Window Upgrades

Respondents to the 2022 REUS were asked to estimate the percentage of their windows that matched the following window glazing types:

- Single pane regular (clear) glass
- Double pane regular (clear) glass
- Double pane low-E
- Triple pane regular (clear) glass
- Triple pane low-E

Respondents with double and/or triple glazed windows with low-E coatings were also asked whether these windows are ENERGY STAR® qualified. Average (mean) percentages for the five window types by FEI region are provided in Table 44.

**Table 44: Window Glazing - Mean % of all Windows by Region**

Window Types	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3362	1993
Single pane (clear) glass	14.8	9.3	7.4	12.3	12.3	14.5	18.2
Double pane (clear) glass	66.2	60.0	66.7	64.6	64.1	62.3	66.3
Double pane low-E coat	16.9	27.1	23.6	20.6	21.6	20.9	13.5
Triple pane (clear) glass	1.1	1.4	1.2	1.2	0.9	0.5	0.5
Triple pane low-E coat	1.0	2.2	1.2	1.3	0.9	0.8	0.4
Other <sup>1</sup>	--	--	--	--	--	1.0	0.7

<sup>1</sup> No "Other" category response option provided in the 2017 and 2022 REUS

Highlights include:

- Double-pane (clear) glass windows continue to be the most common window type present in FEI residential dwellings (65% of all windows in 2022, statistically unchanged from 2017).
- The share of double-pane windows with low-E coatings represents 21% of all windows, statistically unchanged from 2017.
- Penetration of double-pane windows with low-E is highest in the Interior region (27%) and lowest in the Lower Mainland (17%).
- Consistent with past studies, dwellings in the Lower Mainland have the highest share of single-pane windows (15%) compared to the Interior (9%) and Vancouver Island (7%).
- Triple-pane windows, either with or without low-E coatings, continue to account for a very small percentage of all windows (less than 2%).

Table 45 provides detail on the proportion of double-pane low-E and triple-pane low-E windows that are ENERGY STAR qualified. Respondents indicated that six-in-ten (58%) of their double-pane low-E windows and seven-in-ten (76%) triple-pane low-E windows are ENERGY STAR qualified. Of note, 36% of respondents with double-pane low-E units and 23% of respondents with triple-pane low-E units were unsure whether their units are ENERGY STAR qualified.

**Table 45: ENERGY STAR Windows by Region (% ENERGY STAR)**

Windows are ENERGY STAR?	LM	INT	VI	2022 FEI	2017 FEI
Double pane low-E					
Yes	59.5	57.5	56.1	58.3	61.5
No	5.1	6.6	3.7	5.4	6.8
Don't know	35.4	36.0	40.2	36.3	31.7
Triple pane low-E					
Yes	80.0	70.0	76.5	75.6	71.2
No	0.0	4.2	0.0	1.7	5.7
Don't know	20.0	25.7	23.5	22.7	23.1

Percentages of the five window types by dwelling vintage are summarized in Table 46. Consistent with the results from past FEI end-use surveys, older dwellings are the most likely to have single-pane windows. For

example, three-in-ten (29%) windows in residential dwellings constructed before 1950 are single pane compared to only 5% to 6% of windows in dwellings constructed since 2005. Renovation activity among the older housing stock is evident with double pane windows with low-E coatings accounting for 16% to 23% of windows in homes built prior to 2006.

**Table 46: Window Glazing - Mean % of all Windows by Dwelling Vintage**

Window Types	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 – 2005	2006 - 2015	2016 or Newer	Age Un-known
<i>Unweighted base</i>	530	1121	729	842	770	431	251	114
Single pane (clear) glass	28.8	18.3	10.7	4.7	6.2	4.9	5.8	19.9
Double pane (clear) glass	51.9	57.5	62.9	75.2	76.9	67.1	48.6	70.6
Double pane low-E coat	16.8	22.9	23.1	17.2	16.0	24.3	37.3	8.7
Triple pane (clear) glass	1.0	0.6	1.9	1.4	0.4	2.1	2.2	0.8
Triple pane low-E coat	1.4	0.8	1.5	1.5	0.5	1.6	6.1	--

#### 4.6.1 Window Frames

Each survey respondent was asked to estimate the percentage of their home’s windows by frame material (e.g., aluminum, wood, vinyl, and/or other). The results, summarized in Table 47, show that vinyl-framed windows are most common, accounting for one-half (53%) of all windows, followed by aluminum (29%), and wood (18%). Regionally, dwellings in the Lower Mainland have the highest share of aluminum-framed windows (41%).

**Table 47: Window Frame Material - Mean % of all Windows by Region**

Window Frame Material	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3377
Aluminum	40.9	20.3	29.4	28.6	37.6	30.6
Wood	14.4	23.4	11.3	17.9	14.6	20.4
Vinyl	44.0	55.9	58.6	53.0	47.4	47.1
Other	0.7	0.4	0.7	0.6	0.3	1.9

The popularity of different window frame materials, notably aluminum and wood, varies by dwelling age (Table 48). For example, homes built prior to 1950 are most likely to have wood window frames (42% of windows) compared to just 7% of homes constructed since 2015. Aluminum-framed windows are most common among dwellings constructed in the mid-1980s to mid-1990s (47% of windows) but make up 29% of windows for homes constructed since 2005. Vinyl-framed windows, a popular choice for window retrofits and new construction, represent anywhere from 35% of windows in pre-1950 homes to six-in-ten (between 61% and 64%) windows of homes constructed since 1995.

**Table 48: Window Frame Material - Mean % of all Windows by Dwelling Vintage**

Window Frame Material	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 - 2005	2006 - 2015	2016 or Newer	Age Unknown
<i>Unweighted base</i>	530	1121	729	842	770	431	251	114
Aluminum	21.9	32.2	40.6	47.0	24.9	28.8	29.3	44.2
Wood	41.8	15.6	12.2	15.4	11.0	9.6	6.5	16.3
Vinyl	35.0	51.6	46.8	37.5	63.8	61.1	62.1	39.4
Other	1.3	0.7	0.4	0.2	0.3	0.5	2.2	0.0

### 4.6.2 Window Upgrades (Frames & Glass)

Somewhat less than one-quarter (23%) of residential dwellings have had some (9%) or all (14%) of their windows (frames and glass) upgraded in the last five years (Table 49). Regionally, the proportion of homes with some or all of their windows upgraded varied from 20% (Lower Mainland) to 27% (Interior).

**Table 49: Windows Upgraded Last Five Years by Region (%)**

Windows upgraded last five years?	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	1428	2257	1107	4792
Yes - all of them	8.9	9.3	5.8	8.6
Yes - some of them	11.5	18.1	17.5	14.1
No - none of them	78.6	69.7	75.1	75.7
Don't know	1.0	3.0	1.6	1.6
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Some or all upgraded</b>	<b>20.4</b>	<b>27.3</b>	<b>23.3</b>	<b>22.7</b>

Totals may not sum due to rounding.

Consistent with other data presented to this point, the proportion of dwellings that upgraded some or all of their windows in the last five years is typically highest among older dwellings. For example, between 25% and 31% of homes built prior to 1996 have upgraded some or all of their windows, compared to between 3% and 9% for homes built between 1996 and 2016 (Table 50). Respondents in homes constructed since 2015 who indicated they upgraded all of their windows may have interpreted the question as referring to options available to them at the time of construction (i.e., made the decision to upgrade their window package during construction).<sup>6</sup>

**Table 50: Windows Upgraded Last Five Years by Dwelling Vintage (%)**

Windows upgraded last five years?	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 - 2005	2006 - 2015	2016 or Newer	Age Unknown
<i>Unweighted base</i>	530	1121	729	842	770	431	251	114
Yes - all of them	4.9	8.9	13.6	9.2	1.6	0.3	32.1	12.1
Yes - some of them	21.9	17.8	17.1	15.9	7.4	2.9	0.7	11.6
No - none of them	71.3	72.1	68.2	73.8	89.8	94.7	65.8	64.6
Don't know	1.9	1.3	1.1	1.2	1.3	2.1	1.4	11.7
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Some or all upgraded</b>	<b>26.8</b>	<b>26.7</b>	<b>30.7</b>	<b>25.1</b>	<b>9.0</b>	<b>3.3</b>	<b>32.8</b>	<b>23.7</b>

Totals may not sum due to rounding.

<sup>6</sup> This interpretation is consistent with the wording of the question: "Have any of the windows at this residence been upgraded with new windows (frames and glass) in the last five years?"

4.7 Exterior Door Materials and Upgrades

4.7.1 Exterior Door Materials

Respondents were asked to itemize (count) their home’s exterior (outside) doors based on the following six common door types:

- Wood doors
- Wood doors with aluminum storm doors
- Insulated steel or fibreglass doors
- Glass doors with wooden frames
- Glass doors with aluminum frames
- Glass doors with vinyl or fibreglass frames

Respondents living in apts/condos were asked to count only doors in their unit that opened directly to the outdoors.

Table 51 summarizes the percentage distribution of these six door material combinations. Insulated steel or fibreglass doors remain the most common type of exterior door, accounting for one-in-three (30%) of all exterior doors in 2022. Wood doors and glass doors with aluminum frames (e.g., sliding patio doors) are the next two most common door types representing 28% and 14% of exterior doors respectively. The relative percentages of these three most common door types have varied somewhat over the last four end-use surveys but the relative ranking (popularity) is unchanged. Consistent with their colder winters, homes in the Interior are much more likely to have insulated steel or fibreglass doors compared to homes on Vancouver Island and the Lower Mainland.

**Table 51: Exterior Door Material by Region (%)**

Exterior Door Types	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3359	2074
Wood doors	31.7	19.6	26.1	27.9	25.8	22.5	27.2
Wood doors with aluminum storm doors	7.2	7.9	5.1	7.1	6.8	6.2	7.7
Insulated steel or fibreglass doors	26.6	38.4	32.6	30.4	32.8	38.6	33.8
Glass doors with wooden frames	9.9	11.0	9.3	10.1	10.3	9.4	8.5
Glass doors with aluminum frames	14.3	11.5	13.8	13.5	14.7	13.4	16.7
Glass doors with vinyl or fibreglass frames	10.3	11.7	13.1	11.0	9.7 <sup>1</sup>	9.8 <sup>1</sup>	6.2 <sup>1</sup>
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

<sup>1</sup> Category description did not include glass doors with fibreglass frames.

Table 52 summarizes the popularity of different exterior door types by dwelling vintage. Insulated steel or fibreglass doors are the most popular, accounting for between 20% and 40% of exterior doors depending on dwelling vintage. Wood exterior doors are typical of older dwellings (e.g., 46% of exterior doors in homes built before 1950) but continue to represent roughly one-fifth to one-quarter of exterior doors in

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homes built since the mid-1990s. Glass doors with aluminum frames (typically, sliding patio doors) are common among dwellings constructed during the 1970s and 1980s.

**Table 52: Exterior Door Material by Dwelling Vintage (%)**

Exterior Door Types	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 - 2005	2006 - 2015	2016 or Newer	Age Unknown
<i>Unweighted base</i> <sup>1</sup>	530	1121	729	842	770	431	251	114
Wood doors	45.5	31.3	26.0	21.9	19.9	25.4	25.9	37.9
Wood doors with aluminum storm doors	7.9	9.4	7.0	5.5	5.9	6.6	4.7	10.7
Insulated steel or fibreglass doors	19.9	28.7	29.8	32.6	39.6	30.9	28.8	24.3
Glass doors with wooden frames	13.9	8.2	7.4	11.4	10.0	11.6	13.1	7.4
Glass doors with aluminum frames	6.1	11.0	17.5	17.2	13.9	14.1	12.2	14.6
Glass doors with vinyl or fibreglass frames	6.7	11.5	12.2	11.4	10.7	11.5	15.3	5.1
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

Table 53 summarizes the saturation rates for each of the exterior door types. The average residential dwelling has 3.8 exterior doors, of which, 1.2 are insulated steel or fibreglass and 1.1 are wood. Multiplying the saturation rate by the population of FEI residential customers generates an estimate of the total number of exterior doors by type among FEI's residential customer base.

**Table 53: Exterior Door Saturation by Material (Average # per Dwelling)**

Exterior Door Types	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	1428	2257	1107	4792
Wood doors	1.3	0.7	1.0	1.1
Wood doors with aluminum storm doors	0.3	0.3	0.2	0.3
Insulated steel or fibreglass doors	1.1	1.4	1.3	1.2
Glass doors with wooden frames	0.4	0.4	0.4	0.4
Glass doors with aluminum frames	0.6	0.4	0.5	0.5
Glass doors with vinyl or fibreglass frames	0.4	0.4	0.5	0.4
<b>Any Exterior Door Type</b>	<b>4.0</b>	<b>3.6</b>	<b>3.9</b>	<b>3.8</b>

### 4.7.2 Exterior Door Upgrades Last Five Years

On average, slightly less than one-quarter (23%) of dwellings have upgraded some or all of their exterior doors with new doors during the past five years (Table 54).

**Table 54: Exterior Door Upgrades Last Five Years by Region (%)**

Exterior doors upgraded last five years?	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	1428	2257	1107	4792
Yes - all of them	5.9	8.5	4.6	6.4
Yes - some of them	17.4	15.2	18.2	16.9
No - None of them	75.6	72.8	75.3	74.8
DK	1.1	3.5	1.9	1.9
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Some or all upgraded</b>	<b>23.2</b>	<b>23.7</b>	<b>22.8</b>	<b>23.3</b>

Totals may not sum due to rounding.

Three-quarters (75%) had no upgrades during this time. Differences between the regions for those who upgraded either some or all of their exterior doors are not statistically significant at the 95% confidence level.

Consistent with data on upgrades to windows and insulation, the incidence of upgrades to exterior doors correlates with the age of the dwelling. Table 55 shows that roughly one-quarter to one-third of dwellings built prior to the mid-1990s have had all or some of their exterior doors upgraded during the last five years. In contrast, 12% of homes built in the 1996-2005 period and 6% of homes built in 2006-2015 have had some or all of their exterior doors upgraded. As was the case with window upgrades, some respondents living in homes constructed after 2015 interpreted their new home’s exterior doors to be “upgraded”, possibly to a higher standard than the builder’s original or base specification.

**Table 55: Exterior Door Upgrades Last 10 Years by Dwelling Vintage (%)**

Exterior doors upgraded last five years?	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 - 2005	2006 - 2015	2016 or Newer	Age Unknown
<i>Unweighted base</i>	530	1121	729	842	770	431	251	114
Yes - all of them	4.8	8.4	9.3	3.5	1.0	1.0	30.1	4.0
Yes - some of them	18.4	20.6	23.5	20.6	10.8	4.7	0.5	14.1
No - None of them	75.0	69.5	65.4	74.5	86.4	92.6	67.5	70.7
Don't know	1.9	1.5	1.8	1.4	1.9	1.7	1.9	11.2
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Some or all upgraded</b>	<b>23.1</b>	<b>29.0</b>	<b>32.8</b>	<b>24.1</b>	<b>11.8</b>	<b>5.7</b>	<b>30.6</b>	<b>18.1</b>

Totals may not sum due to rounding.

#### 4.8 Payment of Utility Bills

Respondents were asked who pays the natural gas bill for their residence – the property owner, renter, or someone else. The overwhelming majority (95%) of respondents indicated the owner of the property pays the FortisBC natural gas bill (Table 56). Renters represent 4% of bill payers and less than 1% indicated a family member or someone else paid the gas bill.

**Table 56: Who pays the natural gas bill? (%)**

	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	1428	2257	1107	4792
Property owner	95.1	94.9	97.2	95.3
Renter	4.7	4.0	2.7	4.3
Someone else	0.2	1.1	0.1	0.4
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

Similar results were observed when respondents were asked to identify who pays the electricity bill. Table 57 shows that 96% of owners pay the electricity bill for the residence. Four percent (4%) indicated that payment of the bill is the renter’s responsibility. Less than one percent indicated someone else (“Other”) paid the electricity bill.

**Table 57: Who pays the electricity bill? (%)**

	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	1428	2257	1107	4792
Property owner	95.2	95.4	96.8	95.5
Renter	4.6	4.4	2.9	4.3
Other	0.2	0.3	0.4	0.2
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

### 4.9 Rent & Maintenance Fees

Somewhat less than one-in-five (18%) respondents to FEI's 2022 REUS indicated they pay rent or maintenance fees (Table 58) associated with their housing tenure.<sup>7</sup> Regional variations in this percentage are consistent with the proportion of respondents renting or living in condominiums, co-operatives, and other residential dwellings with shared services. The proportion paying rent or maintenance fees varies from 14% on Vancouver Island to 21% in the Lower Mainland.

**Table 58: Households Paying Rent or Maintenance Fees by Region (%)**

	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	1428	2257	1107	4792
Pay rent or maintenance fees	18.0	20.9	14.1	18.3

Most commonly, rent or maintenance fees cover heat (14% of those paying rent or maintenance fees), hot water (19%), and natural gas for fireplaces (8%) (Table 59). Three percent (3%) indicated their rent or maintenance fees include electricity for electric vehicle charging.

**Table 59: Services and Fuels Covered by Rent and Maintenance Fees by Region (%)**  
**Percent of respondents paying rent or maintenance fees<sup>1</sup>**

	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	257	471	156	884
Heat	12.8	15.5	16.0	14.0
Hot water	16.3	22.5	23.1	19.0
Fuel for gas fireplace	5.1	11.5	15.5	8.1
Electricity for electric vehicle charging	2.7	1.9	3.3	2.5
None of the above	81.3	72.6	72.5	77.7
Don't know	2.3	2.1	1.9	2.2

<sup>1</sup> Multiple responses allowed. Percentages may not add to 100%

### 4.10 Business Use of Property

One-in-ten (11%) REUS respondents operate a full- or part-time business from their residence (Table 60). Regional variations are not statistically significant using a 95% confidence interval.

<sup>7</sup> One-in-five (21%) of these respondents are renters. Six-in-ten (59%) renters live in single family detached dwellings.

**Table 60: Use of Dwelling for Full or Part-time Business by Region (%)**

	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	1428	2257	1107	4792
Full-time business	4.3	4.0	4.1	4.2
Part-time business	7.2	6.6	8.1	7.2
Full or part-time business	11.5	10.6	12.2	11.3

## 4.11 Energy-Related Renovations

### 4.11.1 Renovations Completed Last Five Years

A list of common energy-related renovations was provided to respondents. An energy-related renovation is defined as a renovation that directly or indirectly impacts the dwelling’s use of energy. Renovations queried ranged from low-cost activities like weather stripping to more expensive actions like installing an air source heat pump, energy efficient windows or an on-demand water heater. Respondents were asked to indicate whether they had undertaken the renovation in the last five years and whether the renovation was completed with the help of a government or utility rebate (where applicable). The results are summarized in Table 61.

**Table 61: Energy-Related Renovations – Last Five Years With or Without Rebate  
Percent of Respondents <sup>1</sup>**

**Multiple Responses Allowed**

Type of Renovation	With Rebate	Without Rebate	With or Without Rebate	Percent Using Rebate
Install energy-efficient window(s)	3.0	9.4	12.5	24.3
Install weather stripping or caulking	1.7	10.7	12.4	13.8
Install low-flow showerhead(s)	1.7	9.6	11.3	15.0
Improve insulation	2.7	7.6	10.3	26.4
Install high-efficiency hot water tank	3.6	6.2	9.8	37.0
Install a smart / learning style	2.7	6.4	9.0	29.4
Install insulated outside door(s) or storm doors	1.3	6.5	7.8	16.6
Install outdoor clothesline / drying rack	n/a	7.5	7.5	n/a
Install on-demand (tankless or hybrid) water heater	3.6	1.9	5.6	65.1
Install pipe wrap	0.6	4.4	5.0	12.1
Install an air source heat pump	2.2	1.7	3.9	56.0
Install hot tub	n/a	2.6	2.6	n/a
Install hot water heater blanket	0.5	0.7	1.2	39.5
Install drainpipe waste heat recovery system	0.3	0.2	0.6	57.2
Install sauna	n/a	0.5	0.5	n/a
Install heated swimming pool	n/a	0.4	0.4	n/a
<b>At least one of the above (%)</b>	<b>16.8</b>	<b>47.9</b>	<b>64.0</b>	<b>--</b>

n/a = not applicable

<sup>1</sup> Calculated using a base of n=4,792

Totals will not sum to 100% because multiple responses were allowed.

Nearly two-thirds (64%) of respondents completed at least one of the listed energy-related renovations during the last five years. The top three renovations included installing energy-efficient windows (13% of respondents), installing weather stripping or caulking (12%) and installing low-flow showerheads (11%).

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Four percent (4%) of respondents indicated they had installed an air source heat pump in the last five years. The percentage of renovations completed with a rebate (where available) varied from a high of 65% for installations of an on-demand water heater to 12% for installing pipe wrap.

Energy-related renovations undertaken during the last five years are itemized by dwelling vintage in Table 62. The data confirm that older homes are more likely to have had one or more energy-related renovations during the past five years. Even owners of newer homes (those built since 2005) made energy-related changes to their homes.<sup>8</sup>

**Table 62: Energy-Related Renovations – Last Five Years by Dwelling Vintage**  
Percent of Respondents – Multiple Responses Allowed

Type of Renovation	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 - 2005	2006 - 2015	2016 or Newer	Age Unknown
<i>Unweighted base</i>	530	1121	729	842	770	431	251	114
Install energy-efficient window(s)	16.5	15.2	16.4	14.7	4.6	1.6	11.4	12.7
Install weather stripping or caulking	17.5	13.3	13.5	11.3	11.4	6.5	11.7	9.4
Install low-flow showerhead(s)	10.0	11.1	13.5	14.7	10.7	4.7	9.4	9.5
Improve insulation	13.9	11.8	14.3	8.6	5.6	4.0	12.0	13.9
Install high-efficiency hot water tank	6.9	7.9	11.3	12.2	13.8	7.0	6.0	7.5
Install a smart / learning style	6.7	9.9	9.9	8.7	9.4	6.4	8.8	5.3
Install insulated outside door(s) or storm	7.6	9.9	10.7	8.5	4.1	2.6	7.1	6.9
Install outdoor clothesline / drying rack	11.8	9.1	8.2	7.8	5.7	3.1	2.3	3.8
Install on-demand (tankless or hybrid) water heater	8.0	4.5	4.9	7.4	4.4	4.9	7.3	1.6
Install pipe wrap	6.1	5.5	5.1	5.0	3.5	2.3	6.8	7.5
Install an air source heat pump	4.9	3.0	3.8	4.1	4.3	3.3	6.9	2.3
Install hot tub	2.1	2.4	2.7	3.6	2.1	2.4	3.1	0.5
Install hot water heater blanket	1.0	1.4	1.0	0.9	0.5	0.8	1.8	0.5
Install drainpipe waste heat recovery system	0.9	0.2	0.6	0.5	0.6	0.0	2.0	0.5
Install sauna	1.2	0.4	0.2	0.7	0.7	0.3	0.3	0.0
Install heated swimming pool	0.6	0.2	0.2	0.5	0.4	0.8	0.3	0.0
<b>At least one of the above (%)</b>	<b>43.1</b>	<b>41.4</b>	<b>43.7</b>	<b>42.9</b>	<b>35.6</b>	<b>27.0</b>	<b>23.4</b>	<b>30.3</b>

Totals will not sum to 100% because multiple responses were allowed.

### 4.11.2 Planned Energy-Related Renovations – Next Two Years

Using the list of energy-related renovations from the previous section, respondents were asked which, if any, they intended to complete during the next two years. While speculative, these intentions provide a general indication of the types of energy-related renovations most likely to be completed in the short term. The results are summarized in (Table 63).

One-quarter (26%) intend to complete at least one energy-related renovation to their home in the next two years. The most frequently intended renovations include installing energy-efficient windows (9% of respondents), installing weather stripping or caulking (7%), and improving insulation in walls, attics,

<sup>8</sup> These could have arisen because they finished areas of the home that were unfinished at the time of construction (e.g., basement) or possibly additions to their dwelling (e.g., garages, workshops).

basements, or crawlspaces (7%). Five percent (5%) indicated they are intending to install an air source heat pump in the next two years.

**Table 63: Planned Renovations - Next Two Years**  
**Percent of Respondents – Multiple Responses Allowed**

Type of Renovation	% of Respondents
<i>Unweighted base</i>	4792
Install energy-efficient window(s)	8.7
Install weather stripping or caulking	7.4
Improve insulation	7.0
Install insulated outside door(s) or storm	6.3
Install a smart / learning style	5.7
Install an air source heat pump	5.4
Install high-efficiency hot water tank	5.4
Install on-demand (tankless or hybrid) water heater	4.5
Install hot water heater blanket	4.3
Install low-flow showerhead(s)	3.6
Install pipe wrap	3.5
Install outdoor clothesline / drying rack	3.1
Install drainpipe waste heat recovery system	2.8
Install hot tub	2.1
Install sauna	1.5
Install heated swimming pool	1.4
<b>At least one of the above (%)</b>	<b>25.8</b>

Totals will not sum to 100% because multiple responses were allowed.

The proportions of respondents likely to undertake one or more energy-related renovations to their home over the next two years, by dwelling vintage, are presented in Table 64.

**Table 64: Renovations in Next Two Years by Dwelling Vintage**  
**Percent of Respondents – Multiple Responses Allowed**

Energy-Related Renovation – Next Two Years	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 - 2005	2006 - 2015	2016 or Newer	Age Unknown
<i>Unweighted base</i>	530	1121	729	842	770	431	251	114
Improve insulation in walls, attic, basement, or crawlspace	12.3	10.4	7.5	5.5	3.8	2.8	--	8.1
Install energy-efficient window(s)	11.9	10.9	13.8	11.5	5.1	1.5	--	6.7
Install weather stripping or caulking	10.0	8.1	8.2	7.6	9.2	4.8	3.8	4.7
Install insulated outside door(s) or storm doors	6.8	8.3	8.0	5.8	3.4	1.2	--	3.9
Install high-efficiency hot water tank	5.4	3.5	2.8	4.4	2.2	2.5	0.8	1.9
Install hot tub	5.2	5.4	5.1	7.0	7.2	4.7	0.8	2.7
Install hot water heater blanket	4.9	2.9	4.6	2.9	3.1	3.6	1.6	2.3
Install low-flow showerhead(s)	4.3	2.9	3.8	2.7	3.6	3.5	3.8	0.7
Install pipe wrap	3.7	2.1	2.2	2.5	1.6	0.4	--	3.1
Install programmable thermostat(s)	3.1	5.3	3.5	2.9	7.1	4.6	2.0	5.9
Install an outdoor clothesline or clothes drying rack	2.9	3.3	3.4	2.0	1.5	3.7	5.1	3.6
Install drainpipe waste heat recovery system	0.9	0.9	0.4	0.4	0.7	0.1	--	1.9
Install on-demand (tankless or hybrid) water heater	0.9	0.9	0.4	0.4	0.7	0.1	--	1.9
Install sauna	0.7	1.4	1.6	1.1	0.9	0.6	7.7	1.5
Install heated swimming pool	--	0.2	0.2	0.2	0.6	0.3	--	1.5
<b>At least one of the above (%)</b>	<b>33.1</b>	<b>32.0</b>	<b>35.0</b>	<b>28.5</b>	<b>27.5</b>	<b>19.8</b>	<b>19.7</b>	<b>14.7</b>

Totals will not sum to 100% because multiple responses were allowed.

## Dwelling Characteristics

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Similar to the relationship between renovations undertaken in the last five years and dwelling age, the likelihood of energy-related renovations occurring in the next two years generally increases with the age of the home. For example, one-third (33%) of respondents living in a dwelling constructed before 1950 are planning one or more energy-related renovations during the next two years compared to one-in-five (20%) of respondents living in homes constructed between 2006 and 2015.

# 5 SPACE HEATING

This section presents detailed data and analyses on space heating fuels and methods (equipment), fuel switching, furnace and boiler efficiencies, replacement and installation frequencies, and heating system maintenance.

## 5.1 Determining How Dwellings Are Heated

Respondents to FortisBC’s 2022 REUS were asked to identify the fuels used for space heating separately from the methods (equipment) used to heat their homes. This approach is needed as some space heating methods (e.g., forced air furnaces, boilers, fireplaces, etc.) may use different fuels depending upon their design. The alternative is to provide a list of space heating equipment-fuel combinations (e.g., electric forced air furnace, natural gas forced air furnace, oil-fired forced air furnace, etc.). The primary drawback to this approach is the large number of equipment-fuel combinations that exist and would need to be queried of respondents.

## 5.2 Space Heating Fuels

Respondents were asked to identify the main space heating fuel used to heat their home and then, all other fuels used for space heating. Respondents were advised to consider the main space heating fuel as the fuel “that provides most of the heat in the home during a typical year”.

### 5.2.1 Main Space Heating Fuel

Natural gas is the main space heating fuel for 84% of FEI residential customers (Table 65). This share is significantly lower than recorded in previous REUS surveys. Electricity is the main space heating fuel for 14% of respondents. While considerably smaller proportionately when compared to natural gas, its share has increased over the last four surveys. The relative shares represented by all other space heating fuels are not statistically significantly different than that observed in 2017.

**Table 65: Main Space Heating Fuel by Region (%)**

	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3441	2217
Electricity	10.4	10.5	36.0	13.9	12.4	11.4	6.9
Natural gas	88.5	85.2	62.8	84.2	86.1	86.5	91.1
Piped propane	0.1	0.3	0.2	0.2	0.2	0.0*	0.4
Bottled propane	--	1.0	--	0.3	--	0.3	0.1
Oil	--	0.0	0.4	0.1	0.1	0.2	0.2
Wood	0.1	2.4	0.5	0.8	0.6	0.9	0.9
Other	0.1	0.4	0.1	0.2	0.4	0.7	0.2
Don't Know	0.8	0.2	--	0.5	0.2	0.1	0.3
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

\* Value less than 0.1%

Totals may not sum due to rounding.

## Space Heating

Main space heating fuel shares by dwelling type are presented in Table 66. Of the five dwelling types, single-family detached dwellings are most likely to use natural gas as their main space heating fuel (86%), followed by semi-detached dwellings (83%), mobile homes (82%) and townhouses (79%). Half (52%) of apts/condos use gas and the majority of the remaining dwellings of this type use electricity (45%).

**Table 66: Main Space Heating Fuel by Dwelling Type (%)**

	Single Family Detached	Semi-Detached	Row / Town-house	Apt / Apt-Style Condo	Mobile & Other
<i>Unweighted base</i>	3836	218	358	138	242
Electricity	12.6	14.5	18.9	45.0	11.5
Natural gas	85.7	82.9	79.0	52.0	81.7
Piped propane	0.2	--	--	--	--
Bottled propane	0.1	0.3	--	0.6	3.6
Oil	0.1	--	--	--	--
Wood	0.9	--	--	--	2.8
Other	0.1	1.0	0.1	1.3	0.4
Don't Know	0.3	1.3	1.9	1.3	--
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

Main space heating fuel shares are explored by dwelling vintage in Table 67. Of note, the relative share of dwellings using natural gas as their main space heating space fuel has been declining since the mid-1970s. For example, nine-in-ten (90%) of homes constructed between 1950 and 1975 use natural gas as the main space heating fuel compared to two-thirds (66%) of homes constructed between 2006 and 2015. While the decline appears to have reversed somewhat for dwellings constructed since 2005, the difference is not statistically significant at the 95% confidence level. While natural gas remains the predominant main fuel used for space heating, its decline over time is attributed to the growing share of buildings whose main space heating fuel is electricity.

**Table 67: Main Space Heating Fuel by Dwelling Vintage (%)**

	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 - 2005	2006 - 2015	2016 or Newer	Age Unknown
<i>Unweighted base</i>	530	1121	729	842	770	431	251	114
Electricity	9.6	8.1	11.1	14.2	17.8	30.6	19.7	13.4
Natural gas	88.4	90.3	87.0	84.3	80.7	66.3	77.3	79.5
Piped propane	0.4	0.1	--	0.1	0.1	--	--	2.3
Bottled propane	--	0.1	0.1	0.1	0.5	0.3	2.2	--
Oil	0.2	0.1	--	--	--	--	--	--
Wood	1.4	1.0	1.5	0.3	0.2	0.8	--	1.5
Other	--	0.1	0.4	0.2	0.2	0.4	0.3	--
Don't Know	--	0.2	--	0.7	0.5	1.6	0.5	3.5
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

## 5.2.2 Secondary Space Heating Fuels

An initial review of space heating fuel data revealed a decline in the proportion of dwellings using a secondary fuel for spaced heating, from 55% of dwellings in 2017 to 51% in 2022 (Table 68).

**Table 68: Secondary Space Heating Fuel Use by Region – Unadjusted Data (%)**

	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3441	2217
Use secondary space heating fuel(s)	49.6	46.4	66.9	51.1	55.3	58.3	55.6

With the increased penetration of heat pumps (Section 5.5), there was a concern that some respondents failed to report the electricity used by their heat pump as either a main or secondary space heating fuel.<sup>9</sup> To explore the extent that this omission might be occurring, data on space heating fuels for each respondent using a heat pump (either a ducted or mini-split) to heat their home were reviewed. The review found 345 respondents with a heat pump who did not indicate electricity as a secondary (other) space heating fuel.<sup>10</sup> The data for these respondents was changed to indicate they used electricity as a secondary (other) space heating fuel.

Following adjustments to correct secondary space heating fuel data, six-in-ten (59%) respondents to the 2022 REUS are estimated to use one or more secondary fuel(s) to heat their dwelling, up from 55% in 2017 but unchanged from 2012 (Table 69). Regionally, secondary space heating fuel use is highest on Vancouver Island (70%) and lowest in the Interior (55%).

**Table 69: Secondary Space Heating Fuel Use by Region – Adjusted Data (%)**

	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3441	2217
Use secondary space heating fuel(s)	57.5	55.2	70.0	58.6	55.3	58.3	55.6

The incidence of secondary space heating fuels by dwelling type is highest for apts/condos (64%), followed by SFDs (59%), semi-detached and townhouses (54% for each) and, lastly, mobile homes (52%) (Table 70).

**Table 70: Secondary Space Heating Fuel Use by Dwelling Type – Adjusted Data (%)**

	Single Family Detached	Semi- Detached	Row / Town- house	Apt / Apt-Style Condo	Mobile & Other
<i>Unweighted base</i>	3836	218	358	138	242
Use secondary space heating fuel(s)	59.4	53.5	54.0	64.2	52.2

<sup>9</sup> Aware of this possibility, both paper and online survey respondents were reminded to identify electricity as either a main or other space heating fuel if they used a heat pump for space heating.

<sup>10</sup> Interestingly enough, all respondents with a heat pump paired with a gas furnace and who indicated electricity is their main space heating fuel correctly indicated natural gas as their secondary space heating fuel.

## Space Heating

The restated data on fuels used for secondary space heating are summarized in Table 71.<sup>11</sup> Consistent with past surveys, electricity is the most common secondary space heating fuel, used by three-quarters (73%) of customers using a secondary space heating fuel. The next most common secondary fuels are natural gas (20%) and wood (9%). Natural gas use as a secondary space heating fuel is unchanged from 2017, but up from 12% in 2008. The use of wood as a secondary space heating fuel has been steadily declining since 2008.

**Table 71: Secondary Space Heating Fuel(s) by Region (%)**  
**Base: Dwellings Using More than One Space Heating Fuel**  
**Multiple Responses Allowed**

Supplementary space heating fuels	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	815	1244	775	2834	3222	2061	1319
Electricity	80.0	73.3	50.2	73.4	74.3	72.9	70.8
Natural gas	15.2	14.7	45.8	20.1	19.1	16.2	11.9
Piped propane	0.8	0.7	0.1	0.6	0.1	0.6	0.1
Bottled propane	--	1.6	0.1	0.4	0.2	0.6	0.3
Oil	0.3	0.1	--	0.2	0.5	0.3	0.6
Wood	6.4	14.9	7.5	8.8	12.6	17.2	18.2
Other	1.1	1.9	0.7	1.2	0.3	0.8	0.8

Columns do not sum to 100% because of multiple responses.

Table 72 summarizes the restated secondary space heating fuels for each of the five main dwelling types. Electricity is the most common secondary space heating fuel for all dwelling types, ranging from 45% of apts/condos to three-quarters (76%) of mobile and other manufactured homes. Natural gas is the next most common secondary fuel, with its share highest for apts/condos (46%) and lowest for mobile homes (15%).

**Table 72: Secondary Space Heating Fuel(s) by Dwelling Type (%)**  
**Base: Dwellings Using More than One Space Heating Fuel**  
**Multiple Responses Allowed**

Supplementary space heating fuels	Single Family Detached	Semi-Detached	Row / Town-house	Apt / Apt-Style Condo	Mobile & Other
<i>Unweighted base</i>	2314	117	191	85	127
Electricity	74.4	73.6	70.1	44.6	76.2
Natural gas	18.6	23.8	28.4	46.0	15.4
Piped propane	0.6	--	--	3.5	0.7
Bottled propane	0.3	--	0.8	1.1	3.5
Oil	0.2	--	--	--	--
Wood	10.1	3.2	0.5	--	4.9
Other	1.1	--	2.9	5.1	0.7

Columns do not sum to 100% because of multiple responses.

<sup>11</sup> It is important to remember that the presence of a secondary space heating fuel does not provide any information on its contribution to the home's space heating load, only that it is used to some degree in heating the home.

### 5.2.3 Net Space Heating Fuels

Table 73 summarizes all fuels used for space heating regardless of whether they are used as a main or secondary space heating fuel. Natural gas is used by 96% of dwellings for space heating, statistically unchanged from the three previous residential end-use surveys.

**Table 73: Net Space Heating Fuel(s) by Region (%)**

**Base: All REUS Respondents**

**Multiple Responses Allowed**

Main or supplementary space heating fuel	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3441	2221
Electricity	55.2	50.3	70.9	56.0	53.0	53.7	41.1
Natural gas	97.1	93.2	94.6	95.7	95.4	95.3	96.3
Piped propane	0.5	0.7	0.3	0.5	0.5	0.4	0.0*
Bottled propane	--	1.8	0.1	0.5	0.2	0.6	0.2
Oil	0.1	0.1	0.4	0.2	0.3	0.4	0.4
Wood	3.7	10.5	5.8	5.8	7.6	11.0	10.1
Other	0.8	1.4	0.5	0.9	0.8	1.1	0.4

Columns do not sum to 100% because of multiple responses.

\* Value less than 0.1%.

Regionally, the use of natural gas as a main or secondary space heating fuel by FEI residential customers is lowest in the Interior (93%) and highest in the Lower Mainland (97%). As all respondents to the FEI REUS have natural gas service, those who do not use natural gas for space heating, must, by default, use natural gas for some other end-use or end-uses in the home (e.g., domestic water heating, cooking, fireplaces, etc.).

### 5.2.4 Change in Main Space Heating Fuel – Last Five Years

Table 74 shows that 5% of FEI residential customers changed the main fuel used to heat their homes in the last five years, statistically unchanged from 2017 and 2012. A change in main space heating fuel may come about because of the installation of a new space heating system, a decision to use one fuel-specific system more than another (e.g., switch to using a wood stove more and electric baseboards less), or because there is access to a fuel not previously available in the area (e.g., natural gas). Regionally, the largest proportion of homes switching their main space heating fuel occurred on Vancouver Island (9%), followed by the Interior (6%) and the Lower Mainland (4%).

**Table 74: Change in Main Space Heating Fuel in Last Five Years (%)**

Changed main fuel used for space heating?	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3408	2179
Yes	4.3	5.8	8.6	5.3	4.9	4.5	2.8

Totals may not sum due to rounding.

## Space Heating

Detail on the previous space heating fuels for households that changed their main space heating fuel is provided in Table 75. At the utility level, the percentage of households reporting that natural gas was their previous main space heating fuel (36%) is statistically unchanged from 2017, providing further evidence that the long-term shift away from natural gas for space heating may be slowing. Of note, the proportion of respondents in the 2022 REUS that switched from heating oil in the past five years (2%) is significantly lower than that recorded in previous surveys. The shift away from heating oil is a long-term trend highlighted in previous FEI residential end-use surveys.

**Table 75: Previous Main Space Heating Fuel by Region (%)**

Previous main space heating fuel	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	59	123	88	270	361	204	82
Electricity	23.7	39.7	24.9	28.8	34.1	26.3	16.8
Natural gas	45.7	16.3	43.1	36.4	36.7	49.2	56.5
Piped propane	1.7	2.4	--	1.5	--	1.8	0.1
Bottled propane	--	1.7	--	0.5	0.5	0.7	1.0
Oil	--	1.7	6.9	1.9	14.0	10.5	19.2
Wood	1.7	14.6	1.2	5.4	5.4	6.8	6.5
Other	3.4	7.3	12.5	6.5	1.2	--	--
Don't Know	23.7	16.3	11.4	18.9	8.2	2.2	--
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

### 5.3 Space Heating Methods

There are a variety of methods (equipment) that provide space heating for residential dwellings. Respondents to the 2022 REUS were asked to identify their dwelling's main (primary) space heating method from a list of common space heating methods and then all other (secondary) methods used. Methods differ from fuels in that they refer to an appliance or technology (e.g., portable electric heaters, air source heat pumps, etc.).

#### 5.3.1 Number of Space Heating Methods

Two-thirds (66%) of respondents indicated they use more than one method to heat their home (Table 76). One-third (34%) use only one method, half (48%) use two methods, and 14% use three methods. FEI residential customers use, on average, 1.9 different space heating methods per home. These findings mirror those observed in the 2017 REUS.

Regionally, customers in the Interior region are significantly more likely to use only one space heating method compared to customers in the other two regions. Customers on Vancouver Island are significantly more likely to use two or more methods.

**Table 76: Number of Space Heating Methods per Dwelling by Region (%)**

	LM	INT	VI	2022 FEI	2017 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827
1	32.6	41.5	21.9	33.6	33.1
2	48.5	44.4	54.9	48.2	46.9
3	14.8	11.2	17.3	14.2	15.2
4	3.6	2.7	4.5	3.5	3.9
5	0.4	0.3	1.1	0.4	0.8
6	0.1	0.1	0.3	0.1	0.1
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Two or more methods</b>	<b>67.4</b>	<b>58.5</b>	<b>78.2</b>	<b>66.4</b>	<b>66.9</b>
<b>Average (number of methods)</b>	<b>1.9</b>	<b>1.8</b>	<b>2.1</b>	<b>1.9</b>	<b>1.9</b>

Totals may not sum due to rounding.

The number of space heating methods per dwelling varies by type of dwelling (Table 77). Townhouses and SFDs are more likely than other dwelling types to use two or more methods (69% and 67% respectively). Customers living in mobile homes are the most likely of the five dwelling types to use a single method of heating their dwelling (50%).

**Table 77: Number of Space Heating Methods per Dwelling by Dwelling Type (%)**

	Single Family Detached	Semi- Detached	Row / Town- house	Apt / Apt-Style Condo	Mobile & Other
<i>Unweighted base</i>	3836	218	358	138	242
1	32.7	41.8	31.1	37.5	50.4
2	47.6	41.3	58.4	53.5	40.5
3	15.1	15.9	8.7	8.4	8.4
4	4.0	0.6	1.6	0.6	0.7
5	0.5	0.3	0.3	--	--
6	0.1	--	--	--	--
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Two or more methods</b>	<b>67.3</b>	<b>58.2</b>	<b>68.9</b>	<b>62.5</b>	<b>49.6</b>
<b>Average (number of methods)</b>	<b>1.9</b>	<b>1.8</b>	<b>1.8</b>	<b>1.7</b>	<b>1.6</b>

Totals may not sum due to rounding.

The number of space heating methods was examined by dwelling vintage (Table 78). The results show only modest variations in the number of space heating methods based on when the homes were constructed. Regardless of vintage, the majority (between 58% and 71%) of dwellings use two or more methods of space heating.

## Space Heating

**Table 78: Number of Space Heating Methods per Dwelling by Dwelling Vintage (%)**

	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 - 2005	2006 - 2015	2016 or Newer	Age Unknown
<i>Unweighted base</i>	530	1121	729	842	770	431	251	114
1	31.3	37.1	32.7	30.1	34.6	28.9	38.5	42.2
2	43.4	45.4	48.7	53.9	47.0	52.8	47.5	45.4
3	18.8	13.2	13.8	13.5	15.7	14.4	10.2	6.2
4	5.0	3.8	3.9	2.3	2.7	3.2	3.8	5.7
5	1.1	0.4	0.7	0.2	--	0.6	--	0.5
6	0.5	0.1	0.1	--	0.1	0.2	--	--
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Two or more methods</b>	<b>68.7</b>	<b>62.9</b>	<b>67.3</b>	<b>69.9</b>	<b>65.4</b>	<b>71.1</b>	<b>61.5</b>	<b>57.9</b>
<b>Average (number of methods)</b>	<b>2.0</b>	<b>1.9</b>	<b>1.9</b>	<b>1.9</b>	<b>1.9</b>	<b>1.9</b>	<b>1.8</b>	<b>1.8</b>

Totals may not sum due to rounding.

### 5.3.2 Main Space Heating Methods

The main space heating methods used by FEI residential customers are summarized in Table 79. Forced air furnaces represent the most common main method, used by seven-in-ten (68%) households. Air source heat pumps and boilers with hot water in-floor/under-floor heat are the second most common methods (tied at 6% each). Fireplaces and boilers with hot water baseboards or radiators are the next more common methods (5% each).

**Table 79: Main Space Heating Method by Region (%)**

	LM	INT	VI	2022 FEI	2017 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827
Forced air furnace	67.9	78.6	44.0	67.6	69.8
Wired-in electric baseboards	2.9	1.9	13.5	4.1	5.4
Boiler with hot water baseboards or radiators	7.1	1.4	3.3	5.1	5.0
Boiler with hot water in-floor / under-floor heat	8.9	1.4	2.1	5.9	5.9
Combined space and water heating system	2.0	1.0	0.6	1.6	1.2
Fireplace or heater stove	3.5	5.5	13.0	5.3	5.2
Heat pump - air source	3.9	5.1	18.4	6.2	4.6
Heat pump - geothermal	0.4	1.4	0.6	0.7	0.6
Wired-in electric wall heater (fan forced)	0.2	0.3	0.7	0.3	0.3
Electric radiant heat (floors, walls, and/or ceilings)	1.3	0.5	0.8	1.0	0.6
Gas wall heater	0.3	1.1	1.5	0.7	0.6
Portable electric heaters	1.1	1.6	0.8	1.2	0.7
Other	0.4	0.2	0.6	0.4	0.1
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

There are regional differences in main space heating methods. Forced air furnaces are most likely to be used as the main space heating method by customers in the Interior region (79%) and least likely on

Vancouver Island (44%). The latter is notable, in large part because air source heat pumps are indicated as the main space heating method for two-in-ten (18%) of respondents from Vancouver Island, significantly higher than the other two regions. Customers on Vancouver Island are also more likely than those in other regions to use wired-in electric baseboards or a fireplace or heater stove as their main space heating method. FEI customers in the Lower Mainland are much more likely than customers in the other two regions to use a boiler providing underfloor heat or heat via baseboard heaters/radiators as their main space heating method.

Main space heating methods by the five main dwelling types are summarized in Table 80. Mobile and other manufactured homes and SFDs are most likely to use a forced air furnace (80% and 69% respectively). Boilers supplying hot water to baseboards or underfloor systems are most popular in semi-detached dwellings (17%) and SFDs (12%). Apts/condos are the least likely to use a forced air furnace and much more likely to use electric baseboards or a fireplace or heater stove.<sup>12</sup> The use of a fireplace as the main space heating method for apts/condos was noted in the last three FEI end-use surveys.<sup>13</sup>

**Table 80: Main Space Heating Method by Dwelling Type (%)**

	Single Family Detached	Semi-Detached	Row / Town-house	Apt / Apt-Style Condo	Mobile & Other
<i>Unweighted base</i>	3836	218	358	138	242
Forced air furnace	68.6	58.0	65.1	34.2	80.1
Wired-in electric baseboards	2.9	3.0	13.2	19.6	1.6
Boiler with hot water baseboards or radiators	5.7	3.1	1.5	5.8	0.4
Boiler with hot water in-floor / under-floor heat	5.9	13.6	5.2	5.3	0.4
Combined space and water heating system	1.4	3.7	2.5	3.0	0.4
Fireplace or heater stove	5.1	5.9	5.3	13.6	6.2
Heat pump - air source	6.4	8.2	2.1	5.5	7.4
Heat pump - geothermal	0.6	0.9	1.0	4.2	0.4
Wired-in electric wall heater (fan forced)	0.3	--	0.5	0.6	0.4
Electric radiant heat (floors, walls, and/or ceilings)	0.9	2.1	1.8	3.9	--
Gas wall heater	0.6	1.2	0.5	2.4	1.0
Portable electric heaters	1.3	0.3	0.9	0.6	1.8
Other	0.4	--	0.5	1.3	--
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

\* Value less than 0.1%

Totals may not sum due to rounding.

Main space heating methods for SFDs, the most common dwelling type, are explored by dwelling vintage in Table 81. The data show forced air furnaces declining as the main space heating method for SFDs since the

<sup>12</sup> The majority of apartments and apartment-style condominiums with forced air furnaces use a type of furnace known as a wall furnace or wall heater. These self-contained units are mounted on the wall and vent to the outside of the unit. The majority of dwellings with this type of furnace are located in the Interior region.

<sup>13</sup> Sampson Research (2019) p. 58, Sampson Research (2014) p. 75, Sampson Research (2008), p. 5-7

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mid-1970s with an apparent reversal in the trend for those constructed since 2015. For example, 49% of SFDs constructed between 2006 and 2015 used a forced air furnace as the main space heating method compared to 62% of SFDs constructed since 2015. The long-term decline in forced air furnaces as the *main* method is explained, in part, by the increase in penetration of boilers with hot water in-floor / under-floor heat but also by the increased penetration of air source heat pumps.<sup>14</sup>

**Table 81: Main Space Heating Method by Dwelling Vintage – Single Family Detached Dwellings (%)**

	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 - 2005	2006 - 2015	2016 or Newer	Age Un- known
<i>Unweighted base</i>	504	1011	601	625	540	290	187	76
Forced air furnace	73.2	80.8	71.2	61.0	59.9	48.5	61.6	63.5
Wired-in electric baseboards	2.7	1.7	3.8	4.3	2.8	4.1	1.7	--
Boiler with hot water baseboards or radiators	7.7	4.1	5.5	7.6	6.1	4.6	0.3	9.4
Boiler with hot water in-floor / under-floor heat	1.8	0.7	1.4	11.8	12.7	12.7	12.8	4.7
Combined space and water heating system	1.3	1.1	1.0	1.6	0.8	2.5	3.3	3.1
Fireplace or heater stove	5.0	3.9	8.8	5.2	4.5	4.1	1.3	4.8
Heat pump - air source	4.3	4.0	5.7	5.9	8.7	17.2	10.8	4.1
Heat pump - geothermal	0.5	--	--	0.5	1.4	3.3	1.0	--
Wired-in electric wall heater (fan forced)	--	0.4	0.1	0.6	0.2	--	--	1.4
Electric radiant heat (floors, walls, and/or ceilings)	0.1	0.7	0.2	0.9	0.9	1.8	4.5	2.3
Gas wall heater	0.9	0.9	0.4	0.2	0.3	0.2	--	3.6
Portable electric heaters	2.0	1.6	1.4	0.6	1.3	1.0	0.3	--
Other	0.5	0.2	0.5	--	0.2	--	2.3	3.1
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

### 5.3.3 Secondary Space Heating Methods

Secondary space heating methods are summarized in Table 82. The most popular secondary methods include fireplaces or heater stoves (35% of respondents), wired-in electric baseboards (18%), and portable electric space heaters (16%). Forced air furnaces are considered a secondary method for 6% of respondents and air source heat pumps by 4% of respondents.

