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October 26, 2021

Residential Consumer Intervener Association
c/o Midgard Consulting Inc.
Suite 828 – 1130 W Pender Street
Vancouver, B.C.
V6E 4A4

Attention: Mr. Peter Helland, Director

Dear Mr. Helland:

Re: FortisBC Energy Inc. (FEI)

Project No. 1599211

Application for a Certificate of Public Convenience and Necessity (CPCN) for Approval of the Advanced Metering Infrastructure (AMI) Project (Application)

Response to the Residential Consumer Intervener Association (RCIA) Information Request (IR) No. 1

On May 5, 2021, FEI filed the Application referenced above. In accordance with regulatory timetable established in British Columbia Utilities Commission Order G-302-21 for the review of the Application, FEI respectfully submits the attached response to RCIA IR No. 1.

FEI is filing the response to RCIA IR No.1 32.1, and Attachments 14.4B and 14.4C on a confidential basis pursuant to Section 18 of the BCUC's Rules of Practice and Procedure regarding confidential documents, as set out in Order G-15-19, to preserve commercially sensitive information which, if disclosed, could prejudice or negatively impact the bidding process or FEI's ability to negotiate.

If further information is required, please contact the undersigned.

Sincerely,

FORTISBC ENERGY INC.

Original signed:

Diane Roy

Attachments

cc (email only): Commission Secretary
Registered Parties

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A. Project Need and Justification

1. Reference: Exhibit B-1, Application, p. 2

Regarding meter reading errors, FEI states:

"FEI's current meter reading practices are highly manual and vulnerable to errors, and can be inconvenient to customers."

1.1 Explain why meter reading errors are inconvenient to customers.

Response:

Meter reading errors are inconvenient to customers largely because they can result in an unexpected billed amount, either in the billing period in which the error is made, or in a subsequent period when the error is corrected.

When a customer's bill differs from what they expect, they are inconvenienced by having to contact FEI's contact centre to ask any questions they have about the discrepancy. They may also be financially inconvenienced if they are unable to pay more than they were expecting.

1.2 Confirm whether any errors in manual reading of meters are naturally corrected at the subsequent meter reading.

Response:

Confirmed. Manual meter reading errors are corrected when the meter is next read accurately.

1.3 What proportion of FEI's residential customers are on the Equal Payment Plan?

Response:

As of September 2021, approximately 29 percent of FEI's residential customers are on the Equal Payment Plan.

1.4 What proportion of FEI's commercial customers are on the Equal Payment Plan?

Response:

As of September 2021, approximately 9 percent of FEI's commercial customers are on the Equal Payment Plan.

2. Reference: Exhibit B-1, Application, p. 14

Regarding the project need, FEI states:

"This section demonstrates the need for the Project, which is to automate the meter reading process (referred to throughout the Application as Automation) for FEI customers."

2.1 Does FEI view Automation as a "need" in and of itself, or would Automation be better viewed as a method by which to meet other needs?

Response:

As noted throughout the Application, starting with Section 1.1, FEI has determined the need to automate its meter reading process for all FEI customers. Thus, FEI views automation as a need in and of itself.

2.1.1. If Automation is better viewed as a method rather than a "need", please identify the need(s) which the method of Automation helps FEI to meet.

Response:

Please refer to the response to RCIA IR1 1.2.1.

3. Reference: Exhibit B-1, Application, p. 18, Figure 3-1; Exhibit A-4, BCUC IR1, IR 4.2

Regarding meter exchange complaints, FEI states:

"The meter testing and exchange process impacts approximately 60,000 FEI customers on average per year."

Figure 3-1 states:

"Technician is usually required to enter home"

3.1 How many missed appointments for meter exchanges does FEI experience each year?

Response:

FEI interprets this question to be seeking the number of meter exchange appointments scheduled with a customer that are missed and rescheduled each year.

The number of scheduled appointments missed in the last three years is provided in the table below. FEI notes that the number of missed appointments in 2020 is low relative to previous years; this corresponds to the lower number of meters exchanged that year due to meter exchange dispensation granted by Measurement Canada resulting from the COVID-19 pandemic.

	2018	2019	2020
Missed Appointments	607	424	269

3.2 Provide a summary of the meter by-pass program, including the scope and justification.

Response:

The installation of bypass valves on residential meter sets began with a trial in 2015 to improve employee safety, and reduce costs and customer disruptions associated with the residential meter exchange program. The trial led to the start of a full-scale implementation in 2018. The scope of work typically includes replacing the existing meter set inlet shutoff valve and adding an additional valve to the meter set outlet. These allow a portable bypass assembly to be used during future meter exchanges or other work on the meter set equipment, which avoids interrupting the flow of gas (and hence the occasion for the technician to enter customer premises to relight appliances).

The installation of bypass valves in conjunction with residential meter exchanges has numerous benefits including:

- Increased customer satisfaction by eliminating the inconvenience and disruption associated with having to schedule meter exchange appointments and requiring the customer to be present during a meter exchange in relation to appliance relights;
- Decreased future contact centre costs by removing the requirement to schedule meter exchange appointments;
- Improved employee safety associated with eliminating the occasion to access customer homes and relight appliances; and
- Increased operational efficiencies by reducing the time to complete individual meter exchanges, as well as allowing meter exchange activities to be geographically clustered (reducing the associated time and travel).

With these benefits, the most appropriate long-term decision was to begin installation of bypass valves, and further, to include them in the scope of the AMI Project so that the program's full benefits could be realized sooner.

3.3 Once FEI completes the meter by-pass program, would FEI expect the meter testing and exchange process to have any impact on customers? If yes, please explain.

3.3.1. Would there be any difference in the number of affected customers depending whether the meters are AMI or manually read?

Response:

After completion of the bypass valve program, FEI expects the residential meter exchange program to have minimal impact on customers. The AMI meter is expected to have a slightly longer service life and almost all residential meter exchanges will be done without booking an appointment, and will not require the customer's presence for relighting their appliances as the appliances would not need to be relit. For a small number of premises (such as gated or enclosed meter sets), an appointment will be booked for the customer to provide access to the meter set. The customer presence is not required for entering the premises and relighting appliances as the appliances will not need to be relit.

The overall number of customers affected by the meter testing and exchange process is not dependent on whether the meters are AMI or the current manually read meters. All meters must be exchanged at their end of life. On an annualized basis, the AMI meter may result in slightly fewer customer impacts due to the longer service life.

3.4 In what circumstances would a technician not be required to enter the home following a meter exchange to complete the relight process?

Response:

A technician is not required to enter the home and perform a relight if:

- The customer has agreed to have FEI change the meter and leave the meter turned off;
- The customer has indicated that they will relight their own appliances;
- It is unsafe for the FEI technician to enter the premises or relight the appliances;
- The account is locked off for nonpayment or a vacant account; or
- The meter exchange is not initiated by FEI. This occurs when a customer has added an additional gas appliance and requests FEI replace the existing meter set with a higher capacity set. In this situation, the customer arranges for a gas contractor to connect the customer's houseline to the new meter set and relight the appliance(s).

Regarding meter testing and exchanges, BCUC Asks:

"4.2 Please explain whether AMI meter exchanges will be required by Measurement Canada.

4.2.1 If yes, please provide the number of required AMI meter exchanges each year for the next 20 years following initial installation."

3.5 Separately identify the number of meter tests required by Measurement Canada within the total number of exchanges.

Response:

Please refer to the responses to BCUC IR1 4.2 and 4.2.1. Of the exchanges described in those responses, 100 percent will require verification of accuracy as per Measurement Canada (MC) specification S-S-06 *Sampling Plans for the Inspection of Isolated Lots of Meters in Service*.

3.6 Contrast the numbers of meter tests and exchanges required by Measurement Canada for AMI meters with the numbers required for diaphragm meters.

Response:

As discussed in the responses to BCUC IR1 4.2 and 4.2.1, MC compliance sampling of AMI meters will be conducted over a three-year period from 2031 to 2033 at 3,000 meters per year, and again for a three-year period from 2038 to 2040, at 3,000 meters per year (as shown in Confidential Appendix G, Schedule 11). The Meter Capital portion of the Project financial model (Section 6.2.1.1 of the Application) also includes an annual allowance of 0.5 percent for meter failures requiring replacement (based on historical failure data provided by the manufacturer). The total number of AMI meter exchanges and tests over the 20-year period post-deployment is expected to be 28,000 meters.

For diaphragm meters, as shown in Schedule 1 of Confidential Appendix G, FEI would expect to exchange an average of 58,800 meters each year from 2023 to 2043. The total number of diaphragm meter exchanges and tests over the 20-year period is forecast to be approximately 1.2 million meters.

3.7 Provide FEI's justification for the numbers of AMI meter tests and exchanges assumed in its analysis.

Response:

As discussed in Section 3.1.1.2 of the Application, MC is a federal regulatory agency that establishes the requirements for energy metering devices and installations for custody transfer in Canada. The *Electricity and Gas Inspection Act* (EGIA) and associated regulations and specifications set the rules for the sale of natural gas, and define units for energy measurement. The EGIA requires that:

- natural gas meters be approved for use in Canada;
- only approved and verified meters are used to determine the amount of natural gas consumed; and
- the accuracy of electricity and natural gas meters be verified in accordance with the time periods stipulated in the Regulations.

As per section 19 of the EGIA, FEI samples and tests its meter fleet in accordance with MC specification S-S-06 requirements to ensure that the meters are performing as expected and are providing accurate measurements.

4. Reference: Exhibit B-1, Application, p. 19

Regarding increasing meter reading needs, FEI states:

"As shown below, FEI's meter reading needs have been gradually increasing to the point where FEI now requires over 12,000,000 reads per year, averaging over 1,000,000 manual meter reads per month."

4.1 To what does FEI attribute the gradually increasing number of meter reads per month?

Response:

FEI attributes the gradually increasing number of meter reads per month to growth in the number of gas customers over time. As more customers sign up for gas services, the number of required meter reads per month increases.

5. Reference: Exhibit B-1, Application, pp. 20, 24, 25, 67

Regarding AMR solution to access, challenges, FEI states:

Page 20: "Managing and maintaining up-to-date keys and access codes are ongoing challenges for FEI's meter reading contractor."

Page 24: "As of March 2021, approximately 8,000 customers have either a locked 1 gate or a dog identified to be on premises. In these cases, customers are required to provide keys or gate codes and asked to keep their dogs inside for the few days surrounding the planned meter reading date. This is a source of dissatisfaction and inconvenience for customers as well as a source of risk for the meter reader when the required steps are not taken."

5.1 Explain whether FEI considered the installation of AMR meters at known locations with access challenges, such as the 8,000 locations with locked gates or dogs. Explain the pros and cons of this approach, including which of the project objectives or needs shown in Table 4-4 would be met.

Response:

FEI has determined automating the meter reading process to be a need for the AMI Project. One of the drivers for this need is that meter automation is more accurate and more convenient for customers. Meter reading access challenges play a part in this; other aspects of the manual meter reading process that contribute to this driver are described in Section 3.1 of the Application.

FEI has considered the installation of AMR meters at known locations with access challenges and does not believe this approach will meet the Project need. This is based on FEI's current experience with off-site meter reading.

Currently, in addition to the 8,000 customers referred to in the preamble, FEI has approximately 3,500 residential, commercial, and industrial customers with off-site meter reading to address design challenges or access issues known to be associated with their premises. Off-site meter reading is an older form of AMR technology and requires a radio-equipped module to be retrofitted on the existing meter and allows the reader to obtain an off-site meter read using their radio equipped handheld device.

As noted in Section 4.2.2 of the Application, meter reading in this form (AMR) supports a meter reading process that is more convenient and less intrusive for customers as shown in Table 4-4. However, it provides no real-time indication of meter tampering or other service issues, provides only a single read, and offers none of the benefits associated with the data analytics, safety, and resiliency capabilities of AMI meters. The downsides of the AMR solution far outweigh this benefit as it would ultimately lock FEI and its residential and small commercial customers into a solution with limited capabilities. AMR would also not support future opportunities to enhance the customer experience or FEI's operations in the same way as AMI technology as shown in Table 4-4.

5.2 Could such AMR meters be incorporated into the manually reading process by equipping the meter readers with hand-held AMR receivers?

Response:

Equipping meter readers with handheld AMR receivers was not considered as an alternative. While such a solution would support reduced estimates it would not address the four drivers for the Project need and would result in AMR deployment costs without the benefit of reduced labour costs. Please refer to Section 4.2.1 of the Application for an overview of the full AMR scenario that was considered as an alternative to the AMI Project.

5.3 Recalculate and refile the financial analysis with respect to Table 4-2 and 4-5 assuming a limited installation of AMR meters at locations where access to the meter is problematic. Further assume there will be meter reading cost savings resulting from the meter reading contractor no longer being required to maintain control of keys.

Response:

FEI has not completed the financial analysis as requested for the reasons set out in response to RCIA IR1 5.1 and 5.2.

6. Reference: Exhibit B-1, Application, p. 20

Regarding meter reading contract, FEI states:

"FEI has used its current third-party service contractor, Olameter, since 2013.13 The current contract term expires December 31, 2022; however, the contract includes the ability to extend services for four additional terms of one year each through to December 31, 2026."

6.1 Do the one year extensions to the Olameter contract require agreement from both FEI and Olameter?

Response:

The one year contract extensions referred to in the preamble do not require the agreement of both FEI and Olameter. The terms of the contract are such that it will automatically renew for a subsequent calendar year. However, if either FEI or Olameter wishes to terminate the contract, they can do so by providing 180 days' written notice to the other party that the contract will terminate at the end of the current calendar year. This would prevent the contract from automatically renewing.

6.2 Confirm whether Olameter has indicated that it will not extend the contract, or indicated that it is not interested in bidding on future contracts.

Response:

As noted in the preamble, the current contract term expires December 31, 2022. To date, Olameter has not indicated to FEI that Olameter is interested in terminating the contract. However, as noted in the response to RCIA IR1 6.1, Olameter has until June 30 of each year through 2025 to provide written notice of its decision to terminate the contract at the end of year.

FEI has not had discussions with Olameter regarding its interest in bidding on future manual meter reading contracts.

6.3 With respect to the current Olameter contract, provide the number of parties that submitted bids and whether this was fewer bidders than the previous instance when the meter reading contract was bid.

Response:

The current Olameter contract was negotiated as a sole source contract. FEI took this approach because it was preparing the Application and anticipated a decision on the AMI Project in the near future. FEI did not believe that the introduction of a new meter reading service provider for a short term was reasonable in the circumstances.

7. Reference: Exhibit B-1, Application, p. 21

Regarding meter reading contractor performance, FEI states:

"For example, for contract years 2017 and 2018, financial penalties for failing to meet meter reading window distribution and completion targets were paid by Olameter. Olameter paid no penalties for the 2019 contract year."

