



IN THE MATTER OF

FORTISBC INC.

**CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY
FOR THE ADVANCED METERING INFRASTRUCTURE PROJECT**

DECISION

July 23, 2013

Before:

**L.F. Kelsey, Commissioner/Panel Chair
N.E. MacMurchy, Commissioner
D.M. Morton, Commissioner**

TABLE OF CONTENTS

	Page No.
EXECUTIVE SUMMARY	I
1.0 THE APPLICATION	1
1.1 Specific Orders Sought	2
2.0 THE PROCESS	2
2.1 Interveners	2
2.2 Community Input Sessions	3
2.3 Procedural Conference	3
2.4 Written Process	4
2.5 Oral Hearing	4
2.6 Procedural Motions	5
3.0 REGULATORY AND POLICY CONTEXT	5
3.1 Jurisdiction	6
3.2 What Constitutes Public Convenience and Necessity	7
3.3 How do British Columbia's Energy Objectives, Legislation and Regulations Inform this Decision	9
3.4 2008 Advanced Metering Infrastructure Project Decision	10
4.0 EVIDENCE AND EXPERT WITNESSES	13
4.1 How does the Panel Weigh the Evidence?	13
4.2 Expectations for Expert Witnesses	13
4.3 Individuals Qualified as Experts	14
4.3.1 Dr. William Bailey	14
4.3.2 Dr. Martin Blank	18
4.3.3 Dr. David Carpenter	20
4.3.4 Dr. Isaac Jamieson	22
4.3.5 Dr. Donald Maisch	24
4.3.6 Dr. Margaret Sears	25
4.3.7 Dr. Yakov Shkolnikov	28
4.4 Individuals Filing Evidence but not Cross-Examined	29
4.4.1 Mr. Curtis Bennett	29
4.4.2 Mr. Jerry Flynn	30

TABLE OF CONTENTS

	Page No.
4.4.3 Dr. Girish Kumar	33
4.4.4 Robert McLennan	34
4.4.5 Dr. Karl Maret	35
4.4.6 Dr. Timothy Schoechle	36
4.5 Adverse Inference	37
5.0 PROJECT NEED	39
6.0 PROJECT DESCRIPTION	41
6.1 Existing System	41
6.2 Proposed AMI Project	42
6.3 AMI Components	43
6.4 Project Scope	44
6.4.1 Procurement	45
6.5 Project Management	45
6.5.1 Project Schedule and Phasing	46
6.5.2 Project Risks	47
6.6 Consultation	48
7.0 PUBLIC INPUT	50
7.1 Public Participation	50
7.2 Letters of Comment	50
7.3 The Community Input Sessions	51
8.0 ECONOMIC ANALYSIS AND RATE IMPACT OF THE PROJECT	53
8.1 Net Present Value Analysis of Costs and Benefits (Economic Analysis)	55
8.1.1 Key Assumptions	55
8.1.1.1 Discount Rate	55
8.1.1.2 General Inflation and Escalation Rate	56
8.1.1.3 Term of 20 Years	57
8.1.1.4 Income Taxes	58
8.1.2 Project Costs and Benefits	58
8.1.2.1 Project Capital Costs	59

TABLE OF CONTENTS

	Page No.
8.1.2.2 Contingency Allowance and Accuracy of the Project Cost Estimate	60
8.1.2.3 CPCN Development Costs	61
8.1.2.4 Sustaining Capital, Project Operating Costs and Benefits	62
8.1.3 Quantifiable Operational Costs and Savings	63
8.1.3.1 Meter Reading	63
8.1.3.2 Remote Disconnect/Reconnect	64
8.1.3.3 Measurement Canada Compliance	67
8.1.3.4 Meter Exchanges	68
8.1.3.5 Contact Centre	69
8.1.4 Soft Benefits	69
8.1.4.1 Customer Service and Satisfaction	70
8.1.4.2 System Efficiency and Reliability	72
8.1.5 Other Potential and Future Benefits	72
8.1.5.1 Voltage Optimization	73
8.1.5.2 Outage Management	74
8.1.5.3 Development of Future Rates	75
8.2 Policy/Environmental Benefits	76
8.2.1 Clean Energy Act – GHG Reductions	76
8.3 Theft Reduction Benefit	77
8.3.1 Theft Reduction – Revenues	78
8.3.2 Decrease in Network Electricity Losses	79
8.3.2.1 Treatment of Uncertain Benefits	79
8.3.2.2 Identification of Key Assumptions used to Estimate the Theft Benefit	80
8.3.2.3 Review of Key Assumptions in the theft benefit estimate	82
8.3.2.3.1 Number and growth rate of marijuana grow sites on FortisBC’s network	82
8.3.2.3.2 Average Energy Use per Site	83
8.3.2.3.3 Percentage of Sites Stealing Electricity	84
8.3.2.3.4 Theft Detection Rate and Recovered Revenue	85

TABLE OF CONTENTS

	Page No.
8.3.2.4 Valuing the Decreased Network Electricity Losses from the Project	86
8.3.3 Are There Lower Cost Ways of Obtaining the Theft Benefit?	87
8.3.4 Theft Reduction Benefit – Other Considerations	87
8.3.5 Summary	88
8.4 Economic Analysis – Summary	89
8.5 Rate Impact of the Project	89
8.5.1 Carrying Costs	90
8.5.2 Theft Reduction Benefit	91
8.5.3 Depreciation	91
8.5.3.1 AMI Meters	93
8.5.3.2 Other Project Asset Classes	95
8.5.4 Accounting Treatment of the Existing Meters	97
8.5.5 BCUC Staff Model	99
9.0 PROJECT ALTERNATIVES CONSIDERED	100
9.1 Status Quo	101
9.2 Automated Meter Reading	101
9.3 Power Line Carrier AMI	101
9.4 Alternative Evaluation	102
9.4.1 AMI RFP Process and Credibility of PLC estimate	104
10.0 RADIO FREQUENCY EMISSIONS AND HEALTH	105
10.1 Introduction	105
10.2 Does Safety Code 6 Apply To FortisBC’s AMI Program?	106
10.3 Do the Emission Standards Set Out in Safety Code 6 Adequately Protect FortisBC Customers?	108
10.3.1 Thermal Effects	108
10.3.2 Non-Thermal Effects	109
10.3.3 Does Safety Code 6 take the ‘Precautionary Principle’ Into Account?	112
10.4 Other Issues	114
10.4.1 What Will I <i>Actually</i> Be Exposed To From FortisBC’s AMI Equipment?	114

TABLE OF CONTENTS

	Page No.
10.4.2 What are the concerns arising from RF emissions being classified as a "Possible Carcinogen"?	116
10.4.3 What If I Live Near A Bank Of Meters?	120
10.4.4 What about My Total Exposure to EMF from all Sources?	123
10.4.5 How Frequently do AMI Meters Transmit and does this Create a Chronic Health Problem?	125
10.4.6 Will AMI Meters Interfere With My Medical Device?	131
10.4.7 What About People Concerned about Electromagnetic Hypersensitivity?	132
11.0 OTHER KEY ISSUES ARISING	137
11.1 Privacy and Use of Data Collected	137
11.2 Wireless System Security	140
11.2.1 ZigBee and Home Area Network	142
11.3 Fire Risk	143
11.4 Opt-Out	145
11.5 Environmental Impacts	149
11.6 Higher Bills	151
12.0 COMMISSION DETERMINATION	152
12.1 Public Convenience and Necessity	152
12.2 Depreciation Rate for Proposed Meters	153
13.0 SUMMARY OF DIRECTIVES	153

COMMISSION ORDER C-7-13

APPENDICES

APPENDIX A Summary of Rulings Made Before and After the Oral Hearing

APPENDIX B Regulatory Timetable

APPENDIX C List of Acronyms

APPENDIX D List of Exhibits

EXECUTIVE SUMMARY

FortisBC applied for a Certificate of Convenience and Necessity for an advanced metering infrastructure (AMI) project. The Project consists of replacing the existing fleet of meters with advanced (or smart) meters and related infrastructure and software (see Section 1.0 for details of the application). The application generated a high degree of interest from a number of parties, including members of the general public. This interest stemmed from concerns related to a wide variety of topics including costs and benefits of the project, potential health effects, and security, privacy and safety concerns. To hear the community concerns raised by the public in the FortisBC service territory, the Commission held Community Input Sessions in Trail, Osoyoos, and Kelowna (see Section 2.2 for details). This was followed by a public hearing process, with the participation of registered Interveners, that included both written and oral components (see Sections 2.4 and 2.5).

Based on the extensive evidence that was put forward to the Panel, including the testimony of a number of expert witnesses the key decisions of the Panel are:

1. FortisBC is granted a Certificate of Public Convenience and Necessity for the Project subject to a condition that it must confirm by August 1, 2013 that it will file an application for an opt-out provision by November 1, 2013 that follows the direction in Section 11.4 of this decision. The approved capital budget, including approved development costs is \$50.898 million. The reasons for this decision include;
 - Over its 20 year life the Project is expected to generate a net benefit of \$13.9 million as a result of reductions in operating costs and electricity theft;
 - The Project is expected to reduce rates over the 20 year life of the Project. However, it is estimated there will be a modest increase in rates due to the Project over the next five years. Non quantified, “soft” benefits enabled by the Project may mitigate the rate increase;
 - The Project advances the BC 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” as stated in section 17(6) of the *Clean Energy Act*. The Project also supports British Columbia's energy objectives, specifically *Clean Energy Act* sections 2(b) (to take demand side measures to conserve energy); 2(d) (to use and foster the development in BC of innovative technologies that support energy conservation and efficiency) and 2(g) to reduce greenhouse gas emissions. (Sections 5.0 and 8.2.1);
 - There is a potential risk to the implementation schedule arising from a protracted difference of views concerning the Project. This risk could increase costs to and reduce potential benefits from the Project, which would be detrimental to all

FortisBC ratepayers. An opt-out program could mitigate these potential schedule impacts. (Section 6.5.2)

- The Project complies with Canadian safety standards as set out by Health Canada with respect to RF emissions;
 - The Project complies with provincial privacy standards as set out by the *Personal Information Protection Act*; and
 - Security and safety issues have been adequately addressed.
2. A depreciation rate of 5 percent is approved for the advanced meters based on an expected economic life of 20 years. (Section 8.5.2.1)

Section 10 makes additional key findings including:

- Health Canada's Safety Code 6 takes into account the scientific evidence related to the impact of thermal and non-thermal effects of radio frequency emissions on human health and provides an appropriate degree of precaution in setting the limits for these emissions;
- The radio frequency emissions generated by the Project are significantly below the levels set out in Safety Code 6 established by Health Canada to ensure such emissions are not harmful to human health;
- While there are individuals who feel strongly the low level electromagnetic emissions will have a negative impact on their health, the scientific evidence in this Proceeding does not persuade the Panel that there is a causal link between radio frequency emissions and the symptoms of electromagnetic hypersensitivity.

In reaching its decision, the Panel considered all of the evidence put before it. The Panel endeavoured to ensure the Proceeding record included evidence related to the topics put forward by concerned FortisBC customers in the Community Input Sessions, by interested parties, as well as in the many letters of comment received by the Commission.

FortisBC is required to provide reporting on the Project as it proceeds.

1.0 THE APPLICATION

On July 26, 2012, FortisBC Inc. (FortisBC) filed an application with the British Columbia Utilities Commission (Commission) seeking approval pursuant to sections 45 and 46 of the *Utilities Commission Act* (UCA), for a Certificate of Public Convenience and Necessity (CPCN) for the Advanced Metering Infrastructure (AMI) Project (Project; Application). FortisBC is an investor-owned, regulated utility engaged in the business of generation, transmission, distribution and bulk sale of electricity in the southern interior of British Columbia, serving over 162,000 customers directly and indirectly through municipally owned utilities in its service area.

Figure 1-1



Extracted from Exhibit B-11, BCSEA 1.8.1 Appendix, p. 4

The Project consists of replacing the existing fleet of electrical meters with advanced meters and related infrastructure and software. The Application was the subject of a public process (Proceeding) discussed in detail under Section 2 of this Decision.

On November 16, 2012, FortisBC submitted an addendum to the Application following the filing of a separate application to the Commission to purchase the electric utility assets of the City of Kelowna. The addendum included spreadsheets and calculations of costs and benefits for the Project considering the inclusion of an additional approximately 15,000 meters in the City of Kelowna. By Order C-4-13 dated March 1, 2013, the Commission approved the Kelowna utility

assets purchase with conditions that were subsequently met. Unless otherwise noted all discussions of financial considerations in this Decision include the City of Kelowna electrical service territory and assets.

1.1 Specific Orders Sought

In this Application FortisBC specifically seeks:

- 1) Pursuant to sections 45 and 46 of the UCA, an order issuing a CPCN for the Project at an estimated cost of \$51.2 million, including salvage value (Exhibit B-1, p. 6; Exhibit B-1-4, p. 2); and
- 2) Pursuant to section 56 of the UCA, an order approving a revised depreciation rate for the proposed meters of 5 percent until the next depreciation study is completed (Exhibit B-1, p. 7).

2.0 THE PROCESS

Following the submission of the Application, a Commission Panel was established on August 1, 2012, and the following day a Preliminary Regulatory Timetable (Order G-105-12) was issued. The Order required FortisBC to promptly publish a Notice of Application and also re-publish it prior to September 5, 2012. The Regulatory Timetable was amended several times during the course of the Proceeding with the final amendment on May 13, 2013, providing for the filing of the International Agency for Research on Cancer monograph (IARC Report) and for Supplemental Submissions limited to that report. The Regulatory Timetable is shown in Appendix B.

2.1 Interveners

Persons wishing to actively participate in the proceeding were instructed on how to register with the Commission as Interveners and referred to resource material on how to file for Participant Assistance Cost Awards (PACA) to enable participation where financial assistance would be required. Interveners were required to identify issues they intended to pursue and demonstrate that they are either a FortisBC Inc. (electric) customer or a resident in the FortisBC Inc. service territory. Nineteen Interveners registered in the Proceeding and are listed below as they appear in the Proceeding record.

Table 1-1

C1	BC Southern Interior (BCSI) – (represented by Alex Atamanenko, MP)	C11	Keith Miles
C2	BC Municipal Electrical Utilities (BCMEU)	C12	Irrigation Ratepayers Group (IRG)
C3	BC Pensioners and Seniors Organization (BCPSO)	C13	Area D, Regional District of Central Kootenay (RDCK) – (represented by Andy Shadrack)
C4	BC Sustainable Energy Association-Sierra Club British Columbia (BCSEA)	C14	Shonna Hayes
C5	British Columbia Hydro and Power Authority (BC Hydro)	C15	Joe Tatangelo
C6	Jerry Flynn	C16	Beryl Slack
C7	Norman Gabana	C17	Commercial Energy Consumers Association of BC (CEC)
C8	BC Residential Utility Customers Association (BCRUCA)	C18	Nelson Creston Green Party (NCGP) – (represented by Michael Jessen)
C9	Citizens for Safe Technology Society (CSTS)	C19	West Kootenay Concerned Citizens (WKCC) – (represented by Curtis Bennett)
C10	Industrial Customers Group, Zellstoff Celgar Limited Partnership (ICG)		

There were also 13 Interested Parties registered in the Proceeding.

2.2 Community Input Sessions

Community Input Sessions were held in Trail, Osoyoos and Kelowna on November 6, 7 and 8, 2012 respectively. The sessions provided a forum for ratepayers of FortisBC and for ratepayers of its wholesale customers: the Cities of Kelowna, Penticton and Grand Forks, the District of Summerland and Nelson Hydro to present on issues concerning the Application to the Commission Panel. The Panel heard from a total of 51 persons through the three separate Community Input Sessions. Transcripts of the presentations form part of the record. Additional detail is provided in Section 0.

2.3 Procedural Conference

The Commission, by Order G-135-12, established a Procedural Conference to be held in Kelowna on November 8, 2012. The Procedural Conference provided an opportunity for Interveners to identify issues of significance in the proceeding and provide input into the proposed review process and Regulatory Timetable.

Following the Procedural Conference, the Panel issued Order G-177-12 on November 23, 2012, which included an Amended Regulatory Timetable. The Commission determined that the review of the Application would proceed by a combination of a written and an oral hearing, divided as follows:

- i. Financial, operations, fire safety and privacy issues by way of a written process only.
- ii. Health, security and environmental issues by way of an oral hearing.

Other requests made at or prior to the Procedural Conference were also dealt with in Order G-177-12.

2.4 Written Process

Prior to Order G-177-12, the Regulatory Timetable provided for two rounds of Information Requests (IRs) on the Application from each of the BCUC and Interveners. As of the date of Order G-177-12, FortisBC had responded to the first round of IRs. The written process established by Order G-177-12 included the second round of IRs to the Applicant and one round of IRs on any Intervener evidence that was to be filed by January 24, 2013. It also provided for final submissions in writing. Subsequent amendments to the written process included a third round of Intervener IRs, a confidential round of Intervener IRs, an information request by Commission staff and BCPSO related to the Kelowna municipal utility acquisition and supplemental written submissions on the IARC Report. (Exhibit A-32, Order G-17-13; Exhibit A-36, Order G-24-13; Exhibit A-43, Order G-80-13)

2.5 Oral Hearing

The Oral Hearing, which was also provided for by Order G-177-12, took place in Kelowna over two weeks from March 4, 2012 to March 15, 2012. A Commission letter issued on January 10, 2013 (Exhibit A-25) provided participants with information on what to expect and how to prepare for the Oral Hearing, and identified Commission counsel as the contact for any questions relating to the hearing process and Commission staff as the contact for technical questions.

FortisBC provided two witness panels for cross-examination: one on security issues and a second on health and environment issues. FortisBC's security panel consisted of Tom Loski, Paul Chernikhowsky and Tim Swanson of FortisBC, and Michael Stuber of Itron. The health and environment panel consisted of Tom Loski and Mark Warren of FortisBC and Dr. William Bailey and Dr. Yakov Shkolnikov, two of the authors of the Exponent Report¹ upon which FortisBC relied in its Application.

CSTS called five expert witness panels, each consisting of a single witness. The CSTS expert witnesses in order were as follows: Dr. Ronald Maisch, Dr. Martin Blank, Dr. Margaret Sears, Dr. Isaac Jamieson and Dr. David Carpenter. All CSTS witnesses gave their evidence by internet video conference. The transcripts of the Oral Hearing number nearly 2100 pages for the ten hearing days.

2.6 Procedural Motions

During the Proceeding numerous procedural requests were made by participants. A Summary of the Rulings Made Before and After the Oral Hearing is found in Appendix B. The Panel also made a number of Rulings during the Oral Hearing.

3.0 REGULATORY AND POLICY CONTEXT

The Commission's jurisdiction to regulate the operations of public utilities in British Columbia is found in the *Utilities Commission Act*, RSBC 1996, c. 473. The matters over which the Commission has jurisdiction include rates and other terms and conditions of service. The Commission also regulates the construction or operation of new facilities by public utilities through its power to grant a Certificate of Public Convenience and Necessity pursuant to sections 45 and 46 of the UCA. In exercising its CPCN granting powers, the Commission, among other matters, must consider certain provisions of the *Clean Energy Act*, SBC 2010, c. 22 (CEA).

¹ Exhibit B-1, Appendix C-5.

3.1 Jurisdiction

Section 45(1) of the UCA states:

“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 commission a certificate that public convenience and necessity require or will require the construction or operation.”

Section 45(8) states:

“The commission must not give its approval unless it determines that the privilege, concession or franchise proposed is necessary for the public convenience and properly conserves the public interest.”

Section 45(9) states:

“In giving its approval, the commission

- (a) must grant a certificate of public convenience and necessity, and
- (b) may impose conditions about
 - (i) the duration and termination of the privilege, concession or franchise, or
 - (ii) construction, equipment, maintenance, rates or service, as the public convenience and interest reasonably require.”

Section 46(3) sets out the Commission’s powers with respect to granting a CPCN:

“Subject to subsections (3.1) to (3.3), the commission may, by order, issue or refuse to issue the certificate, or may issue a certificate of public convenience and necessity for the construction or operation of a part only of the proposed facility, line, plant, system or extension, or for the partial exercise only of a right or privilege, 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.”

Section 46(3.1) requires the Commission, in deciding whether to issue a CPCN to a public utility (other than British Columbia Hydro and Power Authority), to consider the applicable energy objectives set out in section 2 of the CEA, the most recent long-term resource plan filed by the utility under section 44.1 of the UCA, and the extent to which the application for the CPCN is consistent with the applicable requirements of sections 6 and 19 of the CEA. The British Columbia energy objectives relevant to the Application are discussed in Section 3.3 of the Decision. No party

made submissions that either sections 6 or 19 applied to the Application.

By Order G-50-10, the Commission issued guidelines (CPCN Guidelines) to assist public utilities and other parties wishing to construct or operate utility facilities in preparing CPCN applications and to facilitate the Commission's review of such applications.

In addition to the Commission's CPCN jurisdiction, the Application also engages the Commission's jurisdiction to set rates of depreciation under section 56 of the UCA. Section 56(2) of the UCA states that "[t]he commission must determine and, by order after a hearing, set proper and adequate rates of depreciation."

Rates of Depreciation are discussed in Section 8.5.3.

3.2 What Constitutes Public Convenience and Necessity

Section 45(8) of the UCA contains two elements: (1) that the proposed application "is necessary for the public convenience" and (2) "properly conserves the public interest." The UCA does not define either phrase. FortisBC submits that the phrases have been held to be synonymous, relying upon *Emera Brunswick Pipeline Co. (Re)*, 2007 LNCNEB 3 at para. 43 (FortisBC Final Submission, p. 38). No Intervener challenged this submission.

Memorial Gardens Assn. (Can.) Ltd. v. Colwood Cemetery Co., [1958] S.C.R. 353, 1958 CanLII 82 (*Memorial Gardens*) is the leading case on public convenience and necessity. Abbott J. for the majority, after commenting that it would "be both impracticable and undesirable to attempt a precise definition of general application of what constitutes public convenience and necessity" and that "the meaning in a given case should be ascertained by reference to the context and to the objects and purposes of the statute in which it is found," describes the determination of public convenience and necessity as follows:

"As the Court held in the *Union Gas* case the question whether public convenience and necessity requires a certain action is not one of fact. It is predominantly the formulation of an opinion. Facts must, of course, be established to justify a decision by the Commission but that decision is one which cannot be made without a substantial exercise of administration discretion. In delegating this administration discretion to the Commission the Legislature has delegated to that body the responsibility of deciding in the public interest, the need and desirability of additional cemetery facilities, and in

reaching that decision the degree of need and of desirability is left to the discretion of the Commission.” (p. 357)

The Commission has adopted the *Memorial Gardens* test in past Decisions; *In the Matter of Vancouver Island Energy Corporation (a wholly-owned subsidiary of British Columbia Hydro and Power Authority), Vancouver Island Generation Project, Application for a Certificate of Public Convenience and Necessity*, Decision and Order G-55-03 dated September 8, 2003 (VIGP Decision) the Commission found that “...the test of what constitutes public convenience and necessity is a flexible test.” (VIGP Decision, pp. 75-76)

As noted by FortisBC at paragraphs 99 and 100 of its Final Submission, the Commission also adopted the *Memorial Gardens* test in its Decision *In the Matter of British Columbia Transmission Corporation An Application for a Certificate of Public Convenience and Necessity for the Vancouver Island Transmission Reinforcement Project*, Decision and Order C-4-06, July 7, 2006 (VITR Decision)² where it stated:

“The Commission Panel accepts the submissions of BCTC that there is a broad range of interests that should be considered in determining whether an applied-for project is in the public convenience and necessity. The Commission Panel concludes, as is stated in *Memorial Gardens*, that it is both impractical and undesirable to attempt a precise definition of general application as to what constitutes public convenience and necessity. As the Commission concluded in the VIGP Decision, the test of what constitutes public convenience and necessity is a flexible test ...” (p. 15)

No Intervener proposed an alternative framework for considering public convenience and necessity.

However, in the case of BCPSO, while it accepts that *Memorial Gardens* provides the test for what constitutes public convenience and necessity, it also suggests that the need must be immediate (BCPSO Final Submission, pp. 5, 15). FortisBC addresses whether there must be an immediate need in its May 2, 2013 Reply Submission at paras. 29-33. It refers to the fact that *Memorial Gardens* states that “necessity” includes future needs. At page 356 of *Memorial Gardens*, Abbott J. states as follows:

² Leave to appeal granted in part: *Tsawwassen Residents Against Higher Voltage Overhead Lines Society v. BC Utilities Commission* 2006 BCCA 496, 2006 BCCA 537 (Reasons); Leave order varied *Tsawwassen Residents Against Higher Voltage Overhead Lines Society v. BC Utilities Commission* 2007 BCCA 95; Appeal dismissed: *Tsawwassen Residents Against Higher Voltage Overhead Lines Society v. British Columbia (Utilities Commission)*, 2007 BCCA 211.

“...The term “necessity” has also been held to be not restricted to present needs but to include provision for the future [citation omitted] and this indeed would seem to follow from s. 12 of the *Public Utilities Act*, which provides that the certificate may issue where public convenience and necessity “require or *will require*” such construction or operation.”

The phrase “require or will require” is also found in section 45(1) of the UCA.

The Panel adopts the view that a flexible test of what constitutes the public convenience and necessity is appropriate. It is also of the view that future needs can be considered given the wording of section 45(1). FortisBC states that the pertinent public interest concerns that the Commission should consider with respect to the Project include a) cost effectiveness; b) reliability of service; c) rate impact; and d) socio-economic considerations (including public health, security, and environmental impact) (FortisBC Final Submission, p. 38). The Panel considered these and additional public interest factors and each factor is discussed throughout this Decision.

3.3 How do British Columbia’s Energy Objectives, Legislation and Regulations Inform this Decision

The 2007 BC Energy Plan establishes the framework and goals for the Province in terms of energy self-sufficiency, conservation, efficiency and greenhouse gas (GHG) reductions. Relevant legislation includes:

- *Greenhouse Gas Reduction Targets Act*, SBC 2007, c. 42 (GGRTA)
- *Carbon Tax Act*, SBC 2008, c. 40
- *Clean Energy Act*

In addition, as of June 21, 2010, the Province of BC, together with the Islands Trust and 179 municipalities across British Columbia, signed the British Columbia Climate Action Charter (Climate Action Charter). The Climate Action Charter describes how the signatories both endorse and actively support the goal of GHG emissions reductions. It is, however, not intended to be legally binding on the signatories or to impose any legal obligations upon them and has no legal effect (Exhibit B-1, pp. 21-22 and Appendix B-3).

As noted in Section 3.1 of this Decision, section 46(3.1) of the UCA requires the Commission to consider, among other things, the applicable of British Columbia's energy objectives. Section 2 of the CEA lists British Columbia's energy objectives. FortisBC submits that the proposed Project is consistent with the following energy objectives:

2(b) to take demand-side measures and to conserve energy;

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; and

2(g) to reduce BC greenhouse gas emissions. (FortisBC Final Submission, p. 39)

The CEA also specifically identifies advanced or "smart" metering as a goal in achieving the objectives of the CEA for utilities other than the BC Hydro. Section 17(6) of the CEA states:

(6) If a public utility, other than the authority [BC Hydro], 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.

3.4 2008 Advanced Metering Infrastructure Project Decision

In December of 2007, FortisBC filed its first CPCN application for an AMI project. On March 28, 2008 FortisBC amended the application to include additional functional capabilities including allowing in-home display (IHD) units in the future and hourly meter reading capabilities. The cost estimate for the amended application was \$37.3 million, not including costs for implementing future rate structures, capabilities and in-home displays. Following a public hearing process, the CPCN application was denied in the 2008 AMI Decision.³ The 2008 AMI Decision included the following conclusions:

- "No regulations have yet been issued concerning Smart Meters and their installation. While the regulations, when issued, will apply specifically to BC Hydro, the Commission Panel is of the view that it would be prudent to consider the regulations before FortisBC proceeds with its AMI Project" (2008 AMI Decision, p. 6).

³ In the Matter of FortisBC Inc. An Application for a Certificate of Public Convenience and Necessity for theits Advanced Metering InfrastructureProject Reinforcement Project, Order G-168-08 dated November 12, 2008; Decision, dated December 3, 2008.

- “...the application of the AMI technologies/protocol, and the opportunities for co-ordination [with other utilities including BC Hydro] to achieve optimal cost effectiveness have not been developed in these Applications to the point where the Commission Panel has sufficient evidence before it to assess the merits of the AMI Project” (2008 AMI Decision, p. 12).
- “The Commission Panel considers that FortisBC has not been sufficiently proactive in conducting consultations and research to determine the extent to which its AMI Project can or will be coordinated and/or compatible with other utilities, including BC Hydro, the distribution utilities with FortisBC’s service area and with its own sister utilities in the natural gas distribution sector” (2008 AMI Decision, p. 15).
- “The Commission Panel is of the view that there is insufficient information in the Application and/or Amended Application to allow it to conclude that the expenditures being proposed will, in fact, facilitate development of cost-effective demand side measures” (2008 AMI Decision, p. 30).
- “The Commission Panel concludes that the scoping, planning and overall cost estimates of the AMI Project are not sufficiently complete and advanced to determine whether the end product of the AMI program, including the instant Applications, can be assessed as to the cost effectiveness, appropriateness and ability to qualify for approval of a CPCN” (2008 AMI Decision, pp. 30-31).

These issues can be categorized as:

- 1) Timing – (Smart meter regulations not yet issued and BC Hydro smart meter implementation plan not yet developed)
- 2) Collaboration – (opportunities for efficiencies across utilities)
- 3) Completeness – (sufficiently detailed scope, planning, vision, costs, and evidence of cost-effective demand side measures)

The current Application will be evaluated to ensure the issues raised in the 2008 AMI Decision have been adequately addressed and developed by FortisBC as applicable.

Timing

The *Smart Meters and Smart Grid Regulation* came into force on December 15, 2010. Sections 2 and 3 of the Regulation, prescribe the requirements for smart meters that BC Hydro must install under subsection 17(2) of the CEA. Although there is no regulation defining the term “advanced meter” as that term is used in the CEA, FortisBC compared the Project with the Regulation and concluded that the Project aligns with its requirements (Exhibit B-1, p. 23).

The CEA requires BC Hydro to complete the implementation of its Smart Meter program by the end of the 2012 calendar year (section 17(3)). This requirement was subsequently extended by one year. FortisBC also identifies changes to Measurement Canada compliance requirements that will come into force January 1, 2014 as justification for the current timing of the Project (Exhibit B-1, p. 93).

Collaboration

In Section 8.2 of the Application, FortisBC describes collaborative efforts it undertook with BC Hydro which result in certain province wide consistency benefits of common capability for such things as in-home displays, and ability to incorporate gas and water meter readings (Exhibit B-1, pp. 127, 128). FortisBC further states that shared infrastructure savings with BC Hydro are not possible due to geographic location or are not cost efficient in the case of software systems; however, should FortisBC Energy Inc. (the utility that provides natural gas to customers in the FortisBC territory) decide to pursue a similar system, the FortisBC AMI system infrastructure will be shared “wherever possible and appropriate” (Exhibit B-1, p. 129).

Completeness

In response to the directives in the 2008 AMI Decision, FortisBC undertook several activities:

- Developing the details of specific functional, operational and technical requirements of the proposed AMI system;
- Commissioning a future use study of programs relying on AMI technologies;
- Actively participating in technology and industry groups focused on advanced metering and smart grid strategies;
- Monitoring the progress and results from utilities who have implemented or are in the process of implementing advanced metering projects including FortisAlberta, Fortis Ontario, BC Hydro, and Southern California Edison; and
- Engaging AMI industry experts to help track advances in metering technologies and software products.

(Exhibit B-1, pp. 12-13)

4.0 EVIDENCE AND EXPERT WITNESSES

4.1 How does the Panel Weigh the Evidence?

Subject to issues of relevance and admissibility, all parties to a proceeding are free to put forward “factual” evidence. This evidence provides specific information that may then be used by parties to argue for a specific ruling or outcome that they believe should be reached by the Panel. This factual evidence may be challenged through the information request process or through the cross-examination of witnesses.

The Panel assessed the factual evidence and reached its conclusions with respect to the validity of that evidence and the weight that should be placed upon it. The Panel, in reaching its conclusions, examined the information filed, and in some cases tested by cross-examination. Based on all of the evidence put forward on a specific factual issue the Panel applied its judgment as to the weight to be placed on that evidence.

Another form of evidence is opinion evidence. In assessing opinion evidence, the Panel took into account the education and work experience of the expert, whether the expert adopted an objective approach in putting forward their evidence, and the ability of the expert to defend their evidence when challenged through the information request process or through cross-examination. The Panel also considers a number of matters, including the facts and assumptions upon which the evidence is based, whether there is other evidence that contradicts those facts and assumptions, the effect of cross-examination on the evidence and whether a witness adopts an advocacy role. To facilitate this review the individuals providing evidence have been grouped as follows:

- 1) Qualified as an expert in a particular field, filed opinion evidence and cross-examined at the Oral Hearing; and
- 2) Filed opinion evidence, but not cross-examined.

4.2 Expectations for Expert Witnesses

The Commission does not have published guidelines for its expectations of expert witnesses. However, it looks to them for assistance on the technical issues for which they have been qualified to give their evidence. It expects them to provide their evidence in an objective manner and not to act as advocates.

4.3 Individuals Qualified as Experts

4.3.1 Dr. William Bailey

Dr. Bailey gave evidence on behalf of FortisBC. He was qualified by the Commission Panel as an expert, to give opinion evidence in the field of bio-electromagnetics and in particular, in the health risk assessment of exposure to electromagnetic fields, including radio frequency signals. For the purpose of this qualification, bio-electromagnetics was defined as the study of the interaction of electromagnetic fields with organisms or the environment over a wide range of frequencies. (T3:450-451)

Dr. Bailey's education includes a Ph.D., Neuropsychology, City University of New York, 1975, an M.B.A., University of Chicago, 1969 and a B.A., Dartmouth College, 1966. His curriculum vitae is found in Exhibits B-11⁴ and B-32. His experience includes laboratory and epidemiologic research, health risk assessment, and comprehensive exposure analysis. Dr. Bailey has investigated exposures to alternating current, direct current, and radiofrequency electromagnetic fields.

Dr. Bailey was the lead author of the Exponent Report, a summary report on the status of research related to radiofrequency exposure and health commissioned by FortisBC. He also provided assistance to FortisBC in responding to certain information requests.

RDCK submits that the fact that Dr. Bailey is neither a physician or a clinician affects the weight to be given to his evidence:

"106. Dr. Bailey's evidence and testimony on the issue of patient safety needs to be weighed against the fact that he is neither a physician nor a clinician who has dealt with patients with electro-hypersensitivity. Nowhere did this become more clear than during the cross examination of Dr. Bailey by Mr Andrews, in which Dr. Bailey suggests that one way to resolve the scientific argument around EHS is to increase the intensity of exposure in those claiming to be sensitive."

...

"108. Scientific certainty and risk analysis perception for which Dr. Bailey is qualified to offer an opinion is not the issue here. Dr. Bailey is simply not qualified to make judgments about the medical and clinical portions of the two

⁴ CSTS 1.23.4

AAEM papers, especially in view of the fact that he failed to explain the limitations to his expertise around medical and clinical matters. Dr. Bailey was far too quick to dismiss the opinion of AAEM without explaining the respective roles that he plays as a scientist as compared to the role played by physicians who have to treat patients presenting themselves with symptoms now commonly called Electro Hypersensitivity Syndrome (EHS).” (RDCK Final Submission, pp. 30-31)

In RDCK’s view, Mr. Bailey did not delineate the limits of his personal experience and knowledge. (RDCK Final Submission, p. 26)

RDCK further had this to say about Dr. Bailey’s evidence:

“83. Dr. Bailey is a very knowledgeable and experienced scientist, who vigorously defends his scientific opinion. A scientist with a well-honed opinion, however, is not necessarily useful as an expert in a proceeding. An expert witness should provide a proceeding with the range of opinion on the subjects under discussion and then explain, in his or her considered opinion, what appropriate conclusions may be drawn. Suggesting unanimity and/or consensus when such clearly does not exist shows bias, and the weight of that evidence should be lessened by the Commission accordingly.”

...

“90. Expert opinion must offer the full range of possibilities and probabilities and carefully explain why a certain outcome is likely, or unlikely, given all the variables in play. In contrast, Dr. Bailey consistently expressed the opinion that uniformity and consensus existed in the scientific community, when it was so very obvious from listening to the cross-examination of Citizens for Safe Technologies Society expert witnesses that that was not the case.”

...

“94 In regard to Dr. Bailey’s and Exponent’s failure to acknowledge the range of opinion concerning the Hardell and similar studies, Area D respectfully submits that that omission brings into question the overall accuracy of the Exponent Report. Dr. Bailey and the Exponent Report have a bias to the exclusion of other equally valid scientific opinions, that Area D respectfully asks the Commission to consider when weighing Exponent’s opinions.” (RDCK Final Submission, pp. 24-25, 27)

CSTS argues that the evidence of both Dr. Bailey and Dr. Shkolnikov should be given limited weight in the absence of Dr. Erdreich appearing as a witness. CSTS submits:

“Given that the Exponent Report was not independently authored by either Dr. Bailey or Dr. Shkolnikov, their testimony in defence of its contents, in the absence of Dr. Erdreich, must be given limited weight. As well, the report itself should be given limited weight.”

...

“Dr. Bailey’s doctorate is in psychology. He did not go to medical school and has not conducted scientific research into matters in issue. As will be discussed below - under the heading Blind Faith, Dr. Bailey’s evidence was largely deferential to the findings of bodies, such as ICNIRP [International Commission on Non-Ionizing Radiation Protection] and Health Canada, and was void of his own independent analysis on contested matters of scientific opinion. The bodies to which Dr. Bailey defers have, themselves, omitted to publicly disclose any reasoning or analysis behind their positions. As such, the basis upon which Dr. Bailey defers to these bodies is unsubstantiated by his evidence.” [emphasis in original]

...

“...the expert opinion evidence adduced by FortisBC is inferior in weight to the direct medical & scientific expert opinion evidence provided by Dr. Blank, Dr. Carpenter & Dr. Sears, the former of whom has personally conducted his own independent laboratory research on the very matter in issue.”

...

“In cross-examination, Dr. Bailey demonstrated that the Exponent Report itself is void of any substantive analysis on the issue of whether there might be adverse bio-effects at the non-thermal level...” (CSTS Final Submission, pp. 16-17) (footnotes omitted)

In reply, FortisBC notes that several Interveners sought to “carve out” exceptions to Dr. Bailey’s expertise, on the basis of a lack of medical expertise. FortisBC submits that the Commission Panel has already rejected this carve-out, citing Transcript Volume 3, p. 450, lines 1-21.

FortisBC also submits that among the aspects of medical-related background about which Dr. Bailey testified were the following:

- “(a) he has 30 years of training and experience that include laboratory and epidemiologic research, health risk assessments and comprehensive exposure analysis;
- (b) while he does not have a degree in epidemiology, his training has been in the tools that are used by epidemiologists and he has designed and carried out epidemiological studies;

- (c) he received a Ph.D. in neuropsychology, which is also referred to as neurobiology, and involves research with application to health problems. (Dr. Bailey's doctorate is not, as CSTS asserts on page 16, in "psychology");
- (d) he had also earlier taken courses in the medical school and worked in laboratories including biological research laboratories at Michael Reese Hospital and the Illinois State Psychiatric Institute;
- (e) he was awarded a two-year post-doctoral fellowship by the National Institute of Health to take advanced training in neurochemistry, which he did;
- (f) he is part of the Medicine and Biology Society (whose interest or focus is, as its name indicates, medicine and biology) within the IEEE [Institute of Electrical and Electronic Engineers] Subcommittee for Safety Levels with Respect to Human Exposure to Radiofrequency Fields, 3 kHz to 3 GHz;
- (g) he has authored numerous health-related publications and made numerous health-related presentations;
- (h) since 1986 he has been a Visiting Fellow, Department of Pharmacology, Cornell University Medical College;
- (i) he was the Head of the Laboratory of Neuropharmacology and Environmental Toxicology at the Institute for Basic Research in Developmental Disabilities;
- (j) he has lectured at the University of Texas Health Sciences Centre and the Harvard School of Public Health, among others." (FortisBC May 2 Reply, pp. 56-57) [footnotes omitted]

In the Panel's view Dr Bailey demonstrated a comprehensive knowledge and understanding of a wide range of studies that have been conducted within the area of his qualified expertise. As FortisBC notes the issue of the scope of Dr. Bailey's expertise was dealt with by the Panel during the Oral Hearing. His assessment of comparative studies and their interrelation was objective and presented in an understandable way. He exhibited no apparent signs of bias and he was careful to restrict his responses to those areas where he had been qualified to give opinion evidence. He also did not advocate for any particular position. On a number of occasions, when asked rather complex questions in a way that required a yes or no answer, he was careful to qualify his answer. In some cases the qualifications were rather extensive and preceded the yes/no answer, although the Panel finds that in no way undermined the weight to be given to his evidence. The evidence provided by Dr. Bailey was very useful to the Panel. The issue raised by CSTS regarding the absence of Dr. Erdreich is dealt with below.

For these reasons, the Panel gives considerable weight to the evidence of Dr. Bailey.

4.3.2 Dr. Martin Blank

Dr. Blank gave evidence on behalf of CSTS. He was tendered and qualified as an expert to give opinion evidence “as a specialist in physiology and cellular biophysics and specifically the health-related effects of electromagnetic fields” (T9:1664).

Dr. Blank’s education includes a Ph.D. (Colloid Science) Cambridge University, England, Ph.D. (Colloid Science) 1957-1959, a Ph.D. (Physical Chemistry) Columbia University, 1954-1957 and a B.S. Magna Cum Laude (Chemistry), City College of New York, 1950-1954. His curriculum vitae is found in Tab 1F in Exhibit C9-8. Dr. Blank’s experience includes research, and teaching in Electromagnetic field effects on cells (cellular stress response, enzyme reactions, DNA reactions), Membrane biophysics and transport mechanisms (active, passive, excitation mechanisms) and Biopolymers (surface and electrical properties of proteins, DNA).

Dr. Blank’s written evidence is found at Tabs 1C and D of Exhibit C9-8. His written evidence included, as an enclosure, an article he co-authored with Reba Goldman entitled “DNA is a fractal antenna in electromagnetic fields.” That article forms Tab 1E to Exhibit C9-8. Dr. Blank responded to information requests which are found in Exhibit C9-12-6.

Notwithstanding the areas for which Dr. Blank was qualified, he spent considerable time in his evidence and while under cross-examination advancing views based on epidemiology, an area for which he was not qualified (T9:1726). His evidence in this area was also undermined by cross-examination with a negative resulting effect to the weight the Panel attaches to his evidence. An example is his reference to the recent long term study of cell phone base stations in Belo Horizonte, Brazil (Dode *et al.*, 2011), which showed a 13-fold increase in radio frequency (RF) power density from 2003 to 2008 along with a 35 percent increase in cancer deaths near the center of the city where the RF exposure is greatest. When asked under cross-examination why cancer deaths would increase in a five year period in parallel with the increasing RF energy when it can take many years and sometimes decades for cancers to develop, Dr. Blank agreed that the results do not mesh or make sense. He concluded that “there is no good answer” (T9:1684).

Dr. Blank states that he is an academic scientist who conducts *in vitro* work in a laboratory and is firm in his belief and position that *in vitro* studies are an invaluable component in understanding and assessing health risk related to RF radiation. Notably, other witnesses for CSTS, Dr. Carpenter and Dr. Maisch, disagreed with Dr. Blank’s view on *in vitro* studies and thought it was questionable

whether studies of isolated cells could be used to identify adverse health effects in humans and animals (T8:1531,1631-1632,1637; T11:2125).

During cross-examination Dr. Blank was confronted with critiques of his view from WHO, Advisory Group on Non-Ionising Radiation (AGNIR), and IGNIRP (T9:1749-1750). Instead of addressing the critiques, Dr. Blank was dismissive of the qualifications of the scientists that were involved in reaching these conclusions, expressing the view that the “scientific value” of these studies and commentaries was limited. For example, Dr. Blank was presented with an extract on the comparison of using animal and human studies as compared with *in vitro* studies where the WHO is referenced as concluding that *in vitro* studies cannot serve as the basis for health risk assessments in humans (T9:1748). Dr. Blank questioned the accuracy of this conclusion, stating “unfortunately World Health Organization copy is written by humans, and sometimes humans don’t express themselves exactly” (T9:1748).

