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FortisBC Energy Inc.

Application for a Certificate of Public Convenience and Necessity for the Advanced Metering Infrastructure Project

Decision and Order C-2-23

May 15, 2023

Before:

R. I. Mason, Panel Chair
C. M. Brewer, Commissioner
E. B. Lockhart, Commissioner

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Executive summary

On May 5, 2021, FortisBC Energy Inc. (FEI) filed an application with the British Columbia Utilities Commission (BCUC) for a Certificate of Public Convenience and Necessity (CPCN) pursuant to sections 45 and 46 of the *Utilities Commission Act* (UCA) for the Advanced Metering Infrastructure (AMI) Project (AMI Project or the Project¹ (the Application)). The AMI Project includes the following: ²

- Installation of approximately 1,100,000 residential, commercial, and industrial Sensus Sonix IQ advanced gas meters and meter retrofits of communication modules capable of remote gas consumption measurement;
- Installation of approximately 1,100 communication modules on the gas network to increase operational awareness of the gas system state; and
- Installation of the AMI network and infrastructure to communicate with customer meters and other communication modules on the FEI gas network.

FEI also requests approval, pursuant to sections 59 to 61 of the UCA, to create four new asset accounts with associated depreciation and net salvage rates for the proposed meters to be installed as part of the AMI Project, and four new deferral accounts.³

The BCUC established regulatory timetables for the review of the Application, which included: public notice and intervenor registration, two rounds of BCUC and intervenor information requests (IRs), numerous extension requests from parties,⁴ a procedural conference, intervenor evidence followed by IRs, FEI rebuttal evidence followed by IRs, an evidentiary update from FEI followed by IRs, submissions on the need for an oral hearing and further process and final and reply arguments.⁵

The following parties registered as intervenors in this proceeding: British Columbia Old Age Pensioners' Organization et al. (BCOAPO), BC Sustainable Energy Association, Commercial Energy Consumers Association of British Columbia (the CEC), the Institute for Catastrophic Loss Reduction, Residential Consumer Intervenor Association, the Coalition for the Reduction of Electropollution (CORE), joined with the individual intervenors: Mr. and Ms. Jacob Arie and Lydia Stella de Raadt, Mr. Marcus Schluschen, and Ms. Sharon Noble,⁶ and, separately, Mr. David Balfour and Mr. Curtis Bennett.

The Panel finds that FEI's needs relevant to the scope of its Application for the AMI Project are the following:

- Accurate and convenient meter reading;
- Demand side management (DSM) and energy conservation;

¹ Exhibit B-1, p. 1.

² Ibid., p. 70.

³ Ibid, p. 9.

⁴ RCIA request for extension: Exhibit C1-3; BCOAPO request for extension: Exhibit C3-15; the CEC request for extension: Exhibit C4-2; CORE requests for extension: Exhibit C7-2, C7-4, C7-5, C7-7.

⁵ Orders: G-204-21, dated July 6, 2021; G-269-21, dated September 13, 2021; G-302-21, dated October 21, 2021; G-323-21, dated November 8, 2021; G-365-21, dated December 9, 2021; G-389-21, dated December 22, 2021; G-81-22, dated March 17, 2022; G-92-22, dated March 31, 2022; G-95-22, dated April 6, 2022; G-180-22 dated July 4, 2022; G-206-22 with Reasons for Decision dated July 22, 2022; and G-259-22A with Reasons for Decision dated September 16, 2022.

⁶ Exhibit C7-11, p. 4

- The safety and resiliency of FEI’s gas distribution network;
- Greenhouse gas (GHG) emission reduction; and
- Cost effectiveness (collectively the Relevant Needs).

The Relevant Needs are established in order to evaluate the proposed AMI Project against its alternatives when determining whether the Project is in the public interest. In the Panel’s view, each of the Relevant Needs is sufficiently justified by the evidence and distinct from the others to be useful in comparing the proposed Project with its alternatives.

In the Application, FEI identified two alternatives to address the project need for automation of the meter reading process:

- i. **AMI:** AMI is an integrated system of smart meters, data management systems and communication networks that enable two-way communication between the utilities and the customer meters. The system automatically transmits the data from the meters directly to the utility at predetermined intervals.⁷
- ii. **AMR:** Automated Meter Reading (AMR) is a one-way communication technology that enables utilities to automatically collect consumption and status data from meters. Data collection from AMR systems can be either walk-by, fly-by, or drive-by. Flows and alarm data are collected by utility personnel by walking or driving by with a data receiver in proximity to the device.⁸

A third alternative was explored through IRs. The **Baseline**, or do nothing, is not an alternative FEI presented and becomes the scenario if the Project is not implemented. FEI has included in the Baseline alternative the future costs associated with bringing manual meter reading in-house since its current contract with its outsourced meter reading service provider was due to expire December 31, 2022.⁹

The Panel finds that FEI’s proposed AMI Project is superior to the AMR and Baseline alternatives. Compared to the Baseline, FEI’s proposed AMI alternative costs more unlike the AMR alternative, which would provide a cost saving compared to the Baseline. However, AMI provides superior benefits over the AMR alternative in customer convenience, DSM opportunities, GHG emission reductions and in safety and reliability. Further, as the CEC notes, the AMR alternative would lock FEI into a technology that is “currently trending towards obsolescence.”

The Panel finds that FEI’s description of the AMI Project is satisfactory for the purposes of the CPCN evaluation.

The Panel agrees with FEI that it should offer a “radio-off” option for those customers that refuse to allow FEI to connect the meter on their premises via wireless technology. The Panel also agrees that such customers should pay the additional costs of having their advanced meter installed with the internal communicating radio turned off and of having their meter read manually.

⁷ Exhibit B-1, p. 5.

⁸ Ibid., p. 45.

⁹ Exhibit B-1, p. 104.

FEI is not proposing to install automated seismic shut-off valves as part of the AMI Project. The Panel is satisfied with FEI's evidence that its proposed meters are tested to ensure compliance with required standards for vibration.

CORE cites evidence from Dr. Héroux. The Panel finds that CORE's statement that FEI's collection of data from its AMI meters "potentially amounts to an invasion of privacy, and data theft"¹⁰ is unsupported by evidence and that FEI's proposed AMI meters are a threat to its customers' privacy. The Panel also notes that "CORE's scope of intervention does not include privacy, security or electrical engineering issues."¹¹

In the Panel's view, the expert evidence provided by FEI's expert, Exponent (who rely on Drs. Cotts, Dopart and Bailey) was clearly presented, thorough and credible, and exhibited no apparent bias. The opinions are based on scientific principles and supported by evidence. All three experts have relevant education and experience in their fields.

The Panel acknowledges the concerns of CORE's membership that Mr. Karow has identified in his non-expert statement, specifically their concerns about the alleged effect of electromagnetic radiation that the AMI Project will have on CORE's members. However, as CORE itself has recognized, Mr. Karow is not an expert in any scientific field relevant to this AMI Project. For this reason, the Panel gives no weight to Mr. Karow's evidence when considering whether or not electromagnetic radiation from the AMI Project will have harmful effects on CORE's members, or indeed on the public in general.

Notwithstanding his education and publishing record, the Panel considers Dr. Héroux's evidence to be more in the nature of advocacy of his position rather than a presentation of objective and scientific evidence. Dr. Héroux's lack of objectivity and rigour undermines his role as an objective and neutral scientist, and for this reason the Panel gives little weight to his evidence. Further, the Panel gives no weight to Dr. Héroux's opinion evidence on system security and information privacy, which are outside the scope of his expertise.

The Panel finds that Dr. Miller's review of radiofrequency research omits significant research since 2013 that reached conclusions he does not share, and therefore is overly selective. The Panel accepts Exponent's evidence of radiofrequency research, which we find to be more comprehensive and persuasive than the evidence of Dr. Miller. For the foregoing reasons, and notwithstanding his academic and extensive publishing record, the Panel gives limited weight to Dr. Miller's evidence. The Panel gives no weight to Dr. Miller's opinion evidence on liability for injuries, which is outside the scope of his education and expertise.

Dr. Havas' evidence largely concerns the subjects of physics, engineering and radiofrequency exposure, in which she has no academic training. The Panel acknowledges that she has teaching experience in the areas of "adverse biological & health effects of electromagnetic pollution" and has published peer-reviewed papers on these subjects. However, the Panel considers this inferior to relevant accreditation and specific training in the fields of physics, engineering and radiofrequency exposure. The Panel gives limited weight to Dr. Havas's factual and opinion evidence on physics, engineering and radiofrequency exposure.

¹⁰ CORE Final Argument, p. 17.

¹¹ Exhibit A-30, p. 9.

The Panel finds that the BCUC has the jurisdiction to assess whether radiofrequency emissions from FEI's proposed AMI technology pose a threat to the health of FEI's customers, notwithstanding that the proposed AMI technology is compliant with Health Canada's Safety Code 6.

The Panel finds that Health Canada's Safety Code 6 is applicable to the technology FEI proposes to use for the AMI Project. The Panel further finds that FEI's proposed AMI technology complies with Health Canada's Safety Code 6.

The Panel is not convinced by CORE's submission that Health Canada Safety Code 6 is not a valid or reliable measure of safe radiofrequency exposure limits. The Panel finds that the weight of scientific evidence gathered since 2013 continues to demonstrate that the radiofrequency exposure limits set out in Safety Code 6 are sufficient to protect FEI's customers. Moreover, we also find that CORE has not presented evidence to demonstrate that the radiofrequency exposure limits set out in Safety Code 6 fail to adequately protect the health of FEI's customers. The Panel is satisfied that Safety Code 6 is sufficiently conservative to address any risk to human health arising from exposure to radiofrequency, and it therefore encompasses the precautionary principle.

The Panel is not persuaded by Dr. Havas's criticism of Exponent's calculations in the RF Technology Report due to her lack of expertise in the areas of physics, engineering and radiofrequency exposure.

The Panel finds that FEI's public and Indigenous consultation for the AMI Project has been sufficient.

The Panel finds that the cost and rate impact of the AMI Project are reasonable. The levelized increase in rates of less than half of one percent over the analysis period is justified by the benefits of the AMI Project.

The Panel finds that the AMI Project is consistent with the following BC energy objectives as set out in the *Clean Energy Act* (CEA): to take demand-side measures and to conserve energy (section 2(b)), to use and foster the development in British Columbia of innovative technologies that support energy conservation and efficiency and the use of clean or renewable resources (section 2(d)), to reduce B.C. greenhouse gas emissions (section 2(g)) and to encourage communities to use energy efficiently (section 2(i)).

The Panel disagrees with FEI that the AMI Project is consistent with section 2(k) of the CEA, to encourage economic development and the creation and retention of jobs (section 2(k) of the CEA), as it will eliminate 150 meter reading jobs. The Panel has reviewed the remaining BC energy objectives and finds that they are not relevant to the AMI Project or that the Project is not inconsistent with them.

The Panel further finds that the AMI Project is consistent with provincial government policy, as expressed in the CleanBC Plan, because FEI's proposed AMI meters provide detailed usage data which can enhance energy efficiency programs and help customers to better manage their gas consumption, and substantially eliminate manual meter reading thereby avoiding GHG emissions associated with meter reading vehicles.

The Panel finds that the AMI Project is consistent with FEI's most recently filed long term resource plan, the 2022 Long Term Gas Resource Plan.¹²

¹² FEI 2022 Long Term Gas Resource Plan, p. 3-1.

The Panel finds that the public convenience and necessity require the construction and operation of FEI's AMI Project. The Panel grants a CPCN to FEI for the AMI Project pursuant to sections 45 and 46 of the UCA.

The Panel makes various directives to FEI with regards to reporting related to the AMI Project.

The Panel approves FEI's request to create four new asset accounts with associated depreciation and net salvage rates. The estimated asset life of 20 years for the meter hardware and installation is reasonable because it is based on the manufacturer's estimate and is uncontested in the proceeding. The Panel also accepts the depreciation rates for software and "communication and equipment" being the same as previously approved by the BCUC for FortisBC Inc.'s (FBC) advanced meter infrastructure.

The Panel approves FEI's request to create the following deferral accounts:

- The AMI Application and Feasibility Cost deferral account, attracting a weighted average cost of capital (WACC) return until it is placed into rate base, to capture development and application costs for the AMI Project, with an amortization period of three years once the balance in the account is transferred to rate base.
- The AMI FX Mark to Market deferral account to capture the mark-to-market valuation of any foreign currency risk mitigation contracts related to the AMI Project, attracting no financing return. The Panel finds that the AMI FX Mark to Market deferral account is an appropriate regulatory approach for FEI to manage any foreign currency risk mitigation contracts related to the AMI Project, and notes that the deferral account will not result in any incremental costs or revenue requirement impacts.
- The Existing Meter Cost Recovery deferral account to capture the remaining rate base value of meters to be exchanged as part of the AMI Project with a rolling amortization period of five years. The Panel is satisfied that five years is a sufficiently short period not to burden future ratepayers with costs for which they receive no benefit. The Panel also notes that this is the amortization period approved by the BCUC in Order C-7-13¹³ for analogous costs incurred by FBC.
- The Previously Retired Meter Cost Recovery deferral account to capture the remaining rate base value of previously retired meters, to be amortized over five years. The Panel is satisfied that five years is a sufficiently short period not to burden future ratepayers with costs for which they receive no benefit.

The Panel rejects CORE's request to add conditions to the CPCN for the AMI Project. CORE's requested conditions are not required because the weight of scientific evidence continues to demonstrate that the AMI Project poses no health dangers to FEI's customers.

The Panel acknowledges the need for caution expressed by BCOAPO, but takes no position on the future of the natural gas system in BC. There is no evidence in this proceeding to suggest that the AMI Project will cease to be used and useful within the projected 20-year life of its assets.

¹³ Decision and Order C-7-13 dated July 23, 2013 - FortisBC Ind. Application for a Certificate of Public convenience and Necessity for the Advancement Metering Infrastructure Project.

1.0 Introduction

On May 5, 2021, FortisBC Energy Inc. (FEI) filed an application with the British Columbia Utilities Commission (BCUC) for a Certificate of Public Convenience and Necessity (CPCN) pursuant to sections 45 and 46 of the *Utilities Commission Act* (UCA) for the Advanced Metering Infrastructure (AMI) Project (AMI Project or the Project¹⁴ (the Application).

FEI is a wholly-owned subsidiary of FortisBC Holdings Inc., which in turn is a wholly-owned subsidiary of Fortis Inc. As the largest natural gas distribution utility in British Columbia, FEI provides sales and transportation services to more than one million residential, commercial, and industrial customers in more than 100 communities throughout British Columbia. FEI's distribution network delivers natural and renewable gases to more than 80 percent of the gas customers in the province.¹⁵

According to FEI, the AMI Project is needed to automate the meter reading process for all gas customers. FEI states the current meter reading process is highly manual, vulnerable to errors and inconvenient for customers. Further, the meter reading industry is moving to automation, leading to changes in market conditions and customer expectations. In addition to improvements in accuracy and customer convenience, automated meter reading will avoid cost risks of manual reads and provides a cost-effective, long-term solution.¹⁶

The AMI Project will replace most existing customer meters with advanced meters, retrofit those meters that are not replaced with AMI communication modules, and install the associated AMI network and infrastructure to support delivery to FEI of hourly gas consumption and other metering information from the advanced meters and other communication modules at customer premises. The Project will also include the installation of communication modules on infrastructure and pipeline assets enabling the remote collection of information related to the integrity of FEI's gas system.¹⁷ The Project capital cost is estimated to be \$752.5 million¹⁸ with an estimated incremental 26-year levelized delivery rate impact of 0.442 percent.¹⁹

1.1 Approvals Sought

FEI seeks approval of a CPCN for its AMI Project, pursuant to sections 45 and 46 of the UCA. The AMI Project includes the following:²⁰

- Installation of approximately 1,100,000 residential, commercial, and industrial Sensus Sonix IQ advanced gas meters and meter retrofits of communication modules capable of remote gas consumption measurement;
- Installation of approximately 1,100 communication modules on the gas network to increase operational awareness of the gas system state; and

¹⁴ Exhibit B-1, p. 1.

¹⁵ Ibid., p. 12.

¹⁶ Ibid, p. 1.

¹⁷ Ibid.

¹⁸ Exhibit B-30, Appendix A, p. 98.

¹⁹ Exhibit B-30, Appendix A, pp. 116-117.

²⁰ Exhibit B-1, p. 70.

- Installation of the AMI network and infrastructure to communicate with customer meters and other communication modules on the FEI gas network.

A fulsome description of the technologies FEI proposes to install under the AMI Project can be found in Section 4.3 of this Decision.

FEI also requests approval, pursuant to sections 59 to 61 of the UCA, to create four new asset accounts with associated depreciation and net salvage rates for the proposed meters to be installed as part of the AMI Project, as follows:²¹

- 478-10 / AMI Meter Hardware, with a depreciation rate set to 5 percent, with no net salvage;
- 474-00 / AMI Meter Installation, with a depreciation rate set to 5 percent, with 1.58 percent net salvage;
- 402-06 / AMI Software, with a depreciation rate set to 10 percent; and
- 488-30 / AMI Communications and Equipment, with a depreciation rate set to 6.67 percent, with no net salvage.

FEI also seeks approval, pursuant to sections 59 to 61 of the UCA, to create four new deferral accounts as follows:²²

- A non rate base AMI Application and Feasibility cost deferral account attracting a weighted average cost of capital (WACC) return until it is placed into rate base, to capture development and application costs for the AMI Project, to be amortized over 3 years;
- A non rate base AMI Foreign Exchange (FX) Mark to Market Valuation deferral account to isolate the impact of any foreign exchange hedging used to reduce foreign exchange risk of the AMI Project;
- A rate base Existing Meter Cost Recovery deferral account to capture the remaining costs of the meters to be exchanged as part of the AMI Project with a rolling 5-year amortization period; and
- A rate base Previously Retired Meter Cost Recovery deferral account to capture the remaining rate base value of previously retired meters with an amortization period of 10 years.

1.2 Regulatory Process

The following parties registered as interveners in this proceeding:

- British Columbia Old Age Pensioners' Organization et al. (BCOAPO);
- BC Sustainable Energy Association (BCSEA);
- Commercial Energy Consumers Association of British Columbia (the CEC);
- The Institute for Catastrophic Loss Reduction (ICLR);
- Residential Consumer Intervener Association (RCIA);
- The Coalition for the Reduction of Electropollution (CORE), joined with the individual interveners:

²¹ Ibid, p. 9.

²² Ibid.

- Mr. and Ms. Jacob Arie and Lydia Stella de Raadt, Mr. Marcus Schluschen, and Ms. Sharon Noble;²³
- Mr. David Balfour; and
- Mr. Curtis Bennett.

CORE in its request to intervene, stated its key concern is the harmful effects of electromagnetic radiation. CORE listed the following key issues it intends to address in the proceeding:

- Harmful biological effects associated with electromagnetic microwave radiation;
- Economical feasibility of the switch- over from analog to smart meters; and
- Legal issues due to electromagnetic radiation trespass, bodily assault, etc., without consent.²⁴

Mr. and Ms. de Raadt in their request to intervene explained their personal connection with electromagnetic hypersensitivity. Mr. and Ms. de Raadt listed the following key issues they intended to address in the proceeding:

- The harmful biological effects associated with electromagnetic microwave radiation, on people, fauna and flora;
- The lack of long-term economic benefits associated with replacing perfectly operating analog meters with brand new smart meters;
- Concern with the potential for fires caused by smart meters;
- The lack of support for a Canadian manufacturer of smart meters, and if not, US or Mexican manufacturers; and
- Concern with the disposition of meter reader positions.²⁵

Mr. Schluschen in his request to intervene explained his concerns with electromagnetic radiation and radiofrequency. Mr. Schluschen listed the following key issues he intended to address in the proceeding:

- Public safety, and lack of adequate safety testing;
- Reliance on scientifically outdated information; and
- Involuntary radiation exposure.²⁶

Ms. Noble in her request to intervene explained concern for her health and that of her family. Ms. Noble listed the following key issues she intended to address in the proceeding:

²³ Exhibit C7-11, p. 4.

²⁴ Exhibit C7-1.

²⁵ Exhibit C10-1.

²⁶ Exhibit C9-1.

- Microwave radiation emitted by the Sonix IQ meter;
- Potential fire risk of having a lithium battery on a gas meter; and
- Costs, recurring and unnecessary.²⁷

Sixteen individuals registered as interested parties. The BCUC received eleven letters of comment.

The BCUC established regulatory timetables for the review of the Application, which included:²⁸

- Public notice and intervener registration;
- Two rounds of BCUC and intervener information requests (IRs);
- Numerous extension requests from parties;²⁹
- A procedural conference;
- Submission of intervener evidence followed by BCUC, FEI and intervener IRs;
- Submission of FEI rebuttal evidence followed by BCUC and intervener IRs;
- Submission of an evidentiary update from FEI followed by BCUC and intervener IRs;
- Submissions on the need for an oral hearing;
- Submissions on further process; and
- Final and reply arguments.

In accordance with a regulatory timetable set by the BCUC, CORE submitted its proposed scope of intervener evidence on March 3, 2022.³⁰ The BCUC held a procedural conference to discuss, among other things, the scope of intervener evidence.

On March 31, 2022, the BCUC issued its decision on the scope of intervener evidence. The BCUC:³¹

- Found that the proposed evidence from CORE's three named experts, Drs. Paul Héroux, Magda Havas and Anthony Miller, was within the scope the Panel approved for CORE's intervention in this proceeding; and
- Accepted CORE's request to submit the non-expert evidence of Mr. Hans Karow.

On April 14, 2022, CORE filed its evidence.³² On June 23, 2022, FEI filed its rebuttal evidence, including the

²⁷ Exhibit C6-1.

²⁸ Orders: G-204-21, dated July 6, 2021; G-269-21, dated September 13, 2021; G-302-21, dated October 21, 2021; G-323-21, dated November 8, 2021; G-365-21, dated December 9, 2021; G-389-21, dated December 22, 2021; G-81-22, dated March 17, 2022; G-92-22, dated March 31, 2022; G-95-22, dated April 6, 2022; G-180-22 dated July 4, 2022; G-206-22 with Reasons for Decision dated July 22, 2022; and G-259-22A with Reasons for Decision dated September 16, 2022.

²⁹ RCIA request for extension: Exhibit C1-3; BCOAPO request for extension: Exhibit C3-15; the CEC request for extension: Exhibit C4-2; CORE requests for extension: Exhibit C7-2, C7-4, C7-5, C7-7.

³⁰ Exhibit C7-11.

³¹ Order G-92-22 with Reasons for Decision dated March 31, 2022, Order G-92-22, pp. 9, 12.

³² Exhibits C7-12, C7-12-1.

rebuttal evidence of its expert, Exponent, on behalf of FEI.³³

On September 1, 2022, ICLR filed a letter with the BCUC sharing concerns regarding FEI's responses to ICLR's IRs, to which FEI replied on September 13, 2022. In addition to making general submissions on the evidence in this proceeding, ICLR claims that FEI "makes several contradictory and non-responsive statements" in response to ICLR's IRs and that FEI has "failed to respond" to ICLR's "fundamental question."³⁴

In response, the BCUC found ICLR has not acted in a manner consistent with the BCUC's expectation that it participate actively in the proceeding, explaining that ICLR had sufficient opportunity to review FEI's responses and raise its concerns about FEI's alleged non-responsiveness to its IRs, but has not done so. The Panel denied ICLR's request to hire an objective third party to fairly determine if and where meters equipped with a seismically actuated shut-off device should be deployed as part of FEI's AMI Project. ICLR could have hired an expert in the proceeding to submit intervenor evidence but did not.³⁵

1.2.1 Reconsideration Proceeding

On November 12, 2021, CORE submitted an application for reconsideration (Reconsideration Request) of the Panel's decision (Denial Decision) in the FEI AMI CPCN proceeding to deny CORE's request for an extension to the regulatory timetable to allow for the five additional weeks of intervenor registration and repeat, over four weekly intervals, public notice issued in the newspapers in the Penticton area.³⁶ CORE submitted that the BCUC made an error of fact or law in its Denial Decision and requested the following relief:³⁷

- An Order staying the operation of the Original Decision, pursuant to the BCUC's Rules of Practice and Procedure, Rule 27.02, pending the BCUC's determination of the Reconsideration Application;
- An Order requiring FEI to publish the Public Notice in the FEI AMI CPCN proceeding again in four weekly intervals across all news publications identified in Appendix E to the Reconsideration Application;
- An Order granting an extension to the FEI AMI CPCN proceeding regulatory timetable for a period of five weeks from the date of the Order to allow further intervenor registration;
- An Order requiring FEI to conduct community information sessions in the areas where the FEI AMI CPCN proceeding Public Notice was published; and
- An Order requiring FEI to publish the FEI AMI CPCN proceeding Public Notice in the footer section of the bills provided to its customers.

The BCUC denied CORE's request for a stay of the current proceeding and established a public hearing and regulatory timetable for the review of the Reconsideration Request.³⁸ BCSEA and RCIA submitted responses to CORE's Reconsideration Request. CORE submitted a reply. The BCUC reviewed the evidence and submissions and confirmed the Denial Decision.³⁹

³³ Exhibit B-26.

³⁴ Exhibit C12-3.

³⁵ Exhibit A-39.

³⁶ Exhibit A-14.

³⁷ Exhibit B-1, CORE Reconsideration of BCUC Exhibit A-14 in the FEI CPCN for the AMI proceeding, pp. 1,7.

³⁸ Order G-359-21 with Reasons for Decision dated December 6, 2021.

³⁹ Order G-66-22 with Reasons for Decision dated March 8, 2022.

1.3 Legal and Regulatory Framework

Sections 45 and 46 of the UCA set out the legislative framework for the BCUC review of CPCN applications. Section 45(1) of the UCA states that except as otherwise provided, after September 11, 1980, a person must not begin the construction or operation of a public utility plant or system, or an extension of either, without first obtaining from the BCUC a certificate that public convenience and necessity require, or will require, the construction or operation of the plant or system.⁴⁰

Section 46(3) states that the BCUC may issue or refuse to issue a CPCN or may issue a CPCN for the construction or operation of only a part of the proposed facility, line, plant, system or extension, and may attach terms and conditions to the CPCN.

Section 46 (3.1) of the UCA requires that the BCUC consider the following in determining whether to issue a CPCN:

- a) the applicability of British Columbia's energy objectives,⁴¹
- b) the most recent long-term resource plan filed by the public utility under section 44.1, if any, and
- c) the extent to which the application for the CPCN is consistent with the applicable requirements under sections 6 and 19 of the *Clean Energy Act* (CEA).

The BCUC has jurisdiction to approve the establishment of deferral accounts, pursuant to sections 59 to 61 of the UCA. The BCUC has the jurisdiction to set adequate rates of depreciation, pursuant to section 56 of the UCA.

The BCUC has jurisdiction regarding safety under sections 23, 25 and 38 of the UCA.

Section 23(1) of the UCA states, "The commission has general supervision of all public utilities and may make orders about (g) other matters it considers necessary or advisable for (i) the safety, convenience or service of the public."

Section 25 of the UCA states, "If the commission, after a hearing held on its own motion or on complaint, finds that the service of a public utility is unreasonable, unsafe, inadequate or unreasonably discriminatory, the commission must (a) determine what is reasonable, safe, adequate and fair service, and (b) order the utility to provide it."

Section 38 of the UCA states, "A public utility must (a) provide, and (b) maintain its property and equipment in a condition to enable it to provide, a service to the public that the commission considers is in all respects adequate, safe, efficient, just and reasonable."

The BCUC's CPCN Guidelines provide general guidance regarding the information that should be included in a CPCN application and the flexibility for an application to reflect the specific circumstances of the applicant, the size and nature of the project and the issues raised by the application.⁴²

⁴⁰ *Utilities Commission Act*, RSBC 1996, c. 473, Section 45(1).

⁴¹ BC's energy objectives are defined in section 2 of the *Clean Energy Act*.

⁴² [Order G-20-15, 2015 Certificate of Public Convenience and Necessity Application Guidelines.](#)

Section 17(6) of the CEA states, “If a public utility, other than the authority, makes an application under the Utilities Commission Act in relation to smart meters, other advanced meters or a smart grid, the commission, in considering the application, must consider the government's goal of having smart meters, other advanced meters and a smart grid in use with respect to customers other than those of the authority.”

1.4 Decision Framework

The structure of this Decision largely follows that of the CPCN Application and the BCUC’s CPCN Guidelines. Relevant evidence submitted by FEI and interveners is summarized in each section.

Section 2.0 addresses the Project need and its justification.

Section 3.0 discusses the alternatives that FEI considered that are capable of meeting the Project needs. This section also describes the Project alternatives evaluation and selection of the preferred alternative for the Project.

Section 4.0 describes the scope of the Project, including intervenor issues of voluntary opt-out, security and privacy concerns and automated seismic shut-off valves.

Section 5.0 addresses the issue of radiofrequency emissions (RF) and health impacts, as well as the relevant standard governing radiofrequency emissions in Canada.

Section 6.0 describes FEI’s consultation and engagement activities.

Section 7.0 outlines Project costing, accounting, and rate impact.

Section 8.0 addresses the alignment of the Project with provincial energy objectives and FEI’s internal long-term resource planning.

The Panel’s overall CPCN determinations are provided in Section 9.0, as well as the Panel directives relating to detailed reporting requirements for the Project as set out in Appendix B to this Decision.

Other matters arising are described in Section 10.0, including accounting treatment of capital costs, deferral accounts requested by FEI, CORE’s proposed conditions to granting of the CPCN and the future of the gas system.

2.0 Project Need and Justification

FEI states that the need for the Project is to automate the existing manual meter reading process (referred to throughout the Application as Automation). FEI defines Automation as “the ability to communicate with the meters at customer premises to collect gas consumption readings, alarms, and other diagnostic information.”⁴³ FEI states it views Automation of the metering reading process as “a need in and of itself.”⁴⁴

FEI submits that Automation, via the proposed AMI Project, provides “a more accurate and more convenient process for customers and a stable, cost-effective meter reading solution for the long term.” AMI also provides access to more timely information, which will improve safety and system resiliency, as well as empower customers to make informed energy decisions, enhance their energy conservation efforts, and have more control over their energy costs.⁴⁵

The Application discusses the four Project drivers that justify FEI’s selection of AMI over the alternatives:⁴⁶

1. Provide a more accurate and convenient billing processes for customers;
2. Reduce the cost and service risks of manual meter reading;
3. Provide a cost-effective, long-term metering solution; and
4. Provide additional customer benefits related to energy conservation as well as operational opportunities that support the safety and resiliency of the gas distribution system.

FEI argues its stated Project drivers can alternatively be considered “subsidiary Project needs.”⁴⁷ However, FEI also describes these drivers as reflecting “benefits of the Project, in satisfying the identified project need.”⁴⁸

FEI asserts that continuing to read meters manually for an indeterminate period would delay Automation but would not remove the need for it.⁴⁹ Further, FEI notes that the longer FEI waits to Automate, “the more vulnerable FEI and its customers are in respect of the ability to have access to continuous manual meter reading at a competitive market price, while also continuing to face service risks.”⁵⁰

2.1 Project Driver 1 - Billing Accuracy and Customer Convenience

FEI states that there are limitations and challenges associated with manual meter reading including: a higher level of estimated bills resulting in bill inaccuracies and customer experience challenges; and regular access to customer premises that can be inconvenient for customers and result in complaints and dissatisfaction. FEI states providing a more accurate and convenient billing process for customers is a driver of the Project.⁵¹

⁴³ Exhibit B-1, p. 14.

⁴⁴ Exhibit B-13, RCIA IR 2.1.

⁴⁵ Exhibit B-1, p. 14.

⁴⁶ Ibid.

⁴⁷ FEI Reply Argument, p. 3.

⁴⁸ Ibid., p. 4.

⁴⁹ Ibid., p. 13.

⁵⁰ Ibid., p. 13.

⁵¹ Exhibit B-1, p. 26.

FEI outsources manual meter reading of its 1,037,652 small residential and 25,888 large commercial manually read meters to Olameter Inc. (Olameter).⁵² Between 2016 and 2020 there were approximately 12 to 12.8 million manual meter reads a year.⁵³ Although FEI does not separately track meter reading-related customer contacts, it estimates that there are approximately 2,800 interactions via telephone, email and chat requests related to meter reading.⁵⁴

FEI states the current method of manual transcription of meter data is prone to human error. Although the meter reading devices do provide a reasonability check on the input data, to protect against some errors, inaccurate inputs are still possible. When meter reads are entered incorrectly, the customer's bill will be inaccurate and will remain so until an accurate read is obtained.⁵⁵ When a meter cannot be read, an estimate is used instead. The percentage of estimated reads between 2016 and 2019 ranged between 3.1 percent and 4.8 percent and peaked at 10.85 percent in 2020. FEI explains that in 2020, 30.15 percent of the estimated meter reads were as a result of COVID-19 exposure risk.⁵⁶

FEI estimates that automation of the meter reading process would improve the accuracy of approximately 260,000 to 390,000 bills each year, resulting in an improved experience for many customers. With respect to estimated bills, FEI suggests that manual meter reading was responsible for approximately 9 percent more estimated bills in 2020 than would have been the case under an automated process.⁵⁷

FEI states that inaccurate bills and estimated bills both negatively impact customer experience and result in additional processes, as well as customer confusion and dissatisfaction, and potential payment issues. Customer complaints associated with manual meter reading activities averaged over 500 complaints per year for the five-year period 2016 through 2020. FEI states that, while this number may not be indicative of the overall customer perception or satisfaction with manual meter reading, it does "highlight that customers formally raise a consistent level of concern each year with the manual reading process."⁵⁸

While FEI has not conducted a study specifically addressing the extent to which its customers are dissatisfied with meter readers accessing their property to perform manual meter reads,⁵⁹ FEI has identified that the customer experience may be impacted by the requirement for approximately 8,000 of its customers to provide spare keys or entry codes to FEI for access to the meter on their property⁶⁰ and the testing and exchange process for residential diaphragm meters required by Measurement Canada.⁶¹ FEI estimates the diaphragm meter testing and exchange process impacts approximately 60,000 FEI customers on average per year.⁶²

⁵² Exhibit B-1, p. 15, Table 3-1.

⁵³ Ibid, p. 23, Table 3-4.

⁵⁴ Ibid, p. 23.

⁵⁵ Ibid, p. 22.

⁵⁶ Ibid, p. 23, Table 3-4, Table 3-5.

⁵⁷ FEI Final Argument, p. 14.

⁵⁸ Exhibit B-1, p. 25.

⁵⁹ Exhibit B-6, BCUC IR 5 and 7 series.

⁶⁰ Exhibit B-1, pp. 24-25.

⁶¹ Ibid, p.17.

⁶² Ibid, p.18; Per section 19 of the *Electricity and Gas Inspection Act*, Measurement Canada Regulation S-S-06 requires testing of diaphragm meters.

Positions of the Interveners

BCSEA accepts FEI's evidence that, with over twelve million reads per year, the current manual approach to meter reading involves significant customer service issues, including access to customer premises and estimated and inaccurate billing.⁶³

RCIA argues that inaccurate billings affect customers differently. Billing discrepancies are usually corrected the following month, when an accurate meter reading is obtained, and may go unnoticed by some customers, especially if they have automatic bill payments arranged through their bank, or are on the Equal Payment Plan. RCIA notes that 29 percent of FEI's residential customers are on the Equal Payment Plan, and are, therefore, unlikely to notice an inaccurate meter reading because their bill amounts are fixed for the majority of the year.⁶⁴

FEI disagrees with RCIA's suggestion that customers using automatic bill payments through their banks would not be impacted by billing inaccuracies. FEI argues that automatic payment of an inaccurate amount due to manual meter reading issues, for example, "could result in the customer having less funds than expected in a bank account than the customer requires to pay other monthly bills."⁶⁵

RCIA recognizes that financially vulnerable customers, who are unable to pay their monthly bill due to an inaccurate meter reading, may face financial hardship, even if the inaccuracy is reversed the following month when an accurate reading is obtained.⁶⁶

In reply, FEI states that financial hardship for financially vulnerable customers is exactly one of the circumstances that AMI would improve, as it would eliminate billing estimates and inaccuracies due to human error from meter readers.⁶⁷

RCIA submits that the number of customer complaints FEI receives related to meter reading activities (500 per year on 12 million reads) is too low to be a significant driver for the AMI Project.⁶⁸

FEI does not agree that the number of formal complaints it receives related to manual meter reading activities is indicative of overall customer perception or satisfaction with manual meter reading.⁶⁹ Rather, FEI asserts that the high number of customer interactions at its contact centre that involve meter-reading inquiries (estimated at approximately 2,800 per month) suggests a material level of customer issues or concerns related to manual meter reading.⁷⁰

2.2 Project Drivers 2 and 3 – Cost and Service Risks of Manual Meter Reading

FEI states that its current manual meter-reading operations face long-term cost and service risks due to the industry trend towards Automation.⁷¹ In addition, FEI states that one of its commitments to its customers is to

⁶³ BCSEA Final Argument, p. 9.

⁶⁴ RCIA Final Argument, pp. 9-10.

⁶⁵ FEI Reply Argument, p. 6.

⁶⁶ RCIA Final Argument, p. 9.

⁶⁷ FEI Reply Argument, p. 6.

⁶⁸ RCIA Final Argument, p. 10.

⁶⁹ FEI Reply Argument, p. 6.

⁷⁰ FEI Reply Argument, pp. 6-7.

⁷¹ Exhibit B-1, p. 31.

deliver energy safely and reliably for the lowest reasonable cost and meter reading plays an important role in FEI's ability to provide that service.⁷² Further information on the cost of the Project is provided in Section 7 and the cost of the alternatives in Section 3.3.5 of this Decision.

FEI states it has experienced increased costs for diaphragm meters of approximately 26 percent for residential meters and six percent for commercial meters between 2020 and 2022.⁷³ In FEI's recent experience, diaphragm meter delivery timelines required for operating the utility cannot be met. Late 2021 and 2022 delivery lead times increased from the typical 12 to 16 weeks to more than 36 weeks.⁷⁴ FEI states vendors have been switching their business models even more quickly than expected from diaphragm to ultrasonic meters.⁷⁵

FEI explains that one of the three vendors of diaphragm meters, Itron, provided notice that it was ending the manufacture of all diaphragm meters, effective 2021, to focus its efforts on manufacturing and marketing ultrasonic gas meters.⁷⁶ FEI submits its expectation is that new market participants for diaphragm meters are unlikely to materialize and, as such, the absence of Itron as a supplier in the diaphragm meter marketplace is expected to result in an increase in the unit price and an overall decrease in the supply available.⁷⁷

FEI's position is that the current practice of outsourcing manual meter reading will not be sustainable in the long-term. FEI's manual meter reading contract with Olameter 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, 2026.⁷⁸ FEI's expectation is that if a third-party vendor is still available in 2026, the costs will continue to grow and will approach the cost of providing the service in-house.⁷⁹ FEI states that, starting in 2022, inflationary increases are embedded in the Olameter contract pricing until the end of 2026. Beyond that, FEI states that the cost of manual meter reading by an external vendor is unknown, as is the availability of such vendors.⁸⁰ FEI confirms that it "has not had discussions with Olameter regarding its interest in bidding on future manual meter reading contracts."⁸¹ FEI states it is not aware of another manual meter reading service provider, other than Olameter, able to provide meter reading service on the scale FEI requires.⁸²

FEI considers repatriation of the meter reading function to be the only manual meter reading solution that could be viable in the long term, which would be more costly than the current outsourced model.⁸³ FEI also states that due to the nature of the work, meter readers are difficult to retain. FEI adds that staff recruitment is challenging, and new meter readers are initially less efficient than those they replace.⁸⁴

FEI submits its current manual meter-reading operations face the real risk of increased long-term costs due to the industry trends towards Automation, impacting suppliers of products and services that support manual

⁷² Exhibit B-20, RCIA IR 49.3.

⁷³ Exhibit B-30, p. 5.

⁷⁴ Exhibit B-13, RCIA IR 10.2.

⁷⁵ Exhibit B-30, p. 5.

⁷⁶ Exhibit B-1, p. 33.

⁷⁷ FEI Final Argument, pp. 15-16.

⁷⁸ Exhibit B-1, p. 19.

⁷⁹ Ibid, p. 35.

⁸⁰ Exhibit B-13, RCIA IR 10.1.

⁸¹ Ibid, RCIA IR1 6.2.

⁸² Exhibit B-1, p. 35.

⁸³ Ibid, p. 35.

⁸⁴ Ibid, p. 32.

meter reading.⁸⁵ FEI submits that the viability of contracted meter reading services in the future is uncertain, in terms of both cost and availability, resulting in a material risk that the current practice of outsourcing manual meter reading will be unsustainable in the long term.⁸⁶

Positions of the Interveners

BCSEA agrees with FEI that manual meter reading and traditional mechanical diaphragm meters are becoming outdated and that an “automation” solution is required. BCSEA submits that FEI’s response to why the AMI Project is needed now is persuasive, given the increasing material and metering costs, among other things.⁸⁷

The CEC submits that “the risks related to meter reading and meter supply are significant, and should be weighed heavily by the [BCUC] in its determination regarding the benefits of the AMI solution.”⁸⁸

On the other hand, RCIA questions whether there will be an issue with availability of diaphragm meters in the future considering that several other utilities continue to “use millions of diaphragm meters.”⁸⁹

Similarly, BCOAPO argues that “FEI has not adequately supported its statement that ‘the absence of Itron as a supplier in the diaphragm meter market place is expected to result in an increase in the unit price and overall decrease in the supply available.’” BCOAPO points out that two manufacturers continue to supply diaphragm meters and have not indicated an intention to exit the market.⁹⁰

FEI submits that RCIA and BCOAPO’s submissions about future market conditions for diaphragm meters appear to be based on “hopeful thinking.” FEI reiterates that availability and cost issues mean that diaphragm meter technology is “trending towards obsolescence” and the current meter reading process is potentially non-viable for this reason alone.⁹¹

RCIA submits that FEI’s concerns about the availability and costs of manual meter reading in the future are speculative. RCIA questions whether FEI has provided sufficient evidence that it or other utilities have experienced meter reading service availability issues. RCIA also points out that Olameter has not indicated to FEI that it intends to terminate the contract early or that it would not be interested in bidding on future manual meter reading contracts beyond 2026. In RCIA’s view, the risks of the unavailability of contracted meter reading are overstated by FEI.⁹²

BCOAPO submits that FEI has not provided evidence that Olameter would not be amenable to renegotiating their contract nor has it provided evidence as to why another provider could not be contracted to supply meter reading services.⁹³

⁸⁵ FEI Final Argument, p. 15.

⁸⁶ FEI Final Argument, p. 16.

⁸⁷ BCSEA Final Argument, pp. 8-9.

⁸⁸ CEC Final Argument, p. 15.

⁸⁹ RCIA Final Argument, p. 16.

⁹⁰ BCOAPO Final Argument, p. 10.

⁹¹ FEI Reply Argument, p. 14.

⁹² RCIA Final Argument, p. 30.

⁹³ BCOAPO Final Argument, pp. 10-11.

In reply, FEI states it “does not predict that there will be no third-party meter reading contractors to provide services beyond the expiry of Olameter’s contract in 2026; rather, the Application states FEI’s belief that viability of contracted meter reading services in the future is uncertain in terms of both cost and availability.”⁹⁴

2.3 Project Driver 4 – Customer Expectations, Energy Consumption, Safety and Resiliency

FEI states that Automation provides transformational change, creating future opportunities for customer experience enhancements and operational opportunities to support the safety, resiliency and efficient operation of the gas distribution system.⁹⁵ Each of these topics is explored in the subsections below.

2.3.1 Customer Expectations

FEI states that Automation provides the opportunity to meet current and evolving customer expectations around details of customers’ energy use. Research conducted by Akendi 2017-2019, on behalf of FEI and FBC (collectively FortisBC), to explore customer expectations for their utility bill indicated the importance of detailed consumption information as a key customer priority. Further, in a recent poll of FortisBC’s MyVoice customer panel, approximately 75 percent of respondents rate having comprehensive online information about home energy use as very important.⁹⁶

FEI states that an example of increased customer empowerment is the capability of a customer to adapt their behaviour in response to their own daily and weekly consumption patterns and see results of behavioural changes in their bill. Under the current meter reading process, customers have access to usage and consumption data on a per month basis.⁹⁷ Without Automation, FEI customers are unable to see their daily gas consumption information.⁹⁸ Noting FBC previously implemented AMI on its electric system, FEI provides data from the FortisBC customer web site in 2020 specific to views of energy use. FEI states that although FBC customers only represent 15 percent of the total use of the customer portal web site, they represent 30 percent of page views related to consumption information, from which FEI concludes that detailed energy use information is important to customers.⁹⁹

A summary of a customer survey conducted by FEI in 2019¹⁰⁰ provided insight into customer attitudes of the perceived benefits and drawbacks of a gas AMI system:

Survey results showed that 65 percent of residential customers and 60 percent of small commercial customers responded that the “Ability to access more accurate, daily updates to better understand and manage your gas use” was a “Very” or “Somewhat Useful” advanced meter feature.¹⁰¹

⁹⁴ FEI Reply Argument, p. 9.

⁹⁵ Exhibit B-1, p. 35.

⁹⁶ Ibid, p. 36. FEI states the MyVoice panel represents customers that are willing to participate in surveys and provide their feedback on various subjects from time to time. Results help inform and provide an indication of customers attitudes but are not considered statistically representative.

⁹⁷ FEI Final Argument, p. 17.

⁹⁸ Exhibit B-1, p. 36.

⁹⁹ Ibid, p. 37.

¹⁰⁰ Ibid., Appendix H-5 – Advanced Gas Meters Research.

¹⁰¹ Exhibit B-6, BCUC IR 7.1.

FEI notes that it has not analyzed or surveyed customer willingness to pay for additional benefits.¹⁰²

FEI submits that customers' expectations for service have changed over the last several years and it expects they will continue changing based on improvements, access to technology and experiences with other service providers.¹⁰³

Positions of the Interveners

BCSEA agrees with FEI that customers are increasingly frustrated with the limited information they have access to currently as a result of manual meters. BCSEA believes that "many customers want FEI to be able to implement enhancements such as targeted demand side management (DSM) opportunities and enhanced billing options."¹⁰⁴

In RCIA's view, providing customers with continuous consumption data online to assist them with their gas consumption and energy costs would have limited value to ratepayers. RCIA argues that information from FortisBC's online portal indicates that detailed consumption data would only be accessed by a small proportion of customers.¹⁰⁵

In reply, FEI submits that RCIA's analysis of the FortisBC portal usage is speculative and not based on appropriate assumptions. Regarding the proportion of online page views related to consumption information, FEI explains:

This higher proportion suggests that customers are interested in detailed energy usage information if it is available to them. This data is also consistent with the survey results showing 75 % of customers consider detailed usage information to be important and with anecdotal interactions with customers.¹⁰⁶

BCOAPO asserts that if FEI "has no plans for time of use billing, then BCOAPO submits that any capability greater than monthly billing is irrelevant."¹⁰⁷

In reply, FEI states that BCOAPO overlooks the many benefits of more detailed, hourly consumption data set out in the Application and FEI's Final Argument, such as enhanced billing options, targeted DSM opportunities and empowering customers to make informed energy choices.¹⁰⁸

2.3.2 Energy Consumption

FEI states that without Automation customers will find it increasingly challenging to make informed energy choices in support of long-term energy conservation goals.¹⁰⁹ FEI states:

¹⁰² Exhibit B-7-1, BCOAPO IR 6.1.

¹⁰³ FEI Final Argument, p. 16.

¹⁰⁴ BCSEA Final Argument, p. 10.

¹⁰⁵ RCIA Final Argument, p. 18.

¹⁰⁶ FEI Reply Argument, p. 22.

¹⁰⁷ BCOAPO Final Argument, pp. 11, 24.

¹⁰⁸ FEI Reply Argument, p. 23.

¹⁰⁹ Exhibit B-1, p. 41.