<sup>14</sup> For situations other than new construction, it is important to distinguish between loss of share due to switching to a new method (e.g., physically replacing one system with another) versus shifting the role of an existing space heating method from a primary (main) role to a secondary or supplementary role (e.g., because of the addition of another space heating method). A good example of the latter scenario is when a heat pump is added (paired) with an existing forced air furnace, shifting the furnace from its exclusive role of heating the home to that of secondary or supplementary capacity. Indeed, of those respondents to FortisBC's 2022 REUS who indicated that they have both a forced air furnace and an air source heat pump, approximately half of them identified their heat pump as their home's main space heating method and the furnace as the secondary method.

**Table 82: Secondary Space Heating Methods by Region (%)**  
Multiple Responses Allowed

	LM	INT	VI	2022 FEI	2017 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827
Forced air furnace	5.1	5.3	7.2	5.5	8.9
Wired-in electric baseboards	18.9	12.1	25.2	17.9	15.9
Boiler with hot water baseboards or radiators	1.2	0.2	0.3	0.8	0.9
Boiler with hot water in-floor / under-floor heat	1.1	1.2	0.7	1.0	1.4
Combined space and water heating system	0.8	0.3	0.2	0.6	0.6
Fireplace or heater stove	33.9	29.7	46.8	34.5	33.0
Heat pump - air source	4.0	5.2	4.1	4.3	3.8
Heat pump - geothermal	0.1	0.0	0.5	0.2	0.3
Wired-in electric wall heater (fan forced)	1.6	2.6	4.3	2.2	3.2
Electric radiant heat (floors, walls, and/or ceilings)	5.1	3.4	7.0	4.9	5.6
Gas wall heater	1.2	1.9	2.4	1.5	2.2
Portable electric heaters	17.4	13.9	9.9	15.5	16.2
Other	0.4	0.3	0.3	0.4	0.1
<b>No second method</b>	<b>32.6</b>	<b>41.5</b>	<b>21.9</b>	<b>33.6</b>	<b>32.8</b>

Columns do not sum to 100% because of multiple responses.

Significant regional differences in the relative popularity of secondary methods include the proportionately higher use of fireplaces or heater stoves and wired-in electric baseboard heaters on Vancouver Island (47% and 25% respectively).

Secondary space heating methods by dwelling type are summarized in Table 83.

**Table 83: Secondary Space Heating Methods by Dwelling Type (%)**  
Multiple Responses Allowed

Secondary Space Heating Methods	Single Family Detached	Semi- Detached	Row / Town- house	Apt / Apt-Style Condo	Mobile & Other
<i>Unweighted base</i>	3836	218	358	138	242
Forced air furnace	5.8	4.0	3.5	1.8	6.5
Wired-in electric baseboards	18.1	18.4	20.4	17.5	7.2
Boiler with hot water baseboards or radiators	0.9	1.0	--	0.6	--
Boiler with hot water in-floor / under-floor heat	1.1	1.3	0.5	--	0.8
Combined space and water heating system	0.6	--	0.6	1.3	--
Fireplace or heater stove	35.3	29.3	37.5	32.3	14.9
Heat pump - air source	4.7	3.2	2.1	1.9	4.6
Heat pump - geothermal	0.2	0.3	--	--	0.4
Wired-in electric wall heater (fan forced)	2.4	1.0	1.1	--	3.0
Electric radiant heat (floors, walls, and/or ceilings)	5.3	4.6	2.6	5.1	0.8
Gas wall heater	1.6	1.5	1.4	2.7	0.8
Portable electric heaters	16.0	11.6	11.4	9.1	21.3
Other	0.4	--	0.6	--	--
<b>No second method</b>	<b>32.7</b>	<b>41.8</b>	<b>31.1</b>	<b>37.4</b>	<b>50.1</b>

Columns do not sum to 100% because of multiple responses.

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The data show that fireplaces and heater stoves are the most common secondary space heating method, accounting for 15% to 38% of secondary methods identified by dwelling type. Electric baseboard heaters (wired-in) are the next most common secondary method, representing 7% to 20% depending on the dwelling type. Finally, between 9% and 21% of respondents indicated they use portable electric space heaters as a secondary heating method.

### 5.4 Furnaces, Boilers, and Combination Systems

In addition to questions about space heating methods, respondents to the 2022 REUS were asked whether their home had a natural gas furnace, natural gas boiler, combined space and water heating system, or electric furnace. All respondents, except those with electric furnaces, were asked to provide information on their heating system including age, ENERGY STAR® status, and whether they had installed the system in the last five years. Respondents with gas furnaces and boilers were also asked to provide information on the efficiency of their units. Efficiency data was not collected for combined space and water heating systems.

#### 5.4.1 Overall Findings

Somewhat less than three-quarters (72%) of FEI customers have a gas furnace, down from 74% in 2017, and marking the third consecutive REUS to show a decline in gas furnace share (Table 84). Regionally, the incidence of gas furnaces is highest in the Interior (82%) and lowest on Vancouver Island (50%).

**Table 84: Furnaces, Boilers and Combination Systems by Region (%)**

	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI <sup>1</sup>	2008 FEI <sup>1</sup>
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3441	2221
Gas furnace	73.0	81.5	49.5	72.2	74.3	75.9	79.3
Gas boiler	12.4	3.1	4.6	8.8	11.4 <sup>3</sup>	12.3 <sup>3</sup>	13.1 <sup>3</sup>
Combination system <sup>2</sup>	7.4	4.0	5.1	6.2	n/a	n/a	n/a
Electric furnace	2.2	4.1	8.6	3.6	4.2	2.8	n/a
None of the above	5.0	7.3	32.3	9.3	10.1	9.0	7.6
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

<sup>1</sup> Data for 2008 and 2012 adjusted for misclassification error.

<sup>2</sup> First queried in 2022 REUS

<sup>3</sup> May include combination boiler systems

Totals may not sum due to rounding.

Less than one-in-ten (9%) respondents indicated their home has a gas boiler and 6% indicated they have a combined space and water heating system. The incidence of gas boilers is highest in the Lower Mainland (12%) and lowest in the Interior (3%). The incidence of boilers is also significantly lower than that recorded in previous surveys. As these surveys did not differentiate between boilers and combination boiler systems, respondents with combination boilers in these earlier surveys may have classified their units as a boiler. This would have been the most applicable category in those surveys.

Electric furnaces are present in 4% of homes, unchanged from 2017. One-in-ten (9%) FEI customers indicated their dwelling does not have a gas furnace, gas boiler, combination system, or electric furnace.

Penetration rates for furnaces, boilers, and combination systems by dwelling type, are presented in Table 85. Mobile and other manufactured dwellings are the most likely of the five dwelling types to have a gas furnace (84%) and apts/condos are the least likely (29%). The incidence of gas boilers ranges from less than 1% for mobile homes to 13% for apts/condos and semi-detached dwellings.<sup>15</sup> Gas boilers are present in slightly more than one-in-ten (9%) SFDs. Penetration of combination systems is highest for semi-detached and apts/condos (9% for each). Penetration rates for combined systems among the remaining dwelling types range from 3% to 7%.

**Table 85: Furnaces, Boilers and Combination Systems by Dwelling Type (%)**

	Single Family Detached	Semi-Detached	Row / Town-house	Apt / Apt-Style Condo	Mobile & Other
<i>Unweighted base</i>	3836	218	358	138	242
Gas boiler	9.1	12.9	6.3	13.3	0.4
Gas furnace	73.4	62.5	69.9	28.6	84.2
Combination system	6.1	8.7	6.6	9.3	2.5
Electric furnace	3.5	2.7	2.9	11.8	4.6
None of the above	7.9	13.1	14.2	36.9	8.2
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

Table 86 summarizes the incidence of furnaces, boilers, and combination systems by dwelling vintage.

**Table 86: Furnaces, Boilers, and Combination Systems by Dwelling Vintage (%)**

	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 - 2005	2006 - 2015	2016 or Newer	Age Unknown
<i>Unweighted base</i>	530	1121	729	842	770	431	251	114
Gas boiler	9.0	4.7	5.5	10.9	14.1	9.2	8.1	18.0
Gas furnace	76.9	83.9	77.8	66.6	65.1	56.0	63.0	58.4
Combination system	4.4	4.4	3.3	7.1	6.9	12.0	12.9	6.2
Electric furnace	2.1	1.7	3.4	4.5	2.4	9.7	7.2	3.2
None of the above	7.6	5.2	10.0	10.9	11.5	13.1	8.8	14.2
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

Several trends are apparent. The first is the decline in the penetration of gas boilers and the increased penetration of combination systems in dwellings constructed since 2005. As an example, 14% of dwellings built between 1996 and 2005 have a gas boiler compared to 8% of dwellings built since 2015. In comparison, 7% of dwellings built between 1996 and 2005 have combination systems and this proportion increases to 13% for dwellings constructed since 2015.<sup>16</sup> Data for older dwellings may reflect the replacement of boilers with combination boiler systems. Nearly two-thirds (63%) of dwellings constructed since 2015 have a gas furnace, suggesting the long-run decline in furnace shares in new construction may

<sup>15</sup> The reported incidence of boilers in apartments and apartment-style condominiums likely reflects the tendency of some respondents in these dwellings to indicate their building's central boiler as the space heating method for their unit.

<sup>16</sup> The shift to gas boilers and combination systems in new construction is consistent with the growing popularity of underfloor heating (Table 81, p. 54).

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have ended. Future surveys will confirm whether this is the case or that it is a statistical aberration caused by the small sample of new dwellings (built since 2015) in the 2022 survey.

### 5.4.2 Ages of Gas Furnaces, Boilers and Combination Systems

The average ages of gas furnaces are presented in Table 87. In part reflecting turnover in the furnace stocks and those installed in new builds, the average age of furnaces in 2022 is 12.6 years, statistically unchanged from 2017. Regionally, furnaces in the Interior are significantly younger than those in the other two regions.

**Table 87: Average Age (Years) of Natural Gas Furnaces by Region**

	LM	INT	VI	2022 FEI	2017 FEI
<i>Unweighted base</i>	836	1503	435	2774	4329
Mean	13.4	11.3	12.4	12.6	13.2
Standard Deviation	16.1	7.6	7.0	10.9	10.7

The average age for gas boilers is 15.1 years (Table 88). Differences in the average age of boilers between regions are not statistically significant at the 95% confidence level.

**Table 88: Average Age (Years) of Natural Gas Boilers by Region**

	LM	INT	VI	2022 FEI
<i>Unweighted base</i> <sup>1</sup>	146	48	42	236
Mean	15.0	16.9	14.7	15.1
Standard Deviation	18.1	13.2	8.2	15.8

<sup>1</sup> Caution is advised in interpreting data for samples of less than 50.

The average age for combination systems is 8.6 years (Table 89). Regional differences are not statistically significant.

**Table 89: Average Age (Years) of Combination Systems by Region**

	LM	INT	VI	2022 FEI
<i>Unweighted base</i> <sup>1</sup>	88	81	43	212
Mean	8.6	7.8	10.0	8.6
Standard Deviation	12.9	5.9	7.2	9.6

<sup>1</sup> Caution is advised in interpreting data for samples of less than 50.

### 5.4.3 Gas Furnace Efficiencies

Respondents with a gas furnace were asked to indicate whether their furnace was a low-efficiency, mid-efficiency or high-efficiency unit. Respondents were asked to choose from one of the following:

- Low (standard) efficiency – less than 78% efficient (25 years or older, pilot light and metal flue exiting through the roof)
- Mid efficiency – 78% to 85% efficient (10 years or older, no pilot light and metal flue exiting through the roof)

- High efficiency – 90% efficient or higher (No pilot light, flue is a plastic pipe exiting the side of the home)

Providing efficiency-specific details such as age, type of flue, and the presence or absence of a pilot light was intended to help respondents correctly categorize the efficiency of their furnace. While newer furnaces are more likely to indicate their efficiency (AFUE) rating on a label attached to the unit, older low- and mid-efficient furnaces are less likely to have this information.

An initial review of the data on furnace efficiency suggested efficiency shares did not significantly change from 2017 (Table 90). For example, somewhat more than four-in-ten (42%) respondents indicated their furnace’s efficiency was 90% efficient or higher, statistically unchanged from 2017 (40%). Mid-efficiency furnaces represented 28% of furnaces, also statistically unchanged from 2017. Finally, low-efficiency furnaces increased from 14% in 2017 to 18% in 2022, reversing a downward trend evident since 2008. Overall, the proportion of respondents unsure of their furnace’s efficiency was 13%, down from 17% in 2017. Rebasng the data to exclude those unsure of their furnace’s efficiency (not shown) exacerbated the counterintuitive results.

**Table 90: Natural Gas Forced Air Furnace Efficiencies – Before Adjustments for Age (%)**

Gas furnace efficiency	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1042	1842	548	3432	4329	2351	1411
Low efficiency (< 78%)	19.8	14.4	13.9	17.6	14.2	19.1	38.6
Mid efficiency (78% to 85%)	28.4	25.6	29.9	27.7	29.0	33.9	34.3
High efficiency (90% or higher)	38.6	49.3	41.8	42.2	40.2	31.7	14.1
Don’t know	13.2	10.8	14.4	12.6	16.6	15.3	13.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

These results are counterintuitive for several reasons:

- *Stock turnover due to age* - Low-efficiency furnaces (those with AFUE of less than 78%) are now, at the minimum, 25 years of age or older. While estimates of the lifespan for low-efficiency furnaces vary, these older units are rapidly reaching the end of their working lives and their share of the total stock of gas furnaces in FEI’s service area should be steadily declining over time.
- *Stock turnover due to desire to have a more energy-efficient furnace* – Customer surveys conducted by FortisBC have highlighted the desire for a more efficient furnace and lowering the cost of heating the home as reasons for replacing a working low-efficiency or mid-efficiency furnace. FortisBC’s market research clearly shows that many households do not wait for their old, inefficient furnace to reach the end of its life before having it replaced.
- *Stock turnover due to the availability of rebates for high-efficiency furnaces* - FortisBC has been actively encouraging the replacement of older, inefficient gas furnaces through programming and financial incentives (rebates) during the last decade. Eligibility for rebates was restricted to customers with working low or mid-efficient furnaces, specifically to encourage early replacement of older, less-efficient furnaces (i.e., emergency replacements did not qualify).

- *Government regulations restricting the sale of new furnaces to exclude anything less than AFUE of 90%* - The minimum AFUE for gas forced air furnaces installed in new construction in British Columbia was set at 90% on January 1, 2008. This requirement was extended to all new gas forced air furnaces sold in British Columbia as of January 1, 2010. Any furnace installed in British Columbia after this date is, by law, required to be a high-efficiency model with an AFUE of 90% or higher.

To understand what might have caused counterintuitive results for furnace efficiency shares, the age of each respondent's gas furnace was compared to its efficiency classification. Assuming the estimate of furnace age is reasonably accurate, the results of comparison suggest that some respondents misclassified their furnace as either a low or mid-efficient model when it was a high-efficiency model. For example, several respondents indicated they have a low-efficiency (<78% AFUE) furnace but also indicated it is less than 25 years old, highly unlikely given government regulations restricting the sale of low-efficiency furnaces (i.e., less than 78% AFUE) as of February 1995.<sup>17</sup> Similarly, a number of respondents with mid-efficiency furnaces indicated their units are less than 12 years of age; again, highly unlikely given government regulations restricting the sale of furnaces of less than 90% efficiency went into effect between 2008 and 2010.<sup>18</sup> As there is no other information provided by these respondents to suggest the true efficiency categorization of their furnaces, data on their furnaces was removed from the analysis.<sup>19</sup> In total, 21% of cases were removed.

The results from reclassifying the furnace efficiency data are summarized in Table 91. The revised data suggest that low-efficiency furnaces made up 10% of the stock of furnaces in 2022, down from 14% in 2017. Mid-efficient furnaces represent 20% of the installed stock, down from 29% in 2017. Finally, high-efficiency furnaces now account for more than half (54%) of the residential furnace stock. The proportion of respondents who were unsure of their furnace's efficiency made up 16% of respondents with a gas furnace, statistically unchanged from 2017 (17%).

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<sup>17</sup> The minimum AFUE for gas furnaces sold in Canada was set to 78% as of February 1995. As a result, any furnaces with an AFUE of less than 78% still in service as of August 2022 should be at least 27 years or older.

<sup>18</sup> The minimum AFUE for gas forced air furnaces installed in new construction in British Columbia was set at 90% on January 1, 2008. This requirement was extended to all new gas forced air furnaces sold in British Columbia as January 1, 2010. These regulations effectively mean that any mid-efficiency (80% to 83% AFUE) furnaces still in service as of August 2022 would be at least 12 years old.

<sup>19</sup> While respondents were asked whether their furnace is ENERGY STAR qualified, these data have been unreliable in the past, characterized by significant numbers of respondents unable to answer the question (i.e., indicated they were unsure).

**Table 91: Revised Gas Furnace Efficiencies by Region Including “Don’t Know” Responses (%)**

Gas furnace efficiency	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	801	1484	435	2720	4329	2351	1411
Low efficiency (< 78%)	12.0	8.1	6.9	10.3	14.2	19.1	38.6
Mid efficiency (78% to 85%)	20.6	17.4	22.3	19.7	29.0	33.9	34.3
High efficiency (90% or higher)	50.2	61.2	52.6	53.9	40.2	31.7	14.1
Don’t know	17.2	13.3	18.2	16.1	16.6	15.3	13.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

Regionally, the highest proportion of high-efficiency furnaces occurs in the Interior region (61%) and the lowest is in the Lower Mainland (50%). The Lower Mainland also has the highest share of low-efficiency models (12%).

These data, rebased to exclude “don’t know” responses, are summarized in Table 92. Standard efficient furnaces account for 12% of the stock of furnaces, down from 17% in 2017. Mid-efficient furnaces represent 24% of the installed stock, down from 35% in 2017, and high-efficiency furnaces now account for nearly two-thirds (64%) of the installed residential furnace stock.

**Table 92: Revised Natural Gas Furnace Efficiencies by Region Excluding “Don’t Know” Responses (%)**

Gas furnace efficiency	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	663	1286	356	2305	3485	2001	1210
Low efficiency (< 78%)	14.5	9.3	8.4	12.2	17.0	22.5	44.4
Mid efficiency (78% to 85%)	24.9	20.1	27.3	23.5	34.7	40.0	39.4
High efficiency (90% or higher)	60.6	70.6	64.3	64.2	48.2	37.4	16.2
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

Data on the average ages of furnaces (revised data) differentiated by their efficiency are provided in Table 93. The least efficient furnaces boilers are, on average, the oldest (average of 34.9 years old). In contrast, the most efficient furnaces are the youngest (6.3 years). Mid-efficient furnaces are 18.6 years old, on average. The average age of furnaces whose efficiency was unknown is 14 years.

**Table 93: Average Age (Years) of Natural Gas Furnaces by Efficiency (Revised Efficiency Data)**

Gas furnace efficiency	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	801	1484	435	2720
Low efficiency (< 78%)	36.3	32.7	27.3	34.9
Mid efficiency (78% to 85%)	18.1	19.2	19.8	18.6
High efficiency (90% or higher)	6.3	6.2	6.3	6.3
Unknown efficiency	14.0	12.7	17.1	14.0

Half (51%) of respondents with a gas furnace (revised data) indicated their unit is ENERGY STAR qualified, up from 39% in 2017 (Table 94). The proportion of respondents unsure whether their furnace is ENERGY STAR qualified remains high at 31% (30% to 31% in the previous two surveys).

**Table 94: Incidence of ENERGY STAR Gas Furnaces by Region (%)**

Is gas furnace ENERGY STAR qualified?	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI
<i>Unweighted base</i>	801	1484	435	2720	4329	2355
Yes	47.9	55.0	53.3	50.7	38.5	35.8
No	21.0	16.1	13.1	18.7	32.0	33.1
Don't Know	31.1	28.9	33.6	30.6	29.5	31.1
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

### 5.4.4 Gas Boiler Efficiencies

Respondents indicating they have a gas boiler were asked to indicate the efficiency of their boiler based on the following descriptions:

- Low efficiency (60% to 70% efficient)
- Mid efficiency (80% to 85% efficient)
- High efficiency (90% efficient or higher)

The questionnaire included information on the characteristics of boilers in each efficiency group to further assist the respondent in correctly identifying their boiler's efficiency. In a break from previous surveys, the 2022 REUS differentiated traditional boilers from combined space and water heater systems, meaning comparisons with boiler efficiencies from previous surveys are not valid. For that reason, data on boiler efficiencies from previous surveys are not provided.

The distributions of boilers by efficiency are provided in Table 95. The results indicate that high-efficiency boilers make up 26% of the total stock, followed by mid-efficiency and low-efficiency units (21% for each). The proportion of respondents unable to categorize their boiler's efficiency is high (32%).

**Table 95: Natural Gas Boiler Efficiency by Region Including "Don't Know" Responses (%)**

Boiler Efficiency	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	177	69	51	297
Low efficiency (60%)	20.9	20.3	19.6	20.7
Mid efficiency (80% to 85%)	21.5	18.8	23.6	21.4
High efficiency (90% or higher)	24.9	31.8	29.4	25.8
Don't know	32.8	29.1	27.4	32.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

Table 96 rebases these data to exclude respondents unsure of their boiler's efficiency.<sup>20</sup> The rebased data suggest that high-efficiency boilers account for nearly four-in-ten (38%) boilers. Mid-efficient and low-efficiency boilers each represent 31% of the installed stock of gas boilers.

<sup>20</sup> Rebasings by excluding "don't know" responses implicitly assumes that the mix of boiler efficiencies for those unsure of their boiler's efficiency is comparable to those who knew their unit's efficiency.

**Table 96: Natural Gas Boiler Efficiency by Region Excluding “Don’t Know” Responses (%)**

Boiler Efficiency	LM	INT	VI	2022 FEI
<i>Unweighted base</i> <sup>1</sup>	119	49	37	205
Low efficiency (60%)	31.1	28.6	27.0	30.5
Mid efficiency (80% to 85%)	31.9	26.5	32.6	31.4
High efficiency (90% or higher)	37.0	44.9	40.5	38.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

<sup>1</sup> Caution is advised in interpreting data for samples of less than 50. Results are directional only.

Data on the average ages of boilers differentiated by their efficiency are provided in Table 97. They confirm that the least efficient boilers are, on average, the oldest. In contrast, the most efficient are the youngest. The average age of low-efficiency boilers in the 2022 REUS is 24.6 years compared to 15.4 years for mid-efficient units and 7.6 years for high-efficiency units. The average age of boilers whose efficiency was unknown is 15.4 years.

**Table 97: Average Age (Years) of Natural Gas Boilers by Efficiency Group**

Boiler Efficiency	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	177	69	51	297
Low efficiency (60%)	24.6	24.6	24.9	24.6
Mid efficiency (80% to 85%)	14.8	17.8	19.9	15.4
High efficiency (90% or higher)	8.0	5.9	5.5	7.6
Unknown efficiency	14.0	42.5	16.6	15.4

Roughly four-in-ten (36%) respondents indicated their gas boiler was ENERGY STAR qualified (Table 98). Of note, 37% were unsure whether their boiler is ENERGY STAR qualified. Regional differences in the proportion of boilers that are ENERGY STAR qualified are not statistically significant at the 95% confidence level.

**Table 98: Incidence of ENERGY STAR Gas Boilers by Region (%)**

Is gas boiler ENERGY STAR qualified?	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	177	69	51	297
Yes	36.2	33.3	37.3	36.0
No	26.6	29.0	27.5	26.8
Don’t Know	37.3	37.7	35.3	37.2
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

#### 5.4.5 ENERGY STAR Status of Combination Systems

Somewhat less than three-quarters (72%) of respondents indicated their combination system was ENERGY STAR qualified, 6% indicated it was not, and 22% were unsure whether it was or not (Table 99).

**Table 99: Incidence of ENERGY STAR Combination Systems by Region (%)**

Is combination system ENERGY STAR qualified?	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	106	90	56	252
Yes	73.6	64.4	75.0	72.1
No	5.7	6.7	7.1	6.0
Don't Know	20.8	28.9	17.9	21.9
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

### 5.4.6 Furnace, Boiler, and Combination System Installations – Last Five Years

Respondents with a gas furnace, gas boiler or combined space and water heating system were asked whether they had installed their heating system in the last five years. The results, summarized in Table 100, show that nearly three-in-ten (28%) respondents installed a new gas furnace in the last five years, up from 24% in 2017. Similarly, 27% of respondents with gas boilers installed a new unit in the last five years. Nearly half (47%) of respondents with combination systems installed their system in the last five years.

**Table 100: Installed / Replaced Gas Furnace or Boiler in Last Five Years by Region (%)**

Installed last five years?	LM	INT	VI	2022 FEI	2017 FEI
Installed gas furnace <sup>1</sup>	25.8	30.8	28.1	27.5	23.5
Installed gas boiler <sup>2</sup>	27.1	27.6	25.4	27.0	30.0
Installed combination system <sup>3</sup>	50.0	36.7	39.2	46.5	n/a

<sup>1</sup> Asked only of respondents whose dwelling has a gas furnace.

<sup>2</sup> Asked only of respondents whose dwelling has a gas boiler.

<sup>3</sup> Asked only of respondents whose dwelling has a combination system.

Regionally, the proportion of new furnaces installed in the Lower Mainland (26%) is significantly less than the proportion in the Interior (31%). All other regional differences in installation proportions for furnaces, boilers, and combination systems are not statistically significant at the 95% confidence level.

### 5.4.7 Likelihood of Furnace, Boiler, or Combination System Replacement – Next Two Years

Respondents with gas furnaces, gas boilers, and combination systems were asked about the likelihood of replacing their heating system during the next two years.

#### *Furnaces*

Somewhat more than one-in-five (22%) respondents with gas furnaces indicated it is either *very likely* or *somewhat likely* they will replace their furnace in the next two years (Table 101), statistically unchanged from 2017. Fifteen percent (15%) of respondents with a gas furnace were unsure whether they would be replacing their furnace in the next two years.

**Table 101: Likelihood of Gas Furnace Replacement in Next Two Years by Region (%)**

Likelihood	LM	INT	VI	2022 FEI	2017 FEI
<i>Unweighted base</i>	1042	1840	548	3430	4329
Very likely	5.0	5.7	7.7	5.5	5.5
Somewhat likely	17.1	15.0	19.2	16.6	15.6
Not at all likely	61.9	65.1	59.1	62.6	62.7
Don't know	16.0	14.2	14.1	15.3	16.3
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Very or somewhat likely (%)</b>	<b>22.1</b>	<b>20.7</b>	<b>26.8</b>	<b>22.1</b>	<b>21.1</b>

Totals may not sum due to rounding.

## Boilers

Somewhat more than a quarter (27%) of respondents with boilers indicated it is either *very likely* or *somewhat likely* they will replace their boiler in the next two years (Table 102). Another 22% were unsure whether they will replace their boiler in the next two years.

**Table 102: Likelihood of Boiler Replacement in Next Two Years by Region (%)**

	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	177	69	51	297
Very likely	7.9	8.8	4.1	7.7
Somewhat likely	19.2	17.3	19.7	19.1
Not at all likely	50.9	55.1	56.9	51.7
Don't know	22.0	18.8	19.7	21.6
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.3</b>	<b>100.0</b>
<b>Very or somewhat likely (%)</b>	<b>27.1</b>	<b>26.1</b>	<b>23.7</b>	<b>26.8</b>

Totals may not sum due to rounding.

## Combined Space and Water Heating Systems

Overall, 16% of respondents with a combination system indicated it was either *very likely* or *somewhat likely* they will replace their space heating system in the next two years (Table 103).

**Table 103: Likelihood of Combination System Replacement in Next Two Years by Region (%)**

	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	106	90	56	252
Very likely	3.8	4.4	1.9	3.7
Somewhat likely	13.2	8.8	9.0	12.0
Not at all likely	67.0	74.4	75.0	69.2
Don't know	16.1	12.3	14.2	15.2
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Very or somewhat likely (%)</b>	<b>17.0</b>	<b>13.3</b>	<b>10.8</b>	<b>15.7</b>

Totals may not sum due to rounding.

# Space Heating

## 5.5 Heat Pumps

FEI’s 2022 REUS introduced a series of questions addressing the incidence and use of residential heat pumps including ducted air source models (heat pumps that distribute conditioned air via the home’s existing ductwork), ductless (mini-split) models (standalone units that distribute conditioned air via one or more interior air handling units or “heads”), and ground source (geothermal) models. Respondents who indicated they have one or more of the heat pump types were asked whether they use their units for heating only, cooling only, or for both heating and cooling.

Somewhat more than one-quarter (27%) of respondents to the 2022 REUS indicated their residence has a heat pump (Table 104). Somewhat less than one-quarter (23%) have a ducted air source unit, 4% have a ductless mini-split, and 2% have a ground source (geothermal) unit. Less than two percent of respondents with a heat pump indicated their dwelling has more than one heat pump (data not shown).

**Table 104: Heat Pumps by Type and Region (%)**

**Multiple Responses Allowed**

	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	1428	2257	1107	4792
Ducted air source	22.1	23.6	22.3	22.5
Ductless air source	3.1	3.2	7.8	3.7
Ground source	2.0	1.7	0.6	1.7
<b>One or more heat pumps</b>	<b>26.5</b>	<b>27.8</b>	<b>29.7</b>	<b>27.3</b>

Columns do not sum to 100% because of multiple responses.

Penetration of ducted heat pumps does not significantly vary by region but penetration of ductless models is significantly higher on Vancouver Island. The latter is consistent with the higher incidence of electric baseboard heating in this region.<sup>21</sup>

By dwelling type, the penetration of ducted heat pumps is highest in mobile and other manufactured dwellings (27%) and lowest in townhouses (13%) (Table 105). Nearly one-in-four (23%) single-family detached dwellings have a ducted heat pump.

<sup>21</sup> As they do not require a home to have ductwork for air distribution, ductless (mini-split) air source heat pumps are particularly suited to dwellings whose main method of space heating is wired-in electric baseboards or for dwelling additions that are not connected to the home’s existing heating system.

**Table 105: Heat Pumps by Dwelling Type (%)**  
Multiple Responses Allowed

	Single Family Detached	Semi-Detached	Row / Town-house	Apt / Apt-Style Condo	Mobile & Other
<i>Unweighted base</i>	3836	218	358	138	242
Ducted air source	23.4	22.4	13.4	20.9	26.7
Ductless air source	3.8	2.4	3.8	3.0	3.6
Ground source	1.6	1.2	2.3	6.9	--
<b>One or more heat pumps</b>	<b>28.1</b>	<b>25.9</b>	<b>19.0</b>	<b>30.8</b>	<b>30.1</b>

Columns do not sum to 100% because of multiple responses.

Penetration of heat pumps (any type) is lowest in dwellings constructed prior to 1950 (21%) and highest among residential dwellings built since 2005 (40% to 47%) (Table 106). Penetration rates for ground source heat pumps have been slowly increasing in new construction. For example, 6% of dwellings constructed since 2015 have a geothermal heat pump compared to less than one percent of homes built prior to the mid-1980s. Penetration rates for ductless models do not appear to have any relationship to the age of the dwelling.

**Table 106: Heat Pumps by Dwelling Vintage (%)**  
Multiple Responses Allowed

	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 - 2005	2006 - 2015	2016 or Newer	Age Unknown
<i>Unweighted base</i>	530	1121	729	842	770	431	251	114
Ducted air source	17.6	21.1	23.5	20.7	20.6	35.5	31.3	19.0
Ductless air source	4.1	2.8	2.9	3.7	3.7	6.8	4.9	4.0
Ground source	0.1	0.1	0.8	2.2	2.6	5.4	6.4	0.5
<b>One or more heat pumps</b>	<b>20.8</b>	<b>23.7</b>	<b>26.4</b>	<b>26.2</b>	<b>26.4</b>	<b>46.8</b>	<b>40.4</b>	<b>23.4</b>

Columns may not sum due to multiple responses.

Table 107 explores the penetration of heat pump types depending on whether the dwelling has a gas boiler, gas forced air furnace, combination boiler, electric forced air furnace, or some other type of heating system. Of note, the incidence of ducted air source heat pumps is highest for dwellings with an electric forced air furnace (59%), followed by gas forced air furnaces (24%) and combined space and water heating systems (23%). As expected, the incidence of ductless (mini-split) heat pump models is highest for those dwellings that do not use a forced air furnace, boiler or combination system (16%). This latter group typically has electric baseboard heating as their main space heating method.

**Table 107: Heat Pump and Space Heating Equipment Pairings (%)**  
Multiple Responses Allowed

	Gas Boiler	Gas Furnace	Combined System	Electric Furnace	Other
<i>Unweighted base</i>	290	3415	252	220	593
Ducted air source	7.4	23.6	22.8	58.5	13.7
Ductless air source	5.9	1.8	5.3	4.7	15.5
Ground source	4.0	0.8	5.5	1.7	4.3
<b>One or more heat pumps</b>	<b>15.9</b>	<b>25.8</b>	<b>32.2</b>	<b>64.2</b>	<b>32.2</b>

Columns may not sum due to multiple responses.

## Space Heating

As heat pumps can be used to heat or cool the home depending upon the season, respondents to the 2022 REUS who indicated their dwelling has a heat pump were asked whether they use it for heating only, cooling only, or for both heating and cooling. The results, summarized in Table 108, show that eight-in-ten (81%) use their heat pump for heating (either for heating only or both heating and cooling) and 10% use their systems only for cooling. Regionally, respondents on Vancouver Island were most likely to use their heat pumps for both heating and cooling (79%) compared to those in the Lower Mainland (41%). Nine percent (9%) were unsure how their heat pump is used.

**Table 108: Heat Pump Use by Region (%)**

Heat pump use	LM	INT	VI	2022 FEI
<i>Unweighted base</i> <sup>1</sup>	380	628	330	1338
Both heating and cooling	41.1	58.6	79.1	51.5
Heating only	40.8	17.4	10.6	29.9
Cooling only	7.9	14.2	7.0	9.5
Don't know	10.3	9.9	3.3	9.1
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Total heating</b>	<b>81.8</b>	<b>76.0</b>	<b>89.7</b>	<b>81.4</b>

<sup>1</sup> Respondents with heat pumps

### 5.6 Maintenance Behaviours for Furnaces, Boilers and Combinations Systems

Respondents with a gas furnace, gas boiler or a gas combination system were asked to rate the frequency (always, usually, occasionally or never) in which they undertake three common maintenance behaviours, including:

- Changing the furnace filter regularly
- Servicing the heating system annually using a contractor
- Servicing the heating system annually themselves

Respondents were also allowed to specify “don’t know” or “not applicable” for any of the three behaviours.

Fifty-six percent (56%) of respondents indicated they *always* change their furnace filter, and another 19% indicated they *usually* do (Table 109). One-in-ten (9%) only *occasionally* change the filter and 4% indicated they *never* do.

**Table 109: Frequency of Furnace and Boiler System Maintenance Behaviours (%)**

Rows Sum Across

Heating system maintenance	Always	Usually	Occasion-ally	Never	Don't Know	Not Applicable	Total
Change furnace filter regularly (gas furnaces only)	55.9	18.9	9.1	3.5	2.8	9.8	100.0
Service heating system annually by contractor	25.6	19.2	30.2	19.8	2.9	2.2	100.0
Service heating system annually myself	9.1	8.0	10.8	60.0	3.4	8.8	100.0

Totals may not sum due to rounding.

Somewhat less than half of respondents a gas furnace, gas boiler, or combination system indicated they *always* (26%) or *usually* (19%) have their heating system serviced annually by a contractor. Less than one-in-five respondents indicated that they *always* (9%) or *usually* (8%) service their heating systems themselves.

### 5.7 Maintenance Behaviours for Heat Pumps

Respondents whose dwelling has a heat pump were asked to rate the frequency (always, usually, occasionally or never) in which they undertake the following maintenance behaviours for their heat pump:

- Changing the heat pump filter regularly
- Servicing the heat pump annually using a contractor
- Servicing the heat pump system annually themselves

Respondents were also allowed to specify “don’t know” or “not applicable” for any of the three behaviours.

Thirty-one percent (31%) of respondents with a heat pump indicated they *always* change their heat pump filter regularly, and another 14% indicated they *usually* do (Table 109). Somewhat less than one-quarter (23%) *always* have their heat pump serviced annually by a contractor and another 15% indicated they *usually* do. Finally, 12% indicated they *always* or *usually* service their heat pump annually themselves.

**Table 110: Frequency of Heat Pump Maintenance Behaviours (%)**  
Rows Sum Across

Heat pump maintenance	Always	Usually	Occasion-ally	Never	Don't Know	Not Applicable	Total
Change heat pump filter regularly	30.6	13.7	11.3	14.0	14.6	15.9	100.0
Service heat pump annually by contractor	22.6	14.9	21.6	19.3	10.1	11.5	100.0
Service heat pump annually myself	5.8	5.9	7.7	55.9	9.2	15.5	100.0

Totals may not sum due to rounding.

### 5.8 Heating System Controls

Penetrations of the three different types of thermostats (manual, programmable, and smart or learning style) are summarized in Table 111. One-third (32%) of homes have one or more manual thermostats and more than six-in-ten (63%) homes use one or more programmable thermostats. Learning-style thermostats are present in 9% of homes; their share more than doubling since 2017.

**Table 111: Heating System Controls by Region (%)**  
Multiple Responses Allowed

Heating System Controls	LM	INT	VI	2022 FEI	2017 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827
Manual (non-programmable) thermostats	33.1	25.1	42.4	32.1	40.4
Programmable thermostats	61.9	66.9	58.3	62.8	59.7
“Smart” or learning style thermostats	9.7	10.0	6.1	9.3	3.5
Don’t know	2.1	1.5	2.6	2.0	1.7

Columns do not sum to 100% because of multiple responses.

Penetration rates for the three different types of heating controls by dwelling type are summarized in Table 112. The data show SFDs are the most likely to have a programmable thermostat and apts/condos are the most likely to have a manual thermostat.

**Table 112: Heating System Controls by Dwelling Type (%)**  
Multiple Responses Allowed

Heating System Controls	Single Family Detached	Semi- Detached	Row / Town- house	Apt / Apt-Style Condo	Mobile & Other
<i>Unweighted base</i>	4646	312	428	170	269
Manual (non-programmable) thermostats	30.5	39.8	37.6	53.1	35.9
Programmable thermostats	64.6	55.3	56.0	39.3	35.9
“Smart” or learning style thermostats	9.5	7.9	11.4	4.3	5.2
Don’t know	1.9	2.4	2.1	9.0	0.7

Columns do not sum to 100% because of multiple responses.

Respondents using programmable or smart thermostats were asked to indicate how many (all of them, some of them, none of them, don’t know) are programmed. Eight-in-ten (82%) indicated all are programmed and 8% indicated that some are programmed (Table 113). Another 8% indicated none are programmed. Two percent (2%) were unsure whether their unit or units were programmed.<sup>22</sup>

**Table 113: Programmable Thermostats (incl. Smart Thermostats) by Programming (%)**

How many are programmed?	LM	INT	VI	2022 FEI	2017 FEI
<i>Unweighted base</i>	1010	1709	704	3423	3479
All of them	81.7	84.1	78.8	82.1	83.1
Some of them	9.0	4.1	10.6	7.8	6.4
None of them	7.3	9.9	7.7	8.1	9.1
Don’t know	2.0	1.8	2.8	2.0	1.4
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

<sup>22</sup> See Section 10.2 for detail on thermostat set-back behaviours for space heating and cooling.





# 6 DOMESTIC HOT WATER

This chapter presents and discusses domestic water heating (DWH) systems. These systems provide hot water for domestic activities such as clothes washing, dishwashing, showering, and bathing. This section addresses the following topics:

- Penetration and saturation of DWH equipment by fuel and equipment type
- New DWH equipment installations
- DWH fuel switching
- Age of DWH equipment
- Location of DWH equipment
- Sizes of conventional storage tanks
- Penetration of showerheads, aerators, and other miscellaneous hot water appliances
- Water use metering

## 6.1 Penetration and Saturation

The proportion of households with DWH equipment (i.e., not centrally provided as is the case in many apartment buildings and condominium complexes), including penetration and saturation rates, are summarized in Table 114. The vast majority (98%) of respondents to the 2022 REUS indicated their dwelling is equipped with a domestic water heater.<sup>23</sup> The remaining 2% are assumed to have their domestic hot water supplied via central systems.

**Table 114: Domestic Water Heater (Any Fuel) Penetration and Saturation by Region**

	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1316	2149	1061	4526	5827	3441	2186
Penetration (%)	97.9	96.0	98.5	97.5	94.7 <sup>2</sup>	93.1 <sup>2</sup>	96.5 <sup>2</sup>
Saturation <sup>1</sup>	1.03	1.03	1.04	1.03	1.03	1.04	1.03
Households with >1 water heater (%) <sup>1</sup>	3.0	2.6	3.6	3.0	3.0	3.3	3.1
No hot water heater in residence (%)	2.1	4.0	1.5	2.5	5.3	6.9	3.5

<sup>1</sup> Excludes non-responses and respondents living in apartments, row houses, and townhouses where hot water is centrally provided.

<sup>2</sup> Includes a small proportion of single-family detached and semi-detached dwellings that indicated they do not have a water heater in the residence.

Saturation rates for households with at least one DWH heater are comparable to those observed in the past residential end-use surveys (1.03 units, on average, in 2022, 2017 and 2008, and 1.04 in 2012). The saturation rate for 2022 reflects the small proportion (3%) of homes that have more than one DWH unit.

<sup>23</sup> These data exclude 266 respondents (6% of respondents to FEI's 2022 REUS) living in single family detached and semi-detached dwellings who indicated their dwelling does not have a water heater. These respondents may have misunderstood the question or wanted to avoid answering questions about their hot water heating system. Programming embedded in the online survey automatically forwarded these respondents to the next section of the survey. As a result, all remaining questions in the domestic water heating section of the survey exclude these respondents. The remaining sample (n=4,526), however, is more than adequate to ensure a high degree of statistical accuracy for the remaining questions on domestic water heating.

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Penetration and saturation rates for hot water heaters (any fuel) by dwelling type are presented in Table 115. More than half (55%) of respondents living in apts/condos have their domestic hot water provided via a central system (i.e., no in-dwelling hot water heater).

**Table 115: Domestic Water Heater (Any Fuel) Penetration and Saturation by Dwelling Type**

	Single Family Detached	Semi-Detached	Row / Town-house	Apt / Apt-Style Condo	Mobile & Other
<i>Unweighted base</i>	3588	200	358	138	242
Penetration (%) <sup>1</sup>	100.0	100.0	88.2	44.8	93.8
Saturation <sup>2</sup>	1.04	1.05	1.01	1.03	1.00
Households with >1 water heater (%) <sup>2</sup>	3.4	2.8	0.3	3.0	--
No hot water heater in residence (%)	--	--	11.8	55.2	6.2

<sup>1</sup> Base excludes respondents in single-family detached and semi-detached dwellings that indicated there was no water heater in the residence

<sup>2</sup> Base excludes non-responses and respondents living in apartments, row houses, and townhouses where hot water is centrally provided.

All remaining questions about domestic hot water equipment and fuels were directed to households with in-home DWH systems. Respondents living in apartments, townhouses and other complexes where DWH is centrally provided and those living in single-family detached and semi-detached dwellings that indicated domestic water heaters were not present in residence, were skipped forward in the survey and, for obvious reasons, not asked questions about their DWH equipment or fuels.

## 6.2 Fuels

Data on DWH fuels for the first (main) hot water heater are summarized in Table 116.<sup>24</sup>

**Table 116: Domestic Water Heater Fuels by Region (%)**

### Main DWH Unit

	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1289	2064	1045	4398	5355	3243	2026
Electricity	14.4	28.6	30.5	20.5	20.3	16.9	10.8
Natural gas	82.1	68.0	68.3	76.3	77.8	82.5	88.8
Piped propane	0.2	0.5	--	0.2	0.1	0.1	0.1
Other <sup>1</sup>	0.3	0.8	0.2	0.4	0.1	0.2	0.2
Don't know	3.1	2.0	1.0	2.5	1.6	n/a	n/a
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

<sup>1</sup> Includes bottled propane, geothermal, oil & other.

Totals may not sum due to rounding.

The data suggest the shift from natural gas to electricity for domestic water heating observed in FEI residential end-use studies since 2008, has slowed. Specifically, three-quarters (76%) of dwellings used natural gas for DWH in 2022, statistically unchanged from 2017. The main water heater fuel for one-in-five (21%) respondents is electricity, also unchanged since 2017. All other fuels (e.g., piped propane, heating oil,

<sup>24</sup> For homes with more than one domestic water heater, the "main" heater was defined as the water heater that provides more hot water than they others.

etc.) account for less than 1% of main domestic water heaters. Regionally, 68% of main DWH units on Vancouver Island and the Interior use natural gas, compared to 84% of main DWH units in the Lower Mainland.

Table 117 explores DWH fuel shares (main unit) for SFDs, the single most common dwelling type, based on when they were constructed. The data show the proportion of SFDs using natural gas for DWH peaked between 1996 and 2005 (85% of SFDs constructed during these years) but fell to approximately two-thirds (64% to 65%) of dwellings constructed since then.

**Table 117: Domestic Water Heater Fuels – SFDs by Vintage (%)**

**Main DWH Unit**

	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 - 2005	2006 - 2015	2016 or Newer	Age Unknown
<i>Unweighted base</i>	480	939	555	597	507	273	169	66
Electricity	24.5	17.2	17.0	14.6	10.5	30.4	30.5	19.5
Natural gas	74.0	80.6	81.4	81.6	84.8	64.8	64.4	72.4
Piped propane	0.3	0.2	0.3	--	0.4	--	0.4	--
Other <sup>1</sup>	--	--	--	0.6	1.1	1.2	2.3	--
Don't know	1.1	2.0	1.3	3.1	3.3	3.5	2.4	8.1
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

<sup>1</sup> Includes bottled propane, geothermal, oil & other.  
Totals may not sum due to rounding

**6.2.1 Fuel Switching**

Table 118 summarizes the percentage of respondents with DWH equipment in their homes that switched the fuel used to provide domestic hot water service in the last five years. While low, the percentage of respondents switching from one fuel to another for water heating in the last five years was 5% in 2022, up from 3% in 2017. This increase is statistically significant at a 95% confidence level. Differences in switching rates between the regions, however, are not statistically significant.

**Table 118: Change in Domestic Water Heater Fuel Last Five Years by Region (%)**

Changed DWH fuel last five years?	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1289	2064	1045	4398	5518	3217	2004
Yes	4.3	4.8	5.2	4.6	2.6	2.3	1.1

Of those who switched their DWH fuel in the last five years, three-quarters (73%) switched to natural gas from some other fuel; the majority (two-thirds) switched from electricity and the remainder switched from some fuel other than electricity (e.g., piped propane or some other fuel). One-quarter (24%) switched from natural gas to electricity.

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**Table 119: Change in Domestic Water Heating Fuel Last Five Years (%)**

Current fuel ▼ \ Previous fuel ▶	Electricity	Natural Gas	Piped Propane	Other	Any Previous Fuel
Electricity	--	24.0	--	1.4	25.4
Natural gas	48.2	--	7.9	16.8	72.8
Piped propane	0.9	--	--	--	0.9
Other	0.9	--	--	--	0.9
<b>Any current fuel</b>	<b>50.0</b>	<b>24.0</b>	<b>7.9</b>	<b>18.2</b>	<b>100.0</b>

Calculations based on a sample of 134 respondents.

Total may not sum due to rounding.

### 6.3 Equipment

Respondents to the 2022 REUS were asked to indicate the type of equipment used to provide their domestic hot water from a list of the following common types:

- Conventional storage (tank)
- On-demand (tankless)
- Combined space and water heating system
- Heat pump water heater tank

Respondents could specify up to three DWH systems with the first system being the main system (i.e., the one that provides more hot water than the others). Respondents with conventional storage (tank) water heaters (first, second and/or third units) were asked whether the units had a vent (roof or sidewall) or no vent (electric).

#### 6.3.1 Penetration Rates

Penetration rates for domestic water heater equipment, regardless of fuel or whether they are the household's main, secondary or tertiary unit, are summarized in Table 120.

**Table 120: Domestic Water Heater Penetration Rates by Type (%)**  
Includes First, Second and Third Water Heaters

	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1289	2064	1045	4398	5518	3243	1963
Conventional storage tank	79.9	84.9	78.1	81.0	86.0	91.4	82.9
On-demand (tankless)	11.1	9.2	17.8	11.5	6.3	4.1	2.7
Combined space and water heater	4.4	2.0	1.9	3.4	3.0	1.0	0.7
Heat pump heater tank	1.7	1.0	0.7	1.3	1.1	0.4	n/a
Don't know <sup>1</sup>	3.0	2.9	1.5	2.8	3.5	3.0	13.6
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

<sup>1</sup> Represents uncertainty across all DWH types, including conventional storage tanks.

Totals may not sum due to rounding.

Eight-in-ten (81%) FEI residential customers have one or more conventional storage tanks, down from 86% in 2017 and 91% in 2012. The decline is attributed to the increased penetration of on-demand units (up from 4% in 2012 to 12% in 2022) and combined space and water heating systems (up from 1% in 2012 to

3% in 2022). The penetration rate for heat pump water heaters remained unchanged from 2017 at less than 2%. Notable regional differences in penetration rates for the different water heater types include the relatively high penetration of on-demand units on Vancouver Island (18%) compared to the Lower Mainland and Interior (11% and 9% respectively).

Table 121 provides the distribution of gas-fired conventional DWH storage tanks by their venting arrangement. Those with venting through the side wall are more efficient than those with through-the-roof venting. One-quarter (24%) of respondents with a gas-fired tank indicated the tank’s venting was through a side wall, 43% indicated it was through the roof, and 34% were unsure.

**Table 121: Gas-fired Conventional Storage (Tank) Water Heaters by Venting Arrangement (%) Includes First, Second and Third Water Heaters**

Gas-fired storage tanks	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	1422	2233	1091	4746
Vent through the side wall	23.3	22.4	27.1	23.6
Vent through the roof	46.3	38.3	35.4	42.6
Don’t know <sup>1</sup>	30.3	39.4	37.5	33.8
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

<sup>1</sup> Represents uncertainty across all conventional gas-fired storage tanks regardless of the number of units. Totals may not sum due to rounding.

### 6.3.2 Saturation Rates

Saturation rates for water heaters, by water heater type, are summarized in Table 122 with comparisons to the three previous FEI residential end-use surveys. The saturation rate for conventional storage-style tanks is 0.84, down from 0.90 in 2017 and 0.97 in 2012 and 2008. Saturation rates for conventional tanks vary from 0.81 for Vancouver Island to 0.87 for the Interior. Consistent with their increased penetration, saturation rates for on-demand water heaters have increased from 0.03 in 2008 to 0.12 in 2022.