Dr. Blank made the following comment at the conclusion of his re-examination by counsel for CSTS: “...I appreciate the chance to tell people about this. My role as a professor and teacher, I think has been amply demonstrated. I’ve tried to be-- to not get too emotional in my presentation of my point of view, but I hope I can get across the urgency of my message” (T9:1786).

The weight to be given to the evidence of Dr. Blank was the subject of submissions by both FortisBC and the Intervener CEC. The CEC states: “Dr. Blank’s focus on his studies at the ELF [extremely low frequency] level and his absence of work with RF in the range of the AMI meters severely limits the usefulness of his testimony.” (CEC Final Submission, p. 108) With respect to the Brazil Study, CEC submits that this is evidence that Dr. Blank readily advances advocacy material, which on light questioning he cannot support. CEC further submits that: “Dr. Blank’s evidence should be significantly downgraded in weighting because of his lack of ability to adequately defend it.” (CEC Final Submission, p.108)

FortisBC submits that Dr. Blank has failed to properly consider any opinions or studies contrary to his own in preparing his report, and that his opinion should be given little weight in this proceeding.

The Panel considers Dr. Blank’s evidence to have been more in the nature of advocacy of his position and as such fails to meet the criteria of objectivity. Further, a portion of the evidence he advanced was outside his acknowledged area of expertise as discussed under epidemiology above. Within his area of expertise, when confronted with conflicting opinions by other qualified persons

and organizations, Dr. Blank was quick to discredit the source rather than assist the Panel to understand the differences.

For these reasons, the Panel places little weight on the written evidence and oral testimony of Dr. Blank.

4.3.3 Dr. David Carpenter

Dr. Carpenter gave evidence on behalf of CSTS. He was tendered and accepted as an expert witness qualified to provide opinion evidence as a public health specialist with expertise in electrophysiology, low frequency electromagnetic field bio-effects, and radio frequency and microwave radiation bio-effects (T10: 2069-2070).

Dr. Carpenter's education includes an M.D., Harvard Medical School, Boston, MA 1964 and a B.A., Harvard College, Cambridge, MA 1959. His curriculum vitae is found in Tab 2E of Exhibit C9-8. His experience includes research and education in Ionizing and non-ionizing radiation biology.

His written evidence is found at Tab2B of Exhibit C9-8. His written evidence also includes an article he co-authored with Cindy Sage: "Setting Prudent Health Policy for Electromagnetic Field Exposures" (Exhibit C9-8, Tab 2C). He also responded to information requests (Exhibit C9-12-3.)

FortisBC expressed concern that Dr. Carpenter had been disqualified as an expert witness by the Quebec Board [Régie de l'énergie], and had failed to disclose this (T11:2107).

Further, FortisBC submits that Dr. Carpenter's conclusions regarding the harms posed by AMI meters are made without any reference to, or regard for, the specific level of exposure from the AMI meters. Dr. Carpenter noted that he did not have expertise in exposure levels and was not qualified to comment on the exposure levels from the AMI meters. He provided no scientific reason to disagree that the AMI meters meet the Safety Code 6 limit for both average and peak pulse levels. He does not have the scientific expertise to measure the RF from AMI meters as compared to the standards of the BioInitiative Report 2007. (FBC Final Submission, pp. 174-175)

FortisBC submits that Dr. Carpenter summarizes the references he cites in a manner consistent with his own beliefs, rather than accurately reporting their findings and provides the following illustration at paragraphs 520-521 of its Final Submission:

“...Dr. Carpenter referred to a study by Volkow et al. in support of his theory that cell phone RF alters the metabolism of the brain and various clinical measures in humans at exposure levels below the intensities that cause tissue heating:

Volkow ND, Tomasi D, Wange GJ, Vaska P, Fowler JS, Teland F, et al. 2011. Effects of cell phone radiofrequency signal exposure on brain glucose metabolism. *Journal of the American Medical Association* 305:808-814.: In healthy participants and compared with no exposure, 50-minute cell phone exposure was associated with increased brain glucose metabolism in the region closest to the antenna. This shows direct effects of RF radiation on the brain with cell phone use.”
[underlining added by FortisBC; footnote omitted]

FortisBC submits that the full quote shows that the authors considered the findings in the study much less conclusive:

“Conclusions - In healthy participants and compared with no exposure, 50-minute cell phone exposure was associated with increased brain glucose metabolism in the region closest to the antenna. This finding is of unknown clinical significance.” [underlining added by FortisBC; footnote omitted]
(FortisBC Final Submission, p. 177)

The CEC submits that the evidence submitted by Dr. Carpenter is “of limited assistance in informing the issue.” “Dr. Carpenter’s evidence is unduly weighted in favor of a particular viewpoint and not representative of the body of scientific literature. Such actions typify those of an advocate and are not in keeping with that of an objective contributor to the proceeding. The BCUC should find Dr. Carpenter’s evidence to be of limited value. Certain portions of Dr. Carpenter’s evidence are potentially misleading. Dr. Carpenter is somewhat injudicious in his commentary and is at times disrespectful to organizations which have considerable stature. Several of Dr. Carpenter’s statements are inflammatory and unreasonably dismissive of opinions that are not the same as his, regardless of the credentials of the statute of the decision-maker or the analysis conducted.”⁵

The CEC is of the view that the references cited by Dr. Carpenter were “decidedly weighted” in favour of one viewpoint. In support of this view, the CEC provided the following analysis: “Dr. Carpenter cited a total of 59 studies of which 43 were supportive of their being a negative effect

⁵ CEC Final Submission, pp. 92-93

(73%), 14 were not supportive (24%) and 2 were inconclusive. Of the 14 that were not supportive, Dr. Carpenter cited 5 with caveats. Dr. Carpenter did not provide any caveats with respect to the 43 supportive documents.”

The CEC further submits that some of the information provided as reference material without caveat by Dr. Carpenter is not necessarily well-respected and has been found to be implausible. For example. Dr. Carpenter cites reference item (g) “Mortality by neoplasia and cellular telephone base stations in the Belo Horizonte municipality, Minas Gerais state, Brazil by Dode AC et al without caveat and characterizes it as showing higher rates of death from cancer among individuals living close to cell towers than among those living further away. Rates were highest in residences less than 1 00 m, falling to near background a 1,000 m. This report has been subject to considerable critique and one of the other witnesses, Dr. Blank recognized that the results did not make sense.” (T9: 1681-1685) (CEC Final Submission, pp. 92-94)

CTCS submits “the expert opinion evidence adduced by FortisBC is inferior in weight to the direct medical & scientific expert opinion evidence provided by Dr. Blank, Dr. Carpenter & Dr. Sears the former of whom has personally conducted his own independent laboratory research on the very matter in issue” (CSTS Final Submission, p. 17)

The Panel has significant concerns about Dr. Carpenter’s testimony. Of particular concern is that Dr. Carpenter, in the words of FortisBC, “summarizes the references he cites in a manner consistent with his own beliefs, rather than accurately reporting their findings.” (FortisBC Final Submission, p. 177; T11:2091-2099) The Panel is also concerned with Dr. Carpenter’s reference to studies that suit his views and his inability to properly defend them as exhibited by the Belo Horizonte municipality study example.

In his attempt to summarize the references, Dr. Carpenter adopted a less than objective and fully informed approach. For this reason, the Panel gives little weight to his evidence.

4.3.4 Dr. Isaac Jamieson

Dr. Jamieson gave evidence on behalf of CSTS. Dr. Jamieson was tendered and accepted as an expert witness to provide opinion evidence as “as an environmental scientist with expertise in environmental health, in particular expertise in exposure to radio frequency emissions and the environmental health implications of same.” A caveat was placed on his expertise noting that he

was not an expert on the law. (T10:1918)

Dr. Jamieson's education includes a Ph.D. Environmental Science Imperial College London 2008. His Ph.D thesis "investigated the effects of different types of electromagnetic phenomena on the built environment and suggested ways in which environments could be made more biologically sustainable." He also holds a Diploma in Advanced Architectural Studies, Robert Gordon University, Aberdeen 1988, and a B.Sc. Architecture, Robert Gordon University, Aberdeen 1986. Dr. Jamieson is a Chartered Architect. His detailed curriculum vitae is found in Exhibit C9-10-2. His work experience includes research, writing and organizing conferences on electromagnetic phenomena and health and he has been a stakeholder or committee member on a number of UK and European groups dealing with EMF issues.

Dr. Jamieson provided an extensive report entitled "Comments on Health, Human Rights, Environmental and Security Concerns" which is marked as Exhibit C-10-1.

With regard to Dr. Jamieson's evidence on Human Rights, the Panel notes the caveat placed on his expertise noting that he was not an expert on the law, and therefore no weight is given to this portion of his evidence.

With regard to Dr. Jamieson's evidence on security, the Panel notes that Dr. Jamieson has authored papers on the impact of cold weather on smart meters and the potential impact of electromagnetic pulses (EMPs) on smart meters. Dr. Jamieson was not tendered or accepted as an expert on security and for this reason no weight is given to this portion of his evidence.

In the area of health and environmental matters, Dr. Jamieson provided a great deal of information, including references to, and discussion of, a number of studies. In response to information requests and to questions during cross-examination, Dr. Jamieson admitted that many of the studies he refers to or discusses in his evidence either lack in scientific rigour, such as self report studies, or have potential deficiencies such as the likelihood of confounding factors. Dr. Jamieson repeatedly responded that the studies did indicate that future research was warranted under more carefully designed conditions. Dr. Jamieson, when challenged with the proposal that not all studies indicate that there is a link between EMF exposures and negative health effects, responded: "Indeed. Basically the approach I've taken with regards to writing the document is to raise awareness of studies where it's been indicated there may be a cause for concern so that debate can be opened with BCUC ..." (T10:2008).

In choosing a particular subset of studies in order to open debate with the Commission, Dr. Jamieson strayed from providing objective expert evidence to assist the Panel, into the role of an advocate in support of a particular position.

Given the deficiencies as noted above in many of the studies that Dr. Jamieson relied on to reach conclusions in his report, and his admitted practice of deliberately choosing studies that advocate a particular position, the Panel places little weight on this portion of Dr. Jamieson's evidence.

4.3.5 Dr. Donald Maisch

Dr. Maisch gave evidence on behalf of CSTS. He was tendered and qualified as an expert to give opinion evidence in health standards relating to exposure to electromagnetic radiation (T8:1504).

Dr. Maisch's education includes a Ph.D., University of Wollongong, NSW, Faculty of Arts, Science, Technology and Society Program, 2009. His Ph.D thesis was entitled "A Procrustean Approach: Setting Exposure Standards for Telecommunications." His curriculum vitae is found in Tab 4E of Exhibit C9-8. His experience includes consulting on Exposure to Electromagnetic Fields, EMF standards and related health issues.

His written evidence is found at Tab 4C of Exhibit C9-8. His written evidence also includes his doctoral thesis (Exhibit C9-8, Tab 4D). He also responded to Information Requests

Dr. Maisch acknowledges that AMI meter emissions are far below the human exposure limits in Safety Code 6 but suggests a novel theory, relating to "extremely brief transient emissions", for potential human health issues from advanced meter RF. Fortis BC submits that this theory is beyond Dr. Maisch's qualification to give opinion evidence in this proceeding. Dr. Maisch admitted that it was outside his area of expertise. His theory is highly speculative and, as Dr. Maisch's citing of anecdotal sources suggests, unsupported by scientific research on adverse health effects. Dr. Maisch admits that his only evidence of such effects is "basically discussions with people who are involved in the issue." (FortisBC Final Submission, pp. 192-193)

With regard to Dr. Maisch's submission regarding conflict of interest in standard setting, FortisBC noted that he is also the principal of EMFacts Consultancy. Its consulting work consists mainly of surveys for people who have health complaints and want to check out magnetic fields, and advising

of ways to reduce exposure. Essentially Dr. Maisch's consulting livelihood depends upon public fears or concerns about RF exposure. (FBC Final Submission, p. 193)

The CEC submits that Dr. Maisch's qualifications as an expert in 'health standards relating to exposure to electromagnetic radiation' are limited to identifying the jurisdiction of health organizations setting standards electromagnetic radiation and their role in public policy. CEC recommends that the Commission accept Dr. Maisch's evidence with respect to the jurisdiction and credentials of Health Canada and reject his evidence on most other subjects as being inadequately researched or outside his area of expertise. (CEC Final Submission, p. 99)

The Commission Panel agrees with the CEC that the Commission accept Dr. Maisch's evidence with respect to the jurisdiction and credentials of Health Canada and that other evidence presented by Dr. Maisch should be "limited to identifying the jurisdiction of health organizations setting standards electromagnetic radiation and their role in public policy." (CEC Final Submission, p. 99)

The Panel finds merit to FortisBC's argument that "Dr. Maisch's consulting livelihood depends upon public fears or concerns about RF exposure" (T8:1562-1564). In the Panel's view this was reflected in Dr. Maisch's testimony. The Panel notes that while Dr. Maisch was critical of both Health Canada's Safety Code 6 and FortisBC's proposed AMI meters, his Report was based on the 1999 version of Safety Code 6 (T8:1535) and he was not familiar with the proposed meters (T8:1573).

For these reasons, the Panel assigns only limited weight to the testimony of Dr. Maisch. The Panel is not able to assign any weight to the thesis advanced by Dr. Maisch concerning extremely brief transient emissions because the evidence presented in support of the theory is anecdotal.

4.3.6 Dr. Margaret Sears

Dr. Sears gave evidence on behalf of CSTS. She was tendered and qualified as an expert to give opinion evidence "as a researcher and author of scientific literature with expertise in the scientific body of material relating to the health effects of electromagnetic fields, including radio frequency emissions" (T9:1804-1805).

Dr. Sears' education includes a Ph.D., McGill University 1985. Her Ph.D. thesis was titled "Effects of growth conditions on biosorption by *Rhizopus* biosorbents." A Masters of Chemical Engineering, McGill University 1981. Her Masters thesis was titled "Measurement and mathematical modelling

of biosorption of uranyl ion by biomass of the mould *Rhizopus arrhizus*”, and a Bachelors of Applied Chemistry and Chemical Engineering, with Honours, University of Toronto 1979. Her curriculum vitae is found in Tab 7C in Exhibit C9-8.

Dr. Sears’ experience includes research, education, consulting and writing on health and medicine, epidemiology and toxicology, chemistry, ecology, biology and chemical engineering and topics related to environmental health. Her written evidence is found in Tab 7B in Exhibit C9-8.

Dr. Sears seemed to rely on conversations with others with whom she deals who are treating people. This is evident in one of Dr. Sears’ statements on this point: “It’s really hard in this world today to be avoiding all wireless signals, but there are some people who are very affected by them. Apparently. According to the physicians that I work with” (T9:1807). In the Panel’s view, this is not a sound basis upon which to draw conclusions.

Dr. Sears concedes that EHS is not a disease or condition that is, at this point, specifically included in the (Diagnostic and Statistical Manual of Mental Disorder, Fourth Edition) DSM 4 (T9:1835).

In considering Safety Code 6, Dr. Sears is critical of the Code because it is not designed to avoid all biological effects as in the standard in Russia. (Exhibit C9-8, Attachment 7B, pp. 8-9, 20). When asked on cross-examination whether she had any basis for disagreeing with Dr. Shkolnikov’s conclusion that the AMI meter which FortisBC proposes to use would meet even the Russian standard, Dr. Sears deferred to Dr. Shkolnikov’s opinion. She testified: “[t]he standard as it’s laid out is very clear, and I can’t disagree with Dr. Shkolnikov, because he’s really the expert” (T9:1832).

Dr. Sears cites research by others and at times makes statements that support her view with no substantiating facts. As an example, she testified:

“I have not measured them, but I actually have an Itron meter on my house, because this has happened in Ontario, and I know it’s perhaps -- well, it’s relevant in terms of exposure, but the internet providers here are having a great deal of difficulty because of the interference from these meters. And in fact I was told today that some are going out of business because they can’t provide service as a result of the interference since these meters have been installed. And I have not measured them, but I’ve heard recently that there is a lot of problems that way.

So if there is enough exposure to interfere with internet service, then perhaps it's significant." (T9:1850)

CSTS makes numerous references to Dr. Sears' evidence in its Final Submissions. They relate primarily to the Precautionary Principle, transparency of Health Canada's analysis, the effect of RF and the flaws in Safety Code 6 with respect to non-thermal effects. (CSTS Final Submission, pp. 11, 29, 35, 47)

CEC recommends that the Commission find Dr. Sears' information to be biased in its selection of information and presentation and as such, is evidence of one viewpoint and of limited weight. CEC also recommends that Dr. Sears' analysis of the strength of the radio frequency signal is beyond the scope of her credentials. In reviewing the information provided by Dr. Sears, CEC finds significant bias in the examples cited, substantial gaps in the evidence discussed and inaccurate portrayals of medical opinion. In CEC's view, the evidence presented was clearly one-sided and intended to advocate rather than inform. CEC recommends that the Commission attribute little weight in Dr. Sears' analysis except with respect to the lack of time and resources available to conduct proper analyses. (CEC Final Submission, p. 106)

FortisBC submits: "It is also evident from Dr. Sears' publications and work history that her predominant interests relate to pesticides and toxic metals, not EMF" (FortisBC Final Submission, p. 197). The Panel agrees with FortisBC.

The two areas where Dr. Sears offers an expert opinion that could be helpful to the Commission are Electromagnetic Hypersensitivity (EHS) and a perspective on Safety Code 6 in both cases as a researcher rather than a medical specialist. However, Dr. Sears' evidence on the connection between electromagnetic hypersensitivity syndrome and RF emissions was weakened by her reference during cross-examination to a conversation with her neighbour, who reported getting headaches from his cell phone and the conclusion she appeared to draw from that conversation (T9:1811). This is not the only anecdotal evidence tendered by Dr. Sears. However, the Panel is unable to give weight to evidence that does not have a scientific basis.

While it does not consider Dr. Sears to have adopted the role of an advocate in her evidence to the extent of Dr. Jamieson, the Panel does consider Dr. Sears to have a bias towards the justification of "curtailing and modifying our increasing reliance upon wireless communication" (Exhibit C9-8, Tab 7B, p. 21). Overall, Dr. Sears contributed very little to the Panel's understanding of the matter

before it. Considering her narrow field of expertise related to this matter and the concerns cited above with respect to her expert evidence, the Panel attributes little weight to Dr. Sears' evidence.

4.3.7 Dr. Yakov Shkolnikov

Dr. Shkolnikov gave evidence on behalf of FortisBC. He was tendered and qualified as an expert to give opinion evidence in the fields of electromagnetic exposure, electromagnetic interference and engineering physics, including the physics of electromagnetic fields, which includes radio frequency fields (T3:451). He also provided assistance to FortisBC in responding to certain information requests.

Dr. Shkolnikov's education includes a Ph.D. in Electrical Engineering (minor in Mechanical Engineering), Princeton University (2005), an M.A. in Electrical Engineering, Princeton University, 2004 and a B.S. Engineering Physics, Cornell University, 1999. His curriculum vitae is found in Exhibits B-11⁶ and B-32.

Dr. Shkolnikov's experience includes the development and analysis of high performance electronic devices, software, and communication systems, evaluation and testing systems that produce or communicate via electromagnetic signals as well as analysis and exposure assessments of devices and systems including smart meters.

Dr. Shkolnikov is one of the three co-authors of the Exponent Report that provides a summary report on the status of research related to radiofrequency exposure and health.

CSTS states that Dr. Shkolnikov is an electrical engineer and claims no medical expertise (CSTS Final Submission, p 16).

The Panel is satisfied that Dr. Shkolnikov is sufficiently experienced in the subject matter he responded to. Dr. Shkolnikov provided information in his area of expertise that was very useful to the Panel. The Panel notes that Dr. Shkolnikov was careful to restrict his responses to those areas where he had been qualified to give opinion evidence. He was very thorough in his responses and exhibited no apparent signs of bias. He also did not advocate for any particular position. In responding to questions that were often of a very technical nature, Dr. Shkolnikov demonstrated

⁶ CSTS 1.23.4.

his depth of knowledge and his expertise and articulated his responses in a manner that both directly responded to the questions put to him and put the answers in a form that was readily understandable for parties not as scientifically conversant as Dr. Shkolnikov.

Given the nature of his responses under cross-examination and his education and experience, the Panel gives considerable weight to the evidence of Dr. Shkolnikov.

4.4 Individuals Filing Evidence but not Cross-Examined

4.4.1 Mr. Curtis Bennett

Mr. Bennett appeared and provided evidence on behalf of WKCC. He was not cross-examined at the Oral Hearing. Mr. Bennett's education includes Interprovincial Journeyman Electrician (Red Seal), Building Construction Engineering Technologist. He did not file a curriculum vitae. Mr. Bennett is associated with Thermografix Consulting Corporation.

Mr. Bennett does not claim to have any academic credentials or degrees in the fields of medicine, the health sciences, molecular biology, or geology and admits he is not a physician or registered professional engineer (Exhibit C19-13, WKCC 1 1.1 - 1.4).

Mr. Bennett actively participated in the Proceeding by filing evidence, delivering and responding to information requests, speaking at the Trail Community Input Session, cross-examining FortisBC's witness panels and making a Final Submission.

The Commission Panel acknowledges Mr. Bennett's participation in the Proceeding. Mr. Bennett has no prior experience with a proceeding of this nature, and the Panel appreciates Mr. Bennett's interest and efforts in this proceeding.

Mr. Bennett's evidence was not tested in cross-examination, although there was discussion of some of it in the cross-examination of the FortisBC Health Panel. In particular, Dr. Shkolnikov and Dr. Bailey refuted many of Mr. Bennett's theories including the following:

- (a) RF electro-magnetic fields from the AMI meters will "break DNA" (T6: 1139);
- (b) RF fields will cause electrical failure in the body (T6:1141);

- (c) AMI meters will cause a charge to develop within the AMI Project coverage area which could cause an explosion or fire in volatile areas (T6:1218);
- (e) AMI meter RF emissions will cause high-speed vibration of buildings or lead to B.C. Building Code violations or building collapse (T6: 1186); and
- (f) RF interferes with animals such as birds and bees which make use of the Earth's magnetic field (T6: 1214).

FortisBC describes Mr. Bennett as “a lay advocate and not an expert witness. While Mr. Bennett has an electrician’s knowledge of electrical systems, it is clear that he is unqualified to give expert opinion evidence on the health effects of RF, exposure standards for RF, engineering, physics, or geological phenomena such as earthquakes” (FortisBC Final Submission, p. 159).

The Panel agrees with FortisBC’s evaluation of Mr. Bennett’s qualifications related to the matters in this Proceeding and considers Mr. Bennett’s evidence to be of limited value. No weight is assigned to it.

4.4.2 Mr. Jerry Flynn

Mr. Flynn appeared, provided evidence and participated actively throughout the Hearing. He did not represent a particular group. He was not cross-examined at the Oral Hearing.

Mr. Flynn’s education is not documented in a curriculum vitae format. He states “I have no degrees in the fields of medicine or the health sciences; I am not a physician; I have never had any clinical experience with patients; I am not a registered professional engineer” (Exhibit C6-13). Mr Flynn further states “I am a retired Canadian Armed Forces Captain who spent most of my 26-plus year military career in a “special” branch of wireless radio operations in which I became expert in most matters related to wireless radio communications, electronic warfare (EW) and signals intelligence (SIGINT) operations. My most relevant appointments included: two years as the Executive Officer (2-i/c) and Operations Officer of one of Canada’s largest “special” radio stations. Following that, I was posted to National Defense Headquarters, for another two years, in the Directorate of Electronic Warfare (DEW) as Staff Officer EW, charged with supporting Canada’s Land EW squadron in Kingston, ON. During the latter posting, I successfully completed a NATO Army EW Officers course in Anzio, Italy, following which I participated in a NATO-wide Army EW exercise in Germany” (Exhibit C6-1, p. 1).

Mr. Flynn filed evidence, spoke at the Kelowna Community Input Session, delivered and responded to information requests, cross-examined the FortisBC witness panels and filed a Final Submission.

Mr. Flynn demonstrated a passion for the concerns he holds. The Panel listened to and considered his submissions and his participation is appreciated.

In terms of formal qualifications, other than perhaps Mr. Flynn having an understanding of the terminology and science unique to RF communications, the Panel sees little evidence that the overlap between Mr. Flynn's military career and the issues under consideration was helpful in determining the issues specific to this hearing.

Frequently the Panel found the evidence provided by Mr. Flynn to be incorrect, exaggerated and/or unsubstantiated bringing into question the reliance to be attributed to it. Examples include:

1. "Austria's Salzburg Health Dept. recommends Limits of **0.001** uW/cm² for outdoors and **0.0001** uW/cm² for indoor exposure; (i.e., **1 million to 10,000,000 times** lower/safer than Canada's current Safety Code 6 Exposure Limit)!" (Exhibit C6-4) [Emphasis in original]

"Austria's Exposure Limit for 1800 MHz is 10,000 times lower (SAFER) than is Canada's!" (Exhibit C6-10, p. 1). [Emphasis in original]

"It is also very important that BCUC clearly understands that there currently exists an enormous chasm between Health Canada's, the WHO's and ICNIRP's "RF" Exposure Limits for 1800 MHz Range and those of the "safest" country in the world – Austria. Austria permits an Exposure Limit of just 1,000 uW/m²" (Flynn Final Submission, p. 2). [Emphasis in original]

This matter is further clarified and corrected by FortisBC in its Reply Submission and by Dr. Jamieson in response to a FortisBC IR (Exhibit C9-10-1, p. 47). In its May 2 Reply FortisBC had this to say, in part, about Mr. Flynn's evidence:

"102. Mr. Flynn refers to a limit in Austria. He may be referring to a limit in Salzburg, a particular region within Austria that does not have authority over matters related to limits for RF exposure.

103. In any event, even the Salzburg limits would be met by the proposed advanced meters. Dr. Shkolnikov noted that "Salzburg which matches Bioinitiative 2007 number, under those guidelines you would -- the Fortis AMI

smart meters would actually still fall below that level..." [footnotes omitted]
(FortisBC May 2 Reply, p. 41).

The FortisBC IR asked:

"In Table 2.2 of Dr. Jamieson's Report he has included Salzburg, an Austrian state. Please confirm that the Austrian constitution has assigned sole authority to the federal parliament for matters related to limits for exposure of radio frequency and that the enforcement of these laws are also exclusive to their federal government.

Confirmed. Telecommunications issues like frequency management, licensing, standards etc., are a federal issue with federal regulations applying to the whole of Austria. The Telecommunications Ministry (BMVIT) applies ICNIRP guidelines." (Exhibit C9-13-2, FortisBC 1.8.16.3)

2. Understandably, neither Fortis nor any other electric utility wants us to know that every Smart Meter contains two, separate microwave transmitter/receiver circuits: a LAN (local area network) and a "Zigbee." Nor do they want us to know that they envisage every home eventually having 15-or-so "smart" appliances, each appliance having its own built-in wireless pulsing microwave transmitter that will be controlled by the Smart Meter's ZigBee transmitter and receiver radio circuit. (Exhibit C6-10, p. 2)

The Panel notes that the Application is clear about the presence of two, separate transmitters and makes specific reference to Zigbee technology and the interaction with what Mr. Flynn refers to as smart appliances (Exhibit B-1, pp. 43, 44). Appendix 5 of the Application states "Advanced meters utilized by FortisBC, provided by Itron, Inc., incorporate two radios. The first radio, called RF-LAN, operates in the frequency range of 902 Megahertz (MHz) to 928 MHz. Its purpose is to communicate the power usage at the residence by radiofrequency (RF) signals back to FortisBC. The second radio, called Zigbee, operates in the frequency range of 2,400 MHz to 2,484 MHz. This radio provides consumers, if they wish, with a way to interact with compatible appliances in the home and to read out the appliances' respective contribution to overall household power use" (Exhibit B-1, Appendix 5, p. 42).

Mr. Flynn states when filing his PowerPoint presentation on this electromagnetic radiation (EMR), smart meter, meshed-grid subject "... I have assumed the role of 'messenger' not the 'expert'." (Exhibit C6-10, pp. 1, 3)

FortisBC asserts that Mr. Flynn is a passionate advocate, unwavering in his belief that electro-magnetic radiation and wireless AMI meters are “The Worst Threat to our Health Personal Privacy Democracy and National Security in Canada’s Entire History.” He relies upon any negative information regarding EMF and wireless advanced meters without regard to the reliability of the source. Further, many of the sources he referred to in cross-examination related to the state of scientific research in the 1970s or earlier. These are unhelpful given that there has been extensive research into RF health effects in the years since. Mr. Flynn’s evidence should be given little or no weight (FortisBC Final Submission, p. 184).

The Panel is of the view that throughout the Proceeding Mr. Flynn demonstrated that he was an advocate. A considerable amount of the evidence he submitted was questionable and from untested or unreliable sources. His qualifications are not considered by the Panel to be relevant and Mr. Flynn admitted he is not an ‘expert’. For these reasons, the Panel assigns little to no weight to the evidence provided by Mr. Flynn.

4.4.3 Dr. Girish Kumar

Dr. Kumar was retained by CSTS. He did not give evidence at the Oral Hearing.

Dr. Kumar’s education includes a Ph.D. (Electrical Engineering), I.I.T. Kanpur, India, 1983, and a B.Sc. (Electrical Engineering), A.M.U. Aligarh, India, 1978. His curriculum vitae is found at Tab 3D of Exhibit C9-8. His experience includes research, education and business in the broad area of microwaves and antennas.

He has no medical or epidemiology qualifications nor does he appear to have completed any formal study or research in health or environmental matters, although he may have an interest in the area. His written evidence is found at Tabs 3B, 3C and 3E to G of Exhibit C9-8. He responded to information requests.

FortisBC states “he makes a few health-related statements in his filing, this is obviously outside the area in which he is qualified, given that his degrees and academic work are specifically in electrical engineering and that there is no health-related reference in his noted ‘areas of interest’ on his resume” (FortisBC Final Submission, p. 190). He confirmed during information requests that he does not have any academic qualifications or degrees in the area of health sciences, and that he is not a biological scientist (Exhibit C9-13-4 , CSTS 1 3.3.1-3.3.2).

FortisBC submits that Dr. Kumar does not have the necessary qualifications to provide any evidence with respect to the impact of AMI meters on the environment, stating “Dr. Kumar’s academic qualifications were obtained only in the area of electrical engineering” (FortisBC Final Submission, p. 208). In support of this assertion, it cites a particular question posed and the response which FortisBC argues draws into question Dr. Kumar’s qualifications on environmental matters:

“609. ...he was asked to confirm whether he was submitting the sections of the Cell Tower Report dealing with adverse effects on birds, animals and the environment as an expert report in this proceeding. He responded by stating:

I am not expert as a biological or health scientist but I can read English and acquired knowledge by going through several hundreds of scientific/technical papers, and references of nearly 200 papers have been given. Please question the competence of all these researchers who wrote these papers and also question the competence of all journals/conferences, who published them.”

(Exhibit C9-13-4, CSTS 1 3.3.2; FortisBC Final Submission, p 208)

The Panel notes that CSTS did not refer to or rely on Dr. Kumar’s evidence in its Final Submission.

The Panel does not consider Dr. Kumar’s education and experience relevant to the matters under consideration in this hearing and also note the absence of any referral or reliance on the evidence of Dr. Kumar by CSTS. For these reasons the Panel attaches no weight Dr. Kumar’s evidence.

4.4.4 Robert McLennan

Robert McLennan gave evidence on behalf of RDCK. He did not give evidence at the Oral Hearing. Robert McLennan’s education includes a B.Sc. degree and MBA Simon Fraser University 1994, Certified Wireless Network Administrator 2005, Microsoft Certified Systems Engineer and C.N.E. Certified Novell Engineer designations in Computer Networking in 1996. His curriculum vitae is found in Exhibit C13-1.

Mr. McLennan’s experience includes Avionics, advanced avionics development and testing, Global Positioning System development, Design and maintenance of HF, HF-SSB, VHF-FM (Very High Frequency), Mobile and Fixed communications systems and wireless networking. He is conversant with electronics communications and navigation systems from 150-1720 Khz ADF to 12 Ghz radar.

RDCK indicated that it intends to call Mr. Robert McLennan, former President of Kaslo information Network (KiN), as an expert witness who will give evidence that the wireless technology chosen by FortisBC is incompatible with certain Wi-Fi, ham radio, cordless phones, baby crib monitors, etc. wireless equipment (all using the same non-licensed 900 Mhz frequency band). Mr. McLennan will conclude by explaining that since this wireless technology is so dated, it is likely that it will have to be changed out within the next few years at great expense to FortisBC customers, who will in effect have to pay capital costs twice in as many years. (Exhibit C13-5)

Mr. McLennan filed evidence titled: “Smart Meters and the 21st Century” (Exhibit C13-19). Through February 2013, Mr. McLennan was unavailable to respond to information requests due to health problems. On February 27, 2013, the Commission was advised by RDCK that Mr. McLennan is unable to answer most questions due to ongoing illness (Exhibit C13-34).

Mr. McLennan did not participate further in the Proceeding. Mr. McLennan’s evidence was not tested through information requests or cross-examination.

For these reasons the Panel ascribes no weight to it.

4.4.5 Dr. Karl Maret

Dr. Maret was retained on behalf of CSTS. He did not give evidence at the Oral Hearing and his qualifications relative to the matters under consideration in this hearing have not been established.

Dr. Maret’s education includes a Post-Doctoral Fellowship in Pulmonary Physiology, School of Medicine, University of California San Diego, 1978-1982, a Doctor of Medicine, University of Toronto, 1973-1979, a B.Sc. in Electrical Engineering, Queen’s University, Kingston and Ontario, 1967-1969, and an Engineering Diploma, School of Engineering, Memorial University, St. John’s, 1964-1967. His curriculum vitae is found in Exhibit C9-8, Appendix F of Tab 5C.

Dr. Maret’s experience includes research, education and consulting in energy medicine instrumentation and complementary and alternative medicine.

Dr. Maret's written evidence is entitled "Commentary on Questions by David M. Aaron Esq. associated with FortisBC Inc, Application for a Certificate of Public Convenience and Necessity for the Advanced Metering Infrastructure Project-Project No. 3698682." It forms Tab 5C in Exhibit C9-8. As the title of his evidence suggests, it is provided in the form of comments on a number of specific pieces of evidence filed by FortisBC. A number of these responses were of a detailed technical nature. Unfortunately, Dr. Maret was unable to respond to information requests or to be available for cross-examination due to health problems.

In its Final Submission, FortisBC argues that because Dr. Maret was unavailable for cross-examination and unable to respond to information requests, his evidence is untested and should be given little or no weight.

Dr. Maret's education and experience suggests that he has the background to have provided meaningful input to the Proceeding. His written evidence contains detailed information some of which, such as his comparison of emission standards in a variety of countries, was recognized as useful by other parties to the Proceeding. However, given Dr. Maret's inability to respond to information requests or to be available for cross-examination, the Panel accordingly gives little weight to Dr. Maret's evidence.

4.4.6 Dr. Timothy Schoechle

Dr. Schoechle was retained by CSTS. He did not give evidence at the Oral Hearing.

Dr. Schoechle's education includes a Ph.D. in Communications School of Journalism and Mass Communication, University of Colorado, Boulder, 2004, a MS in Telecommunications: Interdisciplinary Telecommunications Program, University of Colorado, Boulder, 1995, and a B.Sc. in Administrative Science, School of Management, Pepperdine University, Malibu, CA, 1973. His curriculum vitae is found at Tab 6C of Exhibit C9-8.

Dr. Schoechle's work experience lies primarily in research, education, and consulting in standardization, innovation, and intellectual property rights.

His written evidence is found at Tab 6B of Exhibit C9-8. It is in the form of a paper he had prepared for the National Institute for Science Law and Public Policy entitled "Getting Smarter About the Smart Grid."

Dr. Schoechle, while making comments in his paper on health, environment, safety and privacy issues associated with smart meters, does not appear to have personal expertise in any of these areas. In response to information requests, Dr. Schoechle demonstrated that he was not aware of the specifics of the FortisBC advanced metering infrastructure proposed in the Application or of the role and policies of regulators in British Columbia and Canada. (Exhibit C9-14, CEC 7.6-7.7; Exhibit C9-13, FortisBC 6.7, 6.8)

CSTS does not rely on the evidence of Dr. Schoechle in its Final Submission.

Given Dr. Schoechle's educational background and experience and his lack of knowledge of the specifics of the Application, the Panel finds that no weight can be given to Dr. Schoechle's evidence.

4.5 Adverse Inference

As noted in Section 3.5, the Panel heard from seven expert witnesses at the Oral Hearing. Dr. Erdreich, one of the joint authors of the Exponent Report, was not available to attend the Oral Hearing. CSTS submits that an adverse inference should be drawn against FortisBC for its failure to call Dr. Erdreich. The two areas in which CSTS invites the Commission to draw an adverse inference are:

- (a) Whether Dr. Erdreich, under oath, would have continued to stand by the contents of the Exponent Report; and
- (b) Whether Dr. Erdreich's testimony would have been supportive of FortisBC's position on health issues.

CSTS argues that although Dr. Erdreich was in Israel, FortisBC could have made her available for cross-examination by way of Skype and/or video conferencing in the same way that CSTS made its witnesses available (CSTS Final Submission, pp. 14-16).

FortisBC responds that no such inference is necessary in the circumstances as both Dr. Bailey and Dr. Shkolnikov were cross-examined extensively on the Exponent Report. Further, it submits that FortisBC answered extensive IRs from multiple interveners on the contents of the report and counsel advised the Panel that Dr. Erdreich was unavailable because she was attending to family

matters in Israel. In addition, FortisBC submits that the testimony of Dr. Erdreich “would be of no further assistance to the Commission given the testimony of Dr. Bailey and Dr. Shkolnikov.” FortisBC submits that Dr. Bailey’s evidence:

“... is superior to that of Dr. Erdreich in that he directed and supervised the Exponent Report...he was the project director and involved in pulling together the information for the Exponent Report. He requested two of his colleagues, Dr. Shkolnikov and Dr. Erdreich, to provide input to that report. The work was entirely undertaken under Dr. Bailey’s direction and supervision.”

(FortisBC May 2 Reply, pp. 52-53)

The drawing of an adverse inference is a matter of discretion. As stated in Sopinka, Lederman & Bryant (Third Edition at p. 377):

“In civil cases, an unfavourable inference can be drawn when, in the absence of an explanation, a party litigant does not testify, or fails to provide affidavit evidence on an application, or fails to call a witness who would have knowledge of the facts and would be assumed to be willing to assist that party. In the same vein, an adverse inference may be drawn against a party who does not call a material witness over whom he or she has exclusive control and does not explain it away. Such failure amounts to an implied admission that the evidence of the absent witness would be contrary to the party’s case, or at least would not support it.”⁷

The Panel notes that Dr. Erdreich was a co-author of the Exponent Report and Dr. Bailey was the Project Director and accepted responsibility for the Exponent Report. There was extensive cross-examination of both Dr. Bailey and Dr. Shkolnikov by CSTS and others, and their ability to respond did not appear to be compromised by the absence of Dr. Erdreich. Further, FortisBC answered a substantial number of IRs on the Exponent Report. The Panel also accepts FortisBC’s explanation for why Dr. Erdreich was not available.

For the reasons described, the Panel is not prepared to draw an adverse inference against FortisBC for its failure to call Dr. Erdreich.

⁷ Alan W. Bryant, Sidney N. Lederman and Michelle K. Fuerst, eds., *Sopinka, Lederman & Bryant: The Law of Evidence in Canada*, 3rd ed. (Markham, Ontario: LexisNexis Canada, 2009).

5.0 PROJECT NEED

As previously discussed, the Commission must only give its approval if it finds the proposed project is “necessary for the public convenience and properly conserves the public interest” (UCA, s. 45(8)).

FortisBC states that the primary need for the Project is to more efficiently manage electricity usage and associated costs by:

- 1) Enabling customers to make informed decisions about electricity consumption leading to conservation and more efficient use of energy.
- 2) Enabling the Company to:
 - a. Improve the quality and timeliness of information gathered from and provided to customers
 - b. Manage the cost of electricity from “recovery and deterrence of a portion of the estimated \$3.7 million in annual lost revenue due to electricity theft...”
 - c. Make “future system operation and enhancement decisions that will increase the efficiency of service provided to customers, including an improved ability to address outages experienced by customers.” (Exhibit B-1, p. 6)

FortisBC further submits the Project:

- 1) is consistent with British Columbia’s energy objectives;
- 2) is consistent with the Company’s long-term vision and provided for in the most recent long term resource plan (Exhibit B-1, p. 32);
- 3) provides other benefits (financial and non-financial) (Exhibit B-1, p. 17);
- 4) addresses the need to replace the existing meter population due to new Measurement Canada Compliance regulations and manufacturing and support being gradually eliminated for electro-mechanical meters (Exhibit B-1, pp. 17-18); and
- 5) will permit, through the transition to advanced meters as the standard form of metering, more detailed, electricity usage information to be made available to customers through a FortisBC online, web portal as well as through optional IHDs. These tools can be used by customers to obtain detailed information about their overall usage and consumption habits, helping them to better understand their bills and manage their consumption. Increased awareness and access to more information has proven an effective tool that allows customers to modify their usage habits in an effort to lower their bills and save energy as detailed in the Navigant report provided as Appendix C-1. As part of its 2012 Long Term Resource Plan, FortisBC has included estimated savings of 2.3 GWh beginning in 2015 and

increasing to 8.9 GWh by 2025 related to the behavioural changes enabled by the FortisBC online web portal (Exhibit B-1, p. 32).

FortisBC states that given customer concerns regarding rising electricity rates, the rate-mitigating effect of the Project underscores that the Project is in the public interest (Exhibit B-1, p. 18).

FortisBC also submits that the need and benefits of the Project are highly interconnected (FortisBC May 2 Reply, p. 13).

The Commission heard comments that challenged the need for the advanced meters. These included:

- “Would you accept that I am 77 years of age, I’ve lived all over this country in many many homes, all I’ve ever wanted from my utility was they give me a bill at the end of the month. Why is it suddenly I need this stuff?” (T7:1344)
- “I believe households can use electricity responsibly without the devices of the smart meter program and use electricity at off peak periods without the smart meter.” (CIS T1(Trail):25-26)
- “Fortis also states immediate detection of power outages, therefore allowing for more effective restoration of electricity to customers. My goodness we’re doing just fine with this, it doesn’t seem that we need a smart meter for that.” (CIS T2(Osoyoos):36)
- “I would say that Fortis should perhaps improve their internal monitoring for electricity use on these various subsections before imposing this system on the rest of us, which may not be nearly as effective as they claim it will be in terms of energy conservation.” (CIS T2(Osoyoos):77)

BCPSO submits that the need is how to respond to the anticipated acceleration of meter replacement as a result of Measurement Canada’s new requirements (BCPSO Final Submission, p. 3). FortisBC states that BCPSO has too narrowly interpreted the meaning of the term “public convenience and necessity” and references *Memorial Gardens*, submitting that future needs may also be considered (FortisBC May 2 Reply, pp. 12-13).

CEC and BCSEA submit that FortisBC’s submissions on project need are valid and well established. Both further state that the Project is being proposed in the context of BC Hydro having nearly completed its installation of smart meters, which could drive grow-operations into the FortisBC service territory. Both state this represents a need for FortisBC to engage similar technological capabilities for theft detection to avoid detriment to its customers. (CEC Final Submission, p. 12; BCSEA Final Submission, p. 10)

Commission Determination

The Panel finds that the Project need has been established.

The Panel accepts that the need for the Project is not singular. The Commission Panel has concluded in Section 3.2 that it can consider future needs. These future needs include ongoing and future system modernization to improve efficiency, reducing losses due to theft of electrical energy, enhance customer service, and reduce costs. Further, the current timing of changes to Measurement Canada's regulations is also a driver and a consideration in the timing and opportunity for cost and benefit optimization.

The Panel gives considerable weight to the BC 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" as stated in section 17(6) of the CEA. In this regard, the Panel considers the Project and its components to be aligned with the CEA.

While the Panel appreciates the opposing views raised by parties with respect to the need for the Project it does not find their arguments to be persuasive because they raise questions but fail to address issues faced by FortisBC, including the changes to Measurement Canada regulations and the requirements of the CEA.

6.0 PROJECT DESCRIPTION

The CPCN Guidelines require that the applicant provide sufficient detail of the project scope and the planned implementation and risks. The Panel will assess the adequacy of the project planning in defining the project scope, schedule, management, risks and contingencies.