Automation also provides support for achieving energy conservation targets and objectives, ultimately creating potential for customer empowerment. That is, access to detailed energy information better enables customers to make informed energy choices, empowering them to participate in programs and seek options and, as a result, providing the opportunity to participate more fully in their energy choices now and in the future.¹¹⁰

FEI filed a report that it commissioned from Util-Assist Inc. to identify gas utility Automation projects across Canada and the United States (Util-Assist Report). The Util-Assist Report provides a broad overview of the evolving trends related to the transition to Automation by gas utilities within North America.¹¹¹ The Util-Assist Report identifies evidence of energy savings by Southern California Gas Company (SoCalGas). From 2013 to 2017, SoCalGas ran four advanced meter conservation campaigns using various methods and approaches to inform customers of their gas usage and test the effectiveness of the meters at encouraging energy savings. SoCalGas reported that these conservation campaigns produced an overall reduction in gas usage of 1.6 percent by the 2016-2017 fall/winter period. The table below is a summary of the SoCalGas gas conservation program results.¹¹²

**Percent Reduction in Fall/Winter 2016-2017 Gas Usage
for Residential Conservation Treatments**

Treatment	Percentage Reduction
11 New Treatments	1.74%
9 2015-2016 Treatments	1.42%
1 2014-2015 Treatment	1.31%
Overall % Reduction	1.60%

FEI states:

Improved consumption data will support natural gas conservation by providing consumers with actionable insight on their consumption further enabling the implementation of demand side measures to reduce consumption. Finally, reducing customer consumption of natural gas will contribute to lowering GHG [greenhouse gas] emissions in BC and is consistent with climate action plans...¹¹³

FEI argues that without detailed gas usage on a continuous basis through Automation customers will find it increasingly difficult to make informed energy choices to reduce energy consumption and implement energy conservation measures.¹¹⁴ FEI, however, acknowledges that realizing future energy DSM opportunities and enhanced billing options will not manifest without additional investment beyond the scope of the Project and would require development of a business case and future project.¹¹⁵

¹¹⁰ Exhibit B-1, p. 36.

¹¹¹ Exhibit B-1, p. 27; Appendix A.

¹¹² Exhibit B-1, Appendix A, p. 20.

¹¹³ Ibid., p. 140.

¹¹⁴ FEI Final Argument, p. 17.

¹¹⁵ Exhibit B-6, BCUC IR 8.1.

Positions of the Interveners

BCSEA believes that “many customers want FEI to be able to implement enhancements such as targeted demand side management (DSM) opportunities and enhanced billing options.”¹¹⁶

RCIA submits that FEI is unable to quantify the additional energy conservation that may arise from DSM programs enabled by Automation.¹¹⁷

In reply, FEI notes that the Util-Assist report does contain evidence of direct energy savings from Automation. FEI notes the Util-Assist report states “The SoCalGas conservation results are a useful benchmark in proving that [Automation] can enable reduction of natural gas usage just as it does electricity usage.”¹¹⁸

2.3.3 Safety and Resiliency

FEI states that, depending on the form of Automation, there are numerous safety and resiliency related improvement opportunities in the operation of the gas distribution system.¹¹⁹

FEI submits that Automation provides the opportunity to improve the resiliency of FEI’s gas system in the event of a gas supply emergency. FEI defines resiliency as the ability to prevent, withstand and recover from system failures or unforeseen events. A key element that contributes to natural gas system resiliency is load management capabilities, including the ability both to accurately assess actual loads and strategically reduce load.¹²⁰

FEI states improving system resiliency is a key need that Automation would support in three ways:¹²¹

- By allowing near real-time visibility of the load on the system;
- By providing FEI the ability to strategically disconnect gas remotely in an emergency situation; and
- By providing the ability to keep pressure in the system to minimize customer reconnection delays following a shut-down.

FEI’s proposed portfolio of solutions to enhance its system resiliency includes gas storage, increased pipeline supply and load control, the last of which could be supported by Automation.¹²² FEI currently has limited visibility of the overall load on the gas system, specifically regarding where the load is located. An understanding of the real-time behaviour of gas consumers and the direct response of the gas system would be used to support system design, improve utilization of peak resources and quantify DSM activities on peak demand.¹²³

In addition, customers on FEI’s interruptible rate schedules have meters that are connected to a wireless AMR device that provides FEI with consumption data once per day. FEI ensures interruptible customers comply with

¹¹⁶ BCSEA Final Argument, p. 10.

¹¹⁷ RCIA Final Argument, p. 19.

¹¹⁸ FEI Reply Argument, pp. 23-24.

¹¹⁹ Exhibit B-1, p. 56.

¹²⁰ Ibid, pp. 41, 59.

¹²¹ Ibid., p. 41.

¹²² Exhibit B-6, BCUC IR 1.3.

¹²³ Exhibit B-1, p. 60.

requests to adjust gas usage by monitoring consumption information. Real-time consumption information would allow FEI to quickly and accurately determine the current load on the system attributable to these customers and identify compliance concerns with requests to adjust usage.¹²⁴ FEI has no direct ability to remotely or automatically disconnect or curtail gas supply to customers. FEI can only curtail load in the following ways: by directing interruptible customers to disconnect; by making public appeals for usage reduction; and by shutting down major sections of the system with a single valve.¹²⁵

Regarding safety improvements, FEI states Automation will improve its ability to detect theft and improve its emergency response to gas odours and leaks.¹²⁶ FEI states advanced meters can detect large leaks downstream of the meter and be programmed to automatically shut off the internal valve, eliminating the potential for a hazardous situation. Further, smaller leaks could be detected based on unexpected consumption below the automatic shut off threshold. In these situations, FEI could alert customers and improve safety.¹²⁷

In its submissions, ICLR highlighted the safety issues associated with gas systems and meters in the event of an earthquake or seismic activity. ICLR states it believes that “the smart meter program provides a one-time opportunity to include an automatic seismic shut-off capability in the meters to significantly reduce the risk of fires following earthquakes in British Columbia.”¹²⁸

In the event of an extended gas supply emergency that requires a large section of the system to be shut down, FEI would be able to minimize restoration time for customers by executing a controlled shutdown. A controlled shutdown allows FEI to maintain pressure within the section of the system that has been shut down, avoiding a pressure collapse. By keeping the system pressurized, FEI would be able to minimize restoration time for customers by avoiding the need to purge the system of air prior to initiating customer reconnections.¹²⁹

Positions of the Interveners

The CEC submits that the expected Project benefits will “be significant, particularly those related to increased conservation opportunities, and operational improvements that support safety and resiliency of the natural gas network.”¹³⁰ The CEC submits that “the additional safety and resiliency benefits are very important in ensuring the safety and availability of energy for customers” and that “it is appropriate for the gas utility to employ modern technologies and methods to provide high levels of safety and resiliency to customers.”¹³¹

2.4 GHG Emissions Reductions

In addition to the four project drivers identified by FEI, the Panel also considers that a fifth factor, greenhouse gas (GHG) emissions reduction, is a relevant need for the AMI Project.

¹²⁴ Exhibit B-6, BCUC IR 1.6.1.

¹²⁵ Exhibit B-1, p. 59.

¹²⁶ Ibid., p.3; Appendix A, p.18.

¹²⁷ Exhibit B-1, p. 61.

¹²⁸ Exhibit C12-3, p.1.

¹²⁹ Exhibit B-1, p. 60.

¹³⁰ CEC Final Argument, p. 5.

¹³¹ Ibid, p. 17.

The provincial government released its CleanBC Plan, which aims to reduce climate pollution while strengthening BC's economy. Through consultation with the provincial government regarding the CleanBC Plan, FEI and FBC (together FortisBC) developed the FortisBC climate plan, the Clean Growth Pathway to 2050 (Clean Growth Pathway), which outlines FortisBC's vision for aligning with the BC government's goal to transition to a low carbon and renewable energy economy and address climate change solutions in a global context.¹³² FEI states it has set an interim target, 30BY30, to reduce its customer emissions by an amount equivalent to 30 percent by 2030.¹³³

The *Clean Energy Act* defines British Columbia's energy objectives, which include, among other things:¹³⁴

- (b) To take demand-side measures and to conserve energy.
- (d) To use and foster the development in British Columbia of innovative technologies that support energy conservation and efficiency and the use of clean or renewable resources.
- (g) To reduce B.C. greenhouse gas emissions.

FEI states the reduction of GHG emissions is a benefit of Automation.¹³⁵

In addition to the potential of reduced GHG emissions from a reduction in customer energy consumption detailed in Section 2.3.2 above, FEI provides details of its current GHG emissions related to manual meter reading. FEI states that there are approximately 150 meter readers working throughout the province on a daily basis, each driving an average of 35,000 km per year. FEI estimates that the resultant emissions generated are equivalent to 1,100 metric tonnes of carbon dioxide, or the same as heating approximately 250 homes for a year.¹³⁶ FEI submits advanced meters substantially eliminate manual meter reading, thus avoiding GHG emissions associated with meter reading vehicles.¹³⁷

2.5 Summary of Project Need and Justification

FEI submits that the need for Automation, and for the Project, is "compelling and well-established in the Application and other evidence filed in this proceeding."¹³⁸

BCSEA submits that the Project has "many important benefits, including customer access to detailed and timely consumption information, opportunities for DSM measures, GHG emissions reductions."¹³⁹ BCSEA adds that FEI's position that Automation is needed is "appropriate and reasonable."¹⁴⁰

¹³² Exhibit B-1, pp. 141-142.

¹³³ Exhibit B-1, p. 41.

¹³⁴ Ibid, pp. 139-140.

¹³⁵ Ibid, p. 41.

¹³⁶ Ibid, p. 20.

¹³⁷ FEI Final Argument, p. 72.

¹³⁸ Ibid, pp. 12-13.

¹³⁹ BCSEA Final Argument, p. 3.

¹⁴⁰ Ibid, p. 8.

The CEC agrees with FEI's position on the need for Automation and submits that it is "important for utilities that serve a million or more British Columbians to remain technologically up to date where there are proven benefits to doing so."¹⁴¹

RCIA disagrees that Automation is a need, but rather submits that the need FEI should address is reading meters "consistently, accurately, and at lowest cost." RCIA submits that FEI's claimed "project drivers" – customer convenience, stable long-term meter reading solution, collecting ancillary information and empowering customers – are "nice to have" and "not mission-critical" for FEI.¹⁴²

In reply, FEI disagrees with RCIA's view that reading meters consistently, accurately, and cost-effectively is an appropriate description of the Project need. FEI argues reading meters accurately and consistently is not something new the utility needs or requires, but is a basic component of a public utility's obligation to provide reasonable, safe, adequate and fair service under the UCA. A "need" would be an upgrade to or the construction of public utility plant or system that is required in order for the public utility to provide service to its ratepayers in accordance with this standard. FEI submits that "reading meters ... at lowest cost" is not a need, but an objective or a means of achieving the Project need.¹⁴³

BCOAPO submits that it is "at least arguable that some form of technological transformation, some form of automation, for FEI is appropriate going forward," but that FEI has "provided no calculations of the actual benefits" of the Project, nor has it conducted any "willingness to pay" studies, and that these omissions "negatively affect the Utility's case." BCOAPO submits that the evidence is "not sufficiently persuasive so as to justify approval in this case."¹⁴⁴

In reply, FEI submits that both RCIA and BCOAPO appear to accept that "a change to automate the current manual meter reading process is appropriate." FEI further submits that the submissions of RCIA and BCOAPO on the need for the Project are "effectively semantic in nature and distract from the real issue, which is whether there is a demonstrated need for the Project and whether a weighing and balancing of the benefits and costs" justify a CPCN. FEI submits that the Project "drivers" can alternatively be considered "subsidiary Project needs" and "clearly support the overarching Project need of Automation."¹⁴⁵

CORE did not comment on the Project need, drivers or benefits in its argument.¹⁴⁶

Panel Determination

The Panel does not consider that FEI has a need for Automation. Automation is a characteristic of the AMI Project, and of some, but not all, of FEI's possible alternatives. Automation is not, however, something that FEI needs to achieve in order to deliver safe and reliable service to its customers. If Automation itself were a need, as FEI asserts, then any non-automated alternative would be excluded from consideration, no matter how beneficial it might be. The onus is on FEI to justify whether its proposed investment in Automation is superior to

¹⁴¹ CEC Final Argument, p. 5.

¹⁴² RCIA Final Argument, p. 8.

¹⁴³ FEI Reply Argument, p. 4.

¹⁴⁴ BCOAPO Final Argument, pp. 13-14.

¹⁴⁵ FEI Reply Argument, pp. 2-3, 8.

¹⁴⁶ CORE Final Argument, p. 46.

manual or other automated alternatives; FEI cannot exclude an entire category of non-automated alternatives by defining Automation as a need.

That said, the Panel agrees with FEI that the distinction between needs, benefits or drivers is “effectively semantic in nature.”¹⁴⁷ The needs identified by the Panel below are all applicable to FEI’s meter reading function. No intervener disputes this, although RCIA and BCOAPO question whether FEI’s proposed AMI Project is the best alternative to meet them, which the Panel addresses in Section 3 below.

The Panel finds that FEI’s needs relevant to the scope of its Application for the AMI Project are the following:

- Accurate and convenient meter reading;
- DSM and energy conservation;
- The safety and resiliency of FEI’s gas distribution network;
- GHG emission reduction; and
- Cost effectiveness (collectively the Relevant Needs).

The Relevant Needs are established in order to evaluate the proposed AMI Project against its alternatives when determining whether the Project is in the public interest. In the Panel’s view, each of the Relevant Needs is sufficiently justified by the evidence and distinct from the others to be useful in comparing the proposed Project with its alternatives.

Accurate and convenient meter reading

Metering and billing are integral aspects of a public utility’s service, which FEI must perform in a reasonably accurate and convenient manner. FEI currently performs over 12 million meter reads per year and claims it could improve the accuracy of 260,000 to 390,000 bills per year. FEI further asserts that 2,800 customer interactions at its contact centre involve meter-reading inquiries. In the Panel’s view, this demonstrates an opportunity to improve the accuracy of FEI’s current meter reading process.

The Panel also considers that meter reading convenience could be improved for those customers who have to provide spare keys or entry codes to FEI for access to the meter on their property and the testing and exchange process for residential diaphragm meters required by Measurement Canada.

While the accuracy and convenience of its meter reading could be improved, FEI only receives around 500 customer complaints per year related to meter reading activities, and only about 8,000 customers out of over one million require special arrangements to be made to have their meters read. The Panel’s view is that Automation would likely improve accuracy and customer convenience, but the Panel is not convinced that the need to improve meter reading accuracy and customer convenience is significant or urgent.

DSM and energy conservation

The Panel considers that FEI has an ongoing need to conserve energy, both to reduce its customers’ energy costs and to reduce BC’s GHG emissions. While there is no evidence that automating its meter reading operation will

¹⁴⁷ FEI Reply Argument, p. 4.

directly reduce FEI's gas consumption, there is some evidence from SoCalGas that such Automation can be the basis for future natural gas DSM programs. Specifically, four advanced meter conservation campaigns conducted by SoCalGas in 2016-2017 achieved an overall reduction of 1.6 percent in gas usage.¹⁴⁸

The safety and resiliency of FEI's gas distribution network

Safety and reliability are important for any public utility, and FEI must operate its gas distribution network in a safe and reliable manner. Resiliency, the ability to prevent, withstand or recover quickly from system failures or unforeseen events, is an additional and important aspect of reliability.

The Panel accepts that Automation provides opportunities to improve the safety and resiliency of FEI's gas distribution network. Examples of such improvements include remote load monitoring and problem detection, remote shut-off of supply to individual customers, and faster supply restart after a temporary shutdown by retaining pressure in the system.

The inherent safety of any proposed alternative is also an important consideration for FEI, and much has been made in this proceeding of the alleged health risks of radiofrequency emissions from FEI's proposed AMI Project. If such health risks were established, then this would be a factor in the comparison between the Project alternatives. The Panel addresses these alleged health risks in Section 5 below.

GHG emission reduction

Reduction of BC's GHG emissions is the policy of the BC Government and is therefore a need for FEI.

In addition to enabling additional DSM programs as mentioned above, reducing the GHG emissions caused by motor vehicles used for meter reading is a reasonable need for FEI to pursue.

Cost effectiveness

Cost effectiveness is always a need for public utilities; it is inherent in the notion of providing service at just and reasonable rates. Other things being equal, public utilities should provide service at the lowest cost, after allowing for risk.

The Panel is persuaded that FEI faces long-term cost and service risks to its meter reading operations. For example, the Panel agrees with FEI that there is a risk that meter readers may become more difficult to hire and retain, whether by FEI's current meter reading supplier, Olameter, or by FEI itself, should it choose to take over the function internally. This raises concerns as to the quality of the meter reading service FEI will be able to provide and to the cost of providing that service.

The Panel is not persuaded that there is a risk to the availability of diaphragm meters for the foreseeable future. While one supplier, Itron, has announced it is ceasing to manufacture diaphragm meters, two others have not. That said, a decrease in the number of suppliers increases the risk of higher prices for diaphragm meters in future.

¹⁴⁸ Exhibit B-1, Appendix A, p. 20.

The cost effectiveness of FEI's meter reading operation, including costs, benefits and risks, is an important consideration when evaluating the AMI Project.

Customer expectations

The Panel is not persuaded that FEI has a need to address unmet customer expectations for more timely and detailed usage and consumption information.

Frequent and detailed usage information for customers is not inherently a requirement of the service of a public utility and does not constitute a need on its face in the same way that safe and reliable service is a need. It is not sufficient that FEI surveyed its customers and a majority indicated they would classify more timely and detailed usage and consumption information as important. FEI's customers were given no indication of the cost of this information when asked the question, so the Panel considers the value of this survey result to be negligible.

The Panel draws a distinction between frequent and detailed usage information for customers generally, and frequent and detailed usage information for customers that forms the basis for new DSM programs, which the Panel addresses above.

3.0 Description and Evaluation of Alternatives

3.1 Description of Alternatives

In the Application, FEI identified two alternatives to address the project need for automation of the meter reading process:

- iii. **AMI:** Advanced Metering Infrastructure (AMI) is an integrated system of smart meters, data management systems and communication networks that enable two-way communication between the utilities and the customer meters. The system automatically transmits the data from the meters directly to the utility at predetermined intervals.¹⁴⁹
- iv. **AMR:** Automated Meter Reading (AMR) is a one-way communication technology that enables utilities to automatically collect consumption and status data from meters. Data collection from AMR systems can be either walk-by, fly-by, or drive-by. Flows and alarm data are collected by utility personnel by walking or driving by with a data receiver in proximity to the device.¹⁵⁰

A third alternative was explored through IRs. The **Baseline**, or do nothing, is not an alternative FEI presented and becomes the scenario if the Project is not implemented.

Baseline

Since 1988, FEI has annually outsourced its approximately 12,800,000 regular and 67,000 off-cycle meter reads to Olameter.¹⁵¹ The current contract term expires December 31, 2022; however, the contract includes the ability

¹⁴⁹ Exhibit B-1, p. 5.

¹⁵⁰ Ibid, p. 45.

¹⁵¹ Ibid, p. 19.

to extend services for four additional terms of one year each through to December 31, 2026. With uncertainty surrounding cost and future availability of Olameter readers, FEI has included in the Baseline alternative the future costs associated with bringing manual meter reading in-house.¹⁵²

As part of FEI's meter exchange sustainment program, meter set bypass valves are installed and regulators are replaced. Under the Baseline alternative, this process would continue on its regular schedule.¹⁵³

AMR

FEI states that it explored a partial automation solution of meter reading using AMR technology to enable drive-by meter reading. AMR is a one-way communication technology, where communication modules, retrofitted to the existing meter, are used to transmit readings using radio signals to a vehicular-based mobile meter reading base station. A meter reader drives the vehicle carrying the mobile base station along a predetermined route through a section of the service territory and meter reads are transmitted remotely from the meter communication modules to the base station. The meter reader then returns to a utility facility to connect the mobile base station to the utility network, where the meter reads are downloaded for use by the utility billing system.¹⁵⁴

Capital costs include meters, network, software and non-meter costs. For the AMR alternative, the capital costs include retrofitting each diaphragm meter with a battery powered electronic module. The existing meter, bypass valve and regulator will continue to be replaced/exchanged under FEI's sustainment capital program, similar to the status quo.¹⁵⁵ FEI indicates that AMR modules can be fitted on either diaphragm or ultrasonic meters.¹⁵⁶ Network capital includes information systems hardware for the vehicular-based mobile base stations (Base Stations), networks and software expenditures.¹⁵⁷ AMR equipment is assumed to be in place for over 20 years, which is based on the expected service life of the AMR technology and the capacity of the battery contained within the communication module.¹⁵⁸

AMI

A full description of the AMI alternative is provided in Section 4 of this Decision.

For the AMI alternative, the capital costs include replacing each diaphragm meter with a new advanced meter. Given that the Project requires every meter to be exchanged or upgraded with a communication module, the capital sustainment program to replace regulators and install bypass valves will be accelerated and completed during the AMI deployment phase.¹⁵⁹ Similar to AMR, the expected life of the AMI meters is estimated to be 20 years, limited largely by the capacity of the battery.¹⁶⁰ Network capital includes installation of two-way network infrastructure to support wireless delivery of data between meters, other field devices and FEI's existing enterprise information systems.¹⁶¹ Software capital costs and non-meter hardware are also included.¹⁶²

¹⁵² Exhibit B-1, p. 104.

¹⁵³ Ibid., p. 5.

¹⁵⁴ Ibid., p. 45.

¹⁵⁵ Exhibit B-18, BCOAPO IR 3.1.

¹⁵⁶ Exhibit B-13, RCIA IR 16.1.

¹⁵⁷ Exhibit B-1, p. 52.

¹⁵⁸ Ibid., p. 45.

¹⁵⁹ Exhibit B-18, BCOAPO IR 3.1; Exhibit B-1, p. 5.

¹⁶⁰ Exhibit B-1, p. 54.

¹⁶¹ Ibid., p. 55.

¹⁶² Ibid., p. 65.

3.2 BCUC's CPCN Guidelines

A CPCN application to the BCUC is generally expected to comply with the BCUC's CPCN Guidelines. Regarding alternatives, the CPCN Guidelines include provision to submit:

(ii) A comparison of the costs, benefits and associated risks of the project and feasible alternatives, including estimates of the value of all of the costs and benefits of each alternative or, where these costs and benefits are not quantifiable, identification of the cost area or benefit that cannot be quantified. Cost estimates used in the economic comparison should have, at a minimum, a Class 4 degree of accuracy as defined in the most recent revision of the applicable AACE International Cost Estimate Classification System Recommended Practices.

[...]

(iii) A schedule calculating the net present values of the incremental cost and benefit cash flows of the project and feasible alternatives, and justification of the length of the term and discount rate used for the calculation.

3.3 Project Alternatives Evaluation Methodology

FEI submitted the following table to demonstrate each alternative's performance against the stated project drivers:

Alternatives: Project Need Analysis				
EVALUATION		SCORE		
FULLY; Project need is fully met		✓		
PARTIALLY; Project need is partially met		⚠		
NOT; Project need is not met		✗		
1	Automation is more accurate and convenient for customers than FEI’s current meter reading practices, which are highly manual, are vulnerable to errors and can be inconvenient for customers	AMI	AMR	BASELINE
	A more accurate and reliable meter reading process	✓	⚠	✗
	A meter reading process that is more convenient and less intrusive e for customers	✓	✓	✗
	Ability to resolve billing concerns and customer requests in a timely manner	✓	✗	✗
	Reductions in Greenhouse Gas (GHG) emissions	✓	⚠	✗
2	Automation is becoming the industry standard, thereby changing both market conditions and customer expectations	AMI	AMR	BASELINE
	Better consumption data for customer use	✓	✗	✗
	The ability to offer enhanced DSM opportunities	✓	✗	✗
3	Automation alleviates the cost and service risks of manual reading and provides a long term cost effective alternative	AMI	AMR	BASELINE
	Reduced reliance on third party meter reading services in a market characterized by increasing uncertainty	✓	⚠	✗
	A meter technology that is going to be available for the next twenty years	✓	✗	✗
4	Automation provides additional customer benefits as well as operational opportunities that support the safety, resiliency and efficient operation of the gas distribution system	AMI	AMR	BASELINE
	Increased system resiliency	✓	✗	✗
	Improved system planning abilities	✓	✗	✗
	Improved safety for the meter reading function	✓	⚠	✗
	Better theft detection abilities	✓	⚠	✗
	Improved emergency response to larger gas leaks downstream of the meter	✓	✗	✗
	Improved leak detection for smaller leaks downstream of the meter	✓	✗	✗
	Increased distribution system monitoring and alarms	✓	✗	✗
	Enhanced integrity management of the system	✓	✗	✗
	The ability to offer enhanced billing options	✓	✗	✗

In its evaluation of the alternatives, FEI determined that the AMI alternative is its chosen alternative.

The following Sections 3.3.1 through 3.3.5 are structured according to the Relevant Needs established by the Panel in Section 2 above:

- Accurate and convenient meter reading;
- DSM and energy conservation;
- Safety and resiliency;
- GHG emission reductions; and
- Cost-effectiveness.

¹⁶³ Exhibit B-1, Table 4-4, p. 67.

3.3.1 Accurate and Convenient Meter Reading

FEI states that Automation is more accurate and convenient for customers than FEI's current meter reading practices.¹⁶⁴

The annual estimated meter reads for the years 2016 through 2020 are provided in the following table:¹⁶⁵

Total Estimated FEI Meter Reads 2016-2020

Year	# of Estimates	# of Meter Read Requests	Estimates as % of Total
2016	380,398	12,159,770	3.13%
2017	463,564	12,313,865	3.76%
2018	579,997	12,502,206	4.64%
2019	613,849	12,696,599	4.83%
2020	1,398,982	12,894,341	10.85%

With AMI, FEI expects that billing estimates would be reduced to one to two percent per year as a percentage of meter read requests, improving the accuracy of approximately 260,000 to 390,000 bills each year, all else being equal, and resulting in an improved experience for a large number of customers each year.¹⁶⁶ Further, FEI states that AMI would provide the ability to offer enhanced billing options, such as consolidated billing for multiple customer locations and flexible billing dates.¹⁶⁷

AMI would eliminate the need for meter readers to enter customer premises.¹⁶⁸ AMI would allow for remotely managing and monitoring service disconnections, reconnections, vacant premises and service interruptions.¹⁶⁹ Further, subject to Measurement Canada regulations, the complete replacement of FEI's diaphragm meters under the AMI Project would mean that meter testing and exchange process would not be required for residential and most commercial customers for several years.¹⁷⁰

FEI states AMR would also improve billing accuracy, preventing the potential for bills to be generated using incorrect meter reads from manual reading.¹⁷¹ FEI states both AMI and AMR technologies are equally accurate.¹⁷²

AMR would also eliminate the need for meter readers to enter customer premises to complete reads, making the process more convenient and less intrusive for customers than the Baseline alternative.¹⁷³ However, FEI states that, unlike AMI, AMR would still experience some issues with meter reading, such as lack of vehicle

¹⁶⁴ Exhibit B-1, p. 46.

¹⁶⁵ Ibid., Table 3-4, p. 23.

¹⁶⁶ Ibid., p. 24.

¹⁶⁷ Ibid., p. 62.

¹⁶⁸ Ibid., p. 36.

¹⁶⁹ Ibid., pp. 56-57.

¹⁷⁰ Ibid., p. 18.

¹⁷¹ Ibid., p. 47.

¹⁷² Exhibit B-18, BCOAPO IR 4.1.

¹⁷³ Exhibit B-1, p. 23.

access particularly in relation to inclement weather or natural disasters such as floods or wildfires.¹⁷⁴ Further, 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.¹⁷⁵ FEI states under AMR 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.¹⁷⁶

FEI submits that the Baseline alternative has several shortfalls. The Baseline meter reading process results in estimated bills and billing inaccuracies that affect the quality of service provided to FEI’s customers. FEI submits inaccurate bills and estimated bills both negatively impact customer experience and result in additional processes (and associated costs), as well as customer confusion and dissatisfaction, and potential payment issues.¹⁷⁷

FEI’s current manual meter-reading process creates a variety of operational and customer service issues due to lack of Automation.¹⁷⁸ The meter reading process requires an unfamiliar third party (the meter reader) to access customer properties monthly. Some customers must provide spare keys or entry codes to FEI for access to the meter on their property. FEI submits this is inconvenient for customers, but also managing and maintaining up-to-date keys and access codes are ongoing challenges.¹⁷⁹ The nature of the work inevitably leads to safety-related incidents where meter readers attempt, but are unable to complete, meter reads.¹⁸⁰

Positions of the Interveners

The CEC submits that customer inconvenience can be considered as important and can be expected to feel comparatively more intrusive as technology moves towards greater Automation in coming years.¹⁸¹

RCIA submits both AMI and AMR solve the most significant issues identified by FEI with respect to collecting consistent, accurate meter readings. Both AMI and AMR provide monthly meter readings that are not subject to human error and do not require estimations due to the inability to access customers’ premises. Again, both AMI and AMR provide convenient billing processes as customers do not need to be concerned with providing FEI or its meter reading contractor with keys or other means of physical meter access, and customers can be confident in the accuracy of their meter readings and associated utility bills.¹⁸²

BCOAPO submits that accuracy and customer convenience are addressed by AMR as easily as AMI. BCOAPO states FEI’s evidence is that AMI will improve customer convenience as it removes the need for access to customer properties, but BCOAPO notes that AMR addresses the issue of access, whether due to a lack of keys, locked gates, and dogs just as well as AMI.¹⁸³ FEI confirmed that the AMI and AMR equipment have the same

¹⁷⁴ Ibid., p. 47.

¹⁷⁵ Exhibit B-1, p. 47.

¹⁷⁶ Ibid., p. 47.

¹⁷⁷ FEI Final Argument, p. 14.

¹⁷⁸ Ibid., p. 13

¹⁷⁹ Ibid., pp. 13-14.

¹⁸⁰ Ibid., p. 15.

¹⁸¹ CEC Final Argument, p. 14.

¹⁸² RCIA Final Argument, p. 20.

¹⁸³ BCOAPO Final Argument, pp. 8-9.

accuracy so BCOAPO sees no basis upon which FEI can claim that AMR results in billing issues or accuracy concerns not also experienced by utilities using AMI.¹⁸⁴

In reply, FEI submits AMR is not a fully automated solution and would still rely on meter readers to collect monthly meter reads via vehicular-based mobile meter reading Base Stations. Vehicle access issues that impact meter reading would still exist, particularly in relation to inclement weather or natural disasters such as floods or wildfires. Ongoing risks with respect to driving-related incidents would continue, off-cycle manual reads would continue to be required for service disconnections, reconnections, vacant premises, or service interruptions, and the resolution of customer inquiries would continue to require time and expense.¹⁸⁵

3.3.2 DSM and Energy Conservation

FEI states that AMI would be used to further enhance programs within the DSM portfolio, potentially resulting in customer energy savings. Lack of energy use awareness can prevent customers from taking advantage of cost-effective measures or behavioral opportunities to save energy. The availability of hourly consumption data to customers would open new opportunities for DSM programs. FEI states information useful to DSM programs, program development and evaluation includes, among other things, real-time consumption reports, increased customer energy consumption awareness and identifying estimated usage for billing cycle.¹⁸⁶

As stated in Section 2.3.2 above, FEI notes that the Util-Assist report includes evidence of direct energy savings from AMI. The Util-Assist report states that Southern California Gas Company (SoCalGas) conservation results “are a useful benchmark in proving that AMI can enable reduction of natural gas usage just as it does electricity usage.”¹⁸⁷ FEI acknowledges that realizing future energy DSM opportunities and enhanced billing options will not manifest without additional investment beyond the scope of the Project and would require development of a business case and future project.¹⁸⁸

Under AMR, FEI states it would continue to be unable to offer “enhanced Demand Side Management (DSM) programs to support customers with opportunities for energy conservation and saving money.”¹⁸⁹ In the long-term, FEI states that customers will continue to expect access to detailed information to make fully informed energy use decisions, and the AMR alternative would leave FEI to face a growing risk of failing to meet those expectations, similar to that under the Baseline alternative.¹⁹⁰

Due to the limitations of monthly manual meter reads under the current Baseline manual meter reading system, FEI customers only have access to usage and consumption data on a per month basis. Customer feedback has indicated that detailed consumption information is high on the list of customer priorities for their bill from FEI.¹⁹¹ FEI submits the current system leaves FEI unable to develop and implement future opportunities for enhancements to other components of customer experience, including enhanced billing options, and targeted DSM opportunities.¹⁹²

¹⁸⁴ BCOAPO Final Argument, p. 9.

¹⁸⁵ FEI’s Reply Argument, p. 8.

¹⁸⁶ Exhibit B-1, p. 57.

¹⁸⁷ *Ibid.*, Appendix A, p. 20.

¹⁸⁸ Exhibit B-6, BCUC IR 8.1.

¹⁸⁹ Exhibit B-1, p. 48.

¹⁹⁰ *Ibid.*

¹⁹¹ FEI Final Argument, pp. 16-17.

¹⁹² *Ibid.*, p. 17.

Positions of the Interveners

BCSEA submits that the FEI AMI Project has many important benefits including customer access to detailed and timely consumption information, opportunities for DSM measures, and GHG reductions. BCSEA concludes the AMI Project is superior to both the Baseline alternative and the AMR approach.¹⁹³

The CEC submits that the availability of granular consumption information to customers is invaluable in promoting conservation, provides opportunities to reduce bills and lays a foundation for reducing GHGs at a broad level. The CEC recommends that the BCUC weigh these benefits heavily in its determinations regarding the public interest.¹⁹⁴

BCOAPO submits FEI has inflated the benefit of AMI over AMR. FEI confirms it has no plans to introduce time of use billing. If there are no plans for time of use billing, then BCOAPO submits any capability greater than monthly billing is irrelevant.¹⁹⁵

In reply, FEI states BCOAPO overlooks the many benefits of more detailed, hourly consumption data.¹⁹⁶

RCIA submits that, while FEI provided results of customer surveys that show 75 percent of its respondents state that having detailed consumption data available to them online is important, the reality is that when customers have this information, they fail to access it.¹⁹⁷ Further, RCIA submits that FEI is unable to quantify the additional energy conservation that may arise from DSM programs enabled by AMI.¹⁹⁸

FEI submits that RCIA's analysis of portal usage is speculative and not based on appropriate assumptions. FEI notes that FBC customers account for 15 percent of the total use of the FortisBC customer portal in 2020, but those customers who have access to detailed usage information through FBC's AMI system, account for approximately 30 percent of the page views related to consumption information.¹⁹⁹ FEI also notes that BCSEA agrees with its position and submits that customers "are increasingly frustrated with the limited information they have access to currently as a result of manual meter reading."²⁰⁰

3.3.3 Safety and Resiliency of FEI's Gas Network

FEI states AMI would have improved safety and resiliency impacts to FEI's gas network over its other project alternatives. FEI submits that a key element that contributes to natural gas system resiliency is load management capabilities. Load management relates to the ability both to accurately assess the actual load across all parts of the gas system, and when necessary, to strategically reduce load on the gas system. Managing load helps to maintain the pressure on the system by restoring the balance of gas supply and demand in the event of a supply emergency. AMI would enhance FEI's system resiliency to prevent, withstand, and recover from system failures or unforeseen events.²⁰¹

¹⁹³ BCSEA Final Argument, p. 3.

¹⁹⁴ CEC Final Argument, p. 16.

¹⁹⁵ BCOAPO Final Argument, p. 11.

¹⁹⁶ FEI Reply Argument, p. 23.

¹⁹⁷ RCIA Final Argument, p. 18.

¹⁹⁸ *Ibid.*, p. 19.

¹⁹⁹ FEI Reply Argument, p. 22.

²⁰⁰ *Ibid.*, p. 23.

²⁰¹ Exhibit B-1, p. 59.

FEI states that AMI would enable FEI to execute a controlled shutdown in the event of an extended gas supply emergency. A controlled shutdown allows FEI to maintain pressure within the section of the system that has been shut down throughout the duration of the gas supply emergency.²⁰² This is in opposition to an uncontrolled shutdown, or hydraulic collapse, which occurs when the gas system experiences a reduction in pressure down to atmospheric pressure. At atmospheric pressure, infiltration of air into the gas line is possible.²⁰³ AMI will provide FEI with the ability to monitor customer consumption in near real-time, allowing FEI to determine which parts of the system are vulnerable to a pressure collapse.²⁰⁴

Further, FEI states that it expects that AMI would provide a small reduction in the recovery time following a pressure collapse. Customers, who were shut off before the pressure collapse, would not have to be isolated from the system when re-pressurization occurs.²⁰⁵ FEI expects customers may elect to be remotely reconnected following an emergency but expects many other customers may not be comfortable relighting their own appliances. Consequently, during a larger gas supply emergency following a shut-down, customers would likely have to wait for a field technician to attend their premises to perform relighting.²⁰⁶

In addition, FEI states that 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. AMI would improve safety by enabling 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.²⁰⁷

AMI would allow monitoring of distribution system performance through a variety of sensors including pressure, temperature and level and associated alarms for both operation and project support. With AMI, FEI could also deploy cathodic protection sensors on its gas network for remote monitoring purposes to provide near real-time visibility and help to maintain the integrity of FEI's distribution gas lines.²⁰⁸

FEI states AMR would also reduce the potential for theft, using tamper alarms that are stored in the module. The alerts from these alarms to FEI are not provided in real-time and would only become known to FEI upon collecting the read on its regular monthly reading cycle.²⁰⁹

FEI states both AMR and AMI have similar cybersecurity risks, however remote shut-off is not a capability of the AMR alternative.²¹⁰

AMR would provide a small number of operating benefits compared to existing Baseline. FEI states the lack of important features including the ability to provide detailed and timely information regarding gas usage and

²⁰² Exhibit B-1, p. 60.

²⁰³ Exhibit B-23, BCSEA IR 42.1.

²⁰⁴ Exhibit B-9, BCSEA IR 17.2.

²⁰⁵ Exhibit B-23, BCSEA IR 42.2.

²⁰⁶ Exhibit B-9, BCSEA IR 17.3.

²⁰⁷ Exhibit B-1, p. 61.

²⁰⁸ Ibid., pp. 61-62.

²⁰⁹ Ibid., p. 49.

²¹⁰ Exhibit B-18, BCOAPO IR 11.2.

operating parameters, and the inability to remotely disconnect service, severely limits the overall capacity for FEI to realize key operating benefits or provide additional customer benefits with AMR.²¹¹

Positions of the Interveners

In the CEC's view, the additional safety and resiliency benefits are very important in ensuring the safety and availability of energy for customers.²¹²

RCIA submits that FEI did not quantify the amount of gas theft nor the financial benefit of reduced theft of gas that it would expect from implementation of AMI or AMR.²¹³

BCOAPO notes FEI's acknowledgement that under AMR there is no capability of remote shut off in the case of a cyber breach. BCOAPO submits this represents a benefit to AMR because in such a scenario gas would continue to flow and customers would continue to receive service.²¹⁴

In reply, FEI submits that RCIA's submissions do not acknowledge any of the benefits of AMI that support the safety, resiliency, and efficient operation of FEI's gas system, including that AMI:²¹⁵

- Offers additional safety benefits related to theft detection through near real-time alarms. In FEI's view even if the amount of gas loss is not large, unauthorized alterations associated with gas theft create unsafe conditions and this safety benefit AMI would provide should not be disregarded;
- Would improve emergency response to larger gas leaks downstream of the meter;
- Would improve leak detection for smaller leaks downstream of the meter;
- Would increase distribution system monitoring and alarms; and
- Would enhance FEI's system integrity management.

FEI adds that certain benefits may have been overlooked by RCIA and BCOAPO. FEI states that neither RCIA nor BCOAPO acknowledge the important safety benefit of AMI's excess flow shut-off capabilities to address the safety issues in the event of earthquakes, a safety issue highlighted by ICLR and CORE. FEI notes that this benefit is not supported by AMR.²¹⁶ FEI also notes that in FEI's on-going proceeding regarding the Tilbury Liquefied Nature Gas Storage Expansion (TLSE) Project, RCIA filed an expert report that concludes that most of the benefits of a controlled shut-down process in the event of a hydraulic collapse would "arise if AMI is part of the controlled shutdown process. AMI allows FEI to quickly react and preserve the pressure in the distribution system and avoid a hydraulic collapse. Avoiding a hydraulic collapse means FEI could avoid certain steps in the restoration process."²¹⁷

²¹¹ Exhibit B-1, p. 59.

²¹² CEC Final Argument, p. 17.

²¹³ RCIA Final Argument, p. 18.

²¹⁴ BCOAPO Final Argument, p. 11.

²¹⁵ FEI Reply Argument, p. 20.

²¹⁶ Ibid., p. 21.

²¹⁷ Ibid.

3.3.4 GHG Emissions Reductions

FEI states AMI would eliminate the GHG emissions associated with manual meter reading. Currently, there are approximately 150 meter readers working throughout the province on a daily basis, each driving an average of 35,000 km per year. Taking into account the need for 150 meter readers to cover FEI's service territory, FEI states the emissions generated are the equivalent to 1,100 metric tonnes of carbon dioxide equivalent, or the same as heating approximately 250 homes for a year. Under AMI, FEI states these GHG emissions would be eliminated.²¹⁸

FEI states AMR would enable an overall reduction in vehicle usage given the decrease in the number of meter readers. The resulting reduction in vehicle usage under AMR is estimated to create a net reduction of 50 percent of the current GHG emissions.²¹⁹

Positions of the Interveners

The CEC submits the reduction in GHG emissions of 1,100 metric tonnes of tCO₂e from the removal of meter reading vehicles is a clear quantifiable benefit.²²⁰

FEI submits in reply that, in stating their preference for AMR over AMI, neither RCIA nor BCOAPO address British Columbia's energy objectives, as set out in the CEA, or FEI's most recent long-term resource plan. These are express considerations on a CPCN application under section 46(3.1) of the UCA.²²¹ The AMI Project is consistent with, and of significant consequence for, FEI's 2022 Long-term Gas Resource Plan. AMR is not.²²²

3.3.5 Cost Effectiveness

FEI states AMI would greatly reduce exposure to cost and service risks associated with manual meter reading, making it a more cost-effective, long-term alternative.²²³

FEI's cost estimate of the Baseline alternative includes provision to bring manual meter reading in-house following the expiry of the outsourcing contract with Olameter in 2026.²²⁴ FEI submits the nature of meter reading makes it difficult to retain meter readers, which creates operational issues and a risk to customer service.²²⁵ FEI states the long-term costs of manual meter reading services are uncertain but are expected to increase.²²⁶

With AMR, FEI submits that the long-term challenges with recruitment and retention of meter readers would remain. Also, resolution of customer concerns would require special visits outside of the regular meter reading schedule, resulting in additional expense compared to AMI.²²⁷

²¹⁸ Exhibit B-1, p. 20.

²¹⁹ Exhibit B-1, p. 47.

²²⁰ CEC Final Argument, p. 17.

²²¹ FEI Reply Argument, p. 24.

²²² Ibid.

²²³ Exhibit B-1, p. 58.

²²⁴ Exhibit B-1, p. 108; FEI Final Argument, p. 16.

²²⁵ FEI Final Argument, p. 15.

²²⁶ Ibid., p. 16.

²²⁷ Exhibit B-1, p. 47.

The following tables, prepared by the BCUC from evidence in the proceeding, show a comparison of the Net Present Value (NPV) and delivery rate impacts of the alternatives. Further information on Project costs is provided in Section 7 of this Decision, below.

Comparison of NPV Financials (\$ millions)

	AMI ²²⁸	AMR ²²⁹	Baseline ²³⁰
Total Capital Costs (NPV)	\$641.1	\$578.8	\$434.1
Total O&M, incl. Capitalized Overhead (NPV)	\$191.6	\$168.4	\$327.1
Incremental Capital Costs as compared to the Baseline	\$207.0	\$144.7	n/a
Incremental O&M (Savings) as compared to the Baseline	(\$135.5)	(\$158.7)	n/a
Overall Incremental Cost as compared to the Baseline (incremental capital costs less incremental O&M savings) ²³¹	\$71.5	(\$14)	n/a
NPV of the Revenue Requirement	\$1,356.6	\$1,296.1	\$1,303.3
Incremental NPV of the Revenue Requirement as compared to the Baseline	\$53.3	(\$7.2)	n/a

Comparison of Delivery Rate Impacts

	AMI	AMR	Baseline
Levelized % Increase (over 26 years) as compared to 2021 rates	11.256% ²³²	10.755% ²³³	10.814% ²³⁴
Levelized Incremental Delivery Rate Impact as compared to the Baseline (over 26 years)	0.442% ²³⁵	(0.059%) ²³⁶	n/a

FEI submits that the Project using AMI has a “minimal impact of customer annualized rates over the analysis period,” at less than half of a percent.²³⁷

FEI states that all three of North America’s major diaphragm meter suppliers have been focusing on developing an AMI ultrasonic meter for residential and/or small commercial gas distribution markets. Due to the industry trend towards Automation, suppliers of products and services that support manual meter reading have gradually been adapting to the changing marketplace. In response to the automation of meter reading by

²²⁸ Exhibit B-30, Appendix A, pp. 63-64.

²²⁹ Ibid., Appendix A, p. 51.

²³⁰ Ibid.

²³¹ FEI Reply Argument p. 26.

²³² Exhibit B-30, Appendix A, p. 117.

²³³ Levelized Incremental Delivery Rate Impact as compared to the Baseline of -0.059% plus 10.814% Baseline Levelized Increase (over 26 years) as compared to 2021 rates equals 10.755% AMR Levelized Increase (over 26 years) as compared to 2021 rates. (Calculated by BCUC Staff)

²³⁴ Exhibit B-30, Appendix A, p. 117.

²³⁵ Ibid., p. 7.

²³⁶ Ibid., Appendix A, p. 51.

²³⁷ FEI Final Argument, p. 24.

utilities, members of industries supporting manually read meters and manual meter reading are shifting their business models.²³⁸ In 2020 Itron Inc. (Itron) notified its customers that it was focusing its efforts towards developing and marketing gas ultrasonic meters to provide AMI capability for residential and small commercial customer segments, effective 2021.²³⁹ With Itron no longer in the diaphragm meter market, only two other suppliers of diaphragm meters remain.

FEI submits that the risk related to the continued viability of the Baseline and AMR alternatives is impacted by the increasing delivery timelines for diaphragm meters. FEI states “The inability to meet delivery timelines ultimately impacts the viability of a scenario dependent on diaphragm meters at all.”²⁴⁰ Regarding the impacts on Project costs, FEI submits that diaphragm meter costs have increased 26 percent for residential type meters and 6 percent for commercial type meters over the amount originally reflected in the Application.²⁴¹

FEI states that the deployment of AMR technology would mean that the risk associated with procuring diaphragm meters would continue and that an investment in AMR may result in an escalating risk of being locked into a commitment to a technology for over 20 years that is currently trending toward obsolescence in the long term.²⁴² AMI would allow FEI to eliminate the risk associated with procuring diaphragm meters.²⁴³

Positions of the Interveners

BCSEA acknowledges that the AMR approach has benefits over the Baseline alternative. However, BCSEA is satisfied that the AMR alternative is inferior to the AMI alternative based on the evidence. In terms of costs, AMR may appear to be less costly, but would leave FEI vulnerable to the cost and supply risks associated with manual meter reading and diaphragm meters.²⁴⁴

The CEC agrees, stating that, while the cost of the Project is considerably more significant than the AMR alternative, the CEC ultimately agrees with FEI that the AMI alternative is sufficiently superior in its benefits to make it the preferred alternative.²⁴⁵ The CEC submits the AMR alternative would result in a \$7.2 million decrease in the NPV of the revenue requirement, or a decrease in rates of 0.059 percent on a levelized basis over a 26-year analysis period. Despite the economic benefits of AMR, the CEC submits adopting AMR technology would lock FEI into a commitment to a technology that is “currently trending towards obsolescence.” The CEC finds this to be an important detriment of the AMR alternative.²⁴⁶

The CEC submits that a key benefit of the Project is that it reduces FEI’s exposure to the labour market and material market challenges as FEI would no longer be reliant on third-party manual meter reading services and will ensure FEI has a cost-effective meter technology in place for the foreseeable future. The CEC notes there were significant increases, \$78.8 million NPV, in the expected costs of meter capital between the original Application and the Evidentiary Update, of which 36 percent was attributable to labour and materials. The CEC

²³⁸ Exhibit B-1, p. 33.