**Table 122: Domestic Water Heater Saturation Rates by Type Includes First, Second and Third Water Heaters**

	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base <sup>1</sup></i>	1289	2064	1045	4398	5334	3112	1692
Conventional storage tank	0.82	0.87	0.81	0.84	0.90	0.97	0.97
On-demand (tankless)	0.11	0.10	0.18	0.12	0.07	0.04	0.03
Combined space and water heater	0.05	0.02	0.02	0.03	0.03	0.01	0.01
Heat pump heater tank	0.02	0.01	0.01	0.01	0.01	0.00*	n/a

\* Saturation less than 0.01

<sup>1</sup> Base excludes respondents unsure of their water heater type

### 6.3.3 Conventional Tank Sizes

Table 123 provides the distribution of conventional hot water tanks (largest unit) by size (imperial gallons). Tanks sized between 40 and 59 imperial gallons are most common (41% of all tanks), followed by tanks sized between 30 to 39 gallons (20%). Less than one-in-ten (8%) homes use a conventional hot water tank sized at 60 gallons or more. Of note, 28% of respondents were unsure of their DWH tank’s size. Data for

## Domestic Hot Water

2017 are provided but the proportion of respondents unsure of their tank size was significantly lower, making it difficult to compare these data with 2022 data.

**Table 123: Domestic Water Heater Tank Sizes – Conventional Storage Tanks (Any Fuel) (%) Largest Tank in the Home**

	LM	INT	VI	2022 FEI	2017 FEI
<i>Unweighted base</i>	1151	1880	869	3900	4745
Less than 30 imperial gallons	2.5	3.6	2.6	2.8	3.0
30 to 39 imperial gallons	20.2	21.3	19.2	20.4	27.7
40 to 59 imperial gallons	40.6	40.9	44.8	41.2	44.7
60 or more imperial gallons	6.7	8.1	10.6	7.6	7.6
Other	--	--	--	--	0.4
Don't know	30.0	26.2	22.8	28.0	16.5
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

### 6.4 Installations of New Water Heaters – Last Five Years

Four-in-ten (41%) respondents to the 2022 REUS installed a new domestic water heater in the last five years, statistically unchanged from the 2017 and 2012 surveys (Table 124). The 2022 result equates to an average replacement (turnover) rate of approximately one-in-ten (10%) water heaters every year.

**Table 124: Domestic Water Heater Installations Last Five Years by Region (%)**

Installed water heater last five years?	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1289	2064	1045	4398	5355	3208	2011
Yes	39.0	43.2	47.4	41.3	42.8	40.5	38.3

The reasons for installing a water heater are summarized in Table 125.

**Table 125: Main Reason for Installing a New Domestic Water Heater in Last Five Years (%)**

Reasons for installing new water heater	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	503	892	495	1890	2292	1271	730
Water heater had failed	49.1	40.7	45.4	46.1	53.3	59.8	65.1
Anticipated water heater failure	29.4	26.1	30.6	28.7	26.0	22.6	17.5
Wanted more efficient water heater	9.9	8.6	9.1	9.4	7.9	8.5	9.2
New home	3.2	6.4	2.0	3.9	5.9	2.9	4.4
Needed more hot water	1.4	1.2	1.0	1.3	0.7	1.1	0.8
Wanted to change to gas	0.4	1.9	1.4	1.0	0.7	0.5	1.5
Required to qualify for home insurance	2.4	10.3	7.1	5.4	2.6	n/a	n/a
Other	4.2	4.8	3.4	4.2	3.0	4.6	1.5
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

Consistent with past REUS surveys, the most common reasons include failure of the water heater (indicated by 46% of 2022 REUS respondents who installed a hot water heater in the last five years), anticipated water heater failure (29%), and wanting to have a more efficient water heater (9%). Of note, 5% indicated a new DWH unit was installed as a requirement to qualify for home insurance, up from 3% in 2017. Of particular

note, 10% of respondents in the Interior who installed a new water heater in the last five years indicated the main reason was to satisfy home insurance requirements.

### 6.4.1 Ages

Mean (average) ages of the first (main) and second domestic water heaters, regardless of fuel, are summarized in Table 126. The average age of the first (main) water heater is 6.6 years, statistically unchanged from 2017 and 2012. Regional differences in the age of the first heater are notable for Vancouver Island, where hot water heaters are younger than other regions (6.0 years versus 6.4 and 6.8 years). The average age of second waters (where applicable) is 8.8 years.

**Table 126: Average Age (Years) of Hot Water Heaters (Any Fuel)**

	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
Average age of first water heater (years)	6.8	6.4	6.0	6.6	6.5	6.6	7.1
Average age of second water heater (years)	10.0	7.7	6.2	8.8	7.1	8.1	6.7

### 6.4.2 Water Heater Location

Respondents were asked to indicate where in the home their domestic water heater is located. The water heater’s location, particularly whether it is located in a conditioned space, is particularly relevant for conventional storage-type water heaters, as the energy required to maintain the temperature of the large volume of stored water is dependent, in part, upon the effectiveness of the tank’s insulation and the ambient temperature in the space where it is located. The results of this question are summarized in Table 127.

**Table 127: Location of Domestic Water Heater in the Home by Region (%)**

Location of Main Water Heater	LM	INT	VI	2022 FEI	2017 FEI
<i>Unweighted base</i>	1289	2064	1045	4398	5355
Main living area of the home	23.0	22.5	26.8	23.4	26.8
Heated basement	55.2	62.0	37.9	54.7	55.2
Unheated garage	4.1	2.7	6.2	4.0	4.1
Crawl space	4.0	5.4	5.7	4.6	4.4
Heated garage	1.6	1.2	4.8	1.9	2.2
Unheated basement	6.5	1.9	12.4	6.1	6.3
Other	4.7	4.0	5.9	4.7	0.8
Don't know	0.9	0.3	0.2	0.6	0.2
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Located in a heated space</b>	<b>79.8</b>	<b>85.6</b>	<b>69.5</b>	<b>80.0</b>	<b>84.2</b>

Totals may not sum due to rounding.

Eight-in-ten (80%) homes have their domestic water heater located in a heated space within or attached to the home (e.g., 55% in a heated basement, 23% in the main living area, and 2% in a heated garage). One-in-ten (10%) have their water heater located in an unheated space (4% in an unheated garage, 6% in an

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unheated basement). Another 5% have their unit located in a crawl space, of which, two-thirds (65%) of these crawlspaces are unheated during the winter heating season.<sup>25</sup>

### 6.5 Water Use Metering

Forty-five percent (45%) of respondents to the 2022 REUS indicated their home's water use is metered (Table 128). Regionally, metering was most prevalent on Vancouver Island (72% metered) and least prevalent in the Lower Mainland (40%).

**Table 128: Incidence of Water Use Metering by Region (%)**

Home's water use is metered?	LM	INT	VI	2022 FEI	2017 FEI
<i>Unweighted base</i>	1289	2064	1045	4398	5355
Yes	40.2	42.8	71.6	45.3	42.7
No	47.1	49.1	22.5	44.2	48.1
Don't know	12.7	8.1	5.9	10.5	9.3
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

Of those whose water use is metered, the majority (83%) indicated they pay a fee for water based on the volume used (Table 129).

**Table 129: Incidence of Water Use Charges by Region (%)**

Home receives a bill for amount of water used?	LM	INT	VI	2022 FEI	2017 FEI
<i>Unweighted base</i>	518	884	748	2150	2287
Yes	78.8	85.2	91.3	83.2	85.6
No	14.7	10.5	7.5	12.0	10.4
Don't know	6.6	4.3	1.2	4.8	4.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

### 6.6 Showerheads, Aerators, and Miscellaneous Hot Water Appliances

Like that of the last two REUS surveys, the 2022 REUS asked respondents to indicate how many showerheads, low-flow showerheads, water heater blankets, instant hot water dispensers, and bathroom and kitchen faucet aerators are installed in their homes. Penetration and saturation rates for these appliances are summarized in Table 130.

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<sup>25</sup> Table 24, page 26.

**Table 130: Hot Water Appliances by Region (%)**

Hot Water Appliance	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1289	2064	1045	4398	5827	3441	2187
<b>Showerheads</b>							
Penetration (%)	91.3	90.8	91.6	91.2	87.7	98.3	99.4
Saturation	2.22	1.90	2.06	2.11	2.22	2.15	2.15
<b>Low-flow showerheads</b>							
Penetration (%)	36.5	37.1	37.7	36.8	40.2	39.4	46.9
Saturation	0.75	0.71	0.77	0.74	0.79	0.74	0.85
<b>Water heater blankets</b>							
Penetration (%)	1.5	1.9	2.8	1.8	3.7	5.6	6.4
Saturation	0.02	0.02	0.03	0.02	0.04	0.06	0.08
<b>Instant Hot Water Dispensers</b>							
Penetration (%)	3.8	2.1	3.8	3.3	4.0	2.8	n/a
Saturation	0.06	0.03	0.05	0.05	0.08	0.05	n/a
<b>Bathroom &amp; Kitchen Aerators</b>							
Penetration (%)	47.4	48.8	49.4	48.1	48.3	45.9	n/a
Saturation	1.72	1.55	1.61	1.66	1.67	1.43	n/a

The penetration of showerheads (any kind) increased from 88% in 2017 to 91% in 2022. The penetration of low-flow showerheads declined to 37% from 40% over the same period.<sup>26</sup> The penetration of water heater blankets also declined, now used by only 2% of respondents. All other changes from 2017 are not statistically significant at the 95% confidence level.

<sup>26</sup> These results should be treated with caution as many showerheads sold today are considered water efficient or low flow but the packaging may not necessarily indicate as such.



# 7 FIREPLACES AND HEATER STOVES

This section summarizes data on the penetration, saturation, and use of fireplaces and heater stoves. Six fireplace and heater stove types were queried in the 2022 REUS. They were:

- Gas (decorative)
- Gas (heater type)
- Gas (free standing)
- Electric
- Wood burning fireplaces
- Wood burning stoves

Consistent with the FEI’s last three residential end-use surveys, the 2022 REUS differentiated natural gas fireplaces and heater stoves by type and function. Survey respondents were provided the following descriptions to assist them in correctly classifying their gas units:

- *Decorative fireplaces* – Provide ambiance but have little or no heating ability. The hearth is often open to the room or equipped with opening glass doors.
- *Heater-type fireplaces (built-ins and inserts)* – These fireplaces are efficient heaters with fixed glass fronts and may have features such as fans and thermostatic control. They may be built-in at the time of construction or inserted into an existing masonry or other type of fireplace as an upgrade.
- *Free-standing fireplaces and heater stoves* – These are stand-alone units that can be used for both ambiance and heating. Gas heater stoves resemble wood stoves in appearance but use gas instead of wood.

## 7.1 Penetration and Saturation

### 7.1.1 All Fireplace / Heater Stove Types

Table 131 summarizes the penetration and saturation rates for all fireplaces and heater stoves regardless of type or fuel. Overall, greater than eight-in-ten (83%) respondents to the 2022 REUS live in a dwelling that has at least one fireplace or heater stove. Penetration of fireplaces and heater stoves is highest on Vancouver Island (90%) and the Lower Mainland (87%) and lowest in the Interior (71%). The average FEI residential customer has 1.2 fireplaces / heater stoves in their home. The saturation rate for fireplaces and heater stoves has been declining since the 2008 residential survey.

**Table 131: Fireplaces and Heater Stoves by Region  
Any Type, Any Fuel**

	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3384	2167
Penetration (%)	86.6	70.6	89.6	82.7	85.3	83.7	84.8
Saturation	1.38	0.93	1.23	1.24	1.28	1.32	1.52

## Fireplaces and Heater Stoves

Table 132 summarizes penetration and saturation rates for fireplaces and heater stoves (any fuel) by the five main dwelling types. Single-family detached dwellings have the highest penetration rate (85%) and mobile homes have the lowest (42%). On average, SFDs have 1.3 fireplaces / heater stoves.

**Table 132: Fireplaces and Heater Stoves by Dwelling Type**  
Any Type, Any Fuel

	Single Family Detached	Semi-Detached	Row / Town-house	Apt / Apt-Style Condo	Mobile & Other
<i>Unweighted base</i>	3836	218	358	138	242
Penetration (%)	84.9	76.7	81.1	77.7	41.6
Saturation	1.33	0.97	0.95	0.82	0.44

Table 133 provides greater detail on the number of fireplaces and heating stoves per dwelling. Half (47%) of FEI residential customers have one fireplace or heater stove and three-in-ten (30%) have two units. Five percent (5%) have three or more units. Regionally, dwellings in the Lower Mainland are more likely than those in the other two regions to have two or more units. Dwellings on Vancouver Island are more likely than other regions to have just one fireplace or heater stove (62%).

**Table 133: Number of Fireplaces and Heater Stoves per Dwelling by Region (%)**  
Any Type, Any Fuel

	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3384
None	13.4	29.4	10.4	17.3	14.7	16.3
1 unit	42.6	50.3	61.8	47.3	48.9	45.2
2 units	37.6	18.0	23.0	30.3	31.2	31.7
3 units	5.3	1.9	4.1	4.2	4.2	4.9
More than 3 units	1.1	0.3	0.6	0.8	1.1	1.8
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding

Table 134 summarizes the distribution of fireplace and heater stoves by dwelling type.

**Table 134: Fireplaces and Heater Stoves by Dwelling Type**  
Any Type, Any Fuel

	Single Family Detached	Semi-Detached	Row / Town-house	Apt / Apt-Style Condo	Mobile & Other
<i>Unweighted base</i>	3836	218	358	138	242
None	15.1	23.3	18.9	22.3	58.4
1 unit	44.3	57.0	67.8	72.9	38.7
2 units	34.5	19.2	12.7	4.8	2.9
3 units	5.1	0.6	0.6	--	--
More than 3 units	1.0	--	--	--	--
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding

The data show that SFDs and semi-detached dwellings are more likely than other dwelling types to have a second fireplace or heater stove (34% and 19%, respectively). By comparison, the incidence of more than

one fireplace or heater stove is lower in row / townhouses (13%), apts/condos (5%), and mobile homes (3%).

### 7.1.2 Gas Fireplaces and Heater Stoves

Penetration and saturation rates for fireplaces and heater stoves that use natural gas or piped propane (gas) are summarized in Table 135. The data show penetrations of all types of gas fireplaces and heater stoves statistically unchanged from 2017 (i.e., differences are not statistically significant). Decorative gas fireplaces are present in 18% of dwellings. Heater-type fireplaces are present in 46% of dwellings and 5% of dwellings have free-standing models. Regionally, penetration of decorative models is highest in the Lower Mainland (21%), followed by the Interior and Vancouver Island (14% each). Penetration of gas heater-type models is highest on Vancouver Island (62%).

**Table 135: Gas Fireplace and Heater Stove Details by Region**  
**Base: All Households With or Without a Fireplace / Heater Stove**

Fireplace / heater stove type	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3384	2167
<b>Gas (decorative)</b>							
Penetration (%)	20.6	13.5	14.1	17.8	18.0	19.0	18.3
Saturation	0.27	0.15	0.16	0.22	0.22	0.24	0.35
<b>Gas (heater type)</b>							
Penetration (%)	48.9	32.6	62.2	46.2	47.1	43.2	42.5
Saturation	0.67	0.40	0.77	0.61	0.61	0.56	0.61
<b>Gas (free standing)</b>							
Penetration (%)	4.7	5.2	9.3	5.4	5.3	6.8	6.0
Saturation	0.06	0.06	0.10	0.06	0.06	0.08	0.08

Decorative gas fireplaces are most common in row /townhouses (28%) and semi-detached (25%) dwellings. Heater-type gas fireplaces are most common in apartments / condominiums (51%), row/townhouses (49%), and SFDs (48%) (Table 136).

**Table 136: Gas Fireplace and Heater Stove Details by Dwelling Type**  
**Base: All Households With or Without a Fireplace / Heater Stove**

Fireplace / heater stove type	Single Family Detached	Semi-Detached	Row / Town-house	Apt / Apt-Style Condo	Mobile & Other
<i>Unweighted base</i>	3836	218	358	138	242
<b>Gas (decorative)</b>					
Penetration (%)	17.0	24.7	27.6	16.4	5.2
Saturation	0.22	0.32	0.30	0.16	0.06
<b>Gas (heater type)</b>					
Penetration (%)	47.5	41.0	48.7	51.0	46.2
Saturation	0.65	0.47	0.54	0.55	0.61
<b>Gas (free standing)</b>					
Penetration (%)	6.1	1.8	1.3	1.9	6.8
Saturation	0.07	0.02	0.01	0.02	0.08

## Fireplaces and Heater Stoves

Table 137 presents penetration and saturation rates of gas fireplaces and heater stove types by dwelling vintage. The data show the penetration of decorative models peaked for dwellings constructed between 1986 and 1995 (28%). Gas heater-type fireplaces are more common in dwellings constructed between 1996 and 2015. These data reflect trends in new construction and fireplace retrofits for existing dwellings.

**Table 137: Gas Fireplace and Heater Stove Details by Dwelling Vintage**  
**Base: All Households With or Without a Fireplace / Heater Stove**

Fireplace / heater stove type	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 - 2005	2006 - 2015	2016 or Newer	Age Unknown
<i>Unweighted base</i>	530	1121	729	842	770	431	251	114
<b>Gas (decorative)</b>								
Penetration (%)	9.5	11.4	14.2	28.4	25.3	16.9	19.0	13.6
Saturation	0.10	0.14	0.17	0.39	0.34	0.19	0.20	0.15
<b>Gas (heater type)</b>								
Penetration (%)	29.2	40.4	42.5	52.0	61.1	63.2	43.3	19.8
Saturation	0.36	0.54	0.56	0.70	0.86	0.80	0.50	0.24
<b>Gas (free standing)</b>								
Penetration (%)	6.6	5.5	7.3	7.1	4.1	1.2	0.8	6.2
Saturation	0.07	0.06	0.08	0.09	0.05	0.02	0.01	0.06

### 7.1.3 Wood and Electric Fireplaces

Penetration and saturation rates for fireplaces and heater stoves that use either wood or electricity are summarized in Table 138. Wood-burning fireplaces are present in 17% of homes, down from one-quarter (24%) of homes in 2008. The decline is attributed to the combination of retrofits (wood fireplaces converted to gas or electric units), decreased popularity of wood-burning fireplaces in new construction, and changes in municipal and provincial regulations restricting the use/installation of wood-burning fireplaces. Penetration of wood-burning fireplaces is highest in the Lower Mainland (22%) and lowest on Vancouver Island (9%). Penetration rates are lower for electric fireplaces (7%) and wood-burning stoves (3%).

**Table 138: Fireplace and Heater Stove Details by Region – Wood and Electric**  
**Base: All Households With or Without a Fireplace / Heater Stove**

Fireplace / Heater Stove Type	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3384	2167
<b>Electric</b>							
Penetration (%)	6.4	8.9	4.3	6.8	6.6	8.1	5.6
Saturation	0.08	0.10	0.05	0.08	0.07	0.10	0.08
<b>Wood burning fireplace</b>							
Penetration (%)	21.6	11.3	9.0	17.1	19.6	22.2	24.0
Saturation	0.27	0.13	0.10	0.21	0.25	0.28	0.33
<b>Wood burning stove</b>							
Penetration (%)	1.3	7.3	3.4	3.2	3.5	5.0	4.7
Saturation	0.01	0.07	0.03	0.03	0.07	0.05	0.06

Dwelling type-specific data on fireplaces and heater stoves using fuels other than natural gas are provided in Table 139. Wood-burning fireplaces are most common in SFDs (20%) and least common in apts/condos and mobile dwellings (1% or less). Penetration of electric fireplaces is highest in mobile homes (11%). Wood-burning stoves are present in 4% of SFDs and 3% of mobile homes.

**Table 139: Fireplace and Heater Stove Details by Dwelling Type – Wood and Electric**  
**Base: All Households With or Without a Fireplace / Heater Stove**

Fireplace / Heater Stove Type	Single Family Detached	Semi-Detached	Row / Town-house	Apt / Apt-Style Condo	Mobile & Other
<i>Unweighted base</i>	3836	218	358	138	242
<b>Electric</b>					
Penetration (%)	6.7	7.2	5.7	7.9	10.8
Saturation	0.08	0.07	0.06	0.08	0.12
<b>Wood burning fireplace</b>					
Penetration (%)	20.1	7.6	3.5	--	1.4
Saturation	0.25	0.08	0.04	--	0.01
<b>Wood burning stove</b>					
Penetration (%)	3.7	0.3	0.6	--	3.2
Saturation	0.04	0.00	0.01	--	0.03

Data on the penetration and saturation of fireplaces and heater stoves using wood or electricity by dwelling vintage are provided in Table 140. Consistent with past REUS surveys, homes constructed in the last two decades are significantly less likely to have a wood-burning fireplace (less than 2% since the mid-1990s) and much more likely to have an electric fireplace (18% of homes constructed since 2015). In contrast to wood-burning fireplaces which tend to be built-in at the time of construction, electric fireplaces and, to a lesser extent, wood-burning stoves, can be added to a dwelling any time after construction.

**Table 140: Fireplace and Heater Stove Details by Dwelling Vintage – Wood and Electric**  
**Base: All Households With or Without a Fireplace / Heater Stove**

Fireplace / Heater Stove Type	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 - 2005	2006 - 2015	2016 or Newer	Age Unknown
<i>Unweighted base</i>	530	1121	729	842	770	431	251	114
<b>Electric</b>								
Penetration (%)	4.3	6.3	5.9	6.6	6.3	8.9	17.6	5.9
Saturation	0.05	0.08	0.07	0.08	0.08	0.10	0.21	0.08
<b>Wood burning fireplace</b>								
Penetration (%)	26.7	26.6	27.6	12.5	1.9	1.3	1.8	26.2
Saturation	0.29	0.35	0.33	0.15	0.02	0.01	0.02	0.35
<b>Wood burning stove</b>								
Penetration (%)	3.2	4.5	5.2	2.2	1.5	1.4	1.5	2.9
Saturation	0.03	0.05	0.05	0.03	0.02	0.02	0.02	0.03

## 7.2 Gas Fireplaces - Ages and Features

Respondents with gas fireplaces were asked to indicate the age of their fireplace(s), their design (fixed glass front, glass doors that open, open hearth), whether any have a standing pilot light, and whether they can

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be operated with a remote control. These characteristics help define the relative efficiency of gas fireplaces.

Data on the age of the first gas fireplace in the home are summarized in Table 141. The average (mean) age of gas fireplaces for FEI customers is 17 years, compared to 10 years in 2017 and 13 years in 2012. Regionally, gas fireplaces in the Lower Mainland are older, on average, than those in the Interior and on Vancouver Island.

**Table 141: Average Age (Years) of First Gas Fireplace**

Age of first gas fireplace (years)	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI
<i>Unweighted base</i>	762	844	729	2335	4760	1650
Mean	17.8	16.5	15.5	17.2	10.2	13.0
Standard deviation	14.2	7.6	6.6	10.1	10.3	7.4

The average ages of second gas fireplaces (if present) are provided in Table 142. Samples are smaller due to the lower incidence of homes with a second gas fireplace or heater stove, so caution is advised when making regional comparisons. Overall, the average age of the second gas fireplace is 18 years.

**Table 142: Average Age (Years) of Second Gas Fireplace**

Age of second gas fireplace (years)	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI
<i>Unweighted base</i> <sup>1</sup>	318	187	177	682	744	438
Mean	18.7	16.8	17.1	18.3	15.6	14.0
Standard deviation	13.5	7.1	7.3	10.6	9.1	8.1

<sup>1</sup> Caution is advised in interpreting data for samples of less than 50. Results are directional only.

Of the three possible designs for gas fireplaces (fixed glass front, glass doors that open, open hearth), eight-in-ten (79%) gas fireplaces have a fixed glass front, significantly higher than gas fireplaces with glass doors that open (15%), and open hearth models (6%) (Table 143). Of note, 21% are equipped with a remote control and 45% have a standing pilot light. Remote controls are associated with newer, more energy-efficient fireplace models. Regionally, the incidence of models with remote controls is highest on Vancouver Island (30%) and lowest in the Lower Mainland (19%).

**Table 143: Gas Fireplace Characteristics by Region  
Percent of All Gas Fireplaces<sup>1</sup>**

Gas Fireplace Features	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI
Fixed glass front	75.6	83.5	89.5	79.2	74.9	76.2
Glass doors that open	16.5	14.1	9.4	15.0	17.5	15.5
No glass (open hearth)	7.9	2.4	1.1	5.8	7.6	8.2
Remote control	18.8	20.3	29.7	20.7	16.5	n/a
Standing pilot light	41.9	48.4	54.8	45.1	43.1	n/a

<sup>1</sup> Includes homes with more than one gas fireplace

7.3 Fireplace and Heater Stoves – Operating Behaviours

7.3.1 Hours-of-Operation

Average per household hours of use (weekly) for fireplaces and heater stoves (all types, all fuels) are summarized in Table 144. Usage is highest during the fall and winter seasons (average of 16 and 18 hours per week per household with a fireplace heater stove, on average, respectively) and lowest during the spring and summer (5 and <1 hours per week, respectively). Overall, respondents whose dwelling has a fireplace or heater stove operate their units an average of 504 hours per year. Regionally, usage is highest on Vancouver Island (755 hours per year) and lowest in the Lower Mainland (425 hours per year).

**Table 144: Weekly Hours of Fireplace / Heater Stove Operation by Region**  
Average per Household with Fireplace / Heater Stove

Season <sup>1</sup>	LM	INT	VI	2022 FEI
Summer	0.7	0.4	0.8	0.6
Fall	13.1	17.4	22.4	15.5
Winter	15.0	21.6	26.4	18.2
Spring	3.9	3.7	8.5	4.5
<b>Annual Average Hours <sup>2</sup></b>	<b>425</b>	<b>560</b>	<b>755</b>	<b>504</b>

<sup>1</sup> Assumes each season is 13 weeks long.

<sup>2</sup> Average hours of operation per year for all fireplaces and heater stoves in the home

Examining hours of use data for only those households with a single fireplace or heater stove (47% of all homes with a fireplace or heater stove) allows a more detailed analysis of how different fireplace and heater type units are used.<sup>27</sup> For example, Table 145 shows that annual usage is highest for fireplace and heater stoves whose design, by default, allows them to provide significant heat in addition to providing ambiance. Gas free-standing heater stoves and wood-burning stoves have the highest use, averaging 978 hours per year and 1,362 hours per year respectively. Gas (heater type) fireplaces are used 566 hours per year, 90% more than decorative gas fireplaces (298 hours per year). Of the six types, wood-burning fireplaces, arguably the least efficient fireplace type, are used the least, averaging 166 hours annually.

**Table 145: Average Weekly Hours of Fireplace / Heater Stove Operation by Fireplace Type**  
Dwellings with Only One Fireplace or Heater Stove

Fireplace type <sup>1</sup>	Average Weekly Hours per Season				Annual Average Hours <sup>2</sup>
	Summer	Fall	Winter	Spring	
Gas (decorative)	0.4	9.2	10.9	2.4	298
Gas (heater type)	0.9	16.9	20.1	5.6	566
Gas (free standing)	0.4	30.4	34.8	9.6	978
Electric	0.9	9.0	11.1	3.5	319
Wood burning fireplace	0.1	5.7	6.2	0.8	166
Wood burning stove	0.6	42.7	52.3	9.2	1362

<sup>1</sup> Dwellings with only one of any fireplace / heater stove type (n=3042)

<sup>27</sup> Respondents with multiple fireplaces and heater stoves were not asked to provide hours of use for each fireplace / heater stove.

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<sup>2</sup> Annual hours of operation

## 7.3.2 Contribution to Space Heating – All Fireplace / Heater Stove Types

Respondents with a fireplace or heater stove were asked to estimate the contribution of their fireplace or heater stove to their home’s space heating requirements. Consistent with findings from the 2017 and 2012 surveys, three-in-ten (31%) respondents with a fireplace or heater stove indicated it contributes as much as 10% of their home’s space heating needs (Table 146). Another 17% indicated it met up to one-quarter (25%) of their home’s space heating requirements. Seven percent (7%) suggested it was as high as 50% and 7% suggested it was between 75% and 100% of their dwelling’s space heating requirements. Slightly less than one-third (32%) of respondents indicated their fireplace unit(s) do not contribute to their home’s space heating requirements.

**Table 146: Fireplace and Heater Stove Contribution to Space Heating by Region (%)**

Contribution to space heating	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI
<i>Unweighted base</i>	1237	1590	992	3819	4760	2673
0% (none)	36.7	30.4	17.2	32.4	35.2	33.2
Up to 10%	32.3	31.0	26.3	31.2	27.9	30.9
Up to 25%	15.8	16.0	20.5	16.5	16.8	16.1
Up to 50%	5.3	7.9	14.2	7.2	8.5	7.4
Up to 75%	2.3	4.2	10.8	4.0	4.3	4.1
Up to 100%	1.4	4.3	5.7	2.7	2.9	3.2
Don’t know	6.1	6.3	5.2	6.0	4.3	5.2
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding

Regional differences are apparent and consistent with other data on fireplaces and heater stoves collected in the 2022 REUS. For example, Vancouver Island households are most likely to indicate their units contribute to their home’s space heating load (i.e., smallest percentage of homes indicating the fireplace did not contribute at all *and* the largest percentage indicating contributions in excess of 10%). Lower Mainland customers were the most likely to indicate their fireplace did not contribute to space heating (37%), consistent with the higher penetration of seldom-used wood-burning fireplaces. Six percent (6%) of respondents were unsure how much their fireplaces/heater stoves contributed to their home’s space heating requirements.

## 7.3.3 Contribution to Space Heating – By Fireplace / Heater Stove Type

Table 147 explores the relationship between fireplace type and their role in providing space heating. These data are for the subset of homes with a single fireplace or heater stove.<sup>28</sup> Of note, wood-burning fireplaces and decorative gas fireplaces (units that are typically associated with providing ambiance rather than radiant heat) are the least likely to contribute to a home’s space heating load. In contrast, gas heater-type

<sup>28</sup> Respondents with more than one fireplace and/or heater stove were not required to specify the contribution to space heating load for individual fireplaces or heater stove types.

fireplaces, gas free-standing heater stoves, and wood-burning stoves (units designed to provide radiant heat) are much more likely to contribute to the home’s space heating requirements.

**Table 147: Contribution to Space Heating by Fireplace Type (%)**

Contribution to space heating	Gas (Decorative)	Gas (Heater Type)	Gas (Free Standing)	Electric	Wood burning fireplace	Wood burning stove
<i>Unweighted base</i> <sup>1</sup>	454	1218	135	167	313	125
0% (none)	53.3	20.0	14.2	42.1	60.1	10.0
Up to 10%	25.1	34.1	30.0	41.9	23.4	15.2
Up to 25%	10.8	22.2	18.7	5.6	9.1	14.1
Up to 50%	2.3	9.0	14.2	0.8	2.9	21.8
Up to 75%	1.3	5.2	9.5	0.0	0.8	20.0
Up to 100%	0.7	3.3	6.9	0.4	0.3	14.4
Don't know	6.5	6.3	6.6	9.1	3.3	4.5
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding

### 7.3.4 Contribution to Space Heating – By Dwelling Type

Data on the contribution of fireplaces and heater stoves to space heating requirements were explored by dwelling type. These data are summarized in Table 148. They show that respondents living in apts/condos are much more likely than those in other dwelling types to use their fireplace to heat their home. For example, 36% of respondents in apts/condos indicated their fireplace/heater stove contributes 50% or more of their unit’s space heating requirements. Fireplaces and heater stoves also play a significant role in space heating for mobile homes (24% use them for 50% or more of the space heating requirements).

**Table 148: Fireplace and Heater Stove Contribution to Space Heating by Dwelling Type (%)**

Share of space heating load	Single Family Detached	Semi-Detached	Row / Town-house	Apt / Apt-Style Condo	Mobile & Other
<i>Unweighted base</i>	3172	165	282	106	94
0%	32.6	34.1	34.2	18.6	23.2
Up to 10%	32.0	30.2	28.0	17.2	24.0
Up to 25%	16.7	14.6	15.6	20.5	15.9
Up to 50%	7.1	2.4	7.0	16.4	9.8
Up to 75%	3.8	6.4	3.3	7.8	8.2
Up to 100%	2.3	4.5	3.1	11.8	6.0
Don't know	5.5	7.7	8.8	7.8	12.8
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding

## 7.4 Fireplace and Heater Stove Installations

Respondents with a fireplace or heater stove were asked whether one or more of their units had been installed in the last five years. Those that had were then asked what type of unit they installed. The results, summarized in Table 149, show that one-in-ten (10%) FEI residential customers installed a fireplace or

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heater stove unit during the last five years. Regional differences in installation rates are not statistically significant at the 95% confidence level.

**Table 149: Fireplace and Heater Stove Installations – Last Five Years by Region (%)**

Fireplace installations last five years	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	1237	1590	992	3819
Installed at least one (%) <sup>1</sup>	9.2	10.3	10.9	9.7
Installations (% Distribution): <sup>2</sup>				
Gas fireplace or heater stove	90.6	68.5	87.4	84.4
Wood heater stove	1.7	13.8	6.0	5.5
Electric fireplace	6.9	15.5	6.7	9.0
Don't know	0.9	2.2	--	1.1
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

<sup>1</sup> Base: all dwellings with or without a fireplace or heater stove

<sup>2</sup> Base: respondents who installed a fireplace or heater stove in the last five years

Totals may not sum due to rounding

Of the fireplace or heater stoves installed, 84% were gas fireplaces or gas heater stoves, 9% were electric fireplaces, and the remainder (6%) were wood heater stoves. Regionally, installations of gas fireplaces or heater stoves were highest in the Lower Mainland and Vancouver Island (91% and 87% of fireplaces and heater stoves installed respectively). Respondents in the Interior were significantly more likely than respondents in other regions to install a wood stove or electric fireplace in the last five years.

### 7.4.1 Gas Fireplace Installations – Additional Detail

Of the *gas* fireplaces or heater stoves installed in the last five years, nearly half (47%) replaced an existing gas fireplace or heater stove, one-quarter (26%) replaced a wood fireplace or heater stove, and a very small percentage (2%) replaced an electric fireplace (Table 150). One quarter (24%) of respondents indicated the gas fireplace or heater stove was a new installation (did not replace an existing fireplace or heater stove).

**Table 150: What Replaced by New Gas Fireplace and Heater Stove by Region (%)**

#### Gas Fireplace and Heater Stove Installations Only

What did the new gas fireplace or heater stove replace?	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	106	124	104	334
Replaced wood fireplace or heater stove	27.4	22.6	26.9	26.3
Replaced gas fireplace or heater stove	48.1	36.3	53.0	46.5
Replaced electric fireplace	1.9	1.7	2.0	1.8
Nothing - new installation	20.7	38.8	18.3	24.1
Don't know	1.9	0.8	--	1.3
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding

7.4.2 Gas Fireplace Purchase Intentions

Three percent (3%) of REUS respondents indicated they intend to purchase a gas fireplace (insert, zero clearance or free standing) in the next two years (Table 151). One-in-ten (9%) were unsure whether they would purchase a gas fireplace.

**Table 151: Gas Fireplace Purchase Intentions by Region (%)**

Planning to purchase gas fireplace next two years?	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	1428	2257	1107	4792
Yes	3.0	3.0	4.2	3.2
No	87.4	89.4	85.3	87.7
Don't know	9.6	7.6	10.5	9.2
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding

Of those intending to purchase a new gas fireplace in the next two years, almost two-thirds (63%) indicated it would be used to replace an existing gas fireplace and one-in-five (19%) indicated it would replace a wood fireplace or heater stove (Table 152). A small percentage (<1%) indicated it would replace an electric fireplace. Fourteen percent (14%) indicated the gas fireplace would be a new installation (would not be used to replace an existing fireplace).

**Table 152: Intended Purpose of New Gas Fireplace Purchase by Region (%)**

Purpose of new gas fireplace purchase	LM	INT	VI	2022 FEI
<i>Unweighted base</i> <sup>1</sup>	43	68	47	158
Replace a wood fireplace or heater stove	16.2	27.9	16.9	19.4
Replace a gas fireplace	69.8	47.0	66.2	63.2
Replace an electric fireplace	--	3.0	--	0.8
New installation	9.3	20.6	16.9	13.6
Don't know	4.7	1.5	--	3.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

<sup>1</sup> Caution is advised in interpreting data for samples of less than 50. Results are directional only.  
Totals may not sum due to rounding



# 8 APPLIANCES

This section summarizes penetration and saturation rates of a comprehensive list of cooking, refrigeration, cleaning, space heating, and space cooling appliances. The penetration rate for an appliance indicates the proportion of residential dwellings that have at least one. The saturation rate for an appliance indicates the number, on average, present in a residential dwelling. Multiplying an appliance’s saturation rate by the number of dwellings in the residential customer base generates an estimate of the total number of that appliance for that base.

## 8.1 Cooking Appliances

Penetration and saturation rates for gas and electric cooking appliances are summarized in Table 153 and Table 154.

**Table 153: Penetration and Saturation of Cooking Appliances by Region – Part I of II**

Cooking Appliances	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3441	2213
<b>Electric range (cook top &amp; oven)</b>							
Penetration (%)	61.7	69.0	57.5	63.1	67.6	69.7	75.5
Saturation	0.73	0.74	0.63	0.72	0.78	0.78	0.86
<b>Gas range (cook top &amp; oven)</b>							
Penetration (%)	26.8	18.8	27.7	24.7	22.2	19.3	17.6
Saturation	0.29	0.19	0.28	0.26	0.24	0.21	0.19
<b>Dual fuel range (gas cook top, electric oven)</b>							
Penetration (%)	8.8	6.0	10.2	8.2	6.0	4.5	n/a
Saturation	0.09	0.06	0.11	0.09	0.06	0.05	n/a
<b>Electric cook top</b>							
Penetration (%)	15.1	13.2	12.3	14.2	11.3	9.5	12.7
Saturation	0.18	0.14	0.14	0.16	0.13	0.10	0.13
<b>Gas cook top</b>							
Penetration (%)	13.7	9.6	11.7	12.3	8.8	6.4	9.6
Saturation	0.15	0.10	0.12	0.13	0.10	0.07	0.11
<b>Induction range</b>							
Penetration (%)	6.0	6.6	7.5	6.3	n/a	n/a	n/a
Saturation	0.06	0.07	0.08	0.07	n/a	n/a	n/a
<b>Electric wall oven</b>							
Penetration (%)	18.3	12.9	13.7	16.2	14.2	13.3	13.5
Saturation	0.21	0.14	0.15	0.19	0.16	0.15	0.16
<b>Gas wall oven</b>							
Penetration (%)	2.1	1.6	1.6	1.9	1.6	0.9	2.6
Saturation	0.02	0.02	0.02	0.02	0.02	0.01	0.04
<b>Microwave oven</b>							
Penetration (%)	90.1	91.3	90.1	90.4	82.3	82.4	86.4
Saturation	1.05	1.00	1.03	1.03	0.94	0.92	0.98
<b>Toaster oven</b>							
Penetration (%)	51.4	39.2	37.4	46.2	n/a	n/a	n/a
Saturation	0.57	0.41	0.40	0.50	n/a	n/a	n/a

n/a = appliance not queried

**Table 154: Penetration and Saturation of Cooking Appliances by Region – Part II of II**

Cooking Appliances	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3441	2213
<b>Gas barbeque (piped gas)</b>							
Penetration (%)	22.5	26.5	32.7	25.0	22.7	19.6	15.5
Saturation	0.23	0.27	0.33	0.25	0.23	0.20	0.16
<b>Gas barbeque (bottled gas)</b>							
Penetration (%)	48.9	51.5	45.4	49.2	44.3	47.0	48.8
Saturation	0.51	0.53	0.47	0.51	0.47	0.49	0.51
<b>Electric barbeque</b>							
Penetration (%)	1.9	2.4	1.7	2.0	n/a	n/a	n/a
Saturation	0.02	0.03	0.02	0.02	n/a	n/a	n/a

n/a = appliance not queried

The data for 2022 confirm several trends identified in previous residential end-use surveys conducted by FortisBC. For example, while traditional electric ranges (e.g., electric cook top and oven) continue to dominate (present in 63% of dwellings in 2022), their share is down 12 percentage points since 2008. Gas ranges increased seven percentage points during the 2008-22 period (from 18% to 25%). Increases in penetration rates have also been observed for dual fuel ranges, gas cook tops, and piped gas barbeques. Induction ranges, queried for the first time in 2022, are present in 6% of dwellings.

Trends in the popularity of gas cooking appliances and induction ranges are apparent when data on the penetration and saturation of cooking appliances are explored by dwelling vintage (Table 155 and Table 156).

**Table 155: Penetration and Saturation of Cooking Appliances by Dwelling Vintage – Part I of II**

Cooking Appliances	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 - 2005	2006 - 2015	2016 or Newer	Age Un- known
<i>Unweighted base</i>	530	1121	729	842	770	431	251	114
<b>Electric range (cook top &amp; oven)</b>								
Penetration (%)	56.3	70.3	68.4	64.4	59.3	55.2	42.9	73.7
Saturation	0.64	0.80	0.75	0.74	0.69	0.64	0.49	0.81
<b>Gas range (cook top &amp; oven)</b>								
Penetration (%)	34.9	20.8	16.2	17.6	29.1	32.0	51.0	20.9
Saturation	0.39	0.22	0.17	0.19	0.32	0.32	0.54	0.23
<b>Dual fuel range (gas cook top, electric oven)</b>								
Penetration (%)	8.3	7.9	5.4	9.0	6.4	14.3	14.6	1.0
Saturation	0.08	0.08	0.05	0.10	0.07	0.16	0.15	0.01
<b>Electric cook top</b>								
Penetration (%)	11.7	14.1	16.5	17.8	11.9	10.4	11.1	18.9
Saturation	0.14	0.15	0.17	0.20	0.16	0.13	0.12	0.21
<b>Gas cook top</b>								
Penetration (%)	11.3	8.4	7.3	12.6	15.6	16.5	30.3	14.6
Saturation	0.12	0.09	0.07	0.13	0.18	0.18	0.31	0.22
<b>Induction range</b>								
Penetration (%)	6.4	4.1	7.8	5.6	6.5	8.4	11.9	5.5
Saturation	0.07	0.05	0.08	0.06	0.07	0.09	0.13	0.05

**Table 156: Penetration and Saturation of Cooking Appliances by Dwelling Vintage – Part II of II**

Cooking Appliances	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 - 2005	2006 - 2015	2016 or Newer	Age Unknown
<i>Unweighted base</i>	530	1121	729	842	770	431	251	114
<b>Electric wall oven</b>								
Penetration (%)	13.6	12.9	15.6	20.8	16.0	17.3	20.3	18.0
Saturation	0.15	0.15	0.17	0.24	0.19	0.20	0.24	0.19
<b>Gas wall oven</b>								
Penetration (%)	1.5	1.3	0.4	1.4	2.7	1.6	9.6	3.5
Saturation	0.02	0.02	0.00*	0.01	0.03	0.03	0.10	0.03
<b>Microwave oven</b>								
Penetration (%)	84.6	91.0	90.7	91.3	92.5	94.4	85.1	86.9
Saturation	1.00	1.03	0.99	1.04	1.07	1.12	0.99	0.95
<b>Toaster oven</b>								
Penetration (%)	42.6	44.2	47.4	48.4	50.3	45.3	37.6	52.5
Saturation	0.47	0.47	0.50	0.53	0.56	0.52	0.43	0.53
<b>Gas barbeque (piped gas)</b>								
Penetration (%)	15.4	19.2	17.8	25.1	32.0	45.5	49.9	11.2
Saturation	0.15	0.20	0.18	0.25	0.33	0.47	0.52	0.11
<b>Gas barbeque (bottled gas)</b>								
Penetration (%)	54.7	53.4	56.8	48.3	45.3	33.9	37.1	37.5
Saturation	0.56	0.55	0.59	0.49	0.47	0.37	0.39	0.38
<b>Electric barbeque</b>								
Penetration (%)	2.2	2.1	1.7	1.1	2.7	3.3	2.5	1.0
Saturation	0.02	0.02	0.02	0.01	0.03	0.04	0.03	0.01

\* Value less than 0.01

These data show the movement away from electric to gas cooking appliances is most apparent for homes constructed since 2005. These newer homes are much more likely than their older counterparts to have a gas range (gas cook top and gas oven), gas cook top, or a dual fuel range (gas cook top and electric oven). Newer homes are also much more likely to have a piped natural gas barbeque (e.g., 50% of homes constructed since 2015). One exception to the movement towards gas cooking appliances is the growing popularity of electric induction ranges, present in 12% of dwellings constructed since 2015.

The average ages of select cooking appliances (main unit in cases of more than one appliance) are provided in Table 157.<sup>29</sup> The average age of the cooking appliance stock reflects, in part, the rate of turnover in the stock (influenced by the average lifespan of the appliance) and the popularity of the appliance in renovations and new construction. As an example, the recent popularity in induction ranges is reflected by the young age of the stock (average of 4.6 years for induction ranges versus 11 years for electric ranges).

<sup>29</sup> FortisBC's 2022 REUS did not collect age data for microwave ovens, toaster ovens, or BBQs (piped gas, propane, or electricity).

# Appliances

**Table 157: Average Age (Years) of Cooking Appliances by Region  
Main Appliance Only**

Cooking Appliances <sup>1</sup>	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
Electric range (cook top & oven)	11.3	10.4	11.0	11.0	10.1	10.4	9.8
Gas range (cook top & oven)	10.3	8.3	8.1	9.5	8.1	8.7	8.5
Dual fuel range (gas cook top, electric oven)	9.4	8.0	9.1	9.1	6.0	5.6	n/a
Electric cook top	9.8	8.8	10.1	9.6	8.4	11.6	9.2
Gas cook top	11.1	8.7	9.7	10.4	8.0	9.3	7.0
Induction range	4.4	5.1	4.6	4.6	n/a	n/a	n/a
Electric wall oven	11.9	10.4	11.4	11.5	9.6	10.8	9.7
Gas wall oven	8.6	6.6	9.6	8.2	3.6	7.8	6.4

<sup>1</sup> Age data were not collected for microwave ovens, toaster ovens, or BBQs (piped gas, propane, or electric)

n/a = appliance not queried

## 8.2 Refrigerators and Freezers

Penetration and saturation rates for refrigerators and freezers are presented in Table 158. The 2022 REUS queried the presence and quantity of refrigerators with manual or automatic defrost, and for the first time, compact bar fridges / wine coolers. Two types of stand-alone freezers – chest and upright – were queried.

**Table 158: Penetration and Saturation of Refrigerators and Freezers by Region**

Refrigerators & Freezers	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3441	2213
<b>Refrigerator – manual defrost</b>							
Penetration (%)	18.7	18.1	15.7	18.1	15.7	15.0	n/a
Saturation	0.26	0.23	0.20	0.24	0.20	0.19	n/a
<b>Refrigerator – auto defrost</b>							
Penetration (%)	85.7	86.7	89.2	86.4	87.6	87.9	n/a
Saturation	1.25	1.14	1.21	1.21	1.18	1.13	n/a
<b>Compact bar fridge / wine cooler</b>							
Penetration (%)	27.1	28.8	24.5	27.2	20.6 <sup>1</sup>	n/a	n/a
Saturation	0.31	0.33	0.28	0.31	0.23	n/a	n/a
<b>Refrigerator – any type</b>							
Penetration (%) <sup>2</sup>	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Saturation	1.82	1.70	1.69	1.77	1.61	1.32 <sup>3</sup>	1.34 <sup>3</sup>
<b>Stand-alone freezer – upright</b>							
Penetration (%)	31.9	32.7	33.2	32.3	29.1	22.9	n/a
Saturation	0.34	0.35	0.34	0.34	0.31	0.24	n/a
<b>Stand-alone freezer – chest style</b>							
Penetration (%)	43.6	51.9	47.5	46.4	43.6	50.3	n/a
Saturation	0.48	0.60	0.53	0.52	0.49	0.57	n/a
<b>Stand-alone freezer – any type</b>							
Penetration (%)	69.8	76.7	74.6	72.3	72.6	73.2	66.7
Saturation	0.82	0.95	0.87	0.86	0.80	0.81	0.76

n/a = appliance not queried

<sup>1</sup> Category description in 2017 did not include wine coolers

<sup>2</sup> 100% is the default penetration

<sup>3</sup> Excludes compact bar fridges

Consistent with past surveys, manual defrost refrigerators are considerably less common than auto-defrost models and chest-style freezers are more common than upright models. Compact bar fridges / wine coolers are present in somewhat more than one-quarter (27%) of dwellings.

The average ages of refrigerators and stand-alone freezers (main unit only) are summarized by region in Table 159.

**Table 159: Average Age (Years) of Refrigerators and Freezers by Region  
Main Appliance Only**

Refrigerators & Freezers	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI
Refrigerator – manual defrost	11.2	12.2	12.3	11.6	10.6	12.9
Refrigerator – auto defrost	9.7	8.7	9.1	9.3	8.7	8.7
Compact bar fridge / wine cooler	8.3	7.4	8.0	8.0	6.9 <sup>1</sup>	n/a
Stand-alone freezer – upright	9.8	8.4	9.1	9.3	8.8	9.1
Stand-alone freezer – chest style	15.1	14.3	13.1	14.6	14.5	13.9

n/a = appliance not queried

<sup>1</sup> Category description in 2017 did not include wine coolers

### 8.3 Cleaning Appliances

Cleaning appliances include automatic dishwashers, clothes washers (top or front loading), and clothes dryers (gas, electric, or heat pump). Penetration and saturation rates for these appliances are summarized in Table 160.

**Table 160: Penetration and Saturation of Cleaning Appliances by Region**

Cleaning Appliances	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3441	2213
<b>Dishwasher</b>							
Penetration (%)	88.7	84.7	91.9	88.0	86.9	86.2	81.9
Saturation	0.98	0.89	0.98	0.95	0.95	0.91	0.87
<b>Clothes washer - top loading</b>							
Penetration (%)	45.7	48.7	44.5	46.4	49.9	56.6	70.7
Saturation	0.48	0.50	0.46	0.49	0.53	0.59	0.74
<b>Clothes washer - front loading</b>							
Penetration (%)	57.2	52.4	57.2	55.9	50.0	41.7	27.4
Saturation	0.63	0.55	0.61	0.60	0.53	0.43	0.30
<b>Electric clothes dryer</b>							
Penetration (%)	92.2	92.8	90.2	92.1	89.7	88.3	87.1
Saturation	1.01	0.97	0.96	0.99	0.96	0.93	0.91
<b>Gas clothes dryer</b>							
Penetration (%)	5.1	4.3	7.4	5.2	5.1	4.7	5.9
Saturation	0.06	0.04	0.08	0.06	0.05	0.05	0.07
<b>Heat pump clothes dryer</b>							
Penetration (%)	0.8	0.2	0.5	0.6	n/a	n/a	n/a
Saturation	0.01	0.00*	0.00*	0.01	n/a	n/a	n/a

n/a = appliance not queried

\* Value less than 0.01

## Appliances

More than half (56%) of homes in 2022 had a front-loading (horizontal axis) clothes washer compared to one-quarter (27%) in 2008. Top-loading clothes washers have seen their share of the FEI residential customer base decline commensurately over the same period.<sup>30</sup> The proportion of dwellings with a gas clothes dryer (5%) is unchanged from previous survey years. Heat pump clothes dryers, queried for the first time in the 2022 REUS, have a penetration of less than 1%.