6.1 Existing System

The current FortisBC metering fleet consists of approximately 80,000 electro-mechanical and 35,000 digital meters for residential and commercial customers, plus an additional approximately 15,000 customer meters in the recently acquired Kelowna area. FortisBC has been installing digital meters for new or replacement meters for the last six years (residential) and nine years (commercial) as the support for electro-mechanical meters has been gradually eliminated.

(Exhibit B-1, p. 17; Exhibit B-1-2, p. 4)

The current meter fleet, including digital meters, requires manual meter reading whereby a FortisBC representative must physically access the customer's meter and record the meter reading into a hand-held data-logger for subsequent upload into FortisBC's computer billing system. At the end of each day the meter reader must return to the field office to upload the reads into the Customer Information System (CIS) for billing. Currently every customer's meter is read approximately once every two months (Exhibit B-1, p. 79). The current meters record energy consumed in aggregate or totalizing form which FortisBC describes as being like a car odometer (Exhibit B-1, p. 18).

Interim monthly billing is based on consumption estimates and corrected once the actual readings are received. For customer service calls that require verification of meter reading or for service disconnection/reconnection, a service technician must travel to the individual meter to perform the service.

Changes and new regulations from Measurement Canada that will come into force at the beginning of 2014 will increase the accuracy requirements for calibrating and testing meters and increase sampling sizes for meter lots (batches) to be tested. FortisBC states that the increased sampling/testing and accelerated replacement of meters to comply with the new Measurement Canada regulations will have to take place and will have cost impacts. (Exhibit B-1, p. 18)

Based on its 2011 Depreciation Study, FortisBC estimates the average age of the meter fleet to be between 12.7 and 14.7 years at December 31, 2011. The current book value is \$9.1 million as at December 31, 2013. (Exhibit B-6, BCUC 1.6.2, 1.6.2.1)

6.2 Proposed AMI Project

The proposed Project will replace the existing fleet with new advanced meters capable of two-way communication with FortisBC's back-office support system to automate meter reading and certain customer service activities. FortisBC states that these AMI capabilities will allow FortisBC to improve the safety, efficiency and reliability of its electric service, thereby helping to mitigating future rate increases. (Exhibit B-1, p. 18)

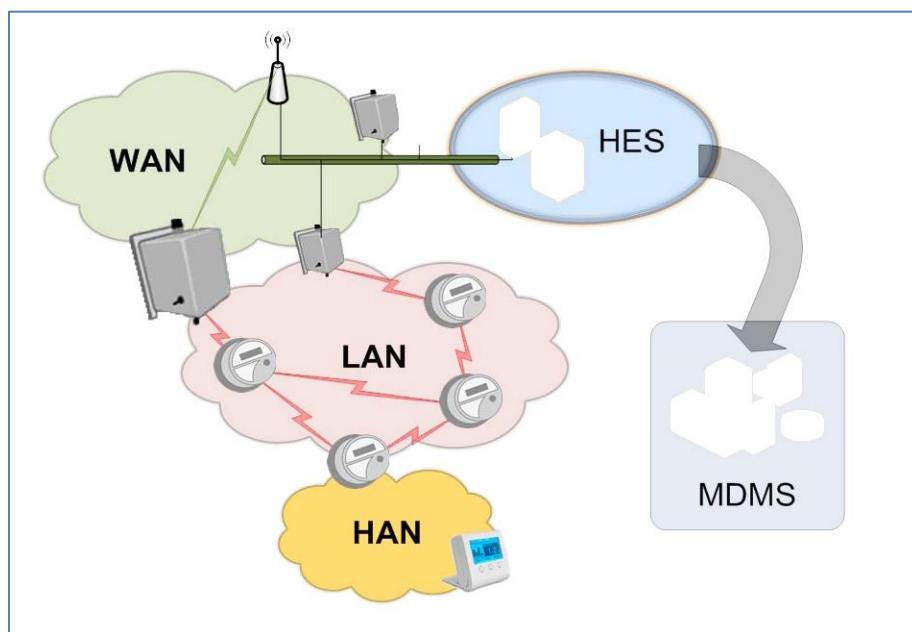
FortisBC proposes that the timing for implementing the Project is opportunistic given that:

- 1) The new Measurement Canada regulations (S-S-06) will come into effect January 1, 2014 and that a delay in the Project will result in unnecessary duplication of capital expenditures related to the replacement of meters to meet Measurement Canada regulations.
- 2) FortisBC believes that if the Project is not deployed at this time, FortisBC will experience a marked decrease in theft deterrence (and a consequent increase in electricity theft) as a result of a perception that energy theft will be a more viable option in FortisBC's service territory as compared to BC Hydro's service territory (Exhibit B-6, BCUC 1.2.1).
- 3) FortisBC calculates a \$5.7 million loss of benefits if the project is delayed by two years (Exhibit B-6, BCUC 1.53.11) but confirms that there is no immediate requirement or critical safety issue driving the timing (Exhibit B-6, BCUC 1.2.2).

6.3 AMI Components

FortisBC's AMI system overview shows a series of two-way communication networks and devices which are reproduced in Figure 6-1.

Figure 6-1



(Extracted from Exhibit B-1, p. 42)

The Home Area Network (HAN) consists of the customer's individual meter and an optional in-home display that can show consumption information. The LAN or Local Area Network consists of advanced meters, range extenders and collectors that communicate with each other to transmit

meter data four to six times per day. The Wide Area Network (WAN) aggregates the data from the individual LAN collectors and transmits this data back to FortisBC's Head End System (HES). In locations where collectors are located on infrastructure where FortisBC has fibre optic cables the system will connect directly to this fibre. The Wide Area Network will be built using a combination of direct connect to optical fibre or wireless communication technologies including "WiMAX", cellular or satellite. (Exhibit B-1, pp. 41-47)

FortisBC anticipates that less than one percent of the AMI meters will not have an economic Wide Area Network connection option at the time of deployment and will still require manually downloading data from the meters. These costs have been included in FortisBC's project cost estimates. (Exhibit B-1, p. 49)

The HES comprises computer hardware and software that manage the secure data transfer and processing to other utility systems, troubleshooting the overall system performance and monitoring diagnostic events and alarms (Exhibit B-1, pp. 49-50). The Meter Data Management System (MDMS) is the software within FortisBC for storing the consumption data and events and allows data verification algorithms or rate structure algorithms to be applied to the raw data received, before the information is transmitted by the MDMS to billing applications.

6.4 Project Scope

FortisBC developed twenty-four immediate and future, functional, process and business requirements for the AMI system. These business requirements were used to develop the specifications for planning, procurement, final design, testing and training (Exhibit B-1, p. 51).

Future uses include compatibility for:

- In-home devices such as a display
- Ability to contract meter reading for other utilities (i.e. gas and water)
- Pre-pay billing
- Innovative rate structures (Exhibit B-1, p. 52)

FortisBC describes Project activities associated with the following key Project phases:

- Define/Design
- Build
- Deploy/Operate
- Transfer

The Define/Design phase will take approximately four months after Commission approval of the proposed project and will refine the scope through the final design of the Project. (Exhibit B-6-4, BCUC 1.40.1, Erratum 2)

6.4.1 Procurement

The requirements identified by FortisBC were used in the Project's procurement process (Exhibit B-1, p. 51). FortisBC engaged an experienced consultant to facilitate the procurement process and shared experiences with BC Hydro to help ensure an efficient Request for Proposals (RFP) process (FortisBC Final Submission, p. 18). Separate RFP processes were used for the MDMS software solution and for the AMI hardware components. The AMI hardware RFP was sent to eleven vendors and two integrators with seven of the thirteen responding with proposals (Exhibit B-34, Table Shadrack 3.24). FortisBC notes that the RFP did not specify the type of communication technology for the AMI system and that all proposals received use wireless RF communications technology (Exhibit B-1, p. 55). Three vendors were selected based on operational and financial scores and were invited to provide product demonstrations. This process resulted in Itron being selected to provide both the AMI hardware and the MDMS software solution. An RFP process will be competitively tendered by Itron for the meter deployment sub-contract (Exhibit B-1, p. 53).

6.5 **Project Management**

FortisBC states that [t]he management of the AMI project is supported by a dedicated cross-functional team following standard project management practices and tools" (Exhibit B-1, p. 56). FortisBC has identified key Project phases and resources that can be mobilized to begin the Project within 60 days of Commission approval (Exhibit B-1, p. 59). Project roles and responsibilities, from the Steering Committee and Executive Sponsor to the AMI Manager and functional Project Managers are identified and defined (Exhibit B-1, pp. 59-66). FortisBC provided a more comprehensive Project Management plan in an Erratum that describes its ongoing Integrated

Management Plan with the following components:

- Scope Management Plan
- Schedule (Time) Management Plan
- Cost (Budget) Management Plan
- Quality Management Plan
- Human Resource Management Plan
- Communication Management Plan
- Risk Management Plan (Exhibit B-6-4, BCUC 1.40.1, Erratum 2).

6.5.1 Project Schedule and Phasing

In addition to the Project phases, FortisBC describes four key activities:

1. Scope Management (Define/Design)
2. Deploy software
3. Deploy communications network
4. Deploy meters

Subject to Commission approval, the Project will begin in third quarter of 2013 and end with meter deployment and system acceptance testing in the fourth quarter of 2015 (Exhibit B-1, p. 57). In response to IRs, FortisBC provided a detailed Gantt chart showing the planned Project schedule with milestones (Exhibit B-6, Attachment BCUC 1.40.1). This Gantt chart was subsequently corrected by an Erratum filing to be consistent with the fourth quarter of 2015 in service date (Exhibit B-6-4, Attachment BCUC 1.40.1, Erratum 2).

The Project deployment is further broken down by geographic regions to focus and balance resources and to allow reduced operating cost benefits to begin accruing sooner, region by region. FortisBC states that meter deployment in any region will not commence until the communications network is deployed and functional. Testing and validation milestones in the early stages of deployment include a “1000 Meter Test group” to ensure the software, communications network and meters function as required. From this 1000 Meter base, Region 1 deployment will continue with general deployment to the other Regions proceeding after Region 1 has been tested and accepted. (Exhibit B-6-4, Attachment BCUC 1.40.1, Erratum 2)

6.5.2 Project Risks

FortisBC provides a table of the major risks to schedule, cost, scope and quality along with its mitigation strategy and contingencies (Exhibit B-1, p. 67). Evidence was filed describing a number of installations of ‘smart’ or advanced meters in Canada and globally, demonstrating the broad application of wireless meter technology (Exhibit B-23). FortisBC references the selection process and contract with Itron as helping to mitigate project risks by dealing with a single vendor with major contract cost elements (meters, communication devices, software) provided on a fixed price or fixed unit price basis (Exhibit B-1, p. 67).

BCPSO submits “that some of the underlying assumptions contained in the cost benefit analysis may be optimistic. In particular, it appears that the number of refusals (0.5%) and perhaps regulatory costs will prove to be low estimates.” (BCPSO Final Submission, p. 18) No other Interveners expressed concern about these project risks.

Some Interveners, interested parties and FortisBC customers challenge the need for the additional information on consumption that advanced meters are expected to provide, and raise health, privacy and security concerns that might cause customers to resist the installation of an advanced meter on their home. Specific examples include:

“I totally and completely object to the forced installation of these meters by FortisBC. If someone wants one, that’s his or her choice.” (Exhibit E-7)

“We [would] like to let you and FortisBC Inc. know that we are strictly against all smart meters and therefore do not want FortisBC to install any smart meter on our property.” (Exhibit E-39)

“And so as I was going out the door my son called. He’s an engineer, and he says—I sent him what I was going to submit to you. And he said, ‘Well, I won’t be letting them on my property because they’re not – they haven’t been proven safe.’” (CIS T3(Kelowna): 33)

FortisBC states that through communications and education these people will either agree to have advanced meters installed or ultimately face disconnection by FortisBC (T7:1406-1407).

More details on these concerns are found in the Public Input and Health, Privacy and Security sections of this Decision.

Commission Determination

The Panel finds that the stated Project risks have been adequately identified and mitigated with one exception. The number of customers opposed to the installation of AMI as proposed is not known. However, even if this is a small percentage of the total number of customers in the FortisBC service territory, the Panel is of the view that any protracted difference of views could result in implementation delays, additional costs to the Project and the potential reduction in benefits. The Panel further discusses these customer concerns in subsequent sections of this Decision.

The Panel finds it difficult to reconcile FortisBC's plan of communication, education and ultimate disconnection with the strongly held and passionately articulated views of a number of its customers opposed to wireless advanced meters. The Panel finds that FortisBC has not adequately considered this risk. This risk must be mitigated for the Project to proceed. This matter will be discussed further in Section 11.4.

6.6 Consultation

The CPCN Guidelines provide requirements for both public and First Nations consultations to be considered in a CPCN application. FortisBC states it has been engaged in public and First Nation consultation processes related to the Project for some time (Exhibit B-1, p. 144). FortisBC refers to a 2008 workshop for its 2009/2010 Capital Expenditure Plan where AMI was introduced, and more recently in 2011 where AMI was discussed as part of its Integrated System Plan public consultation open houses. In June of 2011 FortisBC held a series of open houses focussed on AMI in Kelowna, Osoyoos, Princeton, Creston and Trail with 93 people attending. FortisBC submits these open houses were well attended compared to other open houses it has held in the region (Exhibit B-1, p. 144; Exhibit B-6, BCUC 1.119.1). Feedback through June of 2012 included 305 emails or letters opposing the installation of AMI meters, most (273) without providing a specific reason and others referencing concerns with health issues, rate impacts and/or privacy and security of personal information (Exhibit B-1, p. 144). As of September 28, 2012, FortisBC had been contacted by 324 individuals indicating disapproval of the Project and/or refusal to accept an AMI meter (Exhibit B-6, BCUC 1.119.3).

FortisBC advertised its open houses through local community newspapers and hosted kiosks in shopping malls in Kelowna and Trail. It also sent invitations to Mayors, Council and First Nations in the FortisBC service area to offer presentations on AMI and encouraging participation in its open houses. FortisBC notes it has received some letters of support, namely from the Fire Chiefs' Association of BC and several sustainability/environmental organizations (Exhibit B-1, p. 146).

First Nations Consultation

FortisBC submits that the Project does not involve any green-field construction on any Band land or traditional territory and that no aboriginal or treaty rights are affected as a result of the Project. FortisBC is not a Crown utility and therefore is not required to provide information requirements as set out in the British Columbia Utilities Commission 2010 First Nations Information Filing Guidelines for Crown Utilities. (Exhibit B-1, p. 146)

FortisBC contacted local First Nations' governments via telephone in May/June 2011 requesting input and involvement from First Nations in the AMI process and open houses. FortisBC followed up with letters dated July 4, 2011 to the Chiefs of First Nations in the FortisBC service territory informing them of the Project, providing a link to the open house presentation and providing a contact at FortisBC for any questions or comments. (Exhibit B-1, pp. 146-147, Appendix E-4)

FortisBC submits that the consultation process carried out to date is reasonable and sufficient (Exhibit B-1, p. 147).

Commission Determination

Based on the evidence set out above, **the Panel finds that the consultation process to date has been reasonable and sufficient.**

7.0 PUBLIC INPUT

7.1 Public Participation

There has been a high degree of public interest in this Proceeding. The Commission has attempted to be as accommodating as possible to interested members of the general public in the FortisBC service territory that might not normally participate in a Commission proceeding. In making its determinations, the Panel carefully weighed the views expressed at the Community Input Sessions and in the Letters of Comment, as well as the evidence presented by the Applicant and the registered Interveners.

The Commission received 178 Letters of Comment, with nearly all of them expressing opposition to the Application. When signatures from petitions are included, the number of individuals who wrote to the Commission in opposition to the Application was over 2,200. The letters and petitions form part of the record of the Proceeding.

In addition to the large volume of letters and the high attendance at the Community Input Sessions, the number of registered Interveners who asked to participate in this Proceeding was higher than is normal for a CPCN application brought before the Commission. Some of these Interveners represented private citizens' groups, others represented themselves. The Commission made every effort to ensure that all had a full opportunity to participate in the hearing process.

7.2 Letters of Comment

Of the 178 letters received by the Commission, 92 percent were generally opposed to the Project. Seven percent asked for the Commission to instruct FortisBC to allow for an opt-out provision due to health and privacy concerns. Parties requesting an opt-out also included the Town of Osoyoos, the Regional District of Kootenay Boundary, the Village of Kaslo, and the Regional District of Okanagan Similkameen.

Many of the letters expressed concerns about AMI, though not all for the same reasons. One hundred and forty letters expressed concern over potential negative health impacts from radiofrequency transmissions, while 59 letters brought up issues of privacy relating to FortisBC potentially data-mining power usage data on individual customers. In addition, 56 letters expressed concerns over meter fires related to installation of the AMI system, and a further 44

letters dealt with the potential negative impact of EMF on the environment more generally. Finally, 24 letters submit that the cost of the project is onerous.

7.3 The Community Input Sessions

Community Input Sessions were aimed at both informing residents about the application process and how the Commission operates, as well as giving residents the opportunity to express their views directly to the Panel, so that their views could be taken into account in the decision-making process.

These sessions were advertised via public notice to ensure that everyone who wished to attend was informed. Rules were set out to ensure the participation process was fair and everyone who wished to speak had an opportunity to do so. To encourage individuals who might not normally be comfortable addressing the topic in public, the media, was permitted to take notes, but not permitted to record the event. The Commission Secretary described how a hearing proceeds and how people could participate in the process.

The Panel was pleased with the turnout to all three sessions, and expresses appreciation to all those who made the effort to attend and participate. The concerns heard in all three locations largely mirrored those in the letters the Commission received, and further served to clarify the issues of concern to FortisBC ratepayers and the ratepayers of its wholesale customers.

Some of the views expressed at the Community Input Sessions are provided below:

on health:

- “I know that there is such an overwhelming amount of evidence against wireless infrastructures that in other countries they are taking them out of schools and so on” (CIS T1(Trail): 7).
- “So, I guess my three most concern is the health and safety...the EMR magnetic radiation is not limited to our health and they’ve already listed the sleep disturbance ... Symptoms of electro-hydro sensitivity for radio sickness and there can be pains in all kinds of parts of your body, and the magnetic hypersensitivity can make people ill” (CIS T3 (Kelowna): 31).

- “Health Canada’s safety limits for EMF are based on the thermal effects of radiation on human cells. New studies by scientists around the world are questioning the assumption that thermal effects are the only hazard to humans and are suggesting that biologically based guidelines should be used since the human cell is influenced by more than just heating” (CIS T1(Trail): 55).
- “Well, what about sleeplessness and anxiety and nausea and headaches which have been suffered as a result of people exposed to a smart meter?” (CIS T1(Trail): 101)
- “the radiation emitted from smart meters, routers and cell towers seriously interfere with medical devices such as pacemakers and several medical conditions, for example positional, benign positional vertigo, otherwise known as Ménière’s disease, the problem in the inner ear, and many many more” (CIS T2(Osoyoos): 26).
- “I am not concerned with only radiation that will be emitted by the smart meter on my house; I am deeply concerned about the combined emissions from the meters on every house around me and the mesh grid network that will result” (CIS T1(Trail): 96).

on privacy:

- “There’s also a privacy issue in regards to the protection of that information collected and who has access to that information. Can some or all of that information be sold or shared? Who owns that information once it’s collected and in the possession of the utility company? I have a hard time trusting corporations that are profit driven ...” (CIS T3 (Kelowna): 66)

on wireless technology:

- I am able to regulate my electricity use responsibly without an in-home device and do not want the ZigBee chip on my house. I have no wireless devices nor cell phones in my home and I wish to keep it that way (CIS T1(Trail): 18).

on cost:

- “Now, it seems that the smart meters are just another way customers will be forced to pay more for the same product, in this case electricity” (CIS T2(Osoyoos): 29).

on benefits:

- “Fortis also states immediate detection of power outages, therefore allowing for more effective restoration of electricity to customers. My goodness we’re doing just fine with this, it doesn’t seem that we need a smart meter for that” (CIS T2(Osoyoos): 36).

on safety and fires:

- “Let’s talk about fire liability. There have been numerous fires from faulty connections after the installation of smart meters in California and Ontario” (CIS T3 (Kelowna): 55).

on the economy and jobs:

- “Our concern is for the many individuals who are and have been employed by Fortis in the reading, et cetera, of meters. These individuals may no longer be needed to perform their historic roles in the power company’s business, and will now be obliged to seek other employment, either within or without the company, and perhaps to lose their jobs at a time when job loss is of paramount importance” (CIS T3 (Kelowna): 29).

8.0 ECONOMIC ANALYSIS AND RATE IMPACT OF THE PROJECT

In this Section, the Panel analyzes the economic value of the Project relative to maintaining the Status Quo. Briefly, Status Quo is defined as retaining the current metering technology and the accelerated replacement of that technology over a 20-year period to remain in compliance with Measurement Canada regulations. The Status Quo is discussed in Section 9.1. In addition to determining whether the Project has a positive or negative economic value the impact on customer rates will also be assessed.

The CPCN Guidelines outline the following CPCN Application Requirements under Section 2 of Appendix A, “Project Need, Alternatives and Justification”:

- “(iii) A schedule calculating the **revenue requirements** of the project and feasible alternatives, and the resulting impacts on customer rates; and
- (iv) 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” [Emphasis added]

In the view of the Panel, the Economic Analysis and the Revenue Requirements Analysis are two distinct schedules that should be considered in the evaluation of the Project. The Panel considers the Economic Analysis the appropriate schedule for the examination of the overall economics of the Project over the life of the Project while the Revenue Requirements Analysis is the appropriate schedule for the examination of the expected impact on customer rates in the short-term.

The financial analyses of the Project provided by FortisBC in the Application (Exhibit B-1, p. 69), Errata No. 1 to the Application (Exhibit B-1-1, p. 69), and Addendum to the Application (Exhibit B-1-2, p. 3; Exhibit B-1-3) represent the net present value of the incremental revenue requirements of

the proposed Project, as compared to the Status Quo alternative, over twenty years (Revenue Requirements Analysis). Using the same data and assumptions as provided by FortisBC in the Revenue Requirements Analysis, Commission staff also prepared an analysis that separated the calculation of the revenue requirements of the Project from the calculation of the impact of the Project on customer rates (BCUC Staff Model).

The Revenue Requirements Analysis prepared by FortisBC calculates the NPV of the incremental revenue requirements of the Project, as compared to the Status Quo, over the life of the Project (i.e. 20 years). In the view of the Panel, it is not appropriate to examine the revenue requirements of the Project over a period of 20 years. Although this is an appropriate period over which to analyze the Economic Benefit, the revenue requirements should be examined over the short-term in order to determine the expected impact on customer rates. The Panel discusses the expected rate impact and the Revenue Requirements analysis further in this Section.

The majority of the information requests and Final Submissions from Interveners on the financial aspects of the Project focused on the Revenue Requirements Analysis provided by FortisBC, rather than the Economic Analysis. However, the Panel notes that the majority of the data and assumptions are the same in the two tests and accordingly much of the evidence filed in relation to the Revenue Requirements Analysis is also applicable for the examination of the Economic Analysis.

CEC submits that the proposed Project is in the public interest based on the cost effectiveness and positive rate impact of the Project. With respect to the Revenue Requirements Analysis submitted by FortisBC, CEC states that “the FortisBC Application understates the benefits and overstates the risk of the AMI implementation to a significant degree” (CEC Final Submission, p. 5) and the “FortisBC Application could be reasonably considered to have a probable Net Present Value of \$80 million and a maximum Net Present Value of up to \$350 million” (CEC Final Submission, p. 11).

BCPSO states that “some of the underlying assumptions contained in the cost benefit analysis may be optimistic BCPSO has reservations about accepting FBC’s NPV analysis” (BCPSO Final Submission, p. 18).

8.1 Net Present Value Analysis of Costs and Benefits (Economic Analysis)

In response to BCUC 1.96.1 (Exhibit B-6-5) and BCUC 3.6.1 (Exhibit B-50), FortisBC provided a schedule of the net present value of the incremental cost and benefit cash flows of the Project, as compared to the Status Quo alternative, over twenty years (Economic Analysis). The schedule included the following assumptions:

- Project and sustaining capital costs are included in the year in which they are expected to be incurred.
- No financing or depreciation expense is included.
- Sunk costs are excluded.
- The discount rate is 8 percent.
- The term of the analysis is 20 years. (Exhibit B-50, BCUC 3.6.1)

The Panel considered each cost and benefit item included in the Economic Analysis individually below.

In the economic analysis, Net Present Value (NPV) is used as a reasonable method to compare alternatives that have quantified costs and benefits extending up to 20 years into the future. In order to carry out the analysis and determine rate impacts certain assumptions must be made. The first sub-section makes determinations on these assumptions which include Discount Rate; Inflation; Term; and Taxes.

8.1.1 Key Assumptions

8.1.1.1 Discount Rate

FortisBC used a discount rate of 8 percent to calculate the NPV of the incremental cost and benefit cash flows of the Project in the Economic Analysis (Exhibit B-1, p. 75). FortisBC states:

“The Company had used a nominal discount rate of ten percent in its rate impact and economic analysis impact studies for a number of years based on the Company’s 25 year weighted average cost of capital. The eight percent discount rate is meant to represent a lower long-term after-tax weighted average cost of capital based on an expected lower cost of debt over the study period. The Company is of the opinion that the current low weighted average cost of capital reflects the current anomalous economic conditions and does not reflect the

average long-term cost of capital that would be expected over the study period. The reduction from the historic ten percent to an eight percent discount rate recognizes that lower rates are expected for the near term but would not be expected over a 20 year period.” (Exhibit B-6, BCUC 1.52.2)

BCSEA and CEC both accept the use of a discount rate of 8 percent (BCSEA Final Submission, p. 12; CEC Final Submission, p. 41). No Interveners take the position that a different discount rate should be used.

Commission Determination

The Panel accepts FortisBC’s assertion that a discount rate of 8 percent recognizes that “lower rates are expected over the near term, but would not be expected over a 20 year period.” The Panel agrees that the selection of a discount rate is a matter of judgement and for these reasons the Panel accepts FortisBC’s use of a discount rate of 8 percent as reasonable.

8.1.1.2 General Inflation and Escalation Rate

FortisBC uses a general inflation rate of 1.8 percent for the project costs and benefits, based on a Conference Board of Canada Provincial forecast of BC Consumer Price Index for the period 2012-2016 inclusive (Exhibit B-1, p. 75). The CEC supports the use of a general inflation rate of 1.8 percent, but notes that “...3 percent could be a reasonable estimate of inflation into the future particularly if central bank expansion of money supply continues to be required to support western economics” (CEC Final Submission, pp. 23, 41).

The CPCN Guidelines state the project cost estimate should include escalation (including inflation) amounts. This is intended to deal with situations where future costs of specific capital items may vary at a rate different than a general inflation index. FortisBC states the estimate includes inflation at 1.8 percent per year on all aspects of the Project not covered by fixed unit or fixed price contract and no additional escalation is included. The Project costs include substantial components (approximately 55 percent) covered under fixed price or fixed unit price contracts (Exhibit B-6, BCUC 1.49.1).

CEC considers 1.8 percent to be the likely and the most conservative estimate for all inflationary escalations and that 3 percent could be a reasonable estimate of inflation into the future (CEC Final Submission, p. 23).

Commission Determination

The Panel finds that a 1.8 percent escalation of costs not covered by the Itron contract is reasonable to include in the estimate of project costs. The Panel recognizes the uncertainty in forecasting inflation factors; however, using the Conference Board of Canada inflation forecast for British Columbia is a reasonable approach. While the Panel assessed the use of 3 percent for inflationary cost escalation, the Panel finds no evidence that the 1.8 percent inflation forecast put forward by the Conference Board of Canada is inappropriate. Hence, the Panel accepts the estimate as put forward by FortisBC.

The Panel accepts FortisBC's use of a 1.8 percent general inflation rate, based on the Conference Board of Canada's forecast for British Columbia.

8.1.1.3 Term of 20 Years

FortisBC states that “[t]he 20 year study period was chosen in order to reflect the 20 year economic life of the meters (which are the most significant project expense)” (Exhibit B-6, BCUC 1.52.2).

CEC submits that a 20 year term is conservative and “...FortisBC has also unnecessarily curtailed the attribution of many of the financial benefits from the FortisBC Application by assuming a 20 year economic life of the project and matching the financial benefit stream to the service life of the smart meters” (CEC Final Submission, p. 24).

Commission Determination

The Panel acknowledges that some of the benefits of the proposed Project may extend beyond 20 years; however, in the Panel's opinion, the certainty with which the costs and benefits attributable to the Project can be reasonably estimated diminishes beyond a 20 year time frame. This matter is discussed in further detail in the section covering depreciation rate for project equipment.

In Section 8.5.3 the Panel reviews the evidence for the depreciation rate for the AMI meters. The Panel considers the life determined for depreciation is also appropriate for the Economic Analysis. Accordingly the Panel accepts the estimated economic life of the AMI meters to be 20 years. In the Panel's view, the estimated economic life of the AMI meters is a reasonable means of determining the appropriate timeframe to assess the costs and benefits of the proposed Project. **Accordingly, the Panel accepts FortisBC's use of a 20 year term for the Economic Analysis.**

8.1.1.4 Income Taxes

The Economic Analysis includes an NPV cost of \$4.5 million related to income taxes. No Interveners took issue with the forecast cost for income taxes.

Commission Determination

The Panel reviewed FortisBC's calculation of income taxes, including the combined income tax rate and the composite Capital Cost Allowance (CCA) rate. **The Panel accepts the Income Tax and CCA rate assumptions used by FortisBC, and its calculation of income taxes, as being reasonable.**

8.1.2 Project Costs and Benefits

The following subsections summarize the financial costs of the Project found in the evidence, as well as the economic benefits that are expected to flow as a result of the Project. While a significant amount of detail is included to describe both the costs and benefits and how they are developed, it is not the Panel's intention to reproduce the large volume of detailed information that was filed in both the Application and the responses to information requests. Where specific issues of concern were identified by Interveners or the Panel, more detailed information is included. Unless specifically stated the costs and benefits referred to will include the costs and benefits that are associated with the installation of meters in the City of Kelowna.

In reviewing the financial estimates, the Commission Panel considered the CPCN Guidelines, which state that cost estimates used in the economic comparison should have, at a minimum, a Class 4 degree of accuracy. This is defined in the Advancement of Cost Engineering (AACE International) Recommended Practice No. IOS-90 as "generally prepared based on limited information and subsequently have fairly wide accuracy ranges." Further the CPCN Guidelines state that cost estimates for proposed CPCN project costs should have at a minimum a Class 3 degree of accuracy.

Class 3 estimates are typically prepared to support full project funding requests, and become the first project phase “control estimate” against which all actual costs and resources will be monitored for variations to the budget. (CPCN Guidelines, Appendix A, p. 10 of 12)

The high-level assumptions, in addition to those previously described, included in these subsections are:

- Positive BCUC decision by mid-July 2013, ensuring that the contract with Itron need not be renegotiated or canceled;
- Project implementation begins as per preliminary project plan, in Q3 2013;
- Implementation proceeds as per schedule in preliminary project plan, completing in the fourth quarter of 2015;
- Post-AMI manual meter reading for no more than 1 percent of customer base;
- Customer AMI meter refusals do not exceed 0.5percent of customer base;
- Regulatory costs do not exceed \$2 million; and
- Cost of the existing meter disposal, included in the meter deployment estimate, will be offset by the scrap value of those meters. (Exhibit B-6, BCUC 1.53.8; Exhibit B-1, p. 56; Exhibit B-6, BCUC1.39.2)

8.1.2.1 Project Capital Costs

A summary of the expected costs for the Project as described in the Application is shown in Table 8-1 below. The Project Development and Regulatory Costs are included because typically, if approved, such costs are capitalized.

Table 8-1

Summary of Project Costs				
AMI	Activity	Pre-Deployment Costs	Deployment Costs	Total
		(\$000s)		
AMI Project Development and Regulatory Costs				
	Total	4,915		4,915
Capital Costs				
1	Third Party Software and Services		5,830	
2	Meters (including Deployment)		22,941	
3	Network Infrastructure		4,650	
4	System Integration		2,377	
5	Theft Detection		1,100	
6	Project Management		3,355	
7	Capitalized Overhead, AFUDC, PST		6,005	
	Total Capital Expenditure		46,258	46,258
	Total Deployment Capital (Development + CAPEX)			51,173

(Exhibit B-6, BCUC 1.50.1, 1.53.1; Exhibit B-1-2, Table 2.1.b, p. 4)

The NPV of the capital cost estimate of \$46.258 million is \$39.074 million (Exhibit B-50, BCUC 3.6.1).

Apart from the Intervener submissions on the assumption discussed above, no Intervener challenged the capital cost estimate.

8.1.2.2 Contingency Allowance and Accuracy of the Project Cost Estimate

Each of the deployment costs in Table 8-1 above includes a contingency. The total contingency is \$2.689 million or approximately 5.8 percent of the total Capital estimate of \$46.258 million (Exhibit B-6, BCUC 1.53.4; Exhibit B-1-2, Table 2.1.a, p. 4). FortisBC states this is reasonable as it falls within the estimate accuracy range of -20 percent / +30 percent for a Class 3 estimate based on the AACE guidelines (Exhibit B-6, BCUC 1.53.3).

In its evidence, (excluding the City of Kelowna) FortisBC estimates about 2.6 percent of project costs meet Class 1 estimate criteria (highest accuracy) and are given a contingency factor of 1.2 percent, about 40 percent of costs meet Class 2 estimate criteria and are assigned a 3.65 percent contingency factor. Class 3 estimate costs represent about 26 percent of project costs and are given a 13.16 percent contingency factor and about 2.6 percent of costs fall in the Class 4 estimate criteria and are assigned a 10 percent contingency factor. (Exhibit B-6, BCUC 1.53.4)

There was no evidence provided by Interveners that challenged the contingency amount provided.

Commission Determination

For the reasons outlined above, the Panel accepts for the purposes of the economic analysis, Project capital costs of \$46.258 million, excluding CPCN Development costs, but including contingency amounts as described above, in nominal dollars over the period 2013-2015.

Accordingly, the Panel accepts the NPV amount of the Project capital costs of \$39.074 million.

8.1.2.3 CPCN Development Costs

Although not directly related to this section, having made the decision on project capital costs, the Panel will deal with CPCN Development Costs here.

The CPCN development costs are estimated to be \$4.915 million (Exhibit B-1-1, p. 73). The CPCN development costs are included in the Project capital cost.

Table 8-2 shows the summary of the AMI development and regulatory costs.

Table 8-2

Table 5.1.1.a - AMI Project Development and Regulatory Costs

	Activity	Cost
	(\$000s)	
1	2007 AMI Application	275
2	2012 AMI Application	2,217
3	Consultants	423
4	Regulatory Process (forecast)	2,000
5	Total	4,915

(Exhibit B-1-1, p. 73)

Part of the CPCN development cost in the Application is the 2007 AMI CPCN application cost of \$275,000. In the 2008 AMI Decision, the Commission denied FortisBC's 2007 AMI application. The Commission was of the view that FortisBC should explore opportunities with BC Hydro in several areas, improve consultation, develop an overall vision of the complete program, coordinate its efforts with other utilities, and reapply with another application.

FortisBC requests approval to recover the 2007 AMI CPCN application costs as part of the costs of the Project (Exhibit B-14, BCUC 2.46.1.1, p. 94).

No Intervener expressed support for FortisBC's request.

Commission Determination

As the FortisBC 2007 AMI CPCN application was denied, the Panel finds that the cost of the 2007 AMI proceeding should not form part of this Proceeding. FortisBC is directed to apply for recovery of the 2007 AMI costs in its next Revenue Requirement Application. At this time the Panel accepts the estimate for the current Application and regulatory costs (excluding the 2007 AMI CPCN application costs) for the purpose of establishing the capital budget for the Project. The majority of the CPCN Development Costs are retrospective costs that have already been incurred and accordingly these costs should be excluded from the Economic Analysis.

8.1.2.4 Sustaining Capital, Project Operating Costs and Benefits

In the following subsections, the operating costs and benefits that FortisBC expects to flow from the implementation of the Project are described and assessed. As in the cost subsection, sufficient detail has been included to allow an understanding of the ongoing costs and benefits that are described in the Application. Greater detail is available in the Application itself and in the responses to information requests; however, it should be noted that the financial spreadsheets provided by FortisBC were revised and updated throughout the proceeding through errata, addendum and response to information request filings. The latest version of the FortisBC financial spreadsheet can be found in Exhibit B-50, Electronic Attachment BCUC 3.6.1. Where quantification of certain benefits have been challenged by Interveners or found to be of concern to the Panel, greater detail is provided to allow understanding of the decisions made by the Panel in specific areas. In addition to quantified benefits, the Panel also discusses potential or unquantifiable benefits that could be expected to flow from the implementation of the Project.

Table 8-3 below shows the FortisBC calculated net cost or (benefit) of the Project excluding any theft benefit relative to the current system, or Status Quo over the life of the Project. Both nominal and present value dollars are shown. NPV will be used when comparing alternatives.

Table 8-3

AMI	Activity	Nominal Post Deployment Costs (Benefits)	NPV Post Deployment Costs (Benefits)
		\$000s	
	Sustaining Capital		
	Meter Growth and Replacement	4,941	1,972
	Handheld Replacement	(1,149)	(581)
	IT Hardware, Licensing, and Support Costs	12,864	5,688
	Measurement Canada Compliance	(20,490)	(10,808)
	Total Sustaining Capital	(3,834)	(3,729)
	Operating Expenses		
	New Operating Costs	32,400	14,411
	Meter Reading	(64,609)	(26,444)
	Disconnect/Reconnect	(14,938)	(6,155)
	Meter Exchanges	(1,942)	(1,610)
	Contact Centre	(1,317)	(507)
	Total Operating Expenses	(50,406)	(20,305)
	Total	(54,240)	(24,034)

(Extracted and calculated from Exhibit B-50, Electronic Attachment BCUC 3.6.1)

A more detailed discussion of these benefits is provided in the subsections that follow.

8.1.3 Quantifiable Operational Costs and Savings

Table 8-3 above shows a net ongoing sustaining capital and operating expenses savings of \$20.3 million not including theft reduction savings for the Project relative to the Status Quo. FortisBC states there will be new costs involved with the Project and changes to some existing operating costs. Significant costs of the Project include the higher cost per advanced meter for ongoing meter growth and replacement, higher Information Technology costs for hardware, software licensing and new operating costs including an additional 9.5 persons to support the AMI system and new processes. (Exhibit B-1, p. 74)

A further break-down of each individual benefit is discussed below.

8.1.3.1 Meter Reading

Status Quo meter reading expenses are primarily made up of labour costs (including employee benefits) for a workforce of approximately twenty-one and a half full time equivalent employees and one supervisor. They also include vehicle and administrative expenses as well as the cost of

hand-held meter reading devices (Exhibit B-1, pp. 78, 80; Exhibit B-11, CEC 1.70.2). FortisBC estimates the NPV of meter reading savings of the proposed AMI system over the Status Quo for the life of the Project to be \$26.44 million (Exhibit B-50, BCUC 3.6.1, Net AMI DCF spreadsheet). This estimate is based on actual annual meter reading expenses of between \$2.1 million and \$2.4 million for the years 2008 through 2011 (Exhibit B-1, p. 80) to establish a value of \$2.879 million for December 2013 (Exhibit B-1-3, NPV spreadsheet, Tab Status Quo, Line 47).

This amount is then escalated at approximately 3 percent annually to account for inflation and the expected growth in the number of meters to be read. The savings or benefit NPV is calculated by the difference between the Status Quo meter reading expenses and the meter reading expenses under AMI over the life of the Project. Meter reading expenses under AMI assumes that one percent of meters will still require manual meter reading. For example, in 2016 meter reading costs under Status Quo are projected as \$3,155,000 and under AMI are projected as \$268,000, or approximately eight percent of the Status Quo expense to read one percent of the meters. FortisBC also provided an estimate that would reduce the NPV savings by \$5.7 million over the life of the Project if five percent manual meter reading is required (Exhibit B-50, BCUC 3.9.2).

While not disagreeing with the proposed savings, BCPSO express concern that the savings claimed be realized and stated “the savings in this area should be closely monitored and FBC held accountable for any material reduction from the level of savings anticipated” (BCPSO Final Submission, pp. 10-11). No other Intervener commented on estimated meter reading savings for the proposed Project.

Commission Determination

The Panel accepts the basis and assumptions for the calculation to be reasonable and therefore finds the estimated NPV savings of \$26.44 million from reduced meter reading expense to be reasonable over the life of the Project. However, the Panel notes this potential saving is sensitive to achieving the assumed 99 percent conversion of current manually read meters.

8.1.3.2 Remote Disconnect/Reconnect

This topic raises both cost/benefit and customer service/policy issues. As these matters are related they will both be discussed here.

The Application includes the provision of a remote disconnect/reconnect switch integral to the AMI meter. The switch is capable of remotely disconnecting or reconnecting electric service without FortisBC having to physically access a customer's premise (Exhibit B-1, pp. 89-91). FortisBC forecasts the NPV savings from the AMI remote disconnects and reconnects as \$6.155 million over the 20 year cost benefit analysis period (Exhibit B-50, BCUC 3.6.1, Net AMI DCF Excel spreadsheet).

FortisBC calculated this benefit reflecting a fully avoided cost of all disconnects and reconnects as if these are all done remotely and included an avoided cost of unbilled consumption used at vacant sites (Exhibit B-11, BCPSO 1.47.3) where a disconnect is delayed. In practice FortisBC will conduct visits to 50 percent of vacant sites being disconnected and 100 percent of non-pay sites. These disconnection visit costs have been included in the AMI New Operating Costs line (Exhibit B-11, BCPSO 1.47.4).

FortisBC states it is cognizant of the concerns associated with customers facing disconnection for non-payment. There are legitimate considerations about the safety of occupants of premises facing disconnection for non-payment if an effective communication plan to allow the customer an opportunity to avoid disconnection is not established. FortisBC notes its existing policies concerning disconnection and will continue to maintain processes directing how contact will be made before a disconnection for non-payment is made. (Exhibit B-1, pp. 139-142)

Once the Project is completed, the marginal cost of a remote reconnection is likely to be less than \$10, meaning that in theory the reconnection fee could be dropped substantially. However, FortisBC proposes to maintain the current reconnection charge until the next cost of service application (COSA) in order to better understand all costs associated with the new processes. (Exhibit B-6, BCUC 1 92.2.1)

FortisBC states that in 2011 it dispatched nearly 7,700 service calls to disconnect or reconnect customer services. FortisBC does not expect the total number of disconnects and reconnects to be materially different in the Status Quo and AMI scenarios. (Exhibit B-6, BCUC 1.91.2)

In its Final Submission, CEC does not accept continuing to charge the current reconnection charge of \$100 until the next COSA in 2017 and recommends that FortisBC be directed to reduce the reconnection fee to \$10 or apply for and justify an alternative amount more in keeping with the actual costs. (CEC Final Submission, p. 120)

CEC believes that the process outlined by FortisBC provides sufficient protection for customers in that site visits will be required for 100 percent of disconnections for non-payment. (CEC Final Submission, p. 120)

BCPSO notes inconsistencies and submits that the savings from remote disconnects/reconnects are likely overstated. (BCPSO Final Submission, pp. 12-13) It identifies three issues with regard to the remote disconnects/reconnect:

1. FortisBC needs to clarify its planned approach to reconnection charges;
2. What will be the charge to those that are not switched to AMI meters through no choice of their own; and
3. It disputes the assertion that a higher reconnection charge deters disconnections and a reconnection charge above the cost of service is unduly punitive.

(BCPSO Final Submission, pp. 11-12)

BCPSO further submits that FortisBC's policy on disconnections for nonpayment should be amended to require personal contact with the customer prior to disconnecting service in all but exceptional circumstances. (BCPSO Final Submission, p. 26)

In its May 2 Reply, FortisBC states it will maintain the current disconnection process, retain the current standard charge for the physical disconnection of a meter and its subsequent reconnection until the next Cost of Service application (COSA), and found nothing to reconcile with regards to the request from BCPSO. (FortisBC May 2 Reply, pp. 68-69)

Commission Determination

The Panel accepts FortisBC's forecast of the NPV savings from the AMI remote disconnect/reconnect savings of \$6.155 million over the life of the Project. This amount provides for both the reduction in workload without contemplating any changes to the current policy for communication and contact with customers related to disconnection. The Panel will not consider a change to the customer charge for disconnection/reconnection as this matter is not within the scope of this Proceeding.