²³⁹ Exhibit B-1, p. 33.

²⁴⁰ FEI Final Argument, p. 30.

²⁴¹ Ibid., pp. 15-16.

²⁴² Exhibit B-1, pp. 45, 48.

²⁴³ Ibid., p. 58.

²⁴⁴ BCSEA Final Argument, p. 16.

²⁴⁵ CEC Final Argument, p.19.

²⁴⁶ Ibid., p. 9.

finds this persuasive in demonstrating the increasing costs likely to be experienced by FEI pertaining to diaphragm meters.²⁴⁷ The CEC notes that FEI has incorporated the expected benefits and savings related to reduced meter reading errors into the financial analysis of the Project and accordingly can be considered as a benefit qualitatively but should not be double counted quantitatively as a separate benefit.²⁴⁸

BCOAPO believes the cost differential between AMI and AMR is “fundamental” to the consideration of alternatives. BCOAPO states the drivers of the project can be adequately met using AMR. The incremental costs of AMI versus AMR compared to the Baseline alternative demonstrate that the AMR option has “significantly lower cost and higher O&M savings compared to AMI.” BCOAPO notes that FEI states the AMI alternative is effectively rate neutral with an incremental annualized delivery rate impact of 0.442 percent and the highest cumulative delivery rate of 6.27 percent occurring in 2027 followed by annual rate decreases. Given AMR is cheaper and effective, BCOAPO does not view FEI’s justification of the cost and rate impact of AMI acceptable to a public interest determination.²⁴⁹

BCOAPO submits that there is not sufficient evidence to show AMR is not a viable alternative to AMI. The cost of AMR is much less than AMI, particularly on a per site basis, and BCOAPO submits FEI has not demonstrated the additional value of AMI over AMR. BCOAPO submits that if there is to be an automated program, only AMR should be approved.²⁵⁰ BCOAPO submits that the cost difference between the AMI and AMR alternatives is “fundamental to the consideration of the Application.” Given the availability of the “cheaper and effective option” of AMR, BCOAPO submits that the AMI Project’s cost and rate impacts are not justified. BCOAPO submits that the cost of the AMI Project is \$555 per meter, compared to \$206 per meter for AMR.²⁵¹

In reply, FEI submits that BCOAPO’s calculation of the costs per meter for the AMI and AMR alternatives are not accurate. FEI submits the correct figures are \$48.90 per meter for AMI and \$9.90 for AMR, representing an incremental difference of \$58.80 per meter for the AMI Project.²⁵² FEI notes BCSEA stated its acceptance of FEI’s explanation that \$CAD per meter is not an appropriate measure to compare the AMI Project with other AMI and AMR projects.²⁵³

RCIA further submits that its opposition to the AMI Project “stems from the delivery rate impacts.” RCIA notes that although the levelized rate impact is 0.442 percent per year, the cumulative increase reaches 6.27 percent compared to the Baseline before declining.²⁵⁴ RCIA submits that the AMR Alternative would peak at a cumulative increase of 1.03 percent, which is “substantially more tolerable for FEI customers than AMI, especially when combined with the expected rate increases from other CPCN projects.”²⁵⁵

In reply, FEI submits that RCIA does not recognize the full benefits of the AMI Project compared to AMR, or the risk that AMR may not be a viable alternative given diaphragm meter supply issues. FEI further submits that

²⁴⁷ Ibid., pp. 14-15.

²⁴⁸ CEC Final Argument, p. 13.

²⁴⁹ BCOAPO Final Argument, pp. 12-13.

²⁵⁰ Ibid., p. 14.

²⁵¹ Ibid., pp. 12-13.

²⁵² FEI Reply Argument, p. 26.

²⁵³ Ibid.

²⁵⁴ RCIA Final Argument, pp. 26-27.

²⁵⁵ Ibid., pp. 27-28.

RCIA's focus on the AMI Project's cost is inconsistent with the "weighing and balancing" required to determine whether the Project is "in the public interest and necessity."²⁵⁶

BCOAPO believes the cost differential between AMI and AMR is "fundamental" to the consideration of alternatives. BCOAPO states the drivers of the Project can be adequately met using AMR. The incremental costs of AMI versus AMR compared to the Baseline alternative demonstrate that the AMR option has "significantly lower cost and higher O&M [operations and maintenance] savings compared to AMI." BCOAPO notes that FEI states the AMI alternative is effectively rate neutral with an incremental annualized delivery rate impact of 0.442 percent and the highest cumulative delivery rate of 6.27 percent occurring in 2027 followed by annual rate decreases. Given AMR is cheaper and effective, BCOAPO does not view FEI's justification of the cost and rate impact of AMI acceptable to a public interest determination.²⁵⁷

FEI does not agree that the cumulative peak rate impact is an appropriate way to evaluate the AMI Project or its alternatives. FEI notes that although the AMI Project's cumulative peak rate impact peaks at 6.27 percent higher than the Baseline in 2027, the Project has a cumulative benefit from 2028 to 2046 of 13.5 percent in savings. FEI submits that the levelized rate impact is the correct way to evaluate the AMI Project financially because it considers both the near-term impact of capital spending as well as the long-term savings, and also takes account of the time value of money.²⁵⁸

Regarding the future of manual meter reading, RCIA submits that FEI's view that availability of contract meter reading services is uncertain "appears to be speculative."²⁵⁹ RCIA notes that FEI "appears to assume that.....it will be difficult to retain meter readers"²⁶⁰ and notes FEI confirmed that the responsibility for hiring and retaining meter readers is with Olameter.²⁶¹ RCIA submits FEI has not provided evidence that it or other utilities have experienced meter reading service availability issues. RCIA submits that, in addition to Olameter, there are other contract meter reading providers in Canada. In RCIA's view, the risks of unavailability of contract meter reading are overstated by FEI, noting FEI can mitigate the risks by bringing meter reading in-house, or implementing AMR and not just with AMI.²⁶²

RCIA submits that FEI should continue with manual meter reading or, alternatively, develop and optimize an AMR solution.²⁶³ RCIA agrees there is uncertainty in the cost of future contracted meter reading services because there is no contract with Olameter beyond 2026, but notes FEI also did not explore other options such as alternative vendors²⁶⁴ or reading meters every two months instead of monthly, if capacity of meter readers was constrained.²⁶⁵ RCIA submits both AMI and AMR also remove any uncertainty with the cost and availability of manual meter reading beyond the end of the current Olameter contract in 2026.²⁶⁶

²⁵⁶ FEI Reply Argument, p. 24.

²⁵⁷ BCOAPO Final Argument, pp. 12-13.

²⁵⁸ FEI Reply Argument, p. 25.

²⁵⁹ RCIA Final Argument, p. 11.

²⁶⁰ Ibid.

²⁶¹ Ibid., p. 12.

²⁶² Ibid.

²⁶³ Ibid., p. 6.

²⁶⁴ Ibid., p. 25.

²⁶⁵ Ibid., p. 13.

²⁶⁶ Ibid., p. 20.

BCOAPO submits FEI has not provided any evidence that Olameter would not be amenable to renegotiating its contract when it expires in 2026. BCOAPO submits that MET Utilities Management reads 2.4 million meters for Enbridge in Ontario and notes that FEI has not provided evidence as to why such companies could not be contracted in future. Although BCOAPO agrees that in-house meter reading services would be more costly than outsourcing, there are additional benefits such as cost certainty and quality control which may outweigh some of the additional costs.²⁶⁷ BCOAPO accepts that the long-term metering costs and service risks FEI has outlined may be a reason to look at an automated solution, however, does not accept that FEI's concerns necessarily support choosing AMI over AMR.²⁶⁸

In response to interveners' views regarding the potential risks associated with the availability and costs of manual meter reading in the future, FEI states that it does not predict that there will be no third-party meter reading contractors to provide services beyond the expiry of Olameter's contract in 2026; rather, FEI believes that the viability of contracted meter reading services in the future is uncertain in terms of both cost and availability. FEI submits that its expectation that there will be uncertainty in FEI's ability to contract for manual meter reading services in the future is a reasonable one and is supported by trends in the industry.²⁶⁹

FEI submits that neither RCIA nor BCOAPO have provided any evidence that one of the service providers that Enbridge contracts with in Ontario could be a potential alternative to Olameter.²⁷⁰ FEI notes that Enbridge intends to pursue a future AMI conversion and that all utilities interviewed (including Enbridge) had either moved to Automation or signaled plans to do so within the next five to seven years.²⁷¹

Further, FEI submits that establishing a new local manual meter reading business would face the same challenges that FEI has identified in terms of bringing these operations in-house; it would be a significant task, requiring time for planning, development, recruiting, and training. Doing so would also involve the alternative service provider incurring similar costs to those FEI has estimated for in-house manual meter reading, which is an average O&M cost of \$21.6 million per year. FEI disagrees with RCIA and BCOAPO's speculation that a new third-party service provider is likely to undertake these steps, given the overall industry trends and basic economics of the situation.²⁷²

RCIA's view is that FEI will be able to obtain meters – either diaphragm or ultrasonic – cost effectively for the foreseeable future. This means that FEI can implement AMR, confident that it will be able to cost-effectively obtain ultrasonic meters in the mid- to long-term if and when diaphragm meters cease being produced, or ultrasonic meters become less expensive. Alternatively, FEI can continue with manual meter reading and similarly obtain cost effective ultrasonic meter replacements in future.²⁷³ RCIA submits that, similar to AMI, AMR is a long-term solution as it can also be implemented with either diaphragm or ultrasonic meters.²⁷⁴

²⁶⁷ BCOAPO Final Argument, pp. 10-11.

²⁶⁸ *Ibid.*, p. 9.

²⁶⁹ FEI Reply Argument, p. 9.

²⁷⁰ *Ibid.*, pp. 9-10.

²⁷¹ *Ibid.*, p. 10.

²⁷² *Ibid.*

²⁷³ RCIA Final Argument, p. 17.

²⁷⁴ *Ibid.*, p. 20.

Regarding the future of diaphragm meters, BCOAPO submits that FEI has not adequately supported its statement that “the absence of Itron as a supplier in the diaphragm meter marketplace is expected to result in an increase in the unit price and an overall decrease in the supply available.” BCOAPO notes FEI confirmed that it has not received any other communication from manufacturers and is not aware of any public communications that the two remaining diaphragm meter manufacturers have long-term plans to cease making diaphragm meters.²⁷⁵

FEI submits that its assessment of the availability and cost of diaphragm meters is one of the factors that makes the AMI Project the preferred long-term, cost-effective metering alternative.²⁷⁶ FEI has established real issues with the ongoing availability and cost of diaphragm meters and that such meters are trending towards obsolescence.²⁷⁷ FEI’s Evidentiary Update demonstrated that vendors have been switching their business models even more quickly than expected from the manufacture of diaphragm meters to the manufacture of ultrasonic meters. Late 2021 and 2022 delivery timelines had increased from a typical 12-16 weeks to more than 36 weeks.²⁷⁸

3.4 Summary of Project Alternatives

FEI submits that while AMR could partially satisfy some aspects of the need for Automation, only the AMI alternative would allow FEI and its customers to realize its full value.²⁷⁹

BCSEA submits it is satisfied that the AMI approach is superior to AMR, which in turn has benefits over the Baseline alternative.²⁸⁰

The CEC submits that the AMI alternative is sufficiently superior to AMR to be the preferred alternative.²⁸¹

RCIA submits that AMR meets FEI’s mission critical need to obtain consistent, accurate meter readings at the lowest cost,²⁸² and that AMI is not worth its additional cost compared to AMR or to the Baseline alternative.²⁸³ RCIA submits that FEI’s AMR alternative would fulfil three of FEI’s four project drivers at a lower cost, namely more accurate and convenient billing, reductions in the cost and service risks of manual meter reading, and a cost-effective long-term solution. RCIA submits that the additional cost of the AMI Project is not worth the “ancillary benefits” of real-time hourly consumption data, alarms, real-time theft and tampering alarms, the ability to develop enhanced DSM programs, resiliency improvements, system monitoring, and leak detection.²⁸⁴ RCIA adds that AMR could be implemented if the cost and service risks of manual meter reading are unacceptable.²⁸⁵

²⁷⁵ BCOAPO Final Argument, p. 10.

²⁷⁶ FEI Reply Argument, p. 13.

²⁷⁷ Ibid., pp. 13-14.

²⁷⁸ Ibid., p. 14.

²⁷⁹ Ibid., p. 28.

²⁸⁰ BCSEA Final Argument, p. 16.

²⁸¹ CEC Final Argument, p. 19.

²⁸² RCIA Final Argument, p. 20.

²⁸³ Ibid., p. 27.

²⁸⁴ Ibid., pp. 27-28.

²⁸⁵ Ibid., p. 25.

BCOAPO submits that it is “at least arguable” that some form of automation for FEI is appropriate, but that if there is to be an “automation program” then only AMR should be approved because FEI has not demonstrated the additional benefit of AMI.²⁸⁶

FEI replies that the need for the AMI Project is well established, and that both RCIA and BCOAPO “fail to recognize and acknowledge the extensive evidence FEI provided” to justify the Project’s “minimal cost and rate impacts.”²⁸⁷ FEI does not agree that the benefits RCIA suggests would be provided by both AMI and AMR are equivalent. FEI notes that both BCSEA and the CEC recognized that the AMI Project provides significant benefits that are not available pursuant to an AMR alternative.²⁸⁸

Panel Determination

For the following reasons, the Panel finds that FEI’s proposed AMI Project is superior to the AMR and Baseline alternatives. In coming to this finding, the Panel evaluates the AMI, AMR and Baseline alternatives with respect to the Relevant Needs established in Section 2 above.

Accurate and convenient meter reading

The Panel finds that both AMI and AMR improve accuracy compared to the Baseline alternative by reducing or removing the possibility of errors made by meter readers. The Panel finds that AMI provides no improved accuracy compared to AMR.

The AMI technology also improves the convenience of meter reading for the small number of customers, around 8,000 of 1.1 million, who must provide spare keys or entry codes to FEI for access to the meter on their property and the testing and exchange process for residential diaphragm meters required by Measurement Canada. In these cases, the AMI Project removes the requirement for physical access to read, test or exchange the meter.

Further, the AMI technology allows meters to be read even when meter readers could not access them due to weather conditions or other circumstances.

The AMR alternative would also improve the level of convenience for some customers, but not as much as the proposed AMI Project. With AMR, meter reading vehicles may lack access to read meters during inclement weather, and off-cycle meter reads would still have to be done manually.

DSM and energy conservation

The Panel finds that the AMI Project provides more opportunities for improved DSM and energy conservation than either the AMR or Baseline alternatives.

The evidence from SoCalGas demonstrates that AMI technology provides FEI with the opportunity to offer new DSM programs to its customers to increase energy and capacity savings.

²⁸⁶ BCOAPO Final Argument, pp. 13-14.

²⁸⁷ FEI Reply Argument, p. 2.

²⁸⁸ FEI Reply Argument, p. 19.

The safety and reliability of FEI's gas distribution network (including resiliency)

The Panel finds that the AMI Project provides improvements to the safety and resiliency of FEI's gas distribution network compared to the AMR or Baseline alternatives. The real-time communication feature of AMI meters provides FEI the opportunity to detect small leaks and unintended gas flows, and to remotely and automatically shut off gas flow. These features are not available from AMR technology or the Baseline alternative, which have no real-time connection to FEI.

Further, in the event of an extended gas supply interruption, AMI would give FEI the ability to maintain pressure in any parts of the system it shuts down, shortening the recovery time when the interruption is over.

GHG emission reduction

The Panel finds that the AMI Project reduces GHG emissions more than the AMR or Baseline alternatives.

The proposed AMI Project eliminates approximately 150 meter readers, who drive an average of 35,000 km per year and emit a total of 1,100 metric tonnes of CO₂e. These GHG emissions would be avoided, assuming that the same carbon-emitting vehicles continued to be used and were not replaced with non-carbon-emitting vehicles. The AMR alternative would eliminate only about 50 percent of the GHG emissions compared to the Baseline alternative, as meter readers would still be required to drive through all FEI's service territory to collect the meter data from FEI's customers.

Cost effectiveness

The AMR alternative reduces the levelized delivery rate by 0.059 percent over 26 years compared to the Baseline alternative, whereas the proposed AMI Project increases the rate by 0.442 percent over the Baseline alternative in the same period. From this perspective, the cost of the AMR alternative is preferable to that of the Baseline alternative, which in turn is preferable to that of the AMI Project.

However, in the Panel's view, there are significant unquantified benefits to the AMI Project compared with the AMR and Baseline alternatives, including reductions in cost risk and service risk, that are not incorporated in this financial comparison.

FEI's meter reading function today is labour-intensive, requiring 150 meter readers to perform monthly meter reads across FEI's service territory. The proposed AMI Project, and to a lesser extent the AMR alternative, would reduce FEI's exposure to possible increases in future labour costs. The Panel notes that FEI's forecast of the cost of the Baseline alternative is highly sensitive to labour costs, and that FEI's "high case" version of this forecast, which has a higher labour rate assumption, indicates that the AMI Project would be preferable to the Baseline alternative with a decrease in the levelized delivery rate of 0.153 percent over 26 years.

Itron's decision to cease production of diaphragm meters so that it can focus on producing ultrasonic meters might indicate a general direction towards more sophisticated and automated meter reading technology. This trend would indicate that an investment in AMR meter technology is more likely to become obsolete than an investment in AMI technology over the 20-year anticipated life of the AMR technology.

The Panel has already found that the AMI alternative has benefits over the AMR and Baseline alternatives in providing improved safety and resiliency, increased DSM opportunities and reduced GHG emissions.

For the foregoing reasons, the Panel finds that there are significant unquantified benefits that offset the cost of the AMI alternative.

Overall determination

FEI's proposed AMI alternative costs more than the Baseline, unlike the AMR alternative which would provide a cost saving compared to the Baseline. However, AMI provides superior benefits over the AMR alternative in customer convenience, DSM opportunities, GHG emission reductions and in safety and reliability. Further, as the CEC notes, the AMR alternative would lock FEI into a technology that is "currently trending towards obsolescence." For these reasons, the Panel finds that FEI's proposed AMI Project is superior to the AMR and Baseline alternatives when evaluated against the Relevant Needs.

4.0 Project Description

This section provides a detailed description of the Project and its implementation, including:

- An overview of the Project scope;
- FEI's approach to procurement;
- The Project architecture, which is a description of how technical components of the Project are logically architected to enable delivery of the Project scope;
- FEI's Project schedule and permitting requirements;
- FEI's approach to analyzing project risks;
- FEI's consideration of security and privacy for the Project; and
- Consideration of a future opt-out program for FEI customers who refuse installation of an AMI meter.

4.1 Project Scope

The Project will replace most existing customer meters with advanced meters, retrofit those meters that are not replaced with AMI communication modules, and install associated infrastructure to support delivery of hourly gas consumption and other metering information from the advanced meters/modules at customer premises, back to FEI. The Project will also include the installation of communication modules on infrastructure and pipeline assets enabling the remote collection of information on FEI's gas system integrity. Additionally, FEI customers will have the ability to access their hourly consumption information through FEI's online customer portal. Further, FEI can notify them of gas flow anomalies and identify potential gas leaks, faulty appliances or appliances/equipment mistakenly left on.²⁸⁹

Specifically, the Project scope includes installation of:²⁹⁰

²⁸⁹ Exhibit B-1, p. 69.

²⁹⁰ Ibid., p. 70.

1. Approximately 1,100,000 residential, commercial, and industrial advanced meters and meter retrofits of communication modules capable of remote gas consumption measurement;
2. Approximately 1,100 communication modules on the gas network to increase operational awareness of the gas system state;
3. The AMI network and infrastructure to communicate with customer meters and other communication modules on the FEI gas network;
4. Approximately 780,000 bypass valve sets, as required, on residential and small commercial meter sets; and
5. Residential and small commercial meter set regulators to replace those that will exceed their expected service life prior to the first meter exchange planned for post-AMI solution deployment.

FEI states that since the Project will require every meter to either be exchanged or upgraded with a communication module, the Project will deploy bypass valves and replace residential and small commercial regulators for all applicable meters.²⁹¹ FEI states this approach has several benefits including minimized customer disruption and increased operational efficiencies.²⁹² FEI submits deploying bypass valves as part of the Project scope allows FEI to realize the full Project benefits sooner.²⁹³

FEI submits that it has provided all the information required for a description of the AMI Project under section 4 of the BCUC's CPCN Guidelines.²⁹⁴ FEI adds that the "planning, procurement and other development activities" conducted to date in respect of the Project have been "thorough and robust."²⁹⁵

4.2 Procurement Approach

FEI used request for proposal (RFP) processes for the selection of the Project network and infrastructure, installation deployment services, the supply of bypass valves, and the supply of residential and small commercial regulators.²⁹⁶ These processes are each described below.

Network Vendor RFP

FEI released its Natural Gas Network Vendor RFP in October 2017, which covered the provision of: meter hardware and functions; network hardware and functions; Meter Data Management System (MDMS) and services; and other services, including training and security requirements.²⁹⁷

FEI states that after evaluation and scoring each proposal, one vendor's proposed solution was not mature enough for consideration. The top two vendors were invited to provide product demonstrations, after which reference checks were conducted and contract negotiations were initiated.²⁹⁸

²⁹¹ Exhibit B-1, p. 5.

²⁹² Exhibit B-13, RCIA IR 3.2.

²⁹³ FEI Final Argument, p. 21.

²⁹⁴ *Ibid.*, p. 18.

²⁹⁵ *Ibid.*, p. 22.

²⁹⁶ Exhibit B-1, p. 74.

²⁹⁷ *Ibid.*

²⁹⁸ *Ibid.*, p. 75.

FEI states that Sensus USA Inc. and Sensus Canada Inc. (together, Sensus) were selected as the AMI Network Vendor of choice. FEI considers that Sensus offers mature, proven AMI technology that best meets FEI's network functional requirements, is capable of integrating with existing and future FEI systems to enable delivery of FEI's AMI solution, and is scalable to accommodate future customer growth.²⁹⁹

Deployment Vendor RFP

FEI identifies that in determining the successful Deployment Vendor, FEI will consider each proponent's profile and experience, work plan, and ability to deliver the scope of services in accordance with the Deployment Vendor RFP.³⁰⁰ The final Deployment Vendor RFP was released on June 18, 2021 and covers the provision of: installation services; other deployment services; and provision of installation personnel with the training, tools and equipment required to complete their work safely and reliably.³⁰¹

Other Supporting Contracts

FEI states that its engineering standard for meter set design includes installation of meter set bypass valves and regulators and given that the Project will require every meter to either be upgraded with a communication module or be exchanged, full deployment of 780,000 bypass valves is included in scope of the Project. As such, in May 2020, FEI undertook procurement processes to select preferred suppliers of bypass valves, and residential and small commercial regulators.³⁰² As stated in Section 3.1 above, under the current business model, bypass valves are periodically replaced under sustainment capital as they come due for replacement.

4.3 Project Architecture

This section provides a high-level overview of how the technical components of the Project are logically architected to enable delivery of the Project scope. The Figure below provides the Project architecture in graphic form:

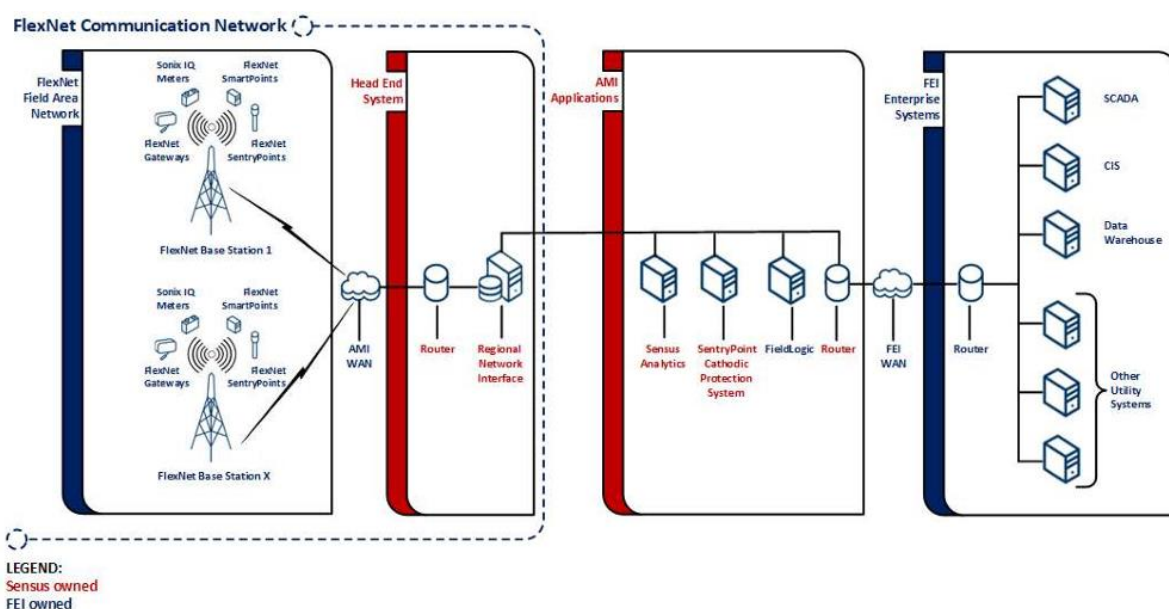
²⁹⁹ Ibid.

³⁰⁰ Ibid., p. 76.

³⁰¹ Ibid., pp. 75-76; Exhibit B-6, BCUC IR 14.7.

³⁰² Ibid., p. 76.

Project Logical Architecture³⁰³



As shown above, the main technical components of the Project's architecture are as follows:

- Sensus FlexNet Field Area Network. The Sensus FlexNet field area network (FAN) is a long-range radio network that provides scalable and reliable two-way communication infrastructure enabling communication modules (End Points) installed on meters or other field-based devices to transmit data for collection by Sensus FlexNet Base Stations.³⁰⁴ A component of the FlexNet network is the advanced meters themselves, which are the Sensus Sonix IQ meters. FEI identifies that these meters are the most customer-facing part of the AMI Project.³⁰⁵
- Sensus Head End System. A Head End System (HES) is the back office that controls the advanced metering infrastructure. Sensus' HES application is a configuration of network software and servers that communicate with Base Stations to continuously gather and process data to store or forward to other AMI applications.³⁰⁶
- Sensus FlexNet Communication Network. The FlexNet communication network is the infrastructure that enables secure, dedicated (licensed radio-frequency spectrum) two-way data transmission between the End Points and Base Stations, and the HES.³⁰⁷ FEI states that each Sonix IQ meter is configured to transmit every 4 hours on a pseudo-random schedule, which results in a constantly shifting but regular transmission schedule. FEI states that the total transmission time for the Sonix IQ meters under typical operation is approximately 0.34 seconds per day.³⁰⁸

³⁰³ Ibid., p. 77, Figure 5-1.

³⁰⁴ Exhibit B-1, p. 77.

³⁰⁵ FEI Final Argument, p. 19.

³⁰⁶ Exhibit B-1, p. 78.

³⁰⁷ Ibid., p. 79.

³⁰⁸ FEI Final Argument, p. 20.

- AMI Applications. FEI states that these software applications are required to enable capabilities of the AMI solution including meter data management, monitoring of FEI's corrosion mitigation assets, and mobile configuration and troubleshooting of End Points.³⁰⁹
- FEI Enterprise Systems. The Project will enhance FEI's data repository system that is used for enterprise reporting and data analysis as well as FEI's customer portal.³¹⁰

As noted in the Figure above, certain components of the Project will be FEI owned, while certain components will be owned, installed, operated and maintained by Sensus as a Software as a Service (SaaS) model. FEI notes that although owned by FEI, the FlexNet communication network will also be operated and maintained as Managed Services by Sensus. FEI states that for complex, integrated computer systems, a SaaS model provides the utility with certainty that the system will meet contracted service level agreements and states that many companies are moving to SaaS for certain applications for this reason.³¹¹ FEI identifies that its contract with Sensus for Managed Services and SaaS solutions has a term of 20 years, with an option for three additional years. FEI states that this term commences coincident with meter deployment and was chosen to ensure services were available for the expected lifespan of the technology.³¹²

4.4 Project Schedule and Permitting

The following table provides the broad, preliminary schedule by implementation phase. FEI states that the implementation start date will be set after receipt of regulatory approval, with a complete integrated system and operational processes in-service date approximately four and a half years later.³¹³

FEI's Project Schedule³¹⁴

Activity	Date
CPCN Filing	May 2021
Prepare	Q2 2021 – Q3 2022
Define	Q2 2022 – Q2 2023
Design, Build, Integrate and Ready For Deployment	Q2 2022 – Q3 2024
Deploy AMI Technology/Billing System Integration	Q3 2022 – Q3 2023
Deployment Region 1: Lower Mainland South	Q4 2022 – Q2 2025
Deployment Region 2: Lower Mainland North	Q2 2024 – Q4 2026
Deployment Region 3: North Interior	Q2 2023 – Q3 2025
Deployment Region 4: South Interior	Q1 2023 – Q2 2026
Deployment Region 5: Vancouver Island	Q3 2023 – Q3 2026
Deployment Region 6: Kootenays	Q3 2024 – Q4 2026
Deploy Enterprise Data Repository, Customer Portal, Leak Detection	Q1 2024 – Q1 2025
Final Acceptance	Q3 2026
Close Out	Q3 2026 – Q4 2026

FEI states that after receipt of BCUC approval, FEI will issue a Notice to Proceed to Sensus and the to-be selected Deployment Vendor, allowing 90 days to mobilize for implementation.³¹⁵

³⁰⁹ Exhibit B-1, p. 79.

³¹⁰ Ibid., p. 80.

³¹¹ Ibid., p. 81.

³¹² Exhibit B-6, BCUC IR 15.2.

³¹³ Exhibit B-1, p. 81.

³¹⁴ Ibid., p. 85, Table 5-2.

³¹⁵ Ibid., p. 84.

FEI identifies the following as the necessary municipal approvals, permits, licenses or authorizations required as part of the AMI Project:³¹⁶

- Measurement Canada advanced meter approval required by Sensus (federal);
- Technical Safety BC Alternative Safety Approach approval required by FEI (provincial);
- Innovation, Science and Economic Development (ISED) Canada radio frequency license approval required by FEI (federal).³¹⁷

4.5 Project Risk Analysis

FEI engaged Yohannes Project Consulting Inc. (YPCI), a company specializing in risk management, to guide FEI's risk analysis. FEI identifies that the overall objectives of its risk analysis process were to:³¹⁸

- Identify key risk areas requiring the Project team's attention for planning the Project;
- Perform qualitative analysis to prioritize and rank the risk using a risk matrix;
- Identify those risk items that can have a critical effect on the Project outcome; and
- Articulate critical risk information that was used as an input to the Project's cost and schedule risk quantification and contingency estimation.

FEI indicates that the risk identification and qualitative analysis were completed using the Association for the Advancement of Cost Engineering (AACE) International Recommended Practice: 62R-11 "Risk Assessment: Identification and Qualitative Analysis" as a guide. FEI states that risks were identified through workshops that leveraged the knowledge of internal FEI employees experienced with large-scale projects, including but not limited to the FBC CPCN for the AMI Project Decision³¹⁹ (2013 FBC AMI Decision). Additionally, FEI solicited risk knowledge from a consultant familiar with several North American AMI implementation projects and spoke to several utilities that have deployed electric and gas AMI solutions.³²⁰

This risk identification process identified a number of risks that are tabulated in the risk register document, which is provided in Confidential Appendix E-1 to the Application. Once the risks were identified, a qualitative analysis was completed to prioritize or rank the risks so that the Project team could focus on risk response actions and mitigation for the high priority risks. Through this qualitative process, FEI applied a likelihood category and consequence rating to each risk identified. The product of the likelihood and consequence was then used to establish the overall risk score and ranking for each risk. FEI states that the risk register is dynamic, and risks will be continually identified, tracked and updated throughout the Project.³²¹

³¹⁶ Exhibit B-6, BCUC IR 16.3.

³¹⁷ Exhibit B-1, Appendix. F-1, pp. 19-20.

³¹⁸ Exhibit B-1, p. 89.

³¹⁹ Decision and Order C-7-13 dated July 23, 2013 - FortisBC Inc. Application for a Certificate of Public convenience and Necessity for the Advancement Metering Infrastructure Project.

³²⁰ Exhibit B-1, pp. 89-90.

³²¹ Ibid., p. 90.

YPCI also completed a quantitative analysis evaluating the impact of the Project's risks to validate contingency estimates prepared by FEI's Project estimating personnel. As a result, FEI's recommended contingency for the Project is \$34.3 million, or 6.2 percent. As the Project design advances through detailed design, the contingency will be re-evaluated using a methodology that continues to align with AACE International recommended practices.³²²

4.6 Security and Privacy

FEI recognizes that due to the nature of AMI, security is an important consideration for a number of Project components. FEI states that it treats the security of its customers' information as a high priority and the requirement for security of information was and is a key consideration throughout design, procurement, and implementation.³²³ The security requirements for the AMI solution include considerations for, but not limited to, the following:³²⁴

- Confidentiality, integrity, security and privacy of data at rest or in transit;
- Controls for malicious code detection, spam protection and intrusion detection;
- User authentication and user role controls based on access of least privilege (that is users can be set up in the system with the least amount of access required to complete their roles);
- Audit controls and logging of user actions and events; and
- Resistant to outside electromagnetic interference.

FEI has developed a formal Cybersecurity Risk Management Program (CRMP) to identify appropriate security measures for individual cyber assets. Cyber assets include infrastructure, data, applications, and all other technology systems, both operationally and corporately. The CRMP requires ongoing assessment of cyber assets to identify any changes in risk to assets that could require a change in approach to the security of that asset.³²⁵

FEI retained a cybersecurity expert consultant to provide a detailed analysis on mechanisms built into Sensus' AMI technology and how FEI will be using and integrating the technology with existing and new systems as part of the Project. FEI identifies that this independent, expert analysis concluded the system will provide sufficient levels of security for its intended use and made recommendations that will inform definition and design deliverables. In addition, FEI states that it will ensure security audits are carried out by a third-party agency during implementation and on an on-going basis to verify that the AMI Project meets or exceeds the security standards set out by AMI-SEC, which is a North American AMI task force charged with developing security guidelines, recommendations, and best practices for AMI system elements.³²⁶

FEI intends to complete an independent third-party audit and cybersecurity test of the proposed system once it is configured. Recommendations from these independent assessments will be applied, if necessary, to enhance or upgrade the security on the AMI system prior to it going live.³²⁷

³²² Ibid., p. 91.

³²³ Ibid., p. 92. FEI Final Argument, p. 64.

³²⁴ Ibid., p. 93.

³²⁵ Exhibit B-16, BCUC IR 43.1.

³²⁶ Exhibit B-1, pp. 92-93; FEI Final Argument, p. 64.

³²⁷ Exhibit B-16, BCUC IR 43.2.

In terms of privacy, FEI states that it respects its customers' privacy and seeks to protect their personal information. The *Personal Information Protection Act* (PIPA) and the federal *Personal Information Protection and Electronic Documents Act*, as applicable, govern the protection of personal information in BC. FEI takes its obligation to protect its customers' personal information seriously and is committed to complying with the requirements under PIPA through, among other things, the application of its privacy policy.³²⁸

4.7 Customer Refusals and Opt-out

FEI acknowledges that some customers will not want an advanced meter installed on their premises and consequently, it is possible that some customers will refuse the installation of an advanced meter. FEI states that it plans to work with these customers, 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. FEI states that 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. The advanced meter will continue to operate as a meter when deactivated; however, it will no longer communicate with Base Stations. Customers choosing to opt-out will be required to pay for their meters to be manually read.³²⁹ FEI states it anticipates there will be separate fees for the installation of a radio-off AMI meter and the ongoing monthly manual reads.³³⁰

FEI considers that this is appropriate because it ensures 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. FEI considers that this approach is consistent with the 2013 FBC AMI Decision, which determined that the incremental cost of opting-out of the AMI program will be borne by the individual choosing to opt out.³³¹

FEI stated in the Application that it estimated two percent of customers would choose to opt-out of having an AMI meter installed.³³² Following engagement with customers, FEI anticipates having fewer opt-out requests than originally specified in the Application. However, this may change as project implementation proceeds.³³³

FEI anticipates that, should the Project be approved, certain amendments to FEI's General Terms and Conditions and applicable commercial and industrial rate schedules will be required. FEI believes that it would be most efficient to propose specific tariff changes related to the Project after the BCUC makes a determination on the Project and, if approved, closer to the actual implementation date. FEI states that the future tariff application will also include the processes and fees for customers who choose the radio-off AMI meter option, and the proposed fees will be set to recover the incremental costs of opting out of an AMI meter. FEI expects to file an application for the necessary tariff changes at least six months prior to the Project's first regional deployment.³³⁴

³²⁸ Exhibit B-1, p. 92; FEI Final Argument, pp. 64-65.

³²⁹ *Ibid.*, p. 94.

³³⁰ Exhibit B-13, RCIA IR 23.1.

³³¹ FEI Final Argument, p. 66; FEI provides reference to BCUC Order C-7-13 and accompanying decision, p. 148.

³³² Exhibit B-1, p. 56; Exhibit B-6, BCUC IR 10.2.

³³³ Exhibit B-6, BCUC IR 38.2.

³³⁴ Exhibit B-1, p. 95.

Regarding other non-communicating options such as wired communications, FEI states the advanced meter does not have a wired communications option.³³⁵

4.8 Safety

In the course of the proceeding, ICLR provided information on seismic safety and CORE provided information on battery safety.

Intervener Evidence

During the proceeding, ICLR stated that it urges the BCUC to require FEI to install AMI meters that are equipped with a seismically actuated shut-off device.³³⁶ ICLR states that including an automatic seismic shut-off capability in the AMI meters would significantly reduce the risk of fires following earthquakes in British Columbia. ICLR states research indicates earthquakes could result in “billion of dollars in preventable fire losses in the Lower Mainland.”³³⁷

FEI states the implementation of the AMI Project will add the ability to remotely disconnect customers, which will improve public safety. FEI states it will conduct internal workshops to discuss the use of remote disconnects during a variety of emergency scenarios, including earthquakes.³³⁸

FEI states it considered the implication of having automatic seismic shut-off valves integrated into its advanced meters, but ultimately determined this option would improve an unacceptable risk to reliability with no meaningful safety benefits. FEI notes the potential for mass actuation of the seismic shut-off valve during a minor earthquake which could result in mass disconnection of customers with gas services that continue to operate safely. FEI states it intends to implement automatic meter shut-off driven by unexpected gas flow, which is a more accurate approach. Further, FEI states that residential meters with an automatic seismic valve are not available in North America.³³⁹

In support of its position, FEI commissioned D.G. Honegger Consulting to provide an expert opinion on this subject. FEI notes the report supports FEI’s view that seismic-actuated valves should not be included in the AMI Project. Further, FEI notes Technical Safety BC does not require seismic valves.³⁴⁰

In his non-expert witness statement on behalf of CORE, Mr. Karow states that the Sonix IQ meter contains a lithium battery “which Sensus warns can explode if heated to 212 degrees Fahrenheit.” Mr. Karow states CORE’s safety concern that high temperatures in the BC Interior areas could cause lithium batteries to explode.³⁴¹ In response to IRs, CORE submits that a lithium battery would quickly reach 212 degrees F in the event of a fire and would then explode. Also, CORE provided a news article stating temperatures in Lytton, BC reached 121 degrees F in June 2021 and submits that a dark coloured building located in the sun may exceed 212 degrees F.³⁴²

³³⁵ Exhibit B-10, CORE IR 13.0.

³³⁶ Exhibit C12-3, p. 3.

³³⁷ Ibid., p. 1.

³³⁸ Exhibit B-21, ICLR IR 1.4

³³⁹ Ibid., ICLR IR 1.16.

³⁴⁰ Ibid.

³⁴¹ Exhibit C7-12-1, Appendix A, p. 2.

³⁴² Exhibit C7-13, CORE Response to BCUC IR 1.2.

In its rebuttal evidence, FEI states that the battery in its proposed meter is a lithium thionyl chloride battery encased in a gel-filled container, ensuring oxygen cannot reach the battery and so there is no risk of ignition. FEI states the meters are designed, tested and certified to meet Canadian Standard Association requirements. Further, FEI states it has not had batteries in its own measurement equipment fail in an unsafe manner over the last 20 years.³⁴³

4.9 Summary of Project Description

Positions of the Interveners

BCSEA is satisfied that the AMI Project is “fully described” in FEI’s evidence.³⁴⁴ BCSEA submits that if the AMI Project is approved then there should be a radio-off option made available with the costs of manual meter reading borne by those who select this option rather than by all FEI customers.³⁴⁵

BCSEA submits that FEI has “appropriately recognized and acted upon the importance of information security regarding the design, implementation and operation of the AMI Project” and has acknowledged its legal obligations to protect the privacy and personal information of its customers.³⁴⁶

BCSEA does not view that the evidence supports the installation of automated seismic shut-off valves as part of the AMI Project. BCSEA considers that the excess flow shut-off capability of FEI’s proposed meters is a preferable approach.³⁴⁷

The CEC finds FEI’s approach to be “comprehensive”³⁴⁸ and that the Project is “well thought out.”³⁴⁹ The CEC recommends that the BCUC approve FEI’s proposal for a radio-off option.³⁵⁰

The CEC submits that FEI has appropriate personal privacy management in place, and recommends that the BCUC find the AMI Project to provide adequate security and privacy.³⁵¹

RCIA submits that if FEI’s Application for the AMI Project is approved, then it is appropriate for FEI to charge for manual meter reads for those customers that choose the radio-off option. However, RCIA disagrees that these manual meter readings must be conducted every month.³⁵²

RCIA submits that customers that do not have demand metering should be allowed to submit their own meter readings most months. RCIA explains that such customers could be required to enter meter readings through FEI’s web site, which is already connected to FEI’s billing system, and that FEI could perform a manual meter

³⁴³ Exhibit B-26, Part 1, p. 2.

³⁴⁴ BCSEA Final Argument, p. 10.

³⁴⁵ Ibid., p. 21.

³⁴⁶ Ibid., pp. 20-21.

³⁴⁷ BCSEA Final Argument, pp. 23-24.

³⁴⁸ CEC Final Argument, p. 21.

³⁴⁹ Ibid., p. 25.

³⁵⁰ Ibid., p. 36.

³⁵¹ Ibid., p. 35.

³⁵² RCIA Final Argument, p. 29.

reading once or twice a year to provide assurance that customers' meter readings were accurate and to correct any prior inaccurate readings.³⁵³

FEI submits in reply that the BCUC should not endorse RCIA's proposal for customers to take their own meter readings as it is inconsistent with the general terms and conditions of FEI's Gas Tariff, which obligates FEI to perform "monthly measurements of customers' gas consumption using supplied meter sets." FEI further submits that its existing process for customers to submit their own readings is only intended for "ad hoc" readings and is not intended to handle the large volume of regular meter readings performed by meter readers, and there is "no system in place to automatically enter customer-supplied meter readings into the billing system."³⁵⁴

CORE submits that it has demonstrated the potential for the lithium batteries in the AMI meters to explode at high temperatures, a "real and substantial risk to public safety" that FEI has failed to address.³⁵⁵

In reply, FEI submits that the evidence demonstrates that even on the hottest day recorded in Canada, the temperature was approximately 90 degrees below the threshold at which a risk of explosion could arise. Further, FEI is unaware of any explosions arising from higher temperatures in other jurisdictions where devices using the same batteries are used.³⁵⁶

CORE further submits that FEI's inclusion of bypass values as part of the scope of the AMI Project "points to a lack of full and fulsome consideration and study by FEI on the safety of the bypass values."³⁵⁷

In reply, FEI explains that bypass value installation is part of its standard meter exchange activity today, and that the inclusion of meter bypass replacement in the scope of the AMI Project is a matter of efficiency.³⁵⁸

CORE also submits that FEI does not appear to address the safety concerns raised by ICLR regarding shutting off gas supply in the event of an earthquake. CORE submits that the BCUC "should have pause in accepting Fortis' contention that there is minimal risk to the performance of the meters in the event of an earthquake" as this information is not on the evidentiary record in this proceeding.³⁵⁹

In reply, FEI notes that CORE does not address any of FEI's evidence or submissions regarding automated seismic shut-off valves, and that these issues are outside CORE's scope of intervention. FEI submits that the AMI Project will provide the ability for it to remotely disconnect customers, which will increase public safety, and that its proposed meters are tested to ensure compliance with required standards for vibration.³⁶⁰

CORE raises concerns with respect to customer privacy and the AMI Project. Regarding the AMI data collection system, Dr. Héroux states, "the system steals data from customers" and "is equivalent to placing a surveillance

³⁵³ Ibid., p. 30.

³⁵⁴ FEI Reply Argument, pp. 27-28.

³⁵⁵ CORE Final Argument, p. 39.

³⁵⁶ FEI Reply Argument, p. 42.

³⁵⁷ CORE Final Argument, p. 39.

³⁵⁸ FEI Reply Argument, p. 43.

³⁵⁹ CORE Final Argument, pp. 41-42.

³⁶⁰ FEI Reply Argument, pp. 43-44.

device in a home, without the owner's consent."³⁶¹ Mr. Karow states, "CORE members are additionally concerned about public safety issues arising from the ability of smart meters to gather personal data not required for billing purposes."³⁶²

In rebuttal evidence, FEI states, unless a customer has explicitly consented, FEI will not sell their personal information to third parties and disclosure of customer information is limited to that which is permitted or required by privacy legislation. FEI states it takes its "obligation to protect the personal information of its customers seriously and is committed to complying with the requirements under PIPA."³⁶³

In response to Dr. Héroux, FEI states Dr. Héroux has no evidentiary basis for making his claims related to customer privacy. Further, FEI states customer privacy and system security are beyond Dr. Héroux's area of expertise which the BCUC ruled were not within CORE's scope of intervention and that CORE was not permitted to file intervenor evidence on such topics.³⁶⁴

During the proceeding, ICLR stated that it urges the BCUC to require FEI to install AMI meters that are equipped with a seismically actuated shut-off device.³⁶⁵

FEI states that the technology ICLR advocates for FEI to include in the advanced gas meters is not commercially available and there is no Measurement Canada approved meter with an integrated seismic actuated valve. FEI also notes other issues with this concept even if it was commercially available, including mass outages from undesirable actuation. FEI considers that the optimal solution is to utilize the intelligent capabilities of AMI, including remote shutoff capabilities, excess flow shutoff, and leak detection.³⁶⁶

Panel Determination

The Panel finds that FEI's description of the AMI Project is satisfactory for the purposes of the CPCN evaluation. The AMI Project consists of more than one million meters, 780,000 bypass valve sets, more than one thousand command modules, plus the AMI network and infrastructure. No issues emerged during the proceeding regarding FEI's approach to procurement, project architecture, project schedule or permitting. The Panel accepts FEI's project risk analysis, which it conducted with the input of a consultant specializing in risk management and in accordance with AACE International recommended practice.

Several issues were raised regarding FEI's description of the AMI Project, dealing with privacy, opting-out and the safety of the AMI devices. The Panel addresses these concerns as follows.

The Panel agrees that FEI should offer a "radio-off" option for those customers that refuse to allow FEI to connect the meter on their premises via wireless technology. The Panel also agrees that such customers should pay the additional costs of having their advanced meters installed with the internal communicating radio turned off and of having their meters read manually.

³⁶¹ Exhibit C7-12-1, Appendix B, p. 27.

³⁶² Ibid., Appendix A, p. 4.

³⁶³ Exhibit B-26, Part 1, p. 7.

³⁶⁴ Ibid., cover letter, p. 2.

³⁶⁵ Exhibit C12-3, p. 3.

³⁶⁶ FEI Final Argument, pp. 66-67.

The Panel rejects RCIA's suggestion that FEI should allow its customers to read their own meters most months and submit those readings to FEI electronically. The Panel accepts FEI's evidence that there is no system in place for such meter readings to be entered automatically into the billing system, and that the existing process for customers to submit their own readings is not intended to handle large volumes.

The Panel finds that CORE has not demonstrated a "real and substantial risk to public safety" from the potential of the lithium batteries in the AMI meters to explode. The Panel accepts FEI's evidence that the highest recorded temperature in Canada was approximately 90 degrees below the threshold at which a risk of explosion could arise.