Table 3-3: Manual Meter Reading Performance Standards

Performance Standard	Definition	Performance Level
Meter Reading Accuracy	The number of correct monthly meter reads divided by the total number of regular reads on a monthly basis.	98%
Meter Reading Completion	The number of actual monthly meter reads obtained within the meter reading window as a percentage of the monthly meter reads requested.	95%
Monthly Reading Window Distribution	The number of monthly meter reads obtained in each workday within the meter reading window. The performance level is to be obtained on the first two workdays in the meter reading window.	80%[16]
Accuracy – Off-Cycle Reads	The number of correct off-cycle reads divided by the total number of off-cycle reads, captured on a monthly basis.	99%
Completion – Off-Cycle Reads	The number of actual off-cycle reads assigned to and completed on or before the required date as a percentage of off-cycle reads requested on a monthly basis.	90%
Resolution – Customer Escalations	All issues raised by customers and brought to the attention of the Contractor to be responded to within two business days and resolved within three business days or in a timeframe agreed to with the customer.	98%

7.1 Explain how FEI measures meter reading accuracy with respect to the performance levels required in the contract.

Response:

As noted in Table 3-3, meter reading accuracy is defined as the number of correct monthly meter reads divided by the total number of regular monthly reads.

For the purposes of this calculation, the number of correct monthly meter reads is determined to be the number of scheduled meters that were read.

For clarity, the calculation for determining the rate of meter reading accuracy is:

(Actual Monthly Reads + Actual Off-Cycle Reads) /

(Monthly Reads Requested + Special Reads Requested)

7.2 Confirm whether Olameter was not required to pay penalties in the 2019 contract year because it met all of the performance metrics, or whether FEI did not levy penalties for other reasons.

Response:

FEI agreed to waive any applicable penalties related to Olameter's 2019 performance in exchange for reaching a timely conclusion to the parties' 2020 contract negotiations.

7.3 Was Olameter required to pay performance penalties in 2020? If so, identify which performance standards were not met.

Response:

FEI interprets this question to be whether Olameter was required to pay penalties based on 2020 performance.

FEI and Olameter remain in discussions regarding the implications of the COVID-19 pandemic on 2020 performance standards and as such a final determination on the calculation of performance standards and any associated penalties has not yet been made.

7.4 What were the consequences to FEI or to ratepayers for Olameter failing to meet the window distribution and completion targets in 2017 and 2018?

Response:

The consequences to FEI and customers for Olameter failing to meet the meter reading window distribution and meter reading completion targets for 2017 and 2018 were that the expected number of meters were not manually read (Meter Reading Completion), and the expected number of meters were not manually read within the meter reading window (Monthly Reading Window Distribution). In both cases, customers were billed based on estimated meter reads.

Please refer to Section 3.1.2 of the Application for a review of the impacts of meter reading estimates and bill accuracy.

7.5 Confirm whether Olameter has indicated to FEI that it expects to have difficulty meeting the contract performance standards in the future.

Response:

FEI's expectation is that Olameter will meet the contracted performance standards every year. FEI has not had any discussions with Olameter (nor any indication from Olameter) regarding their ability to meet the performance standards as set out in the contract in the future.

8. Reference: Exhibit B-1, Application, pp. 25, 26, 50

Regarding meter reading complaints, FEI states:

Page 25: "Finally, customer complaints associated with manual meter reading activities average over 500 complaints per year as shown in the table below (for the five-year period 2016 through 2020)."

Page 26: "Minimal to zero complaints have been received by FBC in recent years in relation to meter reading activities."

8.1 Can FEI categorize the complaints related to meter reading? Are complaints related to the accuracy of the readings included in the 500 complaints per year total?

Response:

FEI is unable to categorize the complaints related to manual meter reading for FEI customers. They are captured generally as a meter reading complaint. FEI can confirm that there are complaints related to the accuracy of the readings in the 500 complaints referenced in the preamble.

8.2 Provide the number of complaints received by FBC per year for the years 2016 to 2020 related to meter reading, not just manual meter reading. Include in these totals any complaints related to consumption amounts.

Response:

FEI confirms that the number of complaints received by FBC per year for the years 2016 to 2020 as reported in Table 3-8 includes complaints related to both manual meter reading and automated metering.

FBC does not specifically track complaints related to consumption amounts. However, to provide context to the number of customer contacts FBC received in each of the years 2016 to 2020 considered high bill inquiries as a percentage of overall customer contacts, please refer to the table below. In FEI's experience, the majority of these inquiries are related to consumption.

Year	Total Calls	Total High Bill Calls	Percentage of Total Calls
2016	174,200	4,170	2.39%
2017	138,255	4,292	3.10%

Year	Total Calls	Total High Bill Calls	Percentage of Total Calls
2018	132,321	2,666	2.01%
2019	128,906	2,482	1.93%
2020	123,205	1,807	1.47%

In addition to meter reading complaints and customer contacts related to high bill inquiries, FBC also records meter disputes. A meter dispute typically arises from a high bill inquiry, and describes a situation where the customer is questioning the accuracy of their meter (even though FBC sees no issues from a billing perspective) and requests Measurement Canada perform a dispute investigation as provided for under Section 23 of the *Electricity and Gas Inspection Act*.

In this case, FBC arranges a meter exchange with FBC, Measurement Canada, and the customer present. FBC removes the disputed meter and it is sent for Measurement Canada testing in a sealed box. Once tested, if the meter meets the accuracy threshold, there is deemed to be nothing wrong with the meter and the customer pays the basic charge for a meter test. If the meter does not meet the accuracy threshold, it is deemed faulty; in this case, the customer does not pay the meter test basic charge, and FBC adjusts the customer's bill(s) as appropriate.

Please refer to the table below for the number of meter disputes by FBC customers in each of the years 2016 to 2020.

2016	2017	2018	2019	2020
41	52	26	38	8

As can be viewed from the data, and consistent with Table 3-8, the number of FBC customer high bill inquiries, and the number of FBC customer meter disputes, like the number of FBC complaints related to meter reading, has continued to decrease in recent years.

8.3 Explain how FBC's costs related to resolving meter disputes have changed following the introduction of AMI. Has FBC experienced increased, decreased, or approximately the same numbers of meter disputes?

Response:

FBC's costs related to resolving meter disputes have dropped following the introduction of AMI. As noted in Table 3-8, the number of meter reading related complaints has dropped significantly since the introduction of AMI. Likewise, as noted in the response to RCIA IR1 8.2, customer

inquiries related to high bill inquiries (both in terms of number of customer inquiries and number in relation to total customer inquiries) have also decreased since the introduction of AMI.

Page 50: "By deploying AMR, the meter reading function would be partially automated resulting in reduced potential for errors and less intrusive meter reading processes. In addition, there would be a reduction in GHG emissions with fewer meter reading vehicles on the road. However, there would continue to be concerns with bill accuracy and time consuming processes for customer inquiries and service requests."

8.4 Does FEI expect there to be minimal numbers of complaints related to meter reading once AMR or AMI is implemented? Or will FEI need to deploy resources to address complaints related to automatic meter reads and bill accuracy?

Response:

FEI expects there to be minimal numbers of complaints related to meter reading once automation is implemented. As noted in Table 3-8 reflecting FBC's experience, the number of complaints dropped from a range of 10 to 24 in the years 2013 to 2015 to a range of 0 to 5 complaints in the years 2016 to 2020. FEI expects its experience to be similar to that of FBC, with a significant drop in the number of complaints relative to number of meter reads (both automated and manual).

FEI may still need to deploy field resources to address complaints related to automated meter reads and bill accuracy in some circumstances. In the case of AMR, FEI would have to send a resource to collect another reading because it is a one-way form of communication. Because AMI has two-way communication abilities, FEI expects that it will be able to confirm the reads of communicating meters without needing to visit or drive by a customer's property to manually read the meter or collect the read through an AMR device. For inquiries around a non-communicating meter (radio-off or non-communicating for some other reason), FEI may still need access to a customer's property to resolve issues.

9. Reference: Exhibit B-1, Application, p. 31

Regarding manual meter reading cost and service risks, FEI states:

"The nature of meter reading makes it difficult to retain meter readers, which creates a risk to customer service."

9.1 Confirm whether the retention of meter readers is the responsibility of FEI or its meter reading contractor.

Response:

Please refer to the response to BCUC IR1 22.7. Meter readers are employed by Olameter, which provides contracted services to FEI. Olameter is therefore directly responsible for the recruitment and retention of meter readers. However, if Olameter is unable to recruit and retain sufficient numbers of meter readers, FEI and its customers are directly and negatively impacted.

10. Reference: Exhibit B-1, Application, p. 31

Regarding project timing, FEI states:

"The transition to Automation addresses cost and service risks presented by manual meter reading, including meter reader retention issues and safety risks, supply and cost of manually read meters as well as rising cost and uncertainty of third party manual meter reading providers, each of which is described further below."

10.1 Confirm whether FEI has experienced, or will experience in the upcoming extensions, meter reading cost increases that materially exceeded inflation.

Response:

Please refer to the response to BCUC IR1 22.1 where FEI notes that the future market for manual meter reading vendors is uncertain, and the outcome of commercial negotiations beyond FEI's current contract with Olameter is unknown.

In FEI's experience with Olameter, negotiated cost increases for 2021 exceeded inflation. FEI attributes this to the fact that its first contract with Olameter included no adjustments for the first three years, and then moderate pricing adjustments until the end of 2020. As a result, the negotiated per-read rate increased by over 14 percent for 2021. Starting in 2022, inflationary increases are embedded in pricing until the end of 2026. Beyond that, the cost of manual meter reading by an external vendor is unknown, as is the availability of such vendors.

10.2 Confirm whether FEI has experienced cost increases for diaphragm meters that materially exceeded inflation.

Response:

Section 3.3.2 of the Application provides the rationale for FEI's expectation that diaphragm meter costs will increase in the future. FEI notes that the late 2021 and 2022 delivery lead times for diaphragm meters have increased from the typical 12 to 16 weeks to more than 36 weeks, and quotes for meter costs in 2022 have increased by 14 percent from 2021 unit prices.

10.3 Explain why FEI is bringing the AMI project forward at the present time and not until after the anticipated cost increases materialize.

Response:

Please refer to the response to BCSEA IR1 6.1.

11. Reference: Exhibit B-1, Application, pp. 34-35

Regarding costs of contracting versus in-house meter reading, FEI states:

"While FEI has chosen to continue contracting for meter reading services from Olameter in the short term, FEI believes the viability of contracted meter reading services in the future is uncertain, in terms of both cost and availability. There are few providers available today and fewer anticipated in the future. There is a material risk to customers and the Company that the current practice of outsourcing manual meter reading will not be sustainable in the long term. That is, either the existing provider(s) may move on to other lines of business, similar to the case of the manufacturers of the diaphragm meters, or the costs for this third-party support will continue to grow and approach the cost of providing the service in-house."

11.1 By what percentage would the current contracted meter reading costs need to increase to be on par with the cost of providing in-house meter reading.

Response:

Please refer to the response to BCUC IR1 22.2.

12. Reference: Exhibit B-1, Application, p. 36

Regarding customer expectations, FEI states:

"Further, in a recent poll of FortisBC's MyVoice panel, approximately 75 percent of respondents rated having comprehensive online information about home energy use as very important."

12.1 Confirm whether the poll mentioned the rate or cost implications of providing comprehensive online information about energy use.

Response:

No, respondents were not asked to consider the rate or cost implications of providing comprehensive online information about home energy use. In the poll, FEI asked respondents to evaluate the importance of this factor and seven other FortisBC service attributes. The survey question is as follows:

> We'd like you to think about the importance of FortisBC's services. On a 10-point scale, where 1 is "Not at all important" and 10 is "Extremely important", please rate the following services according to their importance to you.
>
> - Having staff that are courteous and respectful;
> - Making it easy for you to manage your account;
> - Making it easy for you to speak directly with a FortisBC representative;
> - Having knowledgeable staff;
> - Resolving your issues in a timely manner;
> - Providing a bill that is easy to understand;
> - Providing a bill that is accurate;
> - Providing comprehensive online information about your home's energy use.

12.2 Provide the survey questions and results.

Response:

Please refer to Attachment 12.2 for the following documents:

a) Infrastructure resiliency survey – questionnaire. This document contains the survey questions in a PDF document;

b) Infrastructure resiliency survey - report. This document contains the survey results in an Excel spreadsheet format; and

c) Infrastructure resiliency survey – verbatim analysis summary. This document contains a summary of the open-ended question from the survey.

12.3 Does FEI have any statistically representative surveys of its customers that indicate the priority of its customers for additional online consumption information, or their willingness to pay extra for it? If so, please provide it.

Response:

Please refer to the response to BCUC IR1 7.1.

B. Project Alternatives

13. Reference: Exhibit B-1, Application, p. 43

Regarding project alternatives

"To address the Project need for Automation as described in Section 3, FEI compared the two Automation technologies available in the gas metering industry. Those are:

- Partial Automation of meter reading using AMR technology to enable drive-by meter reading; and
- Full Automation of meter reading using AMI technology characterized by a fixed two-way communication network."

13.1 Has FEI analyzed a strategy of migrating to AMR or AMI at a measured pace (e.g., replacing broken meters with AMR/AMI meters, or replacing clients prone to estimates with AMR/AMI meters)?

13.1.1. If yes, please provide the analysis and decision-making process that followed..

13.1.2. If not, please explain why not?

Response:

Please refer to the responses to CEC IR1 69.3 and RCIA IR1 5.1.

13.2 Has FEI analyzed a strategy of migrating AMR or AMI starting with commercial or industrial client classes, prior to mass deployment to residential consumers?

13.2.1. If yes, please provide the analysis and decision-making process that followed..

13.2.2. If not, please explain why not?

Response:

FEI did not analyze the strategy of migrating AMR or AMI, starting with commercial or industrial customers, prior to mass deployment to residential customers. Please refer to the response to CEC IR1 69.3 for an overview on why a staged technology rollout is not a viable option.

FEI's analysis of AMR and AMI is based on a 36 month technology rollout to all customer groups.

13.3 Please confirm if FEI has explored any distributed solutions to address meter reading challenges, such as:

- FEI offering incentives to customers to accurately report their meter readings themselves;
- Using machine learning or artificial intelligence to improve estimation accuracy (which would enable lowering of the number of visits and facilitate flagging of accounts that fall outside of expectations); or
- Building an application that allows people to take a photo of their meter which is automatically read into a file.