8.1.3.3 Measurement Canada Compliance

FortisBC states that effective January 1, 2014, Measurement Canada will require compliance with the new S-S-06 sampling plan for meters installed in Canada, and that this new sampling plan will increase compliance costs of the current meter fleet (Exhibit B-1, p. 93). FortisBC estimates the NPV of compliance savings compared to the proposed AMI system over the Status Quo over the life of the Project to be \$10.8 million (Exhibit B-50, BCUC 3.6.1, Net AMI DCF Excel spreadsheet).

FortisBC calculates replacing all 115,000 meters (not including Kelowna) would result in an avoided cost under the Status Quo of not having to replace approximately 88,000 meters that will fail under the new Measurement Canada regulations over the 20 year project life. In the financial analysis of calculating the NPV avoided cost benefit, FortisBC states that it only accounted for the incremental number of meters above the ongoing meter exchange process that are replaced or exchanged as a result of S-S-06. (Exhibit B-1, p. 93)

These compliance costs that the Project would avoid, include and are driven by:

1. Fewer meters will have to be tested each year.

FortisBC states that the current fleet of meters is comprised of many different 'compliance groups' or 'batches' with each batch requiring that a sample size be removed from service and tested. Under AMI there will be fewer batches of meters which will require fewer meters to be removed and tested every year as compared to the Status Quo (Exhibit B-1, p. 92). Under the new Measurement Canada S-S-06 regulations, the AMI compliance group would require approximately 6,600 meters be exchanged and tested compared to 18,000 under the Status Quo (Exhibit B-1, p. 94).

2. Fewer meters will fail testing and have to be replaced with new meters.

The Measurement Canada S-S-06 sampling plan includes tighter tolerances for compliance testing which in FortisBC assessment will result in higher failure rate of existing meters compared to solid-state digital meters. For example FortisBC looked at testing results between 2006 and 2010 under the current EG-04 regulations where only 1 out of 92 tested groups failed and applied the new S-S-06 requirements to determine that 12 of 92 groups would have failed (Exhibit B-1, p. 93). In the event of failure of sampled meters, the entire batch of meters is considered to be non-compliant and must be removed and replaced.

Based on the new S-S-06 regulations, FortisBC anticipates increased failures, shorter seal extensions, and an increase in compliance sampling costs and as a result expects an accelerated replacement (shorter lifespan) of approximately 80,000 electro-mechanical meters and 8,000 digital meters (not including Kelowna). FortisBC builds these expectations into the financial model to calculate the NPV of these incremental Measurement Canada Compliance Costs for the Status Quo (under S-S-06) over the life of the Project compared to lower Compliance costs for the proposed Project. (Exhibit B-1, p. 93)

No intervenor raised concerns regarding the estimated Measurement Canada compliance savings.

Commission Determination

The Panel accepts the calculation of the avoided cost benefit for Measurement Canada compliance and therefore finds the estimated NPV savings over the life of the Project of \$10.8 million to be reasonable.

8.1.3.4 Meter Exchanges

The replacement of nearly all existing meters with new AMI meters will avoid operating costs that would have been incurred for meter sampling, exchanges and testing for six years after deployment (Exhibit B-1, p. 94). FortisBC calculates the avoided operating costs compared to the Status Quo have an NPV of approximately \$1.6 million (Exhibit B-1-2, p. 7) over the life of the Project. FortisBC states that new meters have an initial Measurement Canada seal period of 8 to 12 years (the period that the meters do not need to be tested) (Exhibit B-1, p. 92). FortisBC also states that experience shows that solid state digital meters exhibit better test results and are typically granted longer seal extensions by Measurement Canada (Exhibit B-1, p. 93), though it does not appear FortisBC included any benefit from longer seal extensions since it also says that the cost of meter exchanges is expected to begin returning to the pre-AMI deployment levels (Exhibit B-1, p. 94).

BCPSO states: "In principle the savings related to deferred exchange and compliance testing costs should reflect the full savings to be achieved, i.e. both the savings related to the actual removal of the meters involved as well as any savings in actual testing costs. However it is not clear from the evidence provided that this is the case." (BCPSO Final Submission p. 13)

Commission Determination

The Panel accepts the NPV estimate of \$1.6 million in savings over the life of the Project compared to not having to perform meter exchanges for six years following the AMI deployment.

The Panel views this to be a conservative estimate considering the evidence concerning longer seal extensions for solid state digital meters provided by FortisBC.

8.1.3.5 Contact Centre

In 2011 FortisBC reports that over 19,000 unscheduled meter reads (“soft reads”) were processed through its contact center to handle customer moves or verification of readings by customer request or as part of the billing process (Exhibit B-1, p. 95). Labour savings, which include savings from not having to manually input data from unscheduled soft reads of meters over the life of the Project, are estimated to be \$507,000 on an NPV basis (Exhibit B-50, BCUC 3.6.1, Net AMI DCF spreadsheet).

FortisBC expects an increase in Contact Centre call volume during the implementation phase of the Project, which it accounts for, followed by reduced call volumes, resulting in savings from reduced labour costs.

BCPSO commented on the labour savings as difficult to estimate but it did not challenge FortisBC’s estimated benefit. No other interveners challenged the FortisBC estimate.

Commission Determination

The Panel accepts the evidence put forward by FortisBC that there will be labour savings in the Contact Centre of about \$507,000 on an NPV basis over the life of the Project.

8.1.4 Soft Benefits

FortisBC states there are non-financial benefits that all customers, including industrial customers, will realize. FortisBC categorizes these as customer service, operational efficiencies and environmental benefits (FortisBC Final Submission, p. 74). In some cases these non-financial benefits have been assessed in financial terms through the information request process. However these amounts have not been included in the financial justification for the Project. Table 8-4 sets

out the soft benefits from the Project as estimated by FortisBC.

Table 8-4

<i>Functionality</i>	<i>Means</i>	<i>Benefit</i>	<i>Notes</i>	<i>Reference</i>	<i>Duration Note 1</i>
Transition from existing analogue and digital meters to AMI meters	Installation of 115,000 new AMI meters throughout FortisBC territory	1.Improved accuracy of metered consumption, improved billing accuracy	1.Fairness for all rate payers	1.B-1 Appl p.2 and p.33	1.***
Energy balancing and loss management; Increased granularity and synchronicity of customer electricity consumption information; multiple attribute sensing	Feeder, transformer and portable meters	1.Improved system planning	1.May have \$ value	1.B-1 Appl p.35	1.***
	Customer meters with near real-time information recording	2.Improved financial reporting/forecasting	2.Public interest	2.B-1 Appl p.36	2.***
	Software infrastructure;	3.Enhanced billing options such as flexible dates and consolidated bills	3.Customer service	3.B-1 Appl p.33 and p.34	3.***
	additional sensors	4.Customer portal benefits and IHD information for customers	4. Estimated savings of \$3.8 million NPV for CIP and \$9.8 million NPV for IHD	4.B-11 CEC IR 1 61.1	4.***
		5.Improved power quality monitoring	5.May have \$ value	5.B-1 Appl p.39	5.***
		6.Improved outage management /restoration	6.Customer service	6.B-1 Appl p.38	6.***
		7.Theft and grow op deterrence	7.Health and public safety	7.B-1 Appl p.83	7.***
Two way communication between the customer and utility	Radio signal	1. Reduction of 171 tonnes of GHG per year during project life, and enduring thereafter	1.Environment and public health	1.B-11 CEC IR 1 25.1	1.***
		2.Facilitation of Conservation rate structures with IHD	2. Est.\$9.8 million NPV	2.B-11 CEC IR 61.1 & Appl p.31	2.***
		3.Reduced need to access customer premises	3.Customer service	3.B-1,Appl p.34	3.***
		4.Improved safety	4.Safety and public health derived from vehicle use	4.B-1 Appl p.36	4.***

Note 1: *One time reduction ** Reduction over project life *** Enduring benefit (Exhibit B-15, CEC 2.1.1)

8.1.4.1 Customer Service and Satisfaction

Billing and Access to Customer Premises

FortisBC reports that in 2011, 25 percent of all Contact Centre calls were related to billing queries and that it received over 20 customer complaints regarding private property access issues (Exhibit B-1, pp. 33-34). FortisBC expects these issues to be mitigated by customer service benefits resulting from the Project. These benefits include improved billing accuracy, consolidated billing for multiple accounts, ability to offer flexible billing dates, and reduced need for FortisBC to access

customer premises (FortisBC Final Submission, p. 74). Consumption estimates for billing will be eliminated and FortisBC states it plans to allow customers to choose billing dates that meet their needs (Exhibit B-1, pp. 33-34).

Provision of better customer information

FortisBC states that the Project allows for the provision of more detailed information for customers about their energy consumption (including both the timing and amount of energy consumed), for example through an online customer information portal or an optional in-home display (Exhibit B-1, p. 32).

FortisBC estimates that the energy savings from an online customer information portal would have a NPV benefit to customers of \$3.8 million and from an IHD a NPV benefit of \$4.6 million (Exhibit B-14, BCUC 2.72.2).

The CEC considers the online customer information portal will provide immediate information to customers about their energy use, and that the IHD will be valuable to customers in enabling them to monitor their energy consumption. CEC considers that these initiatives will contribute to a culture of conservation. (CEC Final Submission, pp. 34-35) The FortisBC 2010 Conservation and Demand Potential Review, filed as Appendix C of the 2012 Integrated System Plan, indicated that 116 GWh of Achievable Potential energy savings were possible through Behavioural Programs (BCUC 2.70.2).

BCPSO expects that the additional cost of providing a customer information portal is cost effective (BCPSO Final Submission p. 15). BCSEA consider that the web portal and IHD will result in energy and capacity savings, to the benefit of all FortisBC ratepayers (BCSEA Final Submission, p. 14).

The Panel also heard from certain interested parties that they are already conserving as much energy as possible (T2(Osoyoos): 33).

Reduced Safety Incidents

FortisBC reports that between 2006 and 2011 there were 93 safety incidents in the meter reading department related to vehicular incidents, falls, animals, weather or property access incidents. AMI will help to minimize these incidents. (Exhibit B-1, p. 37)

Commission Determination

The Panel accepts that there are soft benefits from the Project, although they are not included in the economic cost benefit analysis. The Panel supports this conservative approach to estimating benefits. However, the Panel makes no determination on the quantum of these benefits.

The Panel agrees with FortisBC and Interveners CEC and BCPSO that the Project allows for the provision of more detailed information to customers, and that this could contribute to a culture of conservation. The Panel considers that providing customers with better information on the quantity of electricity they consume could provide benefits to customers over the longer term.

8.1.4.2 System Efficiency and Reliability

FortisBC already has detailed, timely and accurate information on power supplied into the electrical network from generation and transmission to the substation level (Exhibit B-1, p. 35). It further states that the Project will not directly benefit the monitoring or visibility of this portion of the systems. However, the Project will enable improved distribution system modelling, accuracy and potential optimizations (Exhibit B-1, p. 35).

The Panel considers this to be a potential future benefit.

8.1.5 Other Potential and Future Benefits

FortisBC provides a description of other possible benefits that the Project enables, subject to potential additional capital expenditures. These potential expenditures and future benefits are not included in the financial justification. Table 8-5 sets out the potential future benefits from the Project as estimated by FortisBC.

Table 8-5

Functionality	Means	Benefit	Possible Benefit	Reference	Duration
Transition from existing analogue and digital meters to AMI meters	Installation of 115,000 new digital meters	foundational for all benefits			
Energy balancing and loss management via Increased granularity and synchronicity of customer electricity consumption information;	Customer, Feeder, and transformer meters; Meters with near real-time electricity consumption recording	1. Distribution loss reduction	1. May have \$ value	1.B-1 Appl. P.97	1.***
multiple attribute sensing	Tap changers, voltage regulators,	2.Conservation Voltage Regulation	2.May have \$ value	2.B-1 Appl p.98	2.***
	Software infrastructure; addit'l sensors	3.Distribution automation	3.May have \$ value	3.B-6 BCUC 1.12.3	3.***
		4.Real time transmission line rating	4.May have \$ value	4. B-6 BCUC 1.12.3	4.***
Two way communication between the customer and utility	Radio signal	1.Future conservation rate structures	1.May have \$ value	1.B-1 Applic p.103	1.***
		2.customer pre-pay	2.May have \$ value	2.B-1 Applic p.103	2.***
		3.Improved outage management	3.May have \$ value; customer service	3.B-1 Applic p.101	3.***
		4.Distribution generation	4. May have \$ value; customer service; env't;	4. B-6 BCUC 1.12.3	4.***
		5.Electric vehicle integration	5.env't; cust. Service; may have \$ value	5. B-6 BCUC 1.12.3	5.***
		6.HAN (Zigbee)	6.cust. service	6.B-11 CEC 1.51.1	6.***
		7.Demand Response	7.\$ value; customer service	7.B-11 CEC 1.23.5	7.***

Note: *One time reduction; ** Reduction over project life; *** Enduring benefit
(Exhibit B-15, CEC 2.3.1)

8.1.5.1 Voltage Optimization

FortisBC states:

“Conservation Voltage Regulation (CVR) techniques control field devices such as...customer meters to achieve specific energy efficiency, voltage regulation and VAR optimization objectives. These objectives can be energy conservation, load peak shaving, voltage regulation and feeder loss reduction due to inefficiency. Unlike simpler methods such as Line Drop Compensation (LDC) and Set Point Reduction (SPR), Volt/VAR Optimization (VVO) uses feedback from all the meters on a feeder, and therefore requires the infrastructure provided by an AMI system.” (Exhibit B-1, pp. 98-99)

FortisBC further states that all forms of Conservation Voltage Regulation currently show a negative payback for customers and therefore no form of Conservation Voltage Regulation is proposed at this time. FortisBC states it will continue to study the potential to implement Conservation Voltage Regulation and may propose a solution if higher power purchase costs or lower implementation costs make the project economic. (Exhibit B-1, p. 101)

Commission Determination

The Panel acknowledges that AMI is an enabling technology to realize any future potential benefits and finds it appropriate that any benefit is not included in the financial analysis.

8.1.5.2 Outage Management

Outage data from an Outage Management System (OMS) can be used to map outages and determine location and number of customers without service. The information provided by the OMS will improve identification of the scope of the outage, assist with prioritizing the restoration of service and reduce the field crews' response and repair times. FortisBC states:

“Outage data from the AMI system can be used to map outages and determine location and number of customers without service. Disruptions in power deliver can be detected at specific transformers, down to individual metering endpoints with full visibility provided back to the System Control Center Armed with this information, field crews' response and repair times will be reduced More accurate and timely outage information and the resultant restoration of those outages will result in an increase in customer satisfaction, comfort and safety.”
(Exhibit B-1, pp. 101-102)

FortisBC expects to finalize the development of a business case for the implementation of an OMS for inclusion as part of a future regulatory application with submission possibly in 2014/2015 (Exhibit B-1, p.102; Exhibit B-6, BCUC 1.102.3). The estimated cost of the OMS is \$830,000. The net forecasted savings of an OMS over the term of the Project is \$1.957 million (Exhibit B-1, Section 6.3 Outage Management, Table 6.3.a, p. 102).

BCPSO questions the benefit of an OMS as there may be a several hour delay (in real time) between actual downloads of AMI data and power restoration (BCPSO Final Submission, p. 16).

CEC notes improvements in outage identification and management (CEC Final Submission, p. 11).

Commission Determination

The Panel acknowledges that AMI is an enabling technology to realize any future potential benefits and finds it appropriate that any benefit is not included in the financial analysis.

8.1.5.3 Development of Future Rates

FortisBC states that AMI allows it to remotely and economically apply time-varying rate structures to selected meters (Exhibit B-1, p. 103). These could include time-of-use rate (where rates vary based on the time period); critical peak pricing rates (where customers are charged higher rates during critical peak periods and lower rates during non-critical periods); and critical peak rebates (where customers receive rebates for reducing consumption during critical peak periods) (Exhibit B-1, Appendix C-1, p. 6). These are collectively referred to as time-of-use rates.

FortisBC considers that time-of use rates can provide benefits such as:

- Delaying requirement for new generating facilities and transmission and distribution infrastructure, lowering costs for all customers;
- Reducing future power purchase expense;
- a reduction in reliance on alternative fossil fuel based energy supply, will result in an environmental benefit.

(Exhibit B-6, BCUC 1.107.1)

FortisBC estimated the uptake and response to these rates; however, it did not rely on these estimated benefits in its AMI cost benefit analysis (Exhibit B-1, pp. 103, 104).

Intervenors made submissions for and against time-of-use rates.

Commission Determination

The Panel acknowledges that AMI is an enabling technology that could facilitate time-of-use rates. Whether these potential rate structures provide an overall benefit to ratepayers has not been established in this Proceeding. The Panel will not consider this matter further.

8.2 Policy/Environmental Benefits

FortisBC states that the Project is consistent with the applicable of BC's energy objectives and specifically:

- a) "to take demand-side measures and to conserve energy";
- 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"; and
- c) "to reduce BC greenhouse gas emissions."⁸

(FortisBC Final Submission, p. 39)

8.2.1 Clean Energy Act – GHG Reductions

FortisBC considers that the Project will have a positive environmental impact by reducing emissions from meter reading vehicles. FortisBC meter reading vehicles drive approximately 500,000 kilometres per year consuming approximately 80,000 litres of gasoline and emitting up to an estimated 234 tonnes of carbon dioxide per year based on GHGenius v4.0 modeling software. (Exhibit B-11, BCSEA 1.48.1) Over a 20 year Project life, FortisBC estimates the cumulative GHG emission reduction of 4,996 tonnes. FortisBC also points to additional vehicle emission reductions of future smart grid capabilities such as an outage management system that will assist crews in locating failed equipment compared to having to drive searching for the location of outages (Exhibit B-11, BCSEA 1.3.3).

BCSEA, however, states that these vehicular GHG emission reductions, while directionally supportive, are minor. BCSEA consider it is instead "crucial that marijuana grow-operations are not allowed to switch to diesel generation as an alternative to using stolen electricity" - the GHG emissions from grow-ops switching from grid electricity to diesel-fuelled generation could be greater than the GHG reduction benefits from meter reading vehicles (BCSEA Final Submission, p. 15).

⁸ CEA, s. 2(b),(d) and (g).

Commission Determination

The Panel agrees with FortisBC’s calculation of the GHG reductions that the Project provides. The Panel makes no determination on BCSEA’s submission concerning fuel switching as no evidence was put forward on whether there would or would not be fuel switching to diesel fuel by marijuana grow-ops.

The Panel determines that the Project, by providing more detailed and timely information to customers about their energy use, supports BC’s energy objectives, specifically the objectives found in CEA sections 2(b) to take demand-side measures to conserve energy; and 2(d) to use and foster the development in BC of innovative technologies that support energy conservation and efficiency. The Panel also finds that the Project supports energy objective 2(g) to reduce greenhouse gas emissions.

8.3 Theft Reduction Benefit

Power theft, primarily by illegal marijuana grow-operations, increases costs for all paying FortisBC electricity customers. Reduction of power theft resulting from the Project is estimated by FortisBC to be a significant benefit. FortisBC estimates the NPV benefit to be approximately \$43 million over the life of the Project (Exhibit B-1-2, p. 3). Given the significance and complexity of this issue it is dealt with in its own section here.

In its analysis for the Project, FortisBC includes three components of the forecast theft reduction benefit. The first is a forecast increase in energy sales to paying illegal marijuana grow-operations. The second is a decrease in network electricity losses resulting from a reduction in theft of electricity by illegal marijuana grow-operations. The third is the recovered revenue from theft identification. The three components are broken out as follows:

Table 8-6

	(\$millions)
Revenue margin from paying sites	(16)
Power purchase costs from theft sites	(29)
Recovered revenue from theft identification	2
Total Theft Reduction Benefit	(43)

(Exhibit B-1-3, Excel Attachment, Tab “Theft Reduction”)

Commission Determination

In the view of the Panel, the Economic Analysis should include the Theft Reduction Benefit to FortisBC's ratepayers. Accordingly, the Panel considers the \$43 million to be the appropriate starting point for the examination of the Theft Reduction Benefit to be included in the Economic Analysis. The Panel has considered the three components that make up the Theft Reduction benefit of \$43 million separately below. In addition the Panel will consider other issues, if any, from the effect of the Project on illegal grow-operations.

8.3.1 Theft Reduction – Revenues

This Section deals with the forecast increase in revenues by converting non-paying illegal marijuana grow operators to paying customers. The Panel will consider whether this portion of the benefit (to the extent it exists) should be included in this evaluation.

FortisBC put forward the following argument in support of inclusion of this benefit:

“If the AMI project is implemented as proposed real financial benefits will occur due to illegal marijuana grow-operations being incited to pay for their electricity. It would seem disingenuous and improper not to attribute those financial benefits to the capital investment from which they are derived. In addition, the Company is not aware of any authoritative texts or guidelines for preparing financial analyses that suggest cash flows or other financial consequences of illegal activities are to be ignored when performing an analysis.” (Exhibit B-14, BCUC 2.58.2.1)

In contrast, FortisBC also recognises that illegal activities are not a societal benefit, stating:

“[FortisBC] doubts that Section 2 of the Clean Energy Act was intended to encourage economic development through illegal activities” (Exhibit B-14, BCUC 2.58.1)

In addition, a 2011 study authored by Diplock & Garis and led by Dr. Darryl Plecas, RCMP University Research Chair at the University of the Fraser Valley titled “Commercially Viable Indoor Marijuana Growing Operations in British Columbia: What Makes Them Such A Serious Issue?” (Plecas, Diplock & Garis Report) states:

“[Commercially viable indoor marijuana growing operations] are harmful operations intended to generate on-going tax free profits for those who own them. Collectively across the province of British Columbia commercial [marijuana] growers take money out of the pockets of every taxpayer and worse and increasingly so, facilitate the ability of organized crime to become richer, stronger, and more pervasive.” (Exhibit B-14, Appendix 3 to BCUC 2.59.0, p. 26)

CEC agrees with FortisBC that including the increase in net billable load of grow-operations paying for electricity is a reasonable assumption (CEC Final Submission, p. 16). BCSEA considers that additional revenue from paying illegal grow-operations should be included in the NPV analysis on the basis that ‘but for the project’ the additional revenue would not be received (BCSEA Final Submission, p. 11).

Commission Determination

The Panel considers that this illegal activity cannot, by its very nature, be considered to have a public interest benefit. **The Panel therefore disagrees with FortisBC’s position that an increase in sales to illegal grow-operations can be considered a net benefit of the Project.** While it may be true that some marijuana growers may shift from stealing electricity to paying for it as a result of AMI due to improvements in theft detection provided by AMI, to base a decision on the merits of installing meters on the expectations of gains from an illegal enterprise is, in the Panel’s view, inappropriate. For this reason no such benefit is included in the Panel’s economic analysis of the Project.

8.3.2 Decrease in Network Electricity Losses

This Section deals with the reduction in theft of electricity by illegal marijuana grow-operations and the related decrease in network electricity losses. The following subsections discuss the key assumptions and methodology used in arriving at the Panel’s determination to attribute a NPV benefit of \$33.5 million to the Project.

8.3.2.1 Treatment of Uncertain Benefits

FortisBC acknowledges that there is uncertainty in forecasting the result of the Project on electricity theft (FortisBC Final Submission, pp. 45-46).

BCPSO submits that the benefit from theft reduction is entirely speculative, and granting a CPCN based on a financial analysis that is based on such speculative estimates may not be prudent (BCPSO Final Submission, p. 10). CEC and BCSEA consider adoption of a conservative approach in estimating the benefit is sufficient to address the uncertainty risk. The CEC also submits that the Commission should consider the possible upside as well as the possible risk in evaluating the benefit (CEC Final Submission, pp. 15-16; BCSEA Final Submission, pp. 12-13). FortisBC states that the fact that there is never absolute certainty should not be a reason for rejecting a project, otherwise the electrical grid would simply stagnate (FortisBC May 2 Reply, p. 14).

Commission Determination

The Panel considers that benefits which are uncertain should be estimated conservatively, such that the estimated benefit is more likely to be understated than overstated. The Panel notes that any economic benefit from reduced system losses will accrue to FortisBC's ratepayers as they are the ones who pay these costs.

8.3.2.2 Identification of Key Assumptions used to Estimate the Theft Benefit

The Commission Panel will review each of the key assumptions made by FortisBC in arriving at the probable theft benefit estimate to determine if, when considered together, they are more likely to result in a theft benefit estimate that is understated rather than overstated.

To capture the range of possible results, FortisBC prepared four possible scenarios for calculating the theft benefit, and put forward a 'probable AMI forecast' as a conservative estimate of the benefit. FortisBC states that Table 8-7 provides a reasonable summary of the key assumptions made by FortisBC in estimating electricity theft by illegal marijuana grow-operations.

Table 8-7

	FortisBC Status Quo	FortisBC AMI Probable
Current estimated number of illegal marijuana sites in FortisBC service area	927	927
Annual change in total number of sites	2 percent increase each year	1 percent increase each year
Annual energy use per site	151,200 kWh	151,200 kWh

	FortisBC Status Quo	FortisBC AMI Probable
Percentage sites stealing electricity	25 percent, increasing to 30percent by 2017	25 percent decreasing to 5percent by 2021
Theft detection rate	8 percent	Increasing from 8 percent to 25 percent by 2016
Recovered revenue from theft detection	Each theft site is billed for an average 1 year loss with collection success rate of 20 percent	

(Exhibit B-14, BCUC 2.62.2 – modified to include Kelowna)

FortisBC filed a letter from Professor Neil Boyd, a Professor at the School of Criminology, Simon Fraser University. Professor Boyd raised concerns that future government policy changes and lighting technology improvements could significantly decrease or increase the forecast theft benefit from AMI. He states that marijuana legalization and technology changes to more efficient LED lighting are entirely within the realm of possibility and could dramatically affect the validity of the projections. (Exhibit B-6, Appendix to BCUC 1.86.1, p. 6) FortisBC considers that there is little credible evidence to support a current trend towards LED use by marijuana grow-operations. (Exhibit B-6, BCUC 1.83.4.1)

FortisBC considers that regulation of marijuana production in BC will not result in a reduction in electricity theft as 90 percent of marijuana is exported and the regulated marijuana product may be of a lower potency than that offered in the illegal market (Exhibit B-14, BCUC 2.63.1).

Professor Boyd considers that there could be significantly higher theft levels under the Status Quo if local governments embraced the Safety Standards Amendment Act of 2006 by using electricity consumption data to identify potential illegal grow-operations. Professor Boyd considers that a worst case scenario could emerge, where the number of growers in the region would increase (given knowledge of the lack of AMI deployment) and the majority would steal electricity. (Exhibit B-6, Appendix to BCUC 1.86.1, p. 6)

FortisBC states that there have been no signals from local governments indicating an interest in engaging under the Safety Standards Amendment Act. However, FortisBC notes that, if such a scenario were to occur, the theft benefit will increase beyond that submitted in the Application. (Exhibit B-14, BCUC 2.63.4, 2.63.4.1)

Commission Determination

The Panel agrees with Professor Boyd that legalization of marijuana, LED changes and municipal use of the Safety Standards Amendment Act could significantly increase or decrease the theft benefit from AMI. However, the Panel considers that these potential impacts are hard to predict. The Panel will consider these possibilities when evaluating whether the theft benefit estimate put forward by FortisBC is sufficiently conservative.

8.3.2.3 Review of Key Assumptions in the theft benefit estimate

8.3.2.3.1 Number and growth rate of marijuana grow sites on FortisBC's network

FortisBC used a 2011 study authored by Diplock & Plecas titled "The Increasing Problem of Electrical Consumption in Indoor Marijuana Grow Operations in British Columbia" (Plecas Report, Exhibit A2-1) as its starting point in estimating the number of illegal marijuana sites in FortisBC's service area. This study estimated that there were 13,206 indoor marijuana grow premises in BC in 2010. (Exhibit B-1, p. 82)

As FortisBC serves approximately 6 percent of residential electric customers in BC, FortisBC estimated that 792 sites existed in the Company's service area. This figure was assumed to increase at 2 percent annually in the Status Quo model, resulting in an overall figure of 824 grow sites in FortisBC's service territory in 2012. (Exhibit B-1, p. 82) Professor Boyd supports FortisBC's estimate. (Exhibit B-6, Appendix to BCUC 1.86.1, p. 2) FortisBC subsequently scaled the number of sites up to 927 to include Kelowna (Exhibit B-1-3, AMI Excel NPV Analysis – CoK Addendum, Theft Reduction sheet).

FortisBC also assumes (i) a 2 percent/year increase in the number of illegal marijuana grow-operations without the Project, and (ii) a 1 percent/year increase in the number of illegal marijuana grow-operations year if the Project is installed (Exhibit B-1, pp. 82, 83). Professor Boyd's opinion is that the increase in illegal grow-operations is likely to be greater than estimated by FortisBC without the Project (10 percent increase by 2016 was provided as a low estimate), and if the Project results in a theft ratio of 5 percent, the total number of sites may not increase but may even decrease (Exhibit B-6, Appendix to BCUC 1.86.1, pp. 6, 7). No interveners disputed FortisBC's assumptions regarding the number and growth rate of marijuana grow sites.

Commission Determination

Based on the evidence provided in the report and letter, the Panel accepts (i) FortisBC's estimate of the number of marijuana grow sites as reasonable, and (ii) FortisBC's estimate of the annual increases in the number of theft sites with and without AMI as conservative.

8.3.2.3.2 Average Energy Use per Site

FortisBC estimates that each marijuana grow-operation uses on average thirty 1000 Watt lights per site. This is taken from data compiled by FortisBC of investigations undertaken between 2006 and 2012, and is lower than the estimate of 36 lights per site used in the Plecas Report. Professor Boyd states that he has no reason to doubt this estimate. (Exhibit B-1, p. 82; Exhibit B-6, Appendix to BCUC 1.86.1, p. 3)

A 2011 study titled "The Nature and Extent of Marihuana Growing Operations in Mission British Columbia" (Exhibit A2-7) found that grow-operations involving electricity theft have been consistently larger than operations that do not involve electricity theft (Exhibit A2-7, p. 6).

FortisBC estimates that each marijuana grow-operation uses 151,200 kWh/year based on an assumption of four grow cycles per year used in the Plecas Report (Exhibit B-1, p. 82). FortisBC states that it has consistently assumed and invoiced for four annual grow cycles when theft is detected, and this assumption has not been challenged by producers (Exhibit B-14, BCUC 2.62.3). However, Professor Boyd states "the Plecas Report calculations of 90 days in the grow cycle and 4 grow cycles per year likely assume a degree of organization that does not exist with most grow-operations." Professor Boyd instead supports a more conservative estimate of three grow cycles per year (113,400 kWh per site) (Exhibit B-6, Appendix to BCUC 1.86.1, p. 3). No interveners made submissions regarding FortisBC's assumptions of the average energy use per site.

Commission Determination

The Panel accepts FortisBC's assumption, supported by Professor Boyd that each marijuana grow-operation uses on average thirty 1000W lights per site. The Panel accepts that although some grow-ops may average four grow cycles per year the evidence of Professor Boyd is that a more conservative approach is to assume three grow cycles each year. **The Panel therefore accepts Professor Boyd's conservative approach of three grow cycles per year as being reasonable. This**

reduces the assumed annual energy use per site from FortisBC's estimate of 151,200kWh/year to 113,400/kWh.

8.3.2.3.3 Percentage of Sites Stealing Electricity

FortisBC assumes that 25 percent of illegal marijuana grow sites are stealing electricity, and that this increases to 30 percent by 2017 under the Status Quo, and decreases to 5 percent by 2021 if AMI is installed. FortisBC states that the revenue protection program has identified an average 25 percent of known or suspected marijuana sites as diverting electricity (theft) from 2009 to 2011. (Exhibit B-1, p. 83)

The Plecas Report found that the proportion of growers stealing power appears to be approximately 52 percent, and stated that this figure is nearly identical to the estimate provided to the authors from BC Hydro (51 percent). The Plecas Report also states that this estimate is nearly identical to the estimate provided by individuals who have operated illegal grow-operations and who have a broad knowledge of the industry. These individuals reported that generally "half" of all operators today steal electricity. (Exhibit A2-1, p. 2)

Professor Boyd considers that the higher theft estimates by Plecas could result from approaches taken by some Lower Mainland municipalities to use the provisions of the Safety Standards Amendment Act of 2006 to identify and target high use customers. Professor Boyd notes that no local governments serviced by FortisBC require disclosure of account information of customers with high loads, and this could result in marijuana producers on FortisBC's network being less likely to steal. (Exhibit B-6, Appendix to BCUC 1.86.1, p. 5)

Professor Boyd cites a province-wide 2005 report of theft which found electricity theft in an average of 20 percent of 25,000 cases, and considered it was reasonable to assume an increase in theft levels since that date as a result of an unintended consequence of the Safety Standards Amendment Act of 2006. Professor Boyd considers that there will be some further increase in theft from current levels under the Status Quo due to an influx of growers; however, while he considers it is virtually certain theft will decrease markedly under the Project, it may not drop as low as 5 percent. (Exhibit B-6, Appendix to BCUC 1.86.1, pp.5, 7)

Commission Determination

The Panel accepts FortisBC's evidence of a 25 percent grow-op theft rate, increasing to 30 percent under the Status Quo as conservative.

8.3.2.3.4 Theft Detection Rate and Recovered Revenue

FortisBC states in the Application that revenue protection investigators have discovered an average of 8 percent of the total estimated theft sites annually. Its analysis assumes this 8 percent theft detection rate will increase to 25 percent by 2016 under the Project. (Exhibit B-1, pp. 83, 84) FortisBC considers this to be a conservative assumption (Exhibit B-6, BCUC 1.87.1.4).

FortisBC states that theft reduction following AMI will be achieved in two phases. Phase I will focus on tamper detection, improved data quality and non-demand meter readings. Phase II involves the installation of feeder meters at key points on FortisBC distribution feeders. These meters will measure the total electricity supplied to a specific area and can be used to target areas with higher than expected line losses. The capital cost of installation and operation of Phase II is included in the Project budget. (Exhibit B-1, pp. 87, 88)

FortisBC states that once the Phase I theft detection results are evaluated it will determine if there is a business case for an increase in the Phase II budget to further increase the theft detection rate (Exhibit B-14, BCUC 2.62.5). FortisBC also estimates in the Application that theft sites will be billed for an average one year loss, with a success rate of 20 percent, which is lower than the 50 percent actual recovery rates obtained during 2006 to 2011 (Exhibit B-14, BCUC 2.62.4). No interveners disputed FortisBC's assumptions regarding the theft detection rate and recovered revenue.

FortisBC considers that it has achieved a noteworthy reduction in theft with limited resources, technology and data quality, and considers it is reasonable to predict an additional 20 percent reduction in theft from AMI (Exhibit B-14, BCUC 2.62.3). No interveners disputed FortisBC's assumptions regarding the percentage of sites stealing electricity or the reduction estimates.

Commission Determination

The Panel accepts FortisBC's assumption regarding the theft detection rate and recovered revenue as conservative. **The Panel accepts FortisBC's evidence that it will be able to yield an additional 20 percent reduction in the theft ratio under AMI as reasonable.**

8.3.2.4 Valuing the Decreased Network Electricity Losses from the Project

FortisBC valued the electricity theft from marijuana grow-operations at its short-term avoided cost using the estimated BC Wholesale Market Energy Price (\$54.68 per MWh for 2012) (Exhibit B-6, BCUC 1.81.2). FortisBC states that it elected to use the short-term avoided cost as part of its overall conservative approach to modelling the benefits associated with the AMI Application, and believes this to be an appropriate approach. However, FortisBC states that it would not object to valuing the energy lost due to theft at the full long-run marginal cost of acquiring energy from new resources (Exhibit B-14, BCUC 2.61.2.1). FortisBC estimates the long-run marginal cost for acquisition of new resources is \$111.96/MWh. Adding 11 percent FortisBC system losses increases the estimate to \$125.80/MWh (Exhibit B-14, BCUC 2.61.1).

Commission Determination

In valuing the reduction in electricity lost to theft, the Panel does not consider that the decision should be based on picking whichever of the short-run or long-run cost estimate happens at that time to provide the lowest benefit estimate. The Panel considers that a matching principle should apply. Where the energy saving benefit occurs over the long-term, a long-term cost of energy should be used to calculate the value of that benefit.

The Panel considers that the reduction in energy lost to theft as a result of AMI provides a long-term benefit to customers. Accordingly, in examining the Project over the long-term in the Economic Analysis, the Panel considers that the cost of energy should be valued at FortisBC's long-run marginal cost of \$125.80/MWh.

The Panel considers that while using the long-run marginal cost of energy is appropriate to measure the long-term benefit in the Economic Analysis, this is not appropriate to use when examining the short-term rate impact of the Project. Accordingly, for the purposes of determining the rate impact of the Project over the short-term, the Panel has used the short-term avoided cost

using the estimated BC Wholesale Market Energy Price. The rate impact of the Project is discussed in Section 8.5 of this Decision.

8.3.3 Are There Lower Cost Ways of Obtaining the Theft Benefit?

BCPSO submits that if theft reduction was the primary need to be addressed in this project, then simpler, lower cost systems exist (BCPSO Final Submission, p. 9).

FortisBC does not consider that an expansion of the Revenue Protection Program coupled with only advanced feeder level meters would not increase the number of leads nor improve the quality of tips; both of which are possible with AMI deployment (Exhibit B-6, BCUC 1.85.5). FortisBC states it tested a manual approach to energy balancing at the feeder level and has concluded that the installation of feeder meters without the accompanying advanced meters is not practical as the readings will occur over different time periods and manual readings may contain inaccuracies (Exhibit B-6, BCUC 1.82.4).

Commission Determination

The Commission Panel accepts that advanced meters at the feeder level only would not be a practical means of identifying theft as data obtained would not be time synchronised.

8.3.4 Theft Reduction Benefit – Other Considerations

The Panel previously determined that AMI should result in a reduction in the number of illegal marijuana grow-operations on FortisBC's network compared to the Status Quo. FortisBC considers that this will provide communities with health and safety benefits, and states that it is particularly concerned with the existing risk of electrical fires associated with theft sites. An August 2012 report by Surrey Fire Chief Len Garis and Dr. Joseph Clare found a 36 percent decrease in the frequency of residential fires associated with marijuana grow-operations following deployment of smart meters on BC Hydro's network. (FortisBC Final Submission, pp. 212-213; Exhibit B-14, BCUC 2.58.6)

The Plecas, Diplock & Garis Report, (titled 'Commercially viable indoor marihuana growing operations in British Columbia: what makes them such a serious issue?' states that a reduction in the overall number of illegal marijuana grow-ops on FortisBC's network should provide community

health and safety benefits. These include: reduced fire and other health risks to house occupants (including children) of current grow-operations; reduced health risks to house occupants of past undetected grow-operations; reduced risk of drinking water contamination in the neighbourhood as a result of grow-operation back flushing; and enhanced community safety resulting from a reduction in criminal activity. (Exhibit B-14, Appendix 3 to BCUC 2.59.0)

Professor Boyd states "... the material provided to me by Fortis does not quantify the potential public safety benefits of AMI (in relation to the dangers in theft of electricity). More specifically, the avoidance and/or limitation of fatalities and serious injuries to citizens have economic costs that should be considered." (Exhibit B-6, Appendix to BCUC 1.86.1, p. 8)

Commission Discussion

The Panel is of the view that a reduction in illegal grow-operations resulting from AMI should provide community health and safety benefits, in particular through a reduction in number of residential fires caused by illegal grow-operations. No determination is made on the quantum of these net benefits.

8.3.5 Summary

In summary, the Panel concludes that the total theft reduction benefit should be adjusted for the following items:

- No allowance for increases in sales to illegal grow-operations;
- Annual energy use per site reduced from 151,200 kWh to 113,400 kWh; and
- Short-term avoided cost of energy replaced with the long-run marginal cost of energy.

Using FortisBC's financial model (included in Exhibit B-1-3, Attachment, Tab "Theft Reduction") to make these adjustments results in an estimated net present value benefit of theft reduction of \$33.463 million. The Panel considers this to be the appropriate Theft Reduction Benefit to include in the Economic Analysis of the Project.

8.4 Economic Analysis – Summary

For the reasons outlined above in this Section, the Panel accepts a net benefit of \$13.876 million on a NPV basis over 20 years for the Project Economic Analysis. This is summarized as follows:

Table 8-8

	NPV (\$000s) Net AMI
Operating Expenses:	
New Operating Costs	14,411
Meter Reading	(26,444)
Disconnect / Reconnect	(6,155)
Meter Exchanges	(1,610)
Contact Centre	(507)
Total Operating Expenses	(20,305)
Sustaining Capital:	
Meter Growth and Replacement	1,972
Handheld Replacement	(581)
Measurement Canada Compliance	(10,808)
IT Hardware, Licensing and Support Costs	5,688
Total Sustaining Capital	(3,729)
Income Taxes	4,547
Project Capital	39,074
CPCN Development Costs	-
Theft Reduction Benefit	(33,463)
Total	(13,876)

Given the expected economic benefit of the Project, the Panel expects that the Project will also have a positive impact on rates over the life of the Project.

8.5 Rate Impact of the Project

The Panel does not consider it appropriate to evaluate the customer rate impact over the life of the Project (i.e. 20 years). Instead, the Panel has considered the expected rate impact over the short-term. In the Panel's opinion a period of five years is appropriate given that FortisBC's current Revenue Requirements Application is for the period 2014-2018.

The Revenue Requirements Analysis submitted by FortisBC has a cumulative incremental rate impact over the next five years as follows:

Table 8-9

Cumulative Incremental Rate Impact (Net AMI)					Reference
2014	2015	2016	2017	2018	
1.76%	1.66%	-0.38%	-0.46%	-0.69%	Exhibit B-1-3, Tab "Net AMI", Line No. 14

The Panel has used this Revenue Requirements Analysis (Exhibit B-1-3) as the basis for determining the expected rate impact of the Project. The majority of the project costs and benefits included in the Revenue Requirements Analysis are the same as in the Economic Analysis and accordingly, they are not re-examined here. There are, however, several items that are specific to the calculation of the expected rate impact of the Project that are examined in the sections that follow.

The Economic Model has been adjusted for the following items:

1. Theft Reduction Benefit

- No allowance for increases in sales to illegal grow-operations;
- Annual energy use per site reduced from 151,200 kWh to 113,400 kWh.

2. Write-off of the Existing Meters

- Amortized over a period of 5 years

Making these adjustments, the Panel has summarized below the expected rate impact of the Project over the next five years. The Panel notes that the cumulative incremental rate impact of the Project in any given year is less than 0.9 percent.

Table 8-10

Cumulative Incremental Rate Impact (Net AMI)				
2014	2015	2016	2017	2018
0.39%	0.87%	0.46%	0.54%	0.39%

8.5.1 Carrying Costs

The Panel has reviewed FortisBC's calculation of carrying costs included in the Revenue Requirements Analysis, including the following inputs: deemed capital structure; cost of debt; and cost of equity. The Panel accepts FortisBC's calculation of carrying costs as being reasonable.

8.5.2 Theft Reduction Benefit

The Panel has examined the Theft Reduction Benefit specifically in Section 8.3 of this Decision. In summary, the Panel concluded that the total Theft Reduction Benefit of \$43 million should be adjusted for the following items:

- No allowance for increases in sales to illegal grow-operations;
- Annual energy use per site reduced from 151,200 kWh to 113,400 kWh; and
- Short-term avoided cost of energy replaced with the long-run marginal cost of energy.

In order to determine the appropriate theft reduction benefit to use in the determination of the rate impact of the Project, the adjustments above are also applicable except for the cost of energy. The Panel notes that while using the long-run marginal cost of energy is appropriate to measure the long-term benefit in the Economic Analysis, this is not appropriate to use when examining the short-term rate impact of the Project. Accordingly, for the purposes of determining the rate impact of the Project over the short-term, the Panel has used the short-term avoided cost using the estimated BC Wholesale Market Energy Price.

8.5.3 Depreciation

The depreciation expense included in the Revenue Requirements Analysis represents the incremental expense under the Project, as compared to the Status Quo scenario. For ratemaking purposes, depreciation expense is the allocation of the cost of assets to periods in which the assets are used. The depreciation expense for both the Project and the Status Quo scenario is calculated using the capital costs and applicable depreciation rates.

With respect to depreciation rates, FortisBC provided a summary of the Project capital costs and the proposed depreciation rates excluding the City of Kelowna in Exhibit B-6 (Exhibit B-6, BCUC 1.90.1). The Panel recalculated the summary with the project capital costs for the City of Kelowna using the data provided in the Addendum to the Application (Exhibit B-1-2).