The Panel also finds that CORE's concern about FEI installing bypass valves as part of the AMI Project is misplaced. Installing bypass valves is FEI's standard practice today and installing them as part of the AMI Project is a matter of efficiency.

The Panel accepts that FEI is not proposing to install automated seismic shut-off valves as part of the AMI Project. The Panel is satisfied with FEI's evidence that its proposed meters are tested to ensure compliance with required standards for vibration.

CORE cites evidence from Dr. Héroux that FEI's collection of data from its AMI meters "potentially amounts to an invasion of privacy, and data theft."³⁶⁷ The Panel finds that this statement is unsupported by evidence and does not amount to a credible argument that FEI's proposed AMI meters are a threat to its customers' privacy. The Panel also notes we previously found that "CORE's scope of intervention does not include privacy, security or electrical engineering issues."³⁶⁸

5.0 Radiofrequency Emissions and Health

This section addresses the potential adverse health effects of the radiofrequency emissions from FEI's proposed AMI technology, which is the main subject of CORE's intervention in this proceeding, and includes the following:

- Expert witnesses and Mr. Karow;
- The BCUC's jurisdiction to assess radiofrequency emission safety;
- AMI technology's applicability and compliance with respect to Health Canada's Safety Code 6;
- The sufficiency of Health Canada's Safety Code 6 and CORE's proposed alternative standards;
- The precautionary principle; and
- Alleged errors in the Exponent Reports.

5.1 Expert Witnesses in this Proceeding

Subject to issues of relevance and admissibility, all parties to a proceeding are free to put forward evidence. This evidence may be challenged through IRs or through the cross-examination of witnesses. The Panel assessed the evidence and reached its conclusions with respect to the validity of that evidence and the weight that should be

³⁶⁷ CORE Final Argument, p. 17.

³⁶⁸ Exhibit A-30, Order G-92-22, Appendix B, p. 9.

placed upon it. Based on all of the evidence put forward on a specific factual issue, the Panel applies its judgment as to the weight to be placed on that evidence.

Another form of evidence is opinion evidence of experts which may be admissible to prove facts where the subject matter of the evidence is beyond the common understanding of the panel. In assessing the credibility and relevance of the opinion evidence, and the weight it should be given, the Panel takes into account the education and work experience of the expert, whether the expert adopted an objective approach in presenting their opinion evidence, and the expert's ability to defend their opinion evidence. The Panel also considers the facts and assumptions on which the opinion evidence is based, whether there is other evidence that contradicts those facts and assumptions, and whether a witness adopts an advocacy role.

The BCUC's Participant Assistance/Cost Assistance (PACA) Guidelines states that "Expert witnesses are expected to provide services related to their specialized technical expertise and provide fair, objective and non-partisan opinion evidence."³⁶⁹ Experts are expected to provide their opinion evidence in an objective manner and not to act as advocates.

The Supreme Court of Canada in *White Burgess* set out the following criteria for the admissibility of expert evidence:³⁷⁰

1. The opinion must be relevant;
2. It must be necessary in the sense that the fact or facts cannot be proven satisfactorily in any other way;
3. It must not offend any exclusionary rule;
4. It must be given by a properly qualified expert who is, by virtue of special skill, knowledge, training, or experience, sufficiently qualified to express the opinion in question. This assessment should also concerns relating to the expert's duty to the court and his or her willingness and capacity to comply with it; and
5. In the case of an opinion based on novel or contested science or science used for a novel purpose, the reliability of the underlying science for that purpose must be established.

In the remainder of this section, the Panel addresses the weight to give the evidence submitted by experts retained by FEI and CORE. The Panel has previously accepted that CORE's witnesses are qualified to provide expert evidence and does not consider that further inquiry into whether CORE's witnesses qualify as experts is required. The Panel accepts that FEI's expert witnesses from Exponent are qualified to provide evidence.

FEI's Expert Evidence – Exponent

FEI retained Exponent to prepare an independent study that examined the specific technology proposed for the Project and compare exposure levels from all end points of the proposed FEI network to the Safety Code 6

³⁶⁹ Order G-97-17, Appendix A, PACA Guidelines, Section 7.7, p. 6.

³⁷⁰ *White Burgess Langille Inman v. Abbott and Haliburton Co.*, 2015 SCC 23 (CanLii, [2015] 2 S.C.R. 182, Date: 2015-04-30, paras. 19-23, 53 <https://www.canlii.org/en/ca/scc/doc/2015/2015scc23/2015scc23.html>

exposure limit as well as other commonly used devices.³⁷¹ FEI also retained Exponent to prepare an independent study reviewing the latest scientific research on the potential health effects of electromagnetic frequency as well as the potential impact of FEI's chosen technology.³⁷²

FEI also retained Exponent to prepare its evidence in rebuttal of CORE's evidence.³⁷³

FEI submitted curriculum vitae (CV) for the following three individuals who prepared the Exponent materials:

Dr. Benjamin Cotts:³⁷⁴

- Position at Exponent: Senior Managing Engineer
- Education:
 - Ph.D., Electrical Engineering, Stanford University, 2011
 - M.S., Electrical Engineering, Stanford University, 2004
 - B.S., Electrical Engineering, University of Portland, summa cum laude, 2002
- CV indicates that he performs various types of electromagnetic field evaluations for devices and systems including smart meter mesh networks and government/military communications facilities as well as exposure, EMI or EMC assessments. These assessments are provided for clients such as federal and state agencies, utilities, hospitals, medical-device manufacturers, construction developers, the U.S. military.
- Officer in the IEEE working group for Corona and Field Effects overseeing certain IEEE standards.
- Licensed Professional Electrical Engineer in California.

Dr. Pamela Dopart:³⁷⁵

- Position at Exponent: Managing Scientist
- Education:
 - Ph.D., Environmental Health Sciences, Johns Hopkins School of Public Health, 2015
 - M.P.H., Environmental Health Sciences, University of Michigan, Ann Arbor, 2008
 - B.S., Chemistry, James Madison University, 2006
- Prior to joining Exponent, Dr. Dopart was a Postdoctoral Fellow, Division of Cancer Epidemiology and Genetics, National Cancer Institute, 2015-2018 where her research focused on improving methods for assessing occupational and environmental exposures for epidemiologic studies of cancer.
- CV states that Dr. Dopart is an environmental and occupational health scientist who specializes in exposure assessment methods to inform epidemiologic studies and health risk assessments. Dr. Dopart has experience in the assessment of exposure to extremely low frequency and radiofrequency electromagnetic fields in relation to potential biological and health effects.
- Dr. Dopart is a Certified Industrial Hygienist.

Dr. William Bailey:³⁷⁶

³⁷¹ Exhibit B-1, Appendix F-1, Exponent RF Technology Report.

³⁷² Ibid., Appendix F-2, Exponent RF Health Report.

³⁷³ Exhibit B-26.

³⁷⁴ CV of Dr. Cotts; Exhibit B-1-1-1, pp. 1-5.

³⁷⁵ CV of Dr. Dopart; Exhibit B-1-1-1, pp. 6-9.

³⁷⁶ CV of Dr. Bailey, Exhibit B-1-1-1, pp. 10-22.

- Position at Exponent: Principal Scientist
- Education:
 - Ph.D., Neuropsychology, City University of New York, 1975
 - M.B.A., University of Chicago, 1969
 - B.A., Dartmouth College, 1966
- Teaching appointments, including at: University of Texas Health Science Center, Center for Environmental Radiation Toxicology; and Harvard School of Public Health, Office of Continuing Education.
- Prior experience includes: Vice President, Environmental Research Information, Inc., 1987-1990 Head of Laboratory of Environmental Toxicology and Neuropharmacology, New York State Institute for Basic Research, 1983-1987 Assistant Professor, The Rockefeller University, 1976-1983
- The Institute of Electrical and Electronics Engineers/International Committee on Electromagnetic Safety.
- Dr. Bailey was qualified as an expert witness in the BCUC's 2012-2013 proceeding in respect of the FBC AMI Project. He was qualified by the BCUC in that proceeding as an expert, to give opinion evidence in the field of bio-electromagnetics, specifically in the health risk assessment of exposure to electromagnetic fields, including radio frequency signals.³⁷⁷

FEI filed the following reports in this proceeding:

- Exhibit B-1, Appendix F-1: the Exponent RF Technology Report: "Radiofrequency Fields in the Environment and from Advanced Metering Infrastructure," prepared by Dr. Benjamin Cotts, Ph.D., P.E.³⁷⁸
 - Scope listed in report: At the request of FEI, Exponent prepared this summary report on the types of common environmental exposures to radiofrequency electromagnetic fields and exposure to FEI advanced metering infrastructure.
- Exhibit B-1, Appendix F-2: the Exponent RF Health Report: "Status of Research on Exposure to Radiofrequency Fields and Health in Relation to Advanced Metering Infrastructure," prepared by Exponent's Dr. Pamela Dopart, Ph.D., CIH, and Dr. William Bailey, Ph.D.³⁷⁹
 - Scope listed in report: At the request of FEI, Exponent prepared this summary report on the status of research related to radiofrequency exposure and health.
- Exhibit B-26, Section 2: Exponent Rebuttal Evidence
 - Scope: The purpose of this Rebuttal Evidence is to provide Exponent's response to aspects of the evidence of Mr. Hans Karow, Dr. Paul Héroux, Dr. Anthony Miller, and Dr. Magda Havas on behalf of CORE (Exhibits C7-12 and C7-12-1).³⁸⁰
- Drs. Cotts, Dopart, and Bailey also provided responses to a number of IRs on behalf of Exponent in this proceeding and delivered further written testimony as part of FEI's Rebuttal Evidence.

³⁷⁷ Decision and Order C-7-13 dated July 23, 2013 - FortisBC Ind. Application for a Certificate of Public convenience and Necessity for the Advancement Metering Infrastructure Project, p. 14.

³⁷⁸ Exhibit B-1, Appendix F-1; FEI Final Argument, p. 41.

³⁷⁹ Ibid., Appendix F-2; FEI Final Argument, p. 42.

³⁸⁰ Exhibit B-26, Part 2, A2, p. 2.

FEI's Position – Exponent

FEI submits Drs. Cotts, Dopart and Bailey are all eminently qualified in their fields of study, have extensive academic and other relevant experience, and should be qualified as experts in this proceeding.³⁸¹ FEI submits the independence and impartiality of the Exponent witnesses are demonstrated through the evidence of their experience and credentials; the content of their reports, which are thorough and objective; and the BCUC's findings in qualifying Exponent witnesses in the 2013 FBC AMI Decision.³⁸²

Positions of the Interveners – Exponent

The CEC finds the Exponent evidence to be significantly more persuasive than that provided by CORE's expert witnesses, which appears to be contrary to the scientific consensus in multiple instances.³⁸³

BCSEA submits that the Panel should give full weight to the evidence provided by the FEI and Exponent witnesses on "EMF, health and the proposed AMI technology." Their qualifications and experience are strong and pertinent to the issues. Their evidence is clear, thorough, well referenced and credible. BCSEA agrees with FEI that "the independence and impartiality of the Exponent witnesses are demonstrated through the evidence of their experience and credentials; the content of their reports, which are thorough and objective; and the BCUC's findings in qualifying Exponent witnesses in the 2013 AMI Decision."³⁸⁴

CORE questions the credibility of FEI's expert witness, Exponent, due to its: a) potential bias; b) reliance on unreliable and irrelevant sources in its RF Technology Report and c) reliance on unreliable and irrelevant sources in its RF Technology and RF Health Report.³⁸⁵

CORE submits that the Exponent experts' CVs demonstrate that they have previously been retained exclusively by various energy industry proponents and not on behalf of non-industry or public interest groups. CORE submits that this prior work by the Exponent experts for energy industry proponents may be a factor the BCUC weighs when determining the neutrality and objectivity of the Exponent witness panels' opinion evidence. CORE submits that the BCUC ought to have pause as to the independence of each of the "proffered Exponent Experts" of FEI, particularly when compared to CORE's expert witnesses.³⁸⁶

CORE notes that Exponent is a publicly traded company, and submits that when a company such as Exponent is ultimately answerable to its shareholders, and when its sole objective is to return a profit to its shareholders, the BCUC must have pause in determining whether the opinion evidence advanced by Exponent is independent and objective and whether it is in the public interest.³⁸⁷

³⁸¹ FEI Final Argument, p. 42.

³⁸² Ibid., p. 43.

³⁸³ CEC Final Argument, p. 33.

³⁸⁴ BCSEA Final Argument, p. 19; FEI Final Argument, p. 43.

³⁸⁵ CORE Final Argument, p. 33.

³⁸⁶ Ibid., p. 34.

³⁸⁷ Ibid.

CORE submits that the foregoing establishes the perception of bias on the part of the Exponent experts that diminishes their credibility and therefore little weight should be given to their testimony provided in the Exponent RF Health Report and the Exponent RF Technology Report.³⁸⁸

CORE further submits that the Exponent experts' reliance on irrelevant and unreliable sources that do not address 900MHz range frequencies that will be used by the AMI meters further calls into question the credibility of the Exponent RF Technology Report, which was also raised in a letter of comment submitted by Ms. Margaret Friesen. CORE submits that Exponent's failure to respond to the principled critique of Ms. Friesen demonstrates Exponent's bias in favour of FEI and is not reflective of the evidence of a non-partisan expert in this proceeding.³⁸⁹

FEI submits that CORE has ignored the actual content of the CVs of Drs. Cotts, Dopart, and Bailey. FEI cites numerous clients of Dr. Cotts and Dr. Dopart that are not proponents of the energy industry, such as government and hospitals and reiterates aspects of the CVs of Drs. Cotts, Dopart, and Bailey to demonstrate their respective years of experience.³⁹⁰

FEI states that CORE has not actually provided any sound, much less compelling, explanation for the BCUC to doubt the independence or integrity of Exponent's witnesses and states that the fact that Drs. Cotts, Dopart, and Bailey work at a for-profit consulting business does not disqualify them or prove they lack independence. FEI also notes that expert witnesses from other for-profit consulting firms regularly provide expert evidence in BCUC proceedings. For example, Concentric Advisors has provided expert evidence in respect of the British Columbia Hydro and Power Authority's (BC Hydro) current F2023-F2025 Revenue Requirements Application.³⁹¹

FEI submits that CORE's allegations regarding Exponent's independence, integrity, and reliability as expert witnesses are baseless and entirely without merit.³⁹²

Panel Determination – Exponent

In the Panel's view, the expert evidence provided by Exponent's three experts (Drs. Cotts, Dopart and Bailey) was clearly presented, thorough and credible, and exhibited no apparent bias. The opinions are based on scientific principles, for example examining studies based on quality rather than selecting studies that support a particular opinion, and supported by evidence.

Given his relevant education, honours and extensive peer-reviewed publishing record, the Panel gives considerable weight to the evidence from Dr. Cotts on the subjects of electromagnetics and physics including modeling and measurement of electromagnetic fields.

Her relevant education, experience and extensive publishing record, give weight to Dr. Dopart's evidence on the subjects of environmental and occupational health science.

³⁸⁸ Ibid.

³⁸⁹ CORE Final Argument, pp. 34-35.

³⁹⁰ FEI Reply Argument, pp. 29-30.

³⁹¹ Ibid., p. 32.

³⁹² Ibid.

The Panel also gives considerable weight to the evidence from Dr. Bailey on the subjects of the potential effects of electromagnetic fields on the environment and health given his relevant education, academic appointments and extensive publishing record in the area as briefly described above.

The Panel rejects CORE's allegations that FEI's expert witnesses from Exponent lack credibility due to potential bias. The fact that Drs. Cotts, Dopart and Bailey have previously worked on behalf of proponents in the energy industry is not in itself evidence of bias. Further, all three experts have also worked on behalf of government and academic agencies, as demonstrated in their CVs (examples are Dr. Cotts: US federal and state agencies, Dr. Dopart: National Cancer Institute of the US, Bailey: New York State Institute of Basic Research), undermining CORE's assertion that they do not have "varied industry and non-industry experience."³⁹³

The Panel further rejects CORE's allegation that the evidence from Exponent's witnesses is not "fair, non-partisan and objective."³⁹⁴ The fact that Exponent is a publicly traded company whose sole objective according to CORE is "to return a profit to its shareholders" is not evidence of bias on the part of its employees or contractors.

CORE's Non-expert Evidence – Mr. Hans Karow

Mr. Karow provided opinion evidence, however he was not qualified as an expert and is therefore not an "expert witness."

- CORE proposed a written statement, on behalf of CORE and CORE members, with respect to their concerns with the AMI Project that include, but are not limited to, the social, economic, environmental, and other impacts of the Project. In particular, Mr. Karow will speak to the ways in which members of CORE will be directly and sufficiently affected by the BCUC's decision regarding the AMI proceeding. This includes, but is not limited to, the effects electromagnetic radiation may have on CORE members; and the social and economic impact the AMI Project will have on CORE members.³⁹⁵

The Panel accepted CORE's request to submit the non-expert opinion evidence of Mr. Karow. The Panel requested that Mr. Karow restrict his evidence to the topics in scope for CORE's intervention in this proceeding and that his evidence does not duplicate that provided by CORE's experts.³⁹⁶

- Exhibit C7-12-1, Appendix A. (5-page statement)
- Mr. Karow's statement focuses on the effects of electromagnetic radiation, public safety concerns, and concerns with respect to costs.

FEI's Position – Mr. Karow

FEI objects to certain portions of Mr. Karow's witness statement as including evidence on matters for which he is not qualified as an expert. Specifically, FEI states:³⁹⁷

³⁹³ CORE Final Argument, p. 34.

³⁹⁴ Ibid.

³⁹⁵ Exhibit C7-11, p. 5

³⁹⁶ Order G-92-22 with Reasons for Decision dated March 31, 2022, p. 12.

³⁹⁷ FEI Final Argument, pp. 43-44.

- (a) At pages 1-2 of his witness statement, Mr. Karow makes various statements regarding the power density and other technical characteristics of the Sonix IQ meters, including that, “When data signals are not being sent, the meter will be sending out weaker signals to communicate with the grid”. These statements are inaccurate and not within Mr. Karow’s experience to make; FEI states that CORE acknowledged that Mr. Karow’s statement regarding power density was in error in its IR responses.
- (b) At page 2 of his witness statement, Mr. Karow states that “CORE is of the view that the use of Tadiran batteries poses safety issues” and then questions why the battery in the AMI meters has not been “certified as ‘intrinsically safe’ so that it can be worked on in the presence of a possible methane atmosphere”. Mr. Karow makes this statement after having received an IR response from FEI confirming that Sensus had the devices certified as “intrinsically safe”. Further and in any case, Mr. Karow is not qualified to give expert opinion evidence on these topics. When CEC posed an IR regarding Mr. Karow’s statement about a “possible methane atmosphere”, CORE responded that, “CORE is unable to provide a response as the above IR raises technical matters that are not within the scope of CORE’s knowledge.”
- (c) At page 2 of his witness statement, Mr. Karow makes a statement that Exponent’s RF Health Report “missed identifying at least 88% of the primary references on studies done specifically 900 MHz and over 70% of other relevant literature for the year 2020”. To FEI’s knowledge, Mr. Karow does not have any training or experience with epidemiological research that would qualify him to make this assessment.
[Emphasis added]

However, FEI does not object to Mr. Karow stating that matters are of “concern” to him or to CORE.³⁹⁸

Positions of the Interveners – Mr. Karow

CORE submits that FEI’s criticism is entirely without merit as CORE has never held Mr. Karow’s statement out to be providing expert evidence in this proceeding. The same was confirmed through CORE’s responses to IRs on its Intervener Evidence wherein CORE confirmed that it is unable to provide responses on technical matters outside of the scope of CORE’s knowledge. Through his non-expert statement, Mr. Karow speaks to the concerns and experiences of CORE members, while also discussing publicly available information CORE members have noted as it relates to the AMI Project.³⁹⁹

CORE submits that Mr. Karow’s non-expert statement be given significant weight as it reflects the concerns of the membership of CORE – which CORE states is a coalition comprising thousands of individuals – and raises many concerns in the public interest.⁴⁰⁰

BCSEA submits Mr. Karow is entitled to his opinion that the FEI AMI Project would have adverse health and environmental effects, but agrees with FEI’s submission.⁴⁰¹

BCOAPO, RCIA, and the CEC are silent on Mr. Karow’s statement.

³⁹⁸ FEI Final Argument, p. 43.

³⁹⁹ CORE Final Argument, p. 11.

⁴⁰⁰ Ibid.

⁴⁰¹ BCSEA Final Argument, p. 19.

Panel Determination – Mr. Karow

The Panel acknowledges the concerns of CORE's membership that Mr. Karow has identified in his non-expert statement, specifically their concerns about the alleged effect of electromagnetic radiation that the AMI Project will have on CORE's members.

However, as CORE itself has recognized, Mr. Karow is not an expert in any scientific field relevant to this AMI Project. For this reason, the Panel gives no weight to Mr. Karow's evidence when considering whether or not electromagnetic radiation from the AMI Project will have harmful effects on CORE's members, or indeed on the public in general.

CORE's Expert Evidence – Dr. Paul Héroux

CORE presented a CV for Dr. Héroux which included the following:

- Education:⁴⁰²
 - o Bachelor of Science, Physics (Université Laval, 1972);
 - o Master of Science, Physics (Université du Québec, 1975). Subject: Electrodynamics and Acoustics of Corona Discharges.
 - o Ph.D., Physics (Université du Québec, 1981). Subject: Reduction of Corona Effects of High Voltage Transmission Lines.
- Associate Professor at McGill University's Faculty of Medicine, where he is the current Occupational Health Program Director, and Medical Scientist in the Department of Surgery of the McGill University Health Center. Dr. Héroux teaches Toxicology as well as Health Effects of Electromagnetism.⁴⁰³
- CV indicates memberships in many professional societies, including: Society of Toxicology; Canadian Society of Toxicology; BioElectroMagnetics Society; IEEE Standards Coordinating Committee on Non-Ionizing Radiation.⁴⁰⁴
- Has been hired as a consultant by several companies, including Hydro-Quebec, Nortel (1994) and Siemens (1996). He has worked for the U.S. government as a committee member for the State of New Hampshire assessing the potential health effects of 5G radiation (2019).⁴⁰⁵

Dr. Héroux's proposed scope of evidence included:⁴⁰⁶

- Toxicology and Health Effects of Electromagnetism as it relates to the AMI Project.
- A critique of Exponent's Radiofrequency Technology Report, with specified scope items listed.
- The impact the AMI Project will have on increasing the population's exposure to combined electromagnetic radiation and his research showing the incidence of chronic diseases, including diabetes, is possibly impacted by exposures from power systems and wireless.

⁴⁰² Dr. Paul Héroux CV; Exhibit C7-11, Appendix E.1.1, p. 1.

⁴⁰³ Ibid., p. 24.

⁴⁰⁴ Ibid., p. 3.

⁴⁰⁵ Ibid., pp. 27-28.

⁴⁰⁶ Exhibit C7-11, pp. 5-6.

The Panel previously found that this proposed scope was within the scope the Panel approved for CORE's intervention in this proceeding.⁴⁰⁷

Evidence presented by Dr. Héroux included:

- Exhibit C7-12-1, Appendix B (36-page report).

FEI's Position – Dr. Héroux

FEI states that it does not take a position on Dr. Héroux's credentials to be qualified as an expert witness in his areas of academic training and experience.⁴⁰⁸

However, FEI considers that Dr. Héroux's report includes content on topics that are outside his area of expertise. Further, FEI considers that his report includes various intemperate language and unfounded allegations that are not reflective of an objective and neutral expert scientist. FEI notes that the first section of Dr. Héroux's report, titled "The Pseudo-Science of RF Safety Limits" contains various statements and comments about the motivations and perceived biases of various international standard setting bodies, in particular the Institute of Electrical and Electronics Engineers (IEEE).⁴⁰⁹ FEI cites the following examples:⁴¹⁰

- (a) At page 6 of his report, in describing a standards committee of IEEE, Dr. Héroux states that, "given the need to insure [sic] stability of investments in wireless, it seemed critical to convince everyone that health impacts of non-ionizing RF were impossible, or at the very least negligible".
- (b) At page 8 of his report, Dr. Héroux describes Health Canada as having used "Copy and Paste" from the IEEE's C95.1 RF standard to establish Safety Code 6. He describes the "adoption of the C95.1 model" as "only a formality for many countries, occasionally with small variations in their national versions to maintain the illusion of national sovereignty, as happened in Canada with SC6". He goes on to describe the RF limits in Safety Code 6 as "written by industry" and as promoting "excessively permissive exposures based on heating, for the purposes of favoring deployment of as many wireless devices as possible ('expand the market')."

FEI considers that these statements in Dr. Héroux's report have no evidentiary basis and are not befitting of an objective and impartial expert scientist providing evidence in a BCUC proceeding.⁴¹¹

Regarding statements that are also outside of Dr. Héroux's knowledge or expertise, FEI notes the following passage from his report, under the heading, "The Trojan Horse":⁴¹²

The design of the FortisBC meter deployment goes beyond its stated objectives. This is deception (claiming one objective to hide another). Beyond gathering billing information, the system steals data from customers, and sets an infrastructure for large future increases in the RF exposures of one million customers by adhering to an irrational IoT philosophy. Acquiring data beyond what is necessary for the legitimate operations of billing is equivalent to placing a surveillance device in a home, without the owner's consent. It is important to realize that, as

⁴⁰⁷ Order G-92-22 with Reasons for Decision dated March 31, 2022, p. 9.

⁴⁰⁸ FEI Final Argument, p. 44.

⁴⁰⁹ Exhibit C7-12-1, Appendix B, pp. 4-10.

⁴¹⁰ FEI Final Argument, pp. 44-45.

⁴¹¹ Ibid., p. 45.

⁴¹² Ibid.; Exhibit C7-12-1, Appendix B, p.27.

these meters evolve, they could gain the capability of detailed mapping of user behavior, equivalent to placing a camera inside a home. [Emphasis added by FEI]

FEI states that in this passage, Dr. Héroux makes unfounded and unsupported allegations that are provided without any explanation or substantiation and again are not befitting of an impartial expert witness. Further, Dr. Héroux gives his opinion on matters of system security and customer privacy that are not within his stated areas of expertise. FEI considers that such topics are also outside the scope of CORE's intervention.⁴¹³

Based on the above, and the tenor of Dr. Héroux's report more generally, FEI submits that, if the BCUC does qualify Dr. Héroux as an expert witness in this proceeding, the Panel should be skeptical of his report and evidence and give it reduced weight.⁴¹⁴

FEI also notes that Dr. Héroux (and Dr. Miller) gave evidence about the long-term health effects of electromagnetic fields in a recent Alberta Utilities Commission (AUC) proceeding regarding an ATCO transmission project. The AUC declined to follow this evidence, stating that the evidence of Dr. Héroux and Dr. Miller was inconsistent with the conclusions of the World Health Organization (WHO), Health Canada and other organizations, and further, neither provided sufficient evidence to displace the conclusions of those organizations.⁴¹⁵

Position of the Interveners – Dr. Héroux

As stated above, the CEC finds the Exponent evidence to be significantly more persuasive than that provided by CORE expert witnesses, which appears to be contrary to the scientific consensus in multiple instances.⁴¹⁶

In BCSEA's view, the expert evidence provided by CORE does not withstand scrutiny and should not be preferred to the expert evidence provided by FEI in this proceeding.⁴¹⁷

In reply to FEI's statements on the qualification of CORE's expert witnesses, CORE submits it is important to recall the legislative framework for the BCUC hearing process, which states in Section 40(1) of the *Administrative Tribunals Act* that "The tribunal may receive and accept information that it considers relevant, necessary and appropriate, whether or not the information would be admissible in a court of law."⁴¹⁸ [Emphasis added by CORE] Therefore, CORE submits its position that the BCUC is not bound by strict rules of evidence and may accept any information appropriate to its determination of the matters before it. CORE submits a consideration of the information proffered by CORE's expert witnesses is relevant, necessary and appropriate to the BCUC's consideration of FEI's Application.⁴¹⁹

⁴¹³ FEI Final Argument, p. 45.

⁴¹⁴ FEI Final Argument, p. 46.

⁴¹⁵ Ibid.; AUC Decision 25469-D01-2021: Central East Transfer-out Transmission Development Project (August 10, 2021), para. 216.

⁴¹⁶ CEC Final Argument, p. 33.

⁴¹⁷ BCSEA Final Argument, p. 19.

⁴¹⁸ CORE Final Argument, pp. 8-9.

⁴¹⁹ Ibid.

Further, CORE submits that its witnesses are “eminently qualified to opine in the areas in which they are proffered opinion evidence in this proceeding” and each have provided evidence which is objective, fair and non-partisan.⁴²⁰

CORE submits that having regard to the high evidentiary threshold propounded in *White Burgess*⁴²¹ by the Supreme Court, that the threshold for admissibility is ‘not particularly onerous’ and that it will be ‘quite rare’ that an expert’s evidence will be completely inadmissible. Therefore, there is no principled reason whatever that would disqualify the opinion evidence by Drs. Havas, Miller and Héroux from being duly admitted and weighed in this proceeding.⁴²²

CORE submits that Dr. Héroux has demonstrated through his academic training and work experience his objectivity and independence in opining on the technical issues at stake in this proceeding. The BCUC should therefore have no concerns in qualifying Dr. Héroux as an expert witness in this proceeding notwithstanding the objection advanced by FEI in its final argument.⁴²³

Panel Determination – Dr. Héroux

Notwithstanding his education and publishing record, the Panel considers Dr. Héroux’s evidence to be more in the nature of advocacy of his position rather than a presentation of objective and scientific evidence. This is demonstrated by his allegations, which we find to be unsubstantiated, of what FEI describes as a “conspiracy theory”⁴²⁴ involving the US military and unnamed “industry” organizations to promote an unsafe standard for RF emissions to allow the deployment of “as many wireless systems as possible.”⁴²⁵ Further, we find that Dr. Héroux’s allegations that FEI’s proposed AMI technology “steals data from customers” and could evolve to be “equivalent to placing a camera inside a home”⁴²⁶ are unscientific,, and therefore not credible expert evidence.

Dr. Héroux’s lack of objectivity and rigour undermines his role as an objective and neutral scientist, and for this reason the Panel gives little weight to his evidence.

Further, the Panel gives no weight to Dr. Héroux’s opinion evidence on system security and information privacy, which are outside the scope of his expertise.

CORE’s Expert Evidence – Dr. Anthony Miller

CORE presented a CV for Dr. Miller which included the following:

- Education: B.A. (Cantab) (Pathology) 1952; M.B. (Cantab) 1956; B.Chir. (Cantab) 1955; M.R.C.P. (London) (Internal Medicine) 1964; M.F.C.M. (U.K.) (Community Medicine) 1972; F.R.C.P.(C) (Medical Science) 1972; M.A. (Cantab), 2002; M.D. (Cantab), 2006.⁴²⁷

⁴²⁰ Ibid., p. 9.

⁴²¹ *White Burgess Langille Inman v Abbott and Haliburton Co.*, 2015 SCC 23, para. 49.

⁴²² CORE Final Argument, pp. 9-10.

⁴²³ Ibid., p. 17.

⁴²⁴ FEI Reply Argument, p. 33.

⁴²⁵ Exhibit C7-12-1, Appendix B, p. 4.

⁴²⁶ Exhibit C7-12-1, Appendix B, p. 27.

⁴²⁷ CV of Dr. Miller; Exhibit C7-11, Appendix E.1.2, p. 1.

- Currently Professor Emeritus at the University of Toronto’s Dalla Lana School of Public Health.⁴²⁸
- Numerous previous positions, including:⁴²⁹
 - Director, Epidemiology Unit, National Cancer Institute of Canada, Toronto, (1971 –1986);
 - Professor, Department of Preventive Medicine and Biostatistics, University of Toronto, (1977 – 1997)
- Founder member, Canadian Oncology Society, (1976-).⁴³⁰
- Areas of research include: epidemiology of Breast Cancer, and relationship to preclinical abnormalities; evaluation of Screening for Cancer; impact of nutrition, radiation (ionizing and electrical and magnetic fields) and occupation on cancer; environmental aspects of cancer etiology; and control of cancer.⁴³¹
- Numerous awards, including the first Harold Warwick prize of the National Cancer Institute of Canada in 1993 for Leadership in Cancer Control and more recently the Order of Canada for his expertise in cancer control.⁴³²

Dr. Miller’s proposed scope of evidence included:⁴³³

- Evidence in the areas of epidemiology, cancer control and impacts of radiofrequency radiation and electromagnetic fields on human health as it relates to the AMI Project.
- Expert opinion evidence regarding the impact the AMI Project will have on increasing the population’s exposure to radiofrequency radiation and the causal relationship between such exposure and cancer. Also, expert evidence on current scientific evidence regarding health risks from exposure to radiofrequency radiation.

The Panel previously found that this proposed scope was within the scope of CORE’s intervention in this proceeding.⁴³⁴

Evidence presented by Dr. Miller included:

- Appendix C of Exhibit C7-12-1.
- Report titled: Public Health Implications of Exposure to Radiofrequency Radiation (4-page report, with a 2019 publication attached)

FEI’s Position – Dr. Miller

FEI does not object to Dr. Miller’s qualification as an expert witness in this proceeding, within his area of expertise.⁴³⁵

FEI identifies, however, that in his report Dr. Miller opines on whether or how the BCUC would be “liable” in certain circumstances and references page 53 of the report, which concludes by stating “If this is not done, and

⁴²⁸ Ibid., p. 2.

⁴²⁹ Ibid.

⁴³⁰ CV of Dr. Miller; Exhibit C7-11, Appendix E.1.2, p. 3.

⁴³¹ Ibid., p. 8.

⁴³² Ibid., p. 1; CORE Final Argument, p. 18.

⁴³³ Exhibit C7-11, pp. 6-7.

⁴³⁴ Exhibit A-30, Order G-92-22 with Reasons, p. 9.

⁴³⁵ FEI Final Argument, p. 47.

if an inhabitant of the home were to develop a cancer, the BCUC would be liable for the injury caused to the affected inhabitant of the home.”⁴³⁶

FEI submits that apart from the fact that the evidence does not support those circumstances, opinions as to liability are beyond Dr. Miller’s area of expertise, as he is not a lawyer. Further, matters of law (other than foreign law) are not properly the subject of expert evidence. In any case, FEI submits that the AMI Project will be compliant with the applicable legal framework and does not expect that findings of liability would be made against it or others or that compensation would be awarded in connection with the operation of AMI.⁴³⁷

As previously noted with respect to Dr. Héroux, FEI notes that the AUC recently rejected Dr. Miller’s testimony on matters related to electromagnetic fields and health as being inconsistent with the conclusions of the WHO, Health Canada and other national and international organizations and insufficient to displace the conclusions of those organizations.⁴³⁸

FEI notes that Dr. Miller does not cite any body of evidence in support of his opinions that radiofrequency should be classified as a human carcinogen, nor does he provide evidence that he has performed a formal health assessment regarding risks from the advanced meters and end points proposed in the Project.⁴³⁹

Interveners’ Positions – Dr. Miller

As stated above, the CEC finds the Exponent evidence to be significantly more persuasive than that provided by CORE expert witnesses, which appears to be contrary to the scientific consensus in multiple instances.⁴⁴⁰

In BCSEA’s view, the expert evidence provided by CORE does not withstand scrutiny and should not be preferred to the expert evidence provided by FEI in this proceeding.⁴⁴¹

CORE submits Dr. Miller’s professional qualification and experience are ‘beyond reproach.’⁴⁴²

As stated above, in reply to FEI’s statements on the qualifications on CORE’s expert witnesses, CORE submits the legislative framework for the BCUC hearing process under the *Administrative Tribunals Act* that the BCUC is not bound by strict rules of evidence and may accept any information appropriate to its determination of the matters before it. Further, CORE submits that the threshold for admissibility is ‘not particularly onerous’ and that it will be ‘quite rare’ that an expert’s evidence will be completely inadmissible. Therefore, there is no principled reason whatever that would disqualify the opinion evidence by Drs. Havas, Miller and Héroux.⁴⁴³

⁴³⁶ Ibid.; Exhibit C7-12-1, Appendix C, p. 53.

⁴³⁷ FEI Final Argument, p. 47.

⁴³⁸ Ibid.

⁴³⁹ Ibid., p. 58.

⁴⁴⁰ CEC Final Argument, p. 33.

⁴⁴¹ BCSEA Final Argument, p. 19.

⁴⁴² CORE Final Argument, p. 18.

⁴⁴³ Ibid., pp. 9-10.

Panel Determination – Dr. Miller

The Panel finds that Dr. Miller’s review of radiofrequency research has omitted significant research since 2013 that reached conclusions he does not share, and therefore is overly selective. For example, Dr. Miller has not referenced the following studies that Exponent identifies in its rebuttal evidence: Moon et al., 2014; Vila et al., 2018, Luo et al. 2019. Exponent notes that these studies have been used by scientific and health organizations to conclude that “research does not confirm that [radiofrequency] fields are a cause of cancer or any other disease at the levels we encounter in our everyday environment.”⁴⁴⁴ The Panel accepts Exponent’s evidence in this regard, which we find to be more comprehensive and persuasive than the evidence of Dr. Miller.

For the foregoing reasons, and notwithstanding his academic and extensive publishing record, the Panel gives limited weight to Dr. Miller’s evidence.

The Panel gives no weight to Dr. Miller’s opinion evidence on liability for injuries, which is outside the scope of his education and expertise.

CORE’s Expert Evidence – Dr. Magda Havas

CORE submitted a CV for Dr. Havas including:

- Education:⁴⁴⁵
 - o B.Sc. Honors Biology, University of Toronto, 1971–1975
 - o Ph.D. Department of Botany & Institute for Environmental Sciences, University of Toronto, 1975-1980
- Currently retired (Professor Emerita); previously a Faculty Member, Trent School of the Environment, Trent University, Peterborough, Ontario. (2017-); and an Associate Professor at Trent University, Science Education and Environmental and Resource Studies, since 1989.⁴⁴⁶
- Dr. Havas’ CV identifies that her research falls into two broad categories: The first is acid rain and metal pollution that started in 1975 (1975–2002) with her PhD (1980) and the second is on non-ionizing electromagnetic pollution that began in 1995 with a publication in 2000 –a critical review on the biological effects of extremely low frequency electromagnetic fields (ELF EMF) published in *Environmental Reviews*, a National Research Council of Canada journal.⁴⁴⁷
- Numerous peer-reviewed journal publications, including:⁴⁴⁸
 - o 2021: “Original Findings Confirmed in Replication Study: Provocation with 2.4 GHz Cordless Phone affects the Autonomic Nervous System (ANS) as measured by Heart Rate Variability (HRV).” This was published in the *Medical Research Archives*.
 - o 2017: *The Role of Electromagnetic Pollution in Cancer Promotion*, *Clinics in Oncology 2*, Article 1278, 3 pp. This was published in the publication “*Clinics in Oncology 2*.”

⁴⁴⁴ Exhibit B-26, Exponent response, A22, p. 24.

⁴⁴⁵ CV for Dr. Havas; Exhibit C7-11, Appendix E.1.3, p. 1.

⁴⁴⁶ *Ibid.*, p. 2.

⁴⁴⁷ *Ibid.*, p. 3.

⁴⁴⁸ *Ibid.*

Dr. Havas' proposed scope of evidence included:⁴⁴⁹

- Expert opinion evidence in the area of human health effects of electromagnetic fields, electromagnetic radiation, and radiofrequency as it relates to the AMI Project.
- A critique of sub-areas of Appendix F-1 to FEI's Application, the Exponent Radiofrequency Technology Report, namely Figure 5 and Table 4.
- Measurements conducted of RFR from various devices in a shielded lab setting, and calculations of the Power Density based on the data provided in Figure 5 of the Exponent Radiofrequency Technology Report.

The Panel previously found that this proposed scope was within the scope of CORE's intervention in this proceeding.⁴⁵⁰

Evidence presented by Dr. Havas included:

- Appendix D of Exhibit C7-12-1 (13-page report)
- Video Evidence, Exhibit C7-12 (4 min video)

Most comments in Dr. Havas' report relate to Table 4 and Figure 5 of the Exponent report, which Dr. Havas considers provide false and misleading information leading to erroneous conclusions.⁴⁵¹

- Table 4 of the Exponent Report provides the frequency and representative RF exposure values for common man-made radiofrequency sources.⁴⁵²
- Figure 5 of the Exponent Report provides the radiofrequency exposure of the Sonix IQ meter relative to other radiofrequency sources.⁴⁵³

FEI's Position – Dr. Havas

FEI does not take a position on Dr. Havas being qualified to give expert opinion evidence but does object to evidence in her report that is outside of her experience and training.⁴⁵⁴

FEI states that Dr. Havas provides video evidence⁴⁵⁵ that includes her apparent measurement of the radiofrequency emissions from various devices, including an iPad, cell phone, microwave, as well as a few people. Dr. Havas refers to the testing results from these measurements throughout her report.⁴⁵⁶ FEI considers that Dr. Havas' CV⁴⁵⁷ does not reflect any relevant practical experience or accreditation for the measurement of RF emissions. As noted by Exponent, "Expertise in microwave engineering is required to properly operate such detectors in conjunction with the appropriate focusing and waveguiding elements due to the low signal level of the RF/microwave energy from the blackbody."⁴⁵⁸

⁴⁴⁹ Exhibit C7-11, p. 8.

⁴⁵⁰ Exhibit A-30, Order G-92-22 with Reasons for Decision dated March 31, 2022, p. 9.

⁴⁵¹ Exhibit C7-12-1, Appendix D, p. 1.

⁴⁵² Exhibit B-1, Appendix F-1, Table 4, p. 24.

⁴⁵³ Ibid., Figure 5, p. 26.

⁴⁵⁴ FEI Final Argument, p. 46.

⁴⁵⁵ Exhibit C7-12.

⁴⁵⁶ Exhibit C7-12-1, Appendix D.

⁴⁵⁷ Ibid., Appendix H.

⁴⁵⁸ FEI Final Argument, p. 46; Exhibit B-33, CEC IR 12.1.1.

Also, FEI states that Dr. Havas' report is largely focused on matters involving physics, engineering and radiofrequency exposure, which based on her CV, appear to be outside Dr. Havas' academic training and experience. FEI notes that Dr. Havas holds a B.Sc. degree in Biology and a Ph.D. from the University of Toronto's Department of Botany & Institute for Environmental Sciences. Further, the Academic Employment and Positions listed in her CV all appear to involve environmental sciences, ecology, forestry, and health studies.⁴⁵⁹

FEI notes that Dr. Havas previously provided evidence in a 2006 BCUC proceeding involving the British Columbia Transmission Corporation's Application for a CPCN for the Vancouver Island Transmission Reinforcement Project (VITR).⁴⁶⁰ The BCUC's CPCN decision regarding the VITR Project described her as "disagree[ing] with the conclusions of the IARC, ICNIRP, the National Health Radiological Board, Health Canada and the World Health Organization." The BCUC stated that, "she was unable to provide evidence to support that allegation [that scientific and expert panel conclusions that do not conform to established views are 'often delayed or suppressed'] or to conclude that the IARC, ICNIRP and National Radiological Protection Board reviews are biased."⁴⁶¹ In that decision, the BCUC stated:

The [BCUC] finds Dr. Havas's evidence to be selective and her opinions unconvincing. Dr. Havas conducted one comprehensive study of the pre-2000 research but did not review the more recent scientific research and therefore could not support her position that recent scientific research indicated a need for lower exposure guidelines.⁴⁶²

Positions of the Interveners – Dr. Havas

As stated above, the CEC finds the Exponent evidence to be significantly more persuasive than that provided by CORE expert witnesses, which appears to be contrary to the scientific consensus in multiple instances.⁴⁶³

In BCSEA's view, the expert evidence provided by CORE does not withstand scrutiny and should not be preferred to the expert evidence provided by FEI in this proceeding.⁴⁶⁴

CORE submits that contrary to FEI's submission in its final argument, Dr. Havas has been qualified in prior regulatory proceedings in BC and other jurisdictions in Canada to testify as an expert witness on the biological effects of electromagnetic frequencies in the electromagnetic spectrum. Currently a Professor Emerita at the Trent School of the Environment at Trent University, Dr. Havas has 27 years of experience researching this area. In particular, Dr. Havas' research has focused on the following: extremely low frequency electromagnetic fields; intermediate frequencies commonly referred to as dirty electricity; radio frequency and microwave radiation; infrared radiation; and light frequencies including ultraviolet radiation.⁴⁶⁵

CORE considers that Dr. Havas' background demonstrates that she has monitored and published research on extremely low frequency electromagnetic fields, intermediate frequencies, ground current, radio frequencies

⁴⁵⁹ Ibid., p. 46.

⁴⁶⁰ Ibid., p. 47.

⁴⁶¹ Decision and Order C-4-06 dated July 7, 2026, British Columbia Transmission Corporation Application for a Certificate of Public Convenience and Necessity for the Vancouver Island Transmission Reinforcement Project, p. 68.

⁴⁶² Ibid., p. 69.

⁴⁶³ CEC Final Argument, p. 33

⁴⁶⁴ BCSEA Final Argument, p. 19

⁴⁶⁵ CORE Final Argument, p. 24.

and microwave radiation. Dr. Havas has conducted her own measurements and the results are published in peer-reviewed journals. Accordingly, CORE submits that Dr. Havas is eminently qualified to monitor the aforementioned research, and this is completely supported and justified by Dr. Havas' publication record. Further, FEI fails to acknowledge that Dr. Havas has numerous peer-reviewed publications that deal with most forms of non-ionizing radiation where she monitored the environmental exposure.⁴⁶⁶

CORE submits that Dr. Havas has lectured on this topic at the Building Biology Institute Conference where students are trained on how to do monitoring of the environment for various types of electromagnetic frequencies. As well, Dr. Havas has organized a global EMF monitoring network where she instructs others on how to monitor the environment based on specific projects, including students of the Building Biologists program.⁴⁶⁷

CORE submits that given Dr. Havas' work and academic training, there can be no doubt as to her qualifications as an expert witness to opine in the areas that she has discussed in her expert report in this proceeding.⁴⁶⁸ As stated above, in reply to FEI's statements on the qualifications on CORE's expert witnesses, CORE submits the legislative framework for the BCUC hearing process under the *Administrative Tribunals Act* that the BCUC is not bound by strict rules of evidence and may accept any information appropriate to its determination of the matters before it. Further, CORE submits that the threshold for admissibility is 'not particularly onerous' and that it will be 'quite rare' that an expert's evidence will be completely inadmissible. Therefore, there is no principled reason whatever that would disqualify the opinion evidence by Drs. Havas, Miller and Héroux.⁴⁶⁹

Panel Determination – Dr. Havas

Dr. Havas' evidence largely concerns the subjects of physics, engineering and radiofrequency exposure, in which there is no evidence that she has academic training. The Panel acknowledges that she has teaching experience in the areas of "adverse biological & health effects of electromagnetic pollution" and has published peer-reviewed papers on these subjects. However, the Panel considers this inferior to relevant accreditation and specific training in the fields of physics, engineering and radiofrequency exposure.

The Panel is specifically concerned about the reliability of Dr. Havas's evidence of radiofrequency emission measurements given her lack of accreditation and specific training in physics and engineering.

For these reasons, the Panel gives limited weight to Dr. Havas's opinion evidence on physics, engineering and radiofrequency exposure.

5.2 BCUC's Jurisdiction to Assess Radiofrequency Emission Safety

FEI questions the extent to which the BCUC has jurisdiction to find, contrary to Health Canada's conclusion, that Safety Code 6 does not provide adequate protection from the health risks associated with radiofrequency exposure associated with the Project. FEI submits that doing so is not within the BCUC's mandate under the UCA and the BCUC stated as much in its 2013 FBC AMI Decision, stating the BCUC "has no jurisdiction over

⁴⁶⁶ Ibid.

⁴⁶⁷ Ibid.

⁴⁶⁸ Ibid.

⁴⁶⁹ CORE Final Argument, pp. 9-10.

regulations made by Health Canada and other agencies. Accordingly, it is not within the Commission's mandate to consider any changes to these regulations."⁴⁷⁰

Panel Determination

The Panel finds that the BCUC has the jurisdiction to assess whether radiofrequency emissions from FEI's proposed AMI technology pose a threat to the health of FEI's customers, notwithstanding that the proposed AMI technology is compliant with Safety Code 6.