13.3.1. If not, please explain why not.

13.3.2. If yes, please provide the details of the analysis and decision-making process that followed.

Response:

FEI has not explored the three suggestions in the question as ways to improve manual meter reading and further, FEI does not believe the solutions suggested above will address the challenges detailed in Section 3 of the Application. In order to provide timely, accurate bills to customers, and as set out in the approved General Terms and Conditions within the FEI Tariff,[1] meter reading processes are provided by FEI. In two of the solutions suggested above, the responsibility for the provision of timely and accurate meter reading would be transferred to the customer. The other solution suggests that a meter may be estimated continuously. With respect to the concept of machine learning for estimation accuracy, please refer to the response to BCOAPO IR1 2.1 for more detail on how estimates are performed today, which includes using an algorithm to improve estimation accuracy.

With any of the suggestions noted above, manual meter reading would continue to be required and as such, the four drivers identified in Section 3 of the Application would not be addressed.

13.4 Please confirm how program costs break down between different rate classes (e.g., commercial, industrial, residential, etc.).

[1] Please refer to Sections 11.1, 11.2 and 16.2 of FEI's General Terms and Conditions as most recently approved by Order G-135-18 (Section 11) and Order G-217-20 (Section 16).

Response:

The estimated rate impact of the AMI Project will apply equally to all rate schedules. While FEI does not expect that the AMI Project will create an imbalance in revenue to cost ratios, following implementation of the AMI Project, the replacement of meters, new network infrastructure and other related costs and savings will be included in FEI's next cost of service allocation (COSA) study.

13.5 Is FEI aware of any other utilities that have employed technology like the examples above to address meter readings? Please provide details.

Response:

Please refer to the Util-Assist Report attached as Appendix A to the Application for an overview of the gas utility projects in Canada and the United States that have adopted some form of automation.

Please also refer to the CGA Insights Matter Survey attached as Appendix C to the Application. In Section 3.2.2 of the Application, FEI notes that the results of the CGA Insights Matter Survey indicated that approximately 2,000,000 meters out of an estimated 7,000,000 total gas meters in Canada have already been migrated to some form of automation. The remaining 5,000,000 meters that are not automated are attributable to only three utilities, including FEI.

14. Reference: Exhibit B-1, Application, pp. 45, 54

Regarding service life of AMR and AMI meters:

Page 45: "Finally, this approach to meter reading is assumed to be in place for over 20 years, which is the expected service life of AMR technology based largely upon the capacity of the battery within the communication module attached to each meter."

Page 54: "Finally, similar to AMR, the AMI technology is expected to offer a 20-year service life limited largely by the capacity of the battery."

14.1 Confirm whether the meter vendor fully warrants the battery for 20 years. If not confirmed, describe the warranty provided and the compensation that FEI would obtain for batteries that do not last 20 years.

Response:

Please refer to the response to BCUC IR1 26.2.1.

14.2 Confirm whether meter and module batteries are able to be exchanged in the field.

Response:

Please refer to the response to BCSEA IR1 33.1.

14.3 Confirm whether the financial analysis accounts for meters installed in 2022 through 2025 which are expected to be replaced prior to the end of the financial evaluation period in 2046. If not confirmed, explain why not.

Response:

Please refer to the response to BCUC IR1 32.1.

14.4 Recalculate and refile the financial analyses, including Tables 4-2, 4 3, and 4-5 and Appendices G-1 through G-5, assuming service lives of 15 years for both AMR and AMI meters and modules.

Response:

Changing from a 20-year useful life to a 15-year service life would result in the depreciation rate changing from 5 percent[2] to 6.67 percent[3] for the AMI and AMR assets. As explained in the response to BCUC IR1 32.1, the financial analysis only includes costs related to one meter fleet lifecycle and as a result changing to a 15-year from 20-year useful life only changes the depreciation rate for the AMI and AMR assets and results in no change to the cost input assumptions. As there are no underlying changes in the inputs, there would be no change to Tables 4-2 or Table 4-3 (Confidential Appendices G-1, G-2). There would also be no change in the Baseline model (Confidential Appendix G-4).

The change would result in a change in Table 4-5, Confidential Appendix G-3, and Confidential Appendix G-5. These updates are provided as Attachment 14.4A, Confidential Attachment 14.4B, and Confidential Attachment 14.C respectively.

FEI is filing Attachments 14.4B and 14.4C on a confidential basis pursuant to Section 18 of the BCUC's Rules of Practice and Procedure regarding confidential documents, as set out in Order G-15-19, to preserve commercially sensitive information which, if disclosed, could prejudice or negatively impact the bidding process or FEI's ability to negotiate.

Overall, changing the AMI and AMR useful life assumption from 20 years to 15 years would result in the AMI incremental levelized delivery rate impact increasing from 0.125 percent to 0.135 percent. The AMR incremental levelized delivery rate impact would decrease from -0.286 percent to -0.294 percent.

[2] 1/20 years = 5 percent.
[3] 1/15 years = 6.67 percent.

15. Reference: Exhibit B-1, Application, p. 47, Appendix C p. 14

Regarding AMR challenges and methods, FEI states:

Page 47: "However, as AMR is not a fully automated solution, there would continue to be challenges related to bill accuracy and customer inconvenience. Examples of these challenges include:

- Vehicle access issues that impact meter reading would still exist, particularly in relation to inclement weather or natural disasters such as floods or wildfires;
- The requirement for meter readers to collect the reads through extensive operation of a vehicle would result in ongoing risks with respect to driving-related incidents, increasing the potential for incomplete meter reading routes and also still involving long-term challenges with recruitment and retention;
- The inability to complete "on-demand" reads would mean off-cycle manual reads would continue to be required for service disconnections, reconnections, vacant premises, service interruptions or other reasons that necessitate a meter read; and
- The resolution of inquiries raised by customers or FEI would continue to require time and expense as special visits would need to continue outside of the regular meter reading schedule."

15.1 Explain why FEI expects the implementation of AMR to have long-term challenges with recruitment and retention of meter readers.

Response:

As described in Section 4.2 of the Application, with the implementation of an AMR solution, meter readers are still required to gather the meter reads.

While FEI notes in Section 4.2.2 that recruitment and retention of meter readers would be slightly improved because of the safety enhancement related to driving between meters and not walking, recruitment and retention would still be a challenge in the long-term.

The current challenges associated with recruitment and retention of meter readers who read meters manually is described in Section 3.3.1 of the Application. Challenges such as inclement weather remain a hazard, as does the possibility of dangerous driving conditions.

15.2 Explain how the implementation of AMI would obviate the need to visit a customer's property to resolve any complaints or inquiries.

Response:

FEI interprets this question to be limited to customer complaints or inquiries regarding meter reads perceived to be inaccurate.

Please refer to the response to RCIA IR1 8.4.

Regarding its survey, Insight Matters states:

Appendix C, Page 14: "[ATCO] installed AMR technology in 2011. Until 2015, we conducted drive-by readings but switched to aerial in 2015. We use a vendor called Clear Grid to conduct our aerial readings. Aerial is much more efficient in terms of cost savings for sure and safety, which is a big advantage for us as injuries happen daily with drive-by or manual reads. With drive-by, you have to employ quite a few people who drive vehicles that need to be maintained and insured. A plane picks up more readers in a day."

15.3 Confirm whether FEI considered AMR with aerial collection of reads, similar to ATCO, or through the use of drone technology.

15.3.1. If confirmed, discuss the pros and cons of such an approach and which objectives or needs of the AMI CPCN could be met.

Response:

FEI did not consider AMR with aerial collection of reads or through the use of drone technology.

Please refer to the response to BCUC IR1 11.2 where FEI outlines why it believes aerial collection is not a viable option.

16. Reference: Exhibit B-1, Application, p. 48

Regarding AMR and diaphragm meter costs, FEI states:

"Additionally, the deployment of AMR technology would mean the risk associated with procuring diaphragm meters at a reasonable price would continue to exist as the number of meter manufacturers is decreasing from three to two, as discussed in Section 3.3.2. This risk would be compounded as gas meter manufacturers are expected to continue transitioning toward ultrasonic meters."

16.1 Provide the current prices for AMR-ready diaphragm meters and AMR-ready ultrasonic meters, based on similar order quantities.

Response:

Current (2021) Sensus manufacturer's suggested retail prices (MSRP) are as follows:

- Residential Gas Meter (R275) MSRP is 106 USD;
- Residential SmartPoint MSRP is 71 USD; and
- Sonix IQ with FlexNet Radio (no valve) is 230 USD.

An AMR-ready diaphragm meter would be 177 USD compared to 230 USD for an ultrasonic meter with similar capabilities. The MSRP prices reflect the purchase volume for a single unit of each technology. As such, these prices do not necessarily reflect FEI's volume pricing.

17. Reference: Exhibit B-1, Application, pp. 52, 68

Regarding capital cost assumptions for regulators and bypasses, FEI states:

Page 52: "Under the AMR alternative, FEI's existing meter exchange, bypass valve, and regulator replacement programs would continue to be completed as part of FEI's existing sustainment capital program and have been included in capital spending to provide the full costs over the analysis period."

Page 102: "The AMI Project accelerates the meter exchange process and, as a result, also accelerates the timing of the planned installation of bypass valves to the Deployment phase of this Project."

17.1 Explain why the numbers of regulators and bypasses shown in Schedule 1 of Appendix G-1 do not match the numbers of regulator and bypass installations shown in Schedule 2, nor the numbers of extra meter installations (which presumably account for the remaining bypass installations).

Response:

The number of regulators and bypasses shown in Schedule 1 of Appendix G-1 is the total number of regulators and bypass valves that will be installed during the period of deployment and post-deployment.

The number of regulators and bypass valve installations shown in Schedule 2 is the number of installations projected to be completed by FEI's internal workforce. The remaining balance of regulator and bypass installations will be completed during the meter exchanges listed in Schedule 2.1. An incremental workforce will complete the activities listed in Schedule 2.1.

17.2 Explain why the AMI cost for bypass installations (Appendix G-1 Schedule 2.2 cell Z28) is substantially lower than the Baseline cost for bypass installations (Appendix G-2 Schedule 2 cell Z40). Confirm whether the inclusion of the costs of bypasses and regulators in both the AMI and Baseline alternatives mutes the perceived differences in delivery rate impacts between these alternatives.

Response:

The value of $44.08 million shown in Appendix G-1 AMI Cost Inputs (Schedule 2.2 cell Z28), is the total forecast cost to install 1,034,672 bypass valves in the AMI scenario through the analysis period. The Appendix G-2 Baseline Cost Inputs (Schedule 2 cell Z40) value of $74.96 million is the forecast cost to install 1,034,672 bypass valves in the Baseline scenario through the analysis

period. Therefore, both scenarios have the same number of bypass valves installed; the difference in the amounts is due to cost efficiencies from the AMI Project.

The AMI scenario has the work for both the meter and bypass installation priced together; resulting in significant cost savings overall, of which 12 percent of the total cost has been allocated to the bypass valves. This savings is properly considered in the comparison between the two scenarios.

18. Reference: Exhibit B-1, Application, pp. 55, 60

Regarding resiliency benefit for larger meters, FEI states:

Page 55: "FEI investigated the AMI alternative that replaces existing residential and commercial diaphragm meters with advanced meters and retrofits communication modules within the remaining meters including larger commercial and industrial meters."

Page 60: "In the event of an extended gas supply emergency that requires a large section of the system to be shut down, AMI would enable the Company to execute a controlled shutdown. A controlled shutdown would provide FEI with the ability to maintain pressure within the section of the system that has been shut down throughout the duration of the gas supply emergency. However, a controlled shutdown would also allow the Company to define which meters are required to be temporarily interrupted so critical services can continue operating in the section of the system that has been shut down."

18.1 Confirm whether retrofitting existing meters with AMI modules means these installations do not have the remote shutoff functionality of the other AMI meters

18.1.1. If confirmed, explain whether retrofitting larger commercial and industrial meters with AMI modules reduces or eliminates the resiliency benefit of being able to execute a controlled shutdown and isolate the system.

Response:

FEI confirms that existing meters retrofitted with AMI modules will not have remote shutoff functionality.

AMI provides FEI with a technology platform that will allow the economic installation of additional mid-point pressure and flow sensors, and tail-end pressure sensors. With this technology, FEI will be able to monitor, in near-real time, the performance of all stations throughout FEI's system. To support monitoring and forecasting the total system demand, AMI will provide FEI with the ability to monitor, in near real-time, all customer consumption. This means all meters, no matter the size, will be connected to the AMI network. As customer consumption information is collected throughout each hour, FEI will aggregate the total system demand and will be able to determine the granular demand in specific parts of the system. This near-real time aggregated total demand on the system of interest, and supply performance, will be used by FEI to determine which parts of FEI's system are vulnerable to a pressure collapse. With this knowledge, FEI will be able to focus its response on minimizing the possibility of a pressure collapse. AMI also provides FEI with the ability to remotely disconnect residential and small commercial customers, in order to decrease the possibility of a pressure collapse. As confirmed, large commercial and industrial customer meters will not be equipped with remote shutoff valves, and so FEI will continue to rely on manual processes to curtail these customers. However, as stated above, FEI will have visibility of the current demand by each of the large commercial and industrial customers allowing the Company to prioritize the meters that will require disconnection.

19. Reference: Exhibit B-1, Application, pp. 37, 57

Regarding customer portal and detailed energy use, FEI states:

Page 57: "AMI would help inform customers and FEI about energy usage and patterns."

Page 37: "Figure 3-5 provides the granularity of information available to FBC customers through the customer portal (which is similar to the information available to customers of BC Hydro)."

19.1 Provide the percentage of FBC's residential customers that accessed the granular consumption data (specifically, not just monthly consumption but the detailed information shown in Figure 3-5) at least once in the past year.

Response:

FEI is unable to provide the percentage of FBC's residential customers that accessed the consumption data provided in Figure 3-5 at least once in the past year. This is because Google Analytics is used for this reporting and it identifies the number of times that a page was accessed, but not the number of distinct users of the page.

Thus, up to 37,743 FBC customers or approximately 26 percent of total FBC customers potentially viewed the interval data graphs in 2020.[4]

[4] As calculated by 37,743 divided by 142,321 total average customers (Actual average customers in 2020 as reported in the FBC 2020 Annual Report to the BCUC).

20. Reference: Exhibit B-1, Application, p. 66

Regarding vendor fees, FEI states:

"This includes SaaS55 fees, software licensing, support, site leases for base station sites and bandwidth costs to connect field end points to the data centres."

20.1 Confirm whether the SaaS fees and software licensing fees from Sensus are specified in the contract for the full period until 2046. If not confirmed, explain how FEI is protected from price increases considering it will be captive to Sensus and its technology.

Response:

FEI has secured pricing for SaaS fees and software licensing fees from the vendor for the full analysis period until 2046.

20.2 Confirm whether FEI has secured pricing for AMI meters and modules through to 2046. If not confirmed, explain how FEI is protected from price increases considering it will be captive to Sensus and its technology.