Table 8-11

Item	Total 2013 - 2015 (A) (\$000s)	% of Total (B)	Depreciation Category (C)	Depreciation Rate (C)	Portion of Total Composite Depreciation Rate (B)
1 Third Party Software and Services	5,830	11%	Software	5.01%	0.6%
2 Meters (Including Deployment)	22,941	45%	Meters	5.00%	2.2%
3 Network Infrastructure	4,602	9%	Comm Structure & Equip	8.05%	0.7%
4 Network Infrastructure	48	0%	Software	5.01%	0.0%
5 System Integration	2,377	5%	Software	5.01%	0.2%
6 Theft Detection	1,100	2%	Meters	5.00%	0.1%
7 Project Management	3,355	7%	Average	5.38%	0.4%
8 CPCN Development / Approval Costs	4,915	10%	Average	5.38%	0.5%
9 Capitalized Overhead, AFUDC, PST	6,005	12%	Average	5.38%	0.6%
10 Total	51,173	100%			5.38%
A Agreed to Exhibit B-1-2, p. 4					
B Recalculated					
C Agreed to Exhibit B-6, BCUC IR 1.90.1					

FortisBC requests approval of a depreciation rate of 5 percent for the meters to be installed as part of the Project, based on an estimated economic life of 20 years. With respect to the Project capital costs other than the Meter asset class, specifically the Computer Equipment and Software and Communication Structures and Equipment, FortisBC proposes depreciation accrual rates based on the 2011 Depreciation Study.

Regarding accrual rates, the 2011 Depreciation Study notes the following:

“The annual depreciation accrual, and cost of removal rates and the related calculated requirement for accumulated depreciation and cost of removal were calculated using the straight line method, the remaining life basis and the average service life (ASL) procedure. The calculation was based on the attained ages and estimated service life and net salvage characteristics for each depreciable group of assets.”

With respect to survivor curves, the 2011 Depreciation Study notes the following:

“The use of an average service life for a property group implies that various units in the group have different lives. Thus, the average life may be obtained by determining the separate lives of each of the units, or by constructing a survivor curve by plotting the number of units which survive at successive ages.”
(Exhibit B-6, Appendix BCUC 1.69.4)

8.5.3.1 AMI Meters

FortisBC states in the Application that “Assumptions regarding depreciation rates for the AMI meters have been determined based on the observed useful lives as established through industry experience, as well as through manufacturer’s recommendations” (Exhibit B-1, p. 76).

The 2011 Depreciation Study designates a survivor curve of 20 years to FortisBC’s existing meter population, comprised of both electric and electromechanical meters (Exhibit B-6-5, BCUC 1.89.1). FortisBC submits that the “...Centron meter product was introduced to the marketplace in 1998, so no Centron meters have yet been operating in the field for 20 years” (Exhibit B-11, CEC 1.6.1), However, the Accelerated Life Testing document provided by Itron also indicates that the AMI meters have a “...15 or 20 year life expectancy” (Exhibit B-6, BCUC 1.69.1).

In support of the “manufacturer’s recommendations” FortisBC provided an Itron document that summarizes the accelerated life testing performed at the Oconee electric meter manufacturing facility. The testing summary notes the following:

“Many meters will last beyond their 15 or 20 year life expectancy. Each stress test lasts the equivalent of the product lifespan. The tests show that the product must maintain a $\leq 0.5\%$ yearly failure rate over the product life expectancy. In other words, if we have $0.5\% * 20 \text{ years} = 10\%$ of the meters can fail, but 90% are still operational. From the accelerated life testing, we calculate what the yearly failure rate; we can validate that the failure rate is less than the 0.5%.” (Exhibit B-6, BCUC 1.69.1)

FortisBC also provided an email from Itron which stated that “Itron does not provide guidance on depreciation schedules, as those decisions are a function of utility policy” and “Several utilities have determined that for their purposes the OpenWay CENTRON Meter has a useful life expectancy of 20 years. This is based on a failure rate of less than 0.5% for single-phase meters ... With more than 9 million meters deployed, we also have access to field data to determine the failure rates and reliability of the product. Currently, Itron can demonstrate field failure rates well below 0.5% for the [product(s)].” (Exhibit B-14, Attachment BCUC 2.37.1)

The implementation of AMI meter technology in Canada has been a relatively recent development. In Ontario, legislation was introduced in 2005 to start the process of installing “smart meters” in every home and small business in the province by 2010.⁹ Under BC Hydro’s Smart Metering Program, the installation of “smart meters” began throughout British Columbia in 2011 and 2012 (Exhibit B-1, Exhibit C-4, BC Hydro Smart Meter Business Case). Most recently in October 2012, the Régie de l’énergie [Québec energy board] issued Decision D-2012-127 approving Phase 1 of Hydro-Québec’s Smart Meter Project (Exhibit B-14, Appendix BCUC 2.84.1).

With respect to assumptions made in other Canadian jurisdictions regarding the economic life of AMI meters, the Ontario Energy Board notes the following in their 2010 “Accounting Procedures Handbook Frequently Asked Questions” document:

“For regulatory accounting purposes, 15 years useful life on a straight-line basis is used to calculate and record depreciation of in-service smart meters ... This applies until such time as the distributor presents an independent depreciation study and the Board accepts a different useful life as more appropriate.”
(Exhibit B-6, BCUC 1.69.1)

With respect to “industry experience”, FortisBC notes that “Currently the only other jurisdictions known to FortisBC using an economic life other than 20 years are FortisAlberta (at 25 years) and Ontario (at 15 years)” (Exhibit B-6, BCUC 1.89.5).

The CEC supports a revised depreciation rate of 5 percent for the AMI meter asset class and recommends that this revised rate be approved for the duration of the proposed Project (CEC Final Submission, p. 42). No other Interveners took a position on this issue.

BC Hydro indicated that the amortization period for its smart meters is 20 years (Exhibit B-1, Appendix C4, p. 32).

Commission Determination

For the Revenue Requirement Analysis the Panel accepts the same capital costs as it did for the Economic Analysis, as both analyses concern the same Project and the same set of capital assets.

⁹ <http://gridsmartcity.com/smart-grid-defined/smartgrid-and-green-energy-timeline/>

Given the recent implementation of AMI technology in other Canadian jurisdictions, the Panel is of the view that the economic life of AMI meters based on industry experience is not well established. However, the Panel also recognizes that depreciation rates are based on estimates and consequently assumptions must be made in order to determine appropriate depreciation rates.

The Panel acknowledges that the economic life of AMI meters may differ from that of the existing meter population; however, in the absence of historical data and established industry experience to support the estimated economic life of the AMI meters, the Panel is of the view that the survivor curve of the existing meter population provides support for the expected useful life of meter technology in general.

Based on the evidence set out above, the Panel considers there to be an acceptable range of between 15 and 20 years for the estimated economic life of AMI meters. **Accordingly, the Panel approves a depreciation rate of 5 percent for the AMI meters, based on an estimated economic life of 20 years until the next depreciation study is completed and approved.**

8.5.3.2 Other Project Asset Classes

FortisBC proposes depreciation rates for the Computer Equipment and Software and Communication Structures and Equipment asset classes of 5.01 percent and 8.05 percent respectively based on the recommendations in the 2011 Depreciation Study (Exhibit B-1-1, Updated Application, p. 76). FortisBC submits that this is appropriate for the following reasons:

“The Company is of the opinion that given that the Computer Hardware and Software in the AMI project is very similar to the Computer Hardware and Software that the Company uses in its operations today, the useful lives of the existing Computer Hardware and Software would be similar to that associated with the AMI project.” (Exhibit B-6-5, BCUC IR 1 (Revised Responses), p. 10)

“The communication equipment, software, and structures in the AMI project is very similar to the communication equipment, software, and structures that the Company utilizes in its operations today. The communication equipment, software, and structures would be added to the same asset classes as are found in the depreciation study but the current depreciation rates by asset class would continue to be applied to all assets until a new depreciation study was completed.” (Exhibit B-6, BCUC 1.69.4)

The 2011 Depreciation Study recommended the following accrual rates and survivor curves (Exhibit B-6, Appendix BCUC 1 69.4, 2011 Depreciation Study):

Table 8-12

Asset Class	Accrual Rate	Survivor Curve
Computer Equipment and Software	5.01 percent	10 years
Communications Structures and Equipment	8.05 percent	15 years

The CEC agrees with FortisBC's approach in determining the composite depreciation rates for the Project capital costs (CEC Final Submission, p. 42). No other Interveners took a position on this issue.

Commission Determination

The Panel notes that the attained ages of the assets within each asset class, based on data through 2009, forms part of the basis for the calculation of the accrual rates recommended in the 2011 Depreciation Study. Accordingly, the addition of significant, new capital costs to the existing asset classes could render the existing accrual rates inappropriate by changing the overall composition of the asset class.

Considering the impact that the new AMI capital costs could have on the overall composition of the existing asset classes, the Panel concludes that it is more appropriate to use the survivor curves, rather than the accrual rates, recommended in the 2011 Depreciation Study to determine the appropriate depreciation rates for the AMI Computer Equipment and Software and Communication Structures and Equipment. **FortisBC is directed to use a depreciation rate of 10 percent (1 divided by a 10 year survivor curve) for the AMI Computer Equipment and Software and 6.67 percent (1 divided by a 15 year survivor curve) for the AMI Communications Structures and Equipment until the next depreciation study is completed and approved.**

FortisBC has not had the opportunity to recalculate the Revenue Requirements Analysis and the expected impact of the Project on customer rates using the depreciation rates for the AMI Computer Equipment and Software and AMI Communication Structures and Equipment ordered by the Panel in this Decision. However, in the Panel's opinion, this is not expected to have a material

impact on the expected impact on customer rates, given that the revised depreciation rate of 5 percent for the AMI meters has been approved, and the capital costs associated with meters (including deployment) represent 45 percent of the total Project capital costs. (Exhibit B-1-2, p. 4)

8.5.4 Accounting Treatment of the Existing Meters

The accounting treatment for the write-off of the existing meters for ratemaking purposes is an important consideration in the Revenue Requirements Analysis. The unamortized balance of the existing meter population including the former City of Kelowna service territory is \$10.3 million (Exhibit B-1-3, Tab “Net AMI”, Line No. 64-65). FortisBC has considered three options for the regulatory accounting treatment of the existing meter population (Exhibit B-1, p. 77):

1. Write-off the existing meter population as they are removed from service and replaced with AMI meters over 2014 – 2015.
2. Continue to depreciate the existing meter population based on the depreciation rates set by the 2011 Depreciation Study.
3. Depreciate the existing meters over a period longer than proposed in Option 1 and 2 above.

FortisBC has proposed Option 1, as it does not require a departure from US Generally Accepted Accounting Principles (US GAAP).

Under US GAAP the write-off of the existing meters would normally be expensed as a current period charge as the existing meters are removed from service. Consequently, a variance from US GAAP is required under Option 2 and Option 3. FortisBC submits that “US GAAP recognizes that rate regulated entities might request or be ordered to account for costs in a manner not consistent with US GAAP and allows for the variance in the accounting treatment.” (Exhibit B-15, CEC 2.19.2)

BCPSO supports Option 3 considered by FortisBC, given that “... the longer amortization period is in the customers’ best interest.” (BCPSO Final Submission, p. 19)

CEC supports the accounting treatment proposed by FortisBC on the basis that it is in accordance with US GAAP and accurately reflects the costs of the Project. (CEC Final Submission, p. 42)

Commission Determination

FortisBC is directed to record the cost of these meters in a rate base deferral account attracting FortisBC's weighted average cost of capital (WACC) as they are removed from service. Additions to the deferral account are to be amortized over a period of five years, commencing the year following their addition.

The Panel is in agreement with CEC that Option 1 most accurately reflects the costs of the Project. In addition, this option is advantageous in that it does not require a variation from US GAAP. However, the Panel is of the view that the rate impact must also be considered in determining the appropriate regulatory accounting treatment for the existing meters. Option 1 has the most significant annual rate impact as it proposes the shortest amortization period.

Option 3 results in the lowest annual rate impact of all three deliberated by FortisBC as it proposes the longest amortization period. In the Panel's view this option increases intergenerational inequity with respect to the cost of service impact of the existing meter population. In addition, it results in the most significant ultimate cost to ratepayers due to the amount of financing charges that the balance would attract over the extended amortization period. Accordingly, the Panel does not consider it appropriate to extend the amortization period of the existing meter population beyond what was recommended in the 2011 Depreciation Study.

The Panel considers that an accounting treatment derived from Option 2 proposed by FortisBC appropriately balances the benefit of rate smoothing with the benefit of reducing both intergenerational inequity and the financing costs that deferred expenses attract. As Option 2 requires a variance from US GAAP, the Panel has considered two additional issues with respect to the recovery of the unamortized balance of the existing meters:

1. Amortization Period

With respect to Option 2, FortisBC notes that "This would mean the existing meters would continue to be depreciated at the rate derived from the life estimate of approximately 7 years as determined in the 2011 Depreciation Study." (Exhibit B-1-1, Updated Application, p. 77) In the absence of a more current depreciation study, and in order to account for the two years (i.e. 2012 and 2013) that have passed since the 2011 Depreciation Study, the Panel considers the appropriate amortization period to be 5 years.

2. Financing Costs

Given that the deferral account relates to expenditures that are capital in nature, the Panel considers it appropriate for the deferral account to attract FortisBC's WACC.

Option 2 was used by BCUC staff, in calculating the rate impact.

8.5.5 BCUC Staff Model

Using the same data and assumptions as provided by FortisBC in the Revenue Requirements Analysis, Commission staff also prepared an analysis that separated the calculation of the revenue requirements of the Project from the calculation of the impact of the Project on customer rates (BCUC Staff Model).

FortisBC acknowledges in its Final Submission that:

"An alternative means of looking at this calculation was provided by Commission Staff in Appendix 1 to Exhibit A-15 (the BCUC Staff Model). In the BCUC Staff Model, the impact of the proposed AMI Project was considered on the revenue requirement using only the portion of the theft reduction benefit that directly impacts the revenue requirement. Unlike FortisBC's calculations, the BCUC Staff Model excluded the portion of the benefit related to an increase in net billable load. This benefit was instead reflected in determining the impact of the proposed AMI Project on customer rates." (FortisBC Final Submission, p. 44)

BCSEA states that "Using the BCUC Staff Model, FortisBC's estimate of the AMI NPV is -\$10.8 million -- meaning the financial benefits exceed the financial costs by \$10.8 million" (BCSEA Final Submission, p. 12).

Although the CEC agrees with FortisBC that including the increase in net billable load of grow-operations paying for electricity is a reasonable assumption, it "submits that a positive net present value of \$10 million remains a valuable contribution" (CEC Final Submission, p. 16).

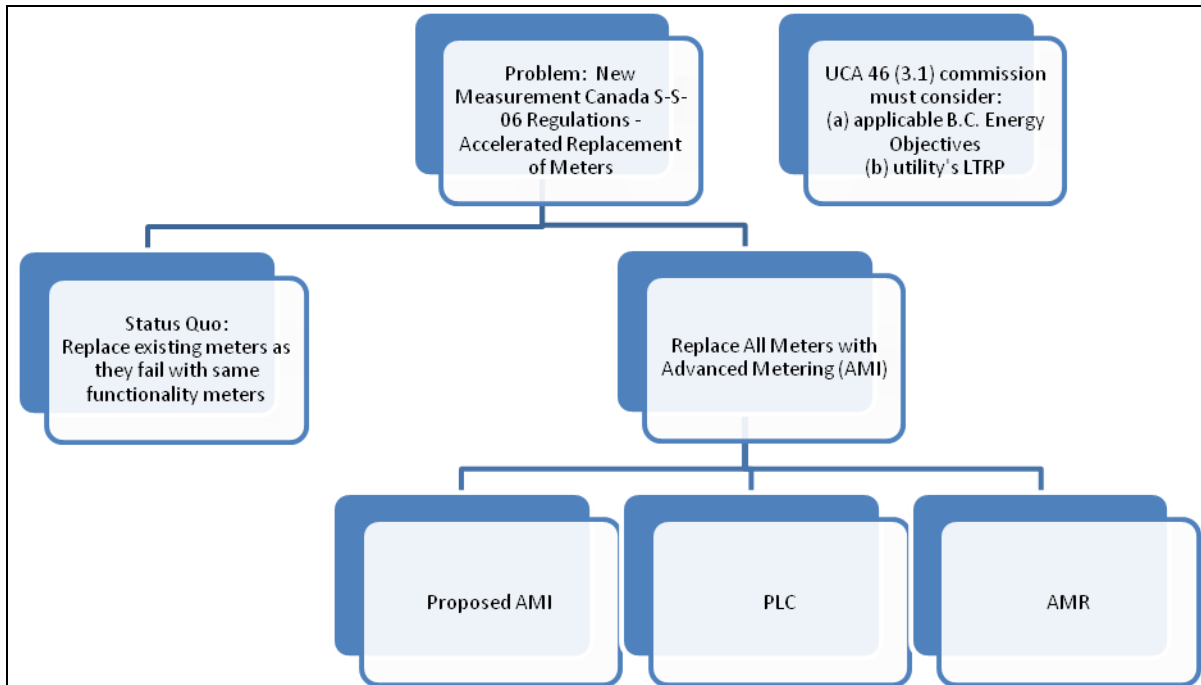
Commission Panel Discussion

The Panel notes that Part 2 of the BCUC Staff Model calculates the expected customer rates impact of the Project, including the Theft Reduction Benefit related to the increase in billable load from marijuana sites. The Panel has examined the Theft Reduction Benefit specifically in Section 8.3 of this Decision and has not approved the portion of the Theft Reduction Benefit related to the increase in billable load from marijuana sites. Accordingly, while the Panel recognizes that the BCUC Staff Model represents another method of calculating the revenue requirements and customer rates impact of the proposed Project, the Panel has not examined the model further in this Decision.

9.0 PROJECT ALTERNATIVES CONSIDERED

The following figure provides an overview of the considerations and alternatives evaluated in the Application.

Figure 9-1



9.1 Status Quo

Status Quo defines the case of the accelerated replacement of an estimated 88,000 meters (not including Kelowna) to remain in compliance with new Measurement Canada S-S-06 regulations over a 21 year period with similarly functional meters (i.e. not advanced meters) (Exhibit B-1, p. 105). The financial analysis only accounted for the predicted incremental number of meters exchanged and replaced as a result of the new S-S-06 regulation, above the current number of meter exchanges and replacements (Exhibit B-1, p. 93). FortisBC chose to use the Status Quo as a baseline despite determining that the Status Quo alternative was a non-feasible alternative based on:

- 1) Not providing quantified benefits of an AMI system;
 - 2) Not providing non-quantified (soft) benefits of AMI system;
 - 3) Not supporting innovative rate structures, efficiency and conservation;
 - 4) Not consistent with supporting British Columbia's energy objectives; and
 - 5) Not consistent with the system and services available to 1.8 million BC Hydro customers.
- (Exhibit B-1, p. 108)

9.2 Automated Meter Reading

Automated Meter Reading (AMR) is a system that allows meter readings from a 'drive-by' vehicle thus improving the productivity of the meter reading function. This alternative still requires the replacement of existing meters with wireless meters and would reduce the number of meter readers from 20 to approximately 8 (Exhibit B-1, p. 108). New project capital would include the replacement of meters with new wireless AMR meters and related vehicle mounted reading equipment. Incremental Measurement Canada Compliance costs are avoided, though drive-by meter reading, disconnect/reconnect and off-cycle reads would still require manual processes. AMR does not significantly increase the frequency or quantity of information collected to allow for better management of the cost of electricity (FortisBC Final Submission, p. 223).

9.3 Power Line Carrier AMI

A Power Line Carrier (PLC) system utilizes existing electrical distribution wires for two-way communication with the advanced meters. Collectors at distribution substations transmit data to the Utility through a separate WAN solution. The method and technologies of transmitting data

through the electrical wires varies as does speed and amount of data that can be transmitted at any given time. Costs are dependent on number of endpoints per substation and distance along the distribution lines. (Exhibit B-1, p. 112) FortisBC submits that operating costs are lower than the AMI alternative due to lower WAN backhaul costs from the substation to the utility but the capital costs would be higher with a net result of being less cost competitive than the AMI alternative. FortisBC also states that PLC does not allow all of the future benefits of the AMI alternative. (Exhibit B-1, pp. 114, 115)

9.4 Alternative Evaluation

FortisBC provided an assessment of the alternatives considered and concluded that the Project as proposed provides the most financial, non-financial and future potential benefits of the alternatives examined. (Exhibit B-1, p. 123) A summary of the estimated cost of the four alternatives is provided in Table 9-1.

Table 9-1
Alternatives Cost Comparison – w/o Kelowna (\$ x 1000)

Analysis Period 2013 – 2032	Status Quo	AMI	AMR	PLC
New Project Capital	-	\$47,689	\$28,270	\$66,351
Sustaining Capital Total	\$23,209	\$20,558	\$7,736	\$20,511
Meter Growth/Replacement	\$3,505	\$7,791	\$6,479	\$7,791
Measurement Canada Compliance	\$18,556	-	-	-
Sustaining Capital Other	\$1,149	\$12,767	\$1,257	\$12,720
Operating Expenses Total	\$107,313	\$65,167	\$70,036	\$61,601
New Operating	-	\$32,196	\$3,509	\$28,631
Meter Reading	\$72,896	\$14,779	\$33,813	\$14,779
Operating Other	\$34,417	\$18,192	\$32,714	\$18,191
Total Capital and Operating Cost	\$130,522	\$133,414	\$106,042	\$148,463

(Reproduced from Exhibit B-1-2, Errata Tables 7.1.a, 7.2.1, 7.3.a, 7.4.a, 7.5.a)

The FortisBC assessment of alternatives also includes an estimated Theft Reduction Benefit for the AMI and PLC alternatives that is over \$90 million greater than for the AMR or Status Quo alternative. Table 9-2 shows the magnitude of the expected difference in this benefit.

Table 9-2
Alternatives Benefit Comparison – w/o Kelowna (\$ x 1000)

Benefits	Status Quo	AMI	AMR	PLC
Estimated Theft Reduction	(127,218)	(220,923)	(127,218)	(220,923)

(from Exhibit B-1-2, Errata Table 7.5.a)

FortisBC also provided Net Present Value, Annual and Cumulative rate impact and current and future functionality assessments to conclude that the Project provides the most financial, non-financial and future potential benefits of available technology solutions. FortisBC states that its selection of the AMI technology alternative is supported by a fair and transparent RFP process that included functional requirements and not specific technology solutions and that only RF AMI proposals were received from vendors.

RDCK specifically provides the following challenges:

1. The RFP process used by FortisBC not including bids for different technologies. (RDCK Final Submission, p. 4)
2. The credibility of FortisBC's PLC cost estimates given the costs for PLC alternatives in similar, nearby jurisdictions are considerably lower than the FortisBC estimates on an installed meter basis. (RDCK Final Submission, pp.7, 8, 9)
3. Given the lower costs of PLC alternative in other jurisdictions, the AMI costs proposed by FortisBC for its AMI Project would lead to unjust and unreasonable rates, contrary to UCA section 59 and competitive concerns for local businesses. (RDCK Final Submission, pp.7, 8, 9)
4. Functionality gaps between PLC and RF AMI systems are overstated and not sufficiently assessed by FortisBC with PLC capabilities proven and improving in other jurisdictions. (RDCK Final Submission, pp. 11-19)
5. The fact the BC Hydro has installed RF based smart meters should not be a determinative factor in the selection of an advanced meter alternative. (RDCK Final Submission, p. 3)

RDCK further submits that the PLC solution would eliminate RF emissions that concern some customers and interveners. RDCK refers to comments provided by the Kaslo and Area Chamber of Commerce which supports the benefits of advanced metering but states in part,

“...we are very concerned that the above application is going forward without requiring that FortisBC provide an appropriate and verifiable wired option for consideration by the commission. In light of the strong public opposition to the

wireless option, issues surrounding interference with rural Internet reception and the higher costs associated with the wireless option...it would seem counter intuitive to not give serious consideration to a wired option..." (Exhibit E-95)

FortisBC provided a further breakdown of the PLC cost estimate showing that the roughly \$19 million estimated higher cost was mostly due to higher network infrastructure and installation costs (\$14 million), third party software and services (\$2 million) and resulting financing and tax costs (\$2.5 million) (Exhibit B-14, BCUC 2.34.2). RDCK provided Idaho commission and utility company documents that showed an installed per meter cost for a recent Idaho Power Company PLC AMI project of \$193.81 for a deployment of 485,000 meters. RDCK uses the Idaho cost figures to estimate a PLC alternative cost of \$22 million ($\$193.81 \times 115,000$) compared to the \$66 million FortisBC estimate. RDCK further argues that FortisBC has been unable to explain why its AMI cost estimate is roughly double the Idaho PLC-AMI cost at approximately \$415 per meter for a deployment of (115,000) meters. (RDCK Final Submission, pp. 7, 8) FortisBC argues that without having received an RFP response for a PLC-AMI system a comparison of included items and functionality is difficult (FortisBC May 2 Reply, p. 18). FortisBC does provide other comparisons such as the FortisAlberta PLC-AMI system which resulted in a cost of approximately \$286 per customer for a deployment of 470,000 meters. If corrected to include HES and MDMS servers, additional functionality (though still not equivalent to the FortisBC RFP) and incidental costs that were not included in the FortisAlberta cost, would result in a PLC-AMI estimate of \$55 million or \$478 per installed meter (Exhibit B-14, BCUC 2.32.2.1).

9.4.1 AMI RFP Process and Credibility of PLC estimate

FortisBC states that the RFP included functional requirements and did not specify the type of meter to collector communication technology (Exhibit B-1, p. 55). FortisBC provided the complete RFP in this proceeding (Exhibit B-11, Appendix BCSEA 1.8.1). The RFP was sent to eleven vendors and two integrators with seven responding with proposals. Four of the vendors that received the RFP document offer PLC or wired technologies including Aclara Technologies, the vendor that supplied Idaho Power's PLC system but who declined to submit a proposal. FortisBC states that only wireless technologies were proposed. (Exhibit B-34, BCSEA 3.107.4; FortisBC May 2 Reply, p. 16) FortisBC further states that the RFP process completed was fair and that compelling FortisBC to seek PLC-AMI bids would be unfair to those that participated in good faith in a fair process (FortisBC May 2 Reply, p. 17).

Commission Determination

The Panel is satisfied that FortisBC has adequately met the CPCN requirements to consider and evaluate reasonable project alternatives. FortisBC established functional requirements without specifying the type of technology to be used. Vendors responded with RF based AMI solutions. The Panel is satisfied that the RFP process was fair. The fact that certain technologies were not proposed or that certain vendors declined to quote would indicate that these vendors self-selected the technology and that for various possible reasons only RF AMI proposals were submitted. The Panel agrees that compelling FortisBC to seek PLC quotes would not be fair to those who participated in a fair RFP process and would add risk and delay to the Project. The Panel is of the view that the cost comparisons to other jurisdictions, though informative, should not over-ride a fair and reasonable RFP process. The Panel accepts that there will be a broader range of accuracy on the PLC estimate since no proposals were received for this alternative, but that the cost of either \$55 million or \$66 million for the PLC alternative would not change the outcome of the alternative analysis. **For the above reasons, the Panel finds that FortisBC has adequately considered alternatives.**

10.0 RADIO FREQUENCY EMISSIONS AND HEALTH

10.1 Introduction

The proposed AMI system transmits data wirelessly at Radio Frequencies. RF emissions and potential impacts on health was a key matter of concern raised at the Community Input Sessions and at the Oral Hearing.

In hearing evidence on the potential human health effects of AMI meters, the Panel sought to ensure that the concerns expressed by the general public and registered interveners were addressed through the evidentiary record. The goal of the Panel was to arrive at a decision that considers, in the words of Mr. Flynn, "... independent, science-based evidence" (J. Flynn Final Argument, p. 1).

One of a series of safety codes prepared by the Consumer and Clinical Radiation Protection Bureau, Health Canada is 'Safety Code 6: Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3 kHz to 300 GHz' (Safety Code 6). Safety Code 6 specifies the requirements for the safe use of, or exposure to, radiation emitting devices (Exhibit B-1,

Appendix B-6, p. 5 of 30). According to Safety Code 6, “the safety limits in this code apply to all individuals working at, or visiting, federally regulated sites. These guidelines may also be adopted by the provinces, industry or other interested parties. This code has also been adopted as the scientific basis for the equipment certification specifications outlined in Industry Canada’s regulatory compliance documents that govern the use of wireless devices in Canada, such as cell phones, cell towers (base stations) and broadcast antennae.” (Exhibit B-1, Appendix B-6, p. 3)

In order to make its determination on matters related to health and safety, the Commission Panel must weigh several inter-related issues. Over the course of several days of Community Input Sessions, a two-week Oral Hearing, and from nearly two hundred Letters of Comment, the Commission Panel has distilled the many issues related to health down to two key points:

- Is Health Canada’s Safety Code 6 applicable to the type of technology used in the proposed Project?
- Are the emission standards set out in Safety Code 6, if they are applicable to AMI meters, sufficient to protect the health of FortisBC’s customers. Alternatively, are they flawed to the extent that the Commission must set its own exposure standards?

The Panel recognizes that many individuals expressed concerns, both general and specific, about the potential impacts on their health from the proposed Project. The Panel addresses those concerns below.

10.2 Does Safety Code 6 Apply To FortisBC’s AMI Program?

The proposed Project will operate in the 900 MHz range (for the AMI infrastructure) and also at the 2400 MHz range (for the optional Zigbee system) (Exhibit B-1, Appendix C-5, p. 42).

Regarding the applicability of Safety Code 6, CSTS argues:

“The guidelines contained in this document [Safety Code 6] are brought into effect through Industry Canada’s licensing procedures....Industry Canada’s licensing procedures do not apply to the proposed AMI meters, so Safety Code 6 does not apply.”

CSTS further submits that the proposed AMI technology operates at a frequency that is exempted from Industry Canada licensing procedures, which renders the requirement to meet Health Canada Safety Code 6 guidelines inoperative (CSTS Final Submission, p. 45).

Dr. Shkolnikov illustrated the relationship between Health Canada and Industry Canada during his testimony at the Oral Hearing:

“I have actually specifically called Industry Canada with the parameters that we’re working with to identify if there was a standard testing method covering calculating the exposure from these devices. And I was directed -- I was told yes and directed to use Industry Canada’s RSS 102 as a method for calculating the exposure as it relates to Safety Code 6 compliance.” (T5: 884-885)

FortisBC argued that Safety Code 6 is, in fact, applicable to the operation of the proposed AMI technology, stating:

“CSTS is correct that the AMI meters are exempt from licensing requirements, as they operate on the 902-928 MHz band. However, this exemption is a qualified one which does not relieve the AMI meters from the burden of compliance with Safety Code 6 through the requirements of the above-mentioned Industry Canada Radio Standards Specifications (certification is also required but no Intervener has taken issue with FortisBC’s compliance in that regard).” (FortisBC May 2 Reply, p. 37)

FortisBC adds:

“CSTS does not address Industry Canada’s RSS-Gen, RSS-102 or RSS-210 in its flawed analysis of the application of Safety Code 6, despite the fact that each is expressly discussed in FortisBC’s Main Submission as part of the legal framework binding the operation of the AMI meters. Nor does CSTS address the testimony of its expert witness, Dr. Maisch, who was qualified as an expert in health standards relating to exposure to electromagnetic radiation and agreed that FortisBC is bound to follow national official standards such as Safety Code 6.” (FortisBC May 2 Reply, p. 40)

Industry Canada RSS-Gen, RSS-102 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.” (Exhibit A2-8, Industry Canada RSS-102, p. 3 of 16)

RSS-102 further states:

“It must be emphasized that the above exemption from routine evaluation is **not** an exemption from compliance.” (Exhibit A2-8, Industry Canada RSS-102, p. 4 of 16, emphasis in original)

FortisBC provided evidence of Industry Canada (IC) certification (Exhibit C9-19).

Commission Determination

Upon review of the contents of Industry Canada’s RSS-102 specifications, the Panel agrees with FortisBC that while the proposed AMI technology is exempted from the routine evaluation as laid out in RSS-102, it is *not* exempt from compliance with Safety Code 6. Safety Code 6 remains the relevant standard for health effects from radio-frequency EMF. Further, the Panel finds that the frequency of the RF emissions from the Project are within the range of frequencies addressed by Safety Code 6.

Accordingly, the Panel finds that Safety Code 6 applies to FortisBC’s AMI Program and emissions from the proposed AMI meters must comply with the requirements of Safety Code 6.

10.3 Do the Emission Standards Set Out in Safety Code 6 Adequately Protect FortisBC Customers?

There were three issues raised with respect to the adequacy of Safety Code 6. These are:

- The treatment of thermal effects;
- The treatment of non-thermal effects; and
- Whether the precautionary principle is adequately embodied.

10.3.1 Thermal Effects

RF signals above a certain intensity are known to heat body tissue, which can pose a health risk. Safety Code 6 provides the following comments on thermal effects:

“For frequencies from 100 kHz to 300 GHz, tissue heating is the predominant health effect to be avoided. Other proposed non-thermal effects have not been conclusively documented to occur at levels below the threshold where thermal effects arise. Studies in animals, including non-human primates, have consistently demonstrated a threshold effect for the occurrence of behavioural changes and alterations in core-body temperature of $\sim 1.0^{\circ}\text{C}$, at a whole-body average SAR of $\sim 4\text{ W/kg}$. This forms the scientific basis for the whole-body average SAR limits in Safety Code 6. To ensure that thermal effects are avoided, a safety factor of 10 has been incorporated for exposures in controlled environments, resulting in a whole-body-averaged SAR limit of 0.4 W/kg .” (Exhibit B-1, Appendix B-6, p. 9)

There were no submissions that thermal effects were not adequately covered by Safety Code 6.

10.3.2 Non-Thermal Effects

Exposures at a level below which tissue heating occurs, other biological effects have been investigated.

CSTS argues that Safety Code 6 is fundamentally flawed in that it does not account for these potential *non-thermal* health effects from EMF energy emitted by devices like the proposed AMI meters. It argues that there is some scientific evidence of negative health effects from exposures below the level at which tissue heating occurs, which makes the Safety Code 6 threshold insufficient to protect the public. CSTS submits:

“In relation to RF exposure, Safety Code 6 does not go so far as to say that tissue heating is the only health effect to be avoided. Indeed, the language of Safety Code 6 implies that there are effects, other than tissue heating, to be avoided. This interpretation was affirmed by Dr. Bailey in cross-examination. (T5:896)

Nevertheless, there is not a specification in Safety Code 6 to identify non-thermal adverse bioeffects within the frequency range emitted by AMI meters. Dr. Bailey confirmed that the basic restrictions in Safety Code 6 are designed to limit temperature increases in tissues.” (CSTS Final Submission, pp. 47-48)

CSTS further argues:

“Health Canada and ICNIRP, through the weight of evidence process, have concluded that adverse health effects are not established - despite the existence of a large number of studies that show an adverse effect.

The problem with FortisBC's reliance on the positions of Health Canada and ICNIRP is that the subjective determination behind this weight-of-evidence analysis occurs behind closed doors without the subsequent publication of explanations or reasons. There is no transparency as to which scientific studies were accepted/rejected by Health Canada or ICNIRP and what are the reasons for same.

In cross-examination, Dr. Bailey admitted that Health Canada's review process involves the exercise of subjective judgment and that nobody outside of Health Canada is privy to the reasoning behind that judgment, and Dr. Bailey, in cross examination, could offer no evidentiary basis upon which to conclude that that judgment was properly made." (CSTS Final Submission, p. 25)

Dr. Sears presented the same view in her report:

"Bulk heating has been a convenient experimental measurement as technology has been available to quantify temperature for decades, but bulk heating is in no way a sensitive indicator of molecular effects of radiofrequency radiation. Indeed, contrary to the opinion expressed in the Exponent report that heating is a sensitive measure of potential harm, bulk heating could be considered an end-stage, least-sensitive measure of molecular perturbations caused by radiofrequency radiation." (Exhibit C9-8, Tab 7B, p. 13)

In response, FortisBC argued that Safety Code 6 does, in fact, specifically address non-thermal health effects, and therefore is still the appropriate regulatory standard governing the use of radio-frequency technology like AMI meters:

"While CSTS also alleges, on page 48 of its submissions, that "Dr. Bailey confirmed that the basic restrictions in Safety Code 6 are designed to limit temperature increases in tissues", the evidence clearly is that Safety Code 6 is intended to protect against all adverse effects. For the frequencies utilized by AMI meters, the adverse effects with the lowest thresholds are for thermal induced effects; other effects (such as stimulation) require much greater exposure. Therefore, protection against adverse thermal effects protects against both thermal and non-thermal effects, as confirmed by the introduction to Safety Code 6 itself." (FortisBC May 2 Reply, p. 33)

The relevant passage from Safety Code 6 states:

"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

possible non-thermal effects of RF energy on biological systems. Health Canada scientists consider all peer-reviewed scientific studies, on an ongoing basis, and employ a weight-of-evidence approach when evaluating the possible health risks of RF energy. This approach takes into account both the quantity of studies on a particular endpoint (whether adverse or no effect), but more importantly, the quality of those studies. Poorly conducted studies (e.g. incomplete dosimetry or inadequate control samples) receive relatively little weight, while properly conducted studies (e.g. all controls included, appropriate statistics, complete dosimetry) receive more weight. The exposure limits in Safety Code 6 are based upon the lowest exposure level at which scientifically-established human health hazards occur. Safety factors have been incorporated into these limits to add an additional level of protection for the general public and personnel working near RF sources. 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. As such, the basic restrictions in Safety Code 6 are similar to those adopted by most other nations, since all recognized standard setting bodies use the same scientific data. It must be stressed that Safety Code 6 is based upon scientifically-established health hazards and should be distinguished from some municipal and/or national guidelines that are based on socio-political considerations.” (Exhibit B-1, Appendix B-6, p. 7)

In addition to the above reference in Safety Code 6 to Health Canada’s consideration of potential non-thermal effects, the Panel reviewed the transcripts of the testimony from *White v. Chateauguay* (referred to in CSTS documents as *Chateauguay v. Rogers*) that both FortisBC and CSTS have referenced at the Oral Hearing and in their respective Final Submissions. In particular, the Panel notes the testimony of Dr. James McNamee of Health Canada regarding scientific evidence of potential non-thermal effects:

Q. And do I understand that, even though there is out there some studies regarding non-thermal effects for our frequency, the position of Health Canada is that none of these studies, because it’s what it’s saying in Safety Code 6, is relevant and there’s no change?

A.: We recognize that there are a large number of studies assessing virtually every health endpoint there is. There are a large number that show an adverse effect here, an adverse effect there. So, I’m not denying that there are studies showing effects, no question. There are also a large number of studies that don’t show effects, and generally, a much larger number of studies, in many cases much more thorough and much more well-conducted. (Exhibit B-46, pp. 69-70)

10.3.3 Does Safety Code 6 take the ‘Precautionary Principle’ Into Account?

There is conflicting evidence as to the definition of the precautionary principle, and whether or not Safety Code 6 adequately embodies the precautionary principle. While some interveners and expert witnesses described the precautionary principle, there was no general agreement on a specific definition.

CSTS argues that the precautionary principle requires the denial of the CPCN application on the basis that any potential risk is unacceptable:

“If there is evidence that AMI meters “could be a risk”, it would be unconscionable to impose those meters on customers at their residential dwellings against their will.” (CSTS Final Submission, p. 10)

This view is echoed in Dr. Sears’ report:

“The position that effects must be proven to a very high standard before action is taken is characterized as devices being “innocent until proven guilty” and is counter to the Precautionary Principle to which Health Canada claims to ascribe” (Exhibit C9-8, Tab 7B, p. 20).

FortisBC argues that the precautionary principle is already built into Safety Code 6, citing Health Canada’s 50-fold safety threshold as evidence of a proactive, precautionary stance built into the guidelines; furthermore, that even by the stringent standards set by Health Canada, the proposed Project’s emissions are far below the Safety Code 6-mandated threshold (FortisBC May 2 Reply, pp. 35-36).

During the Oral Hearing, FortisBC’s expert witness, Dr. Bailey, stated:

“I think scientific agencies, particularly dealing with health, are extraordinarily cautious, and exercise prudence in their assessments. And have at various times set into place in their deliberations ways that would err on the side of caution. And the fact that we have safety factors in these guidelines and Safety Code 6 and the FCC guideline and the ICNIRP guideline, is part of that precautionary basis.” (T3:554, lines 18-26)

Dr. McNamee of Health Canada describes how precaution is taken into account:

“Safety Code 6, when we developed the limits, when we’re establishing the basic restrictions, we’re sort of using the worst-case scenarios for both the development of the basic restrictions and then the derived reference limits that go with them. So, that’s the worst-case body size, worst-case frequency, worst-case orientation with the field, standing on, you know, bare foot on a wet surface. All of these worst-case scenarios are taken into account to establish the envelope of the lowest exposure level which is allowable. So, there’s precaution taken into account there.

Beyond that, we then apply a safety margin of 50-fold for the general public as another precautionary measure. So, precautionary measures are already taken into account and we do other measures such as ongoing review of the science, ongoing studies, research studies. This is not something that we pick up and drop and move on to something else, this is something we do all the time.”

(Exhibit B-46, pp. 50-52)

In considering the various views on the precautionary principle and its application to Safety Code 6, the Panel was informed by Health Canada’s publication, “Health Canada Decision-Making Framework for Identifying, Assessing, and Managing Health Risks (2000)”, which was referenced in Dr. Sears’ evidence (Exhibit C9-8, Tab 7B, p. 20). The Health Canada document states:

“There is considerable debate, both nationally and internationally, over the use of the phrases ‘precautionary approach’ and ‘precautionary principle.’ No definition is universally accepted. The Health Canada Decision Making Framework treats the concept of precaution as pervasive. As such it does not require extremes in the actions taken. Instead, risk management strategies reflect the context and nature of the issue, including the urgency, scope and level of action required.” (p. 8)

In endorsing Safety Code 6, the Chief Medical Health Officer at Vancouver Coastal Health stated that “[t]he current Canadian (Safety Code 6 revised 2009)...standards provide significant safety margins for public exposure to RF” (Exhibit B-15-1, Attachment BCH 2.1 p. 6)

Commission Determination

The Panel notes in reviewing the evidence that there was general agreement during cross-examination of experts that the role of Health Canada is to protect the health of Canadians. Safety Code 6 is the result of the ongoing study by Health Canada on the health effects of RF emissions. With regard to thermal effects there is no evidence that Safety Code 6 does not adequately protect

FortisBC customers. While there was disagreement over the adequacy of Safety Code 6 in dealing with non-thermal effects, the Panel agrees with FortisBC that the exposure limits in Safety Code 6 were established based upon a thorough evaluation of the scientific literature including potential non-thermal effects. No intervenor provided scientific evidence that persuaded the Panel that Safety Code 6 fails to adequately protect FortisBC customers from non-thermal effects. Safety Code 6 has applied a significant safety factor to the allowable exposure levels and is subject to an ongoing evaluation of scientific literature by Health Canada. **For these reasons, the Panel finds that Safety Code 6 provides protection from thermal effects, non-thermal effects and incorporates an adequate degree of precaution.**

10.4 Other Issues

10.4.1 What Will I Actually Be Exposed To From FortisBC's AMI Equipment?

Concern was expressed at the Community Input Sessions, in Letters of Comment and during the course of the Oral Hearing over the actual RF exposure FortisBC customers could experience from the proposed AMI meters.

Table 10-1 below is drawn from BC Hydro material placed in evidence by the CEC. It shows the power density of RF radiation in the 900-range frequency and at various distances from the source. It refers to “smart meters”, which the evidence from this hearing shows to be the same Itron meters proposed by FortisBC for its Project.