The Panel agrees with FEI that the BCUC does not have jurisdiction over Health Canada's regulations, and, therefore, could neither change those regulations nor authorize a public utility to operate infrastructure that was not properly compliant with them. However, the BCUC does have the power to require a public utility to exceed the standards set by Health Canada if the BCUC determines that to be in the public interest.

The BCUC has broad powers under sections 45 and 46 of the UCA to determine whether infrastructure proposed by public utilities is in the public interest. Further, the BCUC has found that it has jurisdiction over "all aspects of public utility safety."⁴⁷¹ Therefore, safety is an appropriate matter for the BCUC to consider when evaluating the public interest of proposed public utility infrastructure. If the Panel were persuaded that the AMI Project posed an unacceptable risk to public health, this would be a valid reason for the Panel to reject the application for a CPCN.

5.3 Applicability of and Compliance with Safety Code 6 to the AMI Project

FEI asserts that the AMI gas meters must comply with the radiofrequency exposure limits specified in Health Canada Safety Code 6.⁴⁷² FEI states that the federal *Radiocommunications Act* governs, among other things, the manufacture, marketing, and operation of "radio apparatus" anywhere within Canada. "Radio apparatus" are devices capable of being used for radiocommunication, which includes the proposed AMI gas meters. Under this statute, the Minister of Industry has enacted the *Radiocommunications Regulation*, providing that certain categories of radio apparatus, which include the AMI gas meters, must be certified and may only be operated if maintained in conformity with applicable standards published by Industry Canada.⁴⁷³

The applicable standards include, among others, Innovation, Science and Economic Development Canada (ISED), formerly Industry Canada, Radio Standards Specification (RSS) 102 "Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)." RSS 102 requires that "all radiocommunication and broadcasting installations comply at all times with Health Canada's Safety Code 6, including consideration of combined effects of nearby installations within the local radio environment."⁴⁷⁴

Health Canada is the Canadian federal agency responsible for setting limits on human exposure to radiofrequency energy. The health risk assessment of radiofrequency exposures performed by the agency and

⁴⁷⁰ FEI Final Argument, p. 57.

⁴⁷¹ Decision and Order G-381-22 dated December 22, 2022, BCUC An Inquiry into the Regulation of Safety Stage 1, Appendix A Final Stage 1 Report, p. 12.

⁴⁷² Exhibit B-26, Part 1, A9, pp. 12-13.

⁴⁷³ Ibid., p. 11.

⁴⁷⁴ Ibid., p. 12; <https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf01904.html>

its limits are summarized in Safety Code 6.⁴⁷⁵ The purpose of Safety Code 6, originally published by Health Canada in 1991, is to “establish safety limits for human exposure to radiofrequency fields in the frequency range from 3 kHz [Kilohertz] to 300 GHz [Gigahertz]” to protect workers and the general public from radiofrequency fields. ISED published standards for certifying equipment that meets Safety Code 6 limits and methods for demonstrating compliance. Health Canada periodically updates Safety Code 6 as new scientific literature becomes available and considers reviews of scientific research prepared for Health Canada by panels of scientists convened by the Royal Society of Canada.⁴⁷⁶

FEI states Safety Code 6 has been adopted as the scientific basis for equipment certification and radiofrequency field exposure compliance specifications outlined in Industry Canada’s regulatory document that governs the use of wireless devices in Canada, such as cell phones, cell towers (base station) and broadcast antennas. Industry Canada states: “It is the responsibility of proponents and operators of antenna system installations to ensure that all radiocommunication and broadcasting installations comply at all times with Health Canada’s Safety Code 6, including the consideration of combined effects of nearby installations within the local radio environment.”⁴⁷⁷

Safety Code 6 establishes limits for exposure to radiofrequency, called Basic Restrictions, which are “based upon the lowest exposure level at which any scientifically established adverse health effect occurs.” Basic Restrictions are measured in terms of the specific absorption rate (SAR), which is the rate of radiofrequency absorption by bodily tissues. Exponent notes that “[e]stimating or measuring SAR from a particular source is quite complex and is not easily accomplished outside a controlled laboratory environment. Therefore, to simplify the safety assessment [Safety Code 6] developed Reference Levels in units of power density (e.g., watts per square meter [W/m²]) that are easy to compute and measure for a comparison to safety limits.”⁴⁷⁸

Exponent explains that organizations such as the Institute of Electrical and Electronics Engineers (IEEE) and the European-based International Commission on Non-Ionizing Radiation Protection (ICNIRP) have also developed exposure limits for electromagnetic fields. The Safety Code 6 limits for the general public at frequencies of FlexNet transmissions (approximately 900 Megahertz [MHz]) are summarized in the table below, along with current IEEE and ICNIRP standards. To determine compliance of SAR and power density within Safety Code 6 limits, the source exposure must be averaged over a 6-minute period.⁴⁷⁹

Exposure Reference Values and Limits Specified by SC6, IEEE, and ICNIRP at 900 MHz

⁴⁷⁵ Exhibit B-1, Appendix F-1, p. 31: https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/pdf/consult/2014/safety_code_6-code_securite_6/final-finale-eng.pdf

⁴⁷⁶ Exhibit B-1, Appendix F-1, p. 10.

⁴⁷⁷ Exhibit B-22, FEI response to CORE IR 36a.

⁴⁷⁸ Exhibit B-1, Appendix F-1, p. 11.

⁴⁷⁹ Ibid., p. 12.

Agency	Reference Level Power Density		Basic Restriction SAR Limit (W/kg)
	(W/m ²)	(mW/cm ²)	
Health Canada SC6 (2015)	2.7	0.27	0.08 (whole body) 1.6 partial body, (over any 1 gram of tissue) 4 (over any 10 grams of tissue in the limbs)
ICNIRP (2020)	4.5	0.45	0.08 (whole body) 2 (partial body, over any 10 grams of tissue) 4 (over any 10 grams of tissue in the limbs)
IEEE, C95.1 (2019)	4.5	0.45	0.08 (whole body) 2 (partial body, over any 10 grams of tissue) 4 (over any 10 grams of tissue in the limbs)

mW/cm² = milliwatts per square centimeter; W/m² = watts per square centimeter; W/kg = watts per kilogram; and
1 mW/cm² = 10 W/m².

The table below shows Exponent’s calculations of radiofrequency exposure from different FlexNet end points to be installed as part of the AMI Project, as discussed in Section 4.3 above, with the final column showing the percentage of Safety Code 6 limit emitted by each particular device.⁴⁸⁰

⁴⁸⁰ Ibid., Appendix B, pp. B-2 – B-3.

Example Calculations of Radiofrequency Exposure from FlexNet End Points

Table B-2. Example calculations of RF exposure from FlexNet End Points

Scenario (Location, Distance in meters [m] or kilometers [km])	Power (P) (W)	Gain (G)	Ground Reflection Factor	Forward/Back Transmission Factor (F)	Transmission through Wall Material (T)	Distance from Source (R)	Duty Cycle (δ)	Power Density (S) (mW/cm ²)	% of SC6 Limit
Sonix IQ Gas Meter (Indoors, 3 m)	0.98	2.00	2.56	0.1	0.736	3 meters	0.00036%	0.0000000012	0.00000043%
Sonix IQ Gas Meter (Indoors, 1 m)	0.98	2.00	2.56	0.1	0.736	1 meter	0.00039%	0.000000011	0.0000042%
Sonix IQ Gas Meter (Indoors, 25 cm)	0.98	2.00	2.56	0.1	0.736	0.25 meters	0.044%	0.000021	0.0075%
Sonix IQ Gas Meter (Outdoors, 3 m)	0.98	2.00	2.56	1	--	3 meters	0.00036%	0.000000016	0.0000059%
Sonix IQ Gas Meter (Outdoors, 1 m)	0.98	2.00	2.56	1	--	1 meter	0.00039%	0.00000016	0.000057%
Sonix IQ Gas Meter (Outdoors, 25 cm)	0.98	2.00	2.56	1	--	0.25 meters	0.044%	0.00028	0.10%
SmartPoint (Indoors, 3 m)	0.78	1.58	2.56	0.1	0.736	3 meters	0.00039%	0.00000000081	0.00000029%
SmartPoint (Indoors, 1 m)	0.78	1.58	2.56	0.1	0.736	1 meter	0.00042%	0.0000000078	0.0000028%
SmartPoint (Indoors, 25 cm)	0.78	1.58	2.56	0.1	0.736	0.25 meters	0.047%	0.000014	0.0051%
SmartPoint (Outdoors, 3 m)	0.78	1.58	2.56	1	--	3 meters	0.00039%	0.000000011	0.0000040%
SmartPoint (Outdoors, 1 m)	0.78	1.58	2.56	1	--	1 meter	0.00042%	0.00000011	0.000039%
SmartPoint (Outdoors, 25 cm)	0.78	1.58	2.56	1	--	0.25 meters	0.047%	0.00019	0.069%
SentryPoint (Outdoors, 50 m)	0.81	1.58	2.56	1	--	50 meters	0.00026%	0.000000000028	0.00000010%
SentryPoint (Outdoors, 10 m)	0.81	1.58	2.56	1	--	10 meters	0.00026%	0.00000000069	0.00000025%
SentryPoint (Outdoors, 25 cm)	0.81	1.58	2.56	1	--	0.25 meters	0.047%	0.00020	0.072%
Smart Gateway (Outdoors, 50 m)	0.893	1.58	2.56	1	--	50 meters	0.00039%	0.000000000045	0.000000017%
Smart Gateway (Outdoors, 10 m)	0.893	1.58	2.56	1	--	10 meters	0.0016%	0.0000000045	0.0000017%
Smart Gateway (Outdoors, 25 cm)	0.893	1.58	2.56	1	--	0.25 meters	0.095%	0.00044	0.16%
Base Station (Outdoors, 3 km)	40.36	16.41	2.56	1	--	3,000 meters*	0.14%	0.0000000021	0.00000076%
Base Station (Outdoors, 100 m)	40.36	16.41	2.56	1	--	100 meters*	0.56%	0.0000073	0.0027%
Base Station (Outdoors, 0 m)	40.36	16.41	2.56	1	--	0 meters*	1.67%	0.0010	0.36%

* Value indicates the horizontal distance from the base station, but includes an antenna height above ground of 15 meters, representative of the minimum expected antenna height above ground.

Exponent explains that the building materials of an individual's home can have a significant effect on a person's radiofrequency exposure from sources outside the home. For example, at the frequency of FlexNet communications or cell phones, a 20-centimeter-thick concrete wall allows less than 1 percent of incident radiofrequency energy through; a 9-centimeter-thick brick wall allows about 45 percent of the energy through; and a 1.9-centimeter-thick plywood wall allows over 80 percent of the energy through.⁴⁸¹

Exponent explains the power density of the radiofrequency field decreases with the square of the distance according to the inverse square law. So, an individual located 10 meters from the source will be exposed to 100 times less radiofrequency energy than an individual located one metre away from the same source.⁴⁸²

⁴⁸¹ Exhibit B-1, Appendix F-1, p. 8.

⁴⁸² Ibid., p. 9.

Under typical operation, the Sonix IQ gas meter transmits radiofrequency energy approximately 0.34 seconds per day in total. Exponent states that this transmission time also means that the indoor radiofrequency exposure from the Sonix IQ gas meter is about 24 million times lower than the Safety Code 6 exposure limit, and substantially lower than the radiofrequency exposures from common natural and man-made sources.⁴⁸³ Exponent concludes that even for a hypothetical 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 exposure limit. The actual exposure level inside the home would be still lower given the necessary physical separation between meters and the rapid decrease in radiofrequency field strength with distance from the source as well as from any building materials between the meter and the occupants.⁴⁸⁴ Exposure to multiple meters for extended periods meets Safety Code 6 limits and constitutes “safe exposure,” no matter the location of the person or duration of exposure.⁴⁸⁵

FEI submits Safety Code 6 is drafted in mandatory terms, with language such as “requirements” and “levels shall not be exceeded.” Based on this regulatory framework, FEI’s understanding is that the AMI meters must comply with Safety Code 6, and that these are not recommendations or voluntary.⁴⁸⁶ FEI states the AMI Project gas meters and endpoints have received the necessary certification from ISED Canada, and provides the ISED certificate.⁴⁸⁷

CORE’s Evidence

CORE states that Safety Code 6 is a guideline and not a requirement, and further, that Safety Code 6 only deals with heating effects of the radiofrequency and not other impacts. CORE also states there is no health standard that applies to wireless gas meters.⁴⁸⁸ Dr. Héroux opines that “SC6 [Safety Code 6] is a national recommendation not a requirement.”⁴⁸⁹ Dr. Havas states, “I don’t understand why HC SC6 [Health Canada Safety Code 6] is being relied upon for RF [radiofrequency] exposure in this case or in any cases related to wireless radiation emissions.” In Dr. Havas’ explanations for this statement, she includes that Safety Code 6 “is a guideline rather than a standard and hence is voluntary.”⁴⁹⁰

With regard to the proposed Sonix IQ meters meeting Health Canada Safety Code 6, Dr. Héroux states, “almost any device that radiates intermittently meets [Safety Code 6], irrespective of power, because [Safety Code 6] is based on average heat over 6 minutes, and takes only heat into account.”⁴⁹¹ Further, Dr. Héroux states that a meter would only exceed the Safety Code 6 limit at a distance of 26 cm if it was continuously communicating, which is not a foreseen operating condition. Dr. Héroux notes the Sonix IQ meter’s “duty cycle is very small: 55 msec every 4 hours... So by the metric of energy averaging, the meter is perfectly safe for everyone.”⁴⁹²

⁴⁸³ Exhibit B-1, Appendix F-1, p. 30.

⁴⁸⁴ Exhibit B-13, RCIA IR 40.1.

⁴⁸⁵ Ibid., RCIA IR 40.2.

⁴⁸⁶ FEI Final Argument, pp. 50-51.

⁴⁸⁷ ISED certificate number Exhibit B-1, Appendix F-1, Table 2, p. 20.

⁴⁸⁸ Exhibit C7-15, BCSEA IR 2.1.

⁴⁸⁹ Exhibit C7-13, BCUC IR 3.2; Exhibit C7-16, CEC IR 7.1.

⁴⁹⁰ Ibid., BCUC IR 4.2.

⁴⁹¹ Ibid., BCUC IR 3.1.

⁴⁹² Ibid. BCUC IR 3.4.

When asked about whether the Sonix IQ meters would meet Safety Code 6 if measured at peak signal strength instead of averaged, Dr Havas responds “I have no first-hand experience regarding the emissions (average or peak) from the Sonix IQ meter so I am unable to answer.”⁴⁹³

Positions of the Interveners

FEI submits that CORE’s witness evidence “effectively acknowledges that the proposed meters are compliant with Safety Code 6.”⁴⁹⁴

CORE submits FEI mischaracterizes CORE’s evidence as establishing that the AMI meters are compliant with Safety Code 6 and that such characterization by FEI fails to acknowledge that the focus of CORE’s expert evidence is on the efficacy of Safety Code 6 as a reliable and relevant standard to protect Canadians from the health effects of radiofrequency. CORE further submits that FEI fails to recognize that CORE’s evidence establishes that Safety Code 6 is not a valid or reliable measure of safe radiofrequency exposure limits.⁴⁹⁵

In response to CORE’s statement that FEI has mischaracterized CORE’s expert evidence as reflecting that the AMI meters comply with Safety Code 6, FEI submits that it stands by its position. Further, FEI submits CORE does not argue that the AMI Project or the meters FEI proposed to install are not compliant with Safety Code 6.⁴⁹⁶

BCSEA submits that the evidence “overwhelmingly supports” the conclusion that FEI’s proposed AMI technology complies with Safety Code 6.⁴⁹⁷

The CEC agrees with FEI that Safety Code 6 is the applicable regulation governing safe radiofrequency exposure limits and that FEI’s proposed AMI technology is compliant with Safety Code 6.⁴⁹⁸

Panel Determination

The Panel finds that Health Canada’s Safety Code 6 is applicable to the technology FEI proposes to use for the AMI Project. RSS 102 applies to the AMI technology because the meters and Base Stations meet the definition of “radio apparatus” in the *Radiocommunication Act*. RSS 102 requires FEI to ensure that the AMI technology complies “at all times with Health Canada’s Safety Code 6.”

The Panel further finds that FEI’s proposed AMI technology complies with Health Canada’s Safety Code 6. FEI provides the certification details from ISED for all four proposed AMI devices.

The Panel notes that no intervener, including CORE, argues that FEI’s AMI technology is not required to comply with Safety Code 6 or that it does not comply with Safety Code 6. While CORE states that “Safety Code 6 is not a health standard,” and Dr. Havas states that Safety Code 6 “is a national recommendation not a requirement,” CORE does not use its own evidence to advance an argument that Safety Code 6 does not apply to FEI’s AMI technology or that FEI’s AMI technology does not comply with Safety Code 6.

⁴⁹³ Exhibit C7-13, BCUC IR 4.2.

⁴⁹⁴ FEI Final Argument, p. 53.

⁴⁹⁵ CORE Final Argument, p. 37.

⁴⁹⁶ FEI Reply Argument, p. 33.

⁴⁹⁷ BCSEA Final Argument, p. 18.

⁴⁹⁸ CEC Final Argument, p. 32.

The Panel addresses CORE's argument that Safety Code 6 is not a "reliable and relevant standard to protect Canadians from the health effects of radiofrequency" in Section 5.4 below.

5.4 Sufficiency of Safety Code 6

Given that the Panel has accepted that FEI's proposed AMI technology complies with Safety Code 6, the Panel now addresses the question of whether there is evidence to demonstrate that the radiofrequency exposure limits set out in Safety Code 6 fail to adequately protect the health of FEI's customers.

In the following discussion we outline FEI's submissions in support of the sufficiency of Safety Code 6. We then outline CORE's submissions on the alleged inadequacy of Safety Code 6. Finally, we outline a summary of the submissions from interveners on the sufficiency of Safety Code 6.

In the 2013 FBC AMI Decision, the BCUC found that Safety Code 6 "provides protection from thermal effects, non-thermal effects and incorporates an adequate degree of precaution."⁴⁹⁹ The BCUC noted there was no scientific evidence to persuade the BCUC that Safety Code 6 did not adequately protect customers from the thermal or non-thermal effects of radiofrequency emissions. The BCUC concluded that FortisBC customers would experience radiofrequency exposure from AMI meters "far below the limits of Safety Code 6."⁵⁰⁰ The BCUC also concluded that although "there are individuals who feel strongly that low levels of electromagnetic emissions will have a negative impact on their health, the scientific evidence did not persuade the Panel that there is a causal link between RF emissions and the symptoms of electromagnetic hypersensitivity."⁵⁰¹

FEI's Submissions on the Sufficiency of Safety Code 6

FEI's expert, Exponent notes that Health Canada published an updated Safety Code 6 in 2015, which post-dates the 2013 FBC AMI Decision, and which includes the following statement:

The exposure limits specified in Safety Code 6 have been established based upon a thorough evaluation of the scientific literature related to the thermal and non-thermal health effects of RF fields. ... The exposure limits in Safety Code 6 are based upon the lowest exposure level at which any scientifically established adverse health effect occurs. Safety margins have been incorporated into the exposure limits to ensure that even worst-case exposures remain far below the threshold for harm. The scientific approach used to establish the exposure limits in Safety Code 6 is comparable to that employed by other science-based international standards bodies. ... At present, there is no scientific basis for the occurrence of acute, chronic and/or cumulative adverse health risks from RF field exposure at levels below the limits outlined in Safety Code 6. The hypotheses of other proposed adverse health effects occurring at levels below the exposure limits outlined in Safety Code 6 suffer from a lack of evidence of causality, biological plausibility and reproducibility and do not provide a credible foundation for making science-based recommendations for limiting human exposures to low-intensity RF fields.⁵⁰²

⁴⁹⁹ Decision and Order C-7-13 dated July 23, 2013 - FortisBC Ind. Application for a Certificate of Public convenience and Necessity for the Advancement Metering Infrastructure Project, p. 114.

⁵⁰⁰ Ibid., p. 115.

⁵⁰¹ Ibid., pp. 115, 137.

⁵⁰² Exhibit B-1, Appendix F-1, p. 10.

Exponent states that within the last decade, several prominent regulatory, scientific, and health organizations have systematically reviewed the research on exposure to radiofrequency fields and health. These organizations include:⁵⁰³

- Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR);
- the International Commission on Non-Ionizing Radiation Protection (ICNIRP);
- the Health Council of the Netherlands (HCN);
- the Swedish Radiation Safety Authority (SSM);
- the World Health Organization (WHO);
- the United States Food and Drug Administration (FDA); and
- the Royal Society of Canada (RSC).

Exponent states these organizations have all independently reached the same conclusion regarding exposure to radiofrequency fields and human health: that exposure below the current scientifically-based exposure limits (e.g., the ICNIRP guidelines) has not consistently or convincingly been established as causing any type of cancer, other chronic diseases, or nonspecific symptoms that adversely affect well-being in humans.⁵⁰⁴

Exponent states that the most recent weight-of-evidence review of radiofrequency fields and health was released in 2015 by SCENIHR.⁵⁰⁵ 14 scientists prepared a 288-page assessment of epidemiologic studies of cancer.⁵⁰⁶ A weight-of-evidence review includes all relevant studies regardless of their conclusions and weighs them according to the quality and reliability of the study design.⁵⁰⁷ SCENIHR concluded that:⁵⁰⁸

[o]verall, the epidemiological studies on mobile phone RF [radiofrequency] EMF [electromagnetic field] exposure do not show an increased risk of brain tumours. Furthermore, they do not indicate an increased risk for other cancers of the head and neck region

...

Epidemiological studies do not indicate increased risk for other malignant diseases, including childhood cancer.

...

[t]he totality of evidence of epidemiological studies weighs against cancer risks from base stations and broadcast antennas. In particular, large [epidemiological] studies modelling RF exposure and investigating the risks of childhood cancers have not shown any association.

⁵⁰³ Ibid., Appendix F-2, p. 23.

⁵⁰⁴ Ibid., Appendix F-2, p. 23.

⁵⁰⁵ Ibid., Appendix F-2, p. 28.

⁵⁰⁶ Exhibit B-26, Part 2, Q20, p. 23.

⁵⁰⁷ Exhibit B-1, Appendix F-2, p. 16.

⁵⁰⁸ Ibid., p. 35.

ICNIRP published a literature review in 2020, and concluded:⁵⁰⁹

[t]aken together, the epidemiological studies do not provide evidence of a carcinogenic effect of radiofrequency EMF [electromagnetic field] exposure at levels encountered in the general population. In summary, no effects of radiofrequency EMFs on the induction or development of cancer have been substantiated (ICNIRP, 2020a, p. 523).

Exponent states that studies reporting non-thermal effects have been reviewed by scientific and regulatory agencies which have concluded the reported non-thermal effects “were not consistent or reproducible, are not supported by any plausible biological explanation as to how they could occur, and in some studies the biological effects reported are not known to be linked to adverse effects on health.”⁵¹⁰

Exponent reviewed other “primary, peer-reviewed epidemiologic and experimental research published since the most recent comprehensive review (SCENIHR 2015) and up to March 2021” to assess the impact of these recent studies on the conclusions about adverse effect of low levels of radiofrequency energy in comparison to the conclusions expressed by recent weight-of-evidence comprehensive reviews.⁵¹¹ Exponent states its review of research “considers recent human and animal studies of exposure to RF fields but does not review *in vitro*”⁵¹² research. Only human and animal studies of radiofrequency exposure were considered because they provide more direct information on human health than *in vitro* studies.”⁵¹³ Exponent’s review focuses on recent epidemiologic and *in vivo*⁵¹⁴ studies of higher quality, regardless of direction of the results, and in general, notes the limitations of weaker studies, such as studies that are too small in size (i.e., too few people or laboratory animals), that have not provided adequate controls, or use proxies or less reliable measures of individual exposure assessment.⁵¹⁵ Exponent states that epidemiologic studies on cancer and radiofrequency energy have been conducted since the 1970s, however, as mobile phone use has increased, research has primarily focused on users of mobile phones because “near-field exposure from a mobile phone is...higher than [sic] other environmental sources.”⁵¹⁶

Exponent concludes:

neither the reviews conducted by scientific and health organizations nor the recently published research provide a reliable scientific basis to conclude that the operation of FortisBC’s proposed FlexNet system will cause or contribute to adverse health effects or physical symptoms in the general population. Exposures to RF [radiofrequency] fields from the proposed Sonix IQ meters are significantly lower than the levels at which biological and health effects have been studied and are substantially lower than the exposure levels produced by other common sources of RF [radiofrequency] fields.⁵¹⁷

⁵⁰⁹ Exhibit B-1, Appendix F-2, p. 36.

⁵¹⁰ Exhibit B-1, Appendix F-2, p. 23; Studies include those by: SCENIHR, 2009, 2015; AGNIR, 2012; RSC, 2014; HCN, 2016; SSM, 2016, 2018, 2019, 2020; IEEE, 2019; ICNIRP, 2020a.

⁵¹¹ Exhibit B-1, Appendix F-2, p. 32.

⁵¹² *In vitro* refers to laboratory studies of cells and tissues.

⁵¹³ Exhibit B-1, Appendix F-2, p. 14.

⁵¹⁴ *In vivo* refers to laboratory studies of humans or laboratory animals.

⁵¹⁵ *Ibid.*, p. 32.

⁵¹⁶ *Ibid.*, p. 37.

⁵¹⁷ *Ibid.*, p. 120.

FEI submits, in summary, that “CORE has not provided any credible or compelling evidence that Safety Code 6 does not adequately protect the public from the potential health effects of RF exposure or that the proposed advanced meters present any health risk to FEI’s customers.”⁵¹⁸

CORE’s Submissions on the Sufficiency of Safety Code 6

We outline CORE’s submissions in two subsections. First, CORE emphasizes that Safety Code 6 is not a reliable or relevant standard. CORE submits that its evidence establishes that “there are flaws in the reliability of Exponent’s understanding of the efficacy of SC6, SC6’s relevance to the AMI Proceeding, and SC6’s applicability to the RF levels produced by the AMI Meter.”⁵¹⁹ Second, CORE submits that studies completed since the FBC 2013 AMI proceeding show potential health impacts of radiofrequency, which is germane to the decision of public convenience and necessity.⁵²⁰

5.4.1 Reliability and Relevance of Safety Code 6

CORE’s Position

CORE states that its expert evidence focuses on “the efficacy of SC6 as a reliable and relevant standard to protect Canadians from the health effects of RF.”⁵²¹ The expert report of Dr. Héroux provides a critique of the radiofrequency safety limits set by Safety Code 6 and Exponent’s use of Safety Code 6 as a measure of health impact.⁵²²

Dr. Héroux states that Safety Code 6 is based on an older IEEE document, C95.1, which “bases its own recommendations on avoidance of short-term tissue heating (temperature rise). Short-term heat cannot represent long-term health.” Dr. Héroux states CORE is “not concerned about heat, but about chronic health impacts of the radiation.”⁵²³ Dr. Héroux asserts that, in developing standards, the IEEE used its influential members to “placate any challenges to the standards by politicians or the public” as the IEEE sought to have its safety limits adopted in most countries in the world (excluding the East).⁵²⁴ Dr. Héroux states the IEEE standard uses “wrong variables, wrong time and space frames.”⁵²⁵

Dr. Héroux also writes that

the determination of safety limits for exposure of humans to RF has been left to the military and to engineering-dominated organizations such as the American National Standards Institute (ANSI), the Institute of Electrical and Electronics Engineers (IEEE), the Federal Communications Commission (FCC), and the International Commission on Non-Ionizing Radiation Protection (ICNIRP).... These organizations have promoted extremely high levels (near thermal) of RF as “safe”, and these limits were accepted in Canada as SC6.”⁵²⁶ According to Dr. Héroux, the “limits of SC6 were copied from IEEE C95.1, themselves written by industry, and promoted excessively

⁵¹⁸ FEI Final Argument, p. 34.

⁵¹⁹ CORE Final Argument, p. 36.

⁵²⁰ Ibid., pp. 19, 23.

⁵²¹ Ibid., p. 37.

⁵²² Exhibit C7-12-1, p. 4.

⁵²³ Exhibit C7-12-1, Appendix B, p. 3.

⁵²⁴ Ibid., p. 8.

⁵²⁵ Ibid., p. 9.

⁵²⁶ Ibid., p. 4.

permissive exposures based on heating, for the purpose of favoring deployment of as many wireless devices as possible (“expand the market”).⁵²⁷

Dr. Héroux submits that “Canada has never really had a different opinion from the U.S., FCC, or ICNIRP on RF hygiene, and that the statements that “Health Canada periodically updates SC6 as new scientific literature becomes available” and “exposure limits for electromagnetic fields based on lengthy and comprehensive assessments of the scientific literature” are unbelievable.”⁵²⁸

Dr. Héroux states that Health Canada Safety Code 6 was developed based on a subset of data and does not restrict radiofrequency emissions enough. Dr. Héroux submits that opinions available from the European Academy for Environmental Medicine (EUROPAEM), the Austrian Medical Association (AMA), the International Guidelines on Non-Ionizing Radiation (IGNIR) and Baubiologies MAES (Bau) concluded that much lower safety limits were appropriate, some of which include categories for ‘sensitive’ individuals and restrictions based on time of day.⁵²⁹ Dr. Héroux notes that these organizations do not recognize time-averaging of radiofrequency signals, according to a thermalist view, and use instead “max peak / peak hold” readings because they feel this metric is more revealing of the health impacts on people.⁵³⁰ Dr. Héroux states these standards are intended for the protection of people anywhere in the world.⁵³¹

CORE reiterates Dr. Héroux’s concerns, noted above, with FEI and Exponent’s emphasis on the Safety Code 6 standard based only on the thermal effects of the proposed meters, which he submits “is irrelevant to the real health impacts.” CORE highlights Dr. Héroux’s concern that the Exponent report includes an inaccurate statement that the exposure limits are based on lengthy and comprehensive assessments of scientific literature.⁵³²

Dr. Héroux further states Exponent averages the radiofrequency signals over time, likening it to the effect of “not [being] worried about being hit by the bullet from a gun, because when averaged over 30 minutes, the impact of the bullet can barely be felt.”⁵³³

In addition to Dr. Héroux’s evidence regarding averaged values, CORE refers to Dr. Havas’s report, where Dr. Havas explains:⁵³⁴

Smart meters emit modulated pulsed radiation andValues are averaged over the period and the shorter the pulse width the greater the discrepancy between average and maximum. The average values are provided when monitoring a smart meter and thus the actual radiation to which a person is exposed is falsely represented. Averages may make sense from an engineering perspective but not from a biological perspective since organisms react to extremes rather than averages. For example, if you place your hand in scalding water and then turn on the cold-water tap, the average temperature will be much lower but your hand will still be injured.

⁵²⁷ Exhibit C7-12-1, Appendix B, p. 8.

⁵²⁸ Ibid., p. 10.

⁵²⁹ Ibid.

⁵³⁰ Exhibit C7-12-1, Appendix B, p. 23.

⁵³¹ Exhibit C7-13, BCUC IR 2.1.

⁵³² CORE Final Argument, p. 12-14.

⁵³³ Exhibit C7-12-1, Appendix B, p. 23.

⁵³⁴ Ibid., Appendix D, p. 76.

Dr. Héroux states, regarding the science of radiofrequency safety limits, that Exponent combines, inappropriately, signals of different frequencies, modulations and pulsations.⁵³⁵

Dr. Havas notes the following regarding frequency modulation, “The radiation from a smart meter is modulated with a carrier wave and communication frequencies. This results in a chaotic emission and chaotic radiation adversely affects the body compared with coherent emissions that can be beneficial. The difference between coherent and chaotic is like the difference between music and noise.”⁵³⁶ Dr. Havas adds:

Smart meters, WiFi, Bluetooth and cell phones, emit modulated and pulsed radiation. Scientists have long known that pulsed frequencies are more harmful than continuous radiation. Natural sources of radiation are continuous and not pulsed. An example of pulsed “light” would be strobing light, which has different biological characteristics to continuous light from an incandescent light bulb, for example. Pulsed light can bring on seizures in epileptics and would be stressful for all others should they be exposed to it for any length of time. Pulsed RFR is detected by the body and causes physiological stress.⁵³⁷

FEI’s Position

In reply, FEI states CORE’s submissions are baseless and meritless and provide no plausible grounds for the BCUC to depart from its own prior conclusion that Safety Code 6 does in fact provide health protection from thermal and non-thermal effects of radiofrequency exposure and incorporates an adequate degree of precaution.⁵³⁸ FEI submits none of CORE’s expert witnesses appear to provide evidence that radiofrequency exposure from the Sonix IQ meters at levels far below the Safety Code 6 limits is a potential source of adverse health risks from the thermal effects associated with radiofrequency exposure. FEI submits that CORE’s evidence instead makes generalized claims regarding the potential non-thermal effects of radiofrequency exposure and primarily focuses its discussion of potential risks to electromagnetic hypersensitivity (EHS) symptoms.⁵³⁹

FEI submits that Dr. Héroux’s evidence does not invalidate the radiofrequency exposure limits in Safety Code 6 nor prove that Health Canada’s determination of exposure limits are unreliable. FEI submits that Dr. Héroux’s assertions, without any ‘real evidence or substantiation’, cannot be grounds for the BCUC to question Health Canada Safety Code 6, which states “the only established adverse health effects associated with RF [radiofrequency] field exposures ... relate to the occurrence of tissue heating or nerve stimulation...there is no scientific basis for the occurrence of ... adverse health risks from RF [radiofrequency] field exposure at levels below the limits outlined in Safety Code 6.”⁵⁴⁰ FEI submits that Dr. Héroux’s view that Health Canada does not appropriately review new scientific literature for the purposes of updating Safety Code 6 is incorrect. Safety Code 6 itself describes the review process.⁵⁴¹

⁵³⁵ Exhibit C7-12-1, Appendix B, p. 15.

⁵³⁶ Ibid., Appendix D, p. 77.

⁵³⁷ Ibid., Appendix D, p. 76.

⁵³⁸ FEI Reply Argument, p. 34.

⁵³⁹ FEI Final Argument, p. 58.

⁵⁴⁰ Ibid., p. 33.

⁵⁴¹ FEI Reply Argument, p. 36.

FEI describes Dr. Heroux's assertions that the US military and engineering dominated organizations promoted unsafe radiofrequency levels in regulatory standards, or that Health Canada simply copied the IEEE C95.1 standard, as 'baseless and meritless accusations', and without any proof or evidence.⁵⁴²

FEI notes Exponent's evidence that known adverse health effects can be caused by high exposures to radiofrequency fields, with the first effect being a rise in body or tissue temperature, given sufficient exposure. The goal of health standards is to limit such warming of tissues as at higher levels of exposure more serious side effects could occur. Therefore, exposure limits are set well below the level at which even minor effects from tissue heating might occur.⁵⁴³

Dr. Héroux and Dr. Havas dismiss the meters' compliance with Safety Code 6 on the basis that the standard "takes only heat into account."⁵⁴⁴ FEI submits this contrasts with the BCUC finding in the 2013 FBC AMI Project proceeding and with Safety Code 6 itself. FEI submits other international health standards also state that reporting effects of all radiofrequency exposures have been reviewed and evaluated, including those of low intensity such that thermal effects are unlikely.⁵⁴⁵

FEI submits CORE's intervener evidence does not provide any credible explanation why radiofrequency exposure limits based on time averaging, like in Safety Code 6, are inappropriate or create health risks for the public. FEI submits Dr. Héroux does not answer the question and implies the body can reach a threshold of damage before moving to a discussion of radiofrequency impacts on sensitive and electromagnetic hypersensitive persons. Dr. Havas describes time-averaged radiofrequency values as falsely representing the actual radiation to which a person is exposed. FEI submits Dr. Havas does not provide scientific explanation or evidentiary support for this position.⁵⁴⁶

FEI states the radiofrequency signal from the Sonix IQ meter turns on and transmits a continuous frequency shift-keying signal for 55 milliseconds and then turns off for approximately four hours. Neither Dr. Héroux nor Dr. Havas have provided scientific evidence that would support their distinction between biological effects of sources of modulated or unmodulated radiofrequency signals. FEI states the mere adding of adjectives such as "spurious," "natural," "pulsed," and "chaotic" to describe radiofrequency signals from the Sonix IQ meters or other sources does not provide evidence for or against the potential effects of radiofrequency exposure on the body. FEI states nowhere in the reports do CORE's experts cite a body of peer-reviewed studies that support their claims in the text cited above.⁵⁴⁷

FEI further submits that, by CORE's experts' own definitions of "pulsed," the FEI system would not be considered "pulsed." Dr. Havas defines "pulsed" as "a reference to digital as opposed to analog signals...The major difference is that the analog signals have continuous electrical signals, while digital signals have non-continuous (or pulsed) electrical signals."⁵⁴⁸ A frequency shift keying signal is simply using two different analog sinusoidal signals (one of higher frequency and one of lower frequency) to represent digital values. Both sinusoids are analog signals; they are simply interpreted by a receiving digital device as digital information.⁵⁴⁹

⁵⁴² Ibid., pp. 33- 34.

⁵⁴³ Exhibit B-1, RF Health Report, p. 18.

⁵⁴⁴ Exhibit C7-12-1, Appendix B, p. 3; Exhibit C7-13, CORE response to BCUC IR 4.2.

⁵⁴⁵ FEI Final Argument, p. 59.

⁵⁴⁶ Ibid., p. 61.

⁵⁴⁷ Exhibit B-26, Part 2, A7, p. 9.

⁵⁴⁸ Exhibit C7-17, CORE response to FEI IR 9.1.

⁵⁴⁹ Exhibit B-26, Exponent response, A7, pp 9-10.

FEI addresses the opinions of other organizations that Dr. Heroux refers to, from EUROPAEM, the Austrian Medical Association, IGNIR and Baubiologie. Exponent notes that the safety limits recommended by these other groups are not radiofrequency standards: “any organization or person can propose an exposure limit, but that does not mean the limit merits the appellation of a “standard.” Standards are developed by expert organizations or agencies to protect occupational and public safety.” Exponent states that there is no evidence that these were developed based upon a robust review of the relevant peer-reviewed scientific literature, or a documented review provided by Safety Code 6, ICNIRP and IEEE.⁵⁵⁰

Further, Exponent states the EUROPAEM guidelines are based on a paper published in the journal *Reviews on Environmental Health* that was later retracted by the authors. Exponent further states that, despite the many references cited, the text devoted to electromagnetic fields at radiofrequencies is scant, and no health assessment or research upon which the guidelines should be based is provided and that the focus is on guidance for avoiding exposure. The guidelines themselves state, “These recommendations are preliminary and in large parts, although related to the whole body of evidence rooted in the experience of the team, cannot in every detail be strictly considered evidence-based.”⁵⁵¹

Positions of the Interveners

BCSEA agrees with FEI’s submissions that CORE has not provided any credible or compelling evidence that Safety Code 6 does not adequately protect the public from the potential health effects of radiofrequency exposure or that the proposed Sonix IQ meters present any health risk to customers. Further, BCSEA submits that the evidence overwhelmingly supports the conclusion that the AMI Project’s proposed meters and communications devices do comply with Safety Code 6.⁵⁵²

The CEC finds the Exponent evidence to be significantly more persuasive than that provided by CORE expert witnesses, which appears to be contrary to the scientific consensus in multiple instances. The CEC has conducted a thorough review of the evidence presented in this proceeding and concludes, similar to the FBC 2013 AMI proceeding, that there is no substantive evidence to suggest that the radiofrequency signals from the meters proposed to be used by FEI represent a health risk to customers or others.⁵⁵³

Panel Discussion

The Panel is not convinced by CORE’s submission that Health Canada Safety Code 6 is not a valid or reliable measure of safe radiofrequency exposure limits. CORE relies on Dr. Héroux’s evidence that Safety Code 6 is unreliable or irrelevant because it establishes the maximum radiofrequency exposure levels based on avoiding short-term tissue heating. Dr. Héroux states that short-term heat cannot represent long-term health, and that CORE is not concerned about heat, but about chronic health impacts of the radiation. The Panel observes that Safety Code 6 makes it clear that it concerns both thermal and non-thermal effects of radiofrequency radiation and is based on a complexity of factors that address adverse health impacts. Therefore, we reject Dr. Héroux’s evidence that Safety Code 6 does not address the non-thermal effects of radiation.

⁵⁵⁰ Exhibit B-26, Part 2, A9, pp. 13-14.

⁵⁵¹ Ibid.

⁵⁵² BCSEA Final Argument, p. 19.

⁵⁵³ CEC Final Argument, pp. 32, 33.

The Panel accepts the evidence from Exponent that the first known adverse health effect to occur as a result of radiofrequency exposure is a rise in body temperature, or tissue heating, and that more serious adverse health effects only occur with higher levels of exposure. Avoidance of tissue heating is therefore an appropriate goal for a radiofrequency exposure safety standard such as Safety Code 6.

The Panel finds that Dr. Héroux's opinion that military and engineering-dominated organizations have promoted the unsafe standards upon which Safety Code 6 is based "for the purpose of favoring deployment of as many wireless devices as possible" is unsupported by evidence and lacks credibility. Further, although Dr. Héroux indicates that other organizations have concluded that lower safety limits may be appropriate for radiofrequency emissions, we are unable to rely on his evidence. We accept instead FEI's observations that these safety limits are not radiofrequency standards and have not been subjected to robust review in the scientific community. In fact, it appears that even some of the safety limits, for example the EUROPAEM guidelines, contain a caveat that they may not be entirely evidence-based.

The Panel is also not persuaded by the evidence of Dr. Héroux and Dr. Havas regarding the effect of time-averaging radiofrequency signals and agrees with FEI that neither has provided supporting evidence or peer-reviewed research. The analogies of the health impacts drawn by Dr. Héroux (comparing the signals to the effect of a bullet) and Dr. Havas (comparing the signals to boiling water and strobe lights) lack credible scientific evidence or explanation.

In the next section the Panel outlines CORE's evidence in support of its submission that studies completed since the FBC 2013 AMI proceeding show potential health impacts of radiofrequency emissions.

5.4.2 Studies on Radiofrequency Emissions since 2013

CORE's Position

CORE submits that new science has emerged since the BCUC's 2013 FBC AMI Decision addressing the relationship between radiofrequency levels and carcinogenicity in animals and humans which are germane to the BCUC's decision of whether FEI's application is in the public interest. CORE submits Dr. Miller's opinion evidence and the post-2013 research studies cited in Dr. Miller's report provide ample evidence of the biological effects of radiofrequency on humans and links to cancer. CORE submits this persuasive evidence simply was not before the BCUC at the time of the issuance of the 2013 FBC AMI Decision. CORE therefore submits that in its determination of whether the radiofrequency exposure from the proposed AMI meters poses a health risk to the public, the BCUC must carefully review these studies and those referenced by Dr. Havas in her evidence and those referenced by Ms. Friesen in her Letter of comment.⁵⁵⁴

Dr. Miller states he reviewed Exponent's RF Health Report and FEI's responses to CORE's IRs and finds "much of this material to be uninformative or simply wrong. Fortis appears to be claiming that radiofrequency radiation (RFR) has no adverse effects on humans other than tissue heating. This was disproved many years ago."⁵⁵⁵

Regarding the possible link between radiofrequency emissions and cancer, Dr. Miller states, "Since then [i.e. publication of IARC (2011)] new science has emerged, both human and animal, confirming that [radiofrequency

⁵⁵⁴ CORE Final Argument, pp. 19, 23, 38-39.

⁵⁵⁵ Exhibit C7-12-1, Appendix C, p. 53.

radiation] causes cancer.”⁵⁵⁶ Dr. Miller also states, “I and many other scientists now believe that [radiofrequency radiation] should be categorized as a Class 1 Human Carcinogen, in the same category as cigarette smoking, asbestos exposure, and X-Rays.”⁵⁵⁷

Dr. Miller references 17 studies in his report and states, “The human evidence comprises three important sets of case-control studies of mobile phone use and brain cancer.... These studies all show that the greater the exposure, the greater the risk.” Dr. Miller cites the following human evidence linking mobile phone use and brain cancer:⁵⁵⁸

- The multi-country Interphone study which found a 2-fold increased risk of glioma after 10+ years of regular use of cell phones, with a dose response relationship (Interphone Study Group, 2010)
- Several studies by Hardell and his colleagues in Sweden (one of the first countries to introduce cell phones) showing 2-5 fold increased risk of glioma after prolonged use, especially when exposure began early in life (Hardell and Carlberg, 2015)
- A large study in France (Cerenat), which found a 5-fold increased risk of glioma after 5+ years use (Coureau et al, 2014)

Dr. Miller cites an increased risk of glioma was not reported from a cohort study in the UK, although there was a doubling of risk of acoustic neuroma with ten or more years of mobile phone use (Benson et al, 2013), confirmed in Hardell et al, 2013, although not by Moon et al 2014. The incidence of parotid or salivary gland tumors has tripled in Israel: 1 in 5 under age 20 (Czerninski et al, 2011), and a rise in the incidence of glioblastoma in the temporal and frontal regions of the brain has been reported from the UK (Philips et al 2018), while the incidence of neuro-epithelial brain cancers has significantly increased in children, adolescents, and young adults from birth to 24 years in the United States (Gittleman et al, 2015; Ostrom et al 2016).⁵⁵⁹

Dr. Miller also states tumour promotion by exposure to radiofrequency electromagnetic fields below exposure limits for humans in mice were first reported in 2010. Dr Miller states Lerchl et al (2015) replicated the finding with higher numbers of mice per group by exposing them to cell phone radiofrequency radiation at 900 MHz resulting in carcinogenic activity. Dr. Miller states: “We have to be extremely cautious about increasing the population’s exposure to radiofrequency radiation. The telecom industry ignores the fact that the International Agency for Research on Cancer of the World Health Organization categorized in 2011 all RFR, including that emitted by cell phones, cell towers, smart meters and routes as in some schools and many homes, as a possible (Class 2B) carcinogen, a grouping that also includes lead and DDT (IARC 2011). Since then new science has emerged, both human and animal, confirming that [radiofrequency radiation] causes cancer.”⁵⁶⁰

Dr. Miller appended to his evidence a paper he wrote, entitled “Risks to Health and Well-Being From Radio-Frequency Radiation Emitted by Cell Phones and Other Wireless Devices (2019).” Dr. Miller submits the paper documents that radiofrequency radiation is a human and animal carcinogen.⁵⁶¹

⁵⁵⁶ Exhibit C7-12-1, Appendix C, p. 52.

⁵⁵⁷ Ibid., p. 54.

⁵⁵⁸ Ibid., p. 52.

⁵⁵⁹ Ibid., p. 52.

⁵⁶⁰ Ibid., pp. 52-53.

⁵⁶¹ Exhibit C7-12-1, Appendix C, pp. 56-65.