The average ages of cleaning appliances are summarized in Table 161. The popularity of front-loading clothes washers is apparent as they are considerably newer than their top-loading counterparts (7.5 years on average versus 10.8 years for top-loading machines).

**Table 161: Average Age (Years) of Cleaning Appliances by Region**

Cleaning Appliances	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
Dishwasher	8.8	7.9	8.5	8.5	8.2	8.2	7.7
Clothes washer - top loading	11.1	10.3	10.6	10.8	10.4	10.5	9.6
Clothes washer - front loading	7.4	7.4	8.1	7.5	6.4	4.9	4.7
Electric clothes dryer	10.1	9.3	10.0	9.8	9.0	8.7	8.8
Gas clothes dryer	10.3	12.5	10.6	10.8	7.4	12.0	9.2
Heat pump clothes dryer	5.5	2.8	1.6	4.9	n/a	n/a	n/a

### 8.4 Make Up Air Units

Table 162 presents penetration and saturation rates for make-up air units including heat recovery ventilators (HRVs) and energy recovery ventilators (ERVs). Of note, the penetration of HRV units in 2022 is 6%, up from 4% in 2017. ERVs, queried for the first time in the 2022 REUS have a penetration rate of less than 2%.

**Table 162: Penetration and Saturation of Make-Up Air Units by Region**

Make-Up Air Units	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3441	2213
<b>Heat recovery ventilator (HRV)</b>							
Penetration (%)	5.5	6.9	7.6	6.1	3.6	2.5	1.9
Saturation	0.06	0.07	0.08	0.06	0.04	0.03	0.02
<b>Energy recovery ventilator (ERV)</b>							
Penetration (%)	1.3	1.5	1.5	1.4	n/a	n/a	n/a
Saturation	0.02	0.02	0.02	0.02	n/a	n/a	n/a

n/a = appliance not queried

Penetration and saturation rates for make-up air units by dwelling vintage show penetration of both HRVs and ERVs highest in newer dwellings (Table 163). The incidence of HRVs and ERVs in older dwellings most likely reflects retrofitted units.

<sup>30</sup> It is noteworthy that many top loading washing machines are now ENERGY STAR® qualified models. While less efficient than horizontal-axis washing machines, their presence in the market place means that determining the efficiency of top loading clothes washers in future surveys will require survey respondents differentiate between the two types of top loading units.

**Table 163: Penetration and Saturation of Make-Up Air Units by Dwelling Vintage**

Heating Appliances	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 - 2005	2006 - 2015	2016 or Newer	Age Unknown
<i>Unweighted base</i>	530	1121	729	842	770	431	251	114
<b>Heat recovery ventilator (HRV)</b>								
Penetration (%)	2.9	1.8	2.9	6.3	7.1	12.5	30.8	6.7
Saturation	0.03	0.02	0.03	0.06	0.07	0.12	0.34	0.08
<b>Energy recovery ventilator (ERV)</b>								
Penetration (%)	0.5	1.1	0.2	1.4	1.3	0.6	8.3	5.7
Saturation	0.00*	0.01	0.00*	0.02	0.02	0.01	0.08	0.09

\* Value less than 0.01

## 8.5 Outdoor Heating Equipment

Table 164 presents penetration and saturation rates for outdoor heating equipment including space heaters, and fireplaces/fire pits. Of note, 13% of FEI customers indicated they have a gas outdoor fireplace or fire pit, up from 6% in 2017 and 3% in 2012. As the question did not specify the type of gas (piped gas or bottled propane), caution is advised in the interpretation of the results for this appliance.

**Table 164: Penetration and Saturation of Outdoor Heating Equipment by Region**

Heating Appliances	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3441	2213
<b>Gas outdoor heater (piped gas)</b>							
Penetration (%)	2.5	1.5	1.3	2.0	1.9	1.7	1.3
Saturation	0.03	0.02	0.01	0.02	0.02	0.02	0.02
<b>Electric Outdoor Heater</b>							
Penetration (%)	4.1	2.3	1.5	3.3	n/a	n/a	n/a
Saturation	0.05	0.03	0.02	0.04	n/a	n/a	n/a
<b>Gas outdoor heater (bottled gas)</b>							
Penetration (%)	4.8	4.6	6.6	5.0	3.3	4.1	1.6
Saturation	0.05	0.05	0.07	0.06	0.03	0.04	0.02
<b>Gas outdoor fire pit or fireplace</b>							
Penetration (%)	14.5	9.6	13.6	13.0	5.5	2.8	n/a
Saturation	0.15	0.10	0.14	0.14	0.06	0.03	n/a

n/a = appliance not queried

Penetration and saturation rates for outdoor heating equipment by dwelling vintage are summarized in Table 165. The data show newer homes (those constructed since 2005) are the most likely to have outdoor heating equipment.

**Table 165: Penetration and Saturation of Outdoor Heating Equipment by Dwelling Vintage**

Heating Appliances	Before 1950	1950 - 1975	1976 - 1985	1986 - 1995	1996 - 2005	2006 - 2015	2016 or Newer	Age Unknown
<i>Unweighted base</i>	530	1121	729	842	770	431	251	114
<b>Gas outdoor heater (piped gas)</b>								
Penetration (%)	0.8	1.5	1.6	2.7	2.0	3.4	5.4	--
Saturation	0.01	0.02	0.02	0.03	0.03	0.04	0.07	--
<b>Electric Outdoor Heater</b>								
Penetration (%)	3.3	4.3	2.1	3.2	2.6	3.6	4.2	2.8
Saturation	0.04	0.05	0.02	0.05	0.03	0.04	0.07	0.03
<b>Gas outdoor heater (bottled gas)</b>								
Penetration (%)	5.6	4.4	4.7	5.5	4.8	3.9	7.9	6.2
Saturation	0.06	0.05	0.06	0.06	0.05	0.04	0.08	0.06
<b>Gas outdoor fire pit or fireplace</b>								
Penetration (%)	11.0	12.2	11.1	11.7	15.8	16.3	23.0	6.7
Saturation	0.12	0.13	0.12	0.12	0.17	0.17	0.24	0.07

## 8.6 Cooling and Miscellaneous Appliances

Penetration and saturation rates for a variety of common household cooling appliances ranging from central air conditioners to ceiling fans plus miscellaneous other equipment are presented in Table 166 and Table 167. Of note, penetrations of central air conditioners, portable air conditioners, room window air conditioners, and portable fans all increased over 2017, possibly due, in part, to the extreme heat (heat dome) experienced in British Columbia during 2021.

**Table 166: Penetration and Saturation of Cooling Equipment by Region – Part I of II**

Cooling Equipment	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3441	2213
<b>Central air conditioner <sup>1</sup></b>							
Penetration (%)	21.4	56.0	15.1	30.0	24.9	20.3	15.2
Saturation	0.23	0.57	0.15	0.31	0.26	0.21	0.15
<b>Portable air conditioner</b>							
Penetration (%)	26.8	12.8	20.1	22.1	16.1	11.4	10.4
Saturation	0.36	0.15	0.24	0.28	0.19	0.14	0.12
<b>Room window air conditioner <sup>2</sup></b>							
Penetration (%)	12.8	13.7	8.5	12.5	9.6	8.3	10.3
Saturation	0.18	0.18	0.10	0.17	0.13	0.10	0.16
<b>Portable fan</b>							
Penetration (%)	81.4	64.4	74.4	75.8	59.7	54.1	n/a
Saturation	1.69	1.12	1.38	1.49	1.12	0.96	n/a
<b>Humidifier</b>							
Penetration (%)	10.2	17.1	6.7	11.6	9.4	6.2	4.8
Saturation	0.13	0.19	0.08	0.14	0.11	0.07	0.05
<b>Dehumidifier</b>							
Penetration (%)	11.9	9.0	17.0	11.8	7.3	5.0	4.4
Saturation	0.13	0.10	0.18	0.13	0.08	0.05	0.05

<sup>1</sup> Queried as “electric central air conditioner” in 2008

<sup>2</sup> Queried as “electric wall unit” in 2008

n/a = appliance not queried

**Table 167: Penetration and Saturation of Cooling Equipment by Region – Part II of II**

Cooling Equipment	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3441	2213
<b>Portable electric heaters</b>							
Penetration (%)	42.8	34.7	35.3	39.6	31.7	28.9	n/a
Saturation	0.64	0.47	0.47	0.57	0.43	0.39	n/a
<b>Rotating ceiling fan – without lights</b>							
Penetration (%)	11.9	12.5	13.9	12.3	11.5	13.3	n/a
Saturation	0.17	0.17	0.17	0.17	0.16	0.18	n/a
<b>Rotating ceiling fan – with lights</b>							
Penetration (%)	44.3	58.7	45.8	48.4	45.5	44.4	n/a
Saturation	0.81	1.04	0.73	0.86	0.79	0.77	n/a

n/a = appliance not queried

## 8.7 Connected Appliances

In a series of new questions added to the 2022 REUS, respondents were queried on the presence of “appliances and other home equipment that can be monitored and controlled remotely from either inside or outside the home by ‘connecting’ them wirelessly to a smart phone, tablet or computer”. Connected appliances can include clothes washers, dishwashers and other devices such as security systems, smart plugs, and thermostats. The results, summarized in Table 168, show that 15% of households have at least one connected appliance or device.

**Table 168: Connected Appliances & Equipment by Region (%)**

Have connected appliance or other equipment?	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	1428	2257	1107	4792
Yes	16.5	14.7	11.5	15.4
No	81.8	84.4	87.6	83.3
Don't know	1.6	0.9	0.9	1.3
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding

Respondents indicating they have a connected appliance or device in the home were provided with a list of the most common connected devices and asked to indicate which ones they have. Of those with connected equipment, somewhat more than half (53%) had one or two appliances or devices that could connect wirelessly with their smart phone, tablet or computer, 28% had three to four, and the remaining 19% had five or more (Table 169).

**Table 169: Number of Connected Appliances & Equipment by Region (%)**

Number	LM	INT	VI	2022 FEI
<i>Unweighted base</i> <sup>1</sup>	236	332	127	695
1 – 2	51.7	54.8	55.9	52.9
3 – 4	28.8	26.8	25.2	27.9
5 – 6	14.8	13.0	15.6	14.4
More than 6	4.7	5.4	3.3	4.7
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

<sup>1</sup> Base: respondents with at least one connected appliance  
Totals may not sum due to rounding

Table 170 provides detail on the penetration rates for each type of connected appliances and devices, ordered by those most frequently indicated. The top three most indicated connected appliances or devices in the home include security systems and thermostats (7% of REUS respondents for each), smart speakers and smart plugs/electrical outlets (6% for each), and lighting (5%). Penetration rates for connected appliances such as clothes washers, dishwashers, and fridges were typically less than 2%.

**Table 170: Penetration Rates of Connected Appliances & Equipment by Region (% of Respondents)**  
**Multiple Responses Allowed**

Connected Appliance or Device	LM	INT	VI	2022 FEI
<i>Unweighted base</i> <sup>1</sup>	1428	2257	1107	4792
Security system	8.1	5.9	3.8	6.9
Thermostats (for heating and/or cooling equipment)	7.2	7.4	4.3	6.8
Smart speakers (e.g. Google Home, Alexa)	6.7	5.3	4.4	6.0
Smart plugs/smart electrical outlets	6.4	5.1	3.7	5.7
Lighting	6.0	4.2	2.7	5.1
Other entertainment items (e.g. televisions, gaming consoles, etc.)	4.3	4.1	3.5	4.2
Clothes washer	1.5	1.8	1.3	1.6
Stove/Oven	1.4	2.1	1.6	1.6
Clothes dryer	1.5	1.5	1.1	1.5
Fridge	1.0	0.9	1.1	1.0
Dishwasher	0.6	0.7	0.9	0.7
Water heating equipment	0.4	0.6	0.9	0.5
Other	2.4	1.5	1.7	2.0
Don't know	0.1	0.2	0.2	0.2

<sup>1</sup> Base: all REUS respondents with or without a connected appliance or device  
Totals will not sum to 100% due to multiple responses

Respondents were provided with the option to specify a connected appliance or device in their home that was not listed in the survey. A review of the verbatim responses revealed a broad list of home appliances and devices that can be controlled wirelessly (e.g., ceiling fans, air conditioners, window blinds, portable heaters and fans, flood detection devices, garage doors, heat pumps, sprinkler and other irrigation systems, vacuums, and in-floor heating).

Respondents indicating the presence of one or more connected appliances were asked whether they had a smart home hub/gateway system installed. This hub/gateway was described as:

*A small standalone box that allows all smart products to “speak the same wireless language” so they can be monitored and controlled from one app. Not to be confused with a modem or wi-fi router.*

The results, summarized in Table 171 show one-quarter (25%) of respondents with at least one connected appliance or device have a smart hub. This is equivalent to 4% of all respondents to FEI’s REUS 2022. Penetration of smart hubs is significantly higher in Lower Mainland (27%) than the Interior or Vancouver Island (20% for each).

**Table 171: Presence of a Smart Home Hub / Gateway by Region (%)**

Have smart home hub or gateways?	LM	INT	VI	2022 FEI
<i>Unweighted base</i> <sup>1</sup>	236	332	127	695
Yes	27.4	19.9	19.7	24.7 <sup>2</sup>
No	67.1	72.0	72.4	68.9
Don’t know	5.5	8.1	7.9	6.4
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

<sup>1</sup> Base: respondents with at least one connected appliance or device

<sup>2</sup> Equivalent to 3.8% of all respondents to FEI’s 2022 REUS

Totals may not sum due to rounding



# 9 POOLS, HOT TUBS & SAUNAS

This section presents data on the incidence of swimming pools, hot tubs/Jacuzzis, and saunas among FEI’s residential customer base. Questions were directed only to respondents who had exclusive access to these amenities (i.e., excludes pools, hot tubs and/or saunas shared with other residences in a townhouse, apartment, or condominium complex).

## 9.1 Penetration Rates

Penetration rates of exclusive-use pools, hot tubs and saunas are provided in Table 172. Saturation figures are not presented, as homes with more than one of any of these end-uses would be very uncommon.

**Table 172: Penetration of Pools, Hot Tubs, and Saunas by Region (%)**

Exclusive use only	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3441	2189
Swimming pool	4.4	7.2	2.5	4.9	4.0	4.3	5.2
Indoor	0.1	0.3	0.2	0.2	0.1	n/a	n/a
Outdoor	4.3	6.9	2.4	4.7	3.9	n/a	n/a
Hot tub /Jacuzzi	9.2	13.6	11.6	10.7	8.7	9.7	13.3
Sauna	1.7	2.1	1.7	1.8	1.9	3.8	n/a

Totals may not sum due to rounding  
n/a = not queried

Five percent (5%) of respondents reported having a swimming pool for their exclusive use, one-in-ten (11%) have a hot tub/Jacuzzi, and 2% have a sauna. The penetration rate for hot tubs in 2022 is up significantly from 2017 (10.7% versus 8.7%), however, the rate tends to vary from survey to survey. Penetration rates for all other amenities are statistically unchanged from 2017 (differences not statistically significant at the 95% confidence level). Regionally, homes in the Interior region are more likely to have a swimming pool and/or hot tub/Jacuzzi. Regardless of region, the majority of pools are outdoor pools.

## 9.2 Heating Fuels

### 9.2.1 Swimming Pools

Natural gas is the most common main fuel used to heat pools, accounting for four-in-ten (41%) exclusive-use pools (Table 173). The next most common main fuel is solar (14%) followed by electricity (11%). Three-in-ten (29%) pools are not heated. Regional comparisons are not presented due to small samples. The table does not differentiate between indoor and outdoor pools because of the very small number of respondents with indoor pools. Three-in-ten (29%) pools are not heated.

## Pools, Hot Tubs & Saunas

**Table 173: Main Fuel Used to Heat Swimming Pool by Region (%)  
Exclusive-Use Pools Only**

Main fuel	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	242	227	169	63
Natural gas	40.8	39.4	49.7	43.4
Solar	14.3	27.2	19.3	15.0
Electricity	11.0	7.3	3.4	5.2
Other	1.6	0.7	0.4	--
Pool not heated	28.5	22.6	27.2	36.4
Don't know	3.9	2.8	n/a	n/a
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding  
n/a = Don't know option not provided

Households using either natural gas, electricity or some other fuel to heat their *outdoor* pool were asked whether they use solar energy to supplement their pool's primary fuel. Fourteen percent (14%) of pools heated with natural gas and 22% of those heated with electricity use solar energy as a supplemental fuel (Table 174).

**Table 174: Use of Solar Heating to Supplement Heating for Outdoor Swimming Pools  
Percent Using Solar Heating by Fuel Type**

	2022 FEI	2017 FEI	2012 FEI
<i>Unweighted base</i> <sup>1</sup>	32	27	24
Natural gas	14.1	24.0	25.9
Electricity	22.1	13.7	44.9
Other	15.8	--	--

<sup>1</sup> Caution is advised in interpreting data for samples of less than 50. Results are directional only.

### 9.2.2 Hot Tubs / Jacuzzis

Nine-in-ten (91%) hot tubs / Jacuzzis are heated using electricity (Table 175). Natural gas is used as the heating fuel for 7% of hot tubs / Jacuzzis.

**Table 175: Hot Tub / Jacuzzi Fuels by Region (%)**

	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	132	307	128	567	584	407	269
Natural gas	9.8	3.3	3.1	6.6	6.9	9.6	15.0
Electricity	88.6	93.5	95.4	91.3	89.5	90.4	83.4
Other	--	0.3	1.6	0.3	1.7	--	1.6
Don't know	1.5	2.9	--	1.8	1.9	--	--
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding

9.2.3 Saunas

Data on fuels used to heat exclusive-use saunas are summarized in Table 176. Greater than eight-in-ten (84%) saunas are heated using electricity and four percent (4%) are heated using natural gas. Regional results are not presented due to small sample sizes.

**Table 176: Sauna Fuels (%)**

	2022 FEI	2017 FEI	2012 FEI
<i>Unweighted base</i>	90	112	122
Natural gas	3.6	2.7	1.1
Electric	83.8	90.1	95.4
Other	6.6	0.6	0.9
Don't know	5.9	6.6	2.6
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding



# 10 ENERGY USE BEHAVIOURS

FEI's 2022 REUS queried respondents about how often they undertake energy-conserving behaviours around the home particularly those related to space heating and hot water use (e.g., bathing, laundry, dishwashing, etc.).

## 10.1 Methodology

Respondents were asked to indicate how often they did each behaviour using a four-point scale (always, usually, occasionally, never). Respondents could answer "don't know" or indicate the behaviour was not applicable to them. The latter is required as one or more behaviours may not apply to some households (e.g., use of storm windows is only relevant to homes with older-style windows).

Energy use behaviours were analyzed from two perspectives. The first perspective was the proportion of households that already regularly undertake the behaviour (i.e., indicated always or usually). These households are the least likely to deliver incremental energy savings by increasing the frequency in which they undertake these behaviours. The second perspective was the proportion of households that occasionally or never undertake the energy-saving behaviour, or are unsure how often they undertake the behaviour. This perspective helps define the market potential for behavioural change. Market potential excludes respondents who indicated the behaviour was not applicable to them (e.g., storm windows). Some respondents, however, may have selected "never" rather than the more appropriate "not applicable" for some behaviours, so the reader is cautioned that the market potential may be somewhat overstated for some behaviours. This is more likely to be the case where the behaviour is linked to a technology that has less than 100% penetration.<sup>31</sup>

Due to constraints on the length of the 2022 REUS questionnaire, the survey did not explore barriers preventing households from increasing the frequency of their energy-conserving behaviours. Estimating or otherwise quantifying the energy savings associated with any specific behaviour or the amount of the remaining potential that could be realistically captured through utility programming or other means is outside the scope of the 2022 REUS.

## 10.2 Behaviours Affecting Space Heating

Respondents were asked to indicate the temperature they usually keep their residence during the winter (heating) season for three common situations:

- When someone is at home
- When no one is at home
- During the night

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<sup>31</sup> As an example, respondents who do not have an automatic dishwasher may choose "never" rather than "not applicable" for how often they undertake conserving behaviours associated with the use of automatic dishwashers. In these cases, their answer would be included with other households whose response suggests there is room for improvement.

## Energy Use Behaviours

The results, including daytime and night time set-backs, are summarized in Table 177. Average daytime temperature when someone is at home is 20.8 degrees Celsius. Respondents turn down their thermostat by an average of 2.9 degrees Celsius when no one is at home during the daytime. At night, respondents turned down their thermostat an average of 2.7 degrees. There are no statistically significant differences in thermostat settings between dwellings whose main space heating (SH) fuel is electricity versus gas (natural gas or piped propane).

**Table 177: Average Winter (Heating Season) Room Temperatures (Degrees Celsius)**

	LM	INT	VI	2022 FEI	Main SH Fuel	
					Electric	Gas
<i>Unweighted base</i>	1428	2257	1107	4792	785	3892
When someone is at home	20.7	21.0	20.6	20.8	20.8	20.8
When no one is at home	17.8	18.2	17.3	17.9	17.7	17.9
During the night	18.0	18.3	17.4	18.0	18.1	18.0
Daytime set-back <sup>1</sup>	2.8	2.8	3.2	2.9	3.0	2.8
Night time set-back <sup>2</sup>	2.6	2.7	3.2	2.7	2.6	2.8

<sup>1</sup>Difference in daytime temperature when someone is at home versus no one is at home – respondent average

<sup>2</sup>Difference between night-time temperature and daytime temperature when someone is at home – respondent average

Seven-in-ten (69%) of FEI customers have the ability to reduce the temperature in unused rooms, either by turning down individual room thermostats or by closing registers or vents (Table 178). As expected, respondents living in dwellings where the main space heating fuel is electricity are more able to control the temperature in individual rooms than homes where natural gas is their main space heating fuel (76% versus 68%). This is consistent with the tendency for homes using electric space heating to have zoned temperature control (either via a wall-mounted thermostat or at the register itself).

**Table 178: Ability to Reduce Temperature in Unused Rooms by Region (%)**

	LM	INT	VI	2022 FEI	Main SH Fuel	
					Electric	Gas
<i>Unweighted base</i>	1428	2257	1107	4792	785	3892
Yes	66.5	71.2	77.0	69.2	76.3	68.1
No	30.4	25.7	20.5	27.8	19.6	29.2
Don't know	3.0	3.2	2.5	3.0	4.1	2.7
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding

Table 179 summarizes the percentage of respondents who indicated they always or usually undertake behaviours to save energy associated with space heating. The frequency of leaving windows open during the winter, an action sometimes used to improve ventilation, was also queried. As some behaviours are not applicable for some respondents (e.g., the ability to install storm windows), these behaviours will have lower percentages of respondents indicating they always or usually undertake these behaviours.

Behaviours that respondents most frequently indicated they always or usually undertake include keeping windows closed during winter (81% usually or occasionally), turning down the heat at night (80%), and

turning down the heat when no one is at home and closing window coverings to keep in the heat (70% for each).

Comparing homes by main heating fuel (electricity versus natural gas or piped propane) reveals two statistically significant differences. First, respondents in electrically heated homes were much more likely than those living in homes heated with gas to close vents / turn down the heat in unused rooms. Second, respondents in gas heated homes were more likely to turn down the heat at night. Differences in the frequency that respondents undertook all other space heating behaviours based on main space heating fuel (electricity versus natural gas) are not statistically significant at the 95% confidence level.

**Table 179: Space Heating Behaviours  
Percent Who Always or Usually Undertake the Behaviour**

Behaviours Impacting Space Heating	LM	INT	VI	2022 FEI	Main SH Fuel	
					Electric	Gas
<i>Unweighted base</i>	1428	2257	1107	4792	785	3892
Keep windows closed during winter	79.4	85.4	78.3	80.9	79.7	81.0
Turn down heat - at night	78.4	81.1	81.1	79.5	76.2	80.3
Turn down heat - no one at home	67.6	74.0	71.2	69.8	68.6	70.1
Close window coverings to keep in heat	69.6	70.3	67.6	69.5	68.5	69.9
Close vents / turn down thermostats in unused rooms	52.1	54.9	60.3	54.0	63.0	52.5
Draft proof at least once a year	29.0	36.0	29.6	31.0	30.6	31.1
Install plastic window coverings during winter months	5.0	8.6	3.3	5.8	5.2	5.7
Install storm windows (single pane windows only)	3.1	4.0	2.6	3.3	2.9	3.4

Table 180 summarizes the remaining market potential for each of the eight space heating behaviours, ordered from most to least outstanding potential. Excluding the installation of storm windows or plastic window coverings, the top three behaviours with the largest remaining potential are:

- draft proofing annually (64% of respondents could do more);
- closing vents or turning down thermostats in unused rooms (35%); and
- closing window coverings to keep in the heat (27%).

The potential for installing storm windows or plastic window coverings is likely overstated as many homes have windows that no longer accept an extra (storm) window. Plastic window coverings are not necessarily restricted by window design but aesthetics and the loss of window functionality (i.e., ability to open or close) will be a concern for some homeowners.

## Energy Use Behaviours

**Table 180: Space Heating Behaviours – Remaining Potential  
Percent Who Occasionally, Never or Are Unsure They Undertake the Behaviour**

Behaviours Impacting Space Heating	LM	INT	VI	2022 FEI	Main SH Fuel	
					Electric	Gas
<i>Unweighted base</i>	1428	2257	1107	4792	785	3892
Draft proof at least once a year	65.7	58.2	65.2	63.6	64.0	63.5
Install plastic window coverings during winter months	52.2	42.9	43.8	48.6	44.9	49.3
Close vents / turn down thermostats in unused rooms	36.0	33.6	29.8	34.5	28.7	35.6
Close window coverings to keep in heat	27.0	26.5	29.0	27.1	28.2	26.7
Install storm windows (single pane windows only)	27.8	20.2	19.9	24.7	20.1	25.3
Turn down heat - no one at home	26.2	20.5	22.8	24.2	25.3	24.0
Keep windows closed during winter	20.1	13.8	21.5	18.6	19.6	18.5
Turn down heat - at night	19.1	16.8	17.5	18.2	21.1	17.6

<sup>1</sup> Respondents who always or usually leave one or more windows open during winter

### 10.3 Laundry and Other Domestic Water Use Behaviours

Respondents were asked a series of questions about household activities and behaviours that affect domestic water use, including clothes washing, dishwashing, bathing, showering and hot water tank shut-off while away on holidays.

Table 181 summarizes the percent of respondents who always or usually do laundry with full loads and run the dishwasher when full (89% and 82% respectively). One-in-four (26%) homes always or usually turn off their water heater or use its vacation setting (gas tanks only) when away from the home for an extended time. Lastly, four-in-ten (38%) respondents indicated they always or usually turn off the water while washing their hands. Households with gas DWH are much more likely those with electric DWH to turn the water heater off when they go away (28% vs. 23% respectively), and to run their dishwasher only when full (84% vs. 81%). All other differences based on DWH fuel are not statistically significant at the 95% confidence level.

**Table 181: Domestic Water Use Behaviours  
Percent Who Always or Usually Undertake the Behaviour**

Behaviours Impacting DWH	LM	INT	VI	2022 FEI	Main DWH Fuel	
					Electric	Gas
<i>Unweighted base</i>	1428	2257	1107	4792	1095	3176
Only do laundry with full loads	88.6	90.1	90.5	89.3	89.6	90.4
Only run dishwasher when full	81.8	80.1	88.9	82.3	81.2	83.9
Turn off water while washing hands	37.2	39.7	41.0	38.4	39.8	37.7
Turn off water heater when away	25.2	29.0	26.3	26.4	23.4	27.7

The remaining potential for saving energy from changes to hot water use behaviours for these four activities is summarized in Table 182. These estimates represent the potential market for a behavioural program, not the potential energy savings from implementing the program.

**Table 182: Domestic Water Use Behaviours – Remaining Potential**  
**Percent Who Occasionally, Never or Are Unsure They Undertake the Behaviour**

Behaviours Impacting DWH	LM	INT	VI	2022 FEI	Main DWH Fuel	
					Electric	Gas
<i>Unweighted base</i>	1428	2257	1107	4792	1095	3176
Only do laundry with full loads	10.4	8.9	9.0	9.8	9.1	9.0
Only run dishwasher when full	6.2	3.8	3.0	5.1	4.4	4.9
Turn off water heater when away	57.2	52.4	52.3	55.2	61.5	55.4
Turn off water while washing hands	61.6	59.8	58.8	60.7	59.7	61.6

Respondents were asked to indicate the number of showers, baths, dishwasher loads, laundry loads (by water temperature) their household undertakes in a typical week. Data were also collected on the number of minutes household occupants spend showering in a typical week.

Table 183 summarizes the frequency of dishwashing, laundry, bathing, and showering. All data are expressed on an average per household basis. The frequency of these activities varies by size of household (number of occupants) and the activity in question. Some activities occur more frequently than others. For example, showers are considerably more common than baths (average of 11.3 showers per week versus 1.0 bath per week). On average, FEI residential customers do 4.1 loads of laundry per week, of which 2.4 loads (59%) use cold water wash and rinse.

**Table 183: Domestic Water Use Activities – Per Household**

Behaviours Impacting DWH	LM	INT	VI	2022 FEI	Main DWH Fuel	
					Electric	Gas
<i>Unweighted base</i>	1428	2257	1107	4792	1095	3176
Average # of people per home	2.9	2.3	2.4	2.7	2.5	2.7
Dishwasher loads per week	3.6	3.3	3.7	3.5	3.3	3.6
Laundry loads per week (any temperature)	4.2	3.9	4.0	4.1	3.8	4.2
Laundry loads using cold water	2.4	2.3	2.3	2.4	2.2	2.4
Baths per week	1.0	1.0	1.0	1.0	1.0	1.0
Showers per week	12.4	9.5	10.6	11.3	9.9	11.7
Average shower time (minutes)	20.5	16.2	17.5	18.9	17.9	19.2

The number and frequency of most hot water use activities for a household typically increase as the number of occupants of the home increases. Table 184 expresses the data from the previous table on a per-person basis using data on the number of people in the home.

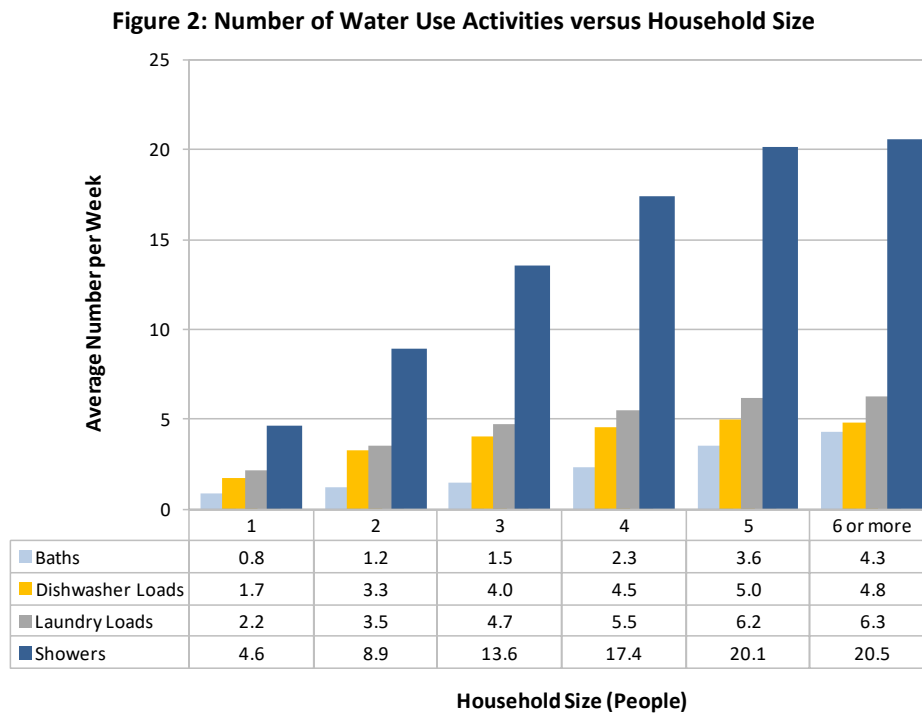
**Table 184: Domestic Water Use Activities – Per Person**

Behaviours Impacting DWH	LM	INT	VI	2022 FEI	Main DWH Fuel	
					Electric	Gas
<i>Unweighted base</i>	1428	2257	1107	4792	1095	3176
Average # of people per home	2.9	2.3	2.4	2.7	2.5	2.7
Dishwasher loads per week	1.2	1.4	1.5	1.3	1.3	1.3
Laundry loads per week (any temperature)	1.4	1.7	1.7	1.5	1.5	1.6
Laundry loads using cold water	0.8	1.0	0.9	0.9	0.9	0.9
Baths per week	0.3	0.4	0.4	0.4	0.4	0.4
Showers per week	4.3	4.0	4.4	4.2	4.0	4.3
Average shower time (minutes)	7.1	6.9	7.2	7.0	7.2	7.1

The relationship between the frequency and duration of these activities and the number of occupants in the home is explored in the next section.

### 10.3.1 Impact of Household Size on Domestic Water Use

Figure 2 shows the relationship between household size (number of people in the home) and the average number of showers, laundry loads, dishwasher loads, and baths per week. Household size affects how many of each activity is performed and, as a result, the demand for water. The rate of increase in the activity as household size increases varies by activity.



## 10.4 Contribution of Household Members to Conserving Energy

For most households, the degree to which energy-conserving behaviours are routinely followed depends upon the individual, with some household members being more energy conscious than others. To explore this dynamic, respondents were asked who in their household makes the most effort to conserve energy. The results, illustrated in Table 185, show half (52%) of survey respondents indicated it was themselves, one-in-four (26%) indicated it was all members of their household, and one-in-five (19%) indicated it was most members of their household. The results generally mirror those observed in 2017.

**Table 185: Who Makes the Most Effort to Conserve Energy in the Home by Region? (%)**

Who makes the most effort?	LM	INT	VI	2022 FEI	2017 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827
Survey respondent	50.8	54.6	53.1	52.2	48.6
All members of the household	24.1	27.9	26.9	25.5	26.4
Most members of the household	21.0	14.0	16.7	18.5	19.6
Someone else in the household	3.4	2.6	3.0	3.2	4.9
None of us	0.6	0.8	0.4	0.7	0.5
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding

Respondents rated their household's current effort to conserve electricity / natural gas (energy) in the home using a four-point scale ranging from "no effort at all" to "a great amount of effort". Six-in-ten (59%) respondents indicated their household makes a "fair amount" of effort to conserve energy (Table 186). One-fifth (20%) indicated they make a "great amount" of effort. Almost the same proportion (19%) indicated they make only a "little effort" and 1% indicated "no effort at all". Regional differences, where they exist, are unremarkable. These results are statistically unchanged from those recorded in 2017.

**Table 186: Current Effort Made to Conserve Energy in the Home (%)**

Effort made to conserve energy	LM	INT	VI	2022 FEI	2017 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827
Great amount of effort	18.8	22.5	19.4	19.9	20.3
A fair amount of effort	57.1	59.7	62.0	58.5	59.5
A little effort	20.8	16.1	16.6	19.0	18.0
No effort at all	1.4	1.2	1.3	1.3	1.0
Don't know	1.9	0.6	0.7	1.4	1.1
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding

Respondents were asked to compare their household's current level of effort at conserving energy with the level of effort made two years ago. Table 187 shows responses are equally divided between no change in effort over the last two years (49%) and making somewhat or much more of an effort to conserve energy compared to two years ago (48%).

**Table 187: Current Effort to Conserve Energy Compared to Two Years Ago (%)**

Compared to 2 years ago	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	1428	2257	1107	4792
Much more of an effort	15.0	15.9	13.2	15.0
Somewhat more of an effort	32.2	34.2	33.1	32.8
Neither more or less effort	49.1	47.7	51.5	49.0
Somewhat less of an effort	1.2	0.5	1.1	1.0
Much less of an effort	0.3	0.1	0.4	0.3
Don't know	2.2	1.6	0.8	1.9
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding

### 10.5 Attitudes toward Energy and Energy Conservation

Table 188 summarizes the relative agreement or disagreement of respondents to a series of statements that address beliefs, attitudes, and behaviours towards energy and energy conservation. Agreement with the statement is represented by those who indicated either a four or five on the five-point scale, while disagreement is represented by either a one or two on the scale. Those undecided, unsure or with no strong opinion (neutral) are represented by a three. Attitudes and behaviours can influence how households use energy and respond to programming designed to reduce energy consumption.

Notable observations include:

- Six-in-ten (57%) feel knowledgeable about what affects energy use in their home, one-in-ten (11%) do not, and three-in-ten (32%) are neutral.
- Four-in-ten (40%) respondents feel they have reduced their household's energy use as much as reasonably possible, while almost one-in-five (18%) disagree, and four-in-ten (42%) were neutral.
- One-in-five (19%) feel they were too busy to research ways to save energy.
- Two-thirds (65%) feel natural gas is a clean and efficient energy source. Ten percent (10%) disagree and 25% are neutral.

**Table 188: Attitudes toward Energy and Energy Conservation (%)**

Attitudes and beliefs	Strongly Disagree (1)	(2)	Neither Agree or Disagree (3)	(4)	Strongly Agree (5)	Disagree (1 or 2)	Agree (4 or 5)
There are many ways that a person can save energy. When you add them up, they result in substantial savings	1.9	4.1	18.3	35.5	40.2	6.0	75.7
By making my home more energy efficient, I am helping to do my part for the environment	2.2	3.7	17.1	32.9	44.1	5.9	77.0
I think natural gas is a clean and efficient energy source	3.5	6.7	25.0	29.8	35.0	10.2	64.8
Members of my household regularly limit the length of their showers to save energy	7.3	12.1	36.1	25.0	19.5	19.4	44.5
I don't want to think about natural gas or electricity. I simply want it to work.	19.5	16.9	34.1	16.4	13.2	36.4	29.6
When something needs to be done around the home, I usually hire someone	18.2	18.6	27.7	20.1	15.5	36.8	35.6
I almost always have a home renovation on the go	37.7	21.2	24.1	11.6	5.5	58.9	17.1
Our household has reduced its energy use by as much as reasonably possible	4.8	13.2	41.7	26.2	14.1	18.0	40.3
I am a busy person with little or no time to research ways to save energy	16.8	21.0	43.0	13.6	5.7	37.8	19.3
I conserve energy because it saves money, not because it helps the environment	17.1	18.3	38.6	16.2	9.8	35.4	26.0
I am knowledgeable about what affects my home's energy use	2.7	8.7	31.7	36.9	20.1	11.4	57.0



# 11 PRODUCTS AND SERVICES

This section summarizes participation in utility and government energy efficiency programs, interest in energy-related products and services, and energy-related attitudes and beliefs.

## 11.1 Participation in Energy Efficiency Rebate Programs

The incidence of participation in a utility and/or government energy efficiency program in the last five years is summarized in Table 189. In the last five years, one-in-five (20%) respondents to FEI’s 2022 REUS participated in a FortisBC program, 8% in a BC Hydro program, and 4% in a federal, provincial or municipal government program. Three-quarters (74%) of respondents did not participate in an energy efficiency program during the last five years. Customers on Vancouver Island were more likely than those in the other two regions to participate in a program.

**Table 189: Participation in Energy Efficiency Programs in the Last Five Years  
Percent of Respondents - Multiple Responses Allowed**

Program sponsor	LM	INT	VI	2022 FEI	2017 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827
FortisBC	19.0	23.5	20.4	20.4	14.7
BC Hydro	9.5	3.0	12.7	8.1	7.8
Federal, provincial or municipal government	3.9	1.9	7.0	3.8	3.7
<b>None of the above</b>	<b>74.4</b>	<b>74.6</b>	<b>69.4</b>	<b>73.8</b>	<b>74.3</b>

Multiple responses allowed. Totals may not sum to 100%

A review of factors (data not shown) that can influence participation in utility or government energy efficiency programs, including dwelling vintage, level of education, and household income, found that respondents with household incomes of less than \$50,000 were less likely to have participated in an energy efficiency program in the last five years. Program participation did not vary by the age of the dwelling or the respondent’s level of education.

## 11.2 Interest in Products and Services

Respondents were provided with a list of potential energy-related programs and services and asked to rate their interest using a four-point scale where one meant “not at all interested” and four meant “very interested”. The results, ranked by the proportion that indicated they are somewhat or very interested (i.e., 3 or 4) are summarized in Table 190. As no financial obligation or commitment is implied or associated with a respondent’s answer, caution is advised in interpreting these results. They are primarily directional in nature.

The top three program suggestions that garnered the most interest from respondents included a furnace or heat pump tune-up program (45% of respondents somewhat or very interested), a program to purchase an electric automobile (40%), and a do-it-yourself home energy audit (39%). The program suggestions with the least amount of interest included program to install a “smart” thermostat (27%), a program to replace a

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standard efficiency clothes washer with a high-efficiency unit (25%), and a program to install a high-efficiency furnace (23%). Interest is low for some of these potential programs, in part, because penetration rates are already high for some of the end-uses they target (i.e., the remaining market potential is lower than other program suggestions targeting an appliance or end-use) and/or the appliances in question are relatively expensive and tend not to be replaced without careful consideration.

**Table 190: Interest in Products and Services (%)**  
**Ordered by % Very or Somewhat Interested**

Product / Service	Not at all Interested (1)	(2)	(3)	Very Interested (4)	Interested (3 or 4)
Furnace or heat pump tune-up to ensure they are working safely and efficiently	36.1	18.9	21.6	23.5	45.0
Program to purchase an electric automobile	42.3	17.4	15.4	24.9	40.4
Do-it-yourself online energy audit	37.6	23.2	22.8	16.4	39.2
Home energy audit to determine main energy uses in the home and identify opportunities to save energy	40.6	23.3	19.3	16.7	36.0
Program to compare your home's energy use with homes of comparable size and type	42.5	21.7	19.3	16.4	35.8
Program to install an in-home display that allows you to monitor your home's energy usage	46.0	20.6	16.5	16.9	33.4
Program to purchase rooftop solar panels	49.5	17.5	13.8	19.2	33.0
Program to replace standard-efficiency water heater with high-efficiency water heater	50.7	16.6	16.2	16.5	32.7
Program to improve draft proofing	46.4	21.6	16.1	15.9	32.0
Program to replace a lower-efficiency furnace with a high-efficiency furnace	54.6	15.9	13.0	16.4	29.4
Program to upgrade attic and wall insulation	54.7	17.6	13.7	14.0	27.7
Program to install programmable or "smart" thermostats	56.9	16.4	13.1	13.6	26.7
Program to replace standard-efficiency clothes washer with high-efficiency clothes washer	58.1	16.6	13.8	11.5	25.3
Program to install high-efficiency gas fireplace	63.2	14.0	10.8	12.0	22.8

### 11.3 Respondent Characteristics Influencing Purchase Decisions

Table 191 offers insight into the relative importance of a variety of characteristics known to influence purchase decisions, including risk aversion, sensitivity to price, brand loyalty, and "buy local" preference. REUS respondents were asked to rate their relative agreement or disagreement with statements addressing each of these factors using a five-point scale where one meant they "strongly disagreed" and five meant they "strongly agreed". Agreement with the statement is represented by either a four or five on the five-point scale, while disagreement is represented by either a one or two. Those undecided, unsure or with no strong opinion (neutral) are represented by a three.

Some findings of note:

- Slightly more than one-in-five (22%) of respondents can be considered early adopters of new products (i.e., usually the first ones to try new products). Conversely, one-third (32%) can be considered late adopters.
- More than three-quarters (77%) of respondents usually research issues thoroughly before making a decision.
- Seven-in-ten (69%) are price sensitive (i.e., always look for the best price).

**Table 191: Respondent Characteristics Influencing Purchase Decisions (%)**

Respondent characteristics	Strongly Disagree (1)	(2)	Neither Agree or Disagree (3)	(4)	Strongly Agree (5)	Disagree (1 or 2)	Agree (4 or 5)
I am usually the first one to try new products	14.8	17.1	45.8	14.7	7.6	31.9	22.3
I am usually willing to pay more for brand-name items	15.4	16.5	35.0	26.2	6.8	31.9	33.0
I prefer dealing with British Columbia-based companies	2.3	4.6	32.3	34.1	26.7	6.9	60.8
I always look for the best price when buying products or services	2.0	5.5	23.2	37.4	31.9	7.5	69.3
I usually take time to research issues thoroughly before making a decision	1.3	3.6	17.9	40.0	37.2	4.9	77.2
I am the type of person to have good insurance coverage	1.7	2.4	14.8	33.9	47.1	4.1	81.0



# 12 DEMOGRAPHICS

This section details the demographic and socio-demographic characteristics of respondents to FEI's 2022 REUS and those of their households. Comparisons are made, where appropriate, with data from FEI's 2017, 2012 and 2008 residential end-use surveys.

## 12.1 Characteristics of Survey Respondents

### 12.1.1 Age of Survey Respondent

Table 192 summarizes the distributions of survey respondents by age cohort. Nine-in-ten (89%) respondents to the 2022 REUS were aged 45 years or older, unchanged from 2017 (88%) but up from 86% in 2012 and 82% in 2008. Regionally, the Interior has a significantly younger respondent profile with 15% of respondents aged 44 years or younger compared to the overall average of 11%.

**Table 192: REUS Respondents by Age Group (%)**

Age cohort	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3341	2186
18 yrs or younger	0.1	--	--	0.0*	0.1	0.0*	--
19 – 24 yrs	--	0.1	--	0.0*	0.1	0.3	0.4
25 – 34 yrs	1.6	3.2	1.9	2.1	2.9	3.8	4.2
35 – 44 yrs	8.1	11.2	6.9	8.8	8.9	10.4	13.7
45 – 54 yrs	15.3	13.2	11.4	14.2	17.6	19.8	20.4
55 – 64 yrs	28.4	24.1	22.5	26.4	25.9	27.4	28.9
65 yrs and older	46.5	48.2	57.3	48.4	44.4	38.4	32.4
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>44 yrs or younger</b>	<b>9.8</b>	<b>14.5</b>	<b>8.8</b>	<b>11.0</b>	<b>12.0</b>	<b>14.4</b>	<b>18.3</b>
<b>45 yrs or older</b>	<b>90.2</b>	<b>85.5</b>	<b>91.2</b>	<b>89.0</b>	<b>88.0</b>	<b>85.6</b>	<b>81.7</b>

Totals may not sum due to rounding.

\* Value less than 0.01%

### 12.1.2 Gender

Distributions of survey respondents, by gender, are provided in Table 193. Women made up 44% of respondents compared to 51% for men. Less than one percent of respondents chose to self-describe. This option was not offered in previous FEI REUS surveys. The 2008 REUS did not query gender.

**Table 193: REUS Respondents by Gender (%)**

Identify as...	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3441
Female	42.7	46.3	48.2	44.4	43.5	40.2
Male	52.9	49.7	47.4	51.3	53.4	57.0
Other (self-describe)	--	<0.1	--	<0.1	n/a	n/a
No answer	4.3	3.9	4.3	4.2	3.2	2.8
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

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### 12.1.3 Employment Status

Respondents include workers (employed full-time, part-time, or unemployed), retirees, homemakers, students, and persons on short or long-term disability (Table 194). Somewhat more than half (52%) of respondents to the 2022 REUS are retired, 36% are employed full-time, and 8% are employed part-time. The remainder includes homemakers, those on short or long-term disability, unemployed or attending school (students). Regionally, respondents from the Lower Mainland are less likely to be retired and more likely to be employed full-time compared to other regions. Allowing for the aging of the population, notably the baby boomer cohort, these results are comparable to those observed in the 2017 REUS.

**Table 194: Employment Status of REUS Respondents by Region (%)**  
Multiple Responses Allowed

Employment status	LM	INT	VI	2022 FEI	2017 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827
Retired	49.9	54.1	60.9	52.4	48.5
Employed full-time	38.1	34.8	30.9	36.2	37.5
Employed part-time	8.6	8.4	7.1	8.3	8.7
Homemaker	4.5	2.7	1.5	3.6	4.5
Short or long-term disability	1.9	2.3	1.9	1.9	2.2
Unemployed	0.9	0.9	0.3	0.8	0.8
Student	0.3	0.8	0.5	0.4	0.3

Columns do not sum to 100% because of multiple responses.

### 12.1.4 Educational Attainment

Distributions of survey respondents by highest level of educational attained are provided in Table 195. Notable trends over the past three residential end-use surveys include a gradual reduction in the proportion of respondents with a high school education or less and a steady increase in the proportion of respondents having a university / college or post-graduate degree.

**Table 195: Education Status of REUS Respondents by Region (%)**  
Highest Level of Education Achieved

Education	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3441	2221
Some high school	2.1	2.9	2.2	2.3	4.4	5.3	4.7
Completed high school	12.3	14.0	12.2	12.8	14.1	13.4	16.9
Some trade / technical school	4.4	6.3	4.1	4.9	5.2	6.4	7.4
Completed trade / technical school	11.4	15.8	11.8	12.7	13.2	13.2	14.4
Some university / college	17.0	18.1	17.1	17.3	16.9	18.4	18.0
Completed university / college	33.3	29.9	32.2	32.2	30.5	27.1	25.8
Post graduate	18.7	12.4	19.8	17.1	13.5	13.2	9.8
No response	0.8	0.6	0.7	0.7	2.0	2.9	3.1
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

## 12.2 Household Characteristics

### 12.2.1 Number of Occupants per Dwelling

Table 196 summarizes the average number of occupants (including renters) per dwelling. Data are broken out to identify homes with two occupants or less, between three and five occupants, and six or more occupants. The number of occupants in the home affects household energy use, notably for domestic hot water activities including clothes washing, dishwashing, and showers (See Section 10.3.1 for additional information).

**Table 196: Number of Occupants per Dwelling by Region**

	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3441	2174
Average per home (persons)	2.9	2.3	2.4	2.7	2.7	2.8	2.8
Standard Deviation (persons)	2.2	0.9	0.9	1.5	1.5	1.2	1.6
Homes by size:							
2 occupants or less (%)	52.7	71.2	68.8	59.9	60.4	58.9	55.3
3 - 5 occupants (%)	41.0	26.6	28.9	35.5	34.1	37.3	39.1
6 occupants or more (%)	6.3	2.2	2.3	4.6	5.4	3.7	5.6
<b>Total (%)</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

The proportion of homes with two occupants or less is unchanged from 2017 (60%); also the proportions of households with three to five occupants and six occupants or more. Regionally, respondents from the Lower Mainland represent larger households, averaging 2.9 persons per dwelling compared to 2.3 to 2.4 persons for households in the other two regions. This is consistent with the tendency for survey respondents from the Lower Mainland to be both younger and more likely to have children in the home (next table).

The distribution of household occupants by age cohort is provided in Table 197.