Table 10-1
Comparison of smart meter emissions to Health Canada Safety Code 6
Limits for public environment

Distance from smart meter	Time-averaged Power Density S 1 operating smart meter ($\mu\text{W}/\text{cm}^2$)	Time-averaged Power Density S 10 operating smart meter ($\mu\text{W}/\text{cm}^2$)
30 cm	0.0022 (0.00037 % of SC 6 Limit)	0.0028 (0.00047 % of SC 6 Limit)
1 meter	0.0011 (0.00018 % of SC 6 Limit)	0.0018 (0.00030 % of SC 6 Limit)
3 meters	0.0008 (0.00013 % of SC 6 Limit)	0.0012 (0.00021 % of SC 6 Limit)

Source: Exhibit B-15-1, BCH 2.2.2 Attachment, p. 6

Safety Code 6 is based on calculating exposure at 20 centimeters away (Exhibit B-1, Appendix B-6, p. 11). However, FortisBC states that the signal strength “drops off [with] the square of the distance” between the meter and an individual (T6:1186). Further, FortisBC states that the “signal gets weaker as it goes through different media” such as walls (T6:1182,). As stated in the Exponent Report:

“In a typical installation, the advanced meter is installed on the outside wall of the residence, mounted on a metal enclosure, and has a faceplate pointing away from the house. In such a configuration, the signal sent by the advanced meter toward the house is 1/10th of the signal sent away from the house. Moreover, the RF signal from the advanced meter is greatly reduced by reflection and absorption from the metal enclosure and the structural materials of the residence walls.” (Exhibit B-1, Appendix C-5, p. 43)

With respect to RF emissions from neighbouring meters, the Exponent Report states:

“Since the signal strength from a advanced meter falls off greatly with distance and advanced meters are typically installed one per house, the additional exposure from other, more distant advanced meters is negligible. [An] advanced meter as close as 5 m adds only 1/100 of the exposure of the advanced meter at 0.5 m (and at 16 m, ~1/1,000 the exposure). At greater distances the contribution from another advanced meter is far less.” (Exhibit B-1, Appendix C-5, p. 44)

Commission Determination

The Panel notes the usefulness of Table 10-1 as a guide in understanding the level of exposure to RF from an advanced meter in a variety of scenarios. In all scenarios, the Table indicates that the levels of RF emissions are significantly below those allowed by Safety Code 6. Letters of Comment expressed concern where individuals would be sleeping next to a wall and an AMI meter was located on the outside of the wall. In this scenario, the evidence shows that the level of RF exposure would be even lower than set out in the Table due to the attenuating effect of different media such as walls. The Panel concludes, based on the scientific evidence, that FortisBC customers would experience RF exposure from AMI meters far below the limits of Safety Code 6.

10.4.2 What are the concerns arising from RF emissions being classified as a “Possible Carcinogen”?

A number of parties expressed concern about the World Health Organization International Agency for Research on Cancer (IARC) 2011 classification of radiofrequency electromagnetic fields (EMF) as “possibly carcinogenic to humans (Group 2B)” (Exhibit C9-25, p. 421). The following submission at the Trail Community Input Session is an example:

“Emission[s] given off by the smart meters have been classified by the World Health Organization International Agency on Research of Cancer as possibly human carcinogens” – (CIS T1(Trail): 115)

While a summary of the views and expert opinions of the IARC Working Group investigating a possible linkage between RF emissions and cancer, was made available in the British medical journal *The Lancet*, and referred to in the information request process and at the Oral Hearing, their full report (IARC Report) was not released until after the close of the evidentiary record.

CSTS filed a copy of the IARC report along with a motion requesting that the Panel amend the regulatory timetable to reopen the evidentiary record to allow the IARC Report into evidence, and that the Panel also allow submissions on the report. By Order G-80-13 the Panel granted the CSTS request, reopened the evidentiary record admitting the IARC Report into evidence and further allowing FortisBC and Interveners to file limited supplemental Submissions on the IARC Report. The IARC Report was filed as CSTS Exhibit C9-25.

Interveners were primarily of the opinion that the full contents of the IARC Report did not significantly alter the evidentiary record, and the submissions on this topic were, for the most part, limited.

BCSEA notes:

“The full Report adds considerable detail to the summary report. However, it is the Working Group’s findings that are important for the Commission’s purposes in this proceeding. The Working Group’s findings are the same in the full Report as they are in the 2011 summary report, which was relied upon by the expert witnesses during the proceeding. Accordingly, the full Report does not change the weight the Commission should give to the existing evidence based on the summary report.” (BCSEA Supplementary Submission, p. 1)

BCPSO concur with BCSEA's submission:

"BCPSO et al. agrees with the submission of B.C. Sustainable Energy Association and Sierra Club British Columbia, dated May 16, 2013. The full IARC Report adds detail to the evidence found in the 2011 summary report, but does not alter the findings set out in the summary report and does not change the weight that should be accorded to those findings." (BCPSO Supplementary Submission)

CEC similarly view the full Report as adding little in the way of new evidence:

"In summary, the CEC submits that there is no material new evidence in the Report which should affect the weight, if any, the Commission should give the other evidence on the record relating to the previously published summary of the views and expert opinions of the IARC Working Group. There is nothing new of a material nature in the Report which was not available to be considered during the course of the hearing or argued in the Final Submissions." (CEC Supplementary Submission, p. 1)

Mr. Atamanenko expressed concern that the IARC Report indicated a lack of clear scientific evidence on human health effects (BCSI Supplemental Submission, pp. 2, 3).

CSTS highlight numerous specific points raised by the IARC Working Group with respect to certain studies showing possible human health effects. In summation, CSTS states:

"No evidence exists with respect to the deliberations or reasoning of Health Canada, IEEE and ICNIRP in dismissing the body of scientific evidence that affirms the existence of adverse effects at non-thermal exposure levels. In that regard, the findings of those bodies are incapable of scrutiny.

In contrast, the IARC monograph carries weight in that it sets out a detailed, transparent analysis in support of its conclusion of risk - a conclusion which is consistent with the evidence provided by CSTS witnesses in these proceedings." (CSTS Supplemental Submission, p. 6)

CSTS also states:

"FortisBC's argues that coffee is among the various substances listed by IARC as a class 2B possible human carcinogen however it is silent about the fact that DDT and lead are also included in the classification. FortisBC compares coffee to RF emissions in an attempt to characterize the latter as benign, which it is not. If RF emissions were benign, they would be under IARC classification 4.

In further reply to the point on coffee, we say that there is no evidence before the Commission as to the health risk of coffee consumption and, as a result, the comparison is a hollow one.

Furthermore, we question: what civil liberties implications would result from a regulatory decision that forces all persons, including babies, to consume coffee? What if the suspected carcinogen was to be imposed on a continuous basis: all day, all night, every day, for an indefinite period of time? Even where the scientifically discernible risk of adverse effects is only a possibility, surely people - in their own homes - have the right to choose.” (CSTS Supplementary Submission, pp. 6-7)

Mr. Bennett’s submission fell out of the scope that the Commission established in allowing Supplemental Submissions in Order G-80-13.

In reply, FortisBC submits:

“As to relative weight between the IARC Working Group’s findings and other health-related information before the Commission, the IARC Monograph reinforces the primacy that should be given to the conclusions of Canadian health authorities, and in particular Safety Code 6, in relation to safe exposure levels. The IARC Working Group acknowledges in the IARC Monograph the limited role it is to play. The IARC Working Group recognizes in the IARC Monograph (as quoted by CEC at page 5 of its Schedule “A”) that its evaluations ‘represent only one part of the body of information on which public health decisions may be based’ and do not constitute a recommendation with regard to regulation or legislation, ‘which are the responsibility of individual governments and other international organizations.’” (Fortis Supplementary Reply, p. 1)

FortisBC also notes that Dr. James McNamee was a member of the IARC working group, indicating Health Canada was well aware of the research and findings of the IARC Working Group.

The IARC Report does list EMF radiation as a Class 2B agent (Exhibit C9-25, p. 421).

IARC’s definition of what criteria are used in making a determination about Class 2 status informed the Commission’s determination on weighting the IARC classification:

“This category includes agents for which, at one extreme, the degree of evidence of carcinogenicity in humans is almost sufficient, as well as those for which, at the other extreme, there are no human data but for which there is evidence of carcinogenicity in experimental animals. Agents are assigned to either Group 2A

(probably carcinogenic to humans) or Group 2B (possibly carcinogenic to humans) on the basis of epidemiological and experimental evidence of carcinogenicity and mechanistic and other relevant data. The terms probably carcinogenic and possibly carcinogenic have no quantitative significance and are used simply as descriptors of different levels of evidence of human carcinogenicity, with probably carcinogenic signifying a higher level of evidence than possibly carcinogenic.” (Exhibit C9-25, Non-ionizing Radiation, Part 2: Radiofrequency Electromagnetic Fields, IARC Monographs on the Evaluation of Carcinogenic Risks to Humans- Preamble, p. 22)

In addition, in *White v. Chateaguay*, Dr. James McNamee gave the following evidence:

“In 2011, an expert panel was composed to assess the possible cancer risks of radiofrequency energy. I was actually a member of that expert panel... This classification [2B] is meant to reflect there is some evidence, from human studies and from animal studies, that could be used to formulate a decision of carcinogenicity. But it’s also an acknowledgement that there’s a much greater... or there’s a large number of other evidence that doesn’t support that. So, essentially, Class 2B is a category for additional study. It means there is evidence, it doesn’t necessarily mean the evidence is strong or causal. Most agents that are studied by this group end up in Class 2B.” (Exhibit B-46, pp. 12-13)

Commission Determination

Upon review of the IARC Report and having considered the submissions of the parties on the IARC Report, the Panel agrees with BCSEA and BCPSO that the IARC Report adds detail to the evidence found in the 2011 summary report, but does not alter the findings set out in the summary report and does not change the weight that should be accorded to those findings.

The IARC Report states that categorization as Class 2B has “no quantitative significance.” This categorization includes other substances such as coffee, pickled vegetables, some uses of talcum powder and nickel alloys (IARC Monographs on the evaluation of carcinogenic risks to humans, <http://monographs.iarc.fr/ENG/Classification/>, Referenced on page 26 of C9-25). The very breadth of substances under this category lends weight to the view that this designation, in and of itself, is of no quantitative significance. The Panel is not persuaded that this designation is sufficient to undermine the validity of Health Canada’s research in establishing the Safety Code 6 limits for human exposure.

10.4.3 What If I Live Near A Bank Of Meters?

The Commission heard from some individuals in the FortisBC service area who live in multi-family dwellings such as apartments and condos, and who are concerned that living near a bank of advanced meters will result in higher exposure to EMF. The Panel gave leave to one such individual, who had not registered as an intervener, Ms. Enns, to question the FortisBC expert witness panel at the Oral Hearing on this subject. The Panel thanks Ms. Enns for her participation in the process, as it believes that the questions she asked of the expert witnesses and the responses she received to her questions have informed the Panel on this matter quite effectively:

MS. ENNS: Q: Well, thank you to the Commissioners and to the panel. As I say, I'm a lay person and all these technical -- so much of the information was technical, and it was just way beyond my understanding. So I've only got a few questions to confirm or clarify a few things. Mostly regarding involuntary and/or uncontrolled exposure. First off, could you please confirm the emissions from one meter? Is it 0.006, is that what -- or 0.002 3?

DR. SHKOLNIKOV: A: Sorry, I just want to cite the correct number. So, a single smart meter will -- sorry, a single AMI meter will, under mean duty cycle, which is a typical one, at half a metre, will produce an exposure of 0.000056 milliwatts per centimetre squared.

MS. ENNS: Q: Four zeroes, five six?

DR. SHKOLNIKOV: A: Yes. So, zero, point, then four zeroes, five six.

MS. ENNS: Q: Okay. And that's, you said, at a -- okay. Well, that's okay, it's getting too technical. So, two meters, then, would be double that? Is that how it works?

DR. SHKOLNIKOV: A: It will be slightly less, because by necessity you can only be in front of one of the smart meters. So as you start adding smart meters, the distance to them, effectively means to increase. But for two meters, it's roughly double.

MS. ENNS: Q: Okay. Let's assume there is two meters side by side.

DR. SHKOLNIKOV: A: Yeah. It's roughly double.

MS. ENNS: Q: Double. So then if you have a bank of 16 meters, all side by side, and in rows, that would be 16 times that?

DR. SHKOLNIKOV: A: No, because at that point the distance to the meters that are not in the centre becomes substantial enough to reduce the exposure from those.

Because you're physically farther away from them.

MS. ENNS: Q: From some of them than you are from others.

DR. SHKOLNIKOV: A: Yes.

MS. ENNS: Q: Okay.

MR. WARREN: A: I should add that -- and this may be helpful, is that there is some evidence in the filing itself -- it didn't come out during this oral hearing, but in filed evidence that from actual measurements on multiple meter banks, Mr. Loski has some of that.

MR. LOSKI: A: So I can go there. I'll state the exhibit number here. It's Exhibit B-15, and this is a response we had to a B.C. Hydro IR No. 2, question 2.2. And there is an attachment there that is from the B.C. Centre for Disease Control. And what they did in this study, they compared the emissions from a single meter with a bank of ten meters. (see Table 10-1 above in Section 10.4.1)

MS. ENNS: Q: Okay.

MR. LOSKI: A: Okay? And there, I'll -- I guess in Table 3 on page 6 of that report, but just to give an example here, that they measured the emissions at different distances. So 30 centimetres, 1 metre and 3 metres. And then compared one meter versus ten. And I'll just pick one of the numbers out of here from --

MS. ENNS: Q: Could we do the three-metre distance?

MR. LOSKI: A: Three metres, sure. And so the emissions here for one meter, as it says in this table -- first of all, I'll do it in terms of the percentage of the Safety Code 6 limit, was 0.00013 percent of Safety Code 6 limit. So that's 1 meter at 3 metres away. And then the 10 meters at that same distance was 0.00021 percent of Safety Code 6 limit. So definitely is not a matter of simply multiplying 1 by 10.

MS. ENNS: Q: No, I understand.

MS. ENNS: Q: Okay, and what is the furthest distance that's in that chart?

MR. LOSKI: A: Well, that was it, so it just had those three distances, 30 centimetres, 1 metre and 3 metres.

MS. ENNS: Q: And up to 3 metres.

MR. LOSKI: A: That's correct.

MS. ENNS: Q: Okay. So then a bank of 16, you wouldn't know unless you did a calculation, which I won't ask you to do. So perhaps now this is not an appropriate question to ask, but I was wondering what is the aggregate or cumulative exposure from those -- was it 10 or 3 that you were giving me the numbers for?

MR. LOSKI: A: That was a bank of 10 meters.

MS. ENNS: Q: Bank of 10, mm-hmm.

MR. LOSKI: A: Correct.

MR. WARREN: A: You may also find it helpful to note, like, Health Canada has also commented on this issue of multiple meter banks in their document that's in evidence called "In Your Health, It's Your Health 2011", and it arises in Exhibit B-15, B.C. Hydro IR 2, question 2.4, and they stated in part: "In cases where smart meters, AMI meters, are installed together, the total exposure will still be far below Health Canada's radio frequency limits."

MS. ENNS: Q: Okay, thank you. Is it true -- my understanding is that these emissions are not blocked by walls, like they travel right through. Is that correct?

DR. SHKOLNIKOV: A: The term that people use is "reduced". So the walls won't necessarily block the signal but they will strongly reduce the amplitude that makes it through.

MS. ENNS: Q: Okay, but some of it gets through.

DR. SHKOLNIKOV: A: Yes.

MS. ENNS: Q: So where you've got 16, of course, more, what's the word, amplitude, would get through than if you had one or two or three meters.

DR. SHKOLNIKOV: A: Actually, one of the difficulties when you have multiple smart meters in a bank, they're close by, and what they do is they form effectively -- one of the reasons why the signal from a single smart meter makes it back into the house is that some of the signal travels around the meter panel. If you have a bank of smart - of advanced meters side by side, then there's actually -- they have to travel much farther to make it around. So typically you would expect even less of the signal to go behind the meter bank. So in the single meter you'd expect one tenth to go back roughly. In the larger meter bank you'd expect substantially less than one-tenth to make it around -- just the meter panels, not including the building continuation.

MS. ENNS: Q: Sure. Okay, but there would be a transfer or travelling of those emissions beyond the walls.

DR. SHKOLNIKOV: A: Some signal will make it inside the residence.

MS. ENNS: Q: Okay.

MR. WARREN: A: Which is why those numbers that Mr. Loski cited were without anything in between them, right, so there was just air in between the meters --

MS. ENNS: Q: Right.

MR. WARREN: A: -- and the measuring device. And so in a real situation, especially where in a lot of apartment buildings the meter room -- not all of them but a lot of the meter rooms they have at minimum a wall but often a concrete wall as well, right, and so you may get quite significant attenuation or reduction in the signal out of the meter room. (T7:1366-1372)

The Panel heard no evidence from any party that contradicted the information provided in response to Ms. Enns' questions on the subject of multiple meters or the information provided on that subject in the Exponent Report.

Commission Determination

The Panel agrees that proximity to multiple meters in a bank results in exposure that is below, (and in the example provided by BC Hydro, and reproduced here in Table 10-1, is considerably below) the maximum allowable exposure of Safety Code 6.

10.4.4 What about My Total Exposure to EMF from all Sources?

Many individuals who spoke at the Community Input Sessions or wrote to the Commission expressed their concern that they are already being exposed to an unhealthy level of EMF from various sources present in modern society, and that the proposed Smart Meter system would add to the aggregate exposure. The author of a Letter of Comment expresses the concern this way:

"I'm not concerned with only the radiation that will be emitted by the Smart Meter on my house - I'm deeply concerned about the combined emissions from the meters on every house around me and the mesh-grid network that will result. Not only will our homes and work places be blanketed under an unknown level of toxic microwave radiation, so will our entire communities! I found no information that any utility actually knows what aggregate levels of highly toxic pulsed-microwave radiation any community could experience from a meshed-

grid network. Start adding pulsed-microwave devices in our homes and communities, like WiFi, routers, cell phones, cell phone towers, iPhones, Smart phones, lap top computers, Blue Tooth, and GPS, to name a few, and top it off with Smart Meters which are in constant communication with each other and the towers that serve those Smart Meters and we could have a deadly mixture.” (Exhibit E-9)

In response to this concern, the Panel asked Dr. Shkolnikov to provide calculations based on a number of typical exposure scenarios, including emissions from AMI systems. These exposure scenarios included individuals living in dense urban settings and in buildings with banks of smart meters, as well as individuals living in rural areas. (Exhibit B-52, Undertaking No. 9, p. 2) No parties challenged this information in their Final Submissions. Table 10-2 presents Dr. Shkolnikov’s calculations.

Table 10-2

RF Exposure by Scenarios ⁱ	All Sources	Dense Urban Environment	Rural Environment (No AMI)	Rural Environment (with AMI)	Rural Environment (with AMI Bank)	Cordless Phone & AMI Bank
Radio Frequency Exposure Sources	<u>Per Cent of Safety Code 6 Limit</u>					
Cell Phone (In Use)	10%	10%	-	-	-	-
Microwave Oven (In Use)	2.3%	2.3%	-	-	-	-
Cordless Phone (In Use)	1.25%	-	-	-	-	1.25%
TV and Radio Antenna	0.53%	0.53%	-	-	-	-
Cellular Base Station Antenna	0.16%	0.16%	-	-	-	-
Human Body	0.018%	0.018%	0.018%	0.018%	0.018%	0.018%
Natural Background	0.013%	0.013%	0.013%	0.013%	0.013%	0.013%
Man Made Background	0.005%	0.005%	0.005%	0.005%	0.005%	0.005%
Wi-Fi	0.0045%	0.0045%	-	-	-	-
Cordless Phone Base Station (In Use)	0.0038%	-	-	-	-	-
ZigBee In-Home Display	0.0024%	0.0024%	-	-	-	-
FortisBC AMI Meter Bank (No Wall)	0.0019%	-	-	-	-	-
Cordless Phone Base Station (Not in Use)	0.00076%	0.00076%	-	-	-	-
FortisBC AMI Meter Bank (Separated by Wall)	0.00032%	0.00032%	-	-	0.00032%	0.00032%

FortisBC Advanced Meter (No wall)	0.00025%	-	-	0.00025%	-	-
FortisBC Advanced Meter (Separated by Wall)	0.000041%	-	-	-	-	-
Zig Bee Radio in AMI (Turned On)	0.000024%	0.000024%	-	-	-	-
Total Sum of RF Exposure by Scenario	13.034004%	0.036%	0.03625%	0.03632%	1.28632%	

¹ Commission Staff created this table based on the typical values for estimated RF energy exposure scenarios as described in **Exhibit B-52, Undertaking No. 9**. The assumptions used to calculate typical RF exposures from each source are also described **Exhibit B-52**. For example, a **FortisBC Meter Bank** assumes a bank of 45 Advanced Meters. Commission Staff also added the “Human Body” as a source of RF exposure to some of the scenarios.

Commission Determination

Based on the evidence summarized in the table above, the Panel is satisfied that RF emissions from the proposed AMI system add a small fraction to the overall RF exposure of an individual, and this aggregate exposure is significantly below the limit established in Safety Code 6.

10.4.5 How Frequently do AMI Meters Transmit and does this Create a Chronic Health Problem?

Another issue in the Proceeding was whether or not the transmissions produced by the AMI meters constituted ‘chronic exposure’, and whether or not ‘chronic’ exposure differed in any way from the type of exposure calculated by Safety Code 6. Central to this issue is how frequently the meters transmit. A Letter of Comment describes the concern as follows:

“One final fact.

If the human physiology is subjected to high doses of EMF’s (sic), over an extended period of time, there is naturally an “accumulative” effect of EMF’s (sic) being “radiated” into the human physiology which creates a favourable environment, within the human physiology, for cancerous tumours.”

(Exhibit E-97)

At the Community Input Sessions a request was made:

“to deny Fortis their application to install the radiating smart meters in our home environment. There would be a constant high level of wireless pulsed microwave radiation that is know by independent experts to be harmful to the body.” (T2 CIS (Osoyoos):53)

The issue of how often the AMI meters transmit, and at what strength, was addressed by a number of parties in IRs and at the Oral Hearing. The Panel found the following exchange from the Oral Hearing to be particularly illustrative of this topic:

MR. AARON: Q: Okay. Mr. Warren, in being crossexamined by Mr. Miles, and I don't need to take you there, I think we could -- possibly we could agree that you said there's no ability to turn them off, or Mr. Miles said these things are on all the time, and you said, "Well, that might be true, there's no ability to turn them off, but they're only on for .06 of the time for those 20 years." Could you agree to having said that or do I need to go to the transcript?

MR. WARREN: A: I do not believe I said that they can't be turned off, but I did say that they were active on average about .06 percent of the time.

MR. AARON: Q: Okay, well, we could agree that they can't be turned off, correct? They're operating all the time. The customer can't turn them [off]. Fortis doesn't intend to turn them off. Correct?

MR. WARREN: A: You're correct that we don't intend to turn them off, correct.

MR. AARON: Q: All right, so that's not an issue. And you said they're operating for only .06 percent of the time.

MR. WARREN: A: On average, yes.

MR. AARON: Q: For 20 years.

MR. WARREN: A: Correct.

MR. AARON: Q: Okay. But you admit that the maximum duty cycle is 5 percent.

MR. WARREN: A: As I said earlier, the theoretical maximum duty cycle is 5 percent. The maximum duty cycle that was measured in a study performed by Itron in their white paper showed a maximum duty cycle of .58 percent.

MR. AARON: Q: And so let's see, what does that amount to, 5 percent of 20 years? Can you calculate that? Mr. -- there you go, I knew you could. You know what? I did it in advance. It's one year, isn't it?

DR. SHKOLNIKOV: A: Yes.

MR. AARON: Q: So the exposure over 20 years would be a one year of continuous exposure to these emissions that were grossly similar to those in the Sommer study, correct?

MR. WARREN: A: No, I would not agree with that. That would be at the theoretical maximum exposure.

MR. AARON: Q: Okay, well, let's just qualify it like that. Theoretically the maximum exposure would be --well, you know. I know you're talking amongst yourselves and I just want to put the question to you.

DR. SHKOLNIKOV: A: I would like to caution here, if we're going to be talking about cumulative exposure over 20 years --

MR. AARON: Q: Yes.

DR. SHKOLNIKOV: A: -- the appropriate metric to use is average duty cycle --

MR. AARON: Q: Okay.

DR. SHKOLNIKOV: A: -- because it is basically impossible to have smart meter, as I would say, continuously win the lottery by always communicating at 5 percent. So the appropriate value, if you're looking at the cumulative exposure, which I think is the question here, is to use 0.06 percent value.

MR. AARON: Q: All right, well, for some reason Health Canada wants you to calculate the theoretical and limits you in that regard, and the theoretical is 5 percent. And I don't hear anyone telling me that the theoretical maximum duty cycle is not more than 5 percent. Nobody's saying that, are they?

DR. SHKOLNIKOV: A: I think that we are mixing here a compliance question versus exposure question. For compliance purposes, Industry Canada doesn't even allow you to use a 5 percent value, but that's really for purposes of compliance. The question you're asking is for comparing to exposure, which is a separate question, and then for exposure the relevant question is what is a -- and especially for the questions of cumulative exposure, the question would be the average value. Because the idea is that, you know, in the long term the value you're going to get averaged over many years is the average value, and therefore 5 percent would be improper to use.

MR. AARON: Q: Okay. So if we use the average, .006, so that would be .0006 times 20 years, you'd be exposed for something like one month of continuous exposure.

MR. WARREN: A: That's roughly correct, I think, yes.

MR. AARON: Q: So on the average duty cycle you've got one month of continuous exposure. On the theoretical maximum duty cycle you've got a year of continuous exposure to the emissions that were grossly similar to those in -- studied in the Sommer study, correct?

DR. BAILEY: A: Yeah.

DR. SHKOLNIKOV: A: And the key thing here would be if we are counting exposure as total duration rather than volume, because this is -- the actual -- so this is true for duration of exposure, I should say.

MR. AARON: Q: Okay. It's not clear to me the ZigBee emissions, it's a whole different kind of emission. Will the smart meter as it is installed, if this application is approved, will it be installed with the ZigBee emission being in a state of emission regardless of whether the ZigBee chip is opted into by the customer?

MR. WARREN: A: No, we intend to install the meters with the ZigBee radios in what's called "quiet mode", in which there are no transmissions.

MR. AARON: Q: All right. And so, unless a customer consents to the ZigBee, there will be no ZigBee transmissions.

MR. WARREN: A: That's correct.

MR. AARON: Q: All right. Well, that satisfies me with respect to the health issues concerning the ZigBee matter.

DR. SHKOLNIKOV: A: I am sorry, I just did the calculation and maybe I am incorrect. For 20 years, 12 month use per year, and 0.06 percent, you are getting -- I am getting about 0.15 of a month instead of one month.

MR. AARON: Q: Isn't it years? It's 20 years, right?

DR. SHKOLNIKOV: A: Yes. So, 20 years, 12 months a year --

MR. AARON: Q: Yes.

DR. SHKOLNIKOV: A: -- times 0.06 divided by 100, I'm getting 0.144 months.

MR. AARON: Q: Oh, okay. I'm not going to query you on the calculation. Why don't you just read into the record your formula for getting to that? To your calculation.

DR. SHKOLNIKOV: A: Yes. So, 0.06 divided by 100, times 20, times 12. (T5: 863-868)

The subject of whether or not the periodic 'check-in' transmissions sent by the proposed AMI devices qualify as 'constant transmissions' was also addressed at the Oral Hearing by Dr. Shkolnikov in response to a question from Mr. Aaron:

“The cell phone that you have, whether you use it or don’t use it, actually continuously transmits. On that definition of word continuously transmits, the signal. About 30 times a minute, your phone in your pocket communicates with a tower. It does it for purposes of notifying that you’re still available to receive phone calls, to receive control information to know how to communicate with the network. And so from that perspective, if you were to use that definition of “continuous”, there are a lot of technologies that do it. Say cordless phones, cellular phones.” (T4:765)

FortisBC provided evidence showing that the typical duty cycle for an AMI meter amounted to 52 seconds of total transmission per day; beyond that, the maximum theoretical duty cycle over an entire 24 hour period amounts to approximately 5 percent of the day (Exhibit B-47, p. 3). However, as noted in the above transcript excerpt, FortisBC took the position that it is inappropriate to calculate exposure based on the maximum theoretical duty cycle, but rather that the typical duty cycle should be used.

CSTS submits that at the maximum theoretical duty cycle of 5 percent exposure to the AMI meter over 20 years would result in one year of continuous exposure (CSTS Final Submission, p. 49).

The Exponent Report, states: “[a]cute effects typically occur from relatively high exposures, and chronic effects, such as cancer, are typically linked to long term exposures at low levels.” (Exhibit B-1, Appendix C-5, p. 10 of 47) Dr. Bailey commented on this statement during cross-examination:

“That’s been the pattern that’s been observed for many chemicals, and so that same kind of observation has been made with regard to radio frequency fields. That very intense high exposures can lead to immediate effects and to evaluate effects that might take a longer period of time that occur at lower levels, you would have to look over a longer period of time.” (T4:744)

CSTS is concerned that the “long term effect is a critical factor in risk assessment.” In support it cites Dr. Bailey’s testimony:

“For some types of diseases we have –there’s not been enough, a long enough time to exhaust all possibility of assessing the risk, because the time frame is -- for which we have good data anyway, is probably 15 years or so. And some types of tumours might take longer to develop than 15 years...for some types of diseases, there may not have been long time enough for these potential effects to be fully investigated.”

CSTS submits that, “[t]he failure of Health Canada to specify any limit on exposure duration clearly fails to consider that the passage of time is a key factor in the assessment of the adverse bio-effects from RF exposure” (CSTS Final Submission, p. 53).

Dr. Bailey pointed out that the fact that Safety Code 6 did not set out a standard for chronic exposure,

“reflects the scientific consensus that there is not a sufficient scientific basis to develop such a standard...[t]he standard bodies and agencies can only review evidence that they have, and they have assessed the evidence and concluded that based upon what is available to date and the latency periods evaluated, that there is not a basis to conclude that there are adverse long-term health effects including cancer.” (T4:752)

FortisBC states:

“Safety Code 6 take[s] into account all studies and literature that are relevant to setting the Code, and the Code is absent a duration limitation, and therefore one isn’t necessary.” (T5:792)

In its Final Submission, CSTS submits:

“FortisBC should not be allowed to subject their customers to these uncertainties, particularly when there are alternative (non-wireless) means of achieving the objectives of the AMI program. At the very least, customers wishing to opt-out should have the right to do so.” (CSTS Final Submission, p. 54)

Safety Code 6 states, “At present, there is no scientific basis for the premise of chronic and/or cumulative health risks from RF energy at levels below the limits outlined in Safety Code 6” (Exhibit B-1, Appendix B-6, p. 11 of 30).

Commission Determination

The Panel notes that the issue of cumulative health risks is addressed in Safety Code 6. **The Panel is not persuaded by the evidence provided that Safety Code 6 fails to protect the public from cumulative or chronic health risks from RF emissions.**

10.4.6 Will AMI Meters Interfere With My Medical Device?

A number of parties raised the question of whether or not the proposed AMI system would interfere with medical devices, such as pacemakers and insulin pumps.

CSTS directly raised the issue of medical device interference in an information request to which FortisBC responded:

Q: “Is FortisBC aware that there have been concerns about the potential impact of RF communication technology on pacemakers and other medical equipment?”

Response:

“Medical equipment such as pacemakers are designed to operate in 900 megahertz and 2.4 gigahertz RF environments since these are common frequencies for baby monitors, cordless phones, and WiFi routers, for example. These are the same frequencies on which advanced meters transmit and receive, so FortisBC believes any concerns would be unfounded.”

(Exhibit B-11, CSTS 1.34.5)

The issue was further explored during the Oral Hearing by Mr. Atamanenko:

“So, the question [...] for Fortis, is what actions would Fortis think to undertake to address [concerns about medical device interference]?” (T5:1003)

Dr. Shkolnikov responded to the question as follows:

“... all the medical manufacturers that I’m familiar with, and I don’t know the manufacturer you’re working with, diligently evaluate what are the common sources of RF exposure, and design a device to protect it and do very rigorous testing to verify it.” (T5:1004)

Later, during cross-examination by Ms. Enns, Dr. Shkolnikov provided the following evidence on pacemakers and other implants:

“... And usually if you look at inserts for different medical devices, they will tell you what is a minimum recommended distance. And typically the number they cite is roughly six inches ... So I would say, you know, people need to be prudent and follow their instructions from their medical device manufacturer. If they are concerned they should talk to the doctor. But this device doesn’t produce anything unusual that wouldn’t be experienced by a person who has a cordless phone or a cell phone or a WiFi router. It’s similar issues. There’s not – with the

only difference is that these devices will typically be installed at a substantial distance from your body, so that effectively reduces the likelihood of interference.” (T7: 1375)

Commission Determination

While the Commission is satisfied on the evidence in this Proceeding that the Project will not increase the current risk to owners of these medical devices, it also agrees with Dr. Shkolnikov that patients using such devices should always consult with the device manufacturer and their physician to obtain specific guidance.

10.4.7 What About People Concerned about Electromagnetic Hypersensitivity?

The issue of electromagnetic hypersensitivity was of great concern to some of the Interveners and members of the public who wrote to the Commission or participated in the Community Input Sessions.

RDCK submits that:

“EMF and EMR sensitivity describes persons with an often multi-faceted illness that ranges from acute, requiring hospitalization, to ongoing chronic, often leaving the patient unable to work and financially unable to support themselves.” It further submits that “critiquing the scientific basis of the disability and its symptoms fails to come to grips with the very real and practical problem which physicians face in having to treat people presenting themselves with EHS symptoms.” (RDCK Final Submission, p. 28)

Dr. Sears testified that:

“The individual finds that their symptoms occur with an exposure, and that when that exposure is removed they get better, and that when they rechallenge themselves they experience the same symptoms. So it’s not a question of, oh, this happened once. It’s a question of every time I go to this particular location where there is a high level of WiFi, or every time I use this device, and in between I go away to my cottage and I’m fine, or I turn off this device and I’m fine. So it’s a lot stronger than simply, “oh, I think that it’s this.”

And so the physician first of all has ruled out other possibilities, and then it’s a repeatable phenomenon that you get these symptoms in association with the exposure. The Austrian doctors also say that along with that there is a suite of

biochemical markers, and then we have animals' evidence that there are a lot of stressed proteins, and then we also have the in vitro evidence. And so it's not simply one --you know, there isn't just one piece, but it's putting together the entire fleet of what we know about biochemistry and all the way up to the patient's experience.

The other one comment I would make in terms of self-reports is that a huge amount of medicine is based on self-reports. Pain is based on self-report. Psychiatry, psychology, all of that is based on self report. There's a huge amount of medicine that is self-report. So saying that shouldn't be used as something to kind of minimize this type of assessment." (T9:1824-1825)

The American Academy of Environmental Medicine (AAEM) recommends:

"Because Smart Meters produce radiofrequency emissions, it is recommended that patients within the above conditions and disabilities be accommodated to protect their health. The AAEM recommends: that no Smart Meters be on these patients' homes, that Smart Meters be removed within a reasonable distance of patients' homes depending on the patients' perception and/or symptoms, and that no collection meters be placed near patients' homes depending on patients' perception and/or symptoms." (Exhibit C11-6, Attachments, American Academy of Environmental Medicine Regarding Electromagnetic and Radiofrequency Exposure, July 12, 2012, p. 2, para. 1)

When asked during cross-examination by Mr. Miles about the AAEM recommendation, Dr. Bailey stated that there is no indication about what kind of assessment or review and what studies were considered, or not studied. It appeared to him that it was only designed to put forth and identify studies that AAEM believed were potentially harmful. In his view it did not represent a valid weighting of the evidence in which one looks at all of the evidence, looks at the strength and quality of those individual studies, and then comes to a reasoned conclusion about what that evidence means. (T3:496-497)

Dr. Carpenter acknowledged that the existence of EHS is widely debated. Dr. Carpenter's definition of EHS is that symptoms are *reported* to be associated with EMF exposure; not that symptoms are *caused* by EMF exposure, although he notes that it is this causal relationship which has been widely debated. He also confirmed that there are many potential causes of symptoms such as headache, fatigue, tinnitus, disruption of sleep, mental dullness and a general feeling of ill health. In the 2012 BioInitiative Report, Dr. Carpenter stated that "it remains unclear whether EHS is actually caused by RF/EMF exposure, or rather is a self-identifying syndrome of excessive responsiveness to a variety

of stimuli.” (Exhibit C9-8, Attachment 6C, p. 8; Exhibit C9-12-3, BCSEA 9.1-9.3; T11:2133; Exhibit C9-12-3, BCSEA 1 11.6)

On this subject, Commission staff made the following information request to FortisBC:

“Does FortisBC consider the ‘nocebo effect’, as referenced in the Exponent report and in other academic studies of the potential link between RF/EMF radiation and human health, to be a significant source of negative effects for some of these concerned stakeholders? If not, please explain why not.”

To which FortisBC responded:

“Yes. Scientific research on radio frequency fields and assessments of this research by health and scientific agencies has described the belief and perception of some individuals that they can detect or develop symptoms in the presence of these fields as unrelated to the physical stimulus itself (referred to as electromagnetic hypersensitivity). As stated by the World Health Organization ‘The symptoms are certainly real and can vary widely in their severity. Whatever its cause, EHS can be a disabling problem for the affected individual. EHS has no clear diagnostic criteria and there is no scientific basis to link EHS symptoms to EMF exposure.’” (Exhibit B-14, BCUC 2.55.1)

According to the World Health Organization:

“EHS is characterized by a variety of non-specific symptoms that differ from individual to individual. The symptoms are certainly real and can vary widely in their severity. Whatever its cause, EHS can be a disabling problem for the affected individuals. EHS has no clear diagnostic criteria and there is no scientific basis to link EHS symptoms to EMF exposure. Further, EHS is not a medical diagnosis, nor is it clear that it represents a single medical problem.

Physicians: Treatment of affected individuals should focus on the health symptoms and the clinical picture, and not on the person’s perceived need for reducing or eliminating EMF in the workplace or home. This requires: a medical evaluation to identify and treat any specific conditions that may be responsible for the symptoms,

- a psychological evaluation to identify alternative psychiatric/ psychological conditions that may be responsible for the symptoms,

- an assessment of the workplace and home for factors that might contribute to the presented symptoms. These could include indoor air pollution, excessive noise, poor lighting (flickering light) or ergonomic factors. A reduction of stress and other improvements in the work situation might be appropriate.
- For EHS individuals with long lasting symptoms and severe handicaps, therapy should be directed principally at reducing symptoms and functional handicaps. This should be done in close co-operation with a qualified medical specialist (to address the medical and psychological aspects of the symptoms) and a hygienist (to identify and, if necessary, control factors in the environment that are known to have adverse health effects of relevance to the patient).

Treatment should aim to establish an effective physician-patient relationship, help develop strategies for coping with the situation and encourage patients to return to work and lead a normal social life.”

(Exhibit B-15-1, Attachment BCH 2.6, p. 3, para. 1 and 5)

FortisBC asserts that while the *symptoms* of EHS are real, there is no clinical pattern to their diagnosis, nor any causal linkage to RF that has been established scientifically (FortisBC Final Submission, pp. 175-176).

RDCK raise the issue of Charter rights in relation to EHS:

“S. 7 of the Canadian Charter of Rights and Freedoms states:

Everyone has the right to life, liberty and security of the person and the right not to be deprived thereof except in accordance with the principles of fundamental justice.

RDCK submits:

“...FortisBC’s proposal to wantonly and deliberately expose its EMF and EMR sensitive customers to electromagnetic and radio frequencies detrimental to their health, and without even the slightest concession to due process in connection with that assault, is a clear and undeniable violation of those customers’ s. 7 right under the *Charter* to security of the person. S. 15 of Charter further states:

Every individual is equal before and under the law and has the right to the equal protection and equal benefit of the law without discrimination and, in particular, without discrimination based on...mental or physical disability.” (RDCK Final Submission, p. 33)

NCGP, in its Final Argument, also makes the same argument:

“NCGPCA submits that FortisBC’s proposal to unilaterally and deliberately expose its EMF and EMR sensitive customers to electromagnetic and radio frequencies detrimental to their health, and without even the slightest concession to due process in connection with that exposure, are a clear and undeniable violation of those customers’ Section 7 and Section 15 Charter rights.” (NCGP Final Argument, p. 7)

FortisBC replies:

“NCGPCA at page 7 and Mr. Shadrack at paragraphs 114-115 further suggest that FortisBC’s proposal, particularly in relation to EHS and opt out, violates the Canadian Charter of Rights and Freedoms (the Charter). Again, these allegations are unfounded.

First, setting aside for a moment the substance of the issues, as a matter of law FortisBC’s proposal could not violate the Charter no matter what its content, as section 32(1) of the Charter limits its application to government actors:

This Charter applies

(a) to the Parliament and government of Canada in respect of all matters within the authority of Parliament including all matters relating to the Yukon Territory and Northwest Territories; and

(b) to the legislature and government of each province in respect of all matters within the authority of the legislature of each province.

As a private company, FortisBC does not fall within this category. As such, the Charter does not govern its actions or proposals.

Second and more fundamentally, even if the Charter were to apply, FortisBC’s proposal does not constitute a breach, for all the reasons set out in the Main Submission and in this reply.” (FortisBC May 2 Reply, pp. 72-73)

Commission Determination

With respect to the issue raised by RDCK and NCGP in regards to the Charter of Rights and Freedoms, the Panel agrees with FortisBC that the Charter is limited to government actors and is therefore not applicable in this case. The Panel notes that the Interveners raising this issue do not indicate how they see the Charter of Rights applying in these circumstances.

The Panel recognizes that there are individuals who feel strongly that low-level EMF emissions will have a negative impact on their health. However based on the scientific evidence in this Proceeding, the Panel is not persuaded that there is a causal link between RF emissions and the symptoms of EHS. The Panel notes that according to the World Health Organization, there is “no scientific basis to link EHS symptoms to EMF exposure.” While the Panel ascribes little weight to Dr. Carpenter’s evidence, it is noted that he acknowledged that although EHS symptoms are reported to be associated with EMF exposure, whether this relationship is causal is widely debated.

11.0 OTHER KEY ISSUES ARISING

11.1 Privacy and Use of Data Collected

By Order G-177-12 the Privacy issue was defined as “the collection and use of information only for its intended and authorized purpose and what those intended and authorized purposes should be.” The *Personal Information Protection Act* (PIPA)¹⁰ governs the collection, use and disclosure of personal information by organizations in British Columbia in a manner that recognizes both the right of the individuals to protect their personal information and the need of organizations to collect, use or disclose personal information for purposes that a reasonable person would consider appropriate in the circumstances. FortisBC must comply with the PIPA and the *Personal Information Protection and Electronic Documents Act*.¹¹ (Exhibit B-1, p. 138) Section 5 of the PIPA requires an organization to “develop and follow policies and practices that are necessary for the organization to meet the obligations of the organization under this Act.”

¹⁰ SBC 2003, c. 63.

¹¹ S.C. 2000, c. 5.

FortisBC states that privacy and security are fundamental considerations in the design and planning of the Project and that it will be collecting the same information it does currently only more frequently (Exhibit B-1, p. 138). FortisBC provided its updated privacy policy and included notes on how its obligations under PIPA regarding the collection, use, disclosure and security of personal information are being met (Exhibit B-9, p. 2).

In response to public concern related to the BC Hydro smart meter implementation the Information and Privacy Commissioner for BC conducted a review and issued Investigation Report F11-03 in December 2011. The report identified several recommendations to BC Hydro for notifying customers of the purposes for collecting the information, the legal authority for the collection and providing contact information within BC Hydro for questions (Exhibit B-9, Attachment 1, p. 3).

In his report the Privacy Commissioner noted that hourly consumption data would not reasonably reveal what appliances are being used and when but could reveal whether people are at home or away. (Exhibit B-9, Attachment 1, para. 49) He also reported that the California Public Utilities Commission was the first state to adopt specific rules regarding the privacy and security of consumption information generated by smart meters (Exhibit B-9, Attachment 1, para. 45).

The concerns that have been raised in this Proceeding include:

- The amount of individual consumption data collected is enormous and not obviously necessary.
- Once collected it is potentially available to law enforcement, insurance companies, marketers, criminals and others through the data being stored in a different jurisdiction outside Canada or other statute or court order.
- The consumption data may provide information on the number of occupants, daily routines, when and potentially what appliances are being used or when people are home or away.
- The collection of usage data on an hourly basis is intrusive and unnecessary.

(BCPSO Final Submission, pp. 20-21; Keith Miles Final Submission, p. 2)

FortisBC's Privacy Policy includes the statement, "From time to time, we may store your Personal Information outside of Canada, where it may be subject to the lawful access requirements of the jurisdiction in which it is being held" (Exhibit B-8, p. 5 of 6, FortisBC Privacy Policy). When asked what purpose and under what circumstances would FortisBC store personal information of its BC

customers outside of Canada, it responded that “[A]ny personal information from the AMI system will not be (not) *sic.* sent outside of Canada and will reside on FortisBC’s servers located within British Columbia” (Exhibit B-14, BCUC 2.56.2). When asked what the business implications would be if this provision were removed from the FortisBC Privacy Policy, the response was that “[T]he legislative requirements under the Personal Information Protection Act are why FortisBC includes this statement in its Privacy Policy” (Exhibit B-14, BCUC 2.56.3).