Response:

FEI has secured pricing for AMI meters and modules from the vendor for the full analysis period until 2046.

21. Reference: Exhibit B-1, Application, pp. 61, 92

Regarding network security, FEI states:

Page 92: "The security of customer information is a high priority to FEI. Given the nature of the AMI Solution, security needs to be considered for several components. These include the meters, network, Base Stations, HES, Sensus applications and FEI enterprise systems. Since many components are installed at residential or business properties and on Company-owned infrastructure, it is critical that the electronic security of the components be comprehensive."

Page 61: "The remote shut-off capabilities of AMI would provide FEI with the ability to enhance safety for customers, the public and employees when responding to emergencies such as gas leaks or structure fires."

21.1 Explain whether FEI and its cybersecurity consultant evaluated the Sensus network for its resistance to a cyber attack that could shut down and lock out the shutdown valves in individual meters.

Response:

FEI and its cybersecurity consultant evaluated the Sensus network for resistance to a cyber attack that could shutdown and lockout valves in AMI meters. The configuration and controls to mitigate against this type of attack have been built into the architecture of the system.

22. Reference: Exhibit B-1 Application, p. 61; Exhibit A-4, BCUC IR1, IR 3.2

Detection of Gas Leaks

Regarding detection of gas leaks, FEI states:

Page 61: "AMI would also enable FEI to detect smaller leaks and unexpected consumption downstream of the gas meter in the customer's house gas lines and below the flow rate of the AMI automatic shut off threshold. In these situations, hourly, high resolution data consumption from the advanced meters could be used to generate timely exception reports that alert FEI to unexpected flows over a given threshold."

BCUC asks:

IR 3.2: "Please describe how FEI would determine the gas flow rate threshold to generate an exception report."

22.1 Explain whether FEI's AMI system would incorporate other inputs other than flow rate in order to discriminate leaks from normal usage.

Response:

FEI will determine if inputs other than flow rate will be incorporated to discriminate leaks from normal usage during the Define phase of Project implementation.

22.2 Confirm whether FEI maintains end use appliance data for its customers that would inform consumption characteristics.

Response:

FEI does not maintain end-use appliance data for its customers that would inform consumption characteristics.

C. Project Description

23. Reference: Exhibit B-1, Application, p. 94

Regarding opt-out charges, FEI states:

Page 94: "Where a customer is refusing the installation of the advanced meter due to its remote communicating capabilities, the customer will have the option to have an advanced meter installed with the internal communicating radio turned off for a fee…Customers choosing to opt out will be required to pay for their meters to be manually read."

23.1 Confirm whether the installation fee for a radio-off AMI meter is distinct from any ongoing charges for manual meter reads.

Response:

Confirmed. FEI anticipates there will be separate fees for the installation of a radio-off AMI meter and the ongoing monthly manual meter reads.

23.2 Explain whether FEI could maintain the existing diaphragm meter if a customer refused an AMI meter, and whether any cost savings would be realized int hat scenario.

Response:

FEI will not be maintaining the existing diaphragm meter for customers refusing an advanced meter. Some of the reasons for using advanced meters if the customer requests the communications technology be turned off include:

- Hourly meter readings are still obtained (but the data is available to the customer and FEI less frequently);
- Avoidance of additional supply issues and expense related to sourcing small volumes of existing meters;
- Fewer meter types would need to be inventoried and tracked throughout the service territory;
- Avoid additional activity related to maintaining a separate meter exchange process that would need to remain for the existing meters;
- Enhanced manual meter reading efficiency by avoiding the requirement to operate using two different technologies to manually collect reads throughout the service territory; and

- The cost of switching premises between "radio-on" and "radio-off" is minimized since the AMI meter does not have to be exchanged.

23.3 For customers who refuse AMI meters, explain whether FEI will allow them to submit their own meter reads, with FEI minimizing the manual meter reading charges by instead performing one or two meter reads each year.

Response:

FEI clarifies that, as stated in the preamble, customers will not have the option of refusing AMI meters; rather, they will have the option to have an advanced meter installed with the internal communicating radio turned off (referred to as radio-off) for a fee.

FEI will not allow customers who choose to have a radio-off meter to submit their own meter reads in lieu of paying the monthly meter reading fee.

As noted in the response to RCIA IR1 13.3, in order to provide timely, accurate bills to customers, and as set out in the approved General Terms and Conditions within the FEI Tariff[5], meter reading processes are provided by FEI. In order to provide timely, accurate bills to customers, FEI is responsible for ensuring that its meter reading processes are consistent, reliable, and available to all customers. FEI does not believe the provision of timely and accurate meter reading should be transferred to the customer.

In addition, a register reading for billing is only one part of the data to be manually downloaded. Overall, a customer reading is not an equal substitute for advanced meter reading data collection. The advanced meter collects daily register readings as well as hourly interval data, both of which are stored and collected during the manual meter reading visit. This interval data is vital for gas load balancing and improves the accuracy of load forecasting, as well as for determining if, where, and how much energy theft may be occurring in an area.

[5] Please refer to Sections 11.1, 11.2 and 16.2 of FEI's General Terms and Conditions as most recently approved by Order G-135-18 (Section 11) and Order G-217-20 (Section 16).

D. Project Costs

24. Reference: Exhibit B-1, Application, pp. 101, 106, 107

Regarding network and meter problems and obsolescence, FEI states:

Page 101: "The Post-deployment phase for Baseline includes the continuation of the Baseline existing meter exchange program, and AMI includes an annual allowance of 0.50 percent of meter failures that would require replacement based on historical failure data provided by the manufacturer."

Page 106: "• AMI network O&M: Consists of the managed network services, radio licenses, backhaul bandwidth, lease costs, and network security. In 2026, the year of full Deployment, the annual network O&M is estimated to cost $4.3 million. This amount has been escalated by inflation94 each year in the Post-deployment phase. FEI notes that $1.5 million of the cost relating to the managed service is sourced in USD and is subject to foreign exchange.95

• AMI software O&M: Consists of hosting fees, SaaS fees, license cost, and internal software updates. In 2026, the year of full Deployment, the annual software O&M is estimated to cost $1.9 million. This amount has been escalated by inflation96 each year in the Post-deployment phase."

Page 107: "Based on FBC's experience with electric AMI meters, FEI has included the conservative assumption that 1.5 percent of the AMI meters will have network connectivity issues and will require a manual read."

RCIA notes that the Province of Ontario experienced a number of problems with electricity AMI related to lack of communication performance and fires, as well as with the roll-out of the program including lack of a business case and ongoing monitoring of the rollout of the meters, as indicated at the following sources:

https://www.thestar.com/news/queenspark/2015/01/22/thousands-of-smart-meters-in-ontario-to-be-removed-over-safety-worries.html

https://nationalpost.com/news/canada/astonishing-hydro-one-pulling-plug-on-36000-rural-smart-meters-after-years-of-complaints

https://www.auditor.on.ca/en/content/annualreports/arreports/en14/311en14.pdf

https://www.auditor.on.ca/en/content/annualreports/arreports/en16/v2_111en16.pdf

24.1 Explain how FEI and its ratepayers are protected from performance problems with the AMI hardware and software, including problems due to:

- Premature failure of the AMI meters and modules prior to the end of their expected lives;

- Inability of the meters and modules to communicate with base stations, or base stations to communicate with head end units, due to hilly and mountainous terrain;
- Safety risks from the AMI meters resulting from fires or leaks; and
- Obsolescence of the base station or head end unit hardware or software, including due to changes in the Software as a Service vendor's software or communication protocols.

Response:

FEI has negotiated warranties, performance guarantees, and other measures with its AMI vendor and these have been included in the contract between FEI and the vendor. These clauses include mitigation for all potential problems referenced in the question, among many others.

In addition, the gas advanced meters are extensively tested by the manufacturer and by FEI and must be certified under CSA 12.22 no. 213 and ANSI/ISA 12.12.01 for intrinsic safety. This means the meters are designed and tested to ensure they will not ignite a fire, even in hazardous areas where flammable gases are present.

25. Reference: Exhibit B-1, Application, p. 108

Regarding continued manual reading assumptions, FEI states:

Page 108: "As described in the Deployment phase above, FEI has assumed 1.13 percent106 of AMI meters will need to incur a manual reading charge."

Footnote 106: "1.50 percent of meters less 25 percent that will be read by field operation crews = 1.13 percent."

25.1 Provide justification for the assumption that 25 percent of manual readings of AMI meters will performed by FEI field operation crews.

Response:

Please refer to the response to BCUC IR1 23.2.

25.2 Provide a version of Table 4-3 assuming that manual meter reads will be required for 5% of the AMI meters due to network or communication problems.

Response:

FEI has provided the following table as requested and has included a column for the totals before and a column for the totals after the change to 5 percent of the AMI meters needing manual reading. However, FEI has no evidence to support such a higher percentage.

Table 4-3: AMI Alternative: NPV of Capital and Operating Costs 5% Manual Reads as Compared to 1.5% Manual Reads ($ millions)

Financial Summary	1.5% Manual Reads	5% Manual Reads
Capital Costs:		
Meter Capital	$ 481.2	$ 481.2
Project Management	$ 35.2	$ 35.2
Software Capital	$ 9.1	$ 9.1
Network Capital	$ 17.1	$ 17.1
Non-Meter Capital	$ 3.6	$ 3.6
AFUDC	$ 12.7	$ 12.7
Total Capital	**$ 558.9**	**$ 558.9**
O&M Costs:		
Meter Reading Costs	$ 78.3	$ 116.8
Operations, Contact Centre and Meter Shop O&M	$ 12.8	$ 12.8
New O&M	$ 97.9	$ 97.9
Total O&M (incl. Capitalized Overhead)	$ 189.0	$ 227.5
Baseline Capital[1]	$ 372.8	$ 372.8
Baseline O&M[2]	$ 323.5	$ 323.5
AMI Incremental Capital[3]	**$ 186.1**	**$ 186.1**
AMI Incremental O&M Savings[4]	**$ (134.5)**	**$ (96.0)**

In the 5 percent scenario, the meter reading costs increases from $78.3 million to $116.8 million.

26. Reference: Exhibit B-1, Application, p.109

Regarding customer service O&M savings, FEI states:

Page 109: "The AMI Project will enable savings in FEI's customer service function. Customer service identified savings will come from the following reduced activities: billing investigation and exceptions, meter reading coordinator workload, improvements in vacant premises processing, and meter switching identification and validation."

26.1 Provide additional justification for the proposed Customer Service O&M savings, and explain why these savings would not be offset by increased customer service demands resulting from the implementation of a brand new metering system for which customers may not have confidence.

Response:

As noted in the response to CEC IR1 35.1, all of the benefits that can be numerically quantified or justified have been detailed in Section 4.3.3 of the Application and included in the financial model (as detailed in Sections 6.2 and 6.3).

FEI does not expect that overall demands of customer service will increase because of the implementation of an automated metering system. This is because benefits to customers and customer service operations are expected to result in greater savings than potential incremental short term customer inquiries associated with the Project.

Further, FEI's customers who are also electricity users will most likely have experience with AMI through their FBC or BC Hydro electric meter and thus, while this is a change for their gas service, it is a familiar approach to metering for most customers. To the extent that FEI does receive customer inquiries about the new metering system, FEI expects these inquiries will occur in the short term, in the billing period(s) immediately following deployment of the customer's new meter.

27. Reference: Exhibit B-1, Application, pp. 109, 110

Regarding O&M savings, FEI states:

Page 109: "FEI's Operations team conducted a review of current activities and identified several activities that would be reduced with the functionality introduced within the AMI Project. Reduced activities include meter trouble calls, meter reads, meter identifications, disconnects, unlocks, cathodic protection data gathering, and odour measurement."

At page 110: "Meter shop O&M is directly impacted by the reduction in volume of meter exchanges and specifically, the reduction in the meter sampling recall program. The AMI Project will halt the meter sampling program in the years 2022-2026 and then resume in 2027 but with a significant decrease in volume of meters included in the sample as a result of the entire meter fleet being replaced with a young vintage. FEI estimates incremental savings in meter shop O&M through Deployment of $1.3 million111 and a further $6.5 million112 in the Post-deployment phase. All savings result from the reduced volume of meters included in the annual meter sampling program."

27.1 Explain how FEI intends to realize the savings from the reduction in meter trouble calls, meter reads, meter identifications, disconnects, unlocks, cathodic protection data gathering, and odour measurement – will FEI re-deploy operations employees, or will operations employees be laid off or terminated?

27.1.1. If these employees are re-deployed within FEI, will ratepayers enjoy any cost reduction?

Response:

The reduction in the referenced activities will result in employee redeployment. The redeployment of these employees will be to activities that are currently performed by contractors.

Any savings from the reduction in these activities have been identified in the AMI financial model and the redeployment of employees is considered cost neutral; to the extent there are any further cost reductions, no matter the cause, they will be reflected in future revenue requirements.

27.2 Explain how FEI intends to realize the savings from the reduction in meter shop work. Will FEI re-deploy meter shop employees, or will meter shop employees be laid off or terminated?

27.2.1. If these employees are re-deployed within FEI, will ratepayers enjoy any cost reduction?

Response:

Meter shop employees associated with compliance sampling activities will be re-deployed to other Measurement-related activities. The overall impact of the meter shop savings has been accounted for in the Application.

27.3 Confirm whether FEI proposes to unlock or reconnect services remotely using the functionality in the AMI meters.

Response:

Please refer to the responses to BCUC Confidential IR1 1.11 and 1.13.

28. Reference: Exhibit B-1, Application, p. 117

Regarding delivery rate impacts, FEI states:

Table 6-11:

Page 117: "The estimated incremental delivery rate impact expected over the 26-year analysis period for the AMI Project is 0.125 percent when compared to 2021 rates. In 2027, the year after full AMI deployment, the cumulative delivery rate impact would be at its highest level of 4.79 percent, resulting in a cumulative annual average bill increase of $21 dollars for a residential customer consuming 90 GJs per year."

28.1 Provide the annual delivery rate increases resulting from the AMI project for each year from 2021 through 2046, and compare with the annual delivery rate increases under the Baseline scenario and the "unlikely" scenario where there is a continuation of the current embedded costs of meter reading.

Response:

FEI provides the following table summarizing the estimated annual delivery rate increases (as compared to 2021 delivery rates) resulting for the Baseline and Baseline Unlikely scenarios when compared to the AMI Project for 2021 to 2046. FEI notes there are no delivery rate impacts due to AMI in 2021. For the purposes of the financial analysis, 2022 assumes no meter exchanges will take place, as FEI plans to halt meter exchange activity leading up to AMI deployment. However, halting of meter exchange activity is dependent on AMI Project approval and its timing, and FEI will evaluate halting meter exchange activity when a decision on the Project is received.