**Table 197: Dwelling Occupants by Age Cohort by Region (%)**  
**Percent of Dwellings**

Age cohort of home's occupants	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3441
5 years or younger	5.2	5.4	4.1	5.1	7.2	7.3
6 – 12 yrs	10.5	8.6	6.7	9.5	10.4	10.4
13 – 18 yrs	13.2	10.1	8.7	11.7	11.4	12.9
19 – 24 yrs	15.9	7.1	8.1	12.4	12.1	13.2
25 – 44 yrs	30.4	24.3	20.8	27.4	26.5	28.8
45 – 64 yrs	52.8	45.0	43.2	49.4	51.3	56.8
65 yrs and older	56.3	52.6	64.6	56.4	48.4	44.2
<b>Households with children (&lt;19 yrs)</b>	<b>22.2</b>	<b>18.7</b>	<b>15.9</b>	<b>20.4</b>	<b>22.0</b>	<b>23.9</b>

Columns do not sum to 100%

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On average, one-in-five (20%) households have children at home (persons 18 years of age or younger). Regionally, Lower Mainland region households are the most likely to have children at home (22%) compared to Vancouver Island (16%) and the Interior (19%).<sup>32</sup> Finally, somewhat less than six-in-ten (56%) households have one or more persons aged 65 years or older in the home, up from 48% in 2017 and 44% in 2012. This is consistent with the aging of the baby boom cohort.

Table 198 explores the relationship between dwelling type and the distribution of occupants by age. Row/townhouses are the most likely dwelling type to have children (25%) and apts / condos and mobile homes are the least likely to have children in the home (8% each). Mobile homes are the most likely to be home to one or more seniors (68%).

**Table 198: Dwelling Occupants by Age Cohort by Dwelling Type (%)**  
Percent of Dwellings

Age cohort of home's occupants	Single Family Detached	Semi-Detached	Row / Town-house	Apt / Apt-Style Condo	Mobile & Other
<i>Unweighted base</i>	3836	218	358	138	242
5 years or younger	5.4	4.6	4.7	3.1	2.9
6 – 12 yrs	9.3	11.3	12.9	4.6	5.8
13 – 18 yrs	12.3	8.1	14.0	2.5	0.8
19 – 24 yrs	13.8	8.5	7.7	2.1	3.3
25 – 44 yrs	28.3	22.4	26.7	26.5	15.2
45 – 64 yrs	52.0	45.3	41.2	22.2	28.3
65 yrs and older	56.3	58.8	51.5	59.2	67.7
<b>Households with children (&lt;19 yrs)</b>	<b>20.8</b>	<b>17.3</b>	<b>25.3</b>	<b>8.3</b>	<b>7.6</b>

Columns do not sum to 100%

Sixteen percent (16%) of FEI households experienced a change in the number of people in the home in the two years prior to the 2022 survey, down significantly from 18% in the two years prior to the 2017 survey (Table 199). Nine percent (9%) experienced an increase in household size, 5% experienced a decrease, and 1% indicated the number of occupants had fluctuated both up and down over the last two years.

**Table 199: Changes in the Number of Occupants per Dwelling – Last Two Years (%)**

Change in number of occupants?	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3441	2181
Yes – changed in last two years	16.5	15.3	15.2	16.0	18.2	21.0	32.2
Yes – more people in the past	9.8	7.8	8.9	9.1	9.8	11.7	17.8
Yes – fewer people in the past	5.4	5.8	5.0	5.4	6.6	6.5	7.1
Yes – both fewer and more people in the past	1.3	1.7	1.3	1.4	1.8	2.1	7.1

<sup>32</sup> When the data are reorganized to identify households with at least one child between the ages of 6 and 24 years, it suggests that up to 27% of FEI's residential customers would have had at least one primary or secondary school age child studying from home during the COVID pandemic. Regionally, the pandemic's effect on home schooling would highest for households in the Lower Mainland (32% of households have school age children) compare to the INT (19%) and VI (20%). Having children who normally would attend school now being required to study from home (possibly with a supervising adult) would, everything else held constant, increase energy use in home due to higher daytime thermostat settings.

### 12.2.2 Working from Home

In a new series of questions for the 2022 REUS, respondents were asked whether anyone in their residence works either part-time or full-time from home and, if yes, whether the number of days had increased over the past two years, and whether the number of days worked from home was expected to increase, decrease or remain the same over the next two years. Working from home versus outside the home tends, everything else held constant, to increase energy use in home due to higher thermostat settings during the day. During the height of the COVID-19 pandemic, many businesses and organizations allowed or required their staff to work from home to minimize transfer of the contagion.

Table 200 shows three-in-ten (30%) households had one or more persons working either part-time or full-time from home at the time of the 2022 survey. Of these, 60% indicated that the number of days worked from home by this person / these persons increased during the past two years. Regionally, the proportion of households with someone working from home is highest in the Lower Mainland (35%) and lowest in the Interior (22%). Proportionately more respondents in the Lower Mainland compared to the other regions indicated the number of days working from home increased during the last two years.<sup>33</sup>

**Table 200: Incidence of Working from Home by Region (%)**

	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	1428	2257	1107	4792
Yes – working from home either part-time or full-time (%)	35.0	21.9	26.6	30.3
Yes – Number of days working from home has increased past two years (%) <sup>1</sup>	62.8	51.0	55.8	59.7

<sup>1</sup> Base: Households with one or more persons working from home either part-time or full-time

In the next two years, two-thirds (68%) of respondents with persons working from home expect the number of hours they work from home to stay the same, 19% expect them to decrease and 4% expect the number of hours to increase (Table 201). Differences between the regions are not statistically significant.

<sup>33</sup> Households with one or more school age children (ages 6 to 24 years) were statistically more likely to (i) have someone working from home and (ii) to have increased the number of hours worked from home during the past two years. While the reasons for working from home or why the number of hours working from home increased during the past two years were not queried, the relationship between school age children and hours worked from home is consistent the pandemic's effects on working families with school-age children (i.e., parents were required to work from home either full or part time, in part, to supervise younger school age children who were required to attend school online).

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**Table 201: Days Working from Home – Next Two Years (%)**

Days working from home in the next two years expected to...	LM	INT	VI	2022 FEI
<i>Unweighted base</i>	314	250	164	728
Increase	6.6	5.9	4.1	6.2
Decrease	18.6	17.6	19.0	18.5
Stay the same	67.2	68.2	71.8	67.9
Don't know	7.6	8.3	5.1	7.4
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

### 12.2.3 Household Income

The distributions of 2022 REUS respondents by household income before taxes (2021) are provided in Table 202. The data are useful in providing context to income-driven differences between respondents regarding behaviours, attitudes, and equipment purchase decisions. While the proportion of respondents who chose to not answer this question is high (30%), the data are not rebased primarily because there are no apparent reasons why non-responses would be distributed across the income categories with the same relative proportions as responses. Regional comparisons should be made with caution as the proportion choosing not to answer the question varies by region.

**Table 202: Annual Household Income before Taxes (2021) by Region (%)**

Household income	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3441	2221
Less than \$20,000	1.3	2.1	0.6	1.5	3.0	3.1	3.7
\$20,000 to \$29,999	2.0	3.7	2.5	2.5	4.3	5.0	16.7
\$20,000 to \$39,999	2.5	5.5	3.4	3.4	5.2	6.3	
\$40,000 to \$49,999	4.2	5.9	5.7	4.9	5.5	6.5	17.6
\$50,000 to \$59,999	4.5	7.1	6.4	5.4	6.5	6.9	
\$60,000 to \$79,999	9.4	11.1	11.4	10.1	11.0	10.7	15.1
\$80,000 to \$99,999	8.1	9.2	7.7	8.4	8.4	9.7	10.8
\$100,000 to \$109,999	6.2	6.3	5.9	6.2	5.1	20.8	21.1
\$110,000 to \$119,999	3.0	3.4	3.8	3.2	4.1		
\$120,000 or more	27.3	19.3	22.6	24.5	15.9		
No response / Prefer not to answer	31.5	26.3	29.9	29.9	31.1	30.9	14.6
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Households with less than \$40K</b>	<b>5.8</b>	<b>11.3</b>	<b>6.5</b>	<b>7.4</b>	<b>12.5</b>	<b>14.4</b>	<b>20.4</b>
<b>Households with less than \$60K</b>	<b>23.9</b>	<b>35.4</b>	<b>30.0</b>	<b>27.8</b>	<b>24.5</b>	<b>27.9</b>	<b>38.0</b>
<b>Households with \$100K or more</b>	<b>36.5</b>	<b>29.0</b>	<b>32.3</b>	<b>33.9</b>	<b>25.1</b>	<b>20.8</b>	<b>21.1</b>

Totals may not sum due to rounding.

Household incomes by dwelling type are summarized in Table 203. As in past studies, occupants of mobile homes stand out as having significantly lower household incomes compared to occupants in other dwelling types. Twenty-six percent (26%) of households in mobile homes had household incomes of less than \$40,000 in 2021 compared to just 7% of households in SFDs and row/townhouses.

**Table 203: Annual Household Income before Taxes (2021) by Dwelling Type (%)**

Household income	Single Family Detached	Semi-Detached	Row / Town-house	Apt / Apt-Style Condo	Mobile & Other
<i>Unweighted base</i>	3836	218	358	138	242
Less than \$20,000	1.3	1.9	0.8	1.8	6.2
\$20,000 to \$29,999	2.1	1.2	3.4	4.8	10.0
\$30,000 to \$39,999	3.1	5.5	2.7	5.5	10.2
\$40,000 to \$49,999	4.6	3.0	4.6	6.9	13.5
\$50,000 to \$59,999	5.1	5.2	6.6	8.2	9.3
\$60,000 to \$79,999	9.3	15.4	13.8	11.2	13.5
\$80,000 to \$99,999	7.9	13.4	11.0	9.7	6.2
\$100,000 to \$109,999	6.5	8.7	3.3	7.5	2.5
\$110,000 to \$119,999	3.5	0.9	2.9	1.3	2.3
\$120,000 or more	25.7	19.1	25.5	16.2	5.4
No response / Prefer not to answer	31.0	25.8	25.4	26.8	21.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Households with less than \$40K</b>	<b>6.5</b>	<b>8.6</b>	<b>6.9</b>	<b>12.1</b>	<b>26.4</b>
<b>Households with less than \$60K</b>	<b>25.5</b>	<b>32.2</b>	<b>31.9</b>	<b>38.4</b>	<b>62.7</b>
<b>Households with \$100K or more</b>	<b>35.6</b>	<b>28.6</b>	<b>31.7</b>	<b>25.1</b>	<b>10.1</b>

Totals may not sum due to rounding.

#### 12.2.4 Languages Spoken in the Home

Respondents were asked to indicate the main language spoken in the home and then all other languages (if any) spoken in the home.

Nine-in-ten (92%) respondents indicated that English is the main language spoken in the home (Table 204). Cantonese and Mandarin are the second and third most commonly spoken languages, representing 4% of households. All other languages individually represented less than one percent of responses.

**Table 204: Main Language Spoken in the Home by Region (%)**

	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3441	2221
English	87.7	97.8	97.9	91.8	91.0	91.5	88.8
Mandarin	2.3	0.1	0.1	1.4	1.4	0.9	1.4
Cantonese	4.6	0.0	0.1	2.8	2.2	2.2	3.6
Hindi	0.4	0.1	0.1	0.3	0.1	--	0.3
Punjabi	1.2	0.0	0.3	0.8	0.5	0.5	0.4
Tagalog	0.7	0.2	0.2	0.5	0.4	0.1	1.0
Farsi (Persian)	0.4	0.1	0.0	0.3	0.3	0.4	--
French	0.4	0.5	0.3	0.4	0.1	0.4	0.4
German	0.1	0.2	0.3	0.2	0.1	0.1	0.6
Other	2.1	0.9	0.8	1.6	1.3	0.7	2.1
No response	--	--	--	--	2.5	3.2	1.4
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Totals may not sum due to rounding.

## Demographics

Slightly less than one-quarter (23%) of respondents indicated that two or more languages are spoken in the home. Languages other than the main language are listed in Table 205. All responses are expressed as a percent of the base of all REUS respondents and include multiple responses.

**Table 205: All Other Languages Spoken in the Home – by Region (%)**

**Multiple Responses Allowed**

	LM	INT	VI	2022 FEI	2017 FEI	2012 FEI	2008 FEI
<i>Unweighted base</i>	1428	2257	1107	4792	5827	3441	2174
English	9.9	1.5	1.5	6.5	5.2	3.7	3.7
Mandarin	2.2	0.3	0.5	1.4	1.3	1.7	0.7
Cantonese	3.1	0.2	0.3	1.9	2.3	1.8	1.4
Hindi	1.1	0.0*	0.3	0.7	0.5	0.6	0.5
Punjabi	1.8	0.3	0.5	1.2	0.7	0.8	0.7
Tagalog	1.7	0.3	0.2	1.1	1.1	0.5	0.6
Farsi (Persian)	0.6	0.0*	0.3	0.4	0.3	0.3	0.0*
French	5.7	5.8	7.5	6.0	5.0	5.1	4.3
German	2.3	2.8	2.3	2.4	2.4	3.8	2.4
Other	6.2	4.9	5.1	5.7	6.1	5.4	2.9

Columns do not sum to 100% because multiple responses were allowed.

\* Value less than 0.1%

# 13 CONDITIONAL DEMAND ANALYSIS

FortisBC Energy Inc. (FEI) uses information on end-use gas consumption for power system planning, load forecasting, marketing, and demand side management. End-use consumption refers to the energy used for space heating, water heating, cooking, and other specific uses, as opposed to total consumption. The Unit Energy Consumption (UEC) for an end-use is defined as the quantity of energy consumed by that end-use in a given period of time.

This section summarizes the results of a Conditional Demand Analysis (CDA) applied to the 2022 REUS data to estimate UEC values for major residential gas end-uses. CDA is a multivariate regression technique which combines utility billing data with weather information and customer specific data. A detailed presentation of the methodology, equation specifications, and equation results for the CDA are included in Appendix B.

## 13.1 Research Objectives

The objectives of the analysis were to:

- estimate weather-normalized UEC values for major residential gas end-uses, including space heating, water heating, fireplaces, cooking and other specific uses;
- estimate UEC values for each of the following regions: Lower Mainland, Interior, and Vancouver Island;
- disaggregate UECs for key end-uses by the following dwelling types (sufficient sample sizes permitting): single-family detached; semi-detached (i.e., duplexes, row houses / townhouses); apartments (apartments and apartment-like condominiums); and
- compare the results with past CDA studies.

The following gas end-uses were modelled:

- Primary space heating
- Secondary space heating (excluding fireplaces)
- Domestic water heating
- Fireplaces (heater type, free standing, and decorative)
- Cooking (gas range, cook top, oven, dual fuel range)
- Gas clothes dryers
- Hot tubs
- Piped gas BBQs
- Swimming pools

# Conditional Demand Analysis

## 13.2 Data and Sample

The sample used for the gas CDA consisted of households in FEI's service territory who participated in the 2022 Residential End-Use Study. For the purpose of the CDA, customers living in mobile homes and other dwelling types were excluded, as well as customers who have not lived in their residence for at least two years. This is consistent with previous studies and allows a more reliable comparison to CDA results over time.

The 2022 CDA used the survey data of each respondent merged with their residence's gas consumption and weather data specific to its location for the period February 2020 to January 2022.<sup>34</sup> Customers with missing consumption data were not used in the estimation of the conditional demand models. The resulting sample at the utility level contained a total of 3,901 customers (Table 206).

**Table 206: Sample used in FEI Conditional Demand Analysis**

	LM	INT	VI	2002 FEI
Single Family Detached	1,171	1,290	883	3,344
Multi-Family Dwelling	195	159	140	494
Apartment/Condominium	8	37	18	63
<b>Total</b>	<b>1,374</b>	<b>1,486</b>	<b>1,041</b>	<b>3,901</b>

## 13.3 Weather Data

Monthly weather data (heating degree days or HDDs) were obtained for nine representative weather stations and then assigned to customers in the sample based on their location (Table 207).<sup>35</sup> Degree days were calculated as the difference between the average daily temperature and a balance point temperature of 18° Celsius.

**Table 207: Representative Weather Stations**

Region	Sub-Region	Customer Location	Weather Station
Lower Mainland		Lower Mainland and Fraser Valley (incl. Hope)	Vancouver (YVR)
Vancouver Island	Southern Island	Ladysmith to Victoria	Victoria (YYJ)
	Northern Island	Nanaimo and the northern island (incl. Sunshine Coast)	Comox (YQQ)
Interior	Kelowna	West Kelowna to Enderby	Kelowna (YLW)
	Southern Interior	Peachland to Osoyoos (incl. Princeton east to Greenwood)	Penticton (YYF)
	Northern Interior – South	Merritt to Kamloops to Revelstoke (and north to 100 Mile House)	Kamloops (YKA)
	Northern Interior – North	North of 100 Mile House	Prince George (YXS)
	West Kootenays	Grand Forks to Creston (incl. Kootenay Lake area)	Castlegar (YCG)
	East Kootenays	East of Kootenay Lake	Cranbrook (YXC)

<sup>34</sup> As the REUS survey was conducted in the summer of 2022, there may be some cases where the household characteristics and behaviours reported in the survey do not reflect conditions during the period covered by the consumption data. More recent gas consumption data were not available at the time of this analysis.

<sup>35</sup> Source: Weather Data Depot ([www.weatherdatadepot.com](http://www.weatherdatadepot.com)).

Monthly averages of actual and normal heating degree days, calculated for the sample of households used in the CDA (weighted by region), are shown in Table 208. Note that there is little difference, on average, between actual and normal heating degree days over the two-year period used for the CDA.

**Table 208: Comparison of Actual and Normal Heating Degree Days**

Month	Actual HDDs <sup>1</sup>	Long-Term Normal HDDs <sup>2</sup>
January	446.8	465.0
February	420.8	424.6
March	383.6	365.0
April	251.4	261.0
May	142.5	135.8
June	63.3	62.2
July	16.6	15.3
August	20.9	12.7
September	69.6	88.4
October	255.1	245.2
November	354.6	366.2
December	494.1	484.2
<b>Monthly Average</b>	<b>243.3</b>	<b>243.8</b>

<sup>1</sup> Monthly averages, calculated over the two-year period used for the CDA (weighted by region).

<sup>2</sup> Ten-year averages (weighted by region).

### 13.4 Analysis

The conditional demand models were estimated using ordinary least squares. The regression models performed well. The adjusted R-squared values were high, and most of the regression coefficients had the correct sign and were significant at the five percent level or better (see Appendix B for the detailed regression outputs).

The regression coefficients were used to calculate Unit Energy Consumption (UEC) values for major residential end-uses. UECs were calculated for each household possessing the end-use by substituting household variables into the end-use equations. Normal heating degree days were substituted to generate weather-normalized UECs for space heating, fireplaces, and water heating. Weighted-average UECs were then calculated across all households possessing the end-use (weighted by region).

### 13.5 Utility Level Results

An overall conditional demand model was constructed to estimate UECs for FEI’s service area. The weather-normalized, weighted UECs are shown in Table 209. The main end-uses are primary space heating at 60.7 GJ per year, decorative fireplaces at 20.2 GJ per year, heater type fireplaces at 16.3 GJ per year, and domestic water heating at 14.9 GJ per year.<sup>36</sup> Secondary gas space heating (excluding fireplaces), gas

<sup>36</sup> The UEC estimate for decorative fireplaces is higher than for heater type fireplaces despite the latter being used more often on average (greater hours of use). This is consistent with past studies and is likely due to differences in efficiency levels.

## Conditional Demand Analysis

heated pools, and gas heated hot tubs are also heavy users of natural gas, but they have low penetration rates compared to other major end-uses.

**Table 209: Penetration Rates and Unit Energy Consumption by End-use – Overall Service Area**

	Sample Size (unweighted)	Penetration (% presence)	Unit Energy Consumption (GJ/year)	Avg. Consumption per Household (GJ/year)	% Dist	UECs in 2017 (GJ/year)	UECs in 2012 (GJ/year)
Primary Space Heating	3,208	86%	60.7	51.9	64%	51.7	52.4
Secondary Space Heating	250	6%	31.6	1.8	2%	23.3	24.5
Decorative Fireplaces	649	19%	20.2	3.8	5%	16.5	17.7
Heater Type Fireplaces	1,889	49%	16.3	8.0	10%	16.0	14.6
Free Standing Fireplaces and Heater Stoves	246	6%	7.2	0.4	<1%	14.7	7.0
Domestic Water Heating	2,783	75%	14.9	11.1	14%	20.8	26.3
Cooking	1,404	38%	6.7	2.6	3%	5.2	12.5
Barbeques	1,052	25%	1.4	0.3	<1%	0.7	0.3
Outdoor Fire Pits and Fireplaces	487	13%	3.8	0.5	1%	2.2	-
Dryers	212	5%	2.1	0.1	<1%	1.8	-
Swimming Pools	82	2%	52.0	1.1	1%	39.3	43.1
Hot Tubs	23	1%	20.8*	0.2*	<1%	-	21.3
<b>Household Consumption</b>							
Estimated				<b>81.8</b>			
Actual				<b>84.9</b>			

\* Small sample size (less than 30 households with end-use present). These results should be interpreted with caution.

Table 209 also shows a comparison between this study's UEC estimates and those produced in two prior conditional demand analyses, conducted as part of FEI's 2012 and 2017 Residential End-Use Studies. It is important to note that the two-year period used to conduct the current analysis (February 2020 to January 2022) coincides with the COVID-19 pandemic, in which many people worked and studied from home or were on furlough.<sup>37</sup> The resultant effects on residential energy demand must be considered when interpreting the results and making comparisons with past studies.

The weather-normalized UEC for primary space heating was estimated to be 60.7 GJ per year in the current analysis, up considerably from 52.4 GJ per year in 2012 and 51.7 GJ per year in 2017. This reversal of the long-term declining trend in UECs for primary space heating is attributed to the increased number of people forced to work or study from home during the COVID-19 pandemic. Space heating requirements, especially during the day, increase when people, traditionally away from home during the day, are required to work or study from home. For the period used in this analysis, the effects of the pandemic appear to more than offset any opposing forces that decrease demand for space heating over time, including the increasing efficiency of space heating equipment, improvements in the thermal efficiency of building envelopes (insulation, windows, etc.), the increasing popularity of supplementary heating systems (e.g., heat pumps paired with furnaces), adoption of energy conserving behaviours and technologies, as well as a general trend toward milder weather conditions, on average, during the heating season.<sup>38</sup>

<sup>37</sup> See Section 12.2.2, p. 128 for a discussion of data addressing changes in working from home patterns during the pandemic.

<sup>38</sup> The weighted average of normal heating degree days, calculated for the sample of households used in the CDA, has decreased over the span of these studies.

In contrast, the weather-normalized UEC for domestic water heating is lower in the current analysis (14.9 GJ per year) than in the 2012 and 2017 studies (26.3 GJ per year and 20.8 GJ per year, respectively). The decline in UEC for water heating is consistent with behavioural changes observed during the pandemic (e.g., fewer showers and laundry loads, on average), as well as more enduring trends that affect demand for water heating, such as improvements in the efficiency of hot water tanks, increasing popularity of on-demand (tankless) heaters, adoption of water conserving behaviours and technologies, as well as milder weather conditions, on average, in the colder months. Note, the water heating UEC may have been overestimated in the 2012 study (particularly among Lower Mainland customers) and so caution should be exercised when comparing these results.

The weather-normalized UEC for decorative fireplaces and, to a lesser extent, heater-type fireplaces, increased in the current analysis compared to the past studies. This may be partly due to behavioural changes related to the pandemic. UEC values for free-standing fireplaces vary considerably between studies (because of low penetration rates, estimates for this end-use should be interpreted with caution).

The pandemic appears to have also affected UECs for gas cooking appliances (e.g., gas ranges, dual fuel ranges, cook tops, and wall ovens) and for piped gas barbeques, both of which increased in the current analysis compared to the 2017 study. The increases are likely the result of more people cooking at home rather than dining out during the pandemic. The UEC for gas cooking appliances appears to be overestimated in the 2012 study.

### 13.5.1 UECs for Select Space Heating Equipment

One of the objectives of the analysis was to model the effects of gas furnaces, boilers, and combined space and water heating systems on primary space heating demand. Exogenous variables were incorporated into the conditional demand model to estimate these effects. Approximately 68% of the households in the CDA sample reported using a gas furnace as their main heating source (Table 210).

**Table 210: Penetration Rates and Unit Energy Consumption for Space Heating Equipment – Overall Service Area**

Primary Space Heating Equipment <sup>1</sup>	Sample Size (unweighted)	Penetration (% presence)	Unit Energy Consumption (GJ/year)
Gas Furnace	2,600	68%	55.7
Gas Boiler	238	9%	83.7
Gas Combined Heating System	158	5%	74.2

<sup>1</sup> Excludes cases in which equipment is used for secondary heating.

Among these customers, the weather-normalized, weighted UEC for primary space heating was 55.7 GJ per year. The overall weighted annual consumption for households with a gas furnace averaged 84.9 GJ per household.

Additionally, 9% of the sample reported using a gas boiler as their main heating source. Among these customers, the UEC estimate for primary space heating was 83.7 GJ per year. Dwellings with gas boilers have weighted average annual consumption of 123.0 GJ per household.

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Finally, 5% of the sample reported using a gas combined heating system that provides both space heating and domestic hot water. Among these customers, the UEC estimate for primary space heating was 74.2 GJ per year. The overall weighted annual consumption for households with a combined space and water heating system averaged 108.4 GJ per household.

### 13.6 Regional Analysis

CDA models typically require large samples and depend on a mix or diversity of end-uses among survey respondents to isolate their UECs statistically. The large regional sample sizes in the 2022 REUS allowed the development of individual conditional demand models for the Lower Mainland, Vancouver Island, and Interior regions. The benefit of this approach is that different model parameters are estimated for each region allowing for more robust UEC estimates. The results are presented in the following sections. Readers are reminded that estimated UECs for end-uses with low penetration rates should be interpreted with caution because of their small sample sizes.

#### 13.6.1 5.2.1 Lower Mainland

Table 211 shows the weather-normalized UECs for the Lower Mainland region. The major end-uses are primary space heating at 70.2 GJ per year, decorative fireplaces at 17.7 GJ per year, heater-type fireplaces at 13.7 GJ per year, and domestic water heating at 11.5 GJ per year.

**Table 211: Penetration Rates and Unit Energy Consumption by End-use – Lower Mainland**

	Sample Size	Penetration (% presence)	Unit Energy Consumption (GJ/year)	Avg. Consumption per Household (GJ/year)	% Dist	UECs in 2017 (GJ/year)	UECs in 2012 (GJ/year)
Primary Space Heating	1,217	89%	70.2	62.7	71%	60.0	55.0
Secondary Space Heating	66	5%	43.3	2.1	2%	33.6	41.5
Decorative Fireplaces	287	21%	17.7	3.7	4%	14.3	12.9
Heater Type Fireplaces	675	49%	13.7	6.8	8%	12.9	10.5
Free Standing Fireplaces and Heater Stoves	65	5%	5.3	0.3	<1%	12.9	5.3
Domestic Water Heating	1,028	77%	11.5	8.9	10%	20.5	29.9
Cooking	566	41%	2.7	1.1	1%	3.0	9.2
Barbeques	306	22%	3.1	0.7	1%	1.9	5.2
Outdoor Fire Pits and Fireplaces	198	14%	4.4	0.6	1%	0.6	-
Dryers	71	5%	4.3	0.2	<1%	0.5	-
Swimming Pools	27	2%	59.8*	1.2*	1%	43.2	37.1
Hot Tubs	13	1%	17.0*	0.2*	<1%	-	21.6
<b>Household Consumption</b>							
Estimated				<b>88.5</b>			
Actual				<b>92.7</b>			

\* Small sample size (less than 30 households with end-use present). These results should be interpreted with caution.

The weather-normalized average annual energy consumption per household (HEC) was estimated to be 88.5 GJ per year. In comparison, the actual average consumption for the sample was 92.7 GJ per year. Primary space heating accounts for approximately 71% of average household consumption in the Lower Mainland sample, followed by domestic water heating (10%), heater type fireplaces (8%), and decorative fireplaces (4%).

In the Lower Mainland, the weather-normalized UEC for primary space heating is greater than in Vancouver Island or the Interior. Compared to these regions, households in the Lower Mainland tend to have greater demand for space heating because dwellings are larger, and slightly older and less insulated, on average. As well, gas furnaces tend to be older and less efficient in the Lower Mainland, and the use of gas boilers is more common. These factors, among others, more than compensate for differences in weather conditions between the Lower Mainland and the Interior.

The weather-normalized UEC for domestic water heating is lower in the Lower Mainland than in the other regions. Considering the average number of people living in households is greater in the Lower Mainland, and that household size is an important driver of water heating demand, one would expect a larger UEC value for the Lower Mainland (this conjecture is supported by past CDA studies). It is possible that pandemic-related effects and/or other factors were more impactful in the Lower Mainland relative to the other regions. On the other hand, it could be the UEC value is somewhat underestimated.

The UEC for primary space heating is greater than the estimates derived in the 2012 and 2017 Residential End-Use Studies. In contrast, the UEC for domestic water heating is less than estimates produced in these past studies. As observed in the overall analysis, these differences can be explained, in part, by the effects of the COVID-19 pandemic on space and water heating demand. Note that the water heating UEC was likely overestimated in the 2012 analysis.

UEC estimates for decorative and heater-type fireplaces are higher in this analysis than in the previous studies, which may also be due to pandemic-related effects on household behaviour. Counter to the results of the overall analysis, the UEC for cooking appliances is somewhat lower compared to the past studies. Since there may be a confounding effect between the use of gas cooking appliances and gas barbeques, it may be more meaningful to consider these end-uses in the aggregate when comparing the results.<sup>39</sup>

It should be noted the Lower Mainland sample contained only eight households residing in apartments. The under-representation of apartments in the sample may skew the results, particularly for end-uses that are influenced by dwelling type. There were relatively few apartments in the 2012 and 2017 studies, and so comparisons are still appropriate.

### 13.6.1.1 UECs for Select Space Heating Equipment

Approximately 69% of the households in the Lower Mainland sample reported using a gas furnace as their main heating source. Among these customers, the weather-normalized UEC for primary space heating was 63.7 GJ per year (Table 212). The average annual consumption of a household with a gas furnace in this region was 89.1 GJ per year.

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<sup>39</sup> These two end-uses were also challenging to model in past studies.

## Conditional Demand Analysis

Of the 12% of the households in the Lower Mainland using a gas boiler as their main heating source, the UEC estimate for primary space heating was 90.5 GJ per year. Actual weighted consumption per household was 125.5 GJ per year.

Just 6% of the households in the Lower Mainland reported using a gas combined heating system that provides both space heating and domestic hot water. Among these customers, the UEC estimate for primary space heating was 80.7 GJ per year. The actual weighted consumption per household was 113.1 GJ per year.

**Table 212: Penetration Rates and Unit Energy Consumption for Space Heating Equipment – Lower Mainland**

Primary Space Heating Equipment <sup>1</sup>	Sample Size (unweighted)	Penetration (% presence)	Unit Energy Consumption (GJ/year)
Gas Furnace	943	69%	63.7
Gas Boiler	158	12%	90.5
Gas Combined Heating System	88	6%	80.7

<sup>1</sup> Excludes cases in which equipment is used for secondary heating.

### 13.6.2 Interior

Table 213 shows the weather-normalized UECs for the Interior region. The major end-uses are primary space heating at 58.2 GJ per year, heater type fireplaces at 17.2 GJ per year, domestic water heating at 13.9 GJ per year, and decorative fireplaces at 12.4 GJ per year.

**Table 213: Penetration Rates and Unit Energy Consumption by End-use – Interior**

	Sample Size	Penetration (% presence)	Unit Energy Consumption (GJ/year)	Avg. Consumption per Household (GJ/year)	% Dist	UECs in 2017 (GJ/year)	UECs in 2012 (GJ/year)
Primary Space Heating	1,332	90%	58.2	52.2	68%	48.1	53.0
Secondary Space Heating	77	5%	32.1	1.7	2%	18.9	18.5
Decorative Fireplaces	215	15%	12.4	1.8	2%	11.7	18.7
Heater Type Fireplaces	558	38%	17.2	6.5	8%	13.9	19.2
Free Standing Fireplaces and Heater Stoves	83	6%	13.8	0.8	1%	13.0	10.8
Domestic Water Heating	1,075	73%	13.9	10.2	13%	19.4	21.3
Cooking	404	27%	5.3	1.4	2%	5.3	11.1
Barbeques	406	27%	1.3	0.3	0%	2.9	1.9
Outdoor Fire Pits and Fireplaces	149	10%	**	**	**	-	-
Dryers	62	4%	4.1	0.2	0%	6.3	11.1
Swimming Pools	51	3%	48.0	1.7	2%	40.9	58.6
Hot Tubs	6	<1%	**	**	**	-	-
<b>Household Consumption</b>							
Estimated				<b>76.7</b>			
Actual				<b>78.3</b>			

\* Small sample size (less than 30 households with end-use present). These results should be interpreted with caution.

\*\* An attempt was made to include end-use in the CDA, but it was not retained in the model because the estimated UEC value was negative.

The weather-normalized average annual energy consumption per household (HEC) was estimated to be 76.7 GJ per year. In comparison, the actual average consumption for households in this sample was 78.3 GJ

per year. Primary space heating accounts for approximately 68% of average household gas consumption in the Interior sample, followed by domestic water heating (13%) and heater type fireplaces (8%). Decorative fireplaces contribute only two percent of average HEC.

The weather-normalized UEC for primary space heating for the Interior region is less than the comparable UEC for the Lower Mainland but greater than the UEC for Vancouver Island. Conversely, the UEC for domestic water heating is greater in the Interior than in the Lower Mainland but lower than in Vancouver Island.

Unit energy consumption values for heater-type and free-standing fireplaces are greater in the Interior than in the Lower Mainland or Vancouver Island regions, whereas the estimate for decorative fireplaces is less than in the other regions.

The UEC for primary space heating in this analysis is greater than in the past two studies, while the UEC for water heating is lower. UEC estimates for fireplaces are greater than in the 2017 study, whereas the UEC for cooking appliances remains unchanged. These patterns are consistent with those observed in the overall and other regional analyses, and can be explained, to a certain degree, by the effects of the pandemic on household behaviours.

### 13.6.2.1 UECs for Select Space Heating Equipment

Eight in ten (80%) households in the Interior CDA sample reported using a gas furnace as their main heating source. Among these customers, the weather-normalized UEC for primary space heating was 56.4 GJ per year (Table 214). The actual average consumption per household was 78.7 GJ per year.

Only 3% of the households in the Interior reported using a gas boiler as their main heating source. Among these customers, the UEC estimate for primary space heating was 78.1 GJ per year. The actual weighted consumption per household with this end-use was 99.1 GJ per year.

Three percent (3%) of households in the Interior CDA sample reported using a gas combined heating system that provides both space heating and domestic hot water. Among these customers, the UEC estimate for primary space heating was 68.3 GJ per year. The actual weighted consumption per household was 86.7 GJ per year.

**Table 214: Penetration Rates and Unit Energy Consumption for Space Heating Equipment – Interior**

Primary Space Heating Equipment <sup>1</sup>	Sample Size (unweighted)	Penetration (% presence)	Unit Energy Consumption (GJ/year)
Gas Furnace	1196	80%	56.4
Gas Boiler	40	3%	78.1
Gas Combined Heating System	45	3%	68.3

<sup>1</sup> Excludes cases in which equipment is used for secondary heating.

## Conditional Demand Analysis

### 13.6.3 Vancouver Island

Table 215 shows the weather-normalized UECs for the Vancouver Island region. The major end-uses are primary space heating at 44.5 GJ per year, domestic water heating at 16.5 GJ per year, heater type fireplaces at 16.0 GJ per year, and decorative fireplaces at 15.1 GJ per year.

**Table 215: Penetration Rates and Unit Energy Consumption by End-use – Vancouver Island**

	Sample Size	Penetration (% presence)	Unit Energy Consumption (GJ/year)	Avg. Consumption per Household (GJ/year)	% Dist	UECs in 2017 (GJ/year)	UECs in 2012 (GJ/year)
Primary Space Heating	659	63%	44.5	28.2	50%	38.6	43.0
Secondary Space Heating	107	10%	12.7	1.3	2%	9.4	6.9
Decorative Fireplaces	147	14%	15.1	2.1	4%	14.4	12.0
Heater Type Fireplaces	656	63%	16.0	10.1	18%	15.1	10.6
Free Standing Fireplaces and Heater Stoves	98	9%	10.7	1.0	2%	18.7	12.8
Domestic Water Heating	680	66%	16.5	10.8	19%	17.0	18.3
Cooking	434	42%	2.6	1.1	2%	3.6	5.7
Barbeques	340	33%	1.6	0.5	1%	1.5	1.1
Outdoor Fire Pits and Fireplaces	140	13%	3.0	0.4	1%	7.3	-
Dryers	79	8%	1.0	0.1	<1%	1.3	3.7
Swimming Pools	4	<1%	38.1*	0.1*	<1%	15.4	-
Hot Tubs	4	<1%	**	**	**	25.3	-
<b>Household Consumption</b>							
Estimated				<b>55.9</b>			
Actual				<b>58.7</b>			

\* Small sample size (less than 30 households with end-use present). These results should be interpreted with caution.

\*\* An attempt was made to include end-use in the CDA, but it was not retained in the model because the estimated UEC value was negative.

The weather-normalized average annual energy consumption per household (HEC) was estimated to be 55.9 GJ per year. In comparison, the actual average consumption for the sample was 58.7 GJ per year. Primary space heating accounts for half of average household gas consumption in the Vancouver Island sample, followed by domestic water heating (19%), heater type fireplaces (18%), and decorative fireplaces (4%).

The estimated UEC for primary space heating in Vancouver Island is significantly less than in the other regions. Compared to the Lower Mainland, dwellings on Vancouver Island tend to have lower demand for space heating because they are smaller and tend to be slightly newer and better insulated. As well, the use of newer, high-efficiency furnaces is more prevalent, while use of relatively more energy-intensive gas boilers is less common, relative to the Lower Mainland. In addition, weather conditions are an important factor in explaining the difference in heating demand between Vancouver Island and the Interior.

In contrast, the estimated UEC for domestic water heating on Vancouver Island is greater than in the other regions. Intuitively, one would expect the opposite given that household sizes tend to be smaller on Vancouver Island than in the Lower Mainland, and the climate milder relative to the Interior. As well, the adoption of on-demand (tankless) water heaters is more widespread on Vancouver Island. Still, the UEC for water heating is in line with estimates from past studies.

In the current analysis, the UEC for decorative fireplaces on Vancouver Island is less than the estimate derived for the Lower Mainland, but greater than in the Interior. Conversely, the UEC for heater type fireplaces is greater than in the Lower Mainland, but less than in the Interior.

The UEC for primary space heating on Vancouver Island is greater than the estimates produced in the 2012 and 2017 Residential End-Use Studies, whereas the UEC for domestic water heating is marginally lower than the estimates from these studies. These patterns are consistent with those observed in the overall and other regional analyses. However, the decline in the water heating UEC is less noticeable in Vancouver Island than in the other regions, which could mean the pandemic-related effects on water heating demand were less marked. If this were true, it would help to explain why the water heating UEC is greater in Vancouver Island than in the other regions, despite any counter factors.

UEC estimates for decorative and heater type fireplaces are greater in this analysis compared to the previous studies, whereas the UEC for cooking appliances is somewhat lower compared to the past studies.

As with the Lower Mainland, the sample used for Vancouver Island did not contain many households in apartments (n=18). Consequently, results may be skewed for end-uses that are influenced by dwelling type. Past studies also had relatively few apartments in their samples.

### 13.6.3.1 UECs for Select Space Heating Equipment

Approximately 44% of the households in the Vancouver Island sample reported using a gas furnace as their main heating source. Among these customers, the weather-normalized UEC for primary space heating was 43.1 GJ per year. Actual average consumption per household was 71.2 GJ per year.

As well, 4% of the households in Vancouver Island reported using a gas boiler as their main heating source. Among these customers, the UEC estimate for primary space heating was 82.3 GJ per year. Actual weighted consumption per household was 114.1 GJ per year.

Only 2% of the households in Vancouver Island reported using a gas combined heating system that provides both space heating and domestic hot water. Among these customers, the UEC estimate for primary space heating was 59.5 GJ per year. Actual weighted consumption per household was 89.8 GJ per year.

**Table 216: Penetration Rates and Unit Energy Consumption for Space Heating Equipment – Vancouver Island**

Primary Space Heating Equipment <sup>1</sup>	Sample Size (unweighted)	Penetration (% presence)	Unit Energy Consumption (GJ/year)
Gas Furnace	461	44%	43.1
Gas Boiler	40	4%	82.3
Gas Combined Heating System	25	2%	59.5 <sup>2</sup>

<sup>1</sup> Excludes cases in which equipment is used for secondary heating.

<sup>2</sup> Small sample size (less than 30 households with end-use present). These results should be interpreted with caution.

# Conditional Demand Analysis

## 13.7 UECs by Dwelling Type

Exogenous variables were incorporated into the CDA models for primary space heating and water heating to disaggregate by the following dwelling types: SFDs, semi-detached, and apts/condos. Of note, meaningful UEC estimates could not be produced for apartments in the individual regions due to the small number of households residing in this dwelling type.

### 13.7.1 Primary Space Heating

Table 217 shows estimated weather-normalized UECs for primary gas space heating by geographic region and dwelling type.

**Table 217: Primary Gas Space Heating UECs (GJ/year)**

	LM <sup>1</sup>	INT <sup>1</sup>	VI <sup>1</sup>	FEI Overall (weighted) <sup>2</sup>
Single Family Detached	75.4	60.0	46.9	64.1
Multi-Family Dwelling	35.8	40.0	30.0	34.4
Apartment/Condominium <sup>3</sup>	na	na	na	na
<b>Overall</b>	<b>70.2</b>	<b>58.2</b>	<b>44.5</b>	<b>60.7</b>

<sup>1</sup> UECs estimated from individual regional conditional demand model.

<sup>2</sup> UECs estimated from overall conditional demand model.

<sup>3</sup> Insufficient sample to produce meaningful estimates.

### 13.7.2 Gas Water Heating

Table 218 shows estimated weather-normalized UECs for gas water heating by geographic region and dwelling type.

**Table 218: Domestic Water Heating UECs (GJ/year)**

	LM <sup>1</sup>	INT <sup>1</sup>	VI <sup>1</sup>	FEI Overall (weighted) <sup>2</sup>
Single Family Detached	10.7	14.4	16.2	14.7
Multi-Family Dwelling	18.4	13.2	19.4	18.0
Apartment/Condominium <sup>3</sup>	na	na	na	na
<b>Overall</b>	<b>11.5</b>	<b>13.9</b>	<b>16.5</b>	<b>14.9</b>

<sup>1</sup> UECs estimated from individual regional conditional demand model.

<sup>2</sup> UECs estimated from overall conditional demand model.

<sup>3</sup> Insufficient sample to produce meaningful estimates.

## 13.8 Limitations

The results of this study should be interpreted with some caution due to several important limitations:

1. The estimated consumption levels of high-penetration end-uses (e.g., primary space heating) may mask the effects of other modelled end-uses and/or capture the effects of non-modelled end-uses.
2. The effects of low-penetration end-uses (e.g., gas dryers) are difficult to estimate because of small sample sizes.

3. The effects of certain end-uses (e.g., gas cooking appliances and barbeques) may be confounded because of a high correlation of ownership.
4. Unit energy consumption values could not be estimated for apartments in the individual regions due to small sample sizes.
5. Some information collected through the self-reported customer survey may be unreliable.
6. The rich model specifications originally developed for some end-uses had to be simplified because of unreasonable regression results.
7. The composition of the sample used to develop the conditional demand model may skew the results (e.g., under-representation of apartments, especially in the Lower Mainland).



# 14 REFERENCES

Natural Resources Canada (2012), *Keeping the Heat In*, Cat. No. M144-41/2012E-PDF. Retrieved from: <https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/canmetenergy/pdf/housing/KeepingtheHeatIn.pdf>.

Province of British Columbia, Energy Efficiency Act of British Columbia, Energy Efficiency Standards Regulation, B.C. Reg. 389/93.

Sampson Research (2009), *2008 Residential End-Use Survey*, report prepared for Terasen Gas Inc. by Sampson Research Inc., November 2009.

Sampson Research (2014), *2012 FEU Residential End-Use Survey*, report prepared for FortisBC Energy Utilities by Sampson Research Inc., July 2014.

Sampson Research (2019), *2017 FEI Residential End-Use Survey*, report prepared for FortisBC Energy Inc. by Sampson Research Inc., March 2019.



# Appendix A

2022 REUS Questionnaire





Service Address

Survey ID

June 23, 2022

Dear Customer,

At FortisBC, we're committed to providing a range of energy services to meet your needs today and tomorrow. Planning for your future needs means understanding how residential customers like you currently use energy and if you plan to change how you use energy in the future.

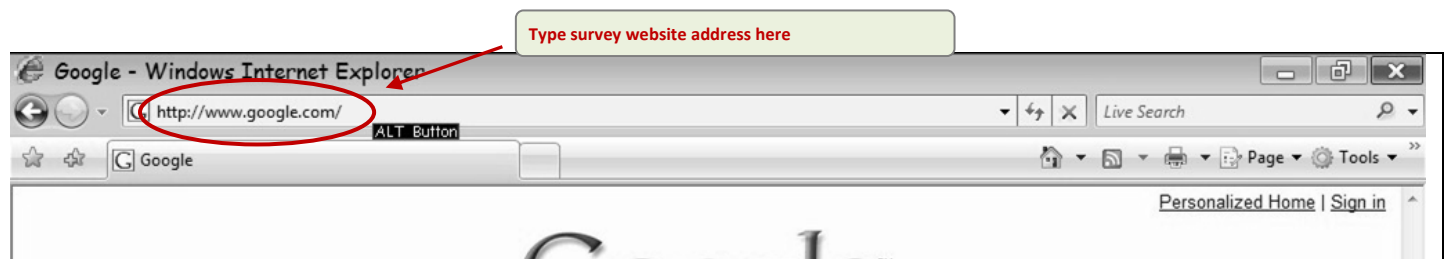
Your household has been randomly selected from a list of our customers to complete this important survey. The survey will improve our understanding of how energy is used in homes, assist in the design of energy efficiency programs to help you reduce your energy bills and lower your greenhouse gas emissions.

Complete this survey by July 31, 2022 and you can enter your name for a chance to win one of four \$1,000 pre-paid VISA® gift cards. If you complete the survey online your name will be entered in the draw twice, doubling your chances of winning. Full contest details are found below.

We have hired Mustel Group, an independent British Columbia-based market research firm to assist us in conducting this research. Your responses will be treated as strictly confidential by FortisBC and will be aggregated with those of other customers. FortisBC will use these results solely for research and planning purposes.

### How to complete this survey

There are two ways you can complete this survey. Complete this printed version and return it using the self-addressed postage paid envelope provided, or complete the survey online (Internet) by typing the following website address into your browser's address window: **fortisbcreus.com** (Do not use a search engine). When prompted, enter the **SURVEY ID** located at the top right-hand corner of this covering letter to begin the survey. Only one survey (paper or online) will be accepted per household.



This survey should be completed by the person responsible for the maintenance and repair of your home.

**Please ensure that your survey responses refer to the residence located at the SERVICE ADDRESS at the top of this page.**

### **Privacy**

The survey will tell us how you use energy in your home. To meet the goals of this survey, FortisBC will also analyze how much energy your home has used over the past two years.

To protect your privacy, Mustel Group, the market research company that is conducting this survey on behalf of FortisBC, will not have access to your account information. As well, FortisBC will not see your individual responses. The information collected will be treated confidentially and in accordance with the provisions of the *Personal Information Protection Act* (British Columbia). The information collected will not be used for any marketing or sales purpose.

If you have any questions about the survey or how the information will be used, please contact: Walter Wright or Roy Mokha, Market Research, FortisBC at 604-592-7653 or 778-578-8095 during business hours or [market.research@fortisbc.com](mailto:market.research@fortisbc.com).

If you have mislaid the return envelope, please mail your completed questionnaire to: c/o FortisBC, élan Data Makers, Suite 350 11120 Horseshoe Way, Richmond, BC V7A 5H7.

Yours truly,

Mark Warren; Director Business Innovation, FortisBC

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Contest rules can be viewed at [www.mustelgroup.com/contestrules](http://www.mustelgroup.com/contestrules) or are available upon request.

**Dear Customer:**

Throughout this questionnaire, when we ask about your home or residence, we are referring to the property at the SERVICE ADDRESS printed on the cover page of this survey. If you live in an apartment, apartment-style condominium or townhouse complex, we are interested only in the areas and appliances covered by your FortisBC bill.

**A. About this residence**

**A1. Which of the following statements best describes your relationship to the residence located at the SERVICE ADDRESS printed on the cover page of this survey?**

- <sup>1</sup> I (co) own and live full-time at this property  
<sup>2</sup> I (co) own and live part-time at this property  
<sup>3</sup> I own and live at this property but also rent part of it to others  
<sup>4</sup> I own this property but live elsewhere  
<sup>5</sup> I am a renter living at this property



Whenever you see this symbol, it means there is additional information available to help you answer one or more survey questions. Please review the information before answering the questions.