CORE submits that the evidence demonstrates the Exponent reports are not credible and therefore should not be relied upon by the BCUC. CORE states the Exponent report does not accurately summarize all relevant and current scientific studies, particularly those post-2013, pertaining to the 900 MHz range. CORE submits that the Exponent reports should therefore be given little, if any, weight.⁵⁶² Both Mr. Karow and Ms. Friesen assert that the Exponent report has missed referencing current research. Mr. Karow states, “The Exponent Status of Research report missed identifying at least 88% of the primary references on studies done specifically on 900 MHz [Megahertz] and over 70% of other relevant literature for the year 2020. Other years—2017, 2018, 2019, 2021 and 2022—had similar shortcomings.”⁵⁶³

In a Letter of comment, dated April 28, 2022, Ms. Friesen, M.Sc. similarly notes that the Exponent report missed reference literature. Friesen states that she reviewed the Exponent RF Health Report and reviewed relevant research studies. Friesen states that there is “clear evidence” that exposure to frequencies of 900 MHz at levels below Safety Code 6 can have injurious effects. Further, Ms. Friesen states that there are no long-term studies demonstrating safety. The longest-term study cited in the Exponent report, Alkis 2021, was for exposure of two hours per day for six months. Friesen states that the proposed Sonix IQ meters will result in continuous exposure for years.⁵⁶⁴

CORE refers to the United States Court of Appeals for the DC Circuit 2021 ruling that the Federal Communications Commission (FCC) as “a clear and compelling example of the emergence of scientific and legal developments since the 2013 AMI Decision.”⁵⁶⁵ According to Dr. Héroux, “SC6 follows FCC and ICNIRP, and the FCC was told in a court decision (US Court of Appeals 2021) that it is actually ignoring the evolution of science.”⁵⁶⁶

CORE submits there is a “live controversy” as to the reliability of the Safety Code 6 standard, evidenced by Dr. Héroux’s statement that the FCC [whose standard Dr. Héroux asserts Safety Code 6 does not differ from] was told by the US Court of Appeals that the FCC “ignored scientific evidence and the evolution of science pertaining to the allowable RF exposures from wireless technologies.”⁵⁶⁷

Finally, CORE refers to a recent article, dated October 18, 2022, written by the International Commission on the Biological Effects of Electromagnetic Fields (ICBE-EMF) titled “Scientific evidence invalidates health assumptions underlying the FCC and ICNIRP exposure limit determinations for radiofrequency radiation: implications for 5G.” CORE notes that the ICBE-EMF includes Dr. Héroux and Dr. Miller. The article highlights “studies that demonstrate the fallacy of inherent assumptions in the FCC/ICNIRP guidelines for RF radiation exposure limits, and we find that the limits fail to protect human and environmental health.” CORE urges the BCUC to carefully review the article in its determination of “whether FEI has sufficiently considered the documented biological effects of RF exposure from the proposed meters and has put in place sufficient measures to mitigate against the biological effects of RF on human health should this Commission approve FEI’s Application as meeting the requisite test for public convenience and necessity.”⁵⁶⁸

⁵⁶² CORE Final Argument, p. 35-36.

⁵⁶³ Exhibit C7-12-1, Appendix A, p. 2.

⁵⁶⁴ Exhibit E-8, p. 3.

⁵⁶⁵ CORE Final Argument, p. 38.

⁵⁶⁶ Exhibit C7-12-1, Appendix B, p. 10.

⁵⁶⁷ CORE Final Argument, p. 38.

⁵⁶⁸ CORE Final Argument, pp. 38-39.

FEI Reply

Exponent states that many organizations have studied the topic since 2013 and have independently concluded that radiofrequency fields below scientifically-based exposure guidelines do not cause or contribute to the development of cancer or other chronic diseases. Further, Exponent states the conclusions of scientific and health agencies do not support Dr. Miller's conclusion that radiofrequency should be classified as a human carcinogen (AGNIR, 2012; HCN, 2013, 2014, 2016; IARC, 2013; WHO, 2014a, RSC, 2014; SCENIHR, 2015; SSM, 2016, 2018, 2019, 2020, 2021; ICNIRP, 2020a; FDA, 2020). The conclusion of these agencies is that there are no confirmed adverse health effects at levels of radiofrequency exposure below levels set to avoid any injurious effect of radiofrequency whatever the mechanism involved. Exponent states that Dr. Miller's claims expressed in his testimony are inconsistent with the assessment of the U.S. National Cancer Institute, which concluded that "the evidence to date suggests that cell phone use does not cause brain or other kinds of cancer in humans."⁵⁶⁹

Further, Exponent states the review article appended to Dr. Miller's testimony (Miller et al., 2019) is clearly focused on research on cell phones, not wireless devices like Sonix IQ meters. Cell phones produce radiofrequency exposure to the head that are approximately 1.8 million-fold higher than the Sonix IQ meters. Regarding Dr. Miller's testimony, Exponent states: "The review itself is quite short, superficial, and selective, and is focused primarily on exposures (RF level and frequency) unrelated to the FEI [AMI] Project."⁵⁷⁰

In response to Dr. Miller's critique of the RF Health Report and FEI's response to IRs, Exponent states Dr. Miller offers no substantive evidence to back up his criticism. Further, health and scientific agencies referenced in Exponent's RF Health Report contradict the opinion offered by Dr. Miller. Exponent states the conclusion of these agencies is that there are no confirmed adverse health effects at levels of radiofrequency exposure below levels set to avoid injurious effect.⁵⁷¹

FEI submits Dr. Miller does not cite any evidence in support of his opinion that radiofrequency should be categorized as a Class 1 human carcinogen nor a formal health assessment conducted regarding health risks associated with the equipment at issue.⁵⁷² Further, Dr. Miller states he finds much of the Exponent Radiofrequency Health Report to be 'uninformative or simply wrong.' FEI submits Dr. Miller does not explain this opinion, nor demonstrate any scientific process to forming his opinions.⁵⁷³

In response to Mr. Karow, Exponent notes that he does not provide any support for his claim nor does he provide a list of the references that the Exponent RF Health Report missed.⁵⁷⁴

In response to Ms. Friesen's letter of comment, Exponent notes that Ms. Friesen states she conducted her own literature search in each of: EMF-Portal using the search term '900' for the years 2017-2022, PubMed and her own database. Exponent reiterates that the objective of the Exponent RF Health Report was to provide a summary of primary, peer-reviewed epidemiologic and experimental research published after the most recent

⁵⁶⁹ Exhibit B-26, Part 2, A18, A19, A21, pp. 22-24.

⁵⁷⁰ Ibid., Part 2, A22, pp. 24-25.

⁵⁷¹ Exhibit B-26, Part 2, A19, A21, A22, pp. 22-24.

⁵⁷² FEI Final Argument, p. 58.

⁵⁷³ Ibid., p. 59.

⁵⁷⁴ Exhibit B-26, Part 2, A3, p. 3.

comprehensive review, SCENIHR (2015) – on such outcomes as cancer and non-specific symptoms. Exponent explains the documents cited by Ms. Friesen were not included because they did not fit these criteria. Specifically, the following list contains some of the information cited by Ms. Friesen and the reasons why the articles information cited by Ms. Friesen were considered out of scope:⁵⁷⁵

- Ms. Friesen included *in vivo* studies of biological and health outcomes other than cancer. *In vivo* studies of non-cancer outcomes were not covered in the Exponent RF Report;
- Ms. Friesen included review articles, not primary research articles. Review articles were intentionally excluded from the Exponent RF Health Report, as is common in systematic literature reviews, because they do not report on new, original data, and are subject to gaps in the literature and the biases of the author;
- Ms. Friesen included other articles that either did not study the association between radiofrequency fields and a health outcome or they were not at all relevant to humans (e.g., a study on ticks' response to radiofrequency exposure; a separate study on the response of onions to radiofrequency exposure); and
- Ms. Friesen included documents that are not peer-reviewed articles published in a reputable journal.

FEI addresses the US Court of Appeal decision and the article by ICBE-EMF as follows.

FEI notes that CORE does not actually reference the US Court of Appeals decision itself and refers instead to Dr. Héroux's interpretation of it. FEI submits that Dr. Héroux does not have legal training and that he describes the decision inaccurately.⁵⁷⁶ According to FEI, the decision has nothing to do with Safety Code 6 and does not even demonstrate a controversy as to the substance of the Federal Communications Commission's radiofrequency guidelines in the United States.⁵⁷⁷ FEI describes the decision:⁵⁷⁸

[t]he US Court of Appeals held ... that the Federal Communications Commission (FCC) had not provided a sufficiently reasoned explanation for its determination that its existing guidelines for exposure to RF radiation adequately protect against harmful effects of exposure to RF unrelated to cancer. On the other hand, the Court held that the FCC had adequately addressed and provided a reasoned response in support of its conclusion that exposure to RF at levels below its guideline limits does not cause cancer. The Court remanded the matter back to the FCC "to provide a reasoned explanation for its determination that its guidelines adequately protect against the harmful effects of exposure to radiofrequency radiation unrelated to cancer.

FEI submits that the article by ICBE-EMF "constitutes new evidence that CORE has not sought leave to file and that the BCUC expressly noted should not be included in final argument Among other things, the fact that this article was included in CORE's Final Argument means that FEI and Exponent do not have an opportunity to address it in an evidentiary filing." FEI goes on to submit that this article does not demonstrate that the RF exposure limits in Safety Code 6 are invalid or unreliable even if the BCUC does consider it as evidence.⁵⁷⁹

⁵⁷⁵ Ibid., Part 2, A3, pp. 3-4.

⁵⁷⁶ FEI Reply Argument, p. 34.

⁵⁷⁷ Ibid., pp. 34-35.

⁵⁷⁸ Ibid., p. 34.

⁵⁷⁹ Ibid., p. 35.

Positions of the Interveners

BCSEA agrees with FEI's submissions that Exponent's comprehensive review of recent scientific research regarding the health effects of radiofrequency exposure concludes that the research does not confirm that radiofrequency fields at levels encountered in the everyday environment are a cause of cancer, chronic disease, or other adverse health effects. BCSEA supports an opt-out option.⁵⁸⁰

The CEC finds the Exponent evidence to be significantly more persuasive than that provided by CORE expert witnesses, which appears to be contrary to the scientific consensus in multiple instances.⁵⁸¹ The CEC has conducted a thorough review of the evidence presented in this proceeding and concludes, similar to the FBC 2013 AMI proceeding, that there is no substantive evidence to suggest that the radiofrequency signals from the meters proposed to be used by FEI represent a health risk to customers or others.⁵⁸²

Panel Determination

The Panel finds that the weight of scientific evidence gathered since 2013 continues to demonstrate that the radiofrequency exposure limits set out in Safety Code 6 are sufficient to protect FEI's customers. In the following discussion we explain why we find FEI's evidence persuasive, and why we do not find CORE's evidence from Drs. Miller, Karow or Friesen, or the U.S. court decision to be sufficient to counter FEI's evidence. Lastly, we explain why we are not persuaded by CORE's evidence on the three specific issues it raises regarding the effects of radiofrequency emissions on sleep, EHS and general densification of radiofrequency emissions.

If radiofrequency exposure at levels insufficient to cause tissue heating caused adverse health effects, it should be apparent from the wealth of scientific research that has been conducted. The Panel accepts Exponent's opinion that exposure below the currently established guidelines "has not consistently or convincingly been established as causing any type of cancer, other chronic diseases, or non-specific symptoms that adversely affect well-being in humans."⁵⁸³

We note that Health Canada updated Safety Code 6 in 2015 and concluded that the exposure limits specified in Safety Code 6 relate to the thermal and non-thermal health effects of radiofrequency fields, are based upon the lowest exposure level at which any scientifically established adverse health effect occurs. Health Canada states, "Safety margins have been incorporated into the exposure limits to ensure that even worst-case exposures remain far below the threshold for harm." In addition, Health Canada concludes that there is no scientific basis for the occurrence of acute, chronic and/or cumulative adverse health risks from radiofrequency field exposure at levels below the limits outlined in Safety Code 6. Further, Health Canada does not agree with the hypotheses of other proposed adverse health effects occurring at levels below the exposure limits outlined in Safety Code 6. Health Canada observes that such contentions suffer from a lack of evidence of causality, biological plausibility and reproducibility and do not provide a credible foundation for making science-based recommendations for limiting human exposures to low-intensity radiofrequency fields.⁵⁸⁴ Thus, the Panel is satisfied that Safety Code 6 continues to address health effects from radiofrequency emissions comprehensively.

⁵⁸⁰ BCSEA Final Argument, pp. 18-19, 21.

⁵⁸¹ CEC Final Argument, p. 33.

⁵⁸² *Ibid.*, p. 32.

⁵⁸³ Exhibit B-1, Appendix F-2, p. 23.

⁵⁸⁴ Exhibit B-1, Appendix F-1, p. 10.

We also note FEI's evidence of the most recent comprehensive review of relevant scientific research identified by Exponent, conducted by a credible scientific body, SCENIHR in 2015, which concludes that the epidemiological studies on mobile phone radiofrequency electromagnetic field exposure do not show an increased risk of brain tumours, other cancers of the head or neck region, or other malignant diseases including childhood cancer. The Panel finds this to be compelling evidence of the safety of the AMI Project because the radiofrequency exposure from FEI's proposed AMI meters is some 1.8 million times lower than the radiofrequency exposure to the head from mobile phones.

The Panel also notes that the SCENIHR 2015 review of scientific literature was performed using a weight-of-evidence approach, which includes all relevant studies regardless of their conclusions, and weighs them according to the quality and reliability of the study design. The Panel finds that this weight-of-evidence approach reduces the likelihood of bias and increases our confidence in the results of the survey.

The Panel also places considerable weight on Exponent's opinion that none of the research published since SCENIHR 2015 provides "a reliable scientific basis to conclude that the operation of FortisBC's proposed FlexNet system will cause or contribute to adverse health effects or physical symptoms in the general population." Exponent has based its opinion on a survey on the "recent epidemiologic and *in vivo* studies of higher quality, regardless of direction of the results" and has transparently identified the studies that it did identify but did not include, and the reasons for their exclusion.

The Panel also notes that at least nine other prominent regulatory, scientific and health organizations (AGNIR, BCCDC, IARC, RSC, WHO, HCN, ICNIRP, SRSA, US FDA) have also reviewed the available research between 2012 and 2020 and all independently reached the same conclusion: that there is no compelling evidence that radiofrequency emissions below scientifically-based exposure limits cause harmful effects to humans. The Panel accepts FEI's evidence that the RF limits established by Safety Code 6 are scientifically-based.

The Panel is not persuaded by the evidence introduced by CORE that there are health risks associated with FEI's AMI technology. CORE has not provided any comprehensive, scientifically-based surveys of relevant epidemiological research to refute the conclusions reached repeatedly by credible international organizations such as SCENIHR and the WHO, and national organizations such as the Health Council of the Netherlands and the Swedish Radiation Safety Authority.

Although CORE refers to Dr. Miller's evidence and the numerous studies included in his expert report, we are unable to consider these in respect of the sufficiency of Safety Code 6 because Dr. Miller does not refer to Safety Code 6. The fact that many studies have taken place since 2013 on the effect of radiofrequency radiation on tumours, for example, tells us nothing about whether those studies measured radiofrequency levels below, at, or even higher than the radiofrequency levels in Safety Code 6.

The Panel is not persuaded that Exponent missed relevant content in its review of scientific research since 2013, as alleged by Mr. Karow and Ms. Friesen. We accept Exponent's evidence that it was appropriate to include only "primary, peer-reviewed epidemiologic and experimental research published after the most recent comprehensive review, SCENIHR (2015)," and to exclude studies that do not meet these criteria. For example, we agree that it was appropriate for Exponent to exclude review studies that did not report on new and original data, that were not peer reviewed and published in a reputable journal, or were not relevant to humans (e.g. those concerning ticks and onions).

In addition, CORE refers to a decision from the US Court of Appeals and a recently published journal article. We reject CORE's submissions on both items. The decision from the US Court of Appeals has no bearing on Safety Code 6 or Health Canada's guidelines, nor does a decision from a US court assist the Panel in determining the sufficiency of Safety Code 6.

CORE submits that this decision demonstrates that there is a live controversy as to the reliability of the Safety Code 6 standard.⁵⁸⁵ The Panel disagrees that this decision impacts the safety levels established in Safety Code 6. The decision of the US Court of Appeals concerned the sufficiency of the FCC's reasoning in its determination that its guidelines were adequate to protect against the harmful effects of radiofrequency emissions unrelated to cancer. The decision of the US Court of Appeals to remand the matter back to the FCC to supplement its reasoning cannot be used to infer insufficiency of the radiofrequency emission standard itself. In fact, the US Court of Appeals expressly took no position on the matter of the health and environmental effects of radiofrequency radiation, as the following extract from the majority decision demonstrates:

To be clear, we take no position in the scientific debate regarding the health and environmental effects of RF radiation – we merely conclude that the Commission's cursory analysis of material record evidence was insufficient as a matter of law. As the dissenting opinion indicates, there may be good reasons why the various studies in the record, only some of which we have cited here, do not warrant changes to the Commission's guidelines.

The Panel disregards the article, published on October 18, 2022, referred to by CORE in its Final Argument⁵⁸⁶ because it was not introduced in evidence during the proceeding and neither FEI nor interveners have had the opportunity to test or rebut the evidence.

5.4.3 Additional Issues

In addition to the research compiled by Dr. Miller, CORE describes three additional effects of radiofrequency underlying its concerns regarding radiofrequency emissions, the details of which are outlined below:

1. Sleep disruption;
2. Electromagnetic hypersensitivity (EHS), and
3. The effects of densification in the number of sources of radiofrequency signals.

⁵⁸⁵ CORE Final Argument, p. 38.

⁵⁸⁶ Ibid., pp. 38-39.

5.4.3.1 Sleep Disruption

CORE's Submission

Dr. Héroux cites two charts showing new or worsened symptoms reported by individuals after exposure to wireless utility meters in the USA, a survey of 318 individuals in 2011, and Australia, a case series from 2014. In each, the top reported symptom is sleep problems.⁵⁸⁷ Dr. Héroux states a number of studies (Lustenberg et al. (2013, 2015), Hung et al. (2007), Regel et al. (2007), Lowden et al. (2011), Schmid et al. (2010) Loughran et al. (2012), Fritzer et al. (2007), Mohler et al. (2010, 2012), Nakatani Enomoto et al. (2013), Peletier et al. (2012, 2014), Mohammed et al. (2013)) regarding the effects of radiofrequency on sleep, concluding radio off meters are a substantial improvement.⁵⁸⁸

FEI Reply

In response to Dr. Héroux's evidence regarding the impact of radiofrequency on sleep, Exponent states public opinion surveys cannot assess the relationship between self-reported symptoms and radiofrequency exposure from smart meters. This can only be assessed through a properly designed epidemiologic or experimental study in which both exposure and outcome are identified *a priori* and measured. Further, Exponent states the cell phone studies to which Dr. Héroux refers involve the measurement of brain electrical activity during sleep not behavioral sleep disturbance; they are not the same. Exponent states the studies were of persons exposed to cell phones or simulated cell phone signals, so the levels of radiofrequency fields were far greater than exposure to persons within homes from Sonix IQ meters.⁵⁸⁹

Exponent states that most of the studies cited by Dr. Héroux were reviewed by SCENIHR (2009, 2015), who stated "the relevance of the small physiological changes remains unclear and mechanistic explanation is still lacking. Overall, there is a lack of evidence that [radiofrequency electromagnetic field] affects cognitive function in humans."⁵⁹⁰

Panel Discussion: Sleep Disruption

Last, we come to the three specific concerns that CORE describes arising from radiofrequency emissions. In regard to Dr. Héroux's observations that people have reported sleep problems after exposure to wireless utility meters, we note that this research appears to be quite dated (studies between 2007 and 2015) which suggests these symptoms are no longer reported or experts in this area of research do not consider this to be a live issue. Moreover, his own summary indicates that these studies conclude that meters with a radio off option are a substantial improvement. FEI will offer the radio-off option. For these reasons, the Panel is not persuaded that this is an actionable concern.

⁵⁸⁷ Exhibit C7-12-1, Appendix B, Figure 5, p. 15.

⁵⁸⁸ Exhibit C7-14, RCIA IR 3.1.1.

⁵⁸⁹ Exhibit B-26, Part 2, A16-17, p. 20.

⁵⁹⁰ Exhibit B-26, Part 2, A17, pp. 20-21.

5.4.3.2 Electromagnetic Hypersensitivity (EHS)

CORE's Submission

Mr. Karow submits, on behalf of CORE, that the AMI Project does not consider those who suffer from Electromagnetic hypersensitivity (EHS) and the effect that the installation of 1.1 million smart meters would have on EHS individuals and the public in general.⁵⁹¹

Regarding electromagnetic sensitivity, Dr. Havas cites Bevington (2021) who estimated that “the prevalence of [electromagnetic hypersensitivity] is between about 5.0 and 30 per cent of the general population for mild cases, 1.5 and 5.0 per cent for moderate cases and [less than] 1.5 per cent for severe cases.”⁵⁹² Dr. Havas cites Belyaev et al. (2016) that the first step in recovering from electromagnetic hypersensitivity and other health issues associated with electromagnetic field exposure is “to eliminate or reduce typical [electromagnetic field] exposures, which may help alleviate health problems within days or weeks.” Dr. Havas states, “if people can’t remove the [radiofrequency radiation] from their own homes, they will NOT be able to recover. Long-term exposure to [radiofrequency radiation] has been associated with cancer and sperm damage in addition to electrohypersensitivity.”⁵⁹³

Dr. Havas states, “the WHO recognizes adverse health effects (not specified) attributed to levels of electromagnetic fields that are below existing international guidelines.”⁵⁹⁴

CORE further submits that, contrary to the assumptions in the Exponent report, the radiofrequency emitted from the Sonix IQ meters is ‘far from inoffensive’ to both electromagnetic hypersensitive people and the general public. Dr. Héroux states, “the fact that the contribution of the meters is expected to be much lower than that allowed by Safety Code 6 is irrelevant.”⁵⁹⁵

FEI Reply

FEI submits neither Dr. Héroux nor Dr. Havas provide any credible scientific evidence that would establish the BCUC’s findings regarding electromagnetic hypersensitivity in the 2013 FBC AMI Decision are wrong or should be re-assessed. FEI notes that the WHO remains of the view that research has not been able to provide support for a causal relationship between exposure to electromagnetic fields and self-reported symptoms or electromagnetic hypersensitivity. FEI notes as well that customers with concerns regarding electromagnetic hypersensitivity will be able to select a radio-off meter option.⁵⁹⁶

In response to Dr. Havas’s evidence, Exponent states the two references cited by Dr. Havas (Bevington 2021 and Belyaev et al., 2016) are “inconsequential” and do not provide any evidence to change the conclusions of reviews by health and scientific agencies that exposure to radiofrequency signals from mobile phones or other sources are not perceived by persons or that such exposures have not been confirmed to cause symptoms or disturbances to well-being. Exponent states the study by Bevington (2021) was to estimate the alleged

⁵⁹¹ Exhibit C7-12-1, Appendix A, p. 1.

⁵⁹² Ibid., Appendix D, p. 78.

⁵⁹³ Ibid., Appendix D, p. 79.

⁵⁹⁴ Exhibit C7-16, CEC IR 25.1.

⁵⁹⁵ CORE Final Argument, pp. 16-17.

⁵⁹⁶ FEI Final Argument, pp. 63-64

prevalence in BC of idiopathic environmental intolerance attributed to electromagnetic fields. Exponent states limitations of the study include lack of clarity over how the author selected the studies included in the analysis and whether a comprehensive literature search was conducted. Specifically, three of the studies included in Bevington (2021) were determined by SCENIHR in their 2015 report to “not add useful information” and an additional three studies were excluded by Swedish Radiation Safety Authority (SSM) (2018, 2019). Exponent states Belayaev et al (2016) is not a research study and is in fact the EUROPAEM EMF Guidelines 2016.⁵⁹⁷

In response to Dr. Havas’ statements of the WHO’s position on health effects from electromagnetic fields, FEI provides the following comments. First, it notes that Dr. Havas’ statement arose in response to an IR from the CEC, and that Exponent then stated that Dr. Havas’s response to the CEC’s IR was incomplete and therefore misleading. Exponent explains that Dr. Havas was referring to a WHO Workshop in 2004, and that the WHO actually stated that idiopathic environmental intolerance symptoms “cannot be attributed to EMF” (p. 4), and also stated: “There are also some indications that these symptoms may be due to pre-existing psychiatric conditions as well as stress reactions as a result of worrying about believed [electromagnetic field] health effects, rather than the [electromagnetic field] exposure itself.”⁵⁹⁸

Exponent goes on to note that Dr. Havas’s response does not make clear that the WHO has not opined specifically about smart meters anywhere, or that in 2014 the WHO concluded that “[a] number of studies have investigated the effects of radiofrequency fields on brain electrical activity, cognitive function, sleep, heart rate, and blood pressure in volunteers. To date, research does not suggest any consistent evidence of adverse health effects from exposure to radiofrequency fields at levels below those that cause tissue heating. Further, research has not been able to provide support for a causal relationship between exposure to electromagnetic fields and self reported symptoms, or “electromagnetic hypersensitivity.”⁵⁹⁹

Panel Discussion

The Panel recognizes that there are people who feel strongly that radiofrequency emissions will have a negative impact on their health. We also note, however, that the WHO remains of the view, as it did at the time of the 2013 FBC AMI Decision, that research has not been able to provide support for a causal relationship between exposure to electromagnetic fields and self-reported symptoms or EHS. The evidence from CORE’s witnesses does not persuade us that there is any merit to claims that EHS symptoms are connected to radiofrequency emissions. Indeed, it appears that even CORE’s expert witness, Dr. Havas, was selective in her evidence to support her opinion, which we find undermines her credibility. Nevertheless, FEI points out that customers with concerns regarding EHS will be able to select a radio-off meter option.

⁵⁹⁷ Exhibit B-26, Part 2, A29, p. 36.

⁵⁹⁸ Ibid., Part 2, A30, p. 37.

⁵⁹⁹ Ibid., Part 2, A30, p. 37.

5.4.3.3 General Densification

CORE's Submission

Dr. Héroux notes that the AMI Project “will add 1 million RF, pulsative transmitters, mostly Sonix IQ gas meters, to the province. This represents a very large increase in the number of imposed RF sources throughout BC. Contrary to what is suggested by Exponent, the impact on spaces presently relatively virgin of RF radiation will be huge.”⁶⁰⁰ CORE submits Dr. Héroux’s concerns with the potential for general densification of one million radiofrequency devices in the AMI Project is significant and ‘the reader’ should note the recommendation of a setback of 500 metres in a recent 2020 case in New Hampshire involved 5G technology and cell phone towers.⁶⁰¹ CORE submits that the military and engineering-dominated organizations have promoted unsafe standards, on which Safety Code 6 is based, “for the purpose of favoring deployment of as many wireless devices as possible.”⁶⁰²

FEI Reply

In reply to Dr. Héroux’s concern regarding the ‘general densification’ of radiofrequency with the addition in British Columbia of one million radiofrequency pulsative transmitters, FEI emphasizes that the proposed advanced gas meters do not emit pulsed radiofrequency signals. Further, FEI states that Dr. Héroux conflates the number of sources with the extent of exposure to radiofrequency fields and that the very small areas around the Sonix IQ meters where radiofrequency signals are greatest in aggregate are much smaller than the area exposed to radiofrequency fields by even a single radio station.⁶⁰³

Panel Discussion

Dr. Héroux’s concern that the addition of the components involved in the AMI Project, which FEI acknowledges will number one million, represents an “impact on spaces presently relative virgin of RF radiation [that] will be huge” is not supported by evidence. The Panel is therefore not persuaded that the number of meters will result in an intensification of radiofrequency signals with potentially harmful effects.

5.5 The Precautionary Principle

CORE's Argument

CORE submits that, in the event the BCUC is not wholly persuaded that there are consequences to human health, safety and the environment arising from exposure to radiofrequency, CORE has established sufficient evidence reflecting the uncertainty of risks such that the precautionary principle should apply in order to conserve the public interest.⁶⁰⁴ CORE submits that, even in the area of health concerns alone, approval of the Application would be premature and not warranted give the significant and substantive uncertainty in the scientific discourse surrounding the injurious biological effects of radiofrequency on human health.⁶⁰⁵ CORE

⁶⁰⁰ Exhibit C7-12-1, Appendix B, p. 25.

⁶⁰¹ CORE Final Argument, p. 15.

⁶⁰² Ibid., p. 37.

⁶⁰³ FEI Reply Argument, p. 37.

⁶⁰⁴ CORE Final Argument, p. 42.

⁶⁰⁵ Ibid., p. 45.

submits the Project is not in the public interest from a human health perspective. As such, CORE requests the BCUC decline FEI's Application as presented.⁶⁰⁶

In response to CORE's submission, FEI refers to the BCUC's 2013 FBC AMI Decision. The Decision states that Health Canada developed the radiofrequency limits in Safety Code 6 using a 50-fold safety threshold and Health Canada decision making treats the concept of precaution as pervasive. FEI submits CORE has not provided any compelling evidence or submissions that this is no longer the case.⁶⁰⁷

Panel Determination

The Panel is satisfied that Safety Code 6 is sufficiently conservative to address any risk to human health arising from exposure to radiofrequency, and it therefore encompasses the precautionary principle.

The Panel notes that exposures in typical operation from the Sonix IQ meters proposed for the Project are approximately 24 million times below the exposure limit set out in Safety Code 6. Even in their maximum duty cycle, during one-time start-up and network connection, the evidence shows that with conservative assumptions, the meters are approximately 1,000 times below the exposure limit set out in Safety Code 6.⁶⁰⁸ Further, the Safety Code 6 exposure limit is itself set on a conservative basis, at a factor of 50 times below the level at which radiofrequency exposure demonstrates health effects.⁶⁰⁹

5.6 Alleged Calculation Errors and Misinformation in the Exponent Health Report

CORE's intervener evidence alleges misinformation in the following components of Exponent's evidence:

- Exponent RF Technology Report: Table 4; and
- Exponent RF Technology Report: Figure 5.

5.6.1 Exponent RF Technology Report: Table 4

On page 24 of the Exponent RF Technology Report, Exponent provides Table 4, reproduced below:⁶¹⁰

⁶⁰⁶ Ibid, p. 46.

⁶⁰⁷ FEI Reply Argument, pp. 41-42.

⁶⁰⁸ Exhibit B-1, Appendix F-1, p. 22.

⁶⁰⁹ Ibid., Appendix F-1, p. 11.

⁶¹⁰ Exhibit B-1-1, Appendix F-1, Table 4, p. 24.

Table 4. Frequency and representative RF exposure values for common man-made RF sources²⁴

Source	Frequency (MHz)	Reported Value (% of SC6 Limit)*	Exposure Conditions
Blackbody radiation from the earth	0.003 – 3,000	0.009	Typical
Blackbody radiation from humans	0.003 – 3,000	0.018	Typical
Cell Phone	800 – 1,900	5 – 12†	Personal Call
Cordless Phone / Handheld Unit	1,880 – 1,900	0.5 – 3.8	Handheld Unit
Wi-Fi	2,400 – 2,484	0.00007 – 0.75	Typical
Bluetooth	2,400 – 2,484	0.002 – 0.31	At 0.25 – 3 meters
Microwave Oven	2,450	0.01 – 2.4	At 1 meter

* RF exposure is presented as a percentage of the SC6 limit to keep these exposure values both consistent and accurate. The SC6 limit is defined as the applicable SAR limit, wave power density limit, or square of the field magnitude limit, all for uncontrolled environments. Both whole body exposure and spatial peak SAR for the head are used where appropriate.

† An average value based upon Abdulla and Badra (2010) is approximately 7.6% (see e.g., Figure 5).²⁵

Dr. Havas notes that Table 4 shows blackbody radiation emits between 0.003-3,000MHz, which Dr. Havas says is incorrect. Dr. Havas states Exponent uses this information in its Figure 5 and states that humans and the earth emit radiofrequency when they are emitting heat instead.⁶¹¹

Dr. Havas' report claims Exponent provides "misinformation" in its conversion of wavelength to frequency in its RF Technology Report. Dr Havas provides Figure 1, which shows the equation for converting wavelength to frequency, reproduced below.⁶¹²

Spectral Radiance Associated with Blackbody Radiation

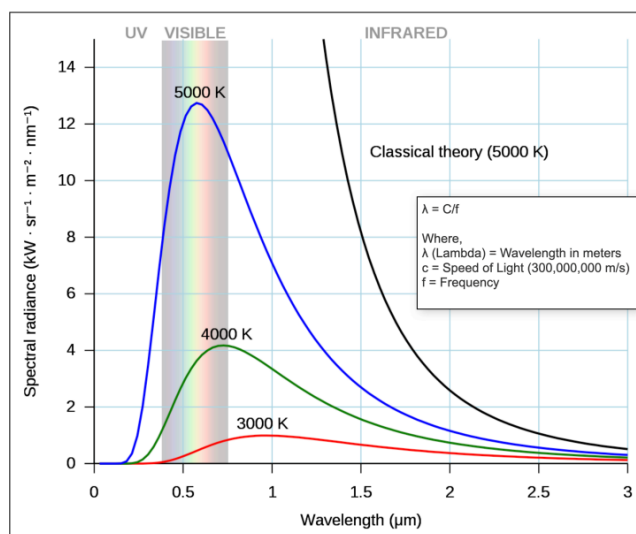


Figure 1. Spectral radiance associated with Blackbody Radiation.
Source: https://commons.wikimedia.org/wiki/File:Black_body.svg

⁶¹¹ Exhibit C7-12-1, Appendix D, p. 67.

⁶¹² Ibid., Figure 1, p. 68.

Dr. Havas states:

It is possible to convert frequency to wavelength and vice versa with the equation shown in Figure 1. Using this equation, the frequency of 3 um wavelength is 100,000 GHz. Since RFR [radiofrequency radiation] only goes up to 300 GHz, this is definitely NOT RFR. [emphasis in original] Similarly, 300 GHz frequency has a wavelength of 1 mm, which is 1,000 um and this is larger than the 3 um in the figure above.

The source of this misinformation has been attributed to reference 24. This list includes, Foster and Valberg, both of whom are known to provide expert testimony on behalf of the wireless industry and the electric utility. It also includes ICNIRP and HPA. ICNIRP is an industry funded “think” tank based in Germany and HPA is the British Health Protection Agency that has one of the worst RF guidelines globally. Industry funded scientists are NOT independent scientists and their work needs to be scrutinized carefully. That is why journals request authors to disclose potential conflicts of interest when articles are submitted for publication [sic].⁶¹³

Dr. Héroux’s report claims Exponent provides disinformation in Table 4 regarding the list of exposures from sources of radiofrequency within the home, stating:

The table is disinformation, as the first two are different from Sonix as to their frequencies, modulations, coherence and polarization: so removed from the subject of this report that they are irrelevant... The next four are all elective sources, that are not imposed on you by any administration, but emanate from objects you elect to buy and use. The last one (oven) is a fixed frequency contained sources that does not radiate and is not pulsed. You will notice that all sources are a tiny fraction of the astronomical SC6 limit, except for the cell phone placed against the ear.

Page 25 (pdf 343) at the bottom says that “other sources both inside and outside a residence are many times greater than that from the Sonix IQ gas meter.” This statement is disinformation, as it does not consider frequency or impulsiveness of these sources. The argument collapses entirely, unless one believes that the only possible effect of RF radiation is heat, as SC6 does.⁶¹⁴

FEI Rebuttal Evidence

Exponent submits that Dr. Havas does not acknowledge that the wavelengths of the electromagnetic fields in the Figure 1 cited from Wikipedia only extend to 3 micrometres (um). In other words, the lowest frequency shown is about 100,000GHz. Exponent states the wavelengths cited by Exponent for the earth and human body extend far off the graph as their frequencies are much lower, in the order of 3kHz to 300GHz. As a comparison, Exponent submits the following Figure, from a peer-reviewed engineering journal, which shows the power density of blackbody radiation from a human body, although less than a light bulb, is evident. Exponent states the energy from a human or earth is so small as to be negligible to any potential exposure assessment.⁶¹⁵

⁶¹³ Exhibit C7-12-1, Appendix D, pp. 68-69.

⁶¹⁴ Exhibit C7-12-1, Appendix B, pp. 24-25.

⁶¹⁵ Exhibit B-26, Part 2, A35 pp. 28-29.

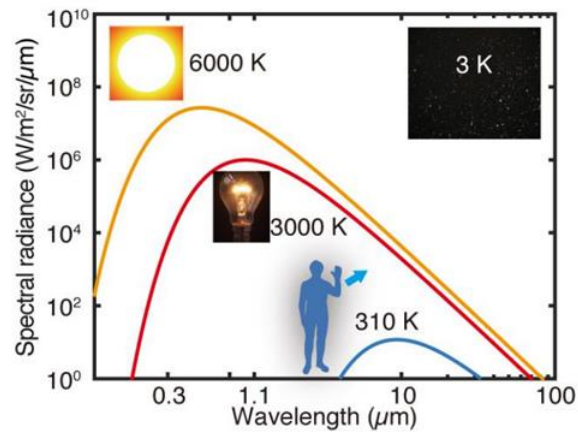


Figure 2. Blackbody thermal radiation at temperatures of several important thermodynamic resources: Sun at 6000 K, light bulb at 3000 K, human body at 310 K, and the universe at 3 K (Li and Fan, 2018).

Positions of the Interveners

CORE submits Dr. Havas points out in her evidence that Exponent’s reliance upon industry-funded scientists such as Foster and Valberg has become more prevalent, expressing concern with “the conflict of interest.”⁶¹⁶

CORE submits that Dr. Héroux’s expert evidence mounts a direct challenge to specific assumptions and disinformation in the Exponent RF Technology Report.⁶¹⁷ CORE submits this represents unreliability of the sources relied upon in the Exponent RF Technology Report which should give the BCUC pause when evaluating whether Exponent should be taken as an objective, fair and non-partisan expert.⁶¹⁸

FEI did not reply.

Panel Determination

The Panel is not persuaded by Dr. Havas’s criticism of Exponent’s calculations. As noted in Section 5.1 above, Dr. Havas lacks expertise in the areas of physics, engineering and radiofrequency exposure. Therefore, the Panel gives limited weight to Dr. Havas’s evidence on these subject matters.

5.6.2 Exponent RF Technology Report: Figure 5

On page 26 of the Exponent RF Technology Report, Exponent provides Figure 5, reproduced below:⁶¹⁹

⁶¹⁶ CORE Final Argument, p. 73.

⁶¹⁷ Ibid., p. 11.

⁶¹⁸ Ibid., p. 25.

⁶¹⁹ Exhibit B-1, Appendix F-1, Figure 5, p. 26.

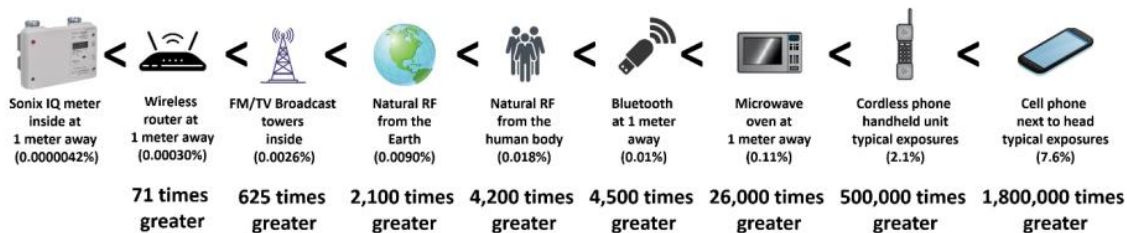


Figure 5. RF exposure of a Sonix IQ gas meter relative to other RF sources.

The RF exposure as a percentage of SC6 limits is shown beneath each graphic in parentheses and a comparison of how much greater each exposure is than that from a Sonix IQ gas meter is shown below that in bold font.

Dr. Havas states that the various devices provided in Figure 5 emit at different frequencies, which were not provided and on which the Safety Code 6 guidelines are frequency dependent, so comparing them is like “comparing apples and oranges.” Dr. Havas provides alternative calculations related to power density of various devices to check the accuracy of the information provided in Figure 5 of the Exponent RF Technology Report.⁶²⁰ Dr. Havas’ calculations are provided in Table 1 of her expert report, reproduced below.⁶²¹

Table 1. Comparison of information provided in Figure 5 (Exponent 2021) with Power Density provided by measurement and calculations.

Object	Details	Distance	Frequency	Distance	Health Canada	Fig 5 (Exponent, May 2021)		Power Density in Figure 5	Havas 2021a	Havas 2021a	Havas 2022	Iberdola
					SC6 guideline	% of SC 6 @ 900, 1800 and 2,400 MHz	Times greater than Sonix IQ Meter		Calculation A	Calculation B	Measurement	Power Density provided by Iberdola
		meters	Mhz	meters	µW/m2	%	factor	µW/m2	µW/m2	µW/m2	µW/m2	µW/m2
Human Body	-	ndp	0.00005	ndp	none	0.018%	4,200	ndp	504	-	0	3,000
Earth	-	ndp	0.00005	ndp	none	0.009%	2,100	ndp	252	-	-	1,300
Gas Smart Meter	Exp & Iberdola	1 m	900	1 m	2,740,000	0.0000042%	1	ndp	0.12	0.12	-	150
Gas Smart Meter	every minute	within 1 m	900	within 1 m	2,740,000	-	-	-	-	-	150**	-
Gas Smart Meter	every 5 minutes	within 1 m	900	within 1 m	2,740,000	-	-	-	-	-	16,000**	-
WiFi Router	-	1 m	2,400	1 m	10,000,000	0.0003%	71	ndp	8.52	30	116,000	10,000
No Device vs. Table	Bluetooth	1 m	2,400	1 m	10,000,000	0.01%	4,500	ndp	540	1,000	497	-
Tablet	OFF	1 m	0	1 m	10,000,000	-	-	-	-	-	0.04	-
Tablet	WiFi	1 m	2,400	1 m	10,000,000	-	-	-	-	-	10,100	-
Tablet	WiFi + Bluetooth	1 m	2,400	1 m	10,000,000	-	-	-	-	-	10,700	-
MicroWave Oven	OFF	at door	0	at door	0	-	-	-	-	-	4.4	-
MicroWave Oven	ON High	at door	2,400	at door	10,000,000	-	-	-	-	-	12,500,000*	-
MicroWave Oven	ON High	1 m	2,400	1 m	10,000,000	0.11%	26,000	ndp	3,120	11,000	335,000	47,000
Cell Phone	OFF	at head	0	at head	0	-	-	-	-	-	0.04	-
Cell Phone	ON	at head	1,800	at head	10,000,000	7.6%	1,800,000	ndp	216,000	760,000	275,000	1,900,000

Calculation A: Based on Sonix IQ as % of SC 6 and the “times greater” for every other object, provided in Fig. 5

* meter maximum exceeded
ndp means no data provided

** Data from Cathy Cooke, Building Biologist
Note: FCC limit for 900 MHz is f/1500 (W/cm2)

Calculation B: based on % of Safety Code 6 for each object, provided in Fig. 5

*** bluetooth (Exponent) vs. measured tablet bluetooth

Dr. Havas states, “something is wrong with the data in [Figure] 5 [of the Exponent RF Technology Report] but, based on inadequate information, it is difficult to determine the sources of the errors.”⁶²²

⁶²⁰ Exhibit C7-12-1, Appendix D, pp. 70-75.

⁶²¹ Ibid., Table 1, p. 73.

⁶²² Exhibit C7-12-1, Appendix D, p. 71.

FEI Rebuttal Evidence

Exponent states that Dr. Havas has made calculations based on an illustrative presentation of the data, rather than on reviewing the data in Table 4 above and without reading the underlying literature. Exponent's footnote to Table 4 reads "RF [radiofrequency] exposure can be heavily dependent upon situation, so exposure conditions are provided for each exposure value" and then lists several sources. Exponent states Dr. Havas' calculations have errors because she uses her initial measurement to scale the potential exposure of all other sources without accounting for variations in frequency. The Sonix IQ meter operates at 900 MHz and the Wifi signal at 2,400 MHz. Exponent asserts this oversight introduces an error factor of approximately 2 into her calculations. Exponent states if Dr. Havas had not made the errors, her calculations would have matched those provided by Exponent.⁶²³

Positions of the Interveners

CORE submits Dr. Havas' report shows inconsistencies in the calculations in the Exponent RF Technology Report, specifically those shown in Figure 5. CORE urges the BCUC to carefully review the findings of Dr. Havas. CORE submits the inconsistent values and power density for each of the objects in Figure 5 cannot be viewed as "internally reliable" and therefore the BCUC should exercise caution in assigning weight to Figure 5.⁶²⁴ In response to Dr. Havas' criticism of Figure 5 of the Exponent RF Technology Report, FEI reiterates that Exponent did, in fact, provide the frequencies and power density of the radiofrequency sources, and Exponent has pointed out multiple errors in Dr. Havas' calculations in rebuttal evidence, which CORE failed to acknowledge.⁶²⁵

Panel Determination

The Panel is not persuaded by Dr. Havas's allegations of errors in Exponent's calculations. The Panel is satisfied with Exponent's rebuttal evidence, and concludes that Dr. Havas herself has made errors which undermine the credibility of her criticisms. As noted in Section 5.1 above, the Panel gives limited weight to Dr. Havas's evidence on physics, engineering and radiofrequency exposure, which are beyond her areas of expertise.

6.0 Consultation and Engagement

Section 3 of the BCUC's CPCN Guidelines outlines the information expected from an applicant regarding consultation with First Nations and the public, which includes: a description of consultation activities; issues and concerns raised; the applicant's assessment of the sufficiency of the consultation process; and a statement of planned future consultation.

FEI created a Consultation, Communications and Engagement Plan. To ensure the effectiveness of its Consultation, Engagement and Communications Plan, FEI considered lessons learned from the implementation of advanced electric meters by FBC between 2013 and 2016. In addition, FEI conducted a Customer Perception Survey of advanced meters, and implemented best practices from other North American utility deployments of advanced meters. Best practices from the COVID-19 pandemic were also considered to ensure FEI engaged and consulted in a safe, effective and timely manner. The Project spans across FEI's entire service territory, meaning

⁶²³ Exhibit B-26, Part 2, A28, pp. 33-34.

⁶²⁴ CORE Final Argument, p. 28.

⁶²⁵ FEI Reply Argument, p. 40.

an ongoing and multifaceted approach was required, including letters and emails, information sessions, outreach to media outlets, advertising campaigns, social media and direct customer communications to accomplish consultation objectives. FEI states it will continue to use its Consultation, Engagement and Communications Plan to guide activities throughout the Project and will update the plan to incorporate feedback as necessary.⁶²⁶

The following subsections provide an overview of FEI's engagement activities with First Nations communities and consultation with stakeholders such as local governments, landowners and customers.

6.1 Indigenous Consultation and Engagement

Section 3 of the BCUC's CPCN Guidelines specifies requirements with respect to First Nations consultation, including that project proponents identify those First Nations potentially affected by the application, and provide a summary of the consultation to date for each potentially affected First Nation. The BCUC considers the sufficiency of consultation to date when evaluating CPCN applications.

FEI states it engages meaningfully with Indigenous groups through transparent, frequent, two-way dialogue. FEI is guided by its 'Statement of Indigenous Principles', developed in 2001, with guidance and input from Indigenous leaders across British Columbia.⁶²⁷ This collaborative approach leads to early identification of issues or concerns, and a shared interest in finding mutually agreeable solutions. Since October 3, 2019, FEI has engaged with Indigenous groups who are potentially affected by the Project. Engagement with Indigenous groups ahead of FEI's Project submission to the BCUC included two notification letters, follow up phone calls and face-to-face meetings as requested. FEI tracked these discussions, with no outstanding concerns raised at the time of filing.⁶²⁸

FEI states due to the nature of the Project, the potential impacts for Indigenous groups are anticipated to be minimal.⁶²⁹

In response to IRs, FEI provided a future consultation plan and updated Indigenous engagement logs.⁶³⁰ Updated consultation logs and progress on consultation to date were provided in IR2.⁶³¹ FEI states it has no documentation from Indigenous groups potentially affected by the Project expressing their level of satisfaction with the engagement to date.⁶³²

FEI states it remains committed to engaging with Indigenous communities in an ongoing, transparent and meaningful manner and will look into creating training and job opportunities for local and Indigenous groups as part of Project implementation.⁶³³

⁶²⁶ Exhibit B-1, p. 120.

⁶²⁷ Exhibit B-1, Appendix I-1.

⁶²⁸ Exhibit B-1, p. 134.

⁶²⁹ Ibid., p. 135.

⁶³⁰ Exhibit B-6, Attachment 36.2, Attachment 37.3.

⁶³¹ Exhibit B-16, BCUC IR Attachment 47.1, Attachment 48.1.

⁶³² Exhibit B-6, BCUC IR 37.1.

⁶³³ Exhibit B-1, p. 138.

FEI submits that its consultation processes demonstrate “sufficient and appropriate Indigenous engagement regarding the Project.”⁶³⁴

Positions of the Interveners

The CEC submits that it has no concerns with FEI’s consultation activities.⁶³⁵

Panel Determination

The Panel finds that FEI’s consultation with Indigenous communities with regards to this Project to date is sufficient.

The evidence demonstrates that FEI has notified Indigenous groups that are potentially affected by the AMI Project and there were no outstanding concerns at the time the Application was filed.