Scenario	2022	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Baseline[1]	0.00%	0.61%	0.04%	0.09%	0.12%	0.13%	0.20%	0.44%	0.18%	0.19%	0.19%	0.20%	0.21%
AMI Compared to Baseline[2]	0.00%	-0.55%	0.72%	1.33%	2.04%	1.21%	0.04%	-0.63%	-1.03%	-1.36%	-1.05%	-0.55%	-0.42%
Baseline Unlikely[3]	0.00%	0.60%	0.04%	0.08%	0.12%	0.13%	0.15%	0.22%	0.16%	0.17%	0.18%	0.19%	0.20%
AMI Compared to Baseline Unlikely[4]	0.00%	-0.54%	0.72%	1.33%	2.05%	1.21%	0.09%	-0.41%	-1.02%	-1.34%	-1.04%	-0.54%	-0.42%

Scenario	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Baseline[1]	0.22%	0.18%	0.00%	0.01%	-0.05%	-0.05%	-0.07%	-0.27%	-0.36%	-0.34%	-0.33%	-0.35%	-0.32%
AMI Compared to Baseline[2]	-0.65%	-0.76%	-0.56%	-0.32%	-0.17%	-0.23%	-0.37%	-0.35%	-0.45%	-0.16%	-0.49%	-0.93%	-0.93%
Baseline Unlikely[3]	0.21%	0.16%	0.03%	0.00%	-0.03%	-0.05%	-0.03%	-0.25%	-0.36%	-0.34%	-0.34%	-0.34%	-0.33%
AMI Compared to Baseline Unlikely[4]	-0.65%	-0.75%	-0.59%	-0.31%	-0.19%	-0.24%	-0.40%	-0.37%	-0.45%	-0.15%	-0.48%	-0.94%	-0.92%

[1] Confidential Appendix G-4, Schedule 10, Line 28, current year less prior year

[2] Confidential Appendix G-5, Schedule 10, Line 28, current year less prior year

[3] Supplemental information filed June 21, 2021, Attachment 1, Table 6-12 Baseline Model with unlikely case CONFIDENTIAL, Schedule 10, Line 28, current year less prior year.

[4] Confidential Appendix G-3, Schedule 10, Line 28 less supplemental information filed June 21, 2021, Attachment 1, Table 6-12 Baseline Model with unlikely case CONFIDENTIAL, Schedule 10, Line 28, Then current year less prior year.

28.2 Confirm whether the annual delivery rate increases for each scenario can be seen in the Levelized Rate Calculation tab of Appendices G 3 and G 4 and the spreadsheet titled "Table 6-12-Baseline Model with unlikely case CONFIDENTIAL" at line 28. If not, explain how this line of the spreadsheets should be interpreted.

Response:

FEI confirms that Line 28 on the "Levelized Rate Calculation: tab in Confidential Appendices G-3, G-4, and Confidential Table 6-12 Baseline Model with unlikely case represents the annual delivery rate increase as compared to 2021 rates. These delivery rate increases are based on the full cost assumptions included in each scenario and do not reflect an incremental view. The incremental delivery rate increase is the difference between the AMI annual percentage increase (Confidential Appendix G-3, Levelized Rate Calculation tab, Line 28) and the Baseline annual percentage increase for the same year (Confidential Appendix G-4, Levelized Rate Calculation tab, Line 28). The Confidential Table 6-12 Baseline Model with unlikely case showed an alternative view for the cost estimate of continuing current outsourced meter reading.

29. Reference: Exhibit B-1, Application, pg. 97

Page 97: "FEI approached the financial analysis for this Project by comparing two full cost scenarios, with the difference between the scenarios being the incremental financial impact of the Project."

29.1 Please confirm why FEI has not conducted a case study on the AMR case (e.g., vs. just using the AMI and Baseline cases).

Response:

FEI notes the purpose of Section 6 of the Application is to present the detailed project costs and financial analysis of the selected alternative, which is AMI.

The AMR scenario was evaluated as an alternative in Section 4 of the Application. The incremental costs of the AMR scenario were evaluated against the Baseline scenario with the financial analysis summarized in Table 4-2 of the Application. Tables 4-4 and 4-5 provided a comparison between the AMI and the AMR scenarios.

30. Reference: Exhibit B-1, Application, p. 98

Table 6-1:

Table 6-1: Capital and Operating Cost Summary

Line	Project Costs As-Spent in $Millions Item	Pre Deployment 2021 - 2022 (1)	Deployment 2023 - 2026 (2)	Subtotal (1+2) 2021 - 2026 (3)	Post Deployment 2027 - 2046 (4)	Total (3+4) 2021 - 2046 (5)	Reference [1] (6)
	AMI						
1	Capital[2]	48.6	589.8	638.4	119.3	757.7	Schedule 6,Line 46 + Schedule 9,Line 31+Line 39+Line 41+Line 43
2	O&M	34.7	72.8	107.6	234.3	341.9	Schedule 2,Line 13
	BASELINE						
3	Capital	46.8	115.6	162.4	474.3	636.7	Schedule 6,Line 28
4	O&M	35.1	77.2	112.3	548.2	660.5	Schedule 6,Line 12
	INCREMENTAL[3]						
5	Capital	1.8	474.2	476.0	(355.0)	121.0	Schedule 6,Line 39 + Schedule 9,Line 28+Line 36+Line 40
6	O&M	(0.4)	(4.3)	(4.7)	(313.9)	(318.6)	Schedule 2,Line 14

Notes:

[1] *Appendix G-3 contains the AMI financial schedules.*

Appendix G-4 contains the Baseline financial schedules.

Appendix G-5 contains the Incremental financial schedules.

[2] *Includes AMI Application and Development deferral additions and AFUDC.*

[3] *Incremental cost AMI Solution less Baseline.*

30.1 Regarding Table 6-1, please provide a table showing the number of FEI Full Time Equivalent ("FTE") employees that are associated with the AMI and Baseline cases for the three (3) time periods.

Response:

Please refer to the response to CEC IR1 85.1 which notes that FEI will determine internal job impacts during the Define phase of Project implementation.

The Baseline case is the status quo in the absence of an AMI Project. In the ordinary course, FTE counts for the entire Company change regularly. For this reason, FEI provides the incremental internal FTE estimates for the AMI Project compared to the Baseline case. For the purposes of financial modeling, FEI estimated the following to be attributable to the AMI Project:

- Average of 4 additional FTE during pre-deployment; and
- Average of 34 additional FTE during the deployment; and
- Average of 2 additional FTE during post-deployment.

Please note that FTEs are internal employees and do not include contracted resources.

31. Reference: Exhibit B-1, Application, pp. 99, 111

Page 99, Table 6-2:

Table 6-2: Capital Cost Summary

Line	Project Capital Costs As-Spent in $Millions Item	Pre Deployment 2021 - 2022 (1)	Deployment 2023 - 2026 (2)	Subtotal (1+2) 2021 - 2026 (3)	Post Deployment 2027 - 2046 (4)	Total (3+4) 2021 - 2046 (5)	Reference [1] (6)
1	Meter Capital	28.4	507.9	536.3	111.7	648.0	Schedule 6, Lines 3 through 9
2	AMI Project Management	15.6	38.0	53.7	-	53.7	Schedule 6, Lines 13 through 17 + Schedule 9 Lines 31+39+41
3	AMI Network & Software	3.6	24.4	28.0	6.4	34.4	Schedule 6, Lines 10 through 11
4	Non-Meter Capital	0.1	3.5	3.6	1.2	4.8	Schedule 6, Line 12
5	AFUDC	0.9	15.9	16.8	-	16.8	Schedule 6, Line 36 + Schedule 9 Line 43
6	**AMI Solution**	**48.6**	**589.8**	**638.4**	**119.3**	**757.7**	Sum of Lines 1 through 5
7	Meter Capital	46.6	112.5	159.1	456.0	615.1	Schedule 6, Lines 1 through 5
8	Non-Meter Capital	0.2	3.1	3.3	3.2	6.6	Schedule 6, Lines 6
9	Meter Reading Capital	-	-	-	15.1	15.1	Schedule 6, Lines 7 through 9
10	**Baseline**	**46.8**	**115.6**	**162.4**	**474.3**	**636.7**	Sum of Lines 7 through 9
11	Meter Capital	(18.2)	395.4	377.3	(344.4)	32.9	Line 1 less Line 7
12	AMI Project Management	15.6	38.0	53.7	-	53.7	Line 2
13	AMI Network & Software	3.6	24.4	28.0	6.4	34.4	Line 3
14	Non-Meter Capital	(0.1)	0.4	0.2	(2.0)	(1.8)	Line 4 less Line 8
15	AFUDC	0.9	15.9	16.8	-	16.8	Line 5
16	Meter Reading Capital	-	-	-	(15.1)	(15.1)	Line 9
17	**Project Costs [2]**	**1.8**	**474.2**	**476.0**	**(355.0)**	**121.0**	Sum of Lines 11 through 16 [3]

Notes:

[1] *Appendix G-3 contains the AMI financial schedules*
Appendix G-4 contains the Baseline financial schedules

Page 111: "Included in the financial analysis for both AMI and Baseline scenarios is the opening balance of current plant and accumulated depreciation for existing (non-AMI) meter hardware (asset class 478-10) and meter installation (asset class 474-00 and 474-02) specific to the series 200116 and 400117 meters as at January 1, 2021. The opening gross plant balance of existing meter hardware is $163.3 million, less accumulated depreciation of $90.3 million, for a net book value of $73.0 million. The opening gross plant balance of existing meter installation costs is $265.7 million, less accumulated depreciation $87.1 million for a net book value of $178.6 million."

31.1 Please confirm if the service provided is any different between the AMI case and the Baseline case.

31.1.1. If yes, please explain the difference in Meter Capital costs in 2021-2022 period.

Response:

FEI is interpreting this information request is to confirm if the service provided in the pre-deployment phase in 2021 and 2022 is any different between the AMI and Baseline case, and explain the difference in Meter Capital costs in 2021 and 2022.

FEI confirms there will be one service difference in the pre-deployment phase under the AMI scenario in year 2022. FEI plans to halt meter exchange activity in 2022 leading up to AMI deployment starting in year 2023. For the purposes of the financial analysis, the difference in meter capital costs in the pre-deployment phase is a direct result of no meter exchanges forecast

in 2022 under the AMI scenario while the Baseline scenario will continue to have the planned meter exchange activities. Halting of meter exchange activity is dependent on AMI Project approval and its timing, and FEI will evaluate halting meter exchange activity when a decision on the Project is received.

31.2 Please confirm if write-off costs (e.g., undepreciated assets) have been included anywhere in Table 6-2.

Response:

FEI confirms the costs presented in Table 6-2 do not include the undepreciated value of the existing diaphragm meters that will be retired early due to AMI. FEI notes the purpose of Table 6-2 is to summarize the capital costs of the Project. Please refer to the response to CEC IR1 47.1 for discussion of the undepreciated value of the existing meters and their inclusion in the financial analysis.

31.3 Do the calculations in Table 6-2 include a terminal value of the assets?

Response:

Table 6-2 does not include a terminal value of the assets. Terminal value is a valuation of the future cash flow and it is unrelated to the forecast capital cost summarized in Table 6-2 of the Application. FEI notes the financial analysis performed is for the purpose of evaluating the incremental revenue requirement and the resulting delivery rate impact due to the proposed AMI Project. It is not a discounted cash flow analysis for investment valuation where terminal value would normally be included. FEI also notes the financial analysis completed for the Project is based on one life cycle of the meter assets. FEI assumes all the assets will be used to end of operational life when the assets are expected to have zero residual value.

31.4 For the Baseline case, the Meter Capital cost divided by the number of years is approximately $25 million per year (e.g., for 2021-2022 period, Baseline Meter Capital costs are $46.60M, or $23.30M per year). Is this an accurate representation of historic annual Meter Capital costs?

31.4.1. If not, please explain and provide the correct figures.

Response:

FEI clarifies that the Baseline meter capital costs in the pre-deployment period of $46.6 million or $23.3 million per year represent the forecast capital costs associated with meter exchanges and new additions for the 200 and 400 series meters in 2021 and 2022. These costs are accurate and in line with costs FEI incurred in prior years for similar activities.

31.5 Please confirm what assumptions have been made regarding the number of AMI meters that will be required to be replaced prior to the 20-year period (e.g., broken, damaged or obsolete meters).

31.5.1. Please compare that assumption under the FEI experience with the number or broken, damaged or obsolete meters over the past 10 years.

Response:

Post deployment AMI includes an annual allowance of 0.5 percent of meter failures that would require replacement. The 0.5 percent failure rate is based on historical failure data provided by the manufacturer. FEI has experienced an average of 3,800 broken, damaged, or obsolete meters per year over the past 10 years.

31.6 For the AMI meters deployed by FEI, please confirm the unplanned replacement rate of these devices.

31.6.1. Please describe what circumstances could result in these devices being deemed obsolete (e.g., based on similar circumstances witnessed in the industry for both electric and gas devices).

31.6.2. What has been the experience in other jurisdictions, and were these experiences part of the mandate provided to Utili-Assist?

31.6.3. Please characterize the risk that a change (or upgrade) in software or communications protocols will render the AMI meters obsolete.

Response:

FEI assumed a 0.5 percent unplanned replacement for meters and meter modules.

FEI is confident there is a very low risk that the metering technology used for the AMI Project will be rendered inoperable by obsolescence. Planning and contract terms are established by both vendors and utilities so that assets remain operational for their expected service lives and are not made obsolete, including the ability to incorporate new releases of hardware or software when appropriate. FEI is not aware of any instance where a utility was forced to replace a meter fleet prior to end of life due to obsolescence. Investigating this consideration was not in the scope of the Util-Assist Report.

31.7 Please explain how FEI included cost contingency considerations in cost estimates.

31.7.1. Please describe any key differences regarding contingency assumptions employed for the AMI and for the Baseline cases.

Response:

Please refer to Appendix E-3 of the Application for details of the contingency for the proposed FEI AMI Project. FEI has not assigned any financial contingency to the Baseline case.