BCPSO makes several submissions on the subject:

- 1) that FBC should identify the specific purposes for which hourly consumption data is being collected and strictly limit its use accordingly;
- 2) that FBC should conduct privacy impact assessments given the evolving functionality of smart meter and smart grid technology;
- 3) that non-FBC personnel should be provided only with de-identified consumption data and only pursuant to agreements placing clear limits on the use of such data by any third party; and
- 4) that restrictions should be placed on the collection and retention of information outside of Canada.

(BCPSO Final Submission, p. 23-24)

An example of the public concern can be found in the Community Input Sessions in Section 7 of this Decision.

Commission Determination

The Panel recognizes that the PIPA governs FortisBC’s obligations related to the collection, use, disclosure and security of personal information of its customers. The Panel is not persuaded that collecting the same information more frequently increases the risk of privacy issues provided the other aspects of disclosure and security are maintained or improved and is satisfied that FortisBC understands its obligations to comply with the PIPA.

There is no evidence that there is a business need for storage of FortisBC customer information outside Canada. **Accordingly, the Panel directs FortisBC to store customer information only in Canada and update its Privacy Policy to reflect this.**

11.2 Wireless System Security

By Order G-177-12, the Panel adopted the definition of security as “the potential unauthorized interception of information (utility information, not just personal information) and includes interception by FortisBC of information belonging to a customer or by a customer of utility information not just interception by third parties” (Exhibit A-14, pp. 4, 5).

Mr. Flynn raised concerns related to the electrical grid security including international hacking and cyber-attacks in written and oral submissions (e.g. T2:310). The Panel clarified that issues of system-wide grid security were not within the scope of this Proceeding (T2:310). FortisBC does, however, state that it considered both the security of information and the security of the electricity grid (FortisBC Final Submission, p. 111).

FortisBC states it included AMI system security requirements including the North American Advanced Metering Infrastructure Task Force’s AMI-SEC standards in its RFP to Vendors (T2:226). It further states that it will ensure third party audits are conducted at implementation and on an ongoing basis to ensure compliance with the AMI-SEC security standards (Exhibit B-1, p. 135). FortisBC confirms that the metering system proposed by Itron meets FortisBC’s security requirements and provide end to end security including:

- 1) Preventing interception of transmissions (RF-LAN using frequency hopping spread spectrum technique);
- 2) Encryption of the data using state of the art encryption and signing keys for communications between meters and FortisBC’s HES;
- 3) Security event software to analyze and detect possible intrusions or attacks into the system; and
- 4) Role based and authenticated user controls for access to the system.

(Exhibit B-1, pp. 136-138; FortisBC Final Submission, pp. 115-119)

FortisBC further states that “[t]he only personal information being transmitted wirelessly over the AMI system is a customer’s aggregate consumption information and this reading is not linked to a customer name or address until it reaches FortisBC’s internal system. Additionally, there are extensive security features of the AMI system that would be in place to prevent unauthorized interception of that information (i.e. encryption). That being said, even if a person were to intercept the data being transmitted over the AMI system, they would only have a number

representing aggregate consumption and a FortisBC meter number, so for that person to link that to an individual customer they would need to know the customer's meter number. In other words, it is improbable that even if a person were to get past all of the security that that they would be able to identify the individual customer that the consumption information related to" (Exhibit B-9, p. 3). During cross-examination by CEC, Mr. Swanson gave evidence on behalf of FortisBC that an individual could physically read the meter number at the meter and thereby link it to the address manually, but that would still require them to hack the wireless transmitted data encryption. He also testified that it would be possible to simply walk up to the meter and read the consumption physically, which is the case now (T2:217-218). FortisBC argues that the security of the system will be at least as secure as it is today and in fact will be improved over the current system due to not having manual meter reads (T2:220-221; FortisBC Final Submission, p. 111).

During the Oral Hearing, questions related to the AMI meter's optical port were raised, specifically relating to security and unauthorized access. If left unsecured, this port could potentially be used to access some personal information of the customer. (T2:253)

FortisBC responded to Commission staff questions by stating that the optical port would be secured with a log-in system that would require a specialized tool, as well as a valid username and password. In addition to this, all attempts to access the secured optical port would be flagged by the meter and transmitted to FortisBC's information system, so that any access attempts that were not pre-cleared in the system as authorized would be immediately flagged for investigation. FortisBC also stated that the system could be configured to only allow access to the optical port during a set, pre-determined "service window" timeframe that would block any and all access outside of that window, allowing for an extra layer of security. FortisBC further elaborated that the final level of security would be determined over time by adjusting the level of sensitivity of these protocols, but that the initial security level would be set at a fairly conservative threshold, and that any adjustments would come later as the network architecture was finalized. (T3:357-361)

Commission Determination

The Panel finds that FortisBC has adequately considered and taken reasonable steps to address security issues related to the proposed Project. The Panel further finds that FortisBC not only considered interception of electrical consumption information but also security of customer information and other utility information that is maintained at FortisBC's internal systems. The Panel notes current internal initiatives to safeguard security and considers that it would be prudent

for FortisBC to continue to do so.

11.2.1 ZigBee and Home Area Network

Each AMI meter will have two, two-way RF radios, one for communication to the LAN for communication to FortisBC's head-end system and a second that may be used to communicate with a HAN device such as In Home Display using the ZigBee protocol. The second RF radio is referred to as the ZigBee chip. FortisBC states that initially the meters will use ZigBee Smart Profile (SEP) 1.1 which supports a wide varied of commercially available IHD's. (Exhibit B-1, p. 43) ZigBee is currently developing Smart Energy (SEP) v2.0 with additional functionality, which the selected meters also support and could be upgraded "over-the-air" to all meters (Exhibit B-11, BCSEA 1.1.2). FortisBC agreed that the HAN could be a possible security issue that could allow others to intercept the customers' consumption data. FortisBC states this would not provide a means to get into the FortisBC AMI system (T3:321, 322).

BCSEA highlights this potential security threat to customer data and proposes that the ZigBee chip be configured to only communicate with a customer's IHD or Customer gateway and not other in-home devices in order to limit or put HAN security as the customers' responsibility (BCSEA Final Submission, pp. 20-22). BCSEA further states that since SEP v. 2.0 is a new version that could connect to a wide and expanding range of home automation and services which raises the potential security concerns, only SEP1.1 should be approved by the Commission and FortisBC could apply at a later date to switch protocol (BCSEA Final Submission, pp. 24, 25).

FortisBC confirmed that the ZigBee radio transmitter will be turned off at installation but could be turned on remotely by request to FortisBC to connect a device or a gateway. If the customer chose to connect a gateway device then multiple devices could be added to the customer's network. If the customer chose to associate multiple devices directly with the meter, they would have to contact FortisBC for each device (T3:372).

FortisBC argues that BCSEA's proposal to only allow IHD or gateway connections could limit customers' choice to easily connect other devices and that it would consider all customer benefits and concerns in deciding whether to implement SEP 2.0 (FortisBC May 2 Reply, p. 10).

Commission Determination

The Panel finds that the presence of the ZigBee chip does not provide an increased security risk to either FortisBC's head end system or to customer consumption information collected by the AMI meter. Unauthorized access to the ZigBee chip by way of a HAN, or an in-home device, will not compromise data in the FortisBC system. There is the potential for unauthorized access to a HAN through customer owned equipment over which FortisBC has no control. However, use of a HAN is entirely at the discretion of the customer.

The Panel has already accepted that one of the more visible potential benefits to customers is the capability to connect in home displays and potentially other devices to allow them to see and manage personal electric consumption. The level of interest and ability of these customers to manage their own wireless network and/or add devices will vary broadly. The Panel observes that allowing customers to connect multiple devices to the Zigbee portion of the meter affords customers this choice and adequate security protection. **FortisBC is directed to provide clear information to customers choosing to connect devices on the options and any potential security risks and precautions along with the level of security provided by the ZigBee RF system to a HAN.**

There is not enough evidence for the Panel to determine whether SEP 2.0 would alter the security or privacy related risks and therefore **the Panel directs FortisBC to seek approval from the Commission prior to releasing a version update to the ZigBee architecture that would affect the communication, devices or security of access to the information on the customers HAN.** As other RF related issues including health have been dealt with extensively in this Proceeding, the application on updates to ZigBee software should be limited to costs, benefits, security and privacy matters.

11.3 Fire Risk

In the information requests, some of the Interveners' questioned the fire safety and fire risk to customers referring to reports of fires allegedly occurring as the result of AMI meter installations in other jurisdictions, such as California, Florida, Texas and Ontario. (Exhibit C9-2, CSTS 1.13; Exhibit C9-4, CSTS 2.36.0; Exhibit C15-2, Tatangelo IR1, p. 6; Exhibit C4-4, BCSEA 1.49.1)

FortisBC states it has reviewed the reports of alleged smart meter fires in other jurisdictions and its investigations indicate “...the problems relate to faulty customer equipment and inadequate installation processes.” (Exhibit B-15 CSTS IR2.36.3) In its response to BCSEA’s query on whether “...the temperature reporting functionality is enabled prior to meter deployment will the AMI system prevent fires associated with cracked meter bases, remote disconnection of service?”, FortisBC states “This functionality cannot be guaranteed to prevent fires associated with faulty meter bases.” (Exhibit B-11, BCSEA IR1.49.1)

FortisBC states it “... has developed specific procedures for the implementation of the AMI Project, to avoid any installation or equipment related problems increasing the risk of fires.” It further states: “During the installation of AMI meters, there is a risk that the FortisBC installer may damage the meter base. FortisBC plans to immediately remedy any damage caused to meter bases, and included in the budget for the AMI Project the cost of replacing over 1,000 meter bases.” (FortisBC Final Submission, p. 214)

FortisBC states Itron will manage all logistics associated with the infrastructure deployment while FortisBC will maintain overall project management of the end-to-end solution including deployment (Exhibit B-1, pp. 55-56). FortisBC states the meter deployment is exempt from the BC *Safety Standards Act*¹² and therefore BC Safety Authority oversight (Exhibit B-6, BCUC 47.1.1). FortisBC has not completed the AMI Meter Deployment Training Manual (Manual) but states “The AMI Project Manager, in consultation with qualified personnel from within the Company, will approve the meter deployment training manual.” FortisBC will review the Manual toward the end of the Define/Design stage, which is expected to be the fourth quarter of 2013 and approve the Manual one month after the final draft is complete (Exhibit B-14, BCUC 2 83.8.3, pp. 221-222).

CSTS, BCSEA and Mr. Talangelo do not address the fire issue further in their Final Submissions.

BCPSO accepts that the Project will not increase the fire risk associated with utility meters. Indeed, properly trained installers should be able to detect existing unsafe conditions in meter bases and eliminate some existing fire risks. (BCPSO Final Submission, p. 26)

¹² SBC 2003, c. 39.

CEC submits “that the Commission determine that the evidence shows there is no increased fire hazard associated with the AMI meters or meter exchange process.” It further submits that electrical hazards may be associated with a damaged base plate which could either be pre-existing or occur at the time of meter exchange (CEC Final Submission, pp. 118-119).

In its Reply, FortisBC states: “None of the Interveners have made submissions as to fire safety except for CEC and BCPSO, which accept FortisBC’s position in this regard” (FortisBC May 2 Reply, p. 68).

Commission Determination

The Panel is of the view there is a low- risk of fires resulting from installation of the new meters. The Panel considers a properly developed and fully documented installation manual and deployment plan, and appropriately trained and supervised installers, will reduce this risk. - The Panel considers the costs included for the replacement of damaged customer meter bases to be a reasonable precautionary measure even though these are not FortisBC assets. **The Panel directs FortisBC to immediately report any meter/meter base incidents to the Commission and other authorities as required or appropriate.**

11.4 Opt-Out

Many of the Letters of Comment touched on the desire for a so-called “opt-out” provision, whereby individuals could choose to have a non-transmitting AMI meter installed on their property and have their meter read manually. The issue of whether or not to allow an opt-out was also addressed in the information request process, at the Oral Hearing and in Final Submissions.

In the Application, FortisBC did not propose an opt-out program of any kind, stating that it did not see a sufficient need for an opt-out to justify the increased cost that would be borne by the ratepayer:

“Several North American jurisdictions have offered an “opt-out” option for customers who oppose having an advanced meter installed. Customers that wish to “opt-out” pay additional fees related to the costs of having to download data from the meters manually, rather than through the wireless network.

FortisBC believes that an opt-out provision is not in the best interest of customers for the following reasons:

“Opt-out” will not resolve all customer concerns, and customer refusals would still be expected.

There is no compelling scientific or other evidence to support the need for an “opt-out” provision.

Advanced metering benefits can be eroded by “opt-out” customers.

It is not consistent with existing provincial policy.” (Exhibit B-1, pp. 142-143)

However, FortisBC also acknowledged during cross-examination that there would be a large number of individuals who may refuse AMI meters entirely, leading to a scenario in which ratepayers were forcibly disconnected if they did not choose to accept an RF-enabled AMI unit on their property:

“And then barring that, if that wasn’t going to be an option for the customer, then ultimately we would be looking at the last option available to us, which would be to disconnect the customer.” (T6:1039)

FortisBC also agreed that some individuals would develop symptoms as a result of believing their AMI meters were exposing them to dangerous levels of RF energy, despite there being no scientific or medical basis for such a belief (also called the ‘nocebo effect’).

Question:

“Does FortisBC consider the ‘nocebo effect’, as referenced in the Exponent report and in other academic studies of the potential link between RF/EMF radiation and human health, to be a significant source of negative effects for some of these concerned stakeholders? If not, please explain why not.”

Response:

Yes. Scientific research on radiofrequency fields and assessments of this research by health and scientific agencies has described the belief and perception of some individuals that they can detect or develop symptoms in the presence of these fields as unrelated to the physical stimulus itself (referred to as electromagnetic hypersensitivity). As stated by the World Health Organization “The symptoms are certainly real and can vary widely in their severity. Whatever its cause, EHS can be a disabling problem for the affected individual. EHS has no clear diagnostic criteria and there is no scientific basis to link EHS symptoms to EMF exposure.” (Exhibit B-14, BCUC 2.55.1)

When asked about a hypothetical model of cost-recovery that might be followed in the event of the AMI program allowing an opt-out, FortisBC responded, both in IRs and to questions at the Oral Hearing, by indicating they would seek to have the party opting-out pay for the entire incremental cost on the principle of ‘cost causation’:

MR. AARON: Q: So, and that opt-out will cost the company nothing extra, and will cost the non-opting out customers nothing extra.

MR. LOSKI: A: The incremental cost that would be borne by the company to implement the opt-out for the customer would be recovered from that customer. Again, with the principle of cost causation, then the remaining -- or the rest of the customers would, in effect, be kept whole. (T5:963)

CEC expressed concern about a potential opt-out reducing the projected future benefits of an AMI system, and wants a potential opt-out program to be limited in scope and duration. CEC submits that the goal of an opt-out program should be to smooth the eventual transition to nearly-universal use of AMI meters, and decisions about how to structure a potential program should reflect that goal. (CEC Final Submission, p. 126)

BCSEA supports an opt-out system, with cost recovery being at the customers’s expense. BCSEA notes that some FortisBC customers are “deeply opposed” to having an AMI meter on their premises because of the RF transmissions. (BCSEA Written Argument, p. 26) BCSEA also wishes for the Panel to “...define the key elements of the opt-out tariff as part of this proceeding, so that only a compliance filing is required.” (BCSEA Final Submission, p. 27)

BCPSO supports an opt-out, based on an individual cost-recovery basis, and with AMI meters being deployed in a transmit-off mode to individuals who opt-out so that most of the benefits of the AMI system can still be realized. BCPSO is also supportive of free opt-outs being granted to individuals who can demonstrate financial or medical hardship. (BCPSO Final Submission, p. 27)

CSTS also supports an opt-out, stating, “At the very least, customers wishing to opt-out should have the right to do so” (CSTS Final Submission, p. 54). However, CSTS requests a separate proceeding to be initiated to determine the parameters of an opt-out program (CSTS Final Submission, p. 71).

Mr. Miles indicates he is in favour of an opt-out provision, provided that, "...project costs should accommodate each complainant" (Miles Final Submission, p. 6). The Panel interpreted this to mean that Mr. Miles echoes BCPSO's position regarding reduced costs being borne by individuals with financial or medical reasons.

RDCK strongly supports an opt-out program (RDCK Final Submission, p. 36).

Commission Determination

In Section 6.5.2, the Panel identified a potential risk to the implementation schedule arising from a protracted difference of views concerning the Project. This risk could increase costs to and reduce potential benefits from the Project, which would be detrimental to all FortisBC ratepayers. The Panel is of the view that an opt-out program could mitigate these potential schedule impacts. On the issue of financial or medical hardship, the Panel is of the view that a properly designed opt-out program allows individuals to decide not to accept a transmitting AMI meter while protecting the remaining FortisBC customers from the increased costs associated with the opt-out Program.

Therefore, the Commission directs FortisBC to design and bring forward to the Commission for approval an opt-out program based on the following principles:

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

FortisBC states that if an opt-out program is required, enough information has been provided during the Proceeding to allow the Commission to set the detailed terms of an opt-out program. However, the Panel is not persuaded that this is the case because the terms and conditions of an opt-out provision were not within the scope of the Proceeding. **Accordingly, the Panel directs FortisBC to file an application for an opt-out program, based on the principles outlined above by November 1, 2013.** As RF-related issues, including health, security, and privacy have been dealt

with extensively in this Proceeding, the opt-out application should be limited to the issues described above.

11.5 Environmental Impacts

Intervenors raised concerns over potential impacts of RF emissions on wildlife, plants and man-made structures. Dr. Jamieson's report includes a section on environmental concerns including possible risk factors of different insects, birds, and plants. In the report Dr. Jamieson discusses the importance of pollinating insects and birds for our ecosystem and phenomenon such as declining numbers of honey bees, and then refers to studies to make an appraisal of possible links to increasing EMF exposure. He states: "The detailed literature review conducted as part of this appraisal, indicates that exposure to inappropriate electromagnetic field (EMF) regimes can adversely affect insects, including bees and other insect pollinators. Greatly reduced insect numbers and insect diversity can adversely affect Nature's food chain, and may partially explain reduced numbers of some bat and bird species." (Exhibit C9-10-1, p. 127)

One particular insect discussed by Dr. Jamieson is honey bees. He speaks to the importance of honey bees in terms of agricultural value of pollination and the concern of the phenomenon known as Colony Collapse Disorder. Dr. Jamieson states that numerous potential causes have been suggested (Exhibit C9-10-1, p. 129) including manmade EMF as one. Dr. Jamieson shares his opinion that a combination of these potential causes may be to blame (Exhibit C9-10-1, p. 129). Dr. Jamieson refers to studies (Sharma and Kumar (2010), Kumar *et al.* (2011) and Sahib (2011)), which he states indicate a reduction in colony strength and queen egg-laying rate. The Sharma and Kumar study observed a total of four colonies with two being exposed to [variables] 900 MHz radiation for 15 minutes twice per day at a reported power density of 8.549 uW/cm^2 (Exhibit C9-10-1, p. 130). Dr. Jamieson states that these findings "indicate the need for a full-scale study to be undertaken where greater numbers of colonies can be assessed and variables reduced" and refers to "confounding" variables in other studies, which he suggests warrants further study and attention (Exhibit C9-10-1, pp. 131, 140). Dr. Jamieson summarizes his basic approach in the report "to raise awareness of studies where it's been indicated that there may be a cause for concern, so that debate can be opened up with BCUC..." (T10:2008).

FortisBC's expert consultant, Exponent, states: "A claim that a cell phone affected bee behaviour has been reported without direct evidence that the radiofrequency field was involved (Shabib, 2011). In short, there is no clear, confirmed adverse effect of radiofrequency field on bird or bee

health” (Exhibit B-15, CSTS 2.4.4). FortisBC further states that it is not aware of scientific evidence that confirms any adverse effect of RF fields on insects and/or birds at the frequencies and intensities of RF fields produced by the FortisBC AMI meters (Exhibit B-11, CSTS 1.27.2).

Plants

Dr. Jamieson’s report also included photos of plant “die-off” to suggest “cause for concern.” When asked by FortisBC if he had considered other factors that could have led to the plant death he responded that time did not permit him to. When asked if there are other observations of bushes perishing near advanced meter installations he responded not that he was aware of. Ultimately, Dr. Jamieson conceded that “there could be other factors that led to the observed die-offs being so acute.” (Exhibit C9-10-1, p. 39)

CSTS adopts Dr. Jamieson’s report on the environmental impacts of the proposed AMI meters (CSTS Final Submission, p. 72).

Man-made structures

WKCC states that RF emissions will radiate infrastructure and will accelerate corrosion and adversely affect municipalities, industries, crops, timber, spawning, health as well as building compliance with building code (WKCC Final Submission, p. 12). WKCC refers to the science of how “everything in the coverage area being electrical at the atomic and molecular levels isn’t (sic) insulated or compatible with these man-made frequencies” (WKCC Final Submission, p. 1); however, no evidence from other jurisdictions with AMI or smart meters was brought forward demonstrating any adverse affects. Dr. Shkolnikov provided a number of examples demonstrating that RF signals, even those many orders of magnitude higher than from AMI, do not result in damage or destruction of materials. One such example was cup used in a micro-wave oven to boil water; another was that the force exerted on a wall by RF radiation from an AMI meter is “a millionth of ... the force of air pressure from a normal human conversation in a room” (T6:1187, 1189).

Commission Determination

There is a significant amount of research and opinion in evidence on the impact of RF emissions on the broad spectrum of the natural habitat including insects, birds and plants and the ongoing interest of study in this area. The Panel considered this evidence and in doing so took into account the conclusions it reached in Section 4 on the weight to be applied to evidence of the experts.

Based on the scientific evidence presented the Panel is not convinced that RF fields produced by the Project would have adverse effects on the natural habitat. In dealing with claims of damage to infrastructure and buildings by WKCC the Panel was not convinced of the science or the basis on which such claims are made and notes that in the many jurisdictions across North America where AMI type meters have been installed there is no evidence of any building code issues or reports of damage to structures. In reaching this conclusion the Panel also considered the determinations in Section 4 regarding the weight to be applied to Mr. Bennett's evidence.

The Panel is satisfied that FortisBC has considered these potential environmental concerns as well as the environmental benefits associated with reduced emissions from vehicles discussed in Section 8.2.1.

11.6 Higher Bills

Several Letters of Comment were received expressing concern over higher bills after smart meters were installed. Two examples are:

- 'There are numerous reports of skyrocketing hydro bills with these meters. As Michael Smyth stated (Vancouver Province, April 8, 2012, p. A3) "Hundreds of Province readers have contacted me with stories of BC Hydro bills that doubled, tripled, quadrupled or spiked even higher after receiving a new smart meter.'" (Exhibit E-113, p. 2)
- "In my research for this presentation, I read dozens of complaints from BC Hydro customers over higher electricity bills after smart meters were installed on their homes. On March 6, 2012 News 1130 radio reporter Erin Loxam interviewed Vancouver homeowner Brad Hugel, who stated his electricity bill tripled after a smart meter installation. Hugel explained that his bills shot from "usually around \$160 for two months" to one for "\$515 for a two-month period", adding he also purchased a more energy-efficient washer/dryer during that same period." (Exhibit E-21)

FortisBC recognizes potential customer concerns regarding accuracy of the AMI meters and references "numerous media articles" detailing customer concerns in other jurisdictions that have implemented smart or advanced meters (Exhibit B-1, p. 131). FortisBC identifies a potential cause as manual meter reading errors during AMI deployment and its plan to tighten the tolerances used by the Company's billing software in order to identify and review any bills potentially in error prior to issue to the customer. FortisBC will use its existing process for handling high bill concerns through its Contact Centre. In addition it says it plans to use a certified electro-mechanical meter as the "parallel check metre" to be able to demonstrate the accuracy of digital AMI meters. (Exhibit B-1, p. 133)

FortisBC further states that all meters will continue to subject to the accuracy requirements and testing mandated by Measurement Canada (Exhibit B-1, p. 131).

Commission Determination

The Panel is satisfied that FortisBC plans to handle customer concerns and accuracy requirements for the AMI meters. **The Panel directs FortisBC to report on customer concerns regarding accuracy of the AMI meters in its project reporting process.**

12.0 COMMISSION DETERMINATION

In its Application FortisBC specifically seeks the following:

- 1) Pursuant to sections 45 and 46 of the UCA, an order issuing a CPCN for the Project at an estimated cost of \$51.2 million, including salvage value (Exhibit B-1, p. 6; Exhibit B-1-4, p. 2 and);
- 2) Pursuant to section 56 of the UCA, an order approving a revised depreciation rate for the proposed meters of 5 percent until the next depreciation study is completed (Exhibit B-1, p. 6).

12.1 Public Convenience and Necessity

Previously in this Decision, the Panel has found the need for the Project is not singular, but flows from a number of needs, including: replace metering technology that is no longer supported and provide a foundation for future upgrades to the grid. In addition, the Project provides FortisBC with opportunities to reduce the amount of energy theft, reduce operating costs and improve customer service, all to the benefit of the customer. The Project results in a quantifiable benefit with a net present value of \$13.9 million.

Further, the Panel has found that FortisBC has adequately analyzed the project alternatives and the project risk. In addition, the Panel is not persuaded that safety standards that apply to the RF radiation emitted by the AMI meters and associated infrastructure, and to which they conform, is inadequate to protect the health and safety of the public.

The Project advances the BC 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" as stated in section 17(6) of the CEA. The Project also supports BC's Energy Objectives, specifically CEA sections 2(b) (to take demand side measures to conserve energy); 2(d) (to use and foster the development in BC of innovative technologies that support energy conservation and efficiency) and 2(g) to reduce greenhouse gases. For these reasons, the Panel finds the Project to be in the public interest and also notes that it is provided for in FortisBC's most recent long term resource plan.

Accordingly, the Panel approves a CPCN for the Project with a capital budget, including approved CPCN Development Costs, of \$50.898 million (\$51.173 million - \$275,000) as described in this Decision, subject to a condition that FortisBC must confirm by August 1, 2013, that it will file an application for an opt-out provision that follows the direction in Section 11.4. As previously outlined in this Decision, FortisBC is directed to bring forward a proposal for an opt-out provision by November 1, 2013. In approving the CPCN the Panel made other decisions, which are listed in Section 13.0.

12.2 Depreciation Rate for Proposed Meters

As set out in Section 8.5.3.1 a depreciation rate of 5 percent is approved for the advanced meters based on an expected economic life of 20 years.

13.0 SUMMARY OF DIRECTIVES

This Summary is provided for the convenience of readers. In the event of any difference between the Directions in this Summary and those in the body of the Decision, the wording in the Decision shall prevail.

	Directive	Page
1.	The Panel finds that the Project need has been established.	41
2.	The Panel finds that the consultation process to date has been reasonable and sufficient.	49

3.	The Panel accepts FortisBC's assertion that a discount rate of 8 percent recognizes that "lower rates are expected over the near term, but would not be expected over a 20 year period." The Panel agrees that the selection of a discount rate is a matter of judgement and for these reasons the Panel accepts FortisBC's use of a discount rate of 8 percent as reasonable.	56
4.	The Panel finds that a 1.8 percent escalation of costs not covered by the Itron contract is reasonable to include in the estimate of project costs.	57
5.	The Panel accepts FortisBC's use of a 1.8 percent general inflation rate, based on the Conference Board of Canada's forecast for British Columbia.	57
6.	The Panel accepts FortisBC's use of a 20 year term for the Economic Analysis.	58
7.	The Panel accepts the Income Tax and CCA rate assumptions used by FortisBC, and its calculation of income taxes, as being reasonable.	58
8.	The Panel accepts the NPV amount of the Project capital costs of \$39.074 million.	61
9.	As the FortisBC 2007 AMI CPCN application was denied, the Panel finds that the cost of the 2007 AMI proceeding should not form part of this Proceeding. FortisBC is directed to apply for recovery of the 2007 AMI costs in its next Revenue Requirement Application.	62
10.	The Panel accepts the basis and assumptions for the calculation to be reasonable and therefore finds the estimated NPV savings of \$26.44 million from reduced meter reading expense to be reasonable over the life of the Project.	64
11.	The Panel accepts FortisBC's forecast of the NPV savings from the AMI remote disconnect/ reconnect savings of \$6.155 million over the life of the Project.	66
12.	The Panel accepts the calculation of the avoided cost benefit for Measurement Canada compliance and therefore finds the estimated NPV savings over the life of the Project of \$10.8 million to be reasonable.	68
13.	The Panel accepts the NPV estimate of \$1.6 million in savings over the life of the Project compared to not having to perform meter exchanges for six years following the AMI deployment.	69
14.	The Panel accepts the evidence put forward by FortisBC that there will be labour savings in the Contact Centre of about \$507,000 on an NPV basis over the life of the Project.	69

15.	The Panel accepts that there are soft benefits from the Project, although they are not included in the economic cost benefit analysis.	72
16.	The Panel determines that the Project, by providing more detailed and timely information to customers about their energy use, supports BC's energy objectives, specifically the objectives found in CEA sections 2(b) to take demand-side measures to conserve energy; and 2(d) to use and foster the development in BC of innovative technologies that support energy conservation and efficiency. The Panel also finds that the Project supports energy objective 2(g) to reduce greenhouse gas emissions.	77
17.	The Panel therefore disagrees with FortisBC's position that an increase in sales to illegal grow-operations can be considered a net benefit of the Project.	79
18.	The Panel considers that benefits which are uncertain should be estimated conservatively, such that the estimated benefit is more likely to be understated than overstated. The Panel notes that any economic benefit from reduced system losses will accrue to FortisBC's ratepayers as they are the ones who pay these costs.	80
19.	The Panel therefore accepts Professor Boyd's conservative approach of three grow cycles per year as being reasonable. This reduces the assumed annual energy use per site from FortisBC's estimate of 151,200kWh/year to 113,400/kWh.	83
20.	The Panel accepts FortisBC's evidence that it will be able to yield an additional 20 percent reduction in the theft ratio under AMI as reasonable.	86
21.	The Commission Panel accepts that advanced meters at the feeder level only would not be a practical means of identifying theft as data obtained would not be time synchronised.	87
22.	Using FortisBC's financial model (included in Exhibit B-1-3, Attachment, Tab "Theft Reduction") to make these adjustments results in an estimated net present value benefit of theft reduction of \$33.463 million. The Panel considers this to be the appropriate Theft Reduction Benefit to include in the Economic Analysis of the Project.	88
23.	The Panel approves a depreciation rate of 5 percent for the AMI meters, based on an estimated economic life of 20 years until the next depreciation study is completed and approved.	95
24.	FortisBC is directed to use a depreciation rate of 10 percent (1 divided by a 10 year survivor curve) for the AMI Computer Equipment and Software and 6.67 percent (1 divided by a 15 year survivor curve) for the AMI Communications Structures and Equipment until the next depreciation study is completed and approved.	96

25.	FortisBC is directed to record the cost of these meters in a rate base deferral account attracting FortisBC's weighted average cost of capital (WACC) as they are removed from service. Additions to the deferral account are to be amortized over a period of five years, commencing the year following their addition.	98
26.	The Panel finds that FortisBC has adequately considered alternatives.	105
27.	The Panel finds that Safety Code 6 applies to FortisBC's AMI Program and emissions from the proposed AMI meters must comply with the requirements of Safety Code 6.	108
28.	The Panel finds that Safety Code 6 provides protection from thermal effects, non-thermal effects and incorporates an adequate degree of precaution.	114
29.	The Panel is not persuaded by the evidence provided that Safety Code 6 fails to protect the public from cumulative or chronic health risks from RF emissions.	130
30.	The Panel directs FortisBC to store customer information only in Canada and update its Privacy Policy to reflect this.	139
31.	The Panel finds that FortisBC has adequately considered and taken reasonable steps to address security issues related to the proposed Project.	141
32.	FortisBC is directed to provide clear information to customers choosing to connect devices on the options and any potential security risks and precautions along with the level of security provided by the ZigBee RF system to a HAN.	143
33.	The Panel directs FortisBC to seek approval from the Commission prior to releasing a version update to the ZigBee architecture that would affect the communication, devices or security of access to the information on the customers HAN.	143
34.	The Panel directs FortisBC to immediately report any meter/meter base incidents to the Commission and other authorities as required or appropriate.	145

35.	<p>Therefore, the Commission directs FortisBC to design and bring forward to the Commission for approval an opt-out program based on the following principles:</p> <ul style="list-style-type: none"> • Customers may choose to opt-out of accepting a wireless transmitting meter. • Customers who choose to opt-out will be provided with an AMI meter that has the wireless transmit functions disabled. Transmit functions on these meters will remain disabled until the individual chooses to opt back in to the AMI program; in the event that the customer moves to a new property, the opt-out choice will move with the customer. • The incremental cost of opting-out of the AMI program will be borne by the individual choosing to opt-out. 	148
36.	The Panel directs FortisBC to file an application for an opt-out program, based on the principles outlined above by November 1, 2013.	148
37.	The Panel directs FortisBC to report on customer concerns regarding accuracy of the AMI meters in its project reporting process.	152

DATED at the City of Vancouver, in the Province of British Columbia, this 23rd day of July 2013.

Original signed by:

L.F. KELSEY
PANEL CHAIR/COMMISSIONER

Original signed by:

N.E. MACMURCHY
COMMISSIONER

Original signed by:

D.M. MORTON
COMMISSIONER

**BRITISH COLUMBIA
UTILITIES COMMISSION**

**ORDER
NUMBER C-7-13**

TELEPHONE: (604) 660-4700
BC TOLL FREE: 1-800-663-1385
FACSIMILE: (604) 660-1102

SIXTH FLOOR, 900 HOWE STREET, BOX 250
VANCOUVER, BC V6Z 2N3 CANADA
web site: <http://www.bcuc.com>



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

and

An Application by FortisBC Inc.
for a Certificate of Public Convenience and Necessity
for the Advanced Metering Infrastructure Project

BEFORE: L.F. Kelsey, Commissioner
D.M. Morton, Commissioner July 23, 2013
N.E. MacMurchy, Commissioner

CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY

WHEREAS:

- A. On July 26, 2012, FortisBC Inc. (FortisBC) applied to the British Columbia Utilities Commission (Commission or BCUC) pursuant to sections 45, 46 and 56 of the *Utilities Commission Act*, for approval of the Advanced Metering Infrastructure (AMI) Project (Project, Application);
- B. By Order G-105-12, dated August 2, 2012, the Commission established a Preliminary Regulatory Timetable requesting comments on the regulatory process for the review of the Application, such as written, oral or both;
- C. By Order G-135-12, dated September 26, 2012, the Commission established a Procedural Conference to take place in Kelowna to hear participant submissions on the regulatory process for the review of the Application. The Order also appended an Amended Preliminary Timetable;
- D. By Order G-137-12, dated September 28, 2012, the Commission set November 6, 7 and 8, 2012, as the dates for Community Input Sessions on the Application in Trail, Osoyoos and Kelowna respectively. The Community Input Sessions took place on those dates;
- E. The Procedural Conference took place in Kelowna on November 8, 2012;
- F. By Order G-177-12, dated November 23, 2012, the Commission directed, among other things, that the review of the Application would proceed through a combination of a written and an oral hearing, with financial, operations, fire safety and privacy issues to be reviewed by way of a written process and health, security and environmental issues by way of an oral hearing. Among other matters, the Order also directed that the oral hearing take place in Kelowna commencing March 4, 2013, and concluding by no later than March 15, 2013. The Order also appended an Amended Regulatory Timetable;
- G. On November 13, 2012, FortisBC filed a application with the Commission to purchase the electric utility assets of the City of Kelowna (CoK CPCN);

**BRITISH COLUMBIA
UTILITIES COMMISSION**

**ORDER
NUMBER C-7-13**

2

- H. On November 16, 2012, FortisBC filed an Addendum to the Application, which described the impacts to the Application in the event the Commission approved the CoK CPCN. On November 20, 2012, FortisBC filed the Excel file containing the Net Present Value analysis in its November 16 Addendum filing;
- I. The estimated cost of the AMI Project, including salvage value, is \$51.2 million;
- J. By Order G-198-12 dated December 20, 2012, the Commission denied the requests of two Interveners, Area D in the Regional District of Central Kootenay (RDCK) and the Nelson–Creston Green Party Constituency Association (NCGP), for a suspension of the proceeding and confirmed the Amended Regulatory Timetable established by Order G-177-12;
- K. By Order G-11-13, dated January 18, 2013, the Commission denied the request of an Intervener, Mr. Jerry Flynn, to make a PowerPoint presentation at the oral hearing;
- L. On January 22, 2013, FortisBC submitted an Evidentiary Filing on the Advanced Metering Initiative Market, technology and North American project costs;
- M. By Order G-12-13, dated January 22, 2013, the Commission ordered that FortisBC's responses to certain Commission Information Requests were to be treated as confidential by the Commission, but did allow access to Intervener counsel and a limited group of Interveners upon the filing of an Undertaking of Confidentiality;
- N. By Order G-17-13, dated February 1, 2013, the Commission, among other matters, granted a limited third round of Information Requests and one round of Confidential Information Requests to Interveners who qualified to make those requests pursuant to Order G-12-13 and issued a Further Amended Regulatory Timetable;
- O. By Order G-21-13, dated February 7, 2013, the Commission denied RDCK's request for reconsideration and variance of Order G-177-12 to permit financial, operational, fire safety and privacy issues including wireless vs. wired meters in the oral hearing;
- P. By Order G-24-13, dated February 13, 2013, the Commission allowed Commission staff and one Intervener, the British Columbia Pensioners' and Seniors' Organization, to submit additional Information Requests focussed on clarification and financial impacts of the Addendum and certain other evidence relating to the Addendum. In addition, the Commission allowed certain Information Requests delivered by another Intervener, BC; Sustainable Energy Association and the Sierra Club of BC, in the CoK CPCN proceeding to be filed as evidence;
- Q. By Letter L-3-13, dated February 15, 2013, the Commission granted the request of the Citizens for Safe Technology Society (CSTS) to have certain of its expert witnesses cross-examined by video-conference at the oral hearing;
- R. By Order C-4-13, dated March 1, 2013, another Panel of the Commission approved the CoK CPCN application with conditions, which were subject to acceptance by FortisBC by March 31, 2013;
- S. The oral hearing took place in Kelowna from March 4 to March 15, 2013, as provided for by Order G-177-12. The evidentiary record was closed following the conclusion of the evidence on March 15, subject to the filing of outstanding undertakings made by witnesses the oral hearing;
- T. FortisBC filed its Final Submissions on March 28, 2013;

**BRITISH COLUMBIA
UTILITIES COMMISSION**

**ORDER
NUMBER C-7-13**

3

- U. On March 29, 2013, FortisBC advised the Commission that it accepted the conditions in Order C-4-13;
- V. By Order G-51-13, dated April 8, 2013, and in response to requests from RDCK and CSTS, the Commission granted Interveners a one week extension to the filing date for their Final Submissions to April 25, 2013, and a corresponding one week extension to FortisBC to May 2 to file its Reply;
- W. On April 19, 2013, CSTS advised the Commission of the release that day of the monograph of the International Agency for Research on Cancer (Report), requested a reopening of the record to admit the Report into evidence and an extension to the Regulatory Timetable by 10 days to allow parties the opportunity to review the Report and reference it in argument. On the same day, by Order G-62-13, the Commission denied RDCK's request to correct Exhibit C13-30-1;
- X. By letter dated April 22, 2013, the Commission denied CSTS's request to extend the Regulatory Timetable, but established a process for written submissions on the reopening of the record to admit the Report;
- Y. By Order G-80-13, dated May 15, 2013, the Commission reopened the evidentiary record, admitted the Report into evidence and allowed the filing of limited Supplemental Submissions on the Report. Interveners filed their Supplemental Submissions by May 23 and FortisBC filed its Reply on May 30, 2013; and
- Z. The Commission Panel has considered the Application, the evidence and submissions presented on the Application and has determined that it is in the public interest that a CPCN be issued to FortisBC for the AMI Project.

NOW THEREFORE pursuant to sections 45, 46 and 56 of the *Utilities Commission Act* the Commission orders as follows:

1. A Certificate of Public Convenience and Necessity is granted to FortisBC for the AMI Project as described in the Application and as modified by directives in this Order and the Decision issued concurrently with it and subject to the condition that FortisBC must confirm in writing by August 1, 2013 that it will file an application for an opt-out provision by November 1, 2013 based on the following principles:
 - (a) Customers may choose to opt-out of accepting a wireless transmitting meter.
 - (b) Customers who choose to opt-out will be provided with an AMI meter that has the wireless transmit functions disabled. Transmit functions on these meters will remain disabled until the individual chooses to opt back in to the AMI program; in the event that the customer moves from the property, the opt-out choice will move with the customer.
 - (c) The incremental cost of opting-out of the AMI program will be borne by the individuals choosing to opt-out.
2. A depreciation rate of 5 percent, to be applied to the AMI meters to be installed as part of the AMI Project, is approved until the completion of FortisBC's next depreciation study.
3. The request to recover the costs of FortisBC's 2007 AMI CPCN application as part of the costs of the AMI Project is denied. FortisBC is directed to apply for the recovery of those costs in its next Revenue Requirements application.
4. A capital budget of \$50.898 million including approved development costs and contingency amounts is approved as a control budget.

**BRITISH COLUMBIA
UTILITIES COMMISSION**

**ORDER
NUMBER C-7-13**

4

5. FortisBC is directed to file with the Commission Quarterly Progress Reports on the AMI Project showing planned vs. actual schedule, planned vs. actual costs, and any variances or difficulties that the AMI Project may be encountering. The Quarterly Progress reports are to be filed within 30 days of the end of each reporting period.
6. FortisBC is directed to file with the Commission a Final Report on the AMI Project schedule and costs within six months of the end or substantial completion of the AMI Project that provides a complete breakdown of the final costs of the AMI Project, compares these costs to the cost estimate in the Application inclusive of the cost increase resulting from the Commission's approval of the CoK CPCN, and provides a detailed explanation and justification for all material cost variances.
7. FortisBC is directed to file with the Commission an Annual Cost/Benefit Tracking Report on the AMI Project benefits (reduced costs) and the new operating costs of the AMI program for each of the first 5 years following the end or substantial completion of the AMI Project. The Annual Cost/Benefit Tracking Report is to be filed with the Commission within 3 months of each calendar year end included in the 5 year period.
8. FortisBC is directed to determine the form and additional content of the Quarterly Progress Reports, Final Report and Annual Cost/Benefit Tracking Reports in consultation with Commission staff.
9. FortisBC is directed to comply with the directives in the Decision issued concurrently with this Order.

DATED at the City of Vancouver, in the Province of British Columbia, this 23rd day of July 2013.

BY ORDER

Original signed by:

L.F. Kelsey
Commissioner

SUMMARY OF RULINGS MADE BEFORE AND AFTER THE ORAL HEARING

- 1.0 Order G-135-12, September 26, 2012 (A-7) re establishing a Procedural Conference and an Amended Preliminary Regulatory Timetable;
- 2.0 Order G-137-12, September 28, 2012 re setting dates, locations and times for the Community Input Sessions; and amending the Regulatory Timetable;
- 3.0 Order G-177-12, November 23, 2012 (A-14) re Procedural Conference Issues including hybrid hearing, (financial, operations, fire safety and privacy issues for written hearing; health, security and environmental issues for oral hearing) video evidence and Updated Regulatory Timetable;
- 4.0 Order G-198-12, December 20, 2012 (A-19) re denial of requests of RDCK and NCGP to suspend proceeding;
- 5.0 Order G-11-13, January 18, 2013 (A-27) re denial of J. Flynn request to make an oral presentation at the Oral Hearing;
- 6.0 Order G-12-13, January 23, 2013 (A-29) re allowing access to confidential information on terms;
- 7.0 Letter, January 30, 2013 (A-31) re leave to CSTS for the late filing of the evidence of Dr. Jamieson;
- 8.0 Order G-17-13, February 1, 2013 (A-32) re Further Amended Regulatory Timetable, third round of IRs, no 2nd Procedural Conference;
- 9.0 Order G-21-13, February 7, 2013 (A-34) re denial of RDCK request for reconsideration and variance of part of Order G-177-12 relating to hybrid hearing;
- 10.0 Order G-24-13, February 13, 2013 (A-34) re additional IRs on financial impacts of addendum exhibits B1-2, B1-3 and B1-4 and inclusion of BCSEA Information Requests No. 1.1 and 1.2 in the FortisBC acquisition of the City of Kelowna electric utility assets proceeding;
- 11.0 Letter L-3-13, February 15, 2013 (A-37) re allowing videoconferencing of witnesses;
- 12.0 Letter L-5-13, February 20, 2013 (A-39) re leave to RDCK to file certain IR responses by 4:00 p.m., March 1, 2013;
- 13.0 Order G-51-13, April 8, 2013 (A-41) re allowing RDCK and CSTS requests to amend the Regulatory Timetable and extend the dates for the filing of Intervener Submissions and Reply;

- 14.0 Order G-62-13, April 19, 2013 re denial of RDCK request to re-open the record to add a chart to Exhibit C13-30-1;
- 15.0 Letter, April 22, 2013 (A-42) re denial of CSTS request to extend the time for the filing of Interveners Final Submissions, but allowing submissions on whether the evidentiary record should be opened to admit the IARC Report into evidence; and
- 16.0 Order G-80-13, May 15, 2013 (A-43) re re-opening record to allow for the filing of the IARC Report and establishing a timetable for Supplemental Submissions.