6.2 Public Consultation

FEI identifies three primary groups affected by the Project as the focus of its public consultation efforts:⁶³⁶

1. FEI’s residential and commercial natural gas customers;
2. Provincial government bodies, including: the Ministry of Energy, Mines and Low Carbon Innovation (formerly, the Ministry of Energy, Mines and Petroleum Resources), and Members of the Legislative Assembly; and
3. Municipal and regional governments, including: the mayors, councils, city managers and/or staff within FEI’s gas service territory.

FEI has provided notification and engagement through announcements, virtual information sessions, 12 in-person public information sessions throughout the province, outreach through media, social media, FEI’s website and bill inserts, paid advertisements and a dedicated project email and phone line.⁶³⁷

FEI contracted a third-party firm to complete a Customer Perception Survey for residential and commercial gas customers in September 2019. Results from the survey provided information on how customers preferred to be contacted, familiarity with the technology proposed and benefits of the Project. This survey information was used to inform the development of the Consultation, Engagement and Communications Plan.⁶³⁸

As of March 1, 2021, FEI states it has responded to over 500 public inquiries over telephone, email and at information sessions. Themes emerged from the contacts including:⁶³⁹

- Health: Concerns regarding the new network generally pertained to perceived health effects related to RF [radiofrequency emissions] and how the Project could exacerbate perceived pre-existing sensitivity to wireless technology.

⁶³⁴ FEI Final Argument, p. 34.

⁶³⁵ CEC Final Argument, p. 31.

⁶³⁶ Exhibit B-1, p. 122.

⁶³⁷ Ibid., pp. 123, 129.

⁶³⁸ Ibid., pp. 123-124.

⁶³⁹ Ibid., pp. 131-132.

FEI's responses generally included discussion of the Project's compliance with SC6, the radio-off option and that the proposed meters only transmit at intervals and generally for less than a few seconds a day.

- Privacy: Concerns centered on whether FEI could use the new technology to tell when customers were using specific appliances and how customer information would be protected.
FEI's responses generally included discussion that the new network will be owned and operated by FEI and all data will be retained in Canada, only instantaneous gas consumption data is transmitted, customer information will be not transmitted, meter reading information sent wirelessly will be encrypted, and all data will be protected under the British Columbia *Personal Information Protection Act*.
- Customer rates: A small number of inquiries raised concerns regarding the Project's costs and the potential to impact customer rates.
FEI's responses generally included why it was pursuing the Project, including customer benefits such as access to gas usage information and safety features such as leak detection and shut-off capabilities.

FEI states its responses generally received either an acknowledgement of the information FEI provided or a positive reply.⁶⁴⁰ FEI acknowledges that there are some members of the community that remain opposed to the Project due largely to perceived health issues associated with the new meters' radiofrequency and the increased use of wireless technology in general. One of the key ways FEI has sought to address radiofrequency-related concerns is by communicating that customers can select a radio-off option from the outset of the Project. FEI states it will continue to consult with the public as the Project progresses, including continuing to look at ways to address or respond to future concerns raised.⁶⁴¹

FEI intends to update its Consultation, Engagement and Communications Plan to incorporate: lessons learned during consultation so far, lessons learned from FBC's deployment of smart meters, feedback from early consultation, ongoing dialogue with stakeholders and industry best practices. Due to the scale of the Project, FEI's future consultation and communication activities will be tailored to address the unique needs of the regions it serves and will include activities such as, bill inserts, media outreach and public information sessions.⁶⁴²

FEI states it believes that its consultation and communication activities at the time of filing the Application have met the requirements of the Application guidelines. FEI states its efforts to date surpassed FEI's standard outreach and consultation for a typical major project. FEI has responded to all feedback received. FEI is committed to maintaining an open and transparent consultation process throughout the Project to support deployment, respond to customer concerns and minimize disruptions.⁶⁴³

FEI states consultation with employees affected by the implementation of AMI will take place during a future stage of the Project.⁶⁴⁴

⁶⁴⁰ Exhibit B-1, p. 132; Appendix H-2, log of interactions.

⁶⁴¹ Ibid., p. 132.

⁶⁴² Ibid., p. 133.

⁶⁴³ Ibid., pp. 133-134.

⁶⁴⁴ Exhibit B-6, BCUC IR 36.1.

FEI submits that it has conducted an “appropriately comprehensive and multifaceted public consultation process” for the AMI Project to date, which surpasses its standard outreach and consultation for a typical major project.⁶⁴⁵

Positions of the Interveners

BCSEA submits that it considers FEI’s public consultation regarding the AMI Project to have been comprehensive and effective.⁶⁴⁶

The CEC submits that it has no concerns with FEI’s consultation activities.⁶⁴⁷

Panel Determination

The Panel finds that FEI’s public consultation for the AMI Project has been sufficient.

The evidence demonstrates that FEI has notified its customers and other stakeholders, and has recorded and responded to feedback it has received.

7.0 Project Costs, Accounting Treatment and Rate Impact

This section analyzes the costs and resulting rate impacts of the AMI Project.

7.1 Project Costs

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. The first scenario is FEI’s Baseline meter program that represents the costs FEI expects to incur if the AMI Project is not approved. The second relates to the proposed AMI solution. For the purpose of the analysis, FEI grouped costs into three phases as follows:⁶⁴⁸

1. Pre-deployment - the time period from 2021 to 2023. During this phase, costs are being incurred for Project development and for the regulatory proceeding;
2. Deployment – the time period from 2024 to 2026. These are the years in which the majority of the AMI meters will be deployed; and
3. Post-deployment – the time period from 2027 to 2046. This is the time period over which the new AMI meters are expected to be in service, based on the estimated useful life of the new AMI meters of 20 years. The majority of the financial benefits of the Project, consisting primarily of reduced meter reading costs, will be realized over this phase.

⁶⁴⁵ FEI Final Argument, pp. 31-33.

⁶⁴⁶ BCSEA Final Argument, p. 18.

⁶⁴⁷ CEC Final Argument, p. 31.

⁶⁴⁸ Exhibit B-30, Appendix B, p. 97.

FEI notes that only the costs in the Pre-deployment and Deployment phases are classified as the cost of the Project. However, FEI also provides the costs and savings in the Post-deployment phase to evaluate the financial impact of the Project over the financial analysis period.⁶⁴⁹

FEI provides the expected capital and O&M costs of the AMI Project, as well as the incremental costs when compared to the Baseline costs in the table below. FEI notes that these costs are in estimated as-spent dollars and include contingency and allowance for funds used during construction (AFUDC).⁶⁵⁰

Capital and Operating Cost Summary

Project Costs As-Spent in \$Millions		Pre Deployment	Deployment	Subtotal (1+2)	Post Deployment	Total (3+4)
Line	Item	2021 - 2023 (1)	2024 - 2026 (2)	2021 - 2026 (3)	2027 - 2046 (4)	2021 - 2046 (5)
AMI						
1	Capital ²	128.3	624.1	752.5	119.2	871.6
2	O&M	57.7	52.7	110.3	234.4	344.7
BASELINE						
3	Capital	80.5	104.4	184.9	563.9	748.8
4	O&M	53.9	59.5	113.4	554.0	667.3
INCREMENTAL³						
5	Capital	47.9	519.7	567.6	(444.7)	122.9
6	O&M	3.8	(6.8)	(3.0)	(319.6)	(322.6)

FEI forecasts the capital cost of the AMI solution at \$752.5 million as compared to the Baseline capital cost of \$184.9 million, with the incremental capital cost of the Project estimated as \$567.6 million. Additionally, FEI estimates an incremental O&M reduction over the Pre-deployment and Deployment phases of \$3.0 million.⁶⁵¹ During the Post-deployment phase, FEI estimates reduced capital spending of \$444.7 million and a further incremental O&M savings of \$319.6 million.⁶⁵²

FEI prepared the cost estimates based on the AACE Class 3 specifications in accordance with the BCUC's CPCN Guidelines. FEI states that cost estimates are based on a mix of negotiated contract prices, FEI current costs adjusted for inflation, and FEI's estimates of future expected costs.⁶⁵³ FEI notes that the later BCUC approval is received, the more FEI is exposed to the potential of inflationary pressures on labour rates, facilities and materials that are not tied to fixed price contracts.⁶⁵⁴

Due to the concerns regarding the availability of manual meter reading in the future, discussed in Sections 3.3.5, the Baseline alternative includes the cost of bringing manual meter reading in-house starting in 2027. FEI states that the cost assumptions used in the Baseline alternative are based on FEI's low case cost estimate.⁶⁵⁵ FEI notes that there would be an overall rate savings for customers if the future cost of manual meter reading is higher than the Baseline low case cost scenario that has been assumed.⁶⁵⁶ The rate impact of the Project is discussed below.

⁶⁴⁹ Ibid.

⁶⁵⁰ Ibid., Appendix B, Table 6-1, p. 98.

⁶⁵¹ Exhibit B-30, Appendix B, p. 98.

⁶⁵² Ibid., Appendix B, Table 6-1, p. 98.

⁶⁵³ Ibid., Appendix B, p. 99.

⁶⁵⁴ Ibid., p. 8.

⁶⁵⁵ Ibid., Appendix B, p. 117.

⁶⁵⁶ Ibid, p. 7.

7.2 Rate Impact

Based on the updated costs following the Evidentiary Update and the regulatory accounting treatment discussed above, FEI calculated a cost of service for both the AMI Project and the Baseline alternative with the difference between them resulting in the incremental impact of the AMI Project. FEI forecasts an incremental levelized delivery rate impact of 0.442 percent over the 26-year analysis period for the AMI Project as compared to approved 2021 rates.⁶⁵⁷ The 26-year analysis period is made up of 6 years for Pre-deployment and Deployment as described in Section 7.1 (from 2021 through to 2026) plus 20 years after Deployment of the last AMI meter equal to the estimated useful life of the new AMI meters and equivalent to the Post-deployment phase described in Section 7.1.⁶⁵⁸

Further, FEI provided the updated incremental annual delivery rate impacts resulting from the AMI Project for each year from 2022 through 2046 as compared to the Baseline alternative, which ranges between an increase of 2.45 percent in 2025 to decrease of 1.62 percent in 2030.⁶⁵⁹

In 2027, the year after full AMI Deployment, FEI states that the cumulative delivery rate impact would be at its highest level, 6.27 percent, resulting in a cumulative annual average bill increase of \$28.5 dollars for a residential customer consuming 90 GJs per year.⁶⁶⁰

FEI provided a sensitivity analysis on the incremental levelized delivery rate impact of the AMI Project assuming different levels of future meter reading costs under the Baseline alternative. As mentioned above, the cost assumptions used in the Baseline alternative are based on FEI's low case cost estimate, which results in the forecast incremental levelized delivery rate impact of 0.442 percent over the 26-year analysis period for the AMI Project when compared to the Baseline alternative. In contrast, FEI demonstrated under the Baseline high case cost scenario that increased labour rates for in-house meter reading would reduce the levelized delivery rate impact of the AMI Project over the 26-year analysis period from 0.442 percent to a levelized delivery rate benefit of 0.153 percent when compared to the Baseline alternative.⁶⁶¹

FEI's Position

FEI recognizes that the AMI Project represents a large investment in its system, but submits that the cost will have a minimal impact on customer annualized rates of less than half of one percent over the analysis period, and the benefits of the AMI Project are significant.⁶⁶²

FEI submits that its challenges in sourcing diaphragm meters and increasing labour costs associated with meter reading described in the Evidentiary Update favour proceeding with the AMI Project in the near future. FEI adds that the later BCUC approval for the Project is received, the more FEI is exposed to inflationary pressures on labour rates, facilities and materials that are not tied to fixed price contracts, and the longer the benefits of the Project are deferred.⁶⁶³

⁶⁵⁷ Ibid., pp. 116–117.

⁶⁵⁸ Exhibit B-1, p. 110.

⁶⁵⁹ Exhibit B-35, RCIA IR 65.2.

⁶⁶⁰ Exhibit B-30, Appendix B, p. 117.

⁶⁶¹ Exhibit B-35, RCIA IR 62.1; Exhibit B-30, Appendix B, Table 6-12, p. 117.

⁶⁶² FEI Final Argument, pp. 23-24.

⁶⁶³ Ibid.

Positions of the Interveners

BCSEA submits that the cost of the AMI Project is warranted, and the Project's rate impact is reasonable given the benefits.⁶⁶⁴

The CEC submits that it expects the benefits of "moving towards modern technology and reducing exposure to meter reading issues and meter supply issues" will outweigh the Project's costs. The CEC considers the AMI Project to be "appropriately costed" and that the capital upgrade provides a "good foundation for controlling O&M and capital costs in the long term."⁶⁶⁵

As noted in Section 3.4 above, RCIA's opposition to the AMI Project "stems from the delivery rate impacts" of 0.442 percent per year, with a cumulative increase reaching 6.27 percent compared to the Baseline before declining.⁶⁶⁶ In reply, also noted in Section 4 above, FEI disagrees with RCIA's focus on the AMI Project's cost and whether the cumulative rate impact is an appropriate way to evaluate the Project.⁶⁶⁷

CORE questions the reliability and feasibility of the AMI Project, "having regard to FEI's position on cost increases identified in its Evidentiary Update" and whether FEI will have sufficient resources to turn on over one million AMI meters throughout the province after the installations occur in 2023.⁶⁶⁸

As noted in Section 4 above, BCOAPO submits that the AMI Project's cost and rate impacts are not justified based on the cost per meter.⁶⁶⁹ In reply, also noted in Section 4 above, FEI submits that BCOAPO's calculation of the cost per meter of the AMI Project is not accurate.⁶⁷⁰

Panel Determination

The Panel finds that the cost and rate impact of the AMI Project are reasonable.

The levelized increase in rates of less than half of one percent over the analysis period is justified by the benefits of the AMI Project, which in Section 4 above the Panel found to be improved accuracy and convenience of meter reading, improved opportunities for DSM and energy conservation, improved safety and resiliency of FEI's gas distribution network and GHG emission reductions.

8.0 Provincial Government Energy Objectives and Long Term Resource Plan

Section 46 (3.1) of the UCA requires that the BCUC consider the following in determining whether to issue a CPCN: the applicable of British Columbia's energy objectives, the most recent long-term resource plan filed by the public utility under section 44.1, if any, and the extent to which the application for the CPCN is consistent with the applicable requirements under sections 6 and 19 of the CEA.

⁶⁶⁴ BCSEA Final Argument, p. 12.

⁶⁶⁵ CEC Final Argument, p. 31.

⁶⁶⁶ RCIA Final Argument, pp. 26-27.

⁶⁶⁷ FEI Reply Argument, pp. 24-25.

⁶⁶⁸ CORE Final Argument, p. 42.

⁶⁶⁹ BCOAPO Final Argument, pp. 12-13.

⁶⁷⁰ FEI Reply Argument, p. 26.

Further, section 17 (6) of the CEA provides that if a public utility, other than BC Hydro, makes an application under the UCA in relation to smart meters, other advanced meters or a smart grid, the BCUC, in considering the application, must consider the government's goal of having smart meters, other advanced meters and a smart grid in use with respect to customers other than those of BC Hydro.

British Columbia's Energy Objectives

FEI submits that the AMI Project is consistent with the following BC energy objectives:⁶⁷¹

- (b): to take demand-side measures and to conserve energy;
- (d): to use and foster the development in British Columbia of innovative technologies that support energy conservation and efficiency and the use of clean or renewable resources;
- (g): to reduce B.C. greenhouse gas emissions;
- (i): to encourage communities to use energy efficiently; and
- (k): to encourage economic development and the creation and retention of jobs.

FEI submits that the AMI technology to be implemented pursuant to the Project provides a foundation to support and enable natural gas conservation and efficiency primarily through the provision of improved natural gas consumption information for customers. FEI considers that improved consumption data will support natural gas conservation by providing consumers with actionable insight on their consumption and, in turn, further enable implementation of DSM measures to reduce consumption. FEI states that this likewise supports the objective of encouraging communities to use energy efficiently. Further, FEI submits that reducing customer consumption of natural gas through implementation of AMI and related conservation will contribute to lowering GHG emissions in BC, which is consistent with the objective in section 2(g).⁶⁷² Lastly, FEI submits that Project will also support the energy objective to encourage economic development and the creation and retention of jobs through FEI's contractors, and result in the procurement of goods and services from locally-owned and operated vendors and subcontractors.⁶⁷³

Long Term Resource Plan

At the time of filing the Application, FEI's most recent Long Term Gas Resource Plan was its 2017 Long Term Gas Resource Plan, which was filed on December 14, 2017. The BCUC accepted the 2017 Long Term Gas Resource Plan on February 25, 2019.⁶⁷⁴

The 2017 Long Term Gas Resource Plan cites advanced metering solutions as important for gaining better data on customer usage that would allow the utility to better plan its system to meet changing customer needs and end- use trends.⁶⁷⁵

⁶⁷¹ FEI Final Argument, p. 71.

⁶⁷² FEI Final Argument, pp. 71-72.

⁶⁷³ Ibid., p. 72.

⁶⁷⁴ Decision and Order G-39-19 dated February 25, 2019, FEI 2017 Long Term Gas Resource Plan.

⁶⁷⁵ FEI's 2017 LTGRP proceeding, Exhibit B-1, pp. 50, 193, 217.

Since the Application was filed, FEI filed its 2022 Long Term Gas Resource Plan with the BCUC on May 9, 2022, which is at time of this Decision is an ongoing proceeding.

The 2022 Long Term Gas Resource Plan references the AMI Project in several locations, including:

- In Section 3, FEI presents its Clean Growth Pathway, which is FEI’s response to the rapid changes in policy and provides the framework and FEI’s 20-year vision for a low-carbon energy future. FEI’s Clean Growth Pathway is supported by four key pillars:⁶⁷⁶
 - Pillar 1: Transitioning to renewable and low-carbon gases to decarbonize the gas supply;
 - Pillar 2: Investing in DSM programs in support of energy efficiency and conservation measures to reduce energy use among residential, commercial and industrial customers;
 - Pillar 3: Investing in low-carbon transportation infrastructure to reduce emissions in this sector; and
 - Pillar 4: Investing in LNG to lower GHG emissions in marine fueling and global markets.

The AMI Project is discussed as a part of FEI’s Clean Growth Pathway, as FEI submits that it, among other things, represents a significant opportunity for modernizing the gas infrastructure and adding additional components to support system resiliency.⁶⁷⁷ Section 3 of the 2022 Long Term Gas Resource Plan also highlights that FEI’s Clean Growth Pathway supports BC’s hydrogen economy. FEI states that there are a number of pathways FEI can undertake for hydrogen distribution, including supplying the existing gas grid at low concentrations or blends, and delivering supply to end users through purpose-built pipeline systems.⁶⁷⁸

- in Section 5.5, in addressing long term DSM impacts on peak demand, FEI describes the AMI Project as having the potential to provide FEI and customers the ability to more actively manage peak demand.⁶⁷⁹
- In Section 7.2, in discussing regional peak demand forecasts, the 2022 Long Term Gas Resource Plan notes that the effectiveness of DSM programs on peak demand cannot be directly measured until hourly metering is deployed, but that the AMI Project would support FEI’s ability to field-validate the projections of the exploratory end use peak demand forecast method and will enable FEI to improve this method in future LTGRPs.⁶⁸⁰
- In Section 7.5, regarding FEI System Resiliency, the 2022 Long Term Gas Resource Plan states that in the medium term, FEI’s AMI Project will be beneficial in enhancing FEI’s Coastal Transmission System load management capabilities and is one of the key components to FEI’s portfolio approach to resiliency while providing other benefits for customers.⁶⁸¹
- In Section 10 of the 2022 Long Term Gas Resource Plan, the AMI Project is noted in item #6 of FEI’s Action Plan as being one of the “cornerstones” of FEI’s Gas System Resiliency plan.⁶⁸²

⁶⁷⁶ FEI’s 2022 LTGRP proceeding, Exhibit B-1, p. 3-1.

⁶⁷⁷ Ibid.

⁶⁷⁸ FEI’s 2022 LTGRP proceeding, Exhibit B-1, pp. 3-13 – 3-14.

⁶⁷⁹ Ibid., p. 5-41.

⁶⁸⁰ Ibid., p. 7-9.

⁶⁸¹ Ibid., p. 7-43.

⁶⁸² Ibid., p. 10-5.

FEI submits that the AMI Project is consistent with both the approved 2017 Long Term Gas Resource Plan and the 2022 Long Term Gas Resource Plan under BCUC review and is a key element of the 2022 Long Term Gas Resource Plan.⁶⁸³

Clean Energy Act

FEI states that sections 6 and 19 of the CEA do not apply to FEI.⁶⁸⁴

FEI submits that the implementation of AMI meets the government's goal of having advanced meters (as defined in the CEA and in the related regulation) in use for FEI customers.⁶⁸⁵

FEI submits that the AMI Project is supportive of the BC government's "goal" stated in section 17(6) of the CEA of having "other advanced meters" in use with respect to "customers other than those of [BC Hydro]". FEI explains that although the prescribed requirements for "smart meters" include measurement of electricity, the Sonix IQ meters that are part of the AMI Project align with many of the regulation's other requirements. FEI submits, therefore, that its proposed meters for the AMI Project constitute "other advanced meters" within the meaning of section 17(6) of the CEA and that FEI's ratepayers are customers of a public utility "other than those of the authority." As a result, FEI submits that the BCUC is "required to consider the government energy goal of having such advanced meters implemented in BC when deciding FEI's present Application."⁶⁸⁶

British Columbia's CleanBC Plan and FortisBC's Clean Growth Pathway

In December 2018, the provincial government released its CleanBC Plan,⁶⁸⁷ which aims to reduce climate pollution, while strengthening BC's economy. Through its consultation with the provincial government regarding the CleanBC Plan, FortisBC developed its climate plan, the Clean Growth Pathway. As discussed above in the 2022 Long Term Gas Resource Plan subsection, the Clean Growth Pathway is FEI's response to the rapid changes in policy and provides the framework and FEI's 20-year vision for a low-carbon energy future.⁶⁸⁸

FEI submits that the AMI Project is aligned with the CleanBC Plan and FortisBC's Clean Growth Pathway as follows:⁶⁸⁹

- The proposed advanced meters are compatible with certain renewable gases, such as hydrogen and biomethane;
- The proposed advanced meters provide detailed data, which can enhance energy efficiency programs and help customers to better manage their gas consumption; and
- The proposed advanced meters substantially eliminate manual meter reading thereby avoiding GHG emissions associated with meter reading vehicles.

⁶⁸³ FEI Final Argument, p. 74.

⁶⁸⁴ Exhibit B-1, p. 139.

⁶⁸⁵ Ibid., p. 140.

⁶⁸⁶ FEI Final Argument, p. 72.

⁶⁸⁷ The CleanBC Roadmap to 2030 was released in Fall 2021, subsequent to the filing of the Application:
https://www2.gov.bc.ca/assets/gov/environment/climate-change/action/cleanbc/cleanbc_roadmap_2030.pdf

⁶⁸⁸ Exhibit B-1, pp. 140-141; FEI's 2022 LTGRP proceeding, Exhibit B-1, p. 3-1.

⁶⁸⁹ Exhibit B-1, p. 142.

Regarding the compatibility of the proposed advanced meters with hydrogen, FEI states the meters will be compatible with up to 10 percent hydrogen content by volume. Further, FEI has performed independent testing to verify compatibility with up to 20 percent hydrogen content. The meters are compatible with up to 100 percent renewable natural gas (biomethane) content.⁶⁹⁰

Positions of the Interveners

BCSEA submits that the AMI Project supports the same five BC's energy objectives that FEI identifies, i.e. sections 2(b), (d), (g), (i) and (k) of the CEA. BCSEA further submits that FEI's AMI Project is consistent with the BC government's climate policy expressed most recently in the *CleanBC Roadmap to 2030*, which foresees provincial legislation requiring natural gas utilities to substantially reduce their customers' total GHG emissions from combustion of delivered natural gas. The Project will assist FEI and its customers in reducing demand for natural gas. BCSEA also submits that the 2017 Long Term Gas Resource Plan and the 2022 Long Term Gas Resource Plan both support issuance of a CPCN for the AMI Project.⁶⁹¹

The CEC recommends that the BCUC find the AMI Project to be beneficial and in the public interest in meeting BC's energy objectives and the CEA. The CEC further submits that FEI's AMI Project is consistent with its long term gas resource plan.⁶⁹²

RCIA considers that there is a risk of early obsolescence based on the potential for increasing percentages of hydrogen being added to FEI's natural gas blend. RCIA submits that FEI's 2022 Long Term Gas Resource Plan indicates that FEI intends to increase the proportion of low-carbon gas in its gas stream, including renewable natural gas and hydrogen. RCIA submits that this raises a concern because of the ability for ultrasonic meters to accurately measure gas flows with higher concentrations of hydrogen. In reply, FEI submits that that it does not expect that the AMI meters would be the limiting factor in terms of the maximum feasible portion of hydrogen in its system. Also, FEI submits that due to the use of ultrasonic technology and its associated benefits, FEI expects that the AMI meters will be able to be updated to handle higher percentages of hydrogen by volume in the future.⁶⁹³

Panel Determination

The Panel finds that the AMI Project is consistent with the following BC's energy objectives as set out in the CEA:

- 2 (b): to take demand-side measures and to conserve energy (section 2(b));
- 2 (d): to use and foster the development in British Columbia of innovative technologies that support energy conservation and efficiency and the use of clean or renewable resources (section 2 (d));
- 2 (g): to reduce B.C. greenhouse gas emissions (section 2(g) ; and
- 2 (i): to encourage communities to use energy efficiently (section 2(i)).

⁶⁹⁰ Exhibit B-6, BCUC IR 34.1, 34.2.

⁶⁹¹ BCSEA Final Argument, p. 25.

⁶⁹² CEC Final Argument, pp. 37-38.

⁶⁹³ FEI's Reply Argument, pp. 16-17.

The AMI Project enables new DSM and energy conservation measures (Section 4.3.3 above), thus achieving the objectives set out in sections 2(b), 2(d) and 2(i). The AMI Project reduces GHG emissions by reducing the need for meter readers to use vehicles to read meters, achieving the objective set out in section 2(g).

The Panel disagrees with FEI that the AMI Project is consistent with section 2(k) of the CEA, to encourage economic development and the creation and retention of jobs (section 2(k) of the CEA). The AMI Project will eliminate 150 meter reading jobs. The Panel acknowledges that some offsetting jobs will be created as a result of procurement related to the AMI Project, but without evidence of the magnitude of the offset the Panel cannot determine that the Project is consistent with section 2(k) of the CEA.

The Panel has reviewed the remaining BC's energy objectives and finds that they are not relevant to the AMI Project or that the Project is not inconsistent with them.

The Panel further finds that the AMI Project is consistent with provincial government policy, as expressed in the CleanBC Plan, because FEI's proposed AMI meters provide detailed usage data which can enhance energy efficiency programs and help customers to better manage their gas consumption, and substantially eliminate manual meter reading thereby avoiding GHG emissions associated with meter reading vehicles.

The Panel finds that the AMI Project is consistent with FEI's most recently filed long-term resource plan, the 2022 Long Term Gas Resource Plan, in which FEI presents four "pillars" for its "20-year vision for a low-carbon energy future."⁶⁹⁴

The AMI Project supports the use of innovative DSM and energy conservation programs (see Section 3.3.2), which is the second of FEI's four "pillars" to its 2022 Long Term Gas Resource Plan, and has the potential to actively manage FEI's peak demand.

With respect to its first "pillar", FEI proposes to increase the use of renewable and low-carbon gases, including hydrogen. While the AMI meters are currently limited to measuring no more than 10 percent hydrogen by volume, the Panel notes that, in the 2022 Long Term Gas Resource Plan, FEI only proposes to use hydrogen at low concentrations or delivered through purpose-built pipeline systems. The Panel concludes there is no evidence that the AMI meters are inconsistent with FEI's adoption of renewable and low-carbon gases.

The AMI Project does not appear to be relevant to FEI's third pillar (low-carbon transportation infrastructure) or fourth pillar (marine fueling and global markets).

The AMI Project also supports FEI's plans to improve the resiliency of its gas distribution network, set out in section 7.5 of its 2022 Long Term Gas Resource Plan, by reducing the time to restart the network in the event of a shutdown (see Section 3.3.3).

The Panel does not share RCIA's concern about the risk of early obsolescence of the AMI meters. FEI's 2022 Long Term Gas Resource Plan refers to delivering hydrogen through the existing gas grid at "low concentration or blends", and the proposed AMI technology is capable of working with blends of up to 10 percent hydrogen.

⁶⁹⁴ FEI's 2022 LTGRP proceeding, Exhibit B-1, p. 3-1.

Further, the Panel accepts FEI's position that the ultrasonic technology used in AMI meters may be updated to handle higher percentages of hydrogen in future.

9.0 CPCN Determination for the AMI Project

Section 45(1) of the UCA⁶⁹⁵ stipulates that a person must not begin the construction or operation of a public utility plant or system, without first obtaining from the BCUC a certificate that public convenience and necessity require, or will require, the construction or operation of the plant or system.

Sections 46(1) and (3) of the UCA state that:⁶⁹⁶

(1) An applicant for a certificate of public convenience and necessity must file with the commission information, material, evidence and documents that the commission prescribes.

...

(3) ... the commission may, by order, issue or refuse to issue the certificate... and may attach to the exercise of the right or privilege granted by the certificate, terms, including conditions about the duration of the right or privilege under this Act as, in its judgment, the public convenience or necessity may require.

FEI's Position

FEI submits that the BCUC should grant the Application and approve a CPCN for the AMI Project.⁶⁹⁷

Positions of the Interveners

BCSEA submits that FEI's AMI Project is in the public interest and that the BCUC should issue a CPCN for the Project.⁶⁹⁸

The CEC submits that the AMI Project is in the public interest and recommends that the BCUC approve the AMI Project as proposed by FEI.⁶⁹⁹

RCIA makes no express submission on whether the BCUC should issue a CPCN for the AMI Project, but submits that FEI should "continue with manual meter reading and negotiate or tender for those services following the Olameter contract, or, alternatively, develop and optimize an AMR solution."⁷⁰⁰

While RCIA agrees that Automation would provide a more accurate and convenient billing process for customers, it is of the view that "such improvements over the current situation do not justify the delivery rate impact of the AMI project."⁷⁰¹

⁶⁹⁵ *Utilities Commission Act*, RSBC 1996, c. 473.

⁶⁹⁶ UCA, s.46(1), (3).

⁶⁹⁷ FEI Final Argument, p. 74.

⁶⁹⁸ BCSEA Final Argument, p. 26.

⁶⁹⁹ CEC Final Argument, pp. 38-39.

⁷⁰⁰ RCIA Final Argument, p. 6.

⁷⁰¹ *Ibid.*, p. 10.

BCOAPO questions the extent of the issues with FEI's current billing accuracy and customer convenience from meter readers entering properties to complete reads.⁷⁰²

BCOAPO makes no express submission on whether the BCUC should issue a CPCN for the AMI Project, but submits that "If there is to be an automated program...only AMR should be approved."⁷⁰³

CORE submits that the Application as currently proposed is not in the public interest and should be dismissed.⁷⁰⁴

FEI submits in reply that the need for the AMI Project is well established, and that RCIA and BCOAPO "fail to recognize and acknowledge the extensive evidence FEI provided that demonstrates the full benefits of the AMI Project" that justify the Project's "minimal cost and rate impacts."⁷⁰⁵ FEI notes that the analysis of public convenience and necessity involves a weighing and balancing of all relevant factors and not consideration of whether any one benefit justified a project given its cost.⁷⁰⁶

Panel Determination

For the reasons set out in this Decision, the Panel finds that public convenience and necessity require the construction and operation of FEI's AMI Project.

Accordingly, **the Panel grants a CPCN to FEI for the AMI Project pursuant to sections 45 and 46 of the UCA.**

The Panel directs FEI to provide ongoing reporting to the BCUC for the duration of the Project, as detailed in Appendix B of this Decision.

10.0 Other Matters

The following matters arose during the proceeding or will arise as a consequence of the issuance of the CPCN for the AMI Project.

10.1 Accounting Treatment of Capital Costs

FEI states that consistent with its typical treatment of CPCN costs, the capital costs of the Project will be held outside of rate base in capital work in process, attracting an allowance for funds used during construction, until they are placed into service. FEI notes that the assets will be placed into service as construction is completed on the various assets included in the Project, and the assets will enter rate base on January 1 of the year following their in-service date. Therefore, the AMI meters exchanged during the Deployment phase of the Project will enter rate base January 1 in the year following the date of the meter installation. Further, FEI states that depreciation of the assets will begin the year that they enter rate base.⁷⁰⁷

⁷⁰² BCOAPO Final Argument, pp. 8-9.

⁷⁰³ Ibid., p. 14.

⁷⁰⁴ CORE Final Argument, p. 46.

⁷⁰⁵ FEI Reply Argument, p. 2.

⁷⁰⁶ Ibid., p. 5.

⁷⁰⁷ Exhibit B-1, p. 113.

10.1.1 Depreciation and Net Salvage

FEI requests approval to create four new asset accounts with associated depreciation and net salvage rates as follows:⁷⁰⁸

- 478-10 / AMI Meter Hardware – depreciation rate set to 5 percent, no net salvage;
- 474-00 / AMI Meter Installation – depreciation rate set to 5 percent, 1.58 percent net salvage;
- 402-06 / AMI Software – depreciation rate set to 10 percent, no net salvage; and
- 488-30 / AMI Communication and Equipment – depreciation rate set to 6.67 percent, no net salvage.

FEI proposes the AMI meters and installation costs be added to plant into their own asset class with the depreciation rate set to the manufacturer's useful life estimate for the meters, equalling 5 percent (20 years). FEI expects the costs of removal for AMI meters to be similar to the existing meters and therefore, proposes to set the net salvage rate for AMI meters equal to that of existing meters.⁷⁰⁹ FEI notes the proposed new rates for AMI software and AMI Communication and Equipment have been assumed to be equivalent to the rates FBC uses for similar assets. FEI has used these rates for the purposes of the financial analysis and requests approval of these rates in the Application, but notes that a new depreciation study is expected to be filed before the majority of the assets are in service, and these rates will be reviewed and confirmed at that time.⁷¹⁰

FEI states that the AMI meter life is linked to the device's battery service life, which was determined by Sensus to be 20 years.⁷¹¹ Unlike electric AMI meters, FEI states that gas AMI meters rely on a battery as the sole power source which ultimately limits the meters' useful life.⁷¹² Further, the gas AMI meters are covered by a manufacturer's warranty for the replacement cost of a meter for the period of up to 20 years.⁷¹³

Positions of the Interveners

BCSEA submits it does not oppose FEI's request to create four new asset accounts.⁷¹⁴

Panel Determination

The Panel approves FEI's request to create four new asset accounts with associated depreciation and net salvage rates as follows:

- **478-10 / AMI Meter Hardware – depreciation rate set to 5 percent, no net salvage;**
- **474-00 / AMI Meter Installation – depreciation rate set to 5 percent, 1.58 percent net salvage;**
- **402-06 / AMI Software – depreciation rate set to 10 percent, no net salvage; and**

⁷⁰⁸ Ibid., pp. 9, 112.

⁷⁰⁹ Ibid., p. 112.

⁷¹⁰ Exhibit B-1, pp. 112–113.

⁷¹¹ Exhibit B-6, BCUC IR 26.1.

⁷¹² Ibid., BCUC IR 26.3.

⁷¹³ Ibid., BCUC IR 26.2.1.

⁷¹⁴ BCSEA Final Argument, p. 26.

- **488-30 / AMI Communication and Equipment – depreciation rate set to 6.67 percent, no net salvage.**

The estimated asset life of 20 years for the meter hardware and installation is reasonable because it is based on the manufacturer’s estimate and is uncontested in the proceeding. The Panel also accepts the depreciation rates for software and “communication and equipment” being the same as previously approved by the BCUC for FBC’s advanced meter infrastructure.

The Panel notes that FBC has an asset account named “AMI communications structures and equipment,”⁷¹⁵ which appears to be similar to FEI’s proposed asset account named “AMI Communication and equipment.” The Panel recommends that FEI rename this asset account to be more similar to that of FBC if its asset characteristics are similar. FEI is directed in a compliance filing to clarify whether account 488-30 refers to communications structures and equipment.

10.2 Deferral Accounts

FEI requests approval to create four new deferral accounts as follows:⁷¹⁶

- **AMI Application and Feasibility Cost** deferral account attracting a WACC return until it is placed into rate base, to capture development and application costs for the Project. Once transferred to rate base FEI proposes an amortization period of three years.
- **AMI Foreign Exchange (FX) Mark to Market Valuation** deferral account to isolate the impact of any foreign exchange hedging used to reduce foreign exchange risk of the Project.
- **Existing Meter Cost Recovery** deferral account to capture the remaining rate base value of meters to be exchanged as part of the Project with a rolling amortization period of 5 years.
- **Previously Retired Meter Cost Recovery** deferral account to capture the remaining rate base value of previously retired meters with an amortization period of 10 years.

These deferral account requests are discussed individually below.

10.2.1 AMI Application and Feasibility Cost

FEI states that the purpose of the AMI Application and Feasibility Cost deferral account is to capture costs associated with developing the AMI Project and the regulatory proceeding to review the Application. FEI proposes that the account will be non-rate base and earn an after tax WACC carrying cost until it enters rate base. FEI expects to incur costs of approximately \$10.3 million, inclusive of the preliminary project planning, application development and regulatory proceeding costs, as well as costs associated with additional public communications and consultations. Upon approval of the AMI Project, FEI will transfer the balance to rate base on January 1 following the BCUC Decision and proposes to amortize the costs accrued to this account over three years.⁷¹⁷

⁷¹⁵ FEI and FBC Application for Approval of a Multi-Year Rate Plan for 2020 through 2024, Exhibit B-1, Table D2-10, p. D-25.

⁷¹⁶ Exhibit B-1, p. 9.

⁷¹⁷ Exhibit B-30, Appendix B, p. 113.

10.2.2 AMI Foreign Exchange (FX) Mark to Market Valuation

FEI proposes to create the “AMI FX Mark to Market” deferral account to capture the mark-to-market valuation of any foreign currency risk mitigation contracts (FX Contracts) entered into related to the Project.⁷¹⁸ FEI views this deferral account as an important tool to mitigate external volatility associated with the use of FX Contracts. FEI states that the deferral account will not attract a financing return, as the mark-to-market adjustments are non-cash. Further, FEI notes that this treatment is similar to what the BCUC approved for the Mt. Hayes LNG Facility CPCN and the Customer Care Enhancement CPCN.⁷¹⁹

A significant portion of the costs of the Project includes US Dollar (USD) payments giving rise to exchange rate risk. FEI may mitigate a portion of the risk by locking in foreign exchange rate exposure using FX Contracts to mitigate the risk of fluctuations in the value of USD/CAD currency exchange rate. The extent of currency risk mitigation will be based on FEI’s risk assessment of the overall exposure as well as the cost and effectiveness of the FX Contracts.⁷²⁰

FEI notes that the deferral account treatment of the mark-to-market adjustments related to the foreign exchange rate hedging for the Project will have no impact on customer rates and will not result in any incremental costs or revenue requirement impacts.⁷²¹ FEI states that the FX Contracts will provide increased cost certainty as they lock in the foreign exchange rates for USD denominated cost components obtained by FEI for this Project. At the end of the Project, the amount of the deferral account will be zero, since the deferral account only captures any unrealized gains and losses related to the requirement to mark-to-market the FX Contracts.⁷²²

FEI submits that it will report on the use of this deferral account as part of the Project progress reports filed with the BCUC.⁷²³

10.2.3 Existing Meter Cost Recovery

As part of the AMI Project, existing meters will be replaced with new AMI meters. Therefore, the financial analysis includes the recovery of the remaining rate base value associated with the existing in-service meters.⁷²⁴

FEI considered two options, a 5-year period and a 10-year period, for the recovery of the remaining rate base value of existing meters to be removed from service as part of the proposed AMI Project. In both cases, the existing meters would be removed from service as they are replaced over the 2024-2026 period, with the remaining net book value for the retired meters transferred to a new rate base “Existing Meter Cost Recovery deferral account”. FEI states that the 5-year amortization period is consistent with the BCUC’s decision for the recovery of the remaining costs of FBC’s existing electric meters as determined by the 2013 FBC AMI Decision.

⁷¹⁸ Exhibit B-1, p. 113.

⁷¹⁹ Ibid., pp. 113–114.

⁷²⁰ Ibid., p. 114.

⁷²¹ Exhibit B-1, p. 114; Exhibit B-6, BCUC IR 28.5.

⁷²² Ibid.

⁷²³ Ibid., p. 115.

⁷²⁴ Ibid.

The 10-year amortization period is based on the estimated remaining life of the existing meters as determined in the 2017 Depreciation Study approved as part of FEI’s 2020-2024 MRP Application.⁷²⁵

FEI proposes an amortization period of five years and notes that the estimated remaining rate base value of FEI’s gas meters to be transferred to the deferral account is approximately \$87 million.⁷²⁶

In response to IRs before the Evidentiary Update, FEI provided the following advantages and disadvantages of amortizing the Existing Meter Cost Recovery deferral account over ten years as compared to five years:⁷²⁷

Advantage and Disadvantages of Amortizing the Existing Cost Recovery Deferral Account⁷²⁸

Amortization Period	Advantages	Disadvantages
10 years	<ul style="list-style-type: none">□ Lower annual amortization expense in the delivery rates.□ Smooths out the initial incremental delivery rate increase due to the AMI Project. For instance, with a 5-year amortization period, the incremental delivery rate increase due to the AMI Project will peak at 4.8% as compared to a peak of 3.7% if a 10-year amortization period is used.	<ul style="list-style-type: none">□ Increasing the amortization period from 5 years to 10 years would result in a small increase of 0.002% to the incremental levelized delivery rate impact over the 26-year analysis period due to the increased rate base return on the deferral account, which offsets the lower annual amortization expense associated with a longer amortization period.

Further to the precedent established in the FBC AMI Application proceeding where the BCUC decided that a 5-year amortization for the remaining value of the meters retired due to AMI was appropriate, FEI states that a 5-year amortization period is also generally more consistent with the duration of the AMI Project and the proposed amortization period of three years for the AMI Application and Feasibility Cost deferral account.⁷²⁹

10.2.4 Previously Retired Meter Cost Recovery

FEI states that 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. With the existing meters being retired due to the AMI Project and to continue recovery of the aforementioned remaining rate base value as approved, FEI proposes to transfer this balance to a new rate base “Previously Retired Meter Cost Recovery” deferral account, with an amortization period of 10 years, which is in line with the estimated average remaining life of the existing meters. FEI states that this would effectively recover the remaining rate base value over the same time period that would have occurred if there were no AMI Project.⁷³⁰

⁷²⁵ Exhibit B-30, Appendix B, p. 115.
⁷²⁶ Ibid., p. 115.
⁷²⁷ Exhibit B-6, BCUC IR 29.4.
⁷²⁸ Exhibit B-6, BCUC IR 29.4, Table by the BCUC.
⁷²⁹ Ibid., BCUC IR 29.4.1.
⁷³⁰ Exhibit B-1, pp. 115–116.

For the previously retired meter costs, FEI states that an amortization period of 10 years is appropriate as it would effectively recover the remaining rate base value over the same time period that would have occurred if there was no AMI Project.⁷³¹ FEI explains that this is because the AMI Project does not impact the retirement of previously retired meters, and therefore should not impact the recovery period.⁷³² FEI states that all else equal, the proposed 10-year amortization period for the deferral account is intended to keep the incremental rate impact similar to the rate impact from recovery through depreciation expense of the remaining book value of the previously retired meters.⁷³³ In the event that the AMI Project does not proceed, FEI states that the undepreciated value of meters previously retired would continue to reside in accumulated depreciation as part of rate base and be recovered from ratepayers in about 10 years, representing the estimated life of the remaining meters.⁷³⁴ FEI notes that if a different amortization period (i.e., higher or lower) is used than the estimated average remaining life of the existing meters, this would result in an increase/decrease in the customer rate impact due to the difference in the recovery period used.⁷³⁵

FEI also considered a 5-year amortization period for the Previously Retired Meter Cost Recovery deferral account but rejected this alternative amortization period because it effectively escalates the recovery of historical losses and increases the rate impact that would have occurred unrelated to the AMI Project.⁷³⁶

In terms of incremental levelized rate impact over a 26-year period, FEI notes that the difference between a 5-year amortization period and a 10-year amortization period is small with a difference of 0.002 percent. However, FEI states that the cumulative rate impact in 2027 (the year after full AMI deployment and full non-AMI meter write offs) would peak at 5.83 percent with a 5-year amortization as compared to a 10-year amortization peak of 4.79 percent, before the Evidentiary Update.⁷³⁷

Positions of the Interveners

BCSEA submits it does not oppose FEI's request to create four new deferral accounts.⁷³⁸

The CEC submits that the deferral accounts requested by FEI are appropriate for the AMI Project and should be approved by the BCUC.⁷³⁹

Panel Determination

The Panel approves FEI's request to create the AMI Application and Feasibility Cost deferral account, attracting a WACC return until it is placed into rate base, to capture development and application costs for the AMI Project. The Panel approves FEI's requested amortization period of three years once the balance in the account is transferred to rate base. The Panel finds that the development and application costs for the AMI Project should be recovered from ratepayers because the costs are related to the AMI Project. The Panel found earlier in the Decision that the AMI Project is in the public convenience and necessity and has accordingly

⁷³¹ Exhibit B-6, BCUC IR 29.4.1.

⁷³² *Ibid.*, BCUC IR 30.1.

⁷³³ *Ibid.*, BCUC IR 30.1.

⁷³⁴ *Ibid.*, BCUC IR 30.1.

⁷³⁵ Exhibit B-6, BCUC IR 30.1.

⁷³⁶ *Ibid.*, BCUC IR 30.2.

⁷³⁷ *Ibid.*

⁷³⁸ BCSEA Final Argument, p. 26.

⁷³⁹ CEC Final Argument, p. 38.

granted FEI a CPCN for the Project. Since the development and application costs were incurred as a result of the AMI Project, we find that these costs should be recoverable from ratepayers.

The Panel approves FEI's request to create the AMI FX Mark to Market deferral account to capture the mark-to-market valuation of any foreign currency risk mitigation contracts related to the AMI Project, attracting no financing return. The Panel finds that the AMI FX Mark to Market deferral account is an appropriate regulatory approach for FEI to manage any foreign currency risk mitigation contracts related to the AMI Project, and notes that the deferral account will not result in any incremental costs or revenue requirement impacts.

The Panel approves FEI's request to create the rate base Existing Meter Cost Recovery deferral account to capture the remaining rate base value of meters to be exchanged as part of the AMI Project with a rolling amortization period of five years.

The meters exchanged as part of the AMI Project are no longer used and useful, and will not be used by future ratepayers. For this reason, the Panel determines that the amortization period should be as short as reasonably possible without unduly burdening the current ratepayers. The Panel is satisfied that 5 years is a sufficiently short period not to burden future ratepayers with costs for which they receive no benefit. The Panel also notes that this is the amortization period approved by the BCUC in the 2013 FBC AMI Decision for analogous costs incurred by FBC.

The Panel approves FEI's request to create the rate base Previously Retired Meter Cost Recovery deferral account to capture the remaining rate base value of previously retired meters.

The meters retired prior to the AMI Project, like the meters exchanged as part of the AMI Project, are no longer used and useful, and will not be used by future ratepayers. For this reason, the Panel determines that the amortization period should be as short as reasonably possible without unduly burdening the current ratepayers. The Panel is satisfied that five years is a sufficiently short period not to burden future ratepayers with costs for which they receive no benefit. The Panel approves FEI to amortize the balance in the Previously Retired Meter Cost Recovery deferral account over five years.

10.3 CORE's Conditions

CORE submits that if the BCUC approves the CPCN requested for the AMI Project, then the BCUC should require FEI to adhere to the following conditions "to mitigate the human health impacts arising from the applied-for Sensus [Sonix IQ] smart meters:"⁷⁴⁰

1. FEI's AMI meters will be reconfigured so that they are wired instead of being wireless.
2. If the AMI meters cannot be reconfigured to be wired, FEI will purchase and install meters that can be wired instead of being wireless.
3. If a wired solution is not feasible, then FEI will conduct a comprehensive study to measure the effectiveness of seismic shut-off devices and whether the AMI meters should be equipped with a seismically actuated shut-off device. In particular, such study will determine: a. FEI's ability to communicate with meters that will be installed as part of the AMI Project after an earthquake; b. the

⁷⁴⁰ CORE Final Argument, pp. 46-47; Appendix A.

error rate for turning services off following a large earthquake; c. the performance of an AMI Meter during an earthquake; and d. and whether or not an AMI Meter will be damaged in an earthquake.