**A2. How many years have you lived in or owned the residence at the SERVICE ADDRESS?**

\_\_\_\_\_ years

**A3. How many weeks per year is this residence normally occupied?**

\_\_\_\_\_ weeks

**A4. Has this residence at the SERVICE ADDRESS been occupied by the same person(s) for the last two years?**

- <sup>1</sup> Yes                      <sup>2</sup> No

**A5. Is this residence part of a housing co-op?**

- <sup>1</sup> Yes                      <sup>2</sup> No

**A6. Who pays the natural gas bill for the residence at the SERVICE ADDRESS?**

- <sup>1</sup> Property owner(s)  
<sup>2</sup> Renter(s)  
<sup>96</sup> Other (please specify): \_\_\_\_\_  
<sup>99</sup> No natural gas service

**A7. Who pays the electricity bill for the residence at the SERVICE ADDRESS?**

- <sup>1</sup> Property owner(s)  
<sup>2</sup> Renter(s)  
<sup>96</sup> Other (please specify): \_\_\_\_\_

**A8. Does the electricity bill for this residence cover any of the following?**

	Yes	No	Don't Know	Not Applicable
Rental suite(s)	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
Coach house or laneway house	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
Detached garage / workshop	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
Other buildings (e.g., sheds, farm buildings)	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
Pumps (e.g., wells, irrigation, etc.)	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>

**A9. Do you pay rent or maintenance fees for this residence?**

- <sup>1</sup> Yes    <sup>2</sup> No → GO TO QUESTION A11

**A10. If you pay rent or maintenance fees, which of the following are included in these fees? (Check all that apply)**

- <sup>1</sup> Heat  
<sup>2</sup> Hot water  
<sup>3</sup> Fuel for gas fireplace  
<sup>4</sup> Electricity for electric vehicle charging  
<sup>97</sup> None of the above  
<sup>98</sup> Don't know  
<sup>99</sup> I do not pay rent or maintenance fees for this property

**A11. Do you or anyone in your household use part of this residence to run a full-time or part-time business?**

- <sup>1</sup> Yes, full-time business      <sup>2</sup> Yes, part-time business      <sup>3</sup> No

**A12. Is this residence a...**

- <sup>1</sup> Single family dwelling (detached)      <sup>4</sup> Apartment or apartment-style condominium  
<sup>2</sup> Duplex      <sup>5</sup> Mobile or manufactured home  
<sup>3</sup> Row/townhouse (3 or more units attached, each with a separate entrance)      <sup>96</sup> Other (please specify): \_\_\_\_\_

**A13. When was this residence built?**

- <sup>1</sup> Before 1950      <sup>4</sup> 1986-1995      <sup>7</sup> 2016 or later  
<sup>2</sup> 1950-1975      <sup>5</sup> 1996-2005      <sup>98</sup> Don't know  
<sup>3</sup> 1976-1985      <sup>6</sup> 2006-2015

**A14. What type of basement does this residence have?**

- <sup>1</sup> Full basement      <sup>3</sup> Crawl space → GO TO QUESTION A16  
<sup>2</sup> Partial basement      <sup>4</sup> No basement → GO TO QUESTION A17

**A15. Is the basement of this residence unfinished, partly finished or completely finished?**

- <sup>1</sup> Unfinished      <sup>2</sup> Partly finished      <sup>3</sup> Completely finished

**A16. During the heating season, is the basement or crawl space usually heated?**

- <sup>1</sup> Yes      <sup>2</sup> No      <sup>98</sup> Don't know

**A17. What is the total floor area of this residence, including the basement and unfinished areas but excluding the garage or carport?**

\_\_\_\_\_ Square feet      OR      \_\_\_\_\_ Square metres

**A18. How many floors (stories) of this residence are heated? Please include the basement if heated. If this residence is an apartment or condominium, this question refers only to your unit.**

- <sup>1</sup> <sup>2</sup> <sup>3</sup> <sup>4</sup> <sup>5+</sup>

**A19. If this service address is an apartment or apartment-style condominium, how many floors (stories) does your building have in total? (Do not count floors used for parking)**

\_\_\_\_\_ floors or stories for this building      <sup>99</sup> Not an apartment or apartment-style condominium

**A20. Please indicate which areas of this residence have insulation.**

Location	Have insulation?			
	Yes	No	Don't know	Not applicable
Attic	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
Exterior walls	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>98</sup>	
Basement	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
Crawl space	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
Heated garages / workshops	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>

**A21. Has the insulation in this residence been improved or upgraded?**

Location	Yes	No	Don't know	Not applicable
Attic	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
Exterior walls	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>98</sup>	
Basement	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
Crawl space	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
Heated garages / workshops	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>

**A22. Which of the following best describes this residence?**

<sup>1</sup> Not at all drafty      <sup>2</sup> Sometimes drafty      <sup>3</sup> Always drafty

**A23. Please indicate the number of outside doors in this residence. If this residence is an apartment or condominium, please count only doors in your unit that open directly to the outdoors.**

	Number		Number
Wood doors	____ <sup>a</sup>	Glass doors with wooden frames	____ <sup>d</sup>
Wood doors with aluminum storm doors	____ <sup>b</sup>	Glass doors with aluminum frames	____ <sup>e</sup>
Insulated steel or fibreglass doors	____ <sup>c</sup>	Glass doors with vinyl or fibreglass frames	____ <sup>f</sup>

**A24. Have any of the outside doors at this residence been upgraded with new doors in the last 5 years?**

<sup>1</sup> Yes – all of them  
<sup>2</sup> Yes – some of them  
<sup>3</sup> No – none of them  
<sup>98</sup> Don't know

**A25. What type of windows does this residence have? Please estimate the percentage of windows by the following window types.**

Window type	% of all windows	ENERGY STAR <sup>®</sup> rated?
Single pane regular (clear) glass	_____ %	
Double pane regular (clear) glass	_____ %	
Double pane low-E*	_____ %	→ <input type="checkbox"/> <sup>1</sup> Yes <input type="checkbox"/> <sup>2</sup> No <input type="checkbox"/> <sup>98</sup> Don't know
Triple pane regular (clear) glass	_____ %	
Triple pane low-E*	_____ %	→ <input type="checkbox"/> <sup>1</sup> Yes <input type="checkbox"/> <sup>2</sup> No <input type="checkbox"/> <sup>98</sup> Don't know
<b>Total</b>	<b>100%</b>	

\* Low-E coated glass has a slight shading or tint when compared to standard windows.

**A26. Please estimate the percentage of your windows that have the following frames:**

	% of windows
Aluminum frames	_____ %
Wood frames	_____ %
Vinyl frames	_____ %
Other (please specify): _____	_____ %
<b>Total</b>	<b>100%</b>

**A27. Have any of the windows at this residence been upgraded with new windows (frames and glass) in the last 5 years?**

<sup>1</sup> Yes – all of them  
<sup>2</sup> Yes – some of them  
<sup>3</sup> No – none of them  
<sup>98</sup> Don't know

## B. Space heating

B1. Please indicate the fuel(s) used to heat this residence. First, indicate the main space heating fuel (check one only). The main fuel is the one that provides most of the heat in the home during a typical year. Next, indicate any other fuels used to provide heat for this home (check all that apply).

Space heating fuels	Main space heating fuel (check one only)	Other space heating fuels (check all that apply)
Electricity	<input type="checkbox"/> 1	<input type="checkbox"/> 1
Natural gas	<input type="checkbox"/> 2	<input type="checkbox"/> 2
Piped propane	<input type="checkbox"/> 3	<input type="checkbox"/> 3
Bottled propane	<input type="checkbox"/> 4	<input type="checkbox"/> 4
Oil	<input type="checkbox"/> 5	<input type="checkbox"/> 5
Wood	<input type="checkbox"/> 6	<input type="checkbox"/> 6
Other	<input type="checkbox"/> 96	<input type="checkbox"/> 96
Don't know	<input type="checkbox"/> 98	<input type="checkbox"/> 98
No other space heating fuel used ▶		<input type="checkbox"/> 99

### Have a heat pump?

If this residence uses an air source heat pump or geothermal heat pump as a source of heat, select "electricity" under the appropriate column.

### Piped propane service?

Piped propane is only applicable to FortisBC customers in Revelstoke

B2. Is the MAIN space heating fuel for this residence different from what was used five years ago?

- 1 Yes → CONTINUE  
 2 No → GO TO QUESTION B4

B3. What was the previous MAIN space heating fuel? (check one fuel only)


- 1 Electricity       3 Piped propane       5 Oil       96 Other  
 2 Natural gas       4 Bottled propane       6 Wood       98 Don't know

 Gas: unless specified "gas" refers to natural gas or propane

### Combined space and water heating systems

Combined or combination heating systems replace a traditional boiler and hot water tank or furnace and hot water tank with an integrated system that supplies both heat and hot water for the home.

B4. Which of the following does this residence have?

- 1 Gas boiler → GO TO QUESTION B5  
 2 Gas furnace → GO TO QUESTION B6  
 3 Combined space & water heating system  → GO TO QUESTION B7  
 4 Electric furnace → GO TO QUESTION B11  
 99 None of the above → GO TO QUESTION B12

B5. GAS BOILERS ONLY: Boiler efficiency refers to how much useful heat your boiler extracts from the gas. The higher the efficiency of the boiler, the less fuel is required to heat your house. Boilers are categorized as low efficiency, mid-efficiency, or high efficiency.

What is the efficiency of your boiler? 

- 1 Low efficiency – 60% to 70% efficient  
 2 Mid-efficiency – 80% to 85% efficient  
 3 High efficiency – 90% efficient or higher  
 98 Don't know

### Gas boiler efficiencies

#### Low efficiency gas boilers:

- Less than 80% efficient
- Uses a standing pilot light

#### Mid-efficiency gas boilers:

- 80% to 85% efficient
- No pilot light, uses igniter instead

#### High efficiency gas boilers:

- 90% efficient or higher
- No pilot light, uses igniter instead
- Flue is a plastic pipe exiting the side of the house

**B6. GAS FURNACES ONLY:** Furnace efficiency refers to how much useful heat your furnace extracts from the gas. The higher the efficiency of the furnace, the less fuel is required to heat your house. Furnaces are categorized as low efficiency, mid-efficiency, or high efficiency.

What is the efficiency of your gas furnace?

- <sup>1</sup> Low efficiency – less than 78% efficient (25 years or older, pilot light and metal flue exiting through the roof)  
<sup>2</sup> Mid-efficiency – 78% to 85% efficient (10 years or older, no pilot light and metal flue exiting through the roof)  
<sup>3</sup> High efficiency – 90% efficient or higher (No pilot light, flue is a plastic pipe exiting the side of the home)  
<sup>98</sup> Don't know

**B7. Is your furnace, boiler or combination system an ENERGY STAR® qualified model? If yes, it should display the ENERGY STAR® symbol.**

- <sup>1</sup> Yes <sup>2</sup> No <sup>98</sup> Don't know



model?

**B8. Has a new gas furnace, gas boiler or gas combination system been installed in this residence in the past five years?**

- <sup>1</sup> Yes  
<sup>2</sup> No  
<sup>98</sup> Don't know

**B9. How old is your gas furnace, boiler, or combination system?**

- \_\_\_\_\_ years <sup>98</sup> Don't know


**B10. How likely is it that the furnace, boiler, or combination system for this residence will be replaced sometime during the next two years?**

- <sup>1</sup> Very likely  
<sup>2</sup> Somewhat likely  
<sup>3</sup> Not at all likely  
<sup>98</sup> Don't know

**B11. Please indicate whether you always, usually, occasionally or never do the following. (check one box per row)**

	Always	Usually	Occasion -ally	Never	Don't know	Not applicable
Change the heating furnace filter regularly	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
Have the heating system serviced annually by a contractor	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
Service the heating system annually myself	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>

**B12. Which of the following does this residence have?**

- <sup>1</sup> Ducted air source heat pump   
<sup>2</sup> Ductless air source heat pump  
<sup>3</sup> Ground source heat pump (Geothermal)  
<sup>99</sup> None of the above → **GO TO QUESTION B15**

### Air source heat pump types

Air source heat pumps provide efficient heating and cooling for your home. There are two types:

**Ductless (mini-split)** – Warm or cold air is provided by one or more air handling units or “heads” mounted on the inside walls of the home.

**Ducted** – these air source heat pumps may be connected to a forced air furnace. Warm or cold air from the heat pump is distributed throughout the home via the dwelling’s duct work.

**B13. Which of the following best describes how you use your heat pump?**

- <sup>1</sup> Both heating and cooling  
<sup>2</sup> Cooling only  
<sup>3</sup> Heating only  
<sup>98</sup> Don't know

**B14. Please indicate whether you always, usually, occasionally or never do the following. (check one box per row)**

	Always	Usually	Occasion -ally	Never	Don't know	Not applicable
Change the heat pump filter regularly	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
Have the heat pump serviced annually by a contractor	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
Service the heat pump system annually myself	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>

**B15. There are several METHODS (heating equipment) that can be used to heat a home. Please indicate the main method used to heat this residence (check one only), then any other methods used to heat this residence (check all that apply).**

Heating methods	Main space heating method (check one only)	Other space heating methods used (check all that apply)
Forced air furnace	<input type="checkbox"/> 1	<input type="checkbox"/> 1
Wired-in electric baseboards	<input type="checkbox"/> 2	<input type="checkbox"/> 2
Boiler with hot water baseboards or radiators	<input type="checkbox"/> 3	<input type="checkbox"/> 3
Boiler with hot water in-floor / under-floor heat	<input type="checkbox"/> 4	<input type="checkbox"/> 4
Combined space and water heating system	<input type="checkbox"/> 5	<input type="checkbox"/> 5
Fireplace or heater stove	<input type="checkbox"/> 6	<input type="checkbox"/> 6
Heat pump – air source	<input type="checkbox"/> 7	<input type="checkbox"/> 7
Heat pump – geothermal	<input type="checkbox"/> 8	<input type="checkbox"/> 8
Wired-in electric wall heater (fan forced)	<input type="checkbox"/> 9	<input type="checkbox"/> 9
Electric radiant heat (floors, walls, and/or ceilings)	<input type="checkbox"/> 10	<input type="checkbox"/> 10
Gas wall heater	<input type="checkbox"/> 11	<input type="checkbox"/> 11
Portable electric heaters	<input type="checkbox"/> 12	<input type="checkbox"/> 12
District or community heating system	<input type="checkbox"/> 13	<input type="checkbox"/> 13
Other (please specify): _____	<input type="checkbox"/> 96	<input type="checkbox"/> 96
No other space heating method used →		<input type="checkbox"/> 99

**B16. Which of the following thermostats are used in this residence? (Check all that apply)**

- 1 Programmable thermostats
- 2 “Smart” or learning-style thermostats (Nest, ecobee, etc.)
- 3 Manual (non-programmable) thermostats → GO TO SECTION C
- 98 Don’t know → GO TO SECTION C

**B17. How many of your programmable thermostat(s) are programmed?**

- 1 All of them
- 2 Some of them
- 3 None of them
- 98 Don’t know

## C. Fireplaces and heater stoves

Many homes are equipped with fireplaces or heater stoves. Some provide ambiance but little or no heat, while others can be used to heat one or more rooms.

### **i** Gas fireplace and heater stove types

**Decorative fireplaces** – Provide ambiance but have little or no heating ability. The hearth is often open to the room or equipped with opening glass doors.

**Heater type fireplaces (built-ins and inserts)** – These fireplaces are efficient heaters with fixed glass fronts and may have features such as fans and thermostatic control. They may be built-in at the time of construction or inserted into an existing masonry or other fireplace as an upgrade.

**Free standing fireplaces and heater stoves** – These are stand alone units that can be used for both ambiance and heating. Gas heater stoves resemble wood stoves in appearance but use gas instead of wood.

**C1. How many fireplaces and heating stoves are there in this residence?**

1  2  3  4+  None  → GO TO SECTION D

**C2. For each fireplace / heating stove this residence has, please indicate the type of fireplace / heating stove.**

	Fireplace 1	Fireplace 2	Fireplace 3
Gas (decorative)	<input type="checkbox"/> 1	<input type="checkbox"/> 1	<input type="checkbox"/> 1
Gas (heater type)	<input type="checkbox"/> 2	<input type="checkbox"/> 2	<input type="checkbox"/> 2
Gas (free standing)	<input type="checkbox"/> 3	<input type="checkbox"/> 3	<input type="checkbox"/> 3
Electric	<input type="checkbox"/> 4	<input type="checkbox"/> 4	<input type="checkbox"/> 4
Wood burning fireplace	<input type="checkbox"/> 5	<input type="checkbox"/> 5	<input type="checkbox"/> 5
Wood burning stove	<input type="checkbox"/> 6	<input type="checkbox"/> 6	<input type="checkbox"/> 6
Other: _____	<input type="checkbox"/> 96	<input type="checkbox"/> 96	<input type="checkbox"/> 96

**IF THIS RESIDENCE DOES NOT HAVE A GAS FIREPLACE OR HEATING STOVE, GO TO C5**

**C3. How old is (are) your gas fireplace(s)?**

Gas fireplace 1 \_\_\_\_\_ years      Don't know  98  
 Gas fireplace 2 \_\_\_\_\_ years      Don't know  98  
 Gas fireplace 3 \_\_\_\_\_ years      Don't know  98

**C4. Please indicate which of the following features each gas fireplace has (check all that apply for each fireplace).**

	Gas Fireplace 1	Gas Fireplace 2	Gas Fireplace 3
Fixed glass front	<input type="checkbox"/> 1	<input type="checkbox"/> 1	<input type="checkbox"/> 1
Glass doors that open	<input type="checkbox"/> 2	<input type="checkbox"/> 2	<input type="checkbox"/> 2
No glass (open hearth)	<input type="checkbox"/> 3	<input type="checkbox"/> 3	<input type="checkbox"/> 3
Remote control	<input type="checkbox"/> 4	<input type="checkbox"/> 4	<input type="checkbox"/> 4
Standing pilot light	<input type="checkbox"/> 5	<input type="checkbox"/> 5	<input type="checkbox"/> 5

**C5. How many hours are the fireplaces and heater stoves in use during a typical week in each of the following seasons? Please sum the total hours for ALL fireplaces and heater stoves used in a typical week in each season.**

July – September \_\_\_\_\_ hours per week  
 October – December \_\_\_\_\_ hours per week  
 January – March \_\_\_\_\_ hours per week  
 April – June \_\_\_\_\_ hours per week

**C6. Approximately, what share of this residence's space heating is provided by fireplaces and/or heater stoves?  
 Please include ALL fireplaces and heater stoves at this residence in your answer.**

0% (none)  0      Up to 25%  2      Up to 75%  4      Don't know  98  
 Up to 10%  1      Up to 50%  3      Up to 100%  5

C7. Has a wood, electric or gas, fireplace or heater stove been installed in this residence during the last five years?

- Yes  1 → CONTINUE  
 No  2  
 Don't know  98 } → GO TO SECTION D

C8. What did you install?

- 1 Gas fireplace or heater stove → CONTINUE  
 2 Wood heater stove  
 3 Electric fireplace  
 98 Don't know } → GO TO SECTION D

C9. Did this Gas fireplace or heater stove replace an existing wood, gas, or electric fireplace or was it a new installation? (select one)

- 1 Replaced a wood fireplace or wood heater stove  
 2 Replaced a gas fireplace or gas heater stove  
 3 Replaced an electric fireplace  
 4 Nothing - new installation  
 98 Don't know

## D. Domestic water heating

D1. How many water heaters are there in this residence? If you live in an apartment, townhouse, or row house where hot water is centrally provided to all units (from outside your unit), please check "none".

- 1  2  3  None → GO TO SECTION E

D2. What types of water heater(s) are there in this residence? Homes with more than one water heater usually have one water heater that provides more hot water than the others. For classification purposes, consider this unit your main water heater.

	Heater 1 (main unit)	Heater 2	Heater 3
Conventional storage (tank)	<input type="checkbox"/> 1	<input type="checkbox"/> 1	<input type="checkbox"/> 1
On-demand (tankless)	<input type="checkbox"/> 2	<input type="checkbox"/> 2	<input type="checkbox"/> 2
Combined space and water heating system	<input type="checkbox"/> 3	<input type="checkbox"/> 3	<input type="checkbox"/> 3
Heat pump water heater tank	<input type="checkbox"/> 4	<input type="checkbox"/> 4	<input type="checkbox"/> 4
Don't know	<input type="checkbox"/> 98	<input type="checkbox"/> 98	<input type="checkbox"/> 98

D3. What type of fuel does your water heater(s) use?



	Heater 1 (main unit)	Heater 2	Heater 3
Electricity	<input type="checkbox"/> 1	<input type="checkbox"/> 1	<input type="checkbox"/> 1
Natural gas	<input type="checkbox"/> 2	<input type="checkbox"/> 2	<input type="checkbox"/> 2
Piped propane	<input type="checkbox"/> 3	<input type="checkbox"/> 3	<input type="checkbox"/> 3
Bottled propane	<input type="checkbox"/> 4	<input type="checkbox"/> 4	<input type="checkbox"/> 4
Oil	<input type="checkbox"/> 5	<input type="checkbox"/> 5	<input type="checkbox"/> 5
Geothermal	<input type="checkbox"/> 6	<input type="checkbox"/> 6	<input type="checkbox"/> 6
Other	<input type="checkbox"/> 96	<input type="checkbox"/> 96	<input type="checkbox"/> 96
Don't know	<input type="checkbox"/> 98	<input type="checkbox"/> 98	<input type="checkbox"/> 98

### Water heater fuels

Most water heaters use gas, oil, or electricity to generate hot water. If your hot water heater has a flue or vent (metal or plastic) that exits the house, then it uses gas or oil. If you cannot see a vent, then it uses

D4. All water heaters that use gas or oil require some way to vent combustion gases. If this residence uses one or more gas or oil fired hot water heaters, please indicate the type of vent used.

	Heater 1 (main unit)	Heater 2	Heater 3
Vent through the side wall	<input type="checkbox"/> 1	<input type="checkbox"/> 1	<input type="checkbox"/> 1
Vent through the roof	<input type="checkbox"/> 2	<input type="checkbox"/> 2	<input type="checkbox"/> 2
Electric - No vent required	<input type="checkbox"/> 3	<input type="checkbox"/> 3	<input type="checkbox"/> 3
Don't know	<input type="checkbox"/> 98	<input type="checkbox"/> 98	<input type="checkbox"/> 98

**D5. Is the fuel used for domestic water heating (main unit) different from what was used five years ago?**

- Yes <sup>1</sup> → CONTINUE  
 No <sup>2</sup> → GO TO QUESTION D7

**D6. What was the previous water heating fuel? (Check one only)**

- Electricity <sup>1</sup>    Bottled propane <sup>4</sup>    Don't know <sup>98</sup>  
 Natural gas <sup>2</sup>    Oil <sup>5</sup>  
 Piped propane <sup>3</sup>    Other <sup>96</sup>

**D7. How old is (are) your water heater(s)?**

- Heater 1 (Main Unit)    \_\_\_\_\_ years    Don't know <sup>98</sup>  
 Heater 2    \_\_\_\_\_ years    Don't know <sup>98</sup>  
 Heater 3    \_\_\_\_\_ years    Don't know <sup>98</sup>

**D8. What is the size (volume) of the largest hot water tank in your home? The size is printed on the label attached to your tank.**

- <sup>1</sup> Not applicable – I have an on-demand (tankless) water heater  
<sup>2</sup> Less than 30 imperial gallons (less than 135 litres)  
<sup>3</sup> 30 to 39 imperial gallons (135 to 180 litres)  
<sup>4</sup> 40 to 59 imperial gallons (181 to 270 litres)  
<sup>5</sup> 60 or more imperial gallons (271 litres or more)  
<sup>96</sup> Other (please specify): \_\_\_\_\_  
<sup>98</sup> Don't know

**D9. Where is your water heating equipment located? (main unit only)**

- <sup>1</sup> In the main living area of the home    <sup>5</sup> In a heated garage  
<sup>2</sup> In a heated basement    <sup>6</sup> In an unheated garage  
<sup>3</sup> In an unheated basement    <sup>96</sup> Other (please specify): \_\_\_\_\_  
<sup>4</sup> Inside a crawl space    <sup>98</sup> Don't know

**D10. Has a new water heater been installed in this residence within the past five years?**

- Yes <sup>1</sup> → CONTINUE  
 No <sup>2</sup> → GO TO QUESTION D12

**D11. What was the main reason for installing a new water heater? (check one only)**

- Water heater had failed <sup>1</sup>  
 Anticipated water heater failure <sup>2</sup>  
 Wanted more efficient water heater <sup>3</sup>  
 New home <sup>4</sup>  
 Wanted to switch to gas <sup>5</sup>  
 Needed more hot water <sup>6</sup>  
 Required to qualify for home insurance <sup>7</sup>  
 Other <sup>96</sup>

**D12. Please indicate the total number of the following for your residence:**

- |   | Number |
|---|--------|
| Showerheads (all kinds)                     | _____  |
| Low flow showerheads                        | _____  |
| Water heater blankets                       | _____  |
| Instant hot water dispensers                | _____  |
| Bathroom and kitchen faucets using aerators | _____  |

**D13. Please indicate the total number of the following for all members of your household:**

- |                                     | Number |
|-------------------------------------|--------|
| Number of dishwasher loads per week | _____  |
| Number of baths per week            | _____  |
| Number of showers per week          | _____  |

**D14. Please estimate the total amount of time that shower(s) are used on a typical weekday (total for all members of this residence)**

\_\_\_\_\_ minutes per day  <sup>999</sup>No showers – take baths only

**D15. Is the water used by this residence metered?**

Yes  <sup>1</sup> → CONTINUE  
 No  <sup>2</sup> }  
 Don't know  <sup>98</sup> } → GO TO SECTION E

**D16. Does this residence receive a bill for the amount of water it uses based on the water meter reading?**

<sup>1</sup> Yes  <sup>2</sup> No  <sup>98</sup> Don't know

## E. Swimming pools, hot tubs & saunas

**E1. Does this residence have a swimming pool, hot tub, or sauna that is for the exclusive use of this residence?**

Yes  <sup>1</sup> → CONTINUE  
 No  <sup>2</sup> → GO TO SECTION F

**E2. Please indicate whether this residence has an indoor or outdoor swimming pool, hot tub or sauna that is for the exclusive use of this residence (for example, not shared with other residences in a townhouse or condominium complex). For each that you have, please indicate the fuel used to heat it.**

	Have one that is for exclusive use of this residence?	If yes, what is the main fuel used to heat it? (check one only)
a. Indoor swimming pool	<input type="checkbox"/> <sup>1</sup> Yes → <input type="checkbox"/> <sup>2</sup> No	<input type="checkbox"/> <sup>1</sup> Electricity <input type="checkbox"/> <sup>3</sup> Propane <input type="checkbox"/> <sup>96</sup> Other <input type="checkbox"/> <sup>2</sup> Natural gas <input type="checkbox"/> <sup>4</sup> Solar <input type="checkbox"/> <sup>98</sup> Don't know
b. Outdoor swimming pool	<input type="checkbox"/> <sup>1</sup> Yes → <input type="checkbox"/> <sup>2</sup> No	<input type="checkbox"/> <sup>1</sup> Electricity <input type="checkbox"/> <sup>3</sup> Propane <input type="checkbox"/> <sup>96</sup> Other <input type="checkbox"/> <sup>2</sup> Natural gas <input type="checkbox"/> <sup>4</sup> Solar <input type="checkbox"/> <sup>98</sup> Don't know  <input type="checkbox"/> <sup>6</sup> Check here if a solar heater is used to supplement main fuel  <input type="checkbox"/> <sup>99</sup> Pool not heated
c. Hot tub / Jacuzzi	<input type="checkbox"/> <sup>1</sup> Yes → <input type="checkbox"/> <sup>2</sup> No	<input type="checkbox"/> <sup>1</sup> Electricity <input type="checkbox"/> <sup>3</sup> Propane <input type="checkbox"/> <sup>98</sup> Don't know <input type="checkbox"/> <sup>2</sup> Natural gas <input type="checkbox"/> <sup>96</sup> Other
d. Sauna	<input type="checkbox"/> <sup>1</sup> Yes → <input type="checkbox"/> <sup>2</sup> No	<input type="checkbox"/> <sup>1</sup> Electricity <input type="checkbox"/> <sup>3</sup> Propane <input type="checkbox"/> <sup>98</sup> Don't know <input type="checkbox"/> <sup>2</sup> Natural gas <input type="checkbox"/> <sup>96</sup> Other

### A REMINDER

Please ensure your survey responses refer to the residence at the service address printed on the front cover of this survey.

To ensure you are eligible to win one of the four \$1,000 pre-paid VISA gift cards, be sure to return your completed survey by July 31, 2022 using the enclosed self-addressed postage-paid return envelope package. Better yet, complete it online and double your chance at winning. Only one survey (paper or online) will be accepted per household.

## F. Appliances

F1. Please indicate the number of each of the following appliances in use in this residence. Where asked, please indicate the approximate age of the main appliance (your best guess is acceptable). If your home does not have the appliance, please check the "0" box.

	Number in use				Age of main appliance (years)
	0	1	2	3+	
<b>COOKING</b>					
Electric range (cook top and oven)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	_____
Gas range (cook top and oven)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	_____
Dual fuel range (gas cook top, electric oven)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	_____
Electric cook top	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	_____
Gas cook top	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	_____
Induction range	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	_____
Electric wall oven	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	_____
Gas wall oven	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	_____
Microwave oven	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	_____
Toaster oven	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	_____
Gas barbeque (piped gas)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	_____
Gas barbeque (propane tank)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	_____
Electric barbeque	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	_____


### REFRIGERATION

Refrigerator – manual defrost	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	_____
Refrigerator – automatic defrost	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	_____
Compact bar fridge (include wine cooler)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	_____
Stand-alone freezer – upright	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	_____
Stand-alone freezer – chest style	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	_____

### CLEANING

Dishwasher	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	_____
Clothes washer - top load	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	_____
Clothes washer - front load	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	_____
Electric clothes dryer	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	_____
Gas clothes dryer	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	_____
Heat pump clothes dryer	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	_____

### HEATING

 Heat recovery ventilator/make up air unit (HRV)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	
Energy recovery ventilator (ERV)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	
Gas outdoor heater (piped gas)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	
Electric outdoor heater	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	
Gas outdoor heater (bottled gas)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	
Gas outdoor fire pit or fireplace	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	

#### HRV/ERV

An HRV captures heat from the stale air leaving your house and uses it to preheat the fresh air coming into your house. Energy recovery ventilators (ERVs) are a type of HRV that can exchange both heat and moisture.

F2. Please indicate the number of each of the following appliances in this residence. If your home does not have the appliance, please check the "0" box.

	Number in use			
	0	1	2	3
Central air conditioner	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Portable air conditioner	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Room window air conditioner	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Portable fan	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Humidifier	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Dehumidifier	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Portable electric heater	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Rotating ceiling fans without light fixtures	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Rotating ceiling fans with light fixtures	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3

**F3. Some appliances and other home equipment can be monitored and controlled remotely from inside or outside the home by 'connecting' them wirelessly to a smartphone, tablet, or computer.**

Does this home have any appliances or equipment 'connected' wirelessly to a smartphone, tablet or computer?


Yes  1  
 No  2  
 Don't know  98 } → GO TO Section G

**F4. Which of the following items does your household monitor and control via a wireless 'connection'? (check all that apply)**

- 1 Clothes washer  
 2 Clothes dryer  
 3 Dishwasher  
 4 Fridge  
 5 Lighting  
 6 Security system  
 7 Stove/Oven  
 8 Smart plugs/smart electrical outlets  
 9 Smart speakers (e.g. Google Home, Alexa)  
 10 Other entertainment items (e.g. televisions, gaming consoles, etc.)  
 11 Thermostats (for heating and/or cooling equipment)  
 12 Water heating equipment  
 96 Other (please specify): \_\_\_\_\_  
 98 Don't know

 **Smart home hub/gateway**

A smart home hub/gateway system is a small, standalone box that allows all your smart products to 'speak the same wireless language' so they can be monitored and controlled from one app. (not to be confused with a modem or wi-fi router).

**F5. Does this home have a smart home hub/gateway system installed?** 

1 Yes     2 No     98 Don't know

**SECTIONS G AND H APPLY TO FORTISBC ELECTRICITY CUSTOMERS ONLY. THESE SECTIONS HAVE BEEN OMITTED FROM YOUR SURVEY.**

## J. Renovations & energy use

- J1. Please indicate renovations or actions you have completed at this residence during the past five years, whether you received a government or utility rebate to complete them, and the renovations you plan to undertake the next two years.

	Did this – past five years		Plan to do this – next two years
	With rebate	Without rebate	
Improve insulation	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>1</sup>
Install energy-efficient window(s)	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>2</sup>
Install insulated outside door(s) or storm doors	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>3</sup>
Install low-flow showerhead(s)	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>4</sup>
Install a smart / learning style thermostat(s)	<input type="checkbox"/> <sup>5</sup>	<input type="checkbox"/> <sup>5</sup>	<input type="checkbox"/> <sup>5</sup>
Install pipe wrap	<input type="checkbox"/> <sup>6</sup>	<input type="checkbox"/> <sup>6</sup>	<input type="checkbox"/> <sup>6</sup>
Install weather stripping or caulking	<input type="checkbox"/> <sup>7</sup>	<input type="checkbox"/> <sup>7</sup>	<input type="checkbox"/> <sup>7</sup>
Install hot water heater blanket	<input type="checkbox"/> <sup>8</sup>	<input type="checkbox"/> <sup>8</sup>	<input type="checkbox"/> <sup>8</sup>
Install drainpipe waste heat recovery system	<input type="checkbox"/> <sup>9</sup>	<input type="checkbox"/> <sup>9</sup>	<input type="checkbox"/> <sup>9</sup>
Install an air source heat pump	<input type="checkbox"/> <sup>10</sup>	<input type="checkbox"/> <sup>10</sup>	<input type="checkbox"/> <sup>10</sup>
Install on-demand (tankless or hybrid) water heater	<input type="checkbox"/> <sup>11</sup>	<input type="checkbox"/> <sup>11</sup>	<input type="checkbox"/> <sup>11</sup>
Install high efficiency hot water tank	<input type="checkbox"/> <sup>12</sup>	<input type="checkbox"/> <sup>12</sup>	<input type="checkbox"/> <sup>12</sup>
Install hot tub		<input type="checkbox"/> <sup>13</sup>	<input type="checkbox"/> <sup>13</sup>
Install sauna		<input type="checkbox"/> <sup>14</sup>	<input type="checkbox"/> <sup>14</sup>
Install heated swimming pool		<input type="checkbox"/> <sup>15</sup>	<input type="checkbox"/> <sup>15</sup>
Install an outdoor clothesline or clothes drying rack		<input type="checkbox"/> <sup>16</sup>	<input type="checkbox"/> <sup>16</sup>
None of the above	<input type="checkbox"/> <sup>99</sup>		<input type="checkbox"/> <sup>99</sup>

- J2. In the next two years, are you planning to install a GAS FIREPLACE (insert, zero clearance or heater type stove) in this residence?

- <sup>1</sup> Yes →CONTINUE  
<sup>2</sup> No  
<sup>98</sup> Don't know } → GO TO SECTION K

- J3. Would this gas fireplace replace an existing wood, gas, or electric fireplace or would it be a new installation? (select one)

- <sup>1</sup> Replace a wood fireplace or heater stove  
<sup>2</sup> Replace a gas fireplace  
<sup>3</sup> Replace an electric fireplace  
<sup>4</sup> New installation  
<sup>98</sup> Don't know

## K. Managing energy use

This section is intended to help FortisBC understand how you use / manage energy at this residence.

- K1. At what temperature do you usually keep this residence during the winter (heating) season? If this residence has air conditioning (central, window, portable, or heat pump), also tell us what temperature you usually keep this residence during the summer (cooling) season.

	Winter (heating)		Summer (cooling)	
	Degrees C	or Degrees F	Degrees C	or Degrees F
When someone is at home	___	___	___	<input type="checkbox"/> <sup>99</sup> NA
When no one is home	___	___	___	<input type="checkbox"/> <sup>99</sup> NA
During the night	___	___	___	<input type="checkbox"/> <sup>99</sup> NA
	<input type="checkbox"/> <sup>97</sup> Do not have air conditioning			

Next, we would also like to understand the types of actions that you take to manage energy use at this residence. Please check the answer that best describes what you normally do.

K2. Space heating		Always	Usually	Occasionally	Never	Don't know	Not applicable
a.	Close window coverings to keep in heat	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
b.	Turn down the heat at night either manually or using a programmable or smart thermostat	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
c.	Turn down the heat either manually or using a programmable or smart thermostat <i>when no one is at home</i>	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
d.	Reduce temperature in unused rooms by closing vents or turning down room thermostats	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
e.	Check and re-seal air leaks in the house at least once a year (weather stripping and caulking)	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
f.	If single pane windows, install storm windows each fall	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
g.	Install plastic window coverings on drafty windows during winter months	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>

**K3. Are you able to reduce the temperature in unoccupied rooms at this residence? This could be done by turning down individual room thermostats, closing doors, and closing vents?**

<sup>1</sup> Yes    <sup>2</sup> No    <sup>98</sup> Don't know

K4. Air conditioning / cooling		Always	Usually	Occasionally	Never	Don't know	Not applicable
a.	Set the thermostat at 26°C (78°F) or higher during the summer to save energy	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
b.	Close the window coverings (drapes, blinds, etc.) during hot weather to reduce heat in the dwelling	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
c.	Clean the air conditioner filter and coils at least once per season	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
d.	Turn on air conditioning only when very hot and natural ventilation is insufficient	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
e.	Use a smart/programmable thermostat or manually turn off air conditioning at night	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
f.	Cool only rooms to be occupied rather than the whole home	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>

K5. Water & laundry		Always	Usually	Occasionally	Never	Don't know	Not applicable
a.	Turn off the water heater or use its "vacation setting" when no one is home for more than 2 or 3 days	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
b.	Only do laundry with full loads	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
c.	Clean the dryer lint filter before drying clothes	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
d.	Use the dryer's temperature / moisture sensor to turn off the dryer rather than using timed dry	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
e.	Hang clothes to dry rather than machine dry to save energy	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
f.	Only run dishwasher when full	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
g.	Air dry the dishes in the dishwasher rather than use the heated dry cycle	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
h.	Leave water running when washing hands	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>

**K6. Please indicate the location of the laundry appliances this residence typically uses.**

- <sup>1</sup> In my own home  
<sup>2</sup> In a laundry room located elsewhere in my building (e.g., laundry appliances shared with other units)  
<sup>3</sup> In another building or at a laundry business

**K7. Does this residence have an outdoor clothesline or other means for hanging clothes to dry outdoors?**

- <sup>1</sup> Yes    <sup>2</sup> No    <sup>3</sup> Not allowed in our building / neighbourhood

**K8. How many loads of laundry does your household do per week?**

Number of loads of laundry done \_\_\_\_\_ per week  
 Number of loads using cold water wash and rinse only \_\_\_\_\_ per week  
 Number of dryer loads \_\_\_\_\_ per week  
 Number of loads dried using a clothesline or drying rack during SUMMER \_\_\_\_\_ per week  
 Number of loads dried using a clothesline or drying rack during WINTER \_\_\_\_\_ per week

K9. Lighting		Always	Usually	Occasion-ally	Never	Don't know	Not applicable
a.	Only have the minimum number of lights on in a room for what I am doing	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
b.	Turn off the lights when no one is in the room	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
c.	Leave outdoor lights on at night (exclude those you do not control)	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
d.	Check timers to reflect daylight savings time	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>

K10. Refrigeration		Always	Usually	Occasion-ally	Never	Don't know	Not applicable
a.	Clean the refrigerator coils at least once a year	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
b.	Check the temperature of the refrigerator to ensure food is not too cold or warm	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
c.	Check the temperature of your freezer to ensure food remains frozen, but that the freezer is not too cold	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>

K11. Other		Always	Usually	Occasion-ally	Never	Don't know	Not applicable
a.	Turn off TV / entertainment systems when no one is in the room and actively using them	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
b.	Turn off the computer and printers when not in use	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
c.	Unplug or use a power bar to turn off TVs, entertainment systems, and computers when not in use?	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>
d.	Leave one or more windows open during winter	<input type="checkbox"/> <sup>1</sup>	<input type="checkbox"/> <sup>2</sup>	<input type="checkbox"/> <sup>3</sup>	<input type="checkbox"/> <sup>4</sup>	<input type="checkbox"/> <sup>98</sup>	<input type="checkbox"/> <sup>99</sup>

**K12. Who usually decides on which energy related repairs or renovations are made to the home? (Choose the most appropriate answer.)**

- <sup>1</sup> Myself    <sup>2</sup> Someone else in the household    <sup>3</sup> Landlord

**K13. Who makes the most effort to conserve electricity / gas in your household? (Choose the most appropriate answer.)**

- <sup>1</sup> Myself    <sup>4</sup> All members of the household  
<sup>2</sup> Someone else in the household    <sup>5</sup> None of us  
<sup>3</sup> Most members of the household

**K14. Overall, how much effort is your household currently making to conserve electricity / gas?**

- 1 Great amount of effort  
 2 A fair amount of effort  
 3 A little effort  
 4 No effort at all  
 98 Don't know

**K15. Compared to two years ago, is your household making more of an effort to conserve electricity / gas, less of an effort or about the same amount of effort?**

- 1 Much more of an effort  
 2 Somewhat more of an effort  
 3 Neither more nor less effort (no change)  
 4 Somewhat less of an effort  
 5 Much less of an effort  
 98 Don't know

**L. Products & services****L1. On a scale of one to four, where one is “not at all interested” and four is “very interested”, how interested would you be in the following products and services?**

		Not at all interested			Very interested
		1	2	3	4
a.	Home energy audit to determine main energy uses in the home and identify opportunities to save energy	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
b.	Do-it-yourself online energy audit	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
c.	Furnace or heat pump tune-up to ensure they are working safely and efficiently	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
d.	Program to replace a lower efficiency furnace with a high-efficiency furnace	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
e.	Program to install high-efficiency gas fireplace	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
f.	Program to replace standard-efficiency clothes washer with high-efficiency clothes washer	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
g.	Program to replace standard-efficiency water heater with high-efficiency water heater	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
h.	Program to upgrade attic and wall insulation	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
i.	Program to improve draft proofing	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
j.	Program to install programmable or “smart” thermostats	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
k.	Program to install an in-home display that allows you to monitor your home’s energy usage	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
l.	Program to purchase an electric automobile	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
m.	Program to compare your home’s energy use with homes of comparable size and type	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
n.	Program to purchase rooftop solar panels	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4

**L2. During the last five years, did your household participate in any utility or government programs offering rebates to reduce energy use in your home? If yes, please indicate who offered the rebate.**

**Check all that apply**

- FortisBC  1  
 BC Hydro  2  
 Federal, provincial or municipal government  3  
 None of the above  99

### M. Attitudes toward energy use

**M1. In order to serve you better, we would like to understand your views on a number of energy related issues. On a scale of one to five, where one means “strongly disagree” and five means “strongly agree”, please indicate how much you agree or disagree with the following statements on energy and natural gas usage.**

	Strongly disagree		Neither agree nor disagree		Strongly agree
	1	2	3	4	5
a. There are many ways that a person can save energy. When you add them up, they result in substantial savings	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
b. By making my home more energy efficient, I am helping to do my part for the environment	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
c. I think natural gas is a clean and efficient energy source	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
d. Members of my household regularly limit the length of their showers to save energy	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
e. I don't want to think about natural gas or electricity. I simply want it to work.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
f. When something needs to be done around home, I usually hire someone	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
g. I almost always have a home renovation on the go	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
h. Our household has reduced its energy use by as much as reasonably possible	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
i. I am a busy person with little or no time to research ways to save energy	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
j. I conserve energy because it saves money, not because it helps the environment	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
k. I am knowledgeable about what affects my home's energy use	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5

**M2. On a scale of one to five, where one means “strongly disagree” and five means “strongly agree”, please indicate how much you agree or disagree with the following statements.**

	Strongly disagree		Neither agree nor disagree		Strongly agree
	1	2	3	4	5
a. I am usually the first one to try new products	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
b. I am usually willing to pay more for brand name items	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
c. I prefer dealing with British Columbia-based companies	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
d. I always look for the best price when buying products or services	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
e. I usually take time to research issues thoroughly before making a decision	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
f. I am the type of person to have good insurance coverage	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5

## N. About your household

Your responses to these final questions are strictly confidential. They will be used to assess whether this survey reached a representative sample of FortisBC's residential customers and to classify responses.

**N1. Which electric utility do you receive your electricity bill from?**

- |                         |                          |   |                        |                          |   |                   |                          |    |
|-------------------------|--------------------------|---|------------------------|--------------------------|---|-------------------|--------------------------|----|
| FortisBC Electric       | <input type="checkbox"/> | 1 | Nelson Hydro           | <input type="checkbox"/> | 4 | City of Penticton | <input type="checkbox"/> | 7  |
| BC Hydro                | <input type="checkbox"/> | 2 | City of Grand Forks    | <input type="checkbox"/> | 5 | Don't know        | <input type="checkbox"/> | 98 |
| City of New Westminster | <input type="checkbox"/> | 3 | District of Summerland | <input type="checkbox"/> | 6 |                   |                          |    |

**N2. Into which age category do you fit?**

- |                   |                          |   |                    |                          |   |
|-------------------|--------------------------|---|--------------------|--------------------------|---|
| 18 years or under | <input type="checkbox"/> | 1 | 35-44 years        | <input type="checkbox"/> | 4 |
| 19-24 years       | <input type="checkbox"/> | 2 | 45-54 years        | <input type="checkbox"/> | 5 |
| 25-34 years       | <input type="checkbox"/> | 3 | 55-64 years        | <input type="checkbox"/> | 6 |
|                   |                          |   | 65 years and older | <input type="checkbox"/> | 7 |

**N3. Do you identify as:**

<input type="checkbox"/>	1	A woman	<input type="checkbox"/>	96	Prefer to self-describe _____
<input type="checkbox"/>	2	A man	<input type="checkbox"/>	99	Prefer not to answer

**N4. Which of the following describe your current status? (check all that apply)**

- |                    |                          |   |            |                          |   |                                    |                          |   |
|--------------------|--------------------------|---|------------|--------------------------|---|------------------------------------|--------------------------|---|
| Employed full-time | <input type="checkbox"/> | 1 | Retired    | <input type="checkbox"/> | 4 | Short-term or long-term disability | <input type="checkbox"/> | 7 |
| Employed part-time | <input type="checkbox"/> | 2 | Unemployed | <input type="checkbox"/> | 5 |                                    |                          |   |
| Homemaker          | <input type="checkbox"/> | 3 | Student    | <input type="checkbox"/> | 6 |                                    |                          |   |

**N5. How many people, including yourself, are currently living at this residence (please include any boarders or renters covered under your FortisBC account)**

\_\_\_\_\_ number

**N6. Please indicate the number of occupants of this residence in the following age categories:**

	0	1	2	3	4	5	6+
0 - 5 years	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 - 12 years	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13 - 18 years	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19 - 24 years	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25 - 44 years	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
45 - 64 years	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
65 years and older	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**N7. Do any of the occupants of this residence work from home either full-time or part-time?**

- 1 Yes       2 No → GO TO QUESTION N10

**N8. Has the number of days these occupants worked from home increased in the past two years?**

- 1 Yes       2 No

**N9. Are the number of days these occupants work from home expected to increase, decrease, or stay about the same over the next two years?**

- 1 Increase  
 2 Decrease  
 3 Stay about the same  
 98 Don't know

**N10. Has the number of people living in this residence changed in the last two years?**

- Yes  1      No  2 → GO TO QUESTION N12

**N11. How has the number of people in this residence changed over the past two years? (check the best answer)**

- 1 In the past there were more people living in this residence  
 2 In the past there were fewer people living in this residence  
 3 In the past there were sometimes more people and sometimes fewer people living in this residence

**N12. What is the highest level of education you have completed?**

- Some high school  1  
 Completed high school  2  
 Some trade/technical school  3  
 Completed trade/technical school  4  
 Some university/college  5  
 Completed university/college  6  
 Postgraduate  7

**N13. What was your total household income before taxes in 2021?**

- Less than \$20,000  1      \$60,000 to \$79,999  6  
 \$20,000 to \$29,999  2      \$80,000 to \$99,999  7  
 \$30,000 to \$39,999  3      \$100,000 to \$109,999  8  
 \$40,000 to \$49,999  4      \$110,000 to \$119,999  9  
 \$50,000 to \$59,999  5      \$120,000 or more  10  
 Prefer not to answer  99

**N14. What are the languages spoken at this residence?**

	<b>Main language</b> <i>(check one only)</i>	<b>Other languages</b> <i>(check all that apply)</i>
English	<input type="checkbox"/> 1	<input type="checkbox"/> 1
Mandarin	<input type="checkbox"/> 2	<input type="checkbox"/> 2
Cantonese	<input type="checkbox"/> 3	<input type="checkbox"/> 3
Hindi	<input type="checkbox"/> 4	<input type="checkbox"/> 4
Punjabi	<input type="checkbox"/> 5	<input type="checkbox"/> 5
Tagalog	<input type="checkbox"/> 6	<input type="checkbox"/> 6
Farsi (Persian)	<input type="checkbox"/> 7	<input type="checkbox"/> 7
French	<input type="checkbox"/> 8	<input type="checkbox"/> 8
German	<input type="checkbox"/> 9	<input type="checkbox"/> 9
Other (please specify):	<input type="checkbox"/> 96 _____	<input type="checkbox"/> 96 _____

FortisBC and Mustel Research would like to thank you for your help and assistance.

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## Appendix B

Conditional Demand Analysis  
Detailed Equations and Results



## 2022 REUS Conditional Demand Analysis

### Detailed Methodology

Conditional Demand Analysis (CDA) was used to disaggregate total household consumption into UECs for several residential end-uses. CDA is based on the notion that total household consumption is directly related to the stock of end-uses present in the dwelling and the energy consumption levels associated with these end-uses (UECs). The basic conditional demand model can be represented as:

$$HEC_{ht} = \sum_{all\ a} UEC_{aht} S_{ah}$$

where  $HEC_{ht}$  is the total energy consumption by household  $h$  in month  $t$ ,  $UEC_{aht}$  is the energy consumption through end-use  $a$  by household  $h$  in month  $t$ , and  $S_{ah}$  is the presence or absence of end-use  $a$  in household  $h$ .

The UECs for these end-uses are modelled as functions of appropriate exogenous variables, such as end-use features, dwelling characteristics, and household utilization patterns. In the remainder of this section, we describe the functional forms for each end-use.

#### B1. Primary Gas Space Heating

The primary gas space heating usage for household  $h$  in month  $t$  is based on a balance equation:

$$UEC_{gasheat,ht} = \frac{HEATLOSS_{ht} - SECHT_{ht}}{EFFH_h}$$

where  $HEATLOSS_{ht}$  is the net heat loss,  $SECHT_{ht}$  is the heat loss replaced by non-gas secondary heating systems, and  $EFFH_h$  is the system efficiency.

##### B1.1 Net Heat Loss

The net heat loss of a structure can be expressed as:

$$HEATLOSS_{ht} = SURFLOSS_{ht} - SOLGAIN_{ht} - INTGAIN_{ht}$$

where  $SURFLOSS_{ht}$  is the heat loss through envelope surfaces,  $SOLGAIN_{ht}$  is the solar gain through all surfaces during heating periods, and  $INTGAIN_{ht}$  is the internal gains during heating periods.

##### B1.1.1 Heat Loss through Envelope

The heat loss through envelope surfaces is given by:

$$SURFLOSS_h = \alpha_1 U_h AREA_h TDIFF_{ht}$$

where  $U_h$  is the overall conductivity of the shell,  $AREA_h$  is the total surface area, and  $TDIFF_{ht}$  is the differential between inside and outside temperature levels.

### B1.1.2 Shell Conductivity

The conductivity of the shell is assumed to depend on dwelling type, the percentage of windows and doors that are insulated, and whether or not the attic, walls, basement, and heated garage/workshop are insulated:

$$U_h = \alpha_1 + \alpha_2 MFD_h + \alpha_3 APT_h + \alpha_4 INSULA_h + \alpha_5 INSULW_h + \alpha_6 BASEMENT_h INSULB_h + \alpha_7 INSULG_h + \alpha_8 DOORS_h + \alpha_9 WINDBL_h + \alpha_{10} WINBEST_h$$

where  $MFD_h$  equals one if the household dwelling is a multi-family dwelling (duplex or row/townhouse),  $APT_h$  equals one if the dwelling is an apartment or apartment-style condominium,  $INSULA_h$  equals one if the attic is insulated,  $INSULW_h$  equals one if the walls are insulated,  $BASEMENT_h$  equals one if a basement or crawl space is present,  $BASEINSUL_h$  equals one if the basement or crawl space is insulated,  $INSULG_h$  equals one if the heated garage/workshop is insulated,  $DOORS_h$  is the proportion of exterior doors that are insulated (aluminium storm doors or insulated doors),  $WINDBL_h$  is the percentage of windows with double pane glass, and  $WINBEST_h$  is the percentage of windows with more insulation than double pane (double pane low-E or triple pane, regular or low-E).