32. Reference: Exhibit B-1, Application, p. 101

Table 6-3:

Table 6-3: Meter Unit Summary

Line	Meter Units 000's Item	Pre Deployment 2021 - 2022 (1)	Deployment 2023 - 2026 (2)	Subtotal (1+2) 2021 - 2026 (3)	Post Deployment 2027 - 2046 (4)	Total (3+4) 2021 - 2046 (5)
1	Meter Exchanges	45.0	1,053.6	1,098.6	106.6	1,205.2
2	New Meters	23.5	42.5	66.0	144.6	210.6
3	**Total AMI Meter Units**	**68.5**	**1,096.1**	**1,164.6**	**251.2**	**1,415.9**
4	Meter Exchanges	90.0	214.0	304.0	894.2	1,198.2
5	New Meters	23.5	42.5	66.0	144.6	210.6
6	**Total Baseline Meter Units**	**113.5**	**256.5**	**370.0**	**1,038.8**	**1,408.8**
7	Meter Exchanges	(45.0)	839.6	794.6	(787.6)	7.0
8	New Meters	-	-	-	-	-
9	**Incremental Units**	**(45.0)**	**839.6**	**794.6**	**(787.6)**	**7.0**

32.1 Please confirm what the cost of a single AMI meter is vs. the cost of a single "baseline" meter.

Response:

FEI notes the unit costs of the AMI and Baseline meters are provided in Confidential Appendices G-1 and G-2 on Schedule 1. FEI is filing the remainder of this response on a confidential basis pursuant to Section 18 of the BCUC's Rules of Practice and Procedure regarding confidential documents, as set out in Order G-15-19, to preserve commercially sensitive information which, if disclosed, could prejudice or negatively impact the bidding process or FEI's ability to negotiate.

[redacted]

32.2 Please confirm the expected life of an AMI meter and the expected life of a "baseline" meter.

Response:

FEI confirms the expected average life of AMI meters is 20 years, and the expected average life of existing (Baseline) meters is 18 years. The 20 year life for AMI meters is based on the manufacturer's useful life estimate as discussed in Section 6.3.1.6. For the existing meters, 18 years is based on the average service life for the meter asset account from FEI's 2017 Depreciation Study filed as part of FEI's 2020-2024 MRP Application and approved pursuant to BCUC Decision and Order G-165-20.

32.3 Please clarify whether the expected lives described in the prior question consider potential for refurbishment and life extension.

32.3.1. If not, please discuss the potential for meter refurbishment and life extension in both AMI and "baseline" meters.

Response:

The expected service life of 20 and 18 years from the response to RCIA IR1 32.2, represents the average expected service life of the AMI and Baseline meters, respectively. Depending on the conditions of the meters it is possible that some meters can be utilized past the expected average service life before needing replacement. Meters at the end of service life are retired and exchanged with a new meter. Refurbishment is not a viable option for retired existing diaphragm meters or advanced meters.

FEI notes that if the meters have an actual life that is either longer or shorter than the average service life, the meters will be over- or under-depreciated at the time of retirement. As per FEI's approved depreciation policy, any gains and losses that result will be recorded in accumulated depreciation and will be taken into account in future depreciation studies that are subject to BCUC review and approval.

33. Reference: Exhibit B-1, Application, p. 105

Table 6-5:

Table 6-5: Incremental O&M Savings Summary

Line	Incremental O&M[1] As-Spent in $Millions Item	Pre Deployment 2021 - 2022 (1)	Deployment 2023 - 2026 (2)	Subtotal (1+2) 2021 - 2026 (3)	Post Deployment 2027 - 2046 (4)	Total (3+4) 2021 - 2046 (5)	Reference[2] (6)
1	New AMI O&M	0.8	21.5	22.2	152.5	174.7	
2	Meter Installation O&M	(0.9)	(2.4)	(3.4)	(16.9)	(20.3)	
3	Meter Reading O&M	(0.0)	(21.7)	(21.7)	(404.4)	(426.2)	
4	Operations O&M	(0.0)	(0.6)	(0.6)	(25.8)	(26.4)	
5	Customer Service O&M	0.0	0.0	0.1	(12.7)	(12.6)	
6	Meter Shop O&M	(0.2)	(1.0)	(1.3)	(6.5)	(7.8)	
7	**Incremental O&M costs / (savings)**	**(0.4)**	**(4.3)**	**(4.7)**	**(313.9)**	**(318.6)**	Schedule 2, Line 14 & Agrees to Table 6-1 Line 6

Notes:

[1] *O&M costs net of capitalized overheads.*

[2] *Appendix G-5 contains the incremental financial schedules.*

33.1 Please confirm if customer service savings (i.e., Line 5 in Table 6-5) are consistent with the FBC experience following implementation of the FBC electrical AMI program.

Response:

Confirmed. As projected for FEI, FBC experienced savings in customer service following the implementation of AMI associated with the reduction of manual meter reads. Please note that the estimated savings for FEI are specific to FEI based on the volume of meter reads, interaction and case load levels, and manual meter reading contract savings.

34. Reference: Exhibit B-1, Application, p. 109

Table 6-7:

Table 6-7: Operations O&M Summary

Line	Operations O&M[1] As-Spent in $Millions Item	Pre Deployment 2021 - 2022 (1)	Deployment 2023 - 2026 (2)	Subtotal (1+2) 2021 - 2026 (3)	Post Deployment 2027 - 2046 (4)	Total (3+4) 2021 - 2046 (5)	Reference (6)
1	Existing Operations Activities	(0.0)	(0.6)	(0.6)	(54.0)	(54.6)	
2	New Operations Activities	-	-	-	28.2	28.2	
3	**Incremental Operations O&M costs / (savings)**	**(0.0)**	**(0.6)**	**(0.6)**	**(25.8)**	**(26.4)**	Agrees to Table 6-6 Line 4

Notes:

[1] *O&M costs net of capitalized overheads.*

34.1 Please explain if FEI has included cost contingencies in the O&M cost estimates.

34.1.1. Please describe any key differences regarding treatment of contingencies between the AMI and Baseline cases.

Response:

FEI has not included any additional costs for contingency in the O&M forecast costs for either the Baseline or AMI scenarios.

35. Reference: Exhibit B-1, Application, p. 115

Page 115: "In addition to the recovery of the remaining rate base value for meters to be retired due to the AMI Project, there is approximately $74 million in remaining rate base value for meters previously retired in the normal course of business but that, due to the group asset accounting employed by FEI, had a remaining net book value at the time of retirement."

35.1 Please confirm the treatment of the $74 million for the Rate Impact under the Baseline case.

Response:

Under the Baseline case (i.e., AMI project does not proceed), the remaining rate base value for meters previously retired in the normal course of business, all else equal, would remain in FEI's rate base as a debit in the Accumulated Depreciation account as per the approved treatment. As these costs remain in FEI's rate base, they will be recovered in customers' rates through future depreciation expense for the meter asset class.

E. Consultation

36. Reference: Exhibit B-1, Application, pp. 94, 120, 131, 132; Exhibit A-4, BCUC IR1, IR 36.2

Regarding customer communications during project roll-out:

Page 120: "Due to its broad nature, reaching nearly 1.1 million customers in 135 communities, FEI developed a comprehensive Consultation, Engagement and Communications Plan to consult with stakeholders and the broader public…"

Pages 131-132: "Concerns regarding the new network generally pertained to perceived health effects related to radiofrequencies (RF), and concerns about how the Project could exacerbate perceived pre-existing sensitivity to wireless technology (Section 5.8.1)… Privacy concerns centred on whether FEI could use the new technology to tell when customers were using specific appliances and how customer information would be protected… A small number of public inquiries raised concerns regarding the Project's costs and the potential to impact customer rates."

BCUC IR 1, IR 36.2: "Please provide an updated Consultation, Engagement and Communications Plan for the duration of the AMI Project including any future public consultation contemplated subsequent to the preparation of the CPCN application."

36.1 Provide details of how FEI's updated Consultation, Engagement and Communications Plan will address customer concerns related to privacy, radiofrequency emissions, and rate impacts.

Response:

FEI's Consultation, Engagement and Communications Plan will continue to provide customers a number of opportunities to engage with FEI to learn more about the Project and provide their feedback. This will include opportunities to engage on issues and concerns they may have including privacy, radio frequency emissions, and Project rate impacts. FEI will continue to be guided by its consultation objectives for the Project which include:

- Ensuring balanced and objective information is available, promoted and understood;
- Communicating and engaging effectively on the benefits of the new meters, and addressing concerns or provide explanations when unable to do so; and
- Creating opportunities for customers, communities and stakeholders to provide feedback.

Page 94: "FEI believes some customers will not want an advanced meter installed on their premises; consequently, it is possible that some customers will seek to refuse the

installation of an advanced meter. FEI plans to work with these customers, seeking to understand any concerns they may have, sharing the benefits of the Project and addressing their concerns to the extent possible. By doing so, FEI hopes to successfully transition these customers to advanced meters."

36.2 Explain how FEI will address customer concerns, specifically what communication channels (mail, phone, email, in-person) will be used.

Response:

Please refer to the response to BCUC IR1 13.10.

F. Util-Assist Report

37. Reference: Exhibit B-1, Application, Appendix A pp. 17, 31

Page 17: "The utilities were also asked what their primary reason for upgrading or considering the upgrade to AMI was, and the majority (57.1%) cited meter-to-cash operational efficiencies as their primary reason."

Page 31: "When presenting its AMI project to council, CMH proposed the following benefits:

• Improve "read to bill" time (reduction in the time between when the meter is read to when the customer is billed. Improves cash flow.)"

37.1 Explain whether FEI expects a cash flow benefit from meter-to-cash operational efficiencies.

Response:

FEI has not identified improved cash flow as a benefit of the Project. While the time from meter reading to billing may be reduced, a key factor in cash flow improvement is the variance between energy use and payment for that use. As noted in the response to CEC IR1 18.5, FEI anticipates that the ability to choose a billing date may reduce payment delays; however, any benefits from this are dependent on customer uptake of such options and billing dates may not necessarily be earlier than they are today as a result. To the extent that a cash flow benefit materializes from automation, the benefit will be inherently reflected in working capital studies that occur from time to time.

G. Insights Matter Report

38. Reference: Exhibit B-1, Application, Appendix C p. 6

At the above reference, Insights Matter discusses current manual meter reading practices.

38.1 Which Canadian gas utilities read residential meters monthly versus bi-monthly or seasonally?

38.1.1. If a utility uses a mix of monthly, bi-monthly, or seasonally read meters, provide details of the approximate split (for example, if urban meters are read monthly but rural meters are read bi-monthly or seasonally).

Response:

FEI does not have information about other Canadian gas utilities' meter reading schedules.

H. Financial Schedules

39. Reference: Exhibit B-1, Application, Appendix G-1

Regarding capital cost assumptions:

39.1 Confirm whether the costs of residential AMI meters are the same as commercial AMI meters, as reflected in Appendix G-1 Schedule 1.

Response:

Confirmed. Please refer to the response to RCIA IR1 32.1.

I. Public Outreach Questions

As part of its engagement with its constituents for this proceeding, RCIA has received questions from members of the public. These are relayed (with some modification by RCIA for clarity) in this section.

40. Reference: Exhibit B-1, Application, Appendix F-1 pg. 19

At the above reference Exponent provides the characteristics of the RF exposure caused by the various proposed endpoints.

40.1 Please explain whether exposure to multiple endpoints simultaneously is safe for FEI's ratepayers. (e.g. a customer's own meter as well as a neighbour's meter, or a bank of meters at a townhouse complex, or a combination of gas and electrical meter(s))

Response:

This response has been provided by Exponent.

Exponent's report "*Radiofrequency Fields in the Environment and from Advanced Metering Infrastructure,*" dated May 3, 2021, states:

> In typical operation, the Sonix IQ gas meter transmits RF energy for a total of approximately 0.34 seconds per day. This very low transmission time also means that the exposures in general are also low, especially the indoor RF exposure from the SonixIQ gas meter [at a distance of 1 meter from the SonixIQ], which is about 24 million times below the SC6 exposure limit, and substantially less than RF exposures from common natural and man-made sources (p. ix)

Even for a hypothetical and implausible scenario in which a bank of 100 meters were all assessed simultaneously, and conservatively assumed to be in the same physical location (i.e., not separated by any distance), the cumulative exposure would still be 240,000 times below the Safety Code 6 (SC6) exposure limit. The actual exposure level inside would be still lower given the necessary physical separation between meters and the rapid decrease in RF field strength with distance from the source as well as from any building materials between the meter and the occupants.

40.2 Are FEI's gas AMI meters safe for customers regardless of their location on a customer's dwelling? For example – if one or more meters are in close proximity to an area in which a resident spends extended periods of time (e.g. a bedroom), does that represent a higher risk?

Response:

This response has been provided by Exponent.

FEI's proposed AMI gas meters are designed to meet the requirements of Health Canada's SC6 (2015). The Preface to SC6 states that it "is one of a series of safety codes prepared by the Consumer and Clinical Radiation Protection Bureau, Health Canada. These safety codes specify the requirements for the safe use of, or exposure to, radiation emitting devices."

The exposures to RF energy from FEI AMI gas meters are so low and infrequent (totaling approximately 0.34 seconds per day), that exposure even to multiple meters for extended periods meets SC6 limits and constitutes "safe exposure", no matter the location of the person or duration of exposure. Please also refer to the response to RCIA IR1 40.1.

41. Reference: Exhibit B-1, Application, Appendix F-1 Figure 6

Figure 6:

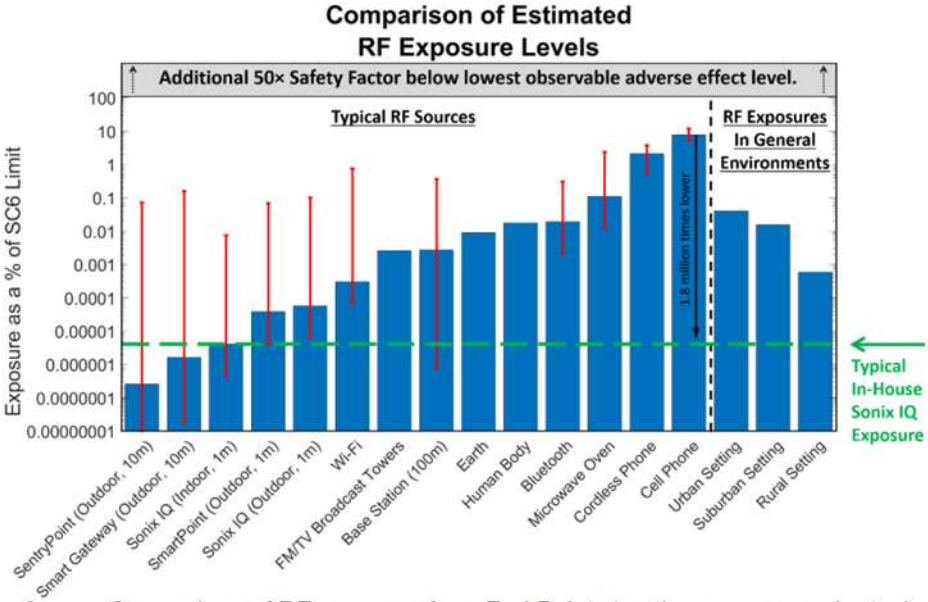

Figure 6. Comparison of RF exposure from End Points to other sources under typical use.