4. The Sensus FlexNet Base Stations must be placed at least 500 m away from an affected resident's home to reduce human exposure to RFR to As Low As Reasonably Achievable (the ALARA principle).
5. If a setback of 500 m is not a viable option, then the Sensus FlexNet Base Stations must be placed at a location that reduces human exposure to RFR to As Low As Reasonably Achievable.
6. If an AMI meter is installed on the outside of a resident's home, FEI shall deploy a covering over the meter in order to minimize the amount of RF that is transmitted from the said meter.
7. If an AMI meter cannot be installed on the outside of a resident's home but instead it must be installed on the inside of the home, FEI shall deploy a covering over the meter in order to minimize the amount of RF that is transmitted from the said meter.
8. If an AMI meter cannot be installed on the outside of a resident's home but instead it must be installed on the inside of the home, FEI shall ensure that the said meter is not installed near any bedroom in the home and instead it shall be installed in an area of the home that reduces human exposure to RFR to As Low As Reasonably Achievable (the ALARA principle).
9. A reading from the AMI meters should be taken from resident's homes once every month.
10. FEI shall be required to prepare an Emergency Response Plan by a date specified by this Commission prior to undertaking any required construction in connection with the installation of the AMI meters and such ERP shall be approved by the BCUC.
11. FEI ratepayers who choose to opt-out of AMI Meter installation will not bear the cost of such choice and any associated costs will be covered by FEI.

In reply, FEI submits that there is no basis for any of CORE's conditions and the BCUC should not impose them in respect of an approved CPCN.⁷⁴¹

As an example, FEI submits that CORE's first condition, that the meters installed should be reconfigured to be wired rather than wireless, is a fundamental change to the nature of the Application and would be tantamount to a dismissal of the Application.⁷⁴² FEI submits it explained in rebuttal evidence that a feasible wired AMI gas meter does not exist and the costs of implementing a wired fibre network would be prohibitive.⁷⁴³

Panel Discussion

The Panel rejects CORE's request to add conditions to the CPCN for the AMI Project.

The Panel has already found in Section 5 above that the weight of scientific evidence continues to demonstrate that the AMI Project poses no health dangers to FEI's customers, and as a result finds that CORE's requested conditions are not required.

⁷⁴¹ FEI Reply Argument, p. 44.

⁷⁴² Ibid.

⁷⁴³ FEI Reply Argument, p. 38.

10.4 Future of the Gas System

BCOAPO believes that the future of natural gas – even its renewable counterparts – is uncertain. BCOAPO notes that in current circumstances when the future of natural gas is uncertain, the BCUC should exercise caution when approving FEI’s capital projects.⁷⁴⁴

Panel Discussion

The Panel acknowledges the need for caution expressed by BCOAPO, but takes no position on the future of the natural gas system in BC. There is no evidence in this proceeding to suggest that the AMI Project will cease to be used and useful within the projected 20-year life of its assets.

DATED at the City of Vancouver, in the Province of British Columbia, this 15th day of May 2023.

Original signed by:

C. M. Brewer
Commissioner

Original signed by:

E. B. Lockhart
Commissioner

Concurring Decision of Commissioner Mason

I have read the draft Decision of the majority of the Panel, and I concur with all the reasoning and determinations contained therein, with the exception of the reasoning the Panel provides in Sub-section 5.4 of the Decision. With respect, I am unable to agree with the reasoning the Panel provides in Sub-section 5.4 of the Decision and I provide my reasoning in Appendix A attached to the Decision.

Original signed by:

R. I. Mason
Panel Chair / Commissioner

⁷⁴⁴ BCOAPO Final Argument, p. 13.



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**ORDER NUMBER
C-2-23**

IN THE MATTER OF
the *Utilities Commission Act*, RSBC 1996, Chapter 473

and

FortisBC Energy Inc.
Application for a Certificate of Public Convenience and Necessity
for the Advanced Metering Infrastructure Project

BEFORE:

R. I. Mason, Panel Chair
C. M. Brewer, Commissioner
E. B. Lockhart, Commissioner

on May 15, 2023

CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY

WHEREAS:

- A. On May 5, 2021, FortisBC Energy Inc. (FEI) filed an application with the British Columbia Utilities Commission (BCUC) for a Certificate of Public Convenience and Necessity (CPCN) pursuant to sections 45 and 46 of the *Utilities Commission Act* (UCA) for FEI's Advanced Metering Infrastructure (AMI) Project (Application);
- B. The AMI Project includes the following:
 - 1. Installation of approximately 1,100,000 residential, commercial, and industrial advanced meters and meter retrofits of communication modules capable of remote gas consumption measurement;
 - 2. Installation of approximately 1,100 communication modules on the gas network to increase operational awareness of the gas system state; and
 - 3. Installation of the AMI network and infrastructure to communicate with customer meters and other communication modules on the FEI gas network;
- C. FEI also requests approval, pursuant to sections 59 to 61 of the UCA, to create four new asset accounts with associated depreciation and net salvage rates for the proposed meters to be installed as part of the AMI Project, as follows:
 - 1. 478-10 / AMI Meter Hardware, with a depreciation rate set to 5 percent, with no net salvage;
 - 2. 474-00 / AMI Meter Installation, with a depreciation rate set to 5 percent, with 1.58 percent net salvage;
 - 3. 402-06 / AMI Software, with a depreciation rate set to 10 percent; and
 - 4. 488-30 / AMI Communications and Equipment, with a depreciation rate set to 6.67 percent, with no net salvage;

- D. FEI also seeks approval, pursuant to sections 59 to 61 of the UCA, to create four new deferral accounts as follows:
1. A non rate base AMI Application and Feasibility cost deferral account attracting a weighted average cost of capital return until it is placed into rate base, to capture development and application costs for the AMI Project, to be amortized over 3 years;
 2. A non rate base AMI Foreign Exchange (FX) Mark to Market Valuation deferral account to isolate the impact of any foreign exchange hedging used to reduce foreign exchange risk of the AMI Project;
 3. A rate base Existing Meter Cost Recovery deferral account to capture the remaining costs of the meters to be exchanged as part of the AMI Project with a rolling 5 year amortization period; and
 4. A rate base Previously Retired Meter Cost Recovery deferral account to capture the remaining rate base value of previously retired meters with an amortization period of 10 years;
- E. On July 6, 2021, by Order G-204-21, the BCUC established a public hearing and regulatory timetable for the review of the Application;
- F. By Orders G-269-21, G-302-21, G-323-21, G-365-21, G-389-21, G-81-22, G-92-22, G-95-22, G-180-22, G-206-22 and G-259-22A, the BCUC amended the regulatory timetable to include, among other things, two rounds of information requests (IRs), a procedural conference, intervener evidence and IRs on same, FEI rebuttal evidence and IRs on same, an evidentiary update, submissions on the need for an oral hearing, and final and reply argument; and
- G. The BCUC has reviewed the Application, the evidence and submissions in this proceeding and determines that certain approvals are warranted.

NOW THEREFORE pursuant to sections 45 to 46 and 59 to 61 of the *Utilities Commission Act* and for the reasons set out in the Decision issued concurrently with this order, the BCUC orders as follows:

1. FEI is granted a CPCN for the AMI Project.
2. FEI is approved to create four new asset accounts:
 - (i) 478-10 / AMI Meter Hardware – depreciation rate set to 5 percent, no net salvage;
 - (ii) 474-00 / AMI Meter Installation – depreciation rate set to 5 percent, 1.58 percent net salvage;
 - (iii) 402-06 / AMI Software – depreciation rate set to 10 percent, no net salvage; and
 - (iv) 488-30 / AMI Communication and Equipment – depreciation rate set to 6.67 percent, no net salvage.
3. FEI is approved to create four new deferral accounts:
 - (i) A non rate base AMI Application and Feasibility cost deferral account attracting a weighted average cost of capital return until it is placed into rate base, to capture development and application costs for the AMI Project, to be amortized over three years;
 - (ii) A non rate base AMI Foreign Exchange (FX) Mark to Market Valuation deferral account to isolate the impact of any foreign exchange hedging used to reduce foreign exchange risk of the AMI Project, attracting no financing return;

- (iii) A rate base Existing Meter Cost Recovery deferral account to capture the remaining costs of the meters to be exchanged as part of the AMI Project with a rolling 5-year amortization period; and
- (iv) A rate base Previously Retired Meter Cost Recovery deferral account to capture the remaining rate base value of previously retired meters with an amortization period of five years.

4. FEI is directed to file reports as outlined in Appendix B to the Decision.

DATED at the City of Vancouver, in the Province of British Columbia, this 15th day of May 2023.

BY ORDER

Original signed by:

R. I. Mason
Commissioner

FortisBC Energy Inc.
Application for a Certificate of Public Convenience and Necessity
for Approval of the Advanced Metering Infrastructure Project

CONCURRING DECISION OF COMMISSIONER MASON

I have read the draft Decision of the majority of the Panel, and I concur with all the reasoning and determinations contained therein, with the exception of the following. With respect, I am unable to agree with the reasoning the Panel provides in Sub-section 5.4 of the Decision.

For greater certainty, I concur with all the other Sub-sections in Section 5 of this Decision, in particular I rely on Sub-sections 5.1 (expert witnesses in this proceeding), 5.2 (the BCUC's jurisdiction in this area) and 5.3 (the applicability of Safety Code 6 to FEI's AMI Project).

Overall, I find that Health Canada Safety Code 6, the health safety standard that applies to FEI's AMI Project and with which the Project is compliant, provides sufficient protection to FEI's customers, for the following reasons:

- The evidence demonstrates that the radiofrequency exposure limits set out in Safety Code 6 are sufficient to protect FEI's customers, and
- I am not convinced by CORE's submission that Health Canada Safety Code 6 is not a valid or reliable measure of safe radiofrequency exposure limits.

I expand below on each of these reasons in turn.

Sufficiency of Safety Code 6

I find that the weight of scientific evidence gathered since 2013 continues to demonstrate that the radiofrequency exposure limits set out in Safety Code 6 are sufficient to protect FEI's customers.

The most recent comprehensive review of relevant scientific research identified by Exponent, conducted by a credible scientific body, SCENIHR in 2015, concludes that the epidemiological studies on mobile phone radiofrequency electromagnetic field exposure do not show an increased risk of brain tumours, other cancers of the head or neck region, or other malignant diseases including childhood cancer. I find this to be compelling evidence of the safety of the AMI Project because the radiofrequency exposure from FEI's proposed AMI meters is some 1.8 million times lower than the radiofrequency exposure to the head from mobile phones.

I also note that the SCENIHR 2015 review of scientific literature was performed using a weight-of-evidence approach, which includes all relevant studies regardless of their conclusions, and weighs them according to the quality and reliability of the study design. I find that this weight-of-evidence approach reduces the likelihood of bias and increases my confidence in the results of the survey.

I also place considerable weight on Exponent's opinion that none of the research published since SCENIHR 2015 provides "a reliable scientific basis to conclude that the operation of FortisBC's proposed FlexNet system will

cause or contribute to adverse health effects or physical symptoms in the general population.” Exponent has based its opinion on a survey on the “recent epidemiologic and *in vivo* studies of higher quality, regardless of direction of the results” and has transparently identified the studies that it did identify but did not include, and the reasons for their exclusion.

I also note that at least nine other prominent regulatory, scientific and health organizations (AGNIR, BCCDC, IARC, RSC, WHO, HCN, ICNIRP, SRSA, US FDA) have also reviewed the available research between 2012 and 2020 and all independently reached the same conclusion: that there is no compelling evidence that radiofrequency emissions below scientifically-based exposure limits cause harmful effects to humans.

I am not persuaded by the evidence introduced by CORE that there are health risks associated with FEI’s AMI technology. CORE has not provided any comprehensive, scientifically-based surveys of relevant epidemiological research to refute the conclusions reached repeatedly by credible international organizations such as SCENHIR and the WHO, and national organizations such as the Health Council of the Netherlands and the Swedish Radiation Safety Authority.

I am not persuaded that Exponent missed relevant content in its review of scientific research since 2013, as alleged by Mr. Karow and Ms. Friesen. I accept Exponent’s evidence that it was appropriate to include only “primary, peer-reviewed epidemiologic and experimental research published after the most recent comprehensive review, SCENIHR (2015)”, and to exclude studies that do not meet these criteria. For example, I agree that it was appropriate for Exponent to exclude review studies that did not report on new and original data, that were not peer reviewed and published in a reputable journal, or were not relevant to humans (e.g. those concerning ticks and onions).

I am also not persuaded that the evidence provided by CORE’s experts, Drs. Héroux, Havas and Miller, is sufficient to invalidate the conclusions reached by SCENIHR and others. I give considerably more weight to the evidence from Exponent, which states:

- The public opinion surveys cited by Dr. Héroux “cannot be used to inform the relationship between [radiofrequency] exposure and self-reported symptoms; this can only be assessed through a properly designed epidemiologic or experimental study in which both exposure and outcome are identified a priori and measured”.⁷⁴⁵
- When citing other studies on the effects of radiofrequency emissions of cell phones on sleep, Dr. Héroux appears to have conflated changes in brain electrical activity with behavioral sleep disturbance, which “are not the same.”⁷⁴⁶
- The studies cited by Dr. Havas are “inconsequential”, have limitations such as lack of clarity as to how they were performed, or have been reviewed by SCENIHR and determined “not add useful information”.⁷⁴⁷

⁷⁴⁵ Exhibit B-26, Exponent response, A 16, p. 20.

⁷⁴⁶ Ibid.

⁷⁴⁷ Ibid., A29, p. 36.

- Dr. Havas’s response to the question was incomplete and therefore misleading. Exponent explains that the WHO actually stated that idiopathic environmental intolerance symptoms “cannot be attributed to EMF” (p. 4), and also stated: “There are also some indications that these symptoms may be due to pre-existing psychiatric conditions as well as stress reactions as a result of worrying about believed [electromagnetic field] health effects, rather than the [electromagnetic field] exposure itself.”⁷⁴⁸
- Dr. Miller “offers no substantial evidence” to justify his opinion that radiofrequency emissions have adverse effects on humans other than tissue heating. Dr. Miller’s opinion is contradicted by the agencies cited in the Exponent RF Health Report (e.g. SCENIHR)⁷⁴⁹
- Dr. Miller’s own evidence (Miller et al., 2019) is “quite short, superficial, and selective, and is focused primarily on exposures ([radiofrequency] level and frequency) unrelated to the FEI Project.”⁷⁵⁰

CORE’s concerns with Safety Code 6

I am not persuaded by CORE’s submission that Health Canada Safety Code 6 is not a valid or reliable measure of safe radiofrequency exposure limits.

CORE bases its arguments on the following:⁷⁵¹

- Dr. Héroux’s opinion that Safety Code 6 is based on “a simplistic thermal experiment that is irrelevant to real health impacts” and that “short-term heat cannot represent long-term health;”
- Dr. Héroux’s opinion that the military and engineering-dominated organizations have promoted unsafe standards on which Safety Code 6 is based “for the purpose of favoring deployment of as many wireless devices as possible;”
- Dr. Héroux’s observation that the US Court of Appeals has ruled that the FCC “ignored scientific evidence and the evolution of science pertaining to the allowable RF exposures from wireless technologies;” and
- A new article published on October 18, 2022 that casts doubt on the exposure limits determined by the FCC and ICNIRP.

I am not convinced by Dr. Héroux’s opinion that Safety Code 6 is unreliable because it sets maximum radiofrequency exposure levels based on avoiding short-term tissue heating. I have already given Dr. Héroux’s opinion evidence low weight because of the advocacy nature of his evidence. I give more weight to Exponent’s opinion that the first known adverse health effect to occur as a result of radiofrequency exposure is a rise in body temperature, or tissue heating, and that more serious adverse health effects only occur with higher levels of exposure. Avoidance of tissue heating is therefore an appropriate goal for a radiofrequency exposure safety standard such as Safety Code 6.

⁷⁴⁸ Ibid., A30, p. 37.

⁷⁴⁹ Ibid., A30, p. 22.

⁷⁵⁰ Ibid., A30, p. 24.

⁷⁵¹ CORE Final Argument paras. 103, 107-109.

Further, if radiofrequency exposure at levels insufficient to cause tissue heating caused adverse health effects, it should be apparent from the wealth of scientific research that has been conducted. I give considerable weight to Exponent’s opinion that exposure below the currently-established guidelines “has not consistently or convincingly been established as causing any type of cancer, other chronic diseases, or non-specific symptoms that adversely affect well-being in humans.”⁷⁵²

I am also not persuaded by the evidence of Dr. Heroux and Dr. Havas regarding the effect of time-averaging radiofrequency signals and agree with FEI that neither has provided supporting evidence or peer-reviewed research. The analogies of the health impacts drawn by Dr. Heroux (comparing the signals to the effect of a bullet) and Dr. Havas (comparing the signals to boiling water and strobe lights) lack credible scientific evidence or explanation.

I find that Dr. Héroux’s opinion that military and engineering-dominated organizations have promoted the unsafe standards upon which Safety Code 6 is based “for the purpose of favoring deployment of as many wireless devices as possible” is unsupported by evidence and lacks any credibility.

Dr. Héroux, cites the US Court of Appeals decision *Environmental Health Trust et. al. vs. Federal Communications Commission (FCC) and the USA*⁷⁵³ to submit that there is a “live controversy” as to the reliability of the Safety Code 6 standard.⁷⁵⁴ I disagree. The decision of the US Court of Appeals concerned the sufficiency of the FCC’s reasoning in its determination that its guidelines were adequate to protect against the harmful effects of radiofrequency emissions unrelated to cancer. The decision of the US Court of Appeals to remand the matter back to the FCC to supplement its reasoning cannot be used to infer insufficiency of the radiofrequency emission standard itself. In fact, the US Court of Appeals expressly took no position on the matter of the health and environmental effects of radiofrequency radiation, as the following extract from the majority decision demonstrates:

To be clear, we take no position in the scientific debate regarding the health and environmental effects of RF radiation – we merely conclude that the Commission’s cursory analysis of material record evidence was insufficient as a matter of law. As the dissenting opinion indicates, there may be good reasons why the various studies in the record, only some of which we have cited here, do not warrant changes to the Commission’s guidelines.

I disregard the article, published on October 18, 2022, referred to by CORE in its argument⁷⁵⁵ because it was not introduced in evidence during the proceeding and neither FEI nor interveners have had the opportunity to test or rebut the evidence.

⁷⁵² Exhibit B-1, Appendix F-2, p. 23.

⁷⁵³ Exhibit C7-12-1, Appendix B, p. 10.

⁷⁵⁴ CORE Final Argument, p. 38.

⁷⁵⁵ Ibid., pp. 38-39.

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Advanced Metering Infrastructure Project

PROJECT REPORTING

The scope of Project reporting for the duration of the Project will comprise the following:

1 Semi-annual Progress Reports

Each report is required to detail:

- Actual costs incurred to date compared to the Project cost breakdown estimate provided in Table 6-1, Table 6-2 and Table 6-5 of the Evidentiary Update, highlighting variances with an explanation of significant variances;
- Updated forecast of costs, highlighting the reasons for significant changes in Project costs / savings anticipated to be incurred; and
- The status of identified risks noted in section 5.7 of the Application, highlighting the status of identified risks, changes in and additions to risks, the options available to address the risks, the actions that FEI is taking to deal with the risks and the likely impact on the Project's schedule and cost.

FEI must file semi-annual progress reports within 30 days of the end of each semi-annual reporting period, with the first report covering the period ending June 30, 2023. Each report must provide the information set out above.

2 Material Change Reports

A material change (Material Change) is a change in FEI's plan for the Project that would reasonably be expected to have a significant impact on the schedule, cost or scope, such that:

- There is a schedule delay of greater than six months compared to the schedule provided in Table 5-2 of the Application;
- The total Project cost exceeds 10 percent of the estimated Project cost provided in Table 6-1 of the Evidentiary Update; or
- There is a change to the Project scope detailed in section 5.4 of the Application.

In the event of a Material Change, FEI must file a Material Change report with the BCUC explaining the reasons for the Material Change, FEI's consideration of the Project risk and the options available, and actions FEI is taking to address the Material Change. FEI must file the Material Change report as soon as practicable and in any event within 30 days of the date on which the Material Change occurs.

3. Final Report

A Final Report within three months of substantial completion or the in-service date of the Project, whichever is earlier. The report is to include:

- The final cost of the Project, including a breakdown of the final costs and O&M savings;
- A comparison of the final costs and O&M savings to the estimates provided in Table 6-1, Table 6-2 and Table 6-5 of the Evidentiary Update; and
- An explanation and justification for any material cost variances that exceed 10 percent for any of the cost items provided in Table 6-2 and Table 6-5 of the Evidentiary Update.

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GLOSSARY AND ACRONYMS

ACRONYM / GLOSSARY	DESCRIPTION
AACE	Association for the Advancement of Cost Engineering
AFUDC	Allowance for funds used during construction
ALARA	As Low As Reasonably Achievable
AMI	Advanced Metering Infrastructure
AMI Project	Advanced Metering Infrastructure Project
AMR	Automated Meter Reading
Application	Application for a Certificate of Public Convenience and Necessity for the Advanced Metering Infrastructure Project
AUC	Alberta Utilities Commission
Bau	Baubiologies
BC Hydro	British Columbia and Hydro Authority
BCOAPO	British Columbia Old Age Pensioners' Organization et al.
BCSEA	BC Sustainable Energy Association
BCUC	British Columbia Utilities Commission f
CEA	<i>Clean Energy Act</i>
CEC	Commercial Energy Consumers Association of British Columbia
CORE	The Coalition for the Reduction of Electropollution
CPCN	Certificate of Public Convenience and Necessity
CV	Curriculum Vitae
DSM	Demand side management
EHS	Electromagnetic hypersensitivity
EUROPAEM	European Academy for Environmental Medicine
FAN	Field area network
FCC	Federal Communications Commission
FDA	Food and Drug Administration
FEI	FortisBC Energy Inc.
FortisBC	FEI and FBC

ACRONYM / GLOSSARY	DESCRIPTION
FX	Foreign Exchange
GHG	Greenhouse gas
GHz	Gigahertz
HC SC6	Health Canada Safety Code 6
HCN	Health Council of the Netherlands
HES	Head End System
ICLR	The Institute for Catastrophic Loss Reduction
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IEEE	Institute of Electrical and Electronics Engineers
IGNIR	International Guidelines on Non-Ionizing Radiation
IRs	Information requests
ISED	Innovation, Science and Economic Development
Itron	Itron Inc.
kHz	Kilohertz
MDMS	Meter Data Management System
NPV	Net Present Value
Olameter	Olameter Inc.
PACA	Participant Assistance/Cost Award
PIPA	<i>The Personal Information Protection Act</i>
RCIA	Residential Consumer Intervener Association
RF	Radiofrequency
RFP	Request for proposal
RFR	Radiofrequency radiation
RSC	Royal Society of Canada
RSS	Radio Standards Specification
SaaS	Sensus as a Software as a Service
SC6	Safety Code 6
SCENIHR	Scientific Committee on Emerging and Newly Identified Health Risks
Sensus	Sensus USA Inc. and Sensus Canada Inc.
SoCalGas	Southern California Gas Company
SSM	Swedish Radiation Safety Authority
TLSE	Tilbury Liquefied Nature Gas Storage Expansion
UCA	<i>Utilities Commission Act</i>

ACRONYM / GLOSSARY	DESCRIPTION
USD	US Dollar
Util-Assist Report	Report from Util-Assist Inc. to identify gas utility Automation projects across Canada and the United States
VITR	Vancouver Island Transmission Reinforcement Project
WACC	Weighted average cost of capital
WHO	World Health Organization
YPCI	Yohannes Project Consulting Inc.

FortisBC Energy Inc.
Application for a Certificate of Public Convenience and Necessity
for Approval of the Advanced Metering Infrastructure Project

EXHIBIT LIST

Exhibit No.	Description
<i>COMMISSION DOCUMENTS</i>	
A-1	Letter dated May 17, 2021 – Appointing the Panel for the review of FortisBC Energy Inc.’s Application for a Certificate of Public Convenience and Necessity for the Advanced Metering Infrastructure Project
A-2	Letter dated May 28, 2021 – BCUC Request for further information
A-3	Letter dated July 6, 2021 – BCUC Order G-204-21 establishing a regulatory timetable
A-4	Letter dated September 9, 2021 – BCUC Information Request No. 1 to FEI
A-5	CONFIDENTIAL – Letter dated September 9, 2021 – BCUC Confidential Information Request No. 1 to FEI
A-6	Letter dated September 13, 2021 – BCUC Order G-269-21 amending the regulatory timetable
A-7	Letter dated September 13, 2021 – BCUC approving Intervener Request from Volansky
A-8	Letter dated September 13, 2021 – BCUC approving Intervener Request from Noble
A-9	Letter dated September 13, 2021 – BCUC approving Intervener Request from CORE
A-10	Letter dated September 13, 2021 – BCUC approving Intervener Request from Balfour
A-11	Letter dated September 13, 2021 – BCUC approving Intervener Request from Schluschen
A-12	Letter dated September 13, 2021 – BCUC approving Intervener Request from Jacob Arie and Lydia Stella de Raadt
A-13	Letter dated September 13, 2021 – BCUC approving Intervener Request from Bennett
A-14	Letter dated September 14, 2021 – BCUC response to CORE’s Extension Request
A-15	Letter dated September 28, 2021 – BCUC providing interveners rules regarding Information Requests
A-16	Letter dated September 28, 2021 – BCUC request to CORE, Mr. and Ms. deRaadt, and Mr. Schluschen regarding coordination and counsel representation

- A-17 Letter dated October 21, 2021 – BCUC Order G-302-21 establishing a further regulatory timetable
- A-18 Letter dated October 27, 2021 – BCUC response to CORE extension request to file responses on further process and offering CORE an opportunity to respond to FEI’s reply submission
- A-19 Letter dated November 8, 2021 – BCUC Order G-323-21 amending the regulatory timetable with reasons for decision
- A-20 Letter dated December 9, 2021 – BCUC Order G-365-21 further amending the regulatory timetable
- A-21 Letter dated December 16, 2021 – BCUC request for submissions on CORE’s extension request
- A-22 Letter dated December 22, 2021 – BCUC Order G-389-21 amending the regulatory timetable
- A-23 Letter dated December 22, 2021 – BCUC Information Request No. 2 to FEI
- A-24 **CONFIDENTIAL** – Letter dated December 22, 2021 – BCUC Confidential Information Request No. 2 to FEI
- A-25 Letter dated January 10, 2022 – BCUC issuing Reasons for Decision for Order G-389-21
- A-26 Letter dated February 15, 2022 – BCUC request to CORE, Mr. and Ms. deRaadt, and Mr. Schluschen regarding coordination with other interveners
- A-27 Letter dated February 24, 2022 – BCUC providing procedural conference information
- A-28 Letter dated March 9, 2022 – BCUC providing further procedural conference information
- A-29 Letter dated March 17, 2022 – BCUC issuing Order G-81-22 with Reasons for Decision
- A-30 Letter dated March 31, 2022 – BCUC issuing Order G-92-22 with Reasons for Decision and regulatory timetable
- A-31 Letter dated April 6, 2022 – BCUC Order G-95-22 amending the regulatory timetable
- A-32 Letter dated May 12, 2022 – BCUC Information Request No. 1 to CORE on Intervener Evidence
- A-33 Letter dated July 4, 2022 – BCUC Order G-180-22 amending the regulatory timetable
- A-34 Letter dated July 14, 2022 - BCUC Information Request to FEI on Rebuttal Evidence
- A-35 Letter dated July 22, 2022 – BCUC Order G-206-22 with reasons for decision and a regulatory timetable
- A-36 Letter dated July 26, 2022 – BCUC Information Request No. 3 to FEI

- A-37 Letter dated September 8, 2022 – BCUC request FEI response to Institute for Catastrophic Loss Reduction submission
- A-38 Letter dated September 16, 2022 – BCUC Order G-259-22 and regulatory timetable with Reasons for Decision
- A-38-1 Letter dated September 16, 2022 – BCUC Order G-259-22A amending Order G-259-22 and regulatory timetable with Reasons for Decision
- A-39 Letter dated September 20, 2022 – BCUC response to Institute for Catastrophic Loss Reductions
- A-40 Letter dated October 20, 2022 – BCUC response to BCOAPO extension request

APPLICANT DOCUMENTS

- B-1 **FORTISBC ENERGY INC. (FEI)** – Application for a Certificate of Public Convenience and Necessity (CPCN) for Approval of the Advanced Metering Infrastructure (AMI) Project dated May 5, 2021
- B-1-1 **CONFIDENTIAL** - Letter dated May 5, 2021 – FEI submitting Application for a CPCN for Approval of the AMI Project Confidential Appendices
- B-1-2 Letter dated October 26, 2021 – FEI submitting errata to the Application
- B-1-2-1 **CONFIDENTIAL** – Letter dated October 26, 2021 – FEI submitting errata to the Application Confidential Supplemental Information
- B-1-1-1 Letter dated October 18, 2021 – FEI submitting Curriculum Vitae for Exhibit B-1 Appendices F-1 and F-2
- B-2 Letter dated June 21, 2021 – FEI submitting further information as requested
- B-2-1 **CONFIDENTIAL** – Letter dated June 21, 2021 – FEI submitting further information Confidential Attachments
- B-3 Letter dated October 20, 2021 – FEI submitting extension request to file Information Request No. 1 responses
- B-4 Letter dated October 25, 2021 – FEI submitting response to CORE extension request to file responses on further process
- B-5 **CONFIDENTIAL** – Letter dated October 26, 2021 – FEI submitting responses to Confidential BCUC Information Request No. 1
- B-5-1 **PUBLIC** – Letter dated October 26, 2021 – FEI submitting non-confidential response to BCUC Confidential Information Request No. 1 Question 1.1

B-6	Letter dated October 26, 2021 – FEI submitting responses to BCUC Information Request No. 1
B-6-1	CONFIDENTIAL - Letter dated October 26, 2021 – FEI submitting confidential responses to BCUC Information Request No. 1
B-7	CONFIDENTIAL - Letter dated October 26, 2021 – FEI submitting responses to Confidential BCOAPO Information Request No. 1
B-7-1	PUBLIC – Letter dated October 26, 2021 – FEI submitting responses to BCOAPO Information Request No. 1
B-8	CONFIDENTIAL – Letter dated October 26, 2021 – FEI submitting responses to Confidential CEC Information Request No. 1
B-8-1	PUBLIC – Letter dated October 26, 2021 – FEI submitting responses to CEC Information Request No. 1
B-8-1-1	CONFIDENTIAL – Letter dated October 26, 2021 – FEI submitting Confidential responses to CEC Information Request No. 1
B-9	Letter dated October 26, 2021 – FEI submitting responses to BCSEA Information Request No. 1
B-10	Letter dated October 26, 2021 – FEI submitting responses to CORE Information Request No. 1
B-11	Letter dated October 26, 2021 – FEI submitting responses to de Raadt Information Request No. 1
B-12	Letter dated October 26, 2021 – FEI submitting responses to Schluschen Information Request No. 1
B-13	Letter dated October 26, 2021 – FEI submitting responses to RCIA Information Request No. 1
B-13-1	CONFIDENTIAL – Letter dated October 26, 2021 – FEI submitting confidential responses to RCIA Information Request No. 1
B-14	Letter dated November 23, 2021 – FEI submitting response on further process
B-15	Replaced on December 17, 2021_Letter dated December 17, 2021 – FEI submitting response to CORE Extension Request
B-16	Letter dated February 17, 2022 – FEI submitting responses to BCUC Information Request No. 2
B-16-1	CONFIDENTIAL – Letter dated February 17, 2022 – FEI submitting confidential response to BCUC Information Request No. 2 Question 44.2

- B-17 **CONFIDENTIAL** – Letter dated February 17, 2022 – FEI submitting responses to Confidential BCUC Information Request No. 2
- B-18 Letter dated February 17, 2022 – FEI submitting responses to BCOAPO Information Request No. 2
- B-19 Letter dated February 17, 2022 – FEI submitting responses to CEC Information Request No. 2
- B-20 Letter dated February 17, 2022 – FEI submitting responses to RCIA Information Request No. 2
- B-21 Letter dated February 17, 2022 – FEI submitting responses to ICLR Information Request No. 2
- B-22 Letter dated February 17, 2022 – FEI submitting responses to CORE Information Request No. 2
- B-23 Letter dated February 17, 2022 – FEI submitting responses to BCSEA Information Request No. 2
- B-24 Letter dated May 12, 2022 – FEI Information Request No. 1 to CORE on Intervener Evidence
- B-25 Letter dated June 9, 2022 – FEI submitting Notice of Intent to file Rebuttal Evidence and Evidentiary Update
- B-26 Letter dated June 23, 2022 – FEI submitting Rebuttal Evidence to CORE
- B-27 Letter dated June 30, 2022 – FEI submitting extension request
- B-28 Letter dated June 30, 2022 – FEI submission on Oral Hearing
- B-29 Letter dated July 4, 2022 – FEI further submission on Oral Hearing
- B-30 Letter dated July 5, 2022 – FEI submitting Evidentiary Update
- B-30-1 **CONFIDENTIAL** – Letter dated July 5, 2022 – FEI submitting confidential Excel Model attachment to the Evidentiary Update
- B-31 Letter dated August 4, 2022 – FEI submitting responses to BCUC Information Request No. 3 on Rebuttal Evidence
- B-32 Letter dated August 4, 2022 – FEI submitting responses to RCIA Information Request No. 3 on Rebuttal Evidence
- B-33 Letter dated August 4, 2022 – FEI submitting responses to CEC Information Request No. 3 on Rebuttal Evidence

- B-34 Letter dated August 4, 2022 – FEI submitting responses to CORE Information Request No. 3 on Rebuttal Evidence
- B-35 Letter dated August 16, 2022 – FEI submitting responses to RCIA Information Request No. 4 on Evidentiary Update
- B-36 Letter dated August 16, 2022 – FEI submitting responses to BCSEA Information Request No. 4 on Evidentiary Update
- B-37 Letter dated August 16, 2022 – FEI submitting responses to CEC Information Request No. 4 on Evidentiary Update
- B-38 Letter dated August 16, 2022 – FEI submitting responses to CORE Information Request No. 4 on Evidentiary Update
- B-39 Letter dated August 16, 2022 – FEI submitting responses to BCOAPO Information Request No. 4 on Evidentiary Update
- B-40 Letter dated August 16, 2022 – FEI submitting responses to BCUC Information Request No. 4 on Evidentiary Update
- B-41 Letter dated August 19, 2022 – FEI submission on Further Process
- B-42 Letter dated August 30, 2022 – FEI reply submission on further process
- B-43 Letter dated September 13, 2022 – FEI submitting response to BCUC regarding Institute for Catastrophic Loss Reduction Information Request Responses

INTERVENER DOCUMENTS

- C1-1 **RESIDENTIAL CONSUMER INTERVENER ASSOCIATION (RCIA)** – Letter dated May 27, 2021 submitting request to intervener by Samuel Mason
- C1-2 Letter dated September 10, 2021 – RCIA Submitting Confidentiality Declaration and Undertakings
- C1-3 Letter dated September 10, 2021 – RCIA submitting request for extension to file Information Request No. 1
- C1-4 Letter dated September 14, 2021 – RCIA submitting Confidentiality Declaration and Undertakings
- C1-5 Letter dated September 17, 2021 – RCIA submitting Additional Confidentiality Declaration and Undertakings
- C1-6 Letter dated September 20, 2021 – RCIA submitting Information Request No. 1 to FEI
- C1-7 Letter dated November 23, 2021 – RCIA submitting response on further process

C1-8	Letter dated December 20, 2021 – RCIA submitting response to CORE Extension Request
C1-9	Letter dated January 13, 2022 – RCIA submitting Information Request No. 2 to FEI
C1-10	Letter dated March 3, 2022 – RCIA will not be submitting Intervener Evidence
C1-11	Letter dated May 12, 2022 – RCIA Information Request No. 1 to CORE on Intervener Evidence
C1-12	Letter dated June 30, 2022 – RCIA submission on Oral Hearing
C1-13	Letter dated July 14, 2022 - RCIA Information Request to FEI on Rebuttal Evidence
C1-14	Letter dated July 26, 2022 – RCIA submitting Information Request No. 1 to FEI on Evidentiary Update
C1-15	Letter dated August 23, 2022 – RCIA submission on Further Process
C2-1	BC SUSTAINABLE ENERGY ASSOCIATION (BCSEA) – Letter dated July 20, 2021 submitting request to intervene by William Andrews and Thomas Hackney
C2-2	Letter dated September 14, 2021 – BCSEA submitting Confidentiality Declaration and Undertakings
C2-3	Letter dated September 20, 2021 – BCSEA submitting Information Request No. 1 to FEI
C2-4	Letter dated November 17, 2021 – BCSEA submitting comments on further process
C2-5	Letter dated December 19, 2021 – BCSEA submitting response to CORE Extension Request
C2-6	Letter dated December 20, 2021 – BCSEA submitting comments on Procedural Conference date
C2-7	Letter dated December 31, 2021 – BCSEA submitting Information Request No. 2 to FEI
C2-8	Letter dated March 3, 2022 – BCSEA submitting Intervener Evidence
C2-9	Letter dated May 11, 2022 – BCSEA submitting Information Request No. 1 to CORE
C2-10	Letter dated June 27, 2022 – BCSEA submitting that BCSEA has no Information Request for FEI regarding FEI’s Rebuttal Evidence
C2-11	Letter dated June 27, 2022 – BCSEA submissions on the need for an oral hearing
C2-12	Letter dated July 26, 2022 – BCSEA submitting Information Request No. 3 to FEI
C2-13	Letter dated August 17, 2022 – BCSEA submitting comments on process

- C3-1 **BRITISH COLUMBIA OLD AGE PENSIONERS' ORGANIZATION, DISABILITY ALLIANCE BC, COUNCIL OF SENIOR CITIZENS' ORGANIZATIONS OF BC, AND THE TENANT RESOURCE AND ADVISORY CENTRE (BCOAPO)** – Letter dated September 8, 2021 – Submitting request to intervene by Leigha Worth, Kristin Barham and Russ Bell
- C3-2 REMOVED
- C3-3 Letter dated September 15, 2021 – BCOAPO submitting Confidentiality Declaration and Undertakings
- C3-4 Letter dated September 20, 2021 – BCOAPO submitting Information Request No. 1 to FEI
- C3-5 **CONFIDENTIAL** – Letter dated September 20, 2021 – BCOAPO submitting Confidential Information Request No. 1 to FEI
- C3-6 Letter dated November 5, 2021 – BCOAPO submitting Confidentiality Declaration and Undertakings
- C3-7 Letter dated November 23, 2021 – BCOAPO submitting response on further process
- C3-8 Letter dated December 20, 2021 – BCOAPO submitting response to CORE Extension Request and Procedural Conference date
- C3-9 Letter dated January 13, 2022 – BCOAPO submitting Information Request No. 2 to FEI
- C3-10 Letter dated March 3, 2022 – BCOAPO submitting no Intervener Evidence
- C3-11 Letter dated May 12, 2022 – BCOAPO will not be submitting Information Request No. 1 to CORE on Intervener Evidence
- C3-12 Letter dated June 30, 2022 – BCOAPO submission on Oral Hearing
- C3-13 Letter dated July 26, 2022 – BCOAPO submitting Information Request to FEI on Evidentiary Update
- C3-14 Letter dated August 23, 2022 – BCOAPO submission on Further Process
- C3-15 Letter dated October 19, 2022 – BCOAPO submitting extension request to file Final Argument
- C4-1 **COMMERCIAL ENERGY CONSUMERS ASSOCIATION OF BRITISH COLUMBIA (CEC)** – Letter dated September 9, 2021 Request to Intervene by Chris Weafer
- C4-2 Letter dated September 9, 2021 – CEC submitting request for extension to file Information Request No. 1
- C4-3 Letter dated September 15, 2021 – CEC submitting Confidentiality Declaration and Undertakings
- C4-4 Letter dated September 20, 2021 – CEC submitting Information Request No. 1 to FEI

- C4-5 **CONFIDENTIAL** - Letter dated September 20, 2021 – CEC submitting Confidential Information Request No. 1 to FEI
- C4-6 Letter dated November 23, 2021 – CEC submitting comments on further process
- C4-7 Letter dated December 22, 2021 – CEC submission on Procedural Conference date
- C4-8 Letter dated January 13, 2022 – CEC submitting Information Request No. 2 to FEI
- C4-9 Letter dated May 12, 2022 – CEC submitting Information Request No. 1 to CORE on Intervener Evidence
- C4-10 Letter dated June 30, 2022 – CEC submission on Oral Hearing
- C4-11 Letter dated July 14, 2020 – CEC Information Request to FEI on Rebuttal Evidence
- C4-12 Letter dated July 26, 2022 – CEC Information Request to FEI on Evidentiary Update
- C4-13 Letter dated August 23, 2022 – CEC submission on Further Process
- C5-1 **MICHAEL VOLANSKY (VOLANSKY)** – Letter dated September 6, 2021 submitting request to intervene
- C6-1 **SHARON NOBLE (NOBLE)** – Letter dated September 8, 2021 submitting request to intervene
- C7-1 **COALITION TO REDUCE ELECTROPOLLUTION (CORE)** – Letter dated September 8, 2021 submitting request to intervene by Hans Karow
- C7-2 Letter dated September 8, 2021 – CORE submitting Extension Request to the Regulatory Timetable
- C7-3 Letter dated September 20, 2021 – CORE submitting Information Request No. 1 to FEI
- C7-4 Letter dated October 22, 2021 – CORE submitting extension request to file submission on further process
- C7-5 Letter dated October 29, 2021 – CORE submitting extension request to respond to FEI
- C7-6 Letter dated November 23, 2021 – CORE submitting comments on further process
- C7-7 Letter dated December 16, 2021 – CORE submitting extension request to file Information Request No. 2
- C7-8 Letter dated December 20, 2021 – CORE submitting reply to FEI and BCSEA regarding CORE Extension Request
- C7-9 Letter dated December 22, 2021 – CORE submission on Procedural Conference date
- C7-10 Letter dated January 13, 2022 – CORE submitting Information Request No. 2 to FEI
- C7-11 Letter dated March 3, 2022 – CORE submitting Intervener Evidence

C7-12	Submission dated April 14, 2022 – CORE submitting Intervener Video Evidence
C7-12-1	Letter dated April 14, 2022 – CORE submitting Intervener Evidence
C7-13	Letter dated June 2, 2022 – CORE submitting responses to BCUC Information Request No. 1
C7-14	Letter dated June 2, 2022 – CORE submitting responses to RCIA Information Request No. 1
C7-15	Letter dated June 2, 2022 – CORE submitting responses to BCSEA Information Request No. 1
C7-16	Letter dated June 2, 2022 – CORE submitting responses to CEC Information Request No. 1
C7-16-1	Letter dated June 2, 2022 – CORE submitting responses to CEC Information Request No. 1 Question 7.2 Appendix B Video
C7-17	Letter dated June 2, 2022 – CORE submitting responses to FEI Information Request No. 1
C7-18	Letter dated June 30, 2022 – CORE submission on Oral Hearing
C7-19	Letter dated July 14, 2022 – CORE Information Request to FEI on Rebuttal Evidence
C7-20	Letter dated July 26, 2022 – CORE Information Request to FEI on Evidentiary Update
C7-21	Letter dated August 23, 2022 – CORE submission on Further Process
C8-1	DAVID BALFOUR (BALFOUR) – Letter dated September 9, 2021 submitting request to intervene
C9-1	MARCUS SCHLUSCHEN (SCHLUSCHEN) – Letter dated September 9, 2021 submitting request to intervene
C9-2	Letter dated September 20, 2021 – Schluschen submitting Information Request No. 1 to FEI
C10-1	JACOB ARIE AND LYDIA STELLA DE RAADT (DE RAADT) – Letter dated September 9, 2021 submitting request to intervene
C10-2	Letter dated September 20, 2021 – De Raadt submitting Information Request No. 1 to FEI
C10-2-1	Letter dated October 8, 2021 – De Raadt submitting Amended Information Request No. 1 to FEI
C11-1	CURTIS BENNETT (BENNETT) – Letter dated September 9, 2021 submitting request to intervene
C12-1	INSTITUTE FOR CATASTROPHIC LOSS REDUCTION (ICLR) – Letter dated December 17, 2021 submitting late request to intervene by Glenn McGillivray
C12-2	Letter dated December 17, 2021 – ICLR submitting Questions to FEI
C12-3	Letter dated September 1, 2022 – ICLR submitting response to FEI Information Request No. 1 Responses

INTERESTED PARTY DOCUMENTS

- D-1 **FUJIOKA, KATHY (FUJIOKA)** – Submission dated July 29, 2021 request for Interested Party Status
- D-2 **LINDNER, EILEEN (LINDNER)** – Submission dated September 6, 2021 request for Interested Party Status
- D-3 **LEIBEL, DONNA (LEIBEL)** – Submission dated September 7, 2021 request for Interested Party Status
- D-4 **BIGGAR, RICK (BIGGAR)** – Submission dated September 8, 2021 request for Interested Party StatusD-5
- D-5 **MCKECHNIE, BOB (MCKECHNIE)** – Submission dated September 8, 2021 request for Interested Party Status
- D-6 **HOFFMANN, JANIS (HOFFMANN)** – Submission dated September 8, 2021 request for Interested Party Status
- D-7 **ALLAERT, DEE (ALLAERT)** – Submission dated September 9, 2021 request for Interested Party Status
- D-8 **VALIS, LILIJA (VALIS)** – Submission dated September 9, 2021 request for Interested Party Status
- D-9 **BALFOUR, DAVID (BALFOUR)** – Submission dated September 10, 2021 request for Interested Party Status
- D-10 **DE RAADT, JACOB ARIE & LYDIA STELLA (DE RAADT)** – Submission dated September 10, 2021 request for Interested Party Status
- D-11 **BORAK, E. (BORAK)** – Submission dated October 17, 2021 request for Interested Party Status
- D-11-1 Borak – Letter of Comment dated October 17, 2021
- D-12 **BORDIAN, C. (BORDIAN)** – Submission dated October 15, 2021 request for Interested Party Status
- D-13 **GREGSON, P. (GREGSON)** – Submission dated October 17, 2021 request for Interested Party Status
- D-13-1 Gregson – Letter of Comment dated October 18, 2021
- D-14 **IRIS, H. (IRIS)** – Submission dated October 15, 2021 request for Interested Party Status
- D-15 **PINKERTON, E. (PINKERTON)** – Submission dated October 16, 2021 request for Interested Party Status
- D-16 **RIDEOUT, S. (RIDEOUT)** – Submission dated October 16, 2021 request for Interested Party Status

LETTERS OF COMMENT

- E-1 GANN, G. (Gann) – Letter of Comment dated August 13, 2021
- E-2 ENGAR, O. (Engar) Fraser Valley Regional District Director Area E – Letter of Comment dated August 26, 2021
- E-3 DAVIS, K.B. (Davis) – Letter of Comment dated August 1, 2021
- E-4 WARD, J. (Ward) – Letter of Comment dated April 26, 2022
- E-5 BORDIAN, C. (Bordian) – Letter of Comment dated April 26, 2022
- E-6 ENGAR, O. (Engar) – Letter of Comment dated April 27, 2022
- E-7 ARMSTRONG, S. (Armstrong) – Letter of Comment dated April 27, 2022
- E-8 FRIESEN, M. (Friesen) – Letter of Comment dated April 28, 2022
- E-9 RIDEOUT, S. (Rideout) – Letter of Comment dated May 9, 2022
- E-9-1 Rideout – Additional Letter of Comment dated May 10, 2022
- ~~E-9-2~~ EXHIBIT REMOVED
- E-10 HITCH, T. (Hitch) – Letter of Comment dated June 14, 2022
- E-11 Pinkerton, E. (Pinkerton) – Letter of Comment dated June 25, 2022