### B1.1.3 Surface Area

The surface area of the structure is modelled as a function of the total floor area:

$$AREA_h = \alpha_1 SQFT_h^\beta$$

where  $SQFT_h$  is the square footage of the household and  $\beta$  is the elasticity of surface area with respect to square footage. We assumed that  $\beta$  equals 0.5 (i.e. the square root) because the surface area of the building shell increases less than proportionately with floor area for standard shaped buildings.

### B1.1.4 Temperature Differential

The differential between inside and outside temperature levels is modelled as a function of heating degree days, household heating behaviour, and whether programmable thermostats or smart/learning-style thermostats are used in the residence<sup>40</sup>:

$$TDIFF_{ht} = HDD_{ht}(\alpha_1 + \alpha_2 TDNIGHT_h + \alpha_3 TDDAY_h + \alpha_4 TDUNUSED_h + \alpha_5 WINTER_t WINCVR_h + \alpha_6 PRGSMARTTHM_h)$$

where  $HDD_{ht}$  is heating degree days,  $TDNIGHT_h$  is the frequency of turning down the heat at night either manually or using a programmable thermostat,  $TDDAY_h$  is the frequency of turning down the heat either manually or using a programmable thermostat when no one is at home,  $TDUNUSED_h$  is the frequency of reducing the temperature in unused rooms by closing vents or turning down room thermostats,  $WINCVR_h$  is the frequency of using plastic window coverings on drafty windows during winter months, and  $PRGSMARTTHM_h$  equals one if programmable thermostats or smart/learning-style thermostats are used.

### B1.1.5 Solar Gain

The solar gain through all surfaces during heating periods is modelled as a function of the surface area of the home:

$$SOLGAIN_{ht} = \alpha_1 AREA_h WINTER_t$$

where  $WINTER_t$  equals one if  $t$  is a winter month (December, January, or February).

### B1.1.6 Internal Gain

The internal gain during heating periods is also modelled as a function of the surface area of the home:

$$INTGAIN_{ht} = \alpha_1 AREA_h WINTER_t$$

## B1.2 Non-gas Secondary Heating System

The heat loss replaced by a non-gas secondary heating system, given that a primary gas heating system is present, can be expressed as:

$$SECHT_{ht} = HDD_{ht} AREA_h (\alpha_1 NONGASSECH_h + \alpha_2 HEATPUMPSECH_h)$$

---

<sup>40</sup> An attempt was made to include household income but the variable was not retained in the final model because it was not statistically significant.

## Appendix B

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where  $NONGASSEC_h$  equals one if non-gas secondary space heating is present (e.g. non-gas fireplace, woodstove, electric baseboards, etc.) and  $HEATPUMPSEC_h$  equals one if a heat pump (air or ground) is used for secondary space heating.

### B1.3 System Efficiency

The model captures the effects of using a gas furnace or boiler for primary space heating. This was done by including exogenous variables that account for the presence of these types of equipment. An attempt was also made to model system efficiencies in terms of the efficiency level of the gas furnace or boiler. However, these variables were not retained in the final model because there were too many missing values.

### B1.4 Overall Primary Gas Space Heating Model

Combining the preceding equations gives the overall model of primary gas space heating usage:

$$\begin{aligned} UEC_{gasheat,ht} = & HDD_{ht}AREA_h(\alpha_1 + \alpha_2MFD_h + \alpha_3APT_h + \alpha_4INSULA_h + \alpha_5INSULW_h \\ & + \alpha_6BASEMENT_hINSULB_h + \alpha_7INSULG_h + \alpha_8DOORS_h + \alpha_9WINDBL_h \\ & + \alpha_{10}WINBEST_h + \alpha_{11}TDNIGHT_h + \alpha_{12}TDDAY_h + \alpha_{13}TDUNUSED_h \\ & + \alpha_{14}WINTER_tWINCVR_h + \alpha_{15}PRGSMARTTHM_h + \alpha_{16}FURNACE_h + \alpha_{17}BOILER_h \\ & + \alpha_{18}NONGASSEC_h + \alpha_{19}HEATPUMPSEC_h) + \alpha_{20}AREA_hWINTER_t \end{aligned}$$

In the specification above, most of the interaction terms are not shown because they were not statistically significant or produced unreasonable results.

## B2. Secondary Gas Space Heating

Secondary gas space heating includes any additional or supplementary use of gas to heat the residence (e.g. furnaces, gas wall heaters, etc.) The use of gas fireplaces and heater stoves is modelled separately.

The secondary gas space heating usage is modelled simply as a function of heating degree days, total surface area, and dwelling type:

$$UEC_{gasseheat,ht} = HDD_{ht}AREA_h(\alpha_1 + \alpha_2MFD_h + \alpha_3APT_h)$$

### B3. Fireplaces and Heater Stoves

The energy usage by gas fireplaces and heater stoves (decorative, heater type, and freestanding) is assumed to depend on the number in use and heating degree days<sup>41</sup>:

$$UEC_{gasfiredec,ht} = GASFIREDEC_h(\alpha_1 + \alpha_2HDD_{ht})$$

$$UEC_{gasfireheat,ht} = GASFIREHEAT_h(\alpha_1 + \alpha_2HDD_{ht})$$

$$UEC_{gasfirefree,ht} = GASFIREFREE_h(\alpha_1 + \alpha_2HDD_{ht})$$

where  $GASFIREDEC_h$  is the number of declarative fireplaces in use,  $GASFIREHEAT_h$  is the number of heater type fireplaces in use, and  $GASFIREFREE_h$  is the number of free standing fireplaces or heater stoves in use.

### B4. Water Heating

Gas water heating energy usage can be expressed as:

$$UEC_{gaswheat,ht} = \frac{WHLOSS_{ht} + VUSE_{ht}}{EFFWH_h}$$

where  $WHLOSS_{ht}$  is the heat losses associated with standby losses from the heating unit,  $VUSE_{ht}$  is the heat losses tied to water usage, and  $EFFWH_h$  is the efficiency of the unit.

#### B4.1 Standby Losses

The heat losses associated with standby losses is assumed to depend on dwelling type, whether or not the home is new, whether a water heater blanket is used, whether an on-demand (tankless) water heater is used, and the temperature differential between the tank temperature and the inlet temperature<sup>42</sup>:

$$WHLOSS_{ht} = WHTDIFF_{ht}(\alpha_1 + \alpha_2MFD_h + \alpha_3APT_h + \alpha_4NEWHOME_h + \alpha_5WHBLANKET_h + \alpha_6ONDEMAND_h)$$

where  $WHTDIFF_{ht}$  is the differential between the tank temperature and the inlet temperature,  $MFD_h$  equals one if the household dwelling is a multi-family dwelling (duplex or row/townhouse),  $APT_h$  equals one if the dwelling is an apartment or apartment-style condominium,  $NEWHOME_h$  equals one if the home is new

<sup>41</sup> An attempt was made to include variables representing the average number of hours in use, the percentage of space heating requirements provided by the fireplace, and if the fireplace is used primarily for heating, ambiance, or both. These variables were not retained in the final model because they were not statistically significant or produced unreasonable results.

<sup>42</sup> An attempt was made to include variables involving the size of the largest hot water tank and the number of household members (a proxy for tank size). These variables were not retained in the final model because they were not statistically significant or produced unreasonable results.

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(2006 or later),  $WHBLANKET_h$  equals one if a water heater blanket is used, and  $ONDEMAND_h$  equals one if an on-demand (tankless) water heater is used.

The differential between tank temperature and inlet temperature is modelled simply as a function of heating degree days:

$$WHTDIFF_{ht} = \alpha_1 HDD_{ht}$$

### B4.2 Water Usage

The heat losses tied to water usage is assumed to depend on the average number of dishwasher and clothes washer loads, the average number of baths and showers taken, whether or not a front loading clothes washer is present, the proportion of low-flow showerheads, and whether or not instant hot water dispensers are present:

$$VUSE_{ht} = \alpha_1 DWASHLOADS_h + \alpha_2 BATHS_h + \alpha_3 TIMESHOWERS_h + \alpha_4 CWASHLOADS_h + \alpha_5 CWASHERFRONT_h + \alpha_6 PROFLOWFLOW_h + \alpha_7 INHOTWATERDISP_h$$

where  $DWASHLOADS_h$  is the number of dishwasher loads per week,  $BATHS_h$  is the number of baths taken per week,  $TIMESHOWERS_h$  is the total amount of time that showers are used on a typical weekday,  $CWASHLOADS_h$  is the number of loads of laundry per week,  $CWASHERFRONT_h$  equals one if a front loading clothes washer is used,  $PROFLOWFLOW_h$  is the proportion of low-flow showerheads, and  $INHOTWATERDISP_h$  equals one if instant hot water dispensers are used.

### B4.3 System Efficiency

An attempt was made to model system efficiencies in terms of the age of the water heater. However, this variable was not retained in the final model because there were too many missing values. Therefore, we assumed that  $EFFWH_h$  is constant across households.

### B4.4 Overall Gas Water Heating Model

Combining the preceding equations gives the overall model for gas water heating energy usage:

$$UEC_{gaswheat,ht} = HDD_{ht}(\alpha_1 + \alpha_2 MFD_h + \alpha_3 APT_h + \alpha_4 NEWHOME_h + \alpha_5 WHBLANKET_h + \alpha_6 ONDEMAND_h) + \alpha_7 DWASHLOADS_h + \alpha_8 CWASHLOADS_h + \alpha_9 BATHS_h + \alpha_{10} TIMESHOWERS_h + \alpha_{11} CWASHERFRONT_h + \alpha_{12} PROFLOWFLOW_h + \alpha_{13} INHOTWATERDISP_h$$

**B5. Cooking**

Energy consumption of gas cooking appliances (gas ranges, cook tops, ovens, and dual fuel ranges) is assumed to depend on the number of these appliances in use<sup>43</sup>:

$$UEC_{gascook,ht} = \alpha_1 GASCOOK_h$$

where  $GASCOOK_h$  is the number of gas ranges, cook tops, ovens, and dual fuel ranges in use.

**B6. Gas BBQs**

Energy consumption of piped gas barbeques is modelled as a function of the number in use, as well as barbeque usage in the summer:<sup>44</sup>

$$UEC_{gasbbq,ht} = GASBBQ_h(\alpha_1 + \alpha_2 SUMMER_t)$$

where  $GASBBQ_h$  is the number of piped gas barbeques in use and  $SUMMER_t$  equals one if  $t$  is a summer month (June, July, or August).

**B7. Gas Outdoor Fire Pits and Fireplaces**

Energy consumption of gas outdoor fire pits and fireplaces is modelled as a function of the number in use:

$$UEC_{gasoutdoorfirepit,ht} = \alpha_1 GASOUTDOORFIREPIT_h$$

where  $GASOUTDOORFIREPIT_h$  is the number of gas outdoor fire pits and fireplaces in use.

**B8. Gas Dryers**

Energy consumption of gas dryers is modelled as a function of the number in use:<sup>45</sup>

$$UEC_{gasdryer,ht} = \alpha_1 GASDRYER_h$$

where  $GASDRYER_h$  is the number of gas dryers in use.

---

<sup>43</sup> An attempt was made to include variables involving household size, income, and the presence of a microwave. These variables were not retained in the final model because they were not statistically significant or produced unreasonable results.

<sup>44</sup> An attempt was made to include a variable involving household size, but it was not retained in the final model because it produced unreasonable results.

<sup>45</sup> An attempt was made to include a variable involving the number of dryer loads done per week, but it was not retained in the final model because it was not statistically significant.

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### B9. Swimming Pools

Energy consumption through the operation of swimming pools is modelled as a function of whether a gas-heated pool is present, and whether solar supplementary heating is used:

$$UEC_{gasheatpool,ht} = \alpha_1 + \alpha_2 SOLARSUP_h$$

where  $SOLARSUP_h$  equals one if a solar heater is used to supplement natural gas use in an outdoor swimming pool.

### B10. Hot Tubs

Energy consumption through the operation of hot tubs is assumed to be constant for those households with gas-heated hot tubs:

$$UEC_{gashottub,ht} = \alpha_1$$

### B13. Regression Models

#### Regression Model – Overall

Model Fit				
Adjusted R-squared: 0.809				
F statistic: 6,382.7				
Variable	Coefficient	SE	t-value	P-value
HDDxAREAxS_GASHEAT	0.001263	0.000010	128.1	0.000
HDDxAREAxMFDxS_GASHEAT	-0.000205	0.000006	-31.6	0.000
HDDxAREAxAPARTMENTxS_GASHEAT	-0.000092	0.000020	-4.6	0.000
HDDxAREAxINSULATTICxS_GASHEAT	-0.000115	0.000004	-25.9	0.000
HDDxAREAxINSULWALLSxS_GASHEAT	-0.000056	0.000007	-8.1	0.000
HDDxAREAxBASEMENTCRAWLxINSULBASEMENTCRAWLxS_GASHEAT	-0.000046	0.000003	-16.4	0.000
HDDxAREAxINSULGARAGExS_GASHEAT	-0.000021	0.000003	-8.4	0.000
HDDxAREAxDOORSxPROP_DOORSINSULATEDxS_GASHEAT	-0.000095	0.000003	-29.5	0.000
HDDxAREAxWINDBLxS_GASHEAT	-0.000184	0.000004	-44.5	0.000
HDDxAREAxWINBESTxS_GASHEAT	-0.000218	0.000005	-46.5	0.000
HDDxAREAxTDNIGHTxS_GASHEAT	-0.000103	0.000004	-24.9	0.000
HDDxAREAxTDDAYxS_GASHEAT	-0.000007	0.000004	-2.0	0.047
HDDxAREAxTDUNUSEDxS_GASHEAT	-0.000019	0.000003	-6.7	0.000
HDDxAREAxWINTERxINSTALLWINCVRxS_GASHEAT	-0.000040	0.000007	-5.6	0.000
HDDxAREAxPROGSMARTTHMxS_GASHEAT	-0.000055	0.000003	-19.9	0.000
HDDxAREAxHRVERVxS_GASHEAT	-0.000060	0.000005	-12.2	0.000
HDDxAREAxGAS_FURNACExS_GASHEAT	-0.000272	0.000006	-44.9	0.000
HDDxAREAxGAS_FURNACExHEATPUMPxS_GASHEAT	-0.000012	0.000003	-4.0	0.000
HDDxAREAxGAS_BOILERxS_GASHEAT	-0.000145	0.000007	-20.9	0.000
HDDxAREAxGAS_BOILERxHEATPUMPxS_GASHEAT	-0.000073	0.000012	-6.1	0.000
HDDxAREAxGAS_COMBINEDSYSTEMxS_GASHEAT	-0.000157	0.000008	-19.7	0.000
HDDxAREAxGAS_COMBINEDSYSTEMxHEATPUMPxS_GASHEAT	-0.000097	0.000011	-9.1	0.000
HDDxAREAxNONGASSECHEATxS_GASHEAT	-0.000064	0.000002	-27.8	0.000
AREAxWINTERxS_GASHEAT	0.025099	0.001056	23.8	0.000
HDDxAREAxS_GASSECHEAT	0.000246	0.000005	50.9	0.000
HDDxAREAxMFDxS_GASSECHEAT	-0.000082	0.000016	-5.3	0.000
HDDxAREAxAPARTMENTxS_GASSECHEAT	-0.000285	0.000034	-8.5	0.000
GASFIREPLACEDECxS_GASFIREPLACEDEC	0.579779	0.046186	12.6	0.000
GASFIREPLACEHEATERxS_GASFIREPLACEHEATER	0.383161	0.030841	12.4	0.000
GASFIREPLACEFREExS_GASFIREPLACEFREE	-0.014230	0.088324	-0.2	0.872
HDDxGASFIREPLACEDECxS_GASFIREPLACEDEC	0.003105	0.000161	19.3	0.000
HDDxGASFIREPLACEHEATERxS_GASFIREPLACEHEATER	0.002645	0.000108	24.5	0.000
HDDxGASFIREPLACEFREExS_GASFIREPLACEFREE	0.002208	0.000295	7.5	0.000
HDDxS_GASWHEAT	0.001233	0.000158	7.8	0.000
HDDxMFDxS_GASWHEAT	0.001783	0.000306	5.8	0.000
HDDxAPARTMENTxS_GASWHEAT	-0.006137	0.000969	-6.3	0.000
HDDxNEWHOMExS_GASWHEAT	-0.002066	0.000220	-9.4	0.000
HDDxTURNOFFWHEATERxS_GASWHEAT	-0.001511	0.000148	-10.2	0.000
HDDxONDEMANDxS_GASWHEAT	-0.000906	0.000181	-5.0	0.000
PEOPLExS_GASWHEAT	1.402891	0.092952	15.1	0.000
DISHWASHERLOADSxS_GASWHEAT	0.036504	0.006432	5.7	0.000
BATHSxS_GASWHEAT	0.036281	0.005104	7.1	0.000
TIMESHOWERSxS_GASWHEAT	0.001320	0.001015	1.3	0.193
PROLOWFLOWxS_GASWHEAT	-0.259544	0.041956	-6.2	0.000
LAUNDRYLOADSxS_GASWHEAT	0.052003	0.006291	8.3	0.000
INSTANTHOTWATERDISPxS_GASWHEAT	-0.432440	0.095616	-4.5	0.000
AERATORxS_GASWHEAT	-0.088178	0.034564	-2.6	0.011
GASCOOKxS_GASCOOK	0.426394	0.019723	21.6	0.000

## Appendix B

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GASBBQxS_GASBBQ	0.068074	0.040397	1.7	0.092
SUMMERxGASBBQxS_GASBBQ	0.189220	0.071101	2.7	0.008
GASOUTDOORFIREPITxS_GASOUTDOORFIREPIT	0.300037	0.040347	7.4	0.000
GASDRYERxS_GASDRYER	0.158067	0.059898	2.6	0.008
S_GASHEATPOOL	5.016626	0.118610	42.3	0.000
SOLARSUPxS_GASHEATPOOL	-4.758545	0.292960	-16.2	0.000
S_GASHOTTUB	1.736197	0.179531	9.7	0.000

## Regression Model – Lower Mainland

## Model Fit

Adjusted R-squared: 0.877

F statistic: 3,993.7

Variable	Coefficient	SE	t-value	P-value
HDDxAREAxS_GASHEAT	0.001943	0.000016	122.2	0.000
HDDxAREAxMFDxS_GASHEAT	-0.000276	0.000010	-28.3	0.000
HDDxAREAxAPARTMENTxS_GASHEAT	*	*	*	*
HDDxAREAxINSULATTICxS_GASHEAT	-0.000163	0.000006	-25.7	0.000
HDDxAREAxINSULWALLSxS_GASHEAT	*	*	*	*
HDDxAREAxBASEMENTCRAWLxINSULBASEMENTCRAWLxS_GASHEAT	-0.000025	0.000004	-6.1	0.000
HDDxAREAxINSULGARAGExS_GASHEAT	*	*	*	*
HDDxAREAxDOORSxPROP_DOORSINSULATEDxS_GASHEAT	-0.000090	0.000005	-17.4	0.000
HDDxAREAxWINDBLxS_GASHEAT	-0.000196	0.000006	-33.4	0.000
HDDxAREAxWINBESTxS_GASHEAT	-0.000207	0.000007	-29.2	0.000
HDDxAREAxTDNIGHTxS_GASHEAT	-0.000131	0.000005	-24.3	0.000
HDDxAREAxTDDAYxS_GASHEAT	*	*	*	*
HDDxAREAxTDUNUSEDxS_GASHEAT	-0.000012	0.000004	-2.8	0.005
HDDxAREAxWINTERxINSTALLWINCVRxS_GASHEAT	-0.000013	0.000013	-1.0	0.311
HDDxAREAxPROGSMARTTHMxS_GASHEAT	-0.000064	0.000004	-14.9	0.000
HDDxAREAxHRVERVxS_GASHEAT	-0.000118	0.000008	-14.4	0.000
HDDxAREAxGAS_FURNACExS_GASHEAT	-0.000849	0.000013	-65.2	0.000
HDDxAREAxGAS_FURNACExHEATPUMPxS_GASHEAT	-0.000018	0.000005	-3.7	0.000
HDDxAREAxGAS_BOILERxS_GASHEAT	-0.000755	0.000014	-55.1	0.000
HDDxAREAxGAS_BOILERxHEATPUMPxS_GASHEAT	-0.000073	0.000016	-4.6	0.000
HDDxAREAxGAS_COMBINEDSYSTEMxS_GASHEAT	-0.000752	0.000015	-51.2	0.000
HDDxAREAxGAS_COMBINEDSYSTEMxHEATPUMPxS_GASHEAT	-0.000095	0.000016	-5.9	0.000
HDDxAREAxNONGASSECHEATxS_GASHEAT	-0.000091	0.000004	-25.4	0.000
AREAxWINTERxS_GASHEAT	0.014603	0.001530	9.5	0.000
HDDxAREAxS_GASSECHEAT	0.000371	0.000008	44.0	0.000
HDDxAREAxMFDxS_GASSECHEAT	-0.000180	0.000026	-7.0	0.000
HDDxAREAxAPARTMENTxS_GASSECHEAT	-0.000453	0.000048	-9.4	0.000
GASFIREPLACEDECxS_GASFIREPLACEDEC	0.504480	0.064476	7.8	0.000
GASFIREPLACEHEATERxS_GASFIREPLACEHEATER	0.390060	0.045373	8.6	0.000
GASFIREPLACEFREExS_GASFIREPLACEFREE	-0.139567	0.140482	-1.0	0.320
HDDxGASFIREPLACEDECxS_GASFIREPLACEDEC	0.002735	0.000240	11.4	0.000
HDDxGASFIREPLACEHEATERxS_GASFIREPLACEHEATER	0.001931	0.000171	11.3	0.000
HDDxGASFIREPLACEFREExS_GASFIREPLACEFREE	0.002267	0.000513	4.4	0.000
HDDxS_GASWHEAT	0.000333	0.000271	1.2	0.219
HDDxMFDxS_GASWHEAT	0.003271	0.000472	6.9	0.000
HDDxAPARTMENTxS_GASWHEAT	*	*	*	*
HDDxNEWHOMExS_GASWHEAT	*	*	*	*
HDDxTURNOFFWHEATERxS_GASWHEAT	-0.001904	0.000244	-7.8	0.000
HDDxONDEMANDxS_GASWHEAT	-0.000335	0.000299	-1.1	0.263
PEOPLExS_GASWHEAT	1.284817	0.124305	10.3	0.000
DISHWASHERLOADSxS_GASWHEAT	0.021538	0.008932	2.4	0.016
BATHSxS_GASWHEAT	0.038517	0.007154	5.4	0.000
TIMESHOWERSxS_GASWHEAT	*	*	*	*
PROFLOWFLOWxS_GASWHEAT	-0.300381	0.061539	-4.9	0.000
LAUNDRYLOADSxS_GASWHEAT	0.059151	0.008916	6.6	0.000
INSTANTHOTWATERDISPxS_GASWHEAT	-0.711379	0.136050	-5.2	0.000
AERATORxS_GASWHEAT	-0.172671	0.050506	-3.4	0.001
GASCOOKxS_GASCOOK	0.172933	0.029074	5.9	0.000

## Appendix B

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GASBBQxS_GASBBQ	0.079487	0.063087	1.3	0.208
SUMMERxGASBBQxS_GASBBQ	0.692825	0.111054	6.2	0.000
GASOUTDOORFIREPITxS_GASOUTDOORFIREPIT	0.348426	0.057854	6.0	0.000
GASDRYERxS_GASDRYER	0.318810	0.088323	3.6	0.000
S_GASHEATPOOL	5.874820	0.182818	32.1	0.000
SOLARSUPxS_GASHEATPOOL	-8.054691	0.500896	-16.1	0.000
S_GASHOTTUB	1.420622	0.249184	5.7	0.000

\* Variable not retained in the final model because its regression coefficient was the wrong sign or insignificant.

## Regression Model – Interior

## Model Fit

Adjusted R-squared: 0.670

F statistic: 1,423.9

Variable	Coefficient	SE	t-value	P-value
HDDxAREAxS_GASHEAT	0.000925	0.000021	45.0	0.000
HDDxAREAxMFDxS_GASHEAT	-0.000107	0.000007	-14.5	0.000
HDDxAREAxAPARTMENTxS_GASHEAT	*	*	*	*
HDDxAREAxINSULATTICxS_GASHEAT	-0.000055	0.000009	-6.2	0.000
HDDxAREAxINSULWALLSxS_GASHEAT	-0.000155	0.000015	-10.0	0.000
HDDxAREAxBASEMENTCRAWLxINSULBASEMENTCRAWLxS_GASHEAT	-0.000121	0.000006	-18.9	0.000
HDDxAREAxINSULGARAGExS_GASHEAT	*	*	*	*
HDDxAREAxDOORSxPROP_DOORSINSULATEDxS_GASHEAT	-0.000053	0.000006	-9.1	0.000
HDDxAREAxWINDBLxS_GASHEAT	-0.000042	0.000009	-4.9	0.000
HDDxAREAxWINBESTxS_GASHEAT	-0.000059	0.000009	-6.4	0.000
HDDxAREAxTDNIGHTxS_GASHEAT	-0.000017	0.000008	-2.2	0.027
HDDxAREAxTDDAYxS_GASHEAT	-0.000023	0.000007	-3.5	0.000
HDDxAREAxTDUNUSEDxS_GASHEAT	*	*	*	*
HDDxAREAxWINTERxINSTALLWINCVRxS_GASHEAT	*	*	*	*
HDDxAREAxPROGSMARTTHMxS_GASHEAT	-0.000039	0.000005	-7.3	0.000
HDDxAREAxHRVERVxS_GASHEAT	*	*	*	*
HDDxAREAxGAS_FURNACExS_GASHEAT	-0.000134	0.000012	-11.6	0.000
HDDxAREAxGAS_FURNACExHEATPUMPxS_GASHEAT	-0.000009	0.000005	-1.8	0.072
HDDxAREAxGAS_BOILERxS_GASHEAT	-0.000073	0.000015	-4.7	0.000
HDDxAREAxGAS_BOILERxHEATPUMPxS_GASHEAT	*	*	*	*
HDDxAREAxGAS_COMBINEDSYSTEMxS_GASHEAT	-0.000064	0.000019	-3.4	0.001
HDDxAREAxGAS_COMBINEDSYSTEMxHEATPUMPxS_GASHEAT	-0.000105	0.000022	-4.8	0.000
HDDxAREAxNONGASSECHEATxS_GASHEAT	-0.000034	0.000004	-8.2	0.000
AREAxWINTERxS_GASHEAT	0.015271	0.002531	6.0	0.000
HDDxAREAxS_GASSECHEAT	0.000193	0.000009	21.8	0.000
HDDxAREAxMFDxS_GASSECHEAT	-0.000021	0.000033	-0.6	0.529
HDDxAREAxAPARTMENTxS_GASSECHEAT	-0.000146	0.000075	-1.9	0.053
GASFIREPLACEDECxS_GASFIREPLACEDEC	0.514136	0.120898	4.3	0.000
GASFIREPLACEHEATERxS_GASFIREPLACEHEATER	0.477234	0.077014	6.2	0.000
GASFIREPLACEFREExS_GASFIREPLACEFREE	0.394803	0.195367	2.0	0.043
HDDxGASFIREPLACEDECxS_GASFIREPLACEDEC	0.001207	0.000327	3.7	0.000
HDDxGASFIREPLACEHEATERxS_GASFIREPLACEHEATER	0.002207	0.000210	10.5	0.000
HDDxGASFIREPLACEFREExS_GASFIREPLACEFREE	0.002027	0.000510	4.0	0.000
HDDxS_GASWHEAT	0.002162	0.000258	8.4	0.000
HDDxMFDxS_GASWHEAT	*	*	*	*
HDDxAPARTMENTxS_GASWHEAT	-0.005476	0.000894	-6.1	0.000
HDDxNEWHOMExS_GASWHEAT	-0.003808	0.000383	-10.0	0.000
HDDxTURNOFFWHEATERxS_GASWHEAT	-0.000665	0.000248	-2.7	0.007
HDDxONDEMANDxS_GASWHEAT	*	*	*	*
PEOPLExS_GASWHEAT	0.528911	0.217444	2.4	0.015
DISHWASHERLOADSxS_GASWHEAT	0.017292	0.016750	1.0	0.302
BATHSxS_GASWHEAT	0.074334	0.014454	5.1	0.000
TIMESHOWERSxS_GASWHEAT	0.006147	0.003161	1.9	0.052
PROFLOWFLOWxS_GASWHEAT	-0.139721	0.092203	-1.5	0.130
LAUNDRYLOADSxS_GASWHEAT	0.040917	0.016218	2.5	0.012
INSTANTHOTWATERDISPxS_GASWHEAT	0.916866	0.280192	3.3	0.001
AERATORxS_GASWHEAT	*	*	*	*
GASCOOKxS_GASCOOK	0.339313	0.046117	7.4	0.000

## Appendix B

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GASBBQxS_GASBBQ	*	*	*	*
SUMMERxGASBBQxS_GASBBQ	0.410573	0.134882	3.0	0.002
GASOUTDOORFIREPITxS_GASOUTDOORFIREPIT	*	*	*	*
GASDRYERxS_GASDRYER	0.327087	0.158459	2.1	0.039
S_GASHEATPOOL	3.998687	0.185447	21.6	0.000
SOLARSUPxS_GASHEATPOOL	*	*	*	*
S_GASHOTTUB	*	*	*	*

\* Variable not retained in the final model because its regression coefficient was the wrong sign or insignificant.

## Regression Model – Vancouver Island

## Model Fit

Adjusted R-squared: 0.849

F statistic: 2,755.5

Variable	Coefficient	SE	t-value	P-value
HDDxAREAxS_GASHEAT	0.000810	0.000014	59.0	0.000
HDDxAREAxMFDxS_GASHEAT	-0.000099	0.000009	-11.5	0.000
HDDxAREAxAPARTMENTxS_GASHEAT	-0.000114	0.000021	-5.5	0.000
HDDxAREAxINSULATTICxS_GASHEAT	*	*	*	*
HDDxAREAxINSULWALLSxS_GASHEAT	-0.000237	0.000011	-21.4	0.000
HDDxAREAxBASEMENTCRAWLxINSULBASEMENTCRAWLxS_GASHEAT	*	*	*	*
HDDxAREAxINSULGARAGExS_GASHEAT	-0.000021	0.000004	-5.3	0.000
HDDxAREAxDOORSxPROP_DOORSINSULATEDxS_GASHEAT	-0.000091	0.000005	-17.4	0.000
HDDxAREAxWINDBLxS_GASHEAT	-0.000094	0.000008	-11.4	0.000
HDDxAREAxWINBESTxS_GASHEAT	-0.000149	0.000009	-17.0	0.000
HDDxAREAxTDNIGHTxS_GASHEAT	-0.000054	0.000006	-8.5	0.000
HDDxAREAxTDDAYxS_GASHEAT	-0.000030	0.000005	-5.5	0.000
HDDxAREAxTDUNUSEDxS_GASHEAT	-0.000028	0.000004	-6.3	0.000
HDDxAREAxWINTERxINSTALLWINCVRxS_GASHEAT	-0.000061	0.000014	-4.5	0.000
HDDxAREAxPROGSMARTTHMxS_GASHEAT	-0.000042	0.000004	-10.3	0.000
HDDxAREAxHRVERVxS_GASHEAT	*	*	*	*
HDDxAREAxGAS_FURNACExS_GASHEAT	0.000031	0.000005	5.8	0.000
HDDxAREAxGAS_FURNACExHEATPUMPxS_GASHEAT	-0.000026	0.000006	-4.4	0.000
HDDxAREAxGAS_BOILERxS_GASHEAT	0.000238	0.000009	26.9	0.000
HDDxAREAxGAS_BOILERxHEATPUMPxS_GASHEAT	0.000135	0.000024	5.6	0.000
HDDxAREAxGAS_COMBINEDSYSTEMxS_GASHEAT	0.000076	0.000010	7.3	0.000
HDDxAREAxGAS_COMBINEDSYSTEMxHEATPUMPxS_GASHEAT	0.000116	0.000020	5.8	0.000
HDDxAREAxNONGASSECHEATxS_GASHEAT	-0.000035	0.000004	-9.2	0.000
AREAxWINTERxS_GASHEAT	0.014863	0.001513	9.8	0.000
HDDxAREAxS_GASSECHEAT	0.000104	0.000005	21.8	0.000
HDDxAREAxMFDxS_GASSECHEAT	-0.000055	0.000014	-3.8	0.000
HDDxAREAxAPARTMENTxS_GASSECHEAT	0.000224	0.000077	2.9	0.004
GASFIREPLACEDECxS_GASFIREPLACEDEC	0.225288	0.075510	3.0	0.003
GASFIREPLACEHEATERxS_GASFIREPLACEHEATER	0.061469	0.038417	1.6	0.110
GASFIREPLACEFREExS_GASFIREPLACEFREE	0.085829	0.096105	0.9	0.372
HDDxGASFIREPLACEDECxS_GASFIREPLACEDEC	0.003791	0.000269	14.1	0.000
HDDxGASFIREPLACEHEATERxS_GASFIREPLACEHEATER	0.004370	0.000140	31.1	0.000
HDDxGASFIREPLACEFREExS_GASFIREPLACEFREE	0.003201	0.000341	9.4	0.000
HDDxS_GASWHEAT	0.002831	0.000191	14.9	0.000
HDDxMFDxS_GASWHEAT	0.001517	0.000348	4.4	0.000
HDDxAPARTMENTxS_GASWHEAT	-0.016435	0.002312	-7.1	0.000
HDDxNEWHOMExS_GASWHEAT	-0.001971	0.000256	-7.7	0.000
HDDxTURNOFFWHEATERxS_GASWHEAT	*	*	*	*
HDDxONDEMANDxS_GASWHEAT	*	*	*	*
PEOPLExS_GASWHEAT	1.145969	0.122292	9.4	0.000
DISHWASHERLOADSxS_GASWHEAT	*	*	*	*
BATHSxS_GASWHEAT	*	*	*	*
TIMESHOWERSxS_GASWHEAT	0.002809	0.001476	1.9	0.057
PROFLOWxS_GASWHEAT	-0.269828	0.052331	-5.2	0.000
LAUNDRYLOADSxS_GASWHEAT	0.035566	0.007955	4.5	0.000
INSTANTHOTWATERDISPxS_GASWHEAT	0.314766	0.107356	2.9	0.003
AERATORxS_GASWHEAT	*	*	*	*
GASCOOKxS_GASCOOK	0.171582	0.025093	6.8	0.000

## Appendix B

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GASBBQxS_GASBBQ	0.073878	0.044498	1.7	0.097
SUMMERxGASBBQxS_GASBBQ	0.243512	0.077919	3.1	0.002
GASOUTDOORFIREPITxS_GASOUTDOORFIREPIT	0.239525	0.050074	4.8	0.000
GASDRYERxS_GASDRYER	0.084268	0.065085	1.3	0.195
S_GASHEATPOOL	3.173425	0.286035	11.1	0.000
SOLARSUPxS_GASHEATPOOL	*	*	*	*
S_GASHOTTUB	*	*	*	*

\* Variable not retained in the final model because its regression coefficient was the wrong sign or insignificant.



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**Appendix G**

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**STAKEHOLDER WORKSHOP PRESENTATION  
JANUARY 22, 2026**



# 2026 System Extension Review

Stakeholder Workshop

January 22, 2026

# The System Extension Test

## What is it ?

The “System Extension Test” (SET) is a rate design mechanism that sets out how a customer attaches to the system and what the customer pays to attach to the system.

## What is the purpose?

The System Extension Test and policies are designed to balance the needs of new and existing customers.

# System Extension Test Review

**The last review  
was 10 years ago**

- Time for periodic review
- BCUC has acknowledged length of time since last review
- Preparing to file application in May 2026

**We want to hear  
from you**

- Effects how you connect and the connection costs
- Seeking your feedback
- What's working, what could be better, anything we should be considering going forward

# Key Topics we will Cover Today

What is the System Extension Test ?

- Background and Context
- System Extension Principles

How does it work?

- System Extension Mechanism

How has it performed?

- Results and Analysis

Your Feedback

- Discussion

# 1. Background and Context Setting

1. Background & Context

2. System Extension Principles

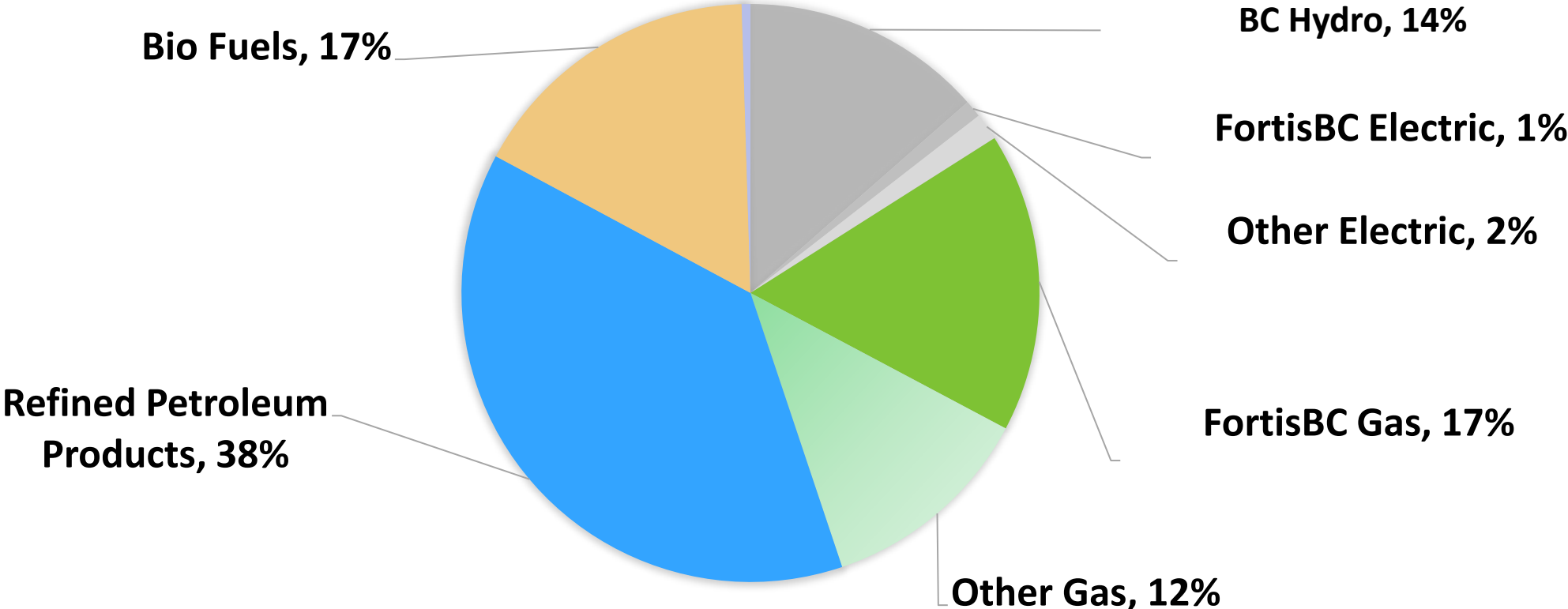
3. System Extension Test Mechanism

4. Results and Analysis

5. Discussion

# Gas Represents 17% of BC's End-Use Energy

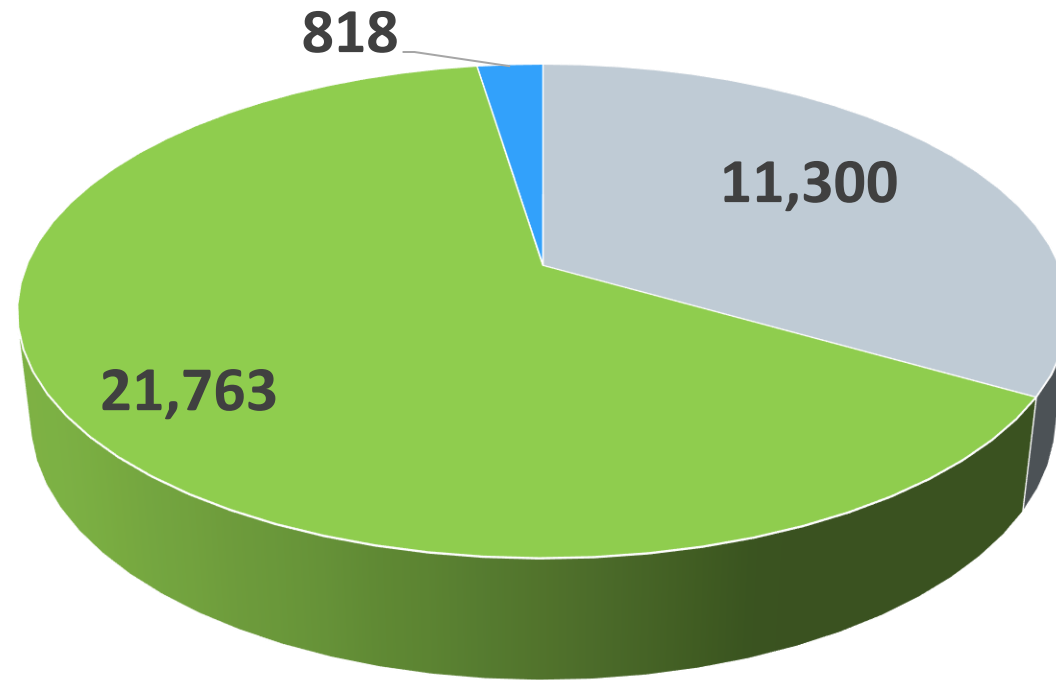
BC's Energy Consumption is 374,000 GWh



Source: NRCan, Year 2019

# Gas System Delivers 2/3 of the Energy on a Cold Day

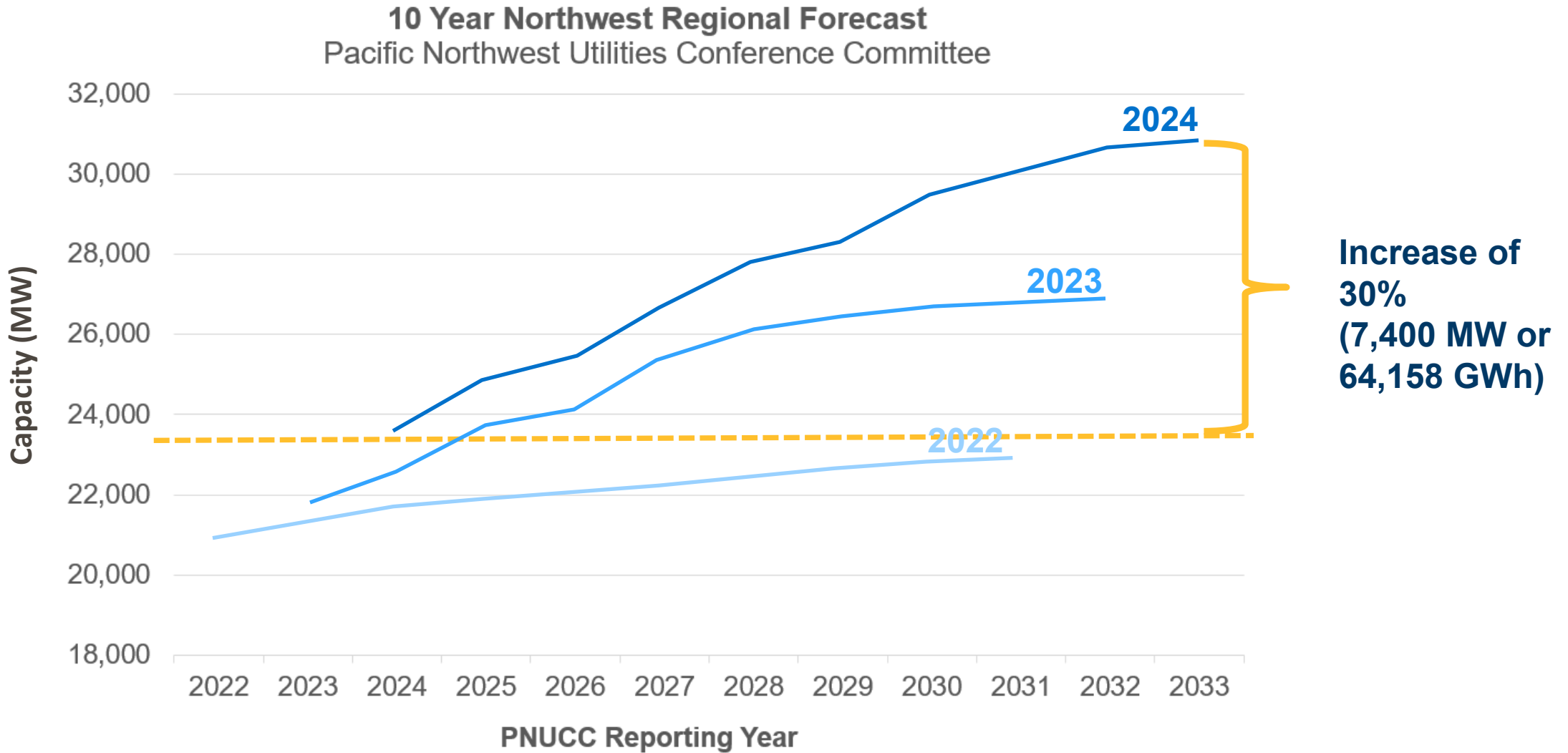
BC's Peak Energy Use in January 2024 (MW)



■ BC Hydro   ■ FortisBC Gas   ■ FortisBC Electricity

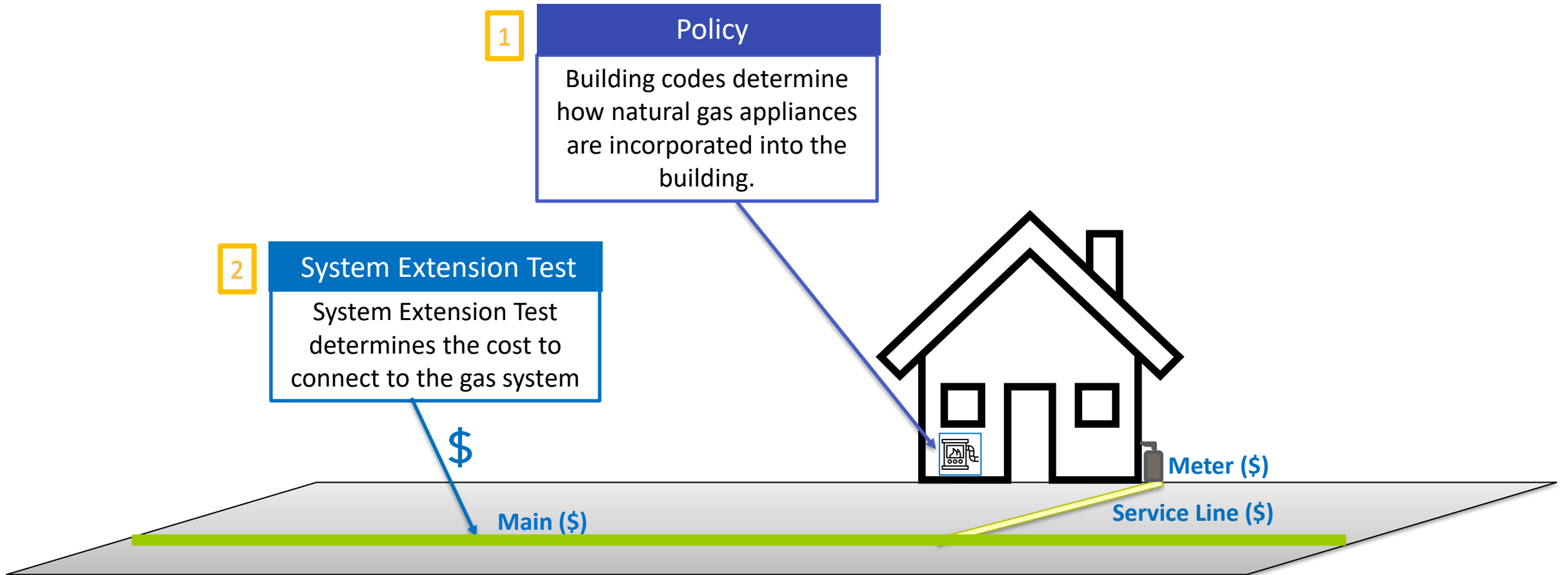
Source: BC Hydro, FEI, FBC

# Energy Demand Continues to Grow

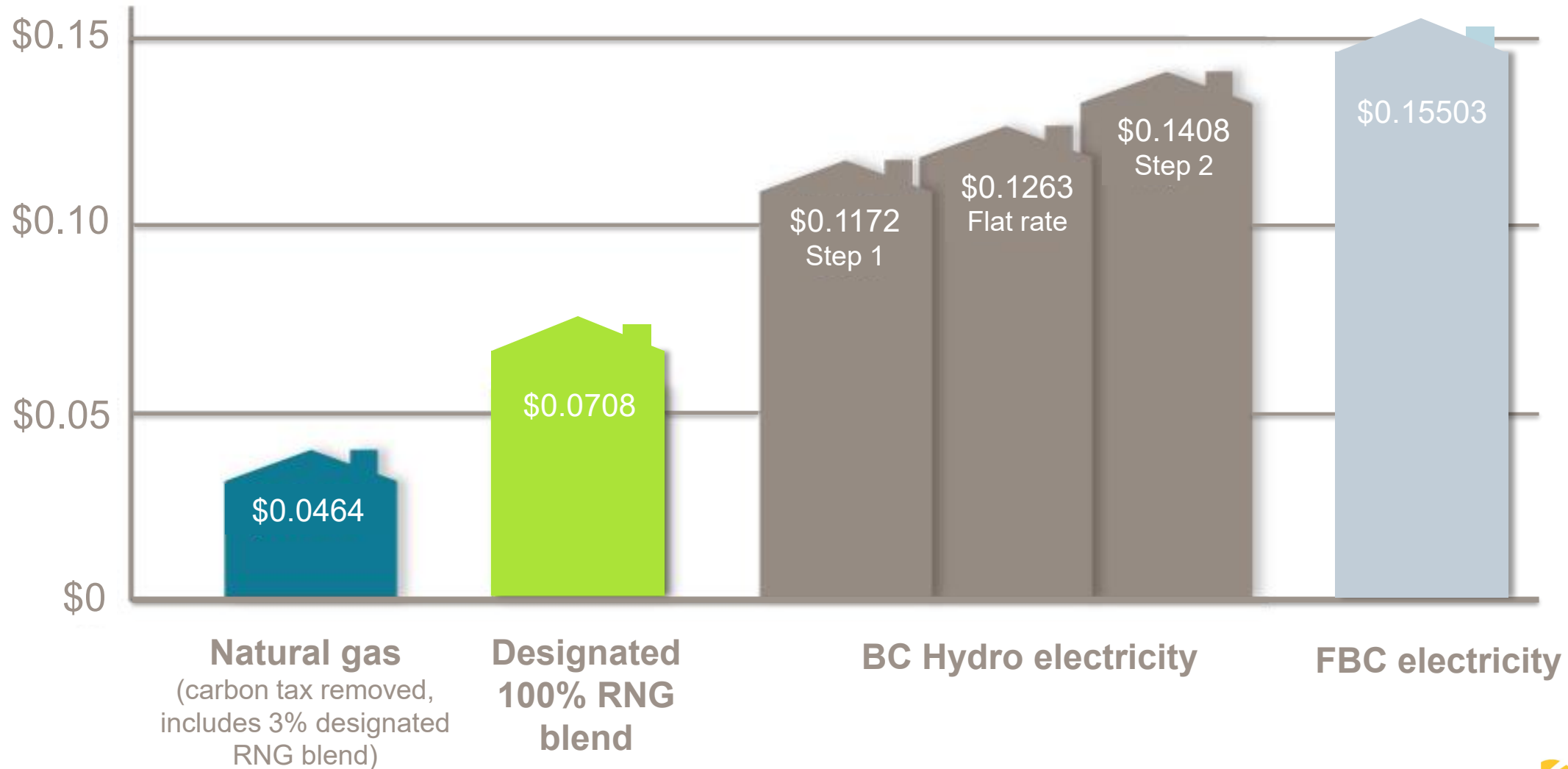


Source: [2024 PNUCC Northwest Regional Forecast](#)

# Distinguishing the Role of Policy versus the System Extension Test



# Gas is an Affordable Energy Source



# Connection Fees are a Key Input to Construction Costs



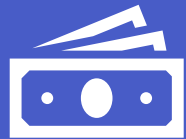
**\$35.6 billion**

Total Value of BC's Residential  
Construction in 2024



**\$22.9 billion**

Total value of building  
permits issued in 2024



**9.1%**

Construction Share of  
Industry GDP in 2024



**100%**

Construction cost  
increase 2014 to 2025

# How we work with Builder/Developers to apply the System Extension Test



Legend

— Gas main

# How we work with Builder/Developers to apply the System Extension Test



Legend

— Gas main

# How we work with Builder/Developers to apply the System Extension Test



Legend

- Gas main
- MX Test boundary

# How we work with Builder/Developers to apply the System Extension Test



Key

- Gas main
- MX Test boundary

# How we work with Builder/Developers to apply the System Extension Test



Legend

- Gas main
- MX Test boundary

# How we work with Builder/Developers to apply the System Extension Test



Key

- Gas main
- MX Test boundary

# 2. System Extension Principles



# Ratemaking Principles Related to System Extensions



New customers cover costs at time of construction or over time



Customer contributions prevent existing customers from subsidizing costs



DCF method protects existing customers from future rate pressure



Encourages efficient investment and growth



Similar customers are treated similarly

# Similarities with other Utilities

## Northwest Territories

- Northland Utilities

## British Columbia

- FortisBC
- Pacific Northern Gas

## Alberta

- ATCO Gas
- Enbridge

## Saskatchewan

- Sask Energy

## Manitoba

- Centra Gas

## Quebec

- Energir
- Gas Metro

## New Brunswick

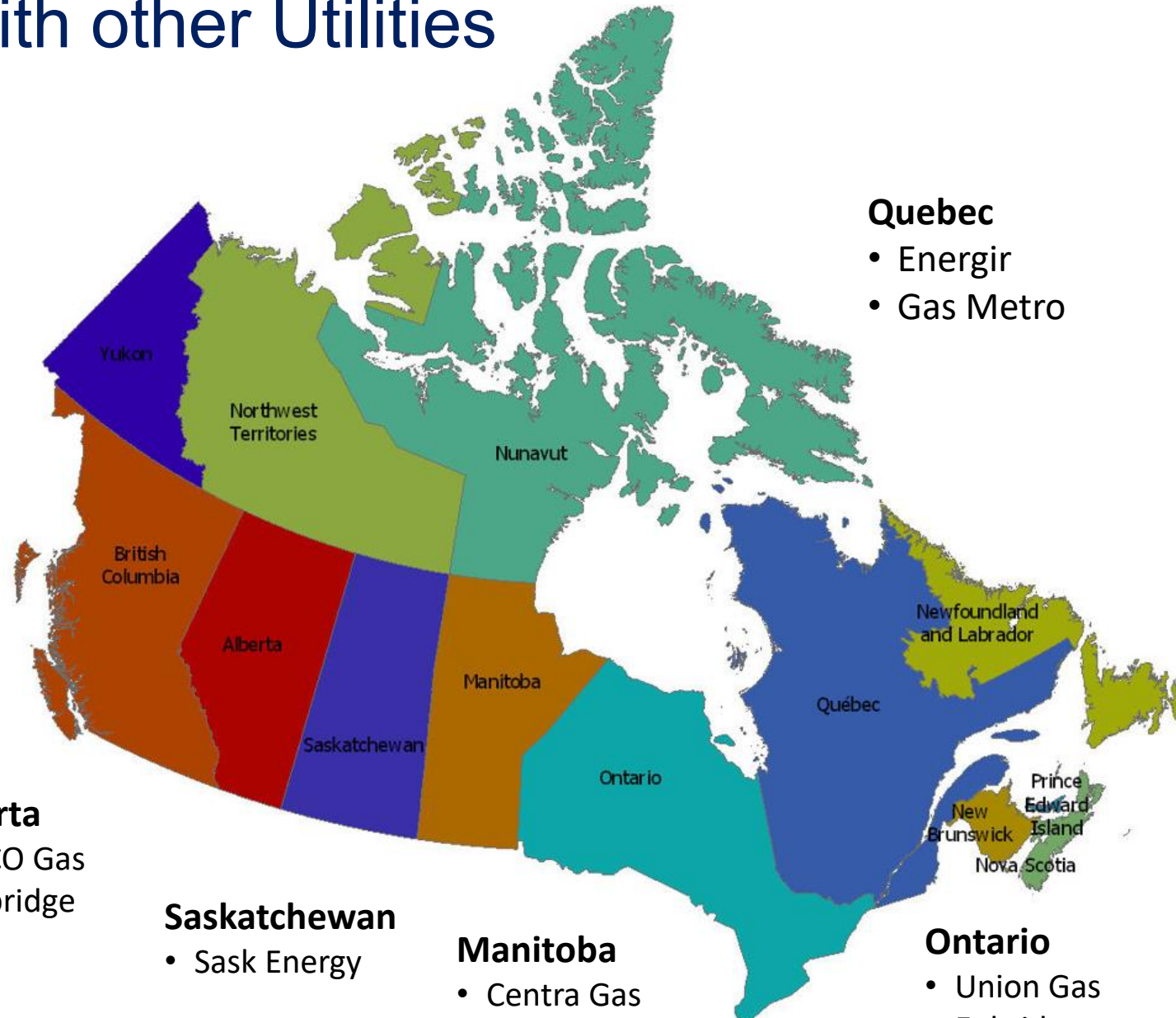
- Liberty Utilities

## Nova Scotia

- Eastward Energy
- Emera Energy

## PEI

- Eastward Energy



# 3. System Extension Test Mechanism

1. Background & Context

2. System Extension Principles

3. System Extension Test Mechanism

4. Results and Analysis

5. Discussion

# Main Extensions vs Service Lines

## Main Extension Test



Providing service to a new  
area of development  
(off main)

Usually on public property

Subject to the Main  
Extension Test

## Service Line Cost Allowance



Service from the existing  
gas main to a building  
(on main)

Mostly on private property

Residential and Small  
commercial service lines  
receive a standard credit  
(Service Line Cost  
Allowance)

# Main Extension Terms and Conditions

## 12. Main Extensions

### 12.1 System Expansion

FortisBC Energy will make extensions of its Gas distribution system in accordance with system development requirements.