The red lines show variability of some man-made sources. Exposures in general environments are from Joseph et al. (2012). Other data sources are from those listed for Table 4.

41.1 Is the *cumulative* effect of all of the above sources of RF exposure safe for FEI's ratepayers? Please explain why or why not.

Response:

This response has been provided by Exponent.

Even if encountered simultaneously, the cumulative, i.e., total exposure from all the sources listed in Figure 6 would be within the limits specified by Health Canada's SC6. This is consistent with SC6 itself which states that "Safety Code 6 protects you from combined exposures of radiofrequency EMF. You are protected from the combined exposure of radiofrequency EMFs [electric and magnetic fields] from multiple sources with Safety Code 6 exposure limits in place. Safety Code 6 takes into account the total exposure from all sources of radiofrequency EMF in the range of 3kHz [kilohertz] to 300 GHz [gigahertz]. This includes those that may be used in 5G technology."

This means that if persons, even small children, had continuous exposure to multiple sources of RF EMF within the SC6 limits, the scientific evidence does not show that total exposure from those multiple sources would cause adverse health effects.

https://www.canada.ca/en/health-canada/services/health-risks-safety/radiation/occupational-exposure-regulations/safety-code-6-radiofrequency-exposure-guidelines.html

41.2 Have the cumulative effects of all of these sources of RF exposure been characterised by epidemiological studies? Please provide any relevant sources.

Response:

This response has been provided by Exponent.

Epidemiologic studies of RF fields have estimated the exposure of populations with respect to proximity and use of sources of interest, measured exposures, and calculated exposures. In recent years, exposures from cordless phones and cell phones in particular have dominated this research because the exposures are greater than many other sources, as is illustrated in Figure 6. Typically, exposures from other RF sources in the environment are not addressed or quantified in epidemiologic studies of cell phone use because of their smaller contributions to exposure. RF from these common sources will be present in virtually all environments, including those in which the subjects of epidemiologic studies live and work. For example, IARC described relative exposures of populations from different sources as:

> The general population receives the highest exposure from transmitters close to the body, such as handheld devices like mobile telephones. Exposure to high-power sources at work might involve higher cumulative RF energy deposited into the body than exposure to mobile phones, but the local energy deposited in the brain is generally less. Typical exposures to the brain from rooftop or tower-mounted mobile-phone base stations and from TV and radio stations are several orders of magnitude lower than those from global system for mobile communications (GSM) handsets (IARC, 2011).

This difference in exposure is further noted in IARC's assessment of epidemiologic studies in which it reported that evidence supporting an association "among [personal] users of wireless telephones for glioma and acoustic neuroma was *limited* and inadequate to draw conclusions for other types of cancers. The evidence from the occupational and environmental exposures mentioned above was similarly judged inadequate".[6] More recent studies have not altered this conclusion.

[6] International Agency for Research on Cancer (IARC). IARC Classifies Radiofrequency Electromagnetic Fields as Possibly Carcinogenic to Humans. Press Release No. 104, May 11, 2011a.

42. Reference: Exhibit B-1, Application, Appendix F-1 pg. 30

Page 30: "Under typical operation, the Sonix IQ gas meter transmits RF energy a total of approximately 0.34 seconds per day"

42.1 What is the approximate number of discrete transmissions that would constitute the 0.34 seconds per day? (For example: 1 transmission lasting 0.34 seconds? 34 transmissions lasting 0.01 seconds? etc.)

Response:

This response has been provided by Exponent.

Exponent's report "*Radiofrequency Fields in the Environment and from Advanced Metering Infrastructure*," dated May 3, 2021, states: "The FlexNet End Points send very short transmissions (typically about 55 milliseconds) at regular pre-programmed intervals of once every 4 hours" (p. 6).

42.2 Do the discussions of RF safety in the Exponent reports consider the effects of many discrete transmissions, and/or the effect of transmission pulses? Please discuss.

Response:

FEI has consulted with and been advised by Sensus that the Sonix IQ gas meters transmit continuously during the approximately 55 millisecond transmission cycles that take place every four hours. The transmission is not pulsed on and off.

The following response has been provided by Exponent based on this information:

The SonixIQ Gas Meters transmit for a continuous duration of approximately 55 milliseconds every 4 hours. It is not pulsed on and off. There is neither evidence that discrete components of RF signals can be perceived nor are we aware of any studies that have attempted to evaluate effects of individual components of RF signals apart from exposures to RF transmissions over designated time periods.

42.3 Does the figure of 0.34 seconds per day include all signals from/to the meter, or just those related to consumption and metering?

42.3.1. If there are other signals from/to the meter above and beyond the 0.34 second figure cited, please provide details and indicate the additional exposure time.

Response:

This response has been provided by Exponent.

Exponent's report "*Radiofrequency Fields in the Environment and from Advanced Metering Infrastructure*," dated May 3, 2021 states, at Table B-1 of Appendix B to the report, that "Under typical operation, Sonix IQ gas meters send one message every 4 hours, as well as about three additional status update messages per week." In addition, "Sonix IQ gas meters … operate at [a higher] … duty cycle [of approximately 1.4 seconds per day] only during the initial installation and connection to the FlexNet network. The initial connection lasts a total of less than 1 hour" (p. B-1).

43. Reference: Exhibit B-1, Application, p. 21

At the above reference FEI discusses improvements in bill accuracy due to AMI.

43.1 Is FEI aware of any accuracy issues with AMI that have been present for other utilities (either gas or electric) using such infrastructure? Please discuss and provide any available references.

Response:

FEI is not aware of any issues relating to billing accuracy for other utilities using AMI infrastructure.

43.2 Will AMI meter readings be vulnerable to tampering by malicious actors at any point on the transmission chain from the customer's meter to FEI's databases? Please explain.

Response:

All AMI meter readings will be protected using industry standard cybersecurity measures, including encryption, to prevent tampering.

43.3 Will AMI meter readings be subject to disruption, distortion, or interference from other wireless devices? Please discuss any impacts.

Response:

AMI meter readings will be transmitted over radio frequency (RF) spectrum licensed to FEI by Innovation, Science and Economic Development (ISED) Canada. The use of licensed RF spectrum mitigates potential RF interference from third parties and provides FEI with the same federal protections against RF interference as Canada's largest telecom providers (e.g., TELUS, Rogers, Bell, etc.). As the holder of this licensed spectrum, FEI can request that ISED legally remove interferers from its licensed spectrum bands.

44. Reference: Exhibit B-1, Application, p. 35

In Section 3.4 FEI discusses the "operational opportunities that support the safety, resiliency and efficient operation of the gas distribution system".

44.1 In the event that operational issue with an AMI meter causes damage to a customer's property (e.g. an improper/inadvertent remote shutoff that leads to the loss of critical heating), will FEI be liable for any such damages? Please discuss.

Response:

There is no change to FEI's liability for any damage to a customer's property as a result of AMI meters as compared to diaphragm meters.

FEI's obligations to its customers are found in FEI's General Terms and Conditions to its Tariff, effective January 1, 2021 and approved by BCUC Order G-338-20, and applicable rate schedules.

Although FEI does not understand the question to relate to the nature of issues raised in CORE IR1 14.0, if the question is in fact broader than FEI understands, please also refer to the response to CORE IR1 14.0.

45. Reference: Exhibit B-1, Application, p. 94

"Customers choosing to opt out will be required to pay for their meters to be manually read."

45.1 How can FEI justify a situation in which customer choosing to opt out will be paying additional fees to receive the same set of services that they currently receive?

Response:

FEI is proposing to move from manual meter reading to automated meter reading through the use of AMI. If the Project is approved, FEI expects that almost all meters will be read automatically, nearly eliminating the need for any manual meter reading. Section 6 of the Application sets out the anticipated savings from no longer requiring manual meter reading, which is a benefit for all customers. However, in order to ensure that all customers are not negatively impacted from the costs for manual meter reading due to customers who prefer to have a radio-off advanced meter installed, it is appropriate that those additional costs should be borne by those choosing to opt out.

In addition, FEI takes guidance from the BCUC's 2013 Decision and Order C-7-13 approving FortisBC Inc.'s (FBC) electric AMI Project, where the BCUC directed FBC to apply for approval of an opt-out program based on the following principles:

- Customers may choose to opt-out of accepting a wireless transmitting meter.
- Customers who choose to opt-out will be provided with an AMI meter that has the wireless transmit functions disabled. Transmit functions on these meters will remain disabled until the individual chooses to opt back in to the AMI program; in the event that the customer moves to a new property, the opt-out choice will move with the customer.
- The incremental cost of opting-out of the AMI program will be borne by the individual choosing to opt-out." [p.148 (pdf p.156)]

FEI expects its proposed radio-off option, including that customers choosing to opt-out should pay the associated costs for manual meter reading, will be in line with the radio-off principles set out in Decision and Order C-7-13.

46. Reference: Exhibit B-1, Application, p. 36

In Section 3.4.1 FEI discusses higher-resolution usage data that will be collected by the AMI meters.

46.1 Please confirm that FEI will store and will also have access to the higher-resolution usage data from customers.

Response:

FEI confirms that FEI will store and have access to higher-resolution usage data from customers.

46.2 Will FEI analyze and use the additional higher-resolution customer data?

46.2.1. If yes, please discuss how. Would use in these cases be anonymized?

Response:

FEI confirms the additional higher resolution customer data will be analyzed and used by FEI.

As discussed in the Application there are a number of ways this higher resolution data can be utilized:

- Customer Billing – refer to Section 4.3.2.1 for additional details;
- Demand Side Management Program enhancements and Cost of Service analysis – refer to Section 4.3.2.2 for additional details;
- System Resiliency enhancements – refer to Section 4.3.2.4.1 for additional details;
- System Planning enhancements – refer to Section 4.3.2.4.1 for additional details; and
- Improve leak detection downstream of the meter – refer to Section 4.3.2.4.6 for additional details

FEI will determine how the above listed opportunities will handle higher resolution customer data during the Define phase of Project implementation.

FEI follows BCUC Order G-161-15 and for each of these listed opportunities FEI's Privacy Officer will conduct a Privacy Impact Assessment to ensure ongoing compliance.

46.3 Please describe how FEI will keep this higher-resolution data safe.

Response:

Please refer to the responses to CEC IR1 66.1 and 66.2.

46.4 Will FEI's AMI meters use or be part of a 5G network? Please discuss and address any implications on the safety of customer data.

Response:

The AMI meters will not be part of a 5G network; however, base stations may use 5G and other cellular technologies to backhaul data to the data centre. As discussed in the response to RCIA IR1 43.2, all data backhauled (whether using 5G technology, or otherwise) will be encrypted.

46.5 Does FEI believe that its customers are consenting to having this additional higher-resolution data about their usage behaviours stored and used by FEI, and perhaps vulnerable to theft/exploitation by malicious actors? Please explain and provide any justification.

Response:

FEI collects consent from its customers in accordance with its Customer Privacy Policy. This Policy applies to the collection, use and disclosure of personal information in all circumstances, including the AMI Project. FEI presently collects gas consumption information about its customers; the AMI Project will enable FEI to collect the same data, but more frequently.

FEI considers the security of consumption information collected via the AMI Project to be an important and significant priority. The information collected is sent automatically from the meter through encrypted wireless technology. The security architecture is designed to secure customer data and to mitigate the risk of unauthorized access or security breaches on the AMI platform.

47. Reference: Exhibit B-1, Application, Appendix F-1 p. 10

At the above reference Exponent discussed Health Canada Safety Code 6. Exponent states that the latest update was published in 2015.

47.1 Is Safety Code 6 still relevant and up to date, despite being published in 2015?

Response:

This response has been provided by Exponent.

Information about SC6, dated October 26, 2020, is posted by Health Canada at https://www.canada.ca/en/health-canada/services/health-risks-safety/radiation/occupational-exposure-regulations/safety-code-6-radiofrequency-exposure-guidelines.html.

Health Canada states "If new scientific evidence were to show that exposure to radiofrequency EMF below the levels found in Safety Code 6 poses a risk, the Government of Canada would take steps to protect the health of Canadians." Health Canada has not announced that there is a basis for updating the 2015 standard.

Other agencies have published more recent assessments of research relevant to setting standards for exposures to RF fields, including:

- Institute of Electrical and Electronics Engineers (IEEE), IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 0 kHz to 300 GHz. New York, NY: IEEE, 2019.
- International Commission on Non-Ionizing Radiation Protection (ICNIRP). ICNIRP note: Critical evaluation of two radiofrequency electromagnetic field animal carcinogenicity studies published in 2018. Health Phys 118: 525-532, 2019.
- International Commission on Non-Ionizing Radiation Protection (ICNIRP). Guidelines for Limiting Exposure to Electromagnetic Fields (100 kHz to 300 GHz). Health Phys 118:483-524, 2020.
- U.S. Food and Drug Administration (FDA). Review of Published Literature between 2008 and 2018 of Relevance to Radiofrequency Radiation and Cancer. FDA Center for Devices and Radiological Health, 2020.

The scientific literature reviewed by these agencies has not prompted them to make material changes to their standards that would suggest that Health Canada needs to update SC6.

47.2 Please discuss any developments in the scientific understanding of the effects of RF energy on humans since the last update of Safety Code 6.

Response:

This response has been provided by Exponent.

Exponent's report "*Status of Research on Exposure to Radiofrequency Fields and Health in Relation to Advanced Metering Infrastructure*," dated May 3, 2021 (Appendix F-2 of Exhibit B-1) provides extensive discussions of research published since the last update of SC6 on humans exposed to RF. Additional discussions are summarized in agency reviews cited in that report (e.g., AGNIR, 2016; SCENIHR, 2015; SSM, 2016; 2018; 2019, 2020; ICNIRP, 2020a; FDA, 2020).

Attachment 12.2

Infrastructure resiliency - JS

Introduction
Instruction

We're seeking your opinion on several aspects of FortisBC's services. We'd like you to consider how important these services are to you and how well they are being performed. This survey will take about four to five minutes to complete, and will give you an automatic entry into our quarterly prize draw.

Overall satisfaction
Single Choice Question : Slider

We would like your opinion of the overall service provided by FortisBC. On a 10-point scale where 1 is “Not at all satisfied” and 10 is “Fully satisfied", how satisfied are you with the overall service provided by FortisBC?

- Not at all satisfied
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- Fully satisfied

Importance - general
Single Choice Grid : Sliders

Now, we'd like you to think about the importance of FortisBC's services. On a 10-point scale, where 1 is "Not at all important" and 10 is "Extremely important", please rate the following services according to their importance to you.