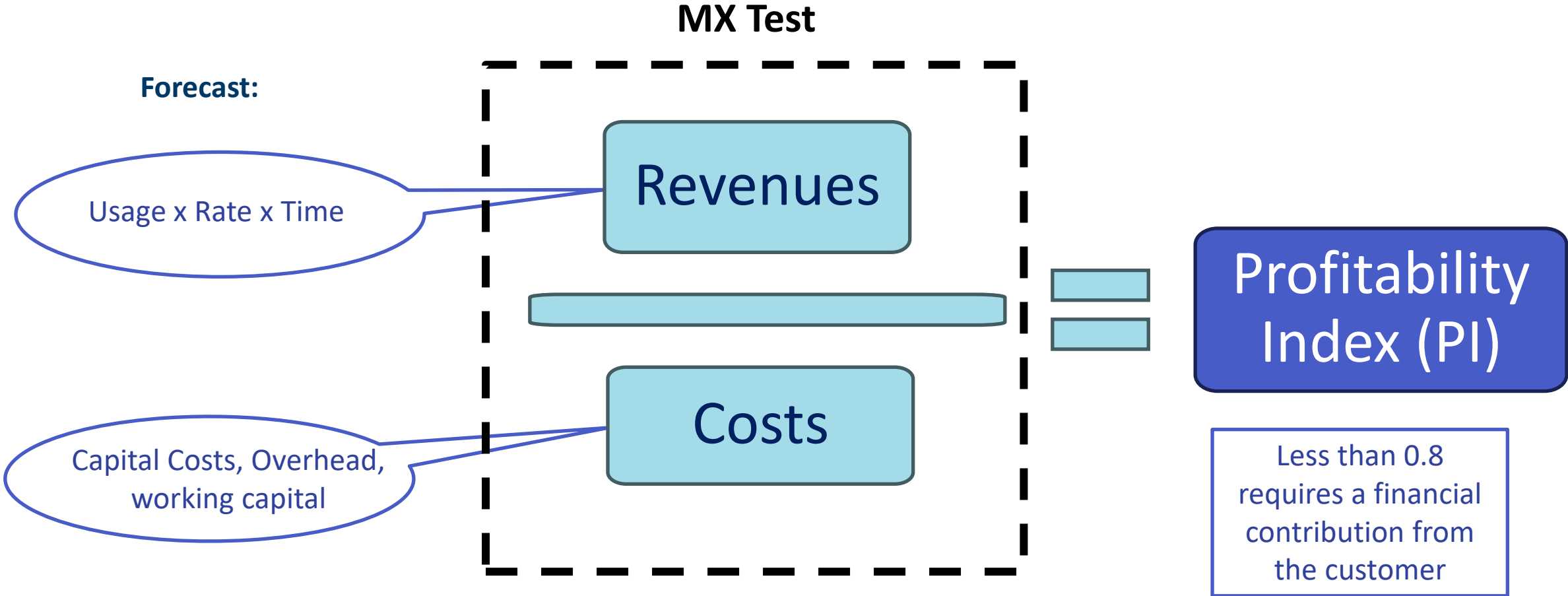
### 12.2 Ownership

All extensions of the Gas distribution system will be the property of FortisBC Energy.

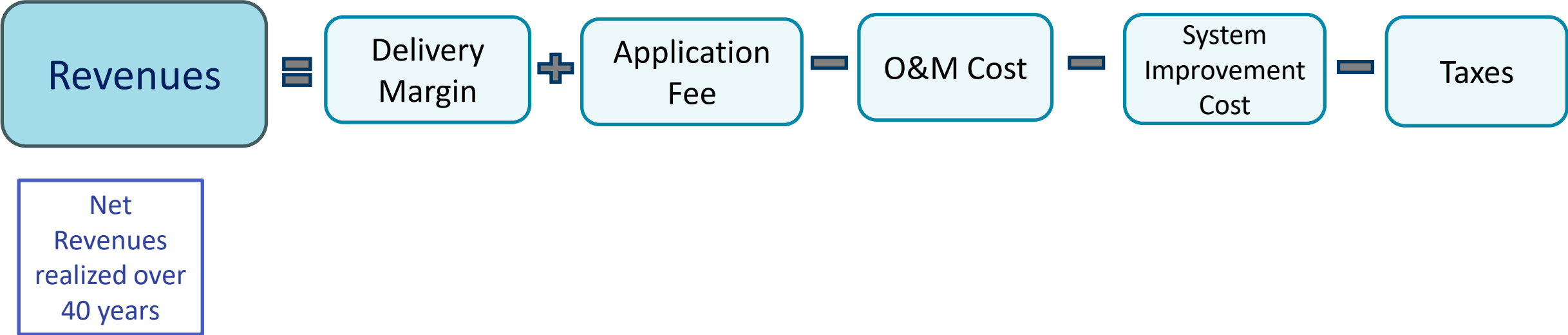
### 12.3 Economic Test

All applications to extend the Gas distribution system to one or more new Customers will be subject to an economic test approved by the British Columbia Utilities Commission. The economic test will be a discounted cash flow analysis of the projected revenue and costs associated with the Main Extension. The Main Extension will be deemed to be economic and will be constructed if the results of the economic test indicate a Profitability Index of 0.8 or greater for an individual Main Extension.

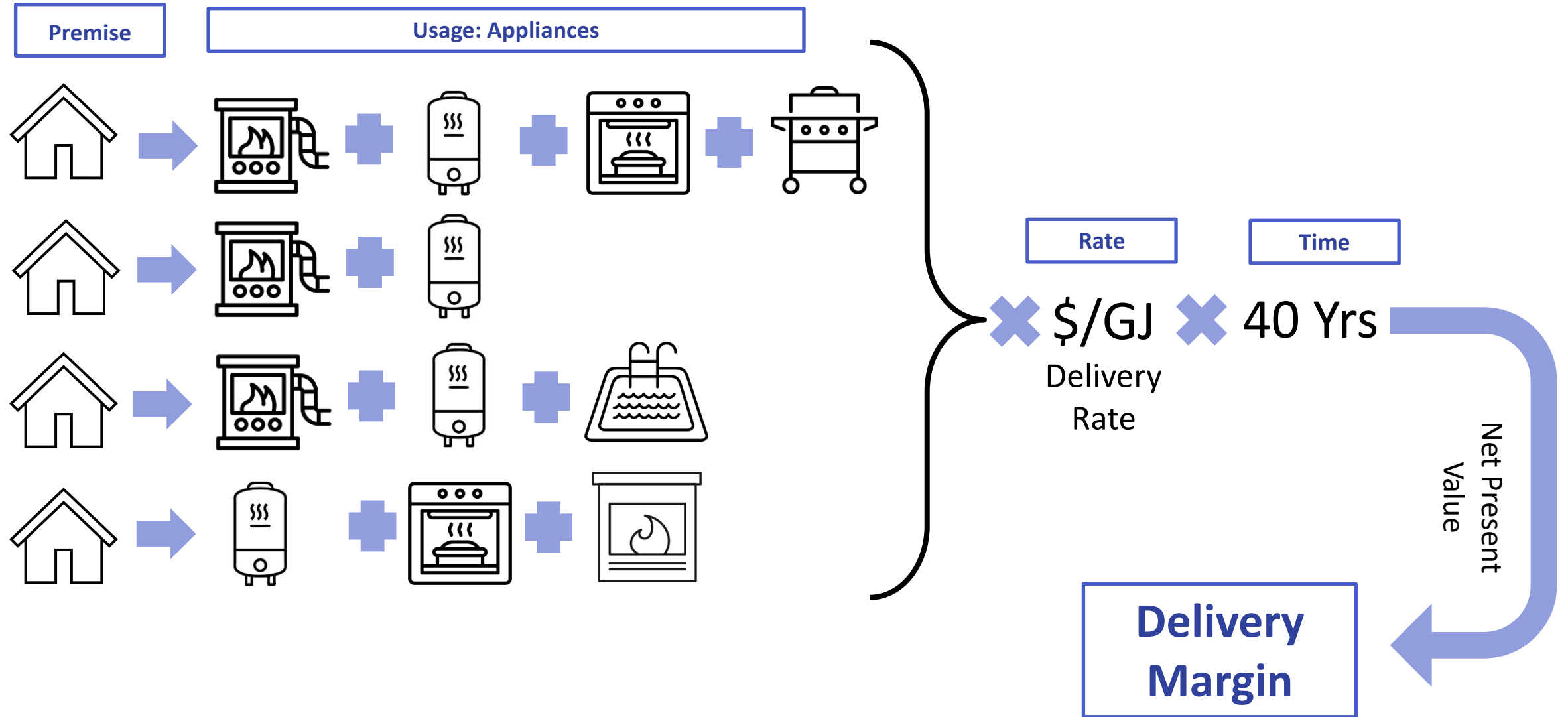
# Main Extension Test Methodology



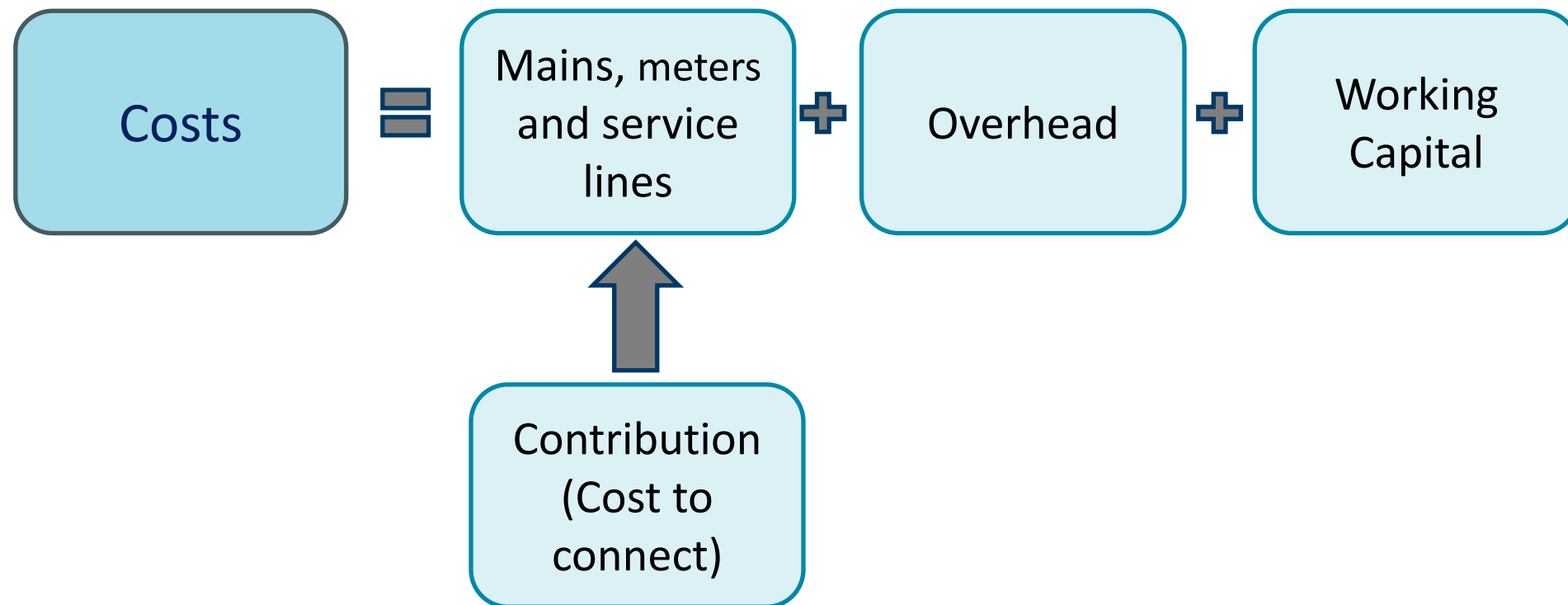
# Main Extension Test Revenues



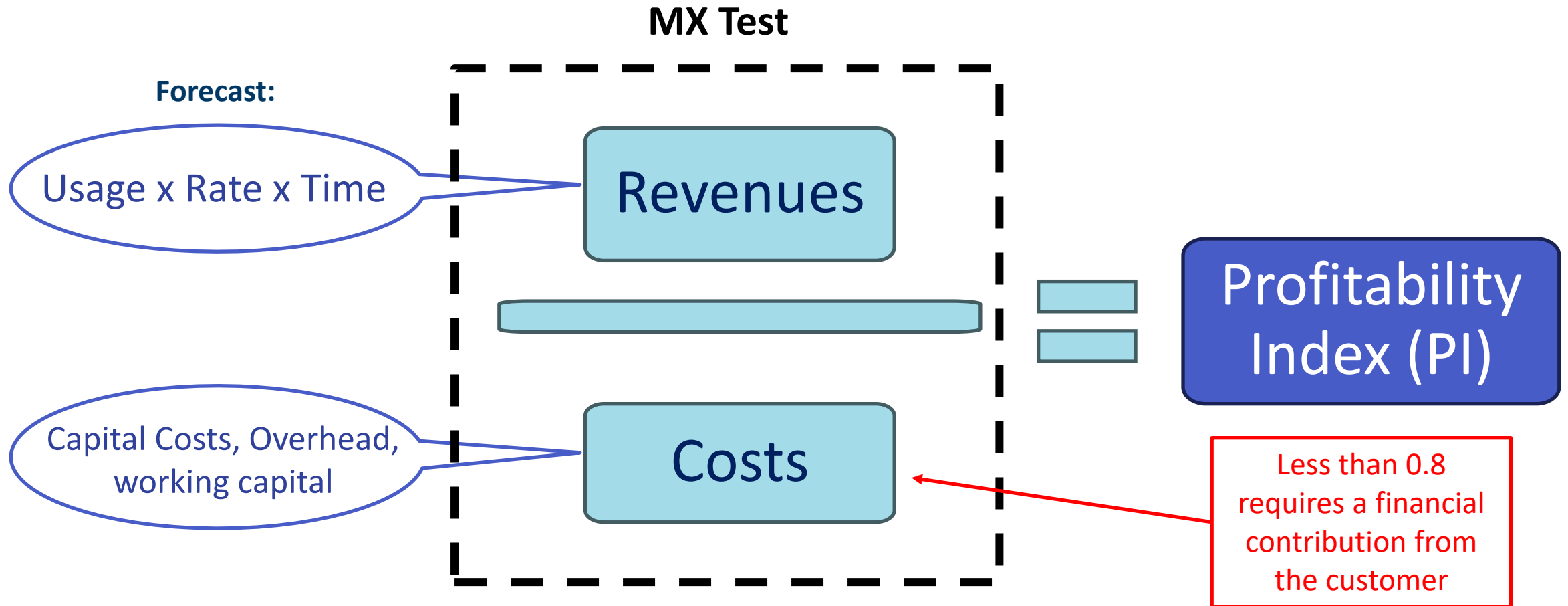
# Main Extension Test Revenues – Delivery Margin



# Main Extension Test Costs



# Main Extension Test Methodology



# Service Line Terms and Conditions

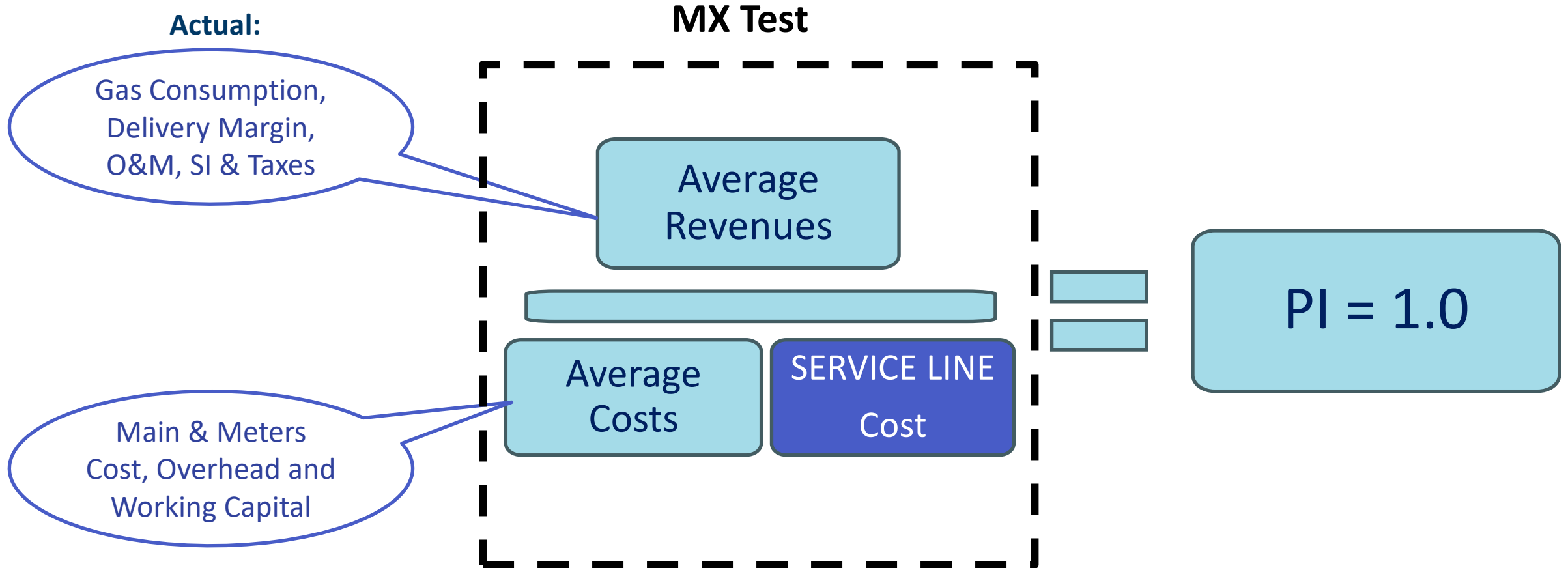
## 10. Service Lines

### 10.1 Provided Installation

If FortisBC Energy's Main is adjacent to the Customer's Premises, FortisBC Energy:

- (a) will designate the location of the Service Lines on the Customer's Premises and determine the amount of space that must be left unobstructed around them;
- (b) will install for Rate Schedule 1 and Rate Schedule 2 Customers the Service Line from the Main to the Meter Set on the Customer's Premises at no additional cost to the Customer provided:
  - (i) the Service Line follows the route which is the most suitable to FortisBC Energy;
  - (ii) the estimated direct cost of the Service Line does not exceed the Service Line Cost Allowance set out in the Standard Charges Schedule; and
  - (iii) the distance from the front of the Customer's building or machinery to the meter does not exceed 1.5 metres;
- (c) will charge Rate Schedule 1 and Rate Schedule 2 Customers for the estimated direct construction costs in excess of the Service Line Cost Allowance set out in the Standard Charges Schedule; and
- (d) will perform an economic test for Customers of Rate Schedule 3 and Customers of Rate Schedules numbered higher than Rate Schedule 3, and for any Customers connecting to a Service Header including Vertical Subdivisions, and, when the Profitability Index of the test is less than 0.8, will charge the Customer a contribution sufficient to achieve a minimum Profitability Index of 0.8. The economic test will be discounted cash flow test, similar to the economic test for Main Extensions set out in Section 12 (Main Extensions).

# Service Line Cost Allowance (SLCA)

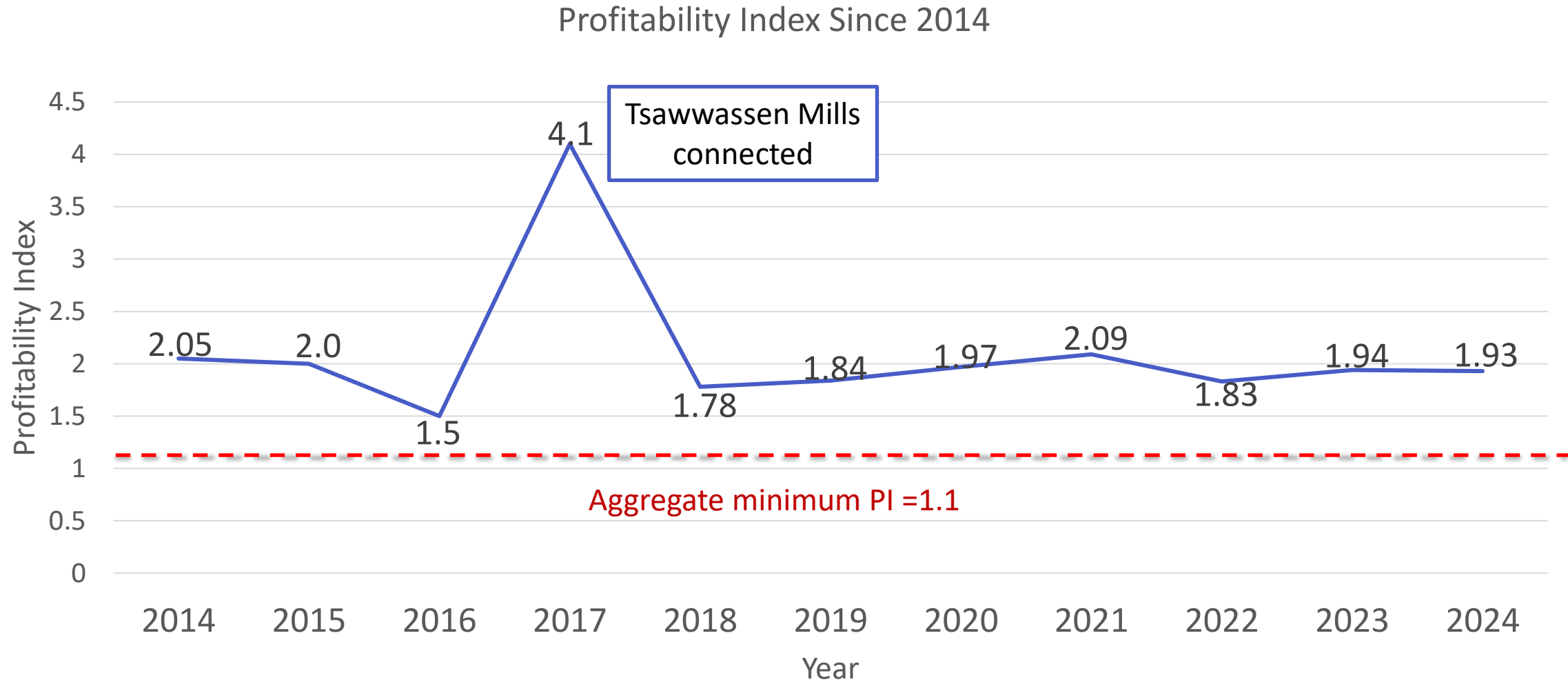


# Main Extension Test Forecast of all Connections

## Aggregate of all MX Tests

- Provides an indication that connections in aggregate will recover costs
- Based on the MX test of all projects completed in the year
- Is a forecast based tool

# Historical Annual Average Profitability Index (Forecast)



# 4. Results and Analysis

1. Background & Context

2. System Extension Principles

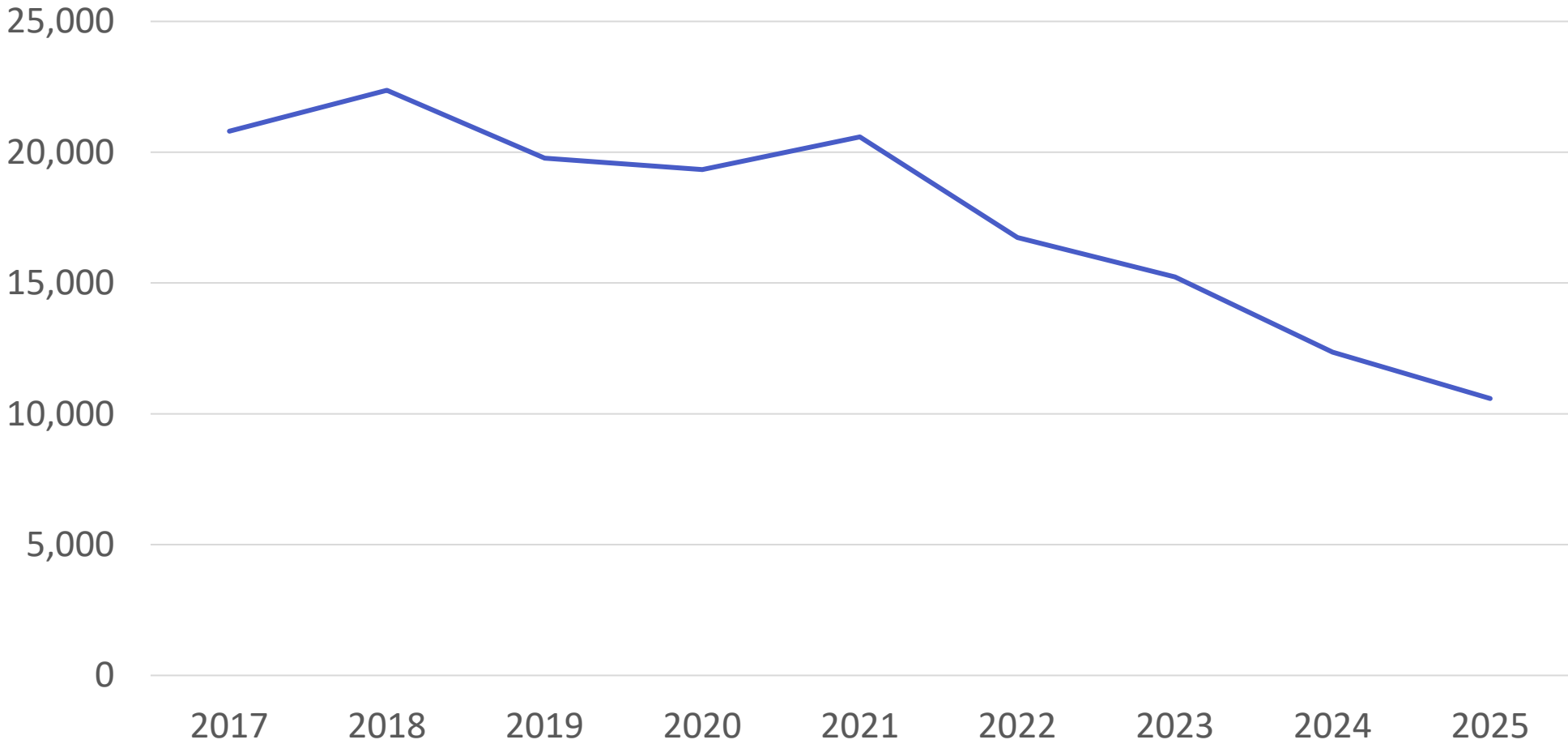
3. System Extension Test Mechanism

4. Results and Analysis

5. Discussion

# Customer Attachment Results Using the Current System Extension Test Mechanism

Gross Attachments



# System Extension Test Evaluation

## Rate Impact Assessment

- Based on actual costs and revenues
- Is an ex-post (backwards-looking) based tool
- Shows the effect on delivery rates

# Rate Impact Assessment: 2 Step Process

*Calculate Delivery Rate With and Without new connections*

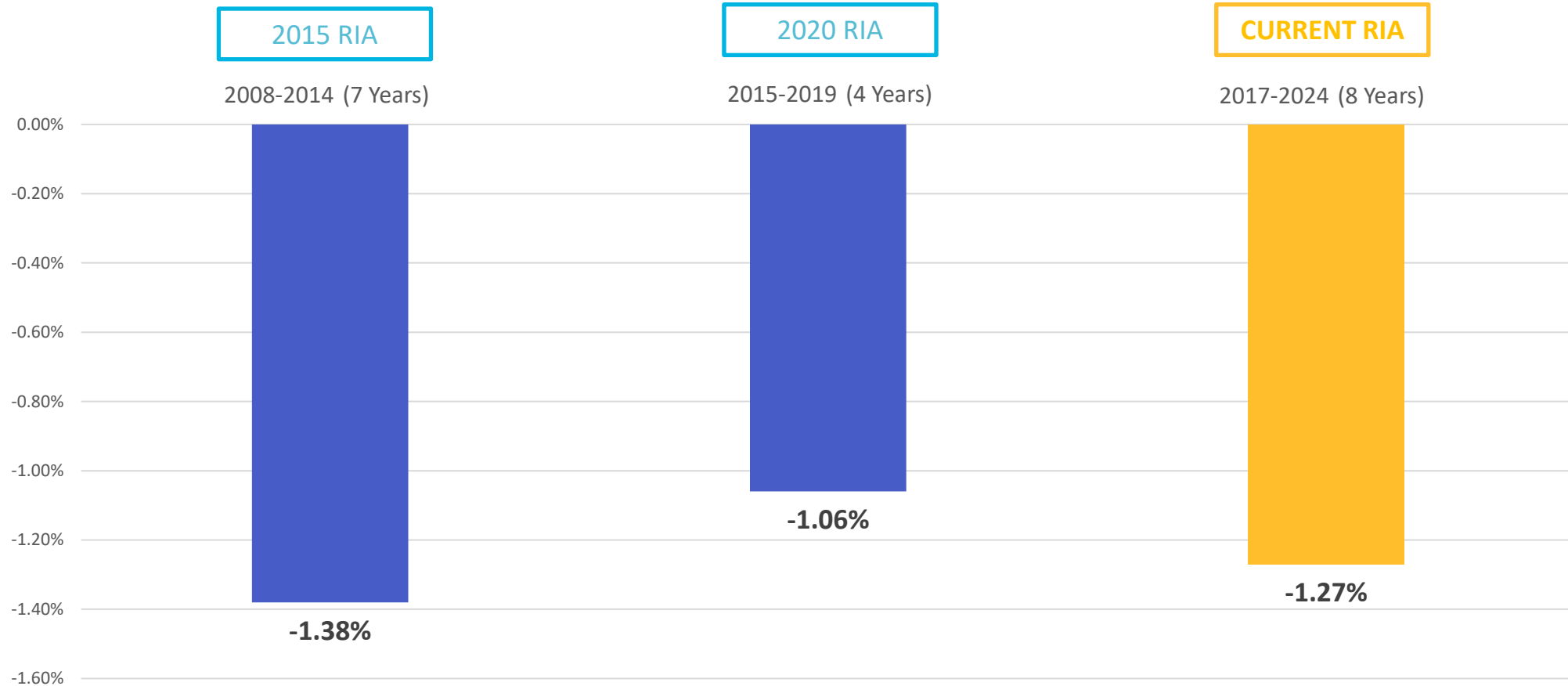
$$\begin{array}{c} \text{Cost of service (\$)} \\ \div \\ \text{Annual consumption (GJ)} \end{array} = \begin{array}{c} \text{\$/GJ per customer} \\ \text{Delivery Rate} \end{array}$$

*Calculate the difference in delivery rates*

$$\begin{array}{c} \text{Delivery Rate With Growth} \\ \text{(\$/GJ)} \end{array} - \begin{array}{c} \text{Delivery Rate Without Growth} \\ \text{(\$/GJ)} \end{array} = \begin{array}{c} \text{Annual Delivery Rate Impact} \\ \text{(\$/GJ or \%)} \end{array}$$

# Rate Impact Assessment Results

## Revenues from New Customers Exceed Costs to Connect



Changes in system extension policies were made October 2016

# 6. Discussion

1. Background & Context

2. System Extension Principles

3. System Extension Test Mechanism

4. Results and Analysis

5. Discussion

# Discussion Questions

1. What has been working well for you?

2. What could be better?

3. What should we keep in mind going forward?

# Highlights of Discussion from Workshop hosted on January 14, 2026

“ There is a cost of delivery crisis – developers cannot build homes at prices buyers can afford. They are trying to reduce costs wherever possible and need to keep all energy options open.....

“ The intent is not to make the test more difficult or change the PI, is it?  
..  
Under BC Hydro’s extension policy, the first developer was responsible for the full cost of servicing the new site as well as all the upgrades to the existing infrastructure. The project stalled because no developer wanted to go first and pay the entire amount.

“ We need reliable energy – both electricity and gas. Private developers build 95% of new housing, and residential construction has slowed significantly. BC Hydro is facing constraints, while gas continues to offer certainty. We should avoid limiting opportunities for energy connections.....

“ It looks like the PI could be lowered...

# Discussion Questions

1. What has been working well for you?

2. What could be better?

3. What should we keep in mind going forward?



**Find FortisBC at:**

Fortisbc.com



604-576-7000

**Appendix H**

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**FEI GENERAL TERMS AND CONDITIONS  
PROPOSED BLACKLINED REVISIONS**

## 12. Main Extensions

### 12.1 System Expansion

FortisBC Energy will make extensions of its Gas distribution system in accordance with system development requirements.

### 12.2 Ownership

All extensions of the Gas distribution system will be the property of FortisBC Energy.

### 12.3 Economic Test

All applications to extend the Gas distribution system to one or more new Customers will be subject to an economic test approved by the British Columbia Utilities Commission. The economic test will be a discounted cash flow analysis of the projected revenue and costs associated with the Main Extension. The Main Extension will be deemed to be economic and will be constructed if the results of the economic test indicate a Profitability Index of 0.6 or greater for an individual Main Extension.

Deleted: 0.8

### 12.4 Revenue

The projected revenue to be used in the economic test will be determined by FortisBC Energy by:

- (a) estimating the number of Customers to be served by the Main Extension;
- (b) establishing consumption estimates for each Customer;
- (c) projecting when the Customer will be connected to the Main Extension; and
- (d) applying the appropriate revenue margins for each Customer's consumption.

The revenue projection will take into consideration the estimated number and type of Gas appliances used. In addition, the projected revenue from the applicable Application Charges will be included. Only those Customers expected to connect to the Main Extension within 5 Years of its completion, or within 10 Years of its completion for the Main Extension with a planning horizon longer than 5 Years as determined by FortisBC Energy will be considered.

Order No.: G-135-18 Issued By: Diane Roy, Vice President, Regulatory Affairs

Effective Date: November 1, 2018 Accepted for Filing: November 9, 2018

BCUC Secretary: Original signed by Patrick Wruck

Original Page 12-1

### 12.9 Extensions to Contributory Extensions

When a Main Extension is attached to an existing contributory Main Extension within the five-Year contributory period for the existing extension or within the ten-Year contributory period for the existing extension (if applicable), the new extension will be evaluated using the Main Extension test to determine whether a contribution is required. A prorated portion of the total contribution for the existing contributory extension will be assigned to the new extension on the basis of expected use, point of connection, and other factors. Any contributions toward the cost of the existing extension from Customers on the new extension will be used to provide partial refunds to the contributing Customers on the existing extension, subject to Section 12.11 (System Extension Fund). The total refunds issued will not exceed the total amount of contributions paid by Customers on the existing extension.

C/O

### 12.10 Security

In those situations where the financial viability of a Main Extension is uncertain, FortisBC Energy may require a security deposit in the form of cash or an equivalent form of security acceptable to FortisBC Energy.

### 12.11 System Extension Fund

FortisBC Energy will budget funds annually to its System Extension Fund, which is intended to provide limited assistance to eligible new Customers who are required to pay a contribution in aid of construction of a Main Extension.

Customers must apply to FEI for funding from the System Extension Fund.

The Customer applying for the System Extension Fund must meet the following requirements:

- (a) The Customer's **Premises** must be located within FortisBC Energy's Mainland and Vancouver Island Service Area;
- (b) The Customer's Premises must be **either**:
  - i. a separately metered single-family dwelling or townhouse, that is the Customer's principal residence and is occupied for the majority of the year; **or**
  - ii. **a separately metered commercial building or commercial suite eligible for service under Rate Schedule 2, that is the Customer's place of business, and which is occupied and open for business the majority of the year; and**
- (c) The result of the economic test for the Main Extension must indicate a Profitability Index of greater than 0.2 and less than **0.6**, indicating that a contribution in aid of construction is required by the Customer.

C/O

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**Appendix I**  
**DRAFT ORDERS**



**ORDER NUMBER**

**G-xx-xx**

IN THE MATTER OF

the *Utilities Commission Act*, RSBC 1996, Chapter 473

and

FortisBC Energy Inc.

2026 Main Extensions and Connection Policies Review

**BEFORE:**

[Panel Chair]  
Commissioner  
Commissioner

on Date

**ORDER**

**WHEREAS:**

- A. By Letters L-11-25 dated June 17, 2025 and L-24-25 dated August 25, 2025, the British Columbia Utilities Commission (BCUC) directed FortisBC Energy Inc. (FEI) to file an application for the review of its terms and conditions, extension policies and the parts of the tariff governing customer connections by May 15, 2026;
- B. On May 15, 2026, FEI filed with the BCUC an application (Application) pursuant to sections 28, 29, 30 and 59 to 61 of the *Utilities Commission Act* (UCA), seeking the following approvals in respect of its Main Extension (MX) Test, Service Line Cost Allowance (SLCA) and System Extension Fund (SEF) (collectively, MX and Connection Policies) effective the first of the month following a BCUC decision:
  1. Continue using the MX Test with the following changes:
    - a. Lower the required Profitability Index (PI) threshold for individual main extensions from 0.8 to 0.6; and
    - b. Update the sliding scale overhead rate;
  2. Continue determining the SLCA as previously approved with the following changes:
    - a. Eliminate the final step in the SLCA calculation method; and
    - b. Lower the PI threshold from 1.0 to 0.8 when calculating the SLCA;
  3. Expand the SEF eligibility to include small commercial customers without increasing the overall SEF funding envelope.

- C. FEI also proposes to file an updated Rate Impact Assessment (RIA) within 7 years of the BCUC’s decision on the Application;
- D. In the Application, FEI states the proposed updates and adjustments to its MX and Connection Policies promote fairness between new and existing customers; and
- E. The BCUC determines that the establishment of a public hearing process and a regulatory timetable for the review of the Application is warranted.

**NOW THEREFORE** the BCUC orders as follows:

- 1. A public hearing process is established for the review of the Application, as set out in the regulatory timetable attached as Appendix A to this order.
- 2. On or before [DATE], FEI is directed to:
  - a. Provide notice of the Application and this order on its website;
  - b. Provide a copy of the Application and this order, electronically where possible, to registered interveners in the 2015 FEI System Extension Application, 2020 System Extension Fund Review and 2026 FEI Long-term Gas Resource Plan proceedings.
  - c. Provide notice of the Application and this order, or post the Public Notice attached as Appendix B to this order, on its existing social media platforms. Reminder posts must be published on each platform every week until the conclusion of the intervener registration period on [DATE].
- 3. FEI is directed to provide to the BCUC, by [DATE], written confirmation of compliance with the notice requirements in Directive 2 of this order, including a list of social media platforms on which notice was published, as well as a list of all parties notified.
- 4. In accordance with the BCUC’s Rules of Practice and Procedure, parties who wish to actively participate in this proceeding must submit the Request to Intervene Form, available on the BCUC’s website at <https://www.bcuc.com/GetInvolved/GetInvolvedProceeding>, by Day/DATE.

**DATED** at the City of Vancouver, in the Province of British Columbia, this (XX) day of (Month Year).

BY ORDER

(X. X. last name)  
Commissioner

Attachment

FortisBC Energy Inc.  
2026 Main Extensions and Connection Policies Review

**REGULATORY TIMETABLE**

Action	Date (2026)
FEI provides notice of Application	Wednesday, June 17
FEI confirmation of compliance with public notice requirements	Monday, June 22
Intervener registration deadline	Monday, June 29
FEI confirmation of compliance with social media reminder posts	Thursday, July 2
BCUC decision on intervener registrations	Thursday, July 9
BCUC Information Request (IR) No. 1	Thursday, July 23
Intervener IR No. 1	Thursday, July 30
FEI responses to BCUC and Intervener IR No. 1	Thursday, August 27
Deadline for submitting letters of comment	Thursday, September 10
FEI final argument	Thursday, September 24
Intervener final arguments	Tuesday, October 13
FEI reply argument	Thursday, October 29



# We want to hear from you

## FortisBC Energy Inc. 2026 Main Extensions and Connection Policies Review

On May 15, 2026, FortisBC Energy Inc. filed a Main Extensions and Connection Policies Review application requesting British Columbia Utilities Commission (BCUC) approval of adjustments to the terms and conditions, extension policies and parts of FEI's tariff governing customer connections.

To participate in the proceeding, please see the options below or visit [www.bcuc.com/get-involved](http://www.bcuc.com/get-involved) for more information.

### GET INVOLVED

- [Request intervenor status](#)
- [Submit a letter of comment](#)
- [Subscribe to the proceeding](#)  
to receive email notifications when public documents are posted to the proceeding page

### IMPORTANT DATES

1. **[Day/DATE]**  
Deadline to request intervenor status
2. **[Day/DATE]**  
Deadline to submit a letter of comment

Please visit the [proceeding page](#) on [bcuc.com](http://bcuc.com) under "Our Work" to learn more.

## CONTACT INFORMATION

### FortisBC Energy Inc. Regulatory Affairs



16705 Fraser Highway  
Surrey, BC V4N 0E8



E: [gas.regulatory.affairs@fortisbc.com](mailto:gas.regulatory.affairs@fortisbc.com)



P: 604.592.7664

### British Columbia Utilities Commission



Suite 410, 900 Howe Street  
Vancouver, BC V6Z 2N3



E: [proceedings@bcuc.com](mailto:proceedings@bcuc.com)



P: 604.660.4700



**ORDER NUMBER**

**G-xx-xx**

IN THE MATTER OF  
the *Utilities Commission Act*, RSBC 1996, Chapter 473

and

FortisBC Energy Inc.  
2026 Main Extensions and Connection Policies Review

**BEFORE:**

[X. X. Last Name, Panel Chair]  
[X. X. Last Name, Commissioner]  
[X. X. Last Name, Commissioner]

on [Month Day, Year]

**ORDER**

**WHEREAS:**

- A. By Letters L-11-25 dated June 17, 2025 and L-24-25 dated August 25, 2025, the British Columbia Utilities Commission (BCUC) directed FortisBC Energy Inc. (FEI) to file an application for the review of its terms and conditions, extension policies and the parts of the tariff governing customer connections by May 15, 2026;
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    - a. Lower the required Profitability Index (PI) threshold for individual main extensions from 0.8 to 0.6; and
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  2. Continue determining the SLCA as previously approved with the following changes:
    - a. Eliminate the final step in the SLCA calculation method; and
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  3. Expand the SEF eligibility to include small commercial customers without increasing the overall SEF funding envelope.

- C. FEI also proposes to file an updated Rate Impact Assessment (RIA) within 7 years of the BCUC’s decision on the Application;
- D. In the Application, FEI states the proposed updates and adjustments to its MX and Connection Policies promote fairness between new and existing customers;
- E. By Order G-###-## dated [DATE], the BCUC established the regulatory timetable for the proceeding, which included public notice of the Application, intervener registration, one round of information requests, and final and reply arguments; and
- F. The BCUC has reviewed the Application, evidence, and arguments filed in the proceeding and makes the following determinations.

**NOW THEREFORE** pursuant to section 28, 29, 30 and 59 to 61 of the UCA, the BCUC orders as follows:

- 1. FEI is approved to:
  - a. Continue the MX Test with the following changes:
    - i. Lower the required Profitability Index (PI) threshold for individual main extensions from 0.8 to 0.6; and
    - ii. Update the sliding scale overhead rate.
  - b. Continue determining the SLCA as previously approved with the following changes:
    - i. Eliminate the final step in the SLCA calculation method; and
    - ii. Lower the PI threshold from 1.0 to 0.8 when calculating the SLCA.
  - c. Expand the SEF eligibility to include small commercial customers without increasing the overall SEF funding envelope.
- 2. FEI is directed to file revised tariff pages for endorsement by the BCUC within 15 days of the date of this order.
- 3. FEI is directed to file an updated RIA within 7 years of this Decision.

**DATED** at the City of Vancouver, in the Province of British Columbia, this [XXth] day of (Month Year).

BY ORDER

(X. X. last name)  
Commissioner