- Not at all important
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- Extremely important
- Don't know / unsure

- Having staff that are courteous and respectful
- Making it easy for you to manage your account
- Making it easy for you to speak directly with a FortisBC representative
- Having knowledgeable staff
- Resolving your issues in a timely manner
- Providing a bill that is easy to understand
- Providing a bill that is accurate
- Providing comprehensive online information about your home's energy use

Importance - reliability and resilience

Single Choice Grid : Sliders

Continue thinking about the importance of FortisBC's services. On a 10-point scale, where 1 is "Not at all important" and 10 is "Extremely important", please rate the following services according to their importance to you.

- Not at all important
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- Extremely important
- Don't know / unsure

  - Having reliable energy service that can withstand and recover from minor disruption events (e.g., typical storms, minor system damage)
  - Keeping you informed during service disruptions
  - Restoring service quickly after it has been disrupted
  - Delivering your energy at a reasonable cost
  - Having a resilient energy network that can withstand and recover from extreme disruption events (e.g., severe weather-related disasters, deliberate system damage or cyber-attacks)

Reasons for score selection

Open Ended : No Validation

What reasons did you consider when rating the importance of the last item above: Having a resilient energy network that can withstand and recover from extreme disruption events ?

-

Service ratings - general

Single Choice Grid : Sliders

Now, think about FortisBC's service quality, rather than "importance". On a 10-point scale, where 1 is "Very poor" and 10 is "Very good", please rate how we're doing on each of the following service aspects.

- Very poor
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- Very good
- Don't know / unsure

  - Having staff that are courteous and respectful
  - Making it easy for you to manage your account
  - Making it easy for you to speak directly with a FortisBC representative
  - Having knowledgeable staff
  - Resolving your issues in a timely manner
  - Providing a bill that is easy to understand
  - Providing a bill that is accurate
  - Providing comprehensive online information about your home's energy use

Service ratings - reliability and resilience

Single Choice Grid : Sliders

Continue thinking about FortisBC's service quality. On a 10-point scale, where 1 is "Very poor" and 10 is "Very good", please rate how we're doing on each of the following service aspects.

- Very poor
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- Very good
- Don't know / unsure

  - Having reliable energy service that can withstand and recover from minor disruption events (e.g., typical storms, minor system damage)
  - Keeping you informed during service disruptions
  - Restoring service quickly after it has been disrupted
  - Delivering your energy at a reasonable cost
  - Having a resilient energy network that can withstand and recover from extreme disruption events (e.g., severe weather-related disasters, deliberate system damage or cyber-attacks)

Risk comparison

Single Choice Question : Slider

Almost done!Comparing today to ten years ago, do you feel energy utilities are facing more or less risk from extreme events like severe weather, deliberate system damage and cyber attacks?

- Much less risk
- Less risk
- Same risk level
- More risk
- Much more risk
- Don't know / unsure

Survey end - MyVoice Member Hub redirect

Type of Termination Point: Redirect
Reason for Termination: Complete
Redirect to: URL
Redirect URL: https://www.myvoicefortisbc.com/hub
Message to display to respondent: Thank you for completing this survey. Your feedback is important to us, and has given you an automatic entry into our quarterly prize contest.Have you checked out our member hub? Click the Finish button below to login and browse all the new content.

Report #2(Survey: Infrastructure resiliency - JS)

Dataset Type: Live

Total: 2125 participants

Data Options: Complete

Exported: 11:20AM Oct 05, 2021

Q1. Overall satisfaction (Single Choice)

We would like your opinion of the overall service provided by FortisBC. On a 10-point scale where 1 is “Not at all satisfied” and 10 is “Fully satisfied", how satisfied are you with the overall service provided by FortisBC?

Total: 2125 responses

		Total
	Total	2125
1	Not at all satisfied	10
		0%
2	2	10
		0%
3	3	13
		1%
4	4	20
		1%
5	5	97
		5%
6	6	100
		5%
7	7	192
		9%
8	8	445
		21%
9	9	474
		22%
10	Fully satisfied	764
		36%

Q2. Importance - general (Single Choice Grid)

Now, we'd like you to think about the importance of FortisBC's services. On a 10-point scale, where 1 is "Not at all important" and 10 is "Extremely important", please rate the following services according to their importance to you.

Total: 2125 responses

	Not at all important	2	3	4	5	6	7	8	9	Extremely important	Don't know / unsure
Having staff that are courteous and respectful	4	4	1	5	30	33	83	267	343	1157	198
	0%	0%	0%	0%	1%	2%	4%	13%	16%	54%	9%
Making it easy for you to manage your account	7	5	5	6	29	60	112	323	412	1130	36
	0%	0%	0%	0%	1%	3%	5%	15%	19%	53%	2%
Making it easy for you to speak directly with a FortisBC representative	9	2	17	15	57	79	127	272	354	961	232
	0%	0%	1%	1%	3%	4%	6%	13%	17%	45%	11%
Having knowledgeable staff	5	3	2	9	25	30	76	257	382	1128	208
	0%	0%	0%	0%	1%	1%	4%	12%	18%	53%	10%
Resolving your issues in a timely manner	4	3	5	2	23	20	92	220	343	1172	241
	0%	0%	0%	0%	1%	1%	4%	10%	16%	55%	11%
Providing a bill that is easy to understand	4	1	6	11	27	47	96	269	414	1232	18
	0%	0%	0%	1%	1%	2%	5%	13%	19%	58%	1%
Providing a bill that is accurate	6	3	1	7	20	20	64	172	257	1522	53
	0%	0%	0%	0%	1%	1%	3%	8%	12%	72%	2%
Providing comprehensive online information about your home's energy use	13	6	17	10	81	114	213	426	403	789	53
	1%	0%	1%	0%	4%	5%	10%	20%	19%	37%	2%

Q3. Importance - reliability and resilience (Single Choice Grid)

Continue thinking about the importance of FortisBC's services. On a 10-point scale, where 1 is "Not at all important" and 10 is "Extremely important", please rate the following services according to their importance to you.

Total: 2125 responses

	Not at all important	2	3	4	5	6	7	8	9	Extremely important	Don't know / unsure
Having reliable energy service that can withstand and recover from minor disruption events (e.g., typical storms, minor system damage)	5	3	2	3	19	25	60	175	337	1439	57

	0%	0%	0%	0%	1%	1%	3%	8%	16%	68%	3%
Keeping you informed during service disruptions	5	7	13	12	34	43	111	268	365	1147	120
	0%	0%	1%	1%	2%	2%	5%	13%	17%	54%	6%
Restoring service quickly after it has been disrupted	3	3	3	4	18	32	67	144	313	1424	114
	0%	0%	0%	0%	1%	2%	3%	7%	15%	67%	5%
Delivering your energy at a reasonable cost	11	7	11	7	41	52	73	128	216	1553	26
	1%	0%	1%	0%	2%	2%	3%	6%	10%	73%	1%
Having a resilient energy network that can withstand and recover from extreme disruption events (e.g., severe weather-related disasters, deliberate system damage or cyber-attacks)	4	4	4	4	23	24	84	168	343	1340	127
	0%	0%	0%	0%	1%	1%	4%	8%	16%	63%	6%

Reasons for score selection (Open End)

What reasons did you consider when rating the importance of the last item above: Having a resilient energy network that can withstand and recover from extreme disruption events ?

See attached summary verbatim analysis report.

Total: 2125 responses

Service ratings - general (Single Choice Grid)

Now, think about FortisBC's service quality, rather than "importance". On a 10-point scale, where 1 is "Very poor" and 10 is "Very good", please rate how we're doing on each of the following service aspects.

Total: 2125 responses

	Very poor	2	3	4	5	6	7	8	9	Very good	Don't know / unsure
Having staff that are courteous and respectful	6	1	3	3	42	39	82	225	341	807	576
	0%	0%	0%	0%	2%	2%	4%	11%	16%	38%	27%
Making it easy for you to manage your account	7	9	11	8	35	70	160	347	447	919	112
	0%	0%	1%	0%	2%	3%	8%	16%	21%	43%	5%
Making it easy for you to speak directly with a FortisBC representative	9	6	13	19	55	74	141	274	273	611	650
	0%	0%	1%	1%	3%	3%	7%	13%	13%	29%	31%
Having knowledgeable staff	5	2	5	9	33	45	100	251	343	700	632
	0%	0%	0%	0%	2%	2%	5%	12%	16%	33%	30%
Resolving your issues in a timely manner	15	5	9	10	46	44	112	246	330	627	681
	1%	0%	0%	0%	2%	2%	5%	12%	16%	30%	32%
Providing a bill that is easy to understand	13	11	11	13	39	75	178	383	436	936	30
	1%	1%	1%	1%	2%	4%	8%	18%	21%	44%	1%
Providing a bill that is accurate	7	7	10	9	33	54	126	276	401	1026	176
	0%	0%	0%	0%	2%	3%	6%	13%	19%	48%	8%
Providing comprehensive online information about your home's energy use	9	12	17	21	73	111	210	374	373	712	213
	0%	1%	1%	1%	3%	5%	10%	18%	18%	34%	10%

Service ratings - reliability and resilience (Single Choice Grid)

Continue thinking about FortisBC's service quality. On a 10-point scale, where 1 is "Very poor" and 10 is "Very good", please rate how we're doing on each of the following service aspects.

Total: 2125 responses

	Very poor	2	3	4	5	6	7	8	9	Very good	Don't know / unsure
Having reliable energy service that can withstand and recover from minor disruption event s (e.g., typical storms, minor system damage)	9	3	18	11	43	61	143	308	352	735	442
	0%	0%	1%	1%	2%	3%	7%	14%	17%	35%	21%
Keeping you informed during service disruptions	24	22	39	41	99	102	159	273	269	489	608
	1%	1%	2%	2%	5%	5%	7%	13%	13%	23%	29%
Restoring service quickly after it has been disrupted	10	10	10	15	54	62	131	306	313	653	561
	0%	0%	0%	1%	3%	3%	6%	14%	15%	31%	26%

Delivering your energy at a reasonable cost	82	28	57	81	165	221	270	377	280	465	99
	4%	1%	3%	4%	8%	10%	13%	18%	13%	22%	5%
Having a resilient energy network that can withstand and recover from extreme disruption events (e.g., severe weather-related disasters, deliberate system damage or cyber-attacks)	12	4	13	21	67	72	125	260	258	542	751
	1%	0%	1%	1%	3%	3%	6%	12%	12%	26%	35%

Risk comparison (Single Choice)

Almost done! Comparing today to ten years ago, do you feel energy utilities are facing more or less risk from extreme events like severe weather, deliberate system damage and cyber attacks?

Total: 2125 responses

		Total
	Total	2125
1	Much less risk	29
		1%
2	Less risk	126
		6%
3	Same risk level	358
		17%
4	More risk	954
		45%
5	Much more risk	446
		21%
6	Don't know / unsure	212
		10%

Infrastructure Resiliency – MyVoice Panel Survey Results – Verbatim Analysis

April 28, 2021

Verbatim Analysis

Respondents were asked to share the reasons they considered when rating the **importance** of "having a resilient energy network that can withstand and recover from extreme disruption events". Approximately fifteen hundred respondents shared their reasons. The most common theme, cited by one quarter of respondents, was centered on the importance of personal comfort and maintaining energy for heating, hot water and running appliances in their homes. One fifth of respondents cited concerns about potential catastrophic events such as earthquakes and cyber-attacks, specifically noting the recent gas disruptions in Texas. Other concerns included medical and security issues. Respondents noted the importance for FortisBC to be proactive rather than reactive in their disaster response plan. A number of respondents noted the low probability of disastrous events occurring and preferred FortisBC to focus on improving current infrastructure before preparing for rare catastrophic events. Some respondents did not feel spending on resiliency was warranted based on the risk, and did want these costs passed onto consumers.

Table 4 shows the common themes from the responses and the percentage of responses with each theme.

Reason	**Percentage of reasons cited**
Comfort: heating, hot water, running appliances	25%
General need for consistent service with quick recovery after a disruption	22%
Concerns about weather, earthquakes, cyber-attacks, world disaster events	16%
Medical reasons, safety or security	8%
No past experience with service disruptions	5%
Important to be proactive, rather than reactive	4%
Consistent connection required for working at home and running businesses	3%
Want FortisBC to focus on improving infrastructure before preparing for rare catastrophic events	2%
Costs – do not want costs passed onto the consumer	2%
Experience with past service disruptions	2%
Low probability of disastrous events occurring	2%
Have access to alternate energy sources	1%

Table 4. Reasons for rating importance of having a resilient energy network
Total sample; Unweighted; base n = 1502; total n = 2125; 623 missing

The following is a sample of verbatim feedback from the respondents:

- *I rely on gas for heating, cooking, hot water and have only minimum electricity as a backup therefore gas service is extremely important to me.*

- *For us it is health related, if we have no power, heat etc. we would be very compromised. My husband is in a hospital bed and needs a ceiling lift to get to his wheelchair. Without power we would be in trouble, so having a good network to recover from disasters is very important.*

- *I rely on power to work from home, dealing with customers online and cannot have disruptions during calls.*

- *I lived through the ice storm in Ontario in 1998. I was without electricity for nine days and then it was sporadic after that for about two weeks. It was horrible and I never want to go through that again no matter what the cause.*

- *Extreme disruptions are no longer as uncommon as they once were. It seems that almost monthly, somewhere across North America, there is some sort of extreme disruption or another. An energy network that is both resilient and recoverable is getting to be a higher and higher priority.*

- *Look what happened in Texas this winter... we don't want that to happen here.*

- *I don't think cyber disruption is prioritized nearly enough by many organization leaders.*

- *Even though it is important to be able to recover in a timely manner, it is also understandable that an unreasonable amount of money should not be invested to withstand an event that is unlikely to occur.*

Attachment 14.4A

Financial Summary	AMR	AMI
Capital Costs (NPV, $millions)		
Meter Capital	$ 458.9	$ 481.2
Project Management	$ 26.2	$ 35.2
Software Capital	$ 2.2	$ 9.1
Network Capital	$ 0.3	$ 17.1
Non-Meter Capital	$ 5.4	$ 3.6
AFUDC	$ 3.6	$ 12.7
Total Capital	**$ 496.6**	**$ 558.9**
O&M Costs (NPV, millions)		
Meter Reading Costs	$ 102.0	$ 78.3
Operations, Contact Centre and Meter Shop O&M	$ 55.4	$ 12.8
New O&M	$ 7.3	$ 97.9
Total O&M (incl. Capitalized Overhead)	**$ 164.7**	**$ 189.0**
Incremental Capital (NPV, $millions)	**$ 123.8**	**$ 186.1**
Incremental O&M (NPV, $millions)	**$ (158.8)**	**$ (134.5)**
Incremental to Baseline Revenue Requirement (NPV, $millions)	**$ (35.4)**	**$ 21.9**
Incremental Delivery Rate Impact (%)	**-0.294%**	**0.182%**

Attachment 14.4B

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Attachment 14.4C

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