Note: In addition to the above Rulings, that Commission also made a number of Rulings at the Oral Hearing.

AMALGAMATED REGULATORY TIMETABLE

ACTION	DATE (2012)
Registration of Interveners and Interested Parties	Friday, September 7
Comments on the regulatory process by which to review the Application, such as written, oral or both	Friday, September 7
Comments on the need to hold Community Input Sessions in the areas of Trail, Osoyoos, and Kelowna	Friday, September 14
Finalization of Registration of Interveners and Interested Parties	Friday, September 14
FortisBC reply on the need to hold Community Input Sessions in the areas of Trail, Osoyoos, and Kelowna	Wednesday, September 19
BCUC Information Request No. 1	Friday, September 14
Comments by Registered Interveners on the regulatory process by which to review the Application, such as written, oral or both	Friday, September 21
Commission Decision on the need to hold Community Input Sessions in the areas of Trail, Osoyoos, and Kelowna	Friday, September 21
Commission Decision on the regulatory process by which to review the Application, such as written, oral or both	Tuesday, September 25
Participants file their PACA Funding Budgets	Tuesday, October 2
FortisBC Response to BCUC Information Request No. 1	Friday, October 5
Intervener Information Request No. 1	Friday, October 26
Community Input Session in Trail	Tuesday, November 6
Community Input Session in Osoyoos	Wednesday, November 7
Community Input Session in Kelowna	Thursday, November 8
Procedural Conference, at the Best Western Plus Kelowna Hotel & Suites, South Ballroom, Kelowna	Thursday, November 8, commencing at 9:30 a.m.
FortisBC Response to Intervener Information Request No. 1	Friday, November 9
BCUC and Intervener Information Request No. 2	Friday, November 23
FortisBC Response to BCUC and Intervener Information Request No. 2	Friday, December 14

ACTION	DATE (2013)
Intervener Filed Evidence	Thursday, January 24
Information Requests on Intervener Filed Evidence	Thursday, February 7
Intervener Information Request No. 3	Friday, February 8
Intervener Confidential Information Request No. 1	Friday, February 8

ACTION	DATE (2013)
Intervener Responses to Information Requests on Intervener Filed Evidence	Thursday, February 21
FortisBC Responses to Intervener Information Request No. 3	Friday, February 22
FortisBC Responses to Intervener Confidential Information Request No.1	Friday, February 22
Oral Hearing in Kelowna	Monday, March 4 to Friday, March 15
FortisBC Responses to Intervener Information Request No. 3 (not related to Oral Hearing subject matter)	Thursday, March 21
FortisBC Response to Commission and BCPSO limited Information Request	Thursday, March 21
FortisBC Final Written Submission	Thursday, March 28
Intervener Final Written Submissions	Thursday, April 25
FortisBC Written Reply Submission	Thursday, May 2
Evidentiary Record reopened to admit International Agency for Research on Cancer monograph (IARC Report)	May 15, 2013
Intervener Supplemental Submissions on IARC Report	May 23, 2013
FortisBC Reply on IARC Report	May 30, 2013

LIST OF ACRONYMS

AACE International	Advancement of Cost Engineering American Association of Cost Engineers
AAEM	American Academy of Environmental Medicine
AGNIR	Advisory Group on Non-Ionising Radiation
AMI	Advanced Metering Infrastructure
AMR	Automated Meter Reading
Application	Advanced Metering Infrastructure Project
BC Hydro	British Columbia Hydro and Power Authority
BCMEU	BC Municipal Electrical Utilities
BCPSO	BC Pensioners and Seniors Organization
BCRUCA	BC Residential Utility Customers Association
BCSEA	BC Sustainable Energy Association and the Sierra Club of BC
BCSI	BC Southern Interior
CEA	<i>Clean Energy Act</i> , SBC 2010, c. 22
CEC	Commercial Energy Consumers Association of BC
Commission	British Columbia Utilities Commission
COSA	cost of service
CPCN	Certificate of Public Convenience and Necessity
CPI	Consumer Price Index
CSTS	Citizens for Safe Technology Society
EHS	Electromagnetic Hypersensitivity
ELF	extremely low frequency
EMP	electromagnetic pulse
FortisBC	FortisBC Inc.

GGRTA	Greenhouse Gas Reductions Targets Act
GHG	Greenhouse Gas
HAN	Home Area Network
HES	Head End System
IARC	International Agency for Research on Cancer
IARC Report	International Agency for Research on Cancer Report
IC	Industry Canada
ICG	Industrial Customers Group, Zellstoff Celgar Limited Partnership
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IEEE	Institute of Electrical and Electronic Engineers
IHD	In-home Display
IRG	Irrigation Ratepayers Group
LAN	Local Area Network
LRMC	Long-run marginal cost
MDMS	Meter Data Management System
MHz	Megahertz
NCGP	Nelson Creston Green Party
NPV	Net Present Value
OMS	Outage Management System
PACA	Participant Assistance Cost Awards
PIPA	<i>Personal Information Protection Act</i> , SBC 2003, c. 63
PLC	Power Line Carrier
Proceeding	Commission public process to review AMI Application
RDCK	Area D, Regional District of Central Kootenay

RF	radio frequency
RFP	Request for Proposals
UCA	<i>Utilities Commission Act</i> , RSBC 1996, c. 473
US GAAP	US Generally Accepted Accounting Principles
VIGP Decision	Vancouver Island Generation Project Decision; Decision and Order G-55-03 dated September 8, 2003
VITR Decision	Vancouver Island Transmission Reinforcement Project Decision; Decision and Order C-4-06, dated July 7, 2006
WACC	weighted average cost of capital
WAN	Wide Area Network
WHO	World Health Organization
WKCC	West Kootenay Concerned Citizens

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

and

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

EXHIBIT LIST

Exhibit No.	Description
<i>COMMISSION DOCUMENTS</i>	
A-1	Letter dated August 1, 2012 – Appointment of Commission Panel
A-2	Letter dated August 2, 2012 – Order G-105-12 Establishing a Preliminary Regulatory Timetable
A-3	Letter dated August 14, 2012 – Response to Requests to Amend the Preliminary Regulatory Timetable
A-4	Letter dated September 13, 2012 – Order G-124-12 Amending the Preliminary Regulatory Timetable
A-5	Letter dated September 14, 2012 – Commission Information Request No. 1
A-6	Letter dated September 21, 2012 – Confirming Community Input Sessions
A-7	Letter dated September 26, 2012 – Order G-135-12 Amending the Regulatory Timetable to include a Procedural Conference
A-8	Letter dated September 28, 2012 – Order G-137-12 Amending the Regulatory Timetable establishing the dates, times and locations for the Community Input Sessions
A-9	Letter dated October 4, 2012 – Community Input Sessions Participant Information
A-10	Letter dated October 11, 2012 – Procedural Conference proposed agenda and regulatory timetable
A-11	Letter dated October 15, 2012 – Order G-149-12 amending registration date for the Osoyoos Community Input Session

Exhibit No.	Description
A-12	Letter dated October 15, 2012 – Community Input Sessions Participant Information Revised
A-13	Letter dated November 9, 2012 – Order G-169-12 Timeframe for Further Submissions
A-14	Letter dated November 23, 2012 – Order G-177-12 Updated Regulatory Timetable and Reasons for Decision
A-15	Letter dated November 23, 2012 – Commission Information Request No. 2
A-16	Letter dated December 4, 2012 - Commission requests comments from Interveners regarding FBC Addendum (Exhibit B-1-2)
A-17	Letter dated December 13, 2012 – Request for Submissions on Mr. Flynn’s request to make Evidence PowerPoint Presentation at the Oral Hearing (Exhibit C6-7)
A-18	Letter dated December 14, 2012 – Request for Comments on Mr. Shadrack’s Reconsideration Application of G-177-12
A-19	Letter dated December 20, 2012 – Commission Order G-198-12 request for suspension of the Proceeding is denied and Reasons for Decision
A-20	Letter dated December 28, 2012 – Request for Comments from FortisBC Inc. and Itron regarding CSTS Objection to Confidential Exhibit B-14-1
A-21	Letter dated January 2, 2013 – Response to Nelson-Creston Comments regarding FortisBC’s Confidentiality Request
A-22	Letter dated January 3, 2013 – Response to Regional District Central Kootenay Comments regarding FortisBC’s Confidentiality Request
A-23	Letter dated January 3, 2013 – Response to FortisBC Inc. request for extension
A-24	Letter dated January 7, 2013 – Response to RDCK providing clarification of Exhibit A-22
A-25	Letter dated January 10, 2013 – Procedural Information
A-26	Letter dated January 11, 2013 – Request for Comments regarding Third Round of Information Requests

Exhibit No.	Description
A-27	Letter dated January 18, 2012 – Commission Order G-11-13 and Reasons for Decision
A-28	Letter dated January 21, 2013 – Request for Submissions regarding Video Conference Testimony at Oral Hearing
A-29	Letter dated January 23, 2013 – Order G-12-13 and Reasons for Decision regarding Objection to Confidentiality Request by FortisBC
A-30	Letter dated January 25, 2013 – Guidance for filing video submissions
A-31	Letter dated January 30, 2013 – Leave granted to CSTS to file Late Evidence of Dr. Isaac Jamieson
A-32	Letter dated February 2, 2013 – Order G-17-13 Further Amended Regulatory Timetable Third Round of Information Requests
A-33	Letter dated February 5, 2013 – Request for Comments on CSTS video conferencing submission
A-34	Letter dated February 7, 2013 – Order G-21-13 Reconsideration and Variance of Order G-177-12 Reasons for Decision
A-35	Letter dated February 13, 2013 – Requesting comments on RDCK’s Application for Leave to file late responses to Intervener Evidence Information Requests
A-36	Letter dated February 13, 2013 – Order G-24-13 regarding the submission of additional information requests to FortisBC on the Addendum exhibits and entering FortisBC’s responses to BCSEA-SCBC IRs 1.1 and 1.2 from the proceeding reviewing the purchase of Kelowna’s electric utility assets
A-37	Letter L-3-13 dated February 15, 2013 – Commission Panel determination on CSTS Expert Witness Video Conference request
A-38	Letter Dated February 20, 2013 – Commission Information Request No. 3
A-39	Letter Dated February 20, 2013 – Extension granted to RDCK to file late responses to information requests on RDCK evidence
A-40	Letter Dated February 28, 2013 – Commission Comments regarding FBC Responses to Information Request No. 3

Exhibit No.	Description
A-41	Letter Dated April 8, 2013 – Order G-51-13 amending the filing dates for Intervener Final Submissions and FortisBC Reply Submission
A-42	Letter dated April 22, 2013 – Request for Submissions on the CSTS application to reopen the evidentiary record to admit the International Agency for Research on Cancer (IARC) 462 page monograph relating to its designation of RF radiation as a possible cancer agent
A-43	Letter dated May 15, 2013 – Order G-80-13 with Reasons for Decision reopening the Evidentiary Record to enter the IARC Report

COMMISSION STAFF DOCUMENTS

A2-1	Letter dated August 14, 2012 – Commission Staff filing The Increasing Problem of Electrical Consumption in Indoor Marihuana Grow Operations in British Columbia
A2-2	Letter dated August 14, 2012 - Commission Staff filing The Marihuana Indoor Production Calculator: A Tool for Estimating Domestic and Export Production Levels and Values
A2-3	Letter dated August 14, 2012 – Commission Staff filing Case Study of Smart Meter System Deployment
A2-4	Letter dated August 17, 2012 – Commission Staff filing online announcement FortisBC Selects Itron as Supplier of Advanced Metering Solution
A2-5	Letter dated August 20, 2012 – Commission Staff filing Victoria, Australia Department of Primary Industries web site, Smart Meters page
A2-6	Not Issued
A2-7	Letter dated September 14, 2012 – Commission Staff filing The Nature and Extent of Marihuana Growing Operations in Mission British Columbia: A 14 Year Review (1997-2010) by Plecas, D., Chaisson, K., Garis, L., and Snow, A.
A2-8	Submitted at Oral Hearing March 11, 2012 - Commission Staff filing Document titled Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

Exhibit No.	Description
<i>COMMISSION COUNSEL DOCUMENTS</i>	
A3-1	Letter dated November 26, 2012 – Commission Council Response to RDCK Appeal
<i>APPLICANT DOCUMENTS</i>	
B-1	FORTISBC INC. (FBC) Letter Dated July 26, 2012 - Application for a Certificate of Public Convenience and Necessity for the Advanced Metering Infrastructure Project
B-1-1	Letter dated October 5, 2012 – Errata No. 1 to the July 26, 212 CPCN Application
B-1-2	Letter dated November 16, 2012 – FBC Submitting Addendum to the Application
B-1-3	Letter dated November 20, 2012 – FBC Submitting AMI Excel NPV Analysis - CoK Addendum
B-1-4	Letter dated January 22, 2013 – FBC Submitting Conditional Amendment
B-2	Letter Dated August 2, 2012 – FBC Submitting Confirmation of Application Notice
B-3	Letter dated August 17, 2012 – FBC Submitting AMI Excel NPV Analysis
B-4	Letter dated September 4, 2012 – FBC Submitting Letter from the National Research Council's Dominion Radio Astrophysical Observatory
B-5	Letter dated September 19, 2012 – FBC Submitting Comments on need for Community Input Sessions
B-6	Letter dated October 5, 2012 – Responses to Commission Information Request No. 1
B-6-1	CONFIDENTIAL - Letter dated October 5, 2012 – Confidential Responses to Commission Information Request No. 1
B-6-2	Letter dated October 12, 2012 – FBC Submitting BCUC IR1 Q44.1
B-6-3	CONFIDENTIAL Letter dated October 19, 2012 – FBC Submitting Confidential Excel Attachments
B-6-4	Letter dated October 19, 2012 – FBC Submitting Erratum 2 to Responses to BCUC IR1

Exhibit No.	Description
B-6-5	Letter dated Letter dated November 8, 2012 - FBC Submitting Revised Responses to BCUC No. 1
B-7	Letter dated October 12, 2012 – FBC Submitting Request for Confidentiality regarding BCUC IR1
B-8	Letter dated October 12, 2012 – FBC Submitting Notice of Community Input Session Ad Publications
B-9	Letter dated October 19, 2012 – FBC Submitting Supplemental Privacy Information
B-10	Letter dated October 30, 2012 – FBC Submitting Comments regarding the Procedural Conference
B-11	Letter dated November 9, 2012 – FBC Submitting Responses to Intervener Information Requests No. 1
B-11-1	Letter dated November 21, 2012 – FBC Submitting Supplemental Response to BCPSO IR No. 1 Question 37.1
B-11-2	Submitted at Oral Hearing March 5, 2012 - DOCUMENT "FIGURE 2: UPDATED CHART", CONTAINING TWO BAR GRAPHS
B-12	Letter dated November 30, 2012 – FBC Submission to RDCK and Nelson-Creston and Interveners
B-13	Letter dated December 11, 2012 – FBC Response to Suspension of Proceedings
B-14	Letter dated December 14, 2012 – FBC Responses to BCUC IR No. 2
B-14-1	Letter dated December 14, 2012 – FBC Request for Confidentiality of certain responses to BCUC Information Requests No. 2
B-14-2	CONFIDENTIAL Letter dated December 14, 2012 – FBC Confidential Responses to BCUC Information Request No. 2
B-15	Letter dated December 14, 2012 – FBC Responses to Intervener Information Requests No. 2
B-15-1	Letter dated December 14, 2012 – FBC Responses to BC Hydro Information Request No. 2

Exhibit No.	Description
B-16	Letter dated December 14, 2012 – FBC Responses to Postnikoff Information Request No. 1
B-17	Letter dated January 3, 2013 - FBC Responses to Exhibits A-20 and A-21 request for extension
B-18	Letter dated January 4, 2013 – FBC comments on Jerry Flynn’s request Exhibit C6-7
B-19	Letter dated January 4, 2013 – FBC Response to RDCK Reconsideration Request
B-20	Letter dated January 9, 2013 – FBC Submitting comments regarding Procedural Conference date
B-21	Letter dated January 11, 2013 – FBC Submitting Itron's comments regarding confidentiality (attachment subject to a request for confidentiality)
B-22	Letter dated January 16, 2013 – FBC Submitting comments regarding Exhibit A-26
B-23	Letter dated January 22, 2013 – FBC Submitting Additional Information
B-24	Letter dated January 22, 2013 – FBC Submitting Comments regarding third round of information requests
B-25	Letter dated February 7, 2013 - FBC Filing Comments on CSTS video conferencing submission
B-26	Letter dated February 7, 2013 - FBC Submitting IR No. 1 to CSTS on Intervener Evidence
B-27	Letter dated February 7, 2013 - FBC Submitting IR No. 1 to Jerry Flynn on Intervener Evidence
B-28	Letter dated February 7, 2013 - FBC Submitting IR No. 1 to KM on Intervener Evidence
B-29	Letter dated February 7, 2013 - FBC Submitting IR No. 1 to RDCK on Intervener Evidence
B-30	Letter dated February 7, 2013 - FBC Submitting IR No. 1 to WKCC on Intervener Evidence

Exhibit No.	Description
B-31	Letter dated February 15, 2013 – FBC Comment regarding RDCK Extension to Filing date for Intervener IR Responses to March 1, 2013
B-32	Letter dated February 20, 2013 - FBC Submitting Witness Panels Members
B-33	CONFIDENTIAL Letter dated February 22, 2013 - FBC Submitting Confidential Response to RDCK Confidential Materials regarding IR No. 1
B-34	Letter dated February 22, 2013 - FBC Submitting Responses to Intervener Information Request No. 3
B-35	Letter dated February 26, 2013 - FBC Submitting Response to CSTS Preliminary Matters
B-36	Letter dated February 27, 2013 - FBC Submitting Comments regarding Witnesses Cross Examination
B-37	Letter dated February 28, 2013 - FBC Submitting Council's Opening Statement
B-38	Letter dated February 28, 2013 - FBC Submitting Opening Statement of Tom Loski
B-39	Submitted at Oral Hearing March 6, 2013 – FBC Undertaking No. 1
B-40	Submitted at Oral Hearing March 6, 2013 - FBC Undertaking No. 2
B-41	Submitted at Oral Hearing March 6, 2013 – FBC Undertaking No. 3
B-42	Submitted at Oral Hearing March 6, 2013 - FBC Undertaking No. 4
B-43	Submitted at Oral Hearing March 7, 2013 - FBC Undertaking No. 5
B-44	Submitted at Oral Hearing March 7, 2013 - FBC Undertaking No. 6
B-45	Submitted at Oral Hearing March 8, 2013 - FBC Undertaking No. 7
B-46	Submitted at Oral Hearing March 13 , 2013 – TRANSCRIPT OF THE EVIDENCE OF JAMES McNAMEE ON FEBRUARY 18, 2013 IN THE SUPERIOR COURT OF QUEBEC IN THE MATTER OF WHITE V. THE VILLE DE CHATEAUGUAY, ROGERS COMMUNICATION INC. AND BERNARD ROY
B-47	Submitted at Oral Hearing March 14 , 2013 - FBC Undertaking No. 8

Exhibit No.	Description
B-48	Submitted at Oral Hearing March 15 , 2013 - PRINTOUT FROM HEALTH CANADA ENTITLED"ENVIRONMENTAL AND WORKPLACE HEALTH"
B-49	Letter dated March 21 , 2013– FBC Submitting Revised Responses to Andy Shadrack IR No. 3 on PLC filing
B-50	Letter dated March 21 , 2013 – FBC Submitting Responses to BCUC IR No. 3
B-51	Letter dated March 21 , 2013 – FBC Submitting Responses to BCPSO IR No. 3
B-52	Letter dated March 26 , 2013– FBC Submitting Undertaking No. 9
B-53	Letter dated May 8, 2013 – FBC Opposing CSTS request to reopen evidentiary record to admit IARC report as evidence
B-54	Letter dated May 16, 2013 – FBC Response to Exhibit A-43

INTERVENER DOCUMENTS

C1-1	RIDING OF BC SOUTHERN INTERIOR (BCSI) Online Registration Dated August 14, 2012 – Request for Intervener Status by Alex Atamanenko and Comments regarding Community Input Sessions
C1-2	Letter dated November 22, 2012 – BCSI Submitting Comments on RDCK and Nelson-Creston suspension requests
C1-3	Letter dated December 7, 2012 – BCSI Submitting Supplemental Comments on suspension requests
C1-4	Letter dated December 20, 2012 – BCSI Submitting Comments on Jerry Flynn’s request Exhibit C6-7
C1-5	Letter dated December 20, 2012 – BCSI Submitting Comments on Request for suspension of the Proceeding Exhibit A-18
C1-6	Letter dated January 28, 2013 - BCSI Submitting Confidentiality Undertaking by Alex Atamanenko
C1-7	Letter dated February 6, 2013 - BCSI Filing Comments on CSTS video conferencing submission
C1-8	Letter dated February 6, 2013 - BCSI Submitting Questions for Expert Witness Mr. Robert McLennan

Exhibit No.	Description
C1-9	Letter dated February 14, 2013 – Comments on RDCK late filing of responses to Intervener Evidence IRs
C1-10	Letter dated February 26, 2013 - BCSI Submitting Comments regarding FBC Incomplete IR No. 3 Responses
C1-11	Submitted at Oral Hearing March 5, 2012 - WRITTEN OPEN STATEMENT FROM MR. MILES
C1-12	Email dated April 22, 2013 – BCSI supporting CSTS request to reopen evidentiary record to admit IARC report as evidence
C2-1	BRITISH COLUMBIA MUNICIPAL ELECTRICAL UTILITIES (BCMEU) Letter dated September 6, 2012 Via Email - Request for Intervener Status by Christopher Weafer
C3-1	BRITISH COLUMBIA PENSIONERS' AND SENIORS' ORGANIZATION (BCPSO ET AL) Letter dated September 7, 2012 via Email – Request for Intervener Status by Tannis Braithwaite, Eugene Kung and Bill Harper
C3-2	Letter dated October 26, 2012 – BCPSO Submitting Information Request No. 1 to FBC
C3-3	Letter dated November 23, 2012 - BCPSO Submitting Comments on RDCK and Nelson-Creston suspension requests
C3-4	Letter dated November 23, 2012 - BCPSO Submitting Information Request No. 2 to FBC
C3-5	Letter dated January 17, 2013 - BCPSO Submitting Comments regarding Third Round of Information Requests
C3-6	Letter dated January 25, 2013 - BCPSO Submitting Confidentiality Undertaking by Tannis Braithwaite
C3-7	Letter dated January 25, 2013 - BCPSO Submitting Confidentiality Undertaking by Eugene Kung
C3-8	Letter dated February 14, 2013 - BCPSO Submitting Comments on RDCK extension request
C3-9	Letter dated February 20, 2013 - BCPSO Submitting Information Request No. 3 to FBC

Exhibit No.	Description
C3-10	Submitted at Oral Hearing March 4, 2012 - OPENING STATEMENT BY MR. KUNG
C4-1	BRITISH COLUMBIA SUSTAINABLE ENERGY ASSOCIATION (BCSEA) Letter dated August 23, 2012 – Request for Intervener Status by William J. Andrews and Comments regarding Community Input Sessions
C4-2	Letter dated September 21 on the regulatory process
C4-3	Letter dated September 6, 2012 – BCSEA Submitting Comments regarding Community Input Sessions
C4-4	Letter dated October 26, 2012 - BCSEA Submitting Information Request No. 1 to FBC
C4-5	Letter dated October 30, 2012 - BCSEA Submitting comment on items to be addressed at the Procedural Conference
C4-6	Letter dated November 22, 2012 - BCSEA Submitting comment on RDCK and Nelson-Creston suspension requests
C4-7	Letter dated November 23, 2012 - BCSEA Submitting Information Request No. 2 to FBC
C4-8	Letter dated December 18, 2012 – BCSEA Submitting Comments on Jerry Flynn’s request Exhibit C6-7
C4-9	Letter dated December 21, 2012 – BCSEA Submission on Reconsideration Application
C4-10	Letter dated December 21, 2012 – BCSEA Request for Third Round of Information Requests
C4-11	Letter dated January 17, 2013 - BCSEA Submitting Comments regarding Third Round of Information Requests
C4-12	Letter dated January 18, 2013 – BCSEA Submitting Comments regarding Third Round of Information Requests
C4-13	Letter dated January 24, 2013 – BCSEA Submitting Confidentiality Undertaking
C4-14	Letter dated February 7, 2013 - BCSEA Submitting IR No. 1 to RDCK

Exhibit No.	Description
C4-15	Letter dated February 7, 2013 - BCSEA Submitting IR No. 1 to CSTS
C4-16	Letter dated February 8, 2013 - BCSEA Comment regarding Confidential Information Request No. 1
C4-17	Letter dated February 8, 2013 - BCSEA Submitting IR No. 3
C4-18	Letter dated February 13, 2013 - BCSEA Submitting Comments on RDCK extension request
C4-19	Submitted at Oral Hearing March 4, 2012 - DOCUMENT ENTITLED "BCSEA-SCBC CROSS-EXAM AIDS...FORTISBC PANEL 1 SECURITY..."
C4-20	Submitted at Oral Hearing March 13 , 2012 – ORIGINAL REPORT, VOLUME 27, NUMBER 33, NOVEMBER 20, 2009, JOURNAL OF CLINICAL ONCOLOGY "MOBILE PHONE USE AND RISK OF TUMORS: A META-ANALYSIS"
C4-21	Submitted at Oral Hearing March 14 , 2012 – WIRELESS UTILITY METER SAFETY IMPACTS SURVEY, FINAL RESULTS SUMMARY, SEPTEMBER 13, 2011, ED HALTEMAN
C4-22	Submitted at Oral Hearing March 14 , 2012 – EXHIBIT D - SMART METER HEALTH EFFECTS, SURVEY AND REPORT
C4-23	Letter dated May 1, 2013 – BCSEA supporting CSTS request to reopen evidentiary record to admit IARC report as evidence
C4-24	Letter dated May 13, 2013 – BCSEA Filing Reply Submission to reopen evidentiary record
C5-1	BRITISH COLUMBIA HYDRO AND POWER AUTHORITY (BCH) Letter dated September 6, 2012 – Request for Intervener Status by Janet Fraser and Comments
C5-2	Letter dated September 21 2012 – BCH Submitting Comments on the regulatory process
C5-3	Letter dated November 23, 2012 - BCH Submitting Information Request No. 2 to FBC
C6-1	FLYNN, JERRY (JF) Letter dated July 31, 2012 via Email – Request for Intervener Status by Jerry Flynn and Comments

Exhibit No.	Description
C6-2	Letter dated September 21, 2012 – JF Submitting Comments on the regulatory process
C6-3	Letter dated November 6, 2012 – JF Submitting Comments
C6-4	Submitted at Community Input Session in Kelowna November 8, 2012- HARD COPY SUBMISSION OF Jerry Flynn
C6-5	Letter dated November 23, 2012 – JF Submitting Letter of Comment
C6-6	Letter dated December 6, 2012 – JF Submitting Comments regarding BCSI Supplemental Submission
C6-7	Emails regarding – JF Request to Present at Oral Hearing
C6-8	Letter dated December 15, 2012 – JF Submitting Comments regarding RDCK submission Exhibit C13-11
C6-9	Letter dated January 2, 2013 – JF Submitting Comments
C6-10	Letter dated January 23, 2013 – JF Submitting Comments and Presentation
C6-11	Letter dated February 5, 2013 - JF Filing Comments on CSTS video conferencing submission
C6-12	Letter dated February 6, 2013 - JF Submitting Response to Intervener IR No. 1
C6-13	Letter dated February 7, 2013 - JF Submitting Responses to FBC IR No. 1
C6-14	Letter dated February 13, 2013 - JF Submitting Comments on RDCK extension request
C6-15	Letter dated February 27, 2013 - JF Submitting Comments regarding Cross Examination
C6-16	Submitted at Oral Hearing March 5, 2012 - WRITTEN OPENING STATEMENT BY MR. FLYNN
C6-17	Email dated April 22, 2013 – JF supporting CSTS request to reopen evidentiary record to admit IARC report as evidence
C7-1	GABANA, NORMAN (NG) Letter dated September 5, 2012 via Email – Request for Intervener Status by Norman Gabana and Comments

Exhibit No.	Description
C7-2	Submitted at Community Input Session in Trail November 6, 2012 - HARD COPY SUBMISSION OF Norman Gabana
C8-1	BC RESIDENTIAL UTILITY CUSTOMERS ASSOCIATION (BCRUCA) Letter dated September 7, 2012 via Email – Request for Intervener Status by Guy Leroux and Comments
C8-2	Letter dated October 26, 2012 – BCRUCA Submitting Information Request No. 1 to FBC
C8-3	Letter dated November 23, 2012 - BCRUCA Submitting Information Request No. 2 to FBC
C8-4	Letter dated January 17, 2013 - BCRUCA Submitting Comments regarding Third Round of Information Requests
C9-1	CITIZENS FOR SAFE TECHNOLOGY SOCIETY (CSTS) Letter dated September 7, 2012 via Email – Request for Intervener Status by David Aaron
C9-2	Letter dated October 29, 2012 - CSTS Submitting Information Request No. 1 to FBC
C9-3	Letter dated October 30, 2012– CSTS submission for the Procedural Conference
C9-4	Letter dated November 23, 2012 -CSTS Submitting Information Request No. 2
C9-5	Letter dated December 21, 2012 – CSTS Request for Third Round of Information Requests
C9-6	Letter dated December 27, 2012 – CSTS Submitting Comments on Exhibit B-14-1
C9-7	Letter dated January 18, 2013 – CSTS Submitting Comments on FBC's January 16, 2013 submission Exhibit B-22
C9-8	Letter dated January 24, 2013 – CSTS Filing Evidence (contains attachments)
C9-9	Letter dated January 24, 2013 – CSTS Filing Witnesses List
C9-10	Letter dated January 25, 2013 – CSTS Request to file Late Evidence of Dr. Isaac Jamieson
C9-10-1	Letter dated January 25, 2013 – CSTS Submitting Evidence of Dr. Isaac Jamieson
C9-10-2	Letter dated January 28, 2013 – CSTS Submitting Supporting Evidence

Exhibit No.	Description
C9-11	Letter dated February 4, 2013 – CSTS Submitting Confidentiality Undertaking
C9-12	Letter dated February 21, 2013 – CSTS Submitting M. Sears Responses to BCSEA IR No. 1
C9-12-1	Letter dated February 21, 2013 – CSTS Submitting Responses to BCSEA IR No. 1 Questions 1.1 and 2.1
C9-12-2	Letter dated February 21, 2013 – CSTS Submitting T. Schoechle Responses to BCSEA IR No. 1
C9-12-3	Letter dated February 21, 2013 – CSTS Submitting D. Carpenter Responses to BCSEA IR No. 1
C9-12-4	Letter dated February 21, 2013 – CSTS Submitting I. Jamieson Responses to BCSEA IR No. 1
C9-12-5	Letter dated February 21, 2013 – CSTS Submitting D. Maish Responses to BCSEA IR No. 1
C9-12-6	Letter dated February 21, 2013 – CSTS Submitting M. Blank Responses to BCSEA IR No. 1
C9-13	Letter dated February 21, 2013 – CSTS Submitting T. Schoechle Responses to FBC IR No. 1
C9-13-1	Letter dated February 21, 2013 – CSTS Submitting D. Carpenter Responses to FBC IR No. 1
C9-13-2	Letter dated February 21, 2013 – CSTS Submitting I. Jamieson Responses to FBC IR No. 1
C9-13-3	Letter dated February 21, 2013 – CSTS Submitting D. Maish Responses to FBC IR No. 1
C9-13-4	Letter dated February 21, 2013 – CSTS Submitting G. Kumar Responses to FBC IR No. 1
C9-13-5	Letter dated February 23, 2013 – CSTS Late Filing M. Blank Responses to FBC IR No. 1
C9-14	Letter dated February 21, 2013 – CSTS Submitting T. Schoechle Responses to CEC IR No. 1

Exhibit No.	Description
C9-14-1	Letter dated February 21, 2013 – CSTS Submitting D. Carpenter Responses to CEC IR No. 1
C9-14-2	Letter dated February 21, 2013 – CSTS Submitting I. Jamieson Responses to CEC IR No. 1
C9-14-3	Letter dated February 21, 2013 – CSTS Submitting D. Maish Responses to CEC IR No. 1
C9-14-4	Letter dated February 21, 2013 – CSTS Submitting M. Blank Responses to CEC IR No. 1
C9-15	Letter dated February 25, 2013 – CSTS Submitting Preliminary Matters for Hearing
C9-16	Letter dated February 27, 2013 – CSTS Submitting Request Leave for Witnesses to Appear by Video Conference
C9-17	Submitted at Oral Hearing March 6, 2012 - PRESS DOCUMENT HEADED "A REVIEW OF THE POTENTIAL HEALTH RISKS OF RADIOFREQUENCY FIELDS FROM WIRELESS TELECOMMUNICATION DEVICES", DATED MARCH 1999
C9-18	Submitted at Oral Hearing March 6, 2012 - PRESS RELEASE WITH HEADER "THE SWERDLOW REPORTS: DOWNPLAYING THE MOBILE PHONE CANCER RISK/EMFACTS CONSULTANCY"
C9-19	Submitted at Oral Hearing March 6, 2012 - ACS "CERTIFICATE EXHIBIT - FCC ID: SK9AMI7...RF EXPOSURE"
C9-20	Letter dated March 22, 2012 – CSTS Submitting Undertakings of Dr. Jamieson
C9-21	Letter dated March 22, 2012 – CSTS Submitting Undertakings of Dr. Sears and Carpenter
C9-22	Letter dated April 19, 2013 – CSTS request to reopen evidentiary record to admit the International Agency for Research on Cancer – Monographs on Non-Ionizing Radiation, Part 2: Radiofrequency Electromagnetic Fields, Volume 102
C9-23	Letter dated May 1, 2013 – CSTS Response to BCSEA Comments on Request to reopen evidentiary record
C9-24	Email dated May 13, 2013 - CSTS advising they will not be filing a Reply Submission on the admission of the IARC monograph into evidence

Exhibit No.	Description
C9-25	International Agency for Research on Cancer – Monographs on Non-Ionizing Radiation, Part 2: Radiofrequency Electromagnetic Fields, Volume 102
C10-1	INDUSTRIAL CUSTOMERS GROUP (ICG) Letter dated September 10, 2012 via Email – Request for Intervener Status by Robert Hobbs and Brian Merwin
C10-2	Letter dated September 14, 2012 – ICG Submitting Information Request No. 1 to FBC
C11-1	MILES, KEITH (KM) Letter dated September 7, 2012 via Email AND Online Registration dated August 29, 2012 – Request for Intervener Status by Keith Miles
C11-2	Letter dated September 24, 2012 – KM Submitting Comments on the regulatory process
C11-3	Letter dated October 26, 2012 – KM Submitting Information Request No. 1 to FBC
C11-4	Letter dated November 23, 2012 – KM Submitting Comments regarding the Suspension of Proceedings
C11-5	Letter dated November 23, 2012 - KM Submitting Information Request No. 2
C11-6	Letter dated January 22, 2013 – KM Submitting Evidence
C11-7	Letter dated January 24, 2013 – KM Submitting Evidence
C11-8	Letter dated February 7, 2013 - KM Filing Comments on CSTS video conferencing submission
C11-9	Letter dated February 8, 2013 – KM Submitting Information Request No. 3
C11-10	Letter dated February 21, 2013 – KM Submitting Responses to FBC IR No. 1
C11-11	Letter dated February 21, 2013 – KM Submitting Responses to RDCK IR No. 1
C11-12	Letter dated February 25, 2013 - KM Submitting Comments regarding FBC Incomplete IR No. 3 Responses
C11-13	Submitted at Oral Hearing March 5, 2012 - WRITTEN OPEN STATEMENT FROM MR. MILES
C12-1	IRRIGATION RATEPAYERS GROUP (IRG) Letter dated September 10, 2012 via Email – Request for Intervener Status by Fred Weisberg

Exhibit No.	Description
C13-1	ELECTORAL AREA D REGIONAL DISTRICT CENTRAL KOOTENAY (RDCK) Letter dated July 28, 2012 via Email – Request for Intervener Status by Andy Shadrack, Comments and resume of expert witness Robert McLennan
C13-2	Letter dated September 21, 2012 – RDCK Submitting Comments on the regulatory process
C13-3	Letter dated October 26, 2012 - RDCK Submitting Information Request No. 1 to FBC
C13-4	Letter dated October 30, 2012– RDCK Comments regarding Proceedings
C13-5	Letter dated November 7, 2012 - RDCK Submitting Notice of Expert Witness and Testimony
C13-6	Letter dated November 16, 2012 - RDCK Submitting Comments regarding a Wired Option
C13-7	Letter dated November 23, 2012 - RDCK Submitting Information Request No. 2
C13-8	Letter dated November 23, 2012 - RDCK Submitting Appeal to Proceeding Order Exhibit A-14
C13-9	Letter dated December 7, 2012 - RDCK Submission regarding Suspension Applications
C13-10	Letter dated December 10, 2012 - RDCK Further Submission regarding Suspension Applications
C13-11	Letter dated December 15, 2012 – RDCK Submitting Comments on Jerry Flynn’s request Exhibit C6-7
C13-12	Letter dated December 21, 2012 – RDCK Submitting Request for a Third Round of Intervener Questions
C13-13	Letter dated December 31, 2012 – RDCK Submitting Comments regarding FBC request for Confidentiality
C13-14	Letter dated January 7, 2013 – RDCK requesting clarification Exhibit A-22
C13-15	Letter dated January 11, 2013 – RDCK Reply to submissions on RDCK Application to the Commission for reconsideration of Order G-177-12

Exhibit No.	Description
C13-16	Letter dated January 18, 2013 – RDCK Submitting Comments on Third Round of Information Requests
C13-17	Letter dated January 21, 2013 – RDCK Notice of Filing Further Evidence
C13-17-1	Letter dated January 21, 2013 – RDCK Submitting Evidence
C13-18	Letter dated January 23, 2013 – RDCK Filing Further Evidence
C13-19	Letter dated January 24, 2013 – RDCK Submitting Smart Meter Presentation
C13-20	Letter dated January 27, 2013 - RDCK Submitting Confidentiality Undertaking by Andy Shadrack
C13-21	Letter dated February 5, 2013 - RDCK Filing Comments on CSTS video conferencing submission
C13-22	Letter dated February 5, 2013 - RDCK Submitting Intervener IR No. 1 to Jerry Flynn
C13-23	Letter dated February 7, 2013 - RDCK Submitting Intervener IR No. 1 to Keith Miles
C13-24	Letter dated February 7, 2013 - RDCK Submitting Intervener IR No. 1 to Curtis Bennett
C13-25	CONFIDENTIAL Letter dated February 8, 2013 – RDCK Submitting Information Request for CONFIDENTIAL Materials regarding IR No. 1
C13-26	Letter dated February 8, 2013 – RDCK Submitting Information Request No. 3
C13-27	Email dated February 12, 2013 – RDCK Application for Leave to file Late Responses to Intervener Evidence Information Requests
C13-28	Email dated February 18, 2013 – RDCK Submitting Partial Response to FBC Information Request No. 1
C13-29	Email dated February 15, 2013 – RDCK Submitting Response to BCSEA-SCBC Information Request No. 1 Question 1.6
C13-30	Letter dated February 21, 2013 – RDCK Submitting Responses to BCSEA IR No. 1
C13-30-1	Letter dated February 21, 2013 – RDCK Submitting Addendum to BCSEA IR No. 1

Exhibit No.	Description
C13-31	Letter dated February 25, 2013 – RDCK Submitting Comments regarding Extension Request
C13-32	Letter dated February 25, 2013 – RDCK Submitting Request to Panel to review IR No. 3 scope
C13-33	Letter dated February 26, 2013 – RDCK Submitting Comments regarding Partial response to BCSEA IR No. 1
C13-34	Letter dated February 27, 2013 – RDCK Filing Responses to the Remaining IR No. 1 to FortisBC
C13-35	Submitted at Oral Hearing March 5, 2012 - WRITTEN OPENING STATEMENT BY MR. SHADRACK
C13-36	Email dated April 22, 2013 - RDCK supporting CSTS request to reopen evidentiary record to admit IARC report as evidence
C13-37	Email dated May 13, 2013 - RDCK Reply Submission on CSTS request to reopen evidentiary record
C14-1	HAYES, SHONNA (SH) Letter dated September 5, 2012 via Email – Request for Intervener Status by Shonna Hayes and Comments
C14-2	Letter dated October 10, 2012 – SH Submitting Representative Appointment Notice
C14-3	Submitted at Community Input Session in Trail November 6, 2012 - HARD COPY SUBMISSION OF Shonna Hayes
C15-1	TATANGELO, JOE (JT) Letter dated September 4, 2012 via Email – Request for Intervener Status by Joe Tatangelo
C15-2	Letter dated October 24, 2012 – JT Submitting Information Request No. 1 to FBC
C16-1	SLACK, BURL (BS) Letter dated August 17, 2012 – Request for Intervener Status by Burl Slack and Comments
C16-2	Submitted at Oral Hearing March 6, 2012 - COPY OF HANDWRITTEN LETTER DATED MARCH 1, 2013
C17-1	COMMERCIAL ENERGY CONSUMERS ASSOCIATION OF BRITISH COLUMBIA (cec) Letter dated August 20, 2012 – Request for Intervener Status by Christopher Weafer

Exhibit No.	Description
C17-2	Letter dated September 7, 2012 – CEC Submitting Comments on Community Input Sessions
C17-3	Letter dated September 20, 2012 – CEC Submitting Clarification regarding Community Input Sessions
C17-4	Letter dated September 21, 2012 – CEC Submitting Clarification regarding J Flynn Comments
C17-5	Letter dated October 26, 2012 – CEC Submitting Information Request No. 1 to FBC
C17-6	Letter dated October 30, 2012– CEC submission for the Procedural Conference
C17-7	Letter dated November 23, 2012 – CEC Submitting Comments on RDCK and Nelson-Creston suspension requests
C17-8	Letter dated November 23, 2012 - CEC Submitting Information Request No. 2 to FBC
C17-8-1	Letter dated November 28, 2012 - CEC Submitting IR No. 2 Appendix H Replacement
C17-9	Letter dated December 20, 2012 – CEC Submitting Comments on Jerry Flynn’s request Exhibit C6-7
C17-10	Letter dated December 21, 2012 – CEC Submitting Comments on Mr. Shadrack’s Reconsideration Application
C17-11	Letter dated January 17, 2013 - CEC Submitting Comments regarding Third Round of Information Requests
C17-12	Letter dated January 24, 2013 – CEC Submitting Confidentiality Undertaking
C17-13	Letter dated February 7, 2013 - CEC Filing Comments on CSTS video conferencing submission
C17-14	Letter dated February 7, 2013 - CEC Submitting IR No. 1 to CSTS Intervener Evidence Carpenter
C17-15	Letter dated February 7, 2013 - CEC Submitting IR No. 1 to CSTS Intervener Evidence Maisch

Exhibit No.	Description
C17-16	Letter dated February 7, 2013 - CEC Submitting IR No. 1 to CSTS Intervener Evidence Kumar
C17-17	Letter dated February 7, 2013 - CEC Submitting IR No. 1 to CSTS Intervener Evidence Jamieson
C17-18	Letter dated February 7, 2013 - CEC Submitting IR No. 1 to CSTS Intervener Evidence Maret
C17-19	Letter dated February 7, 2013 - CEC Submitting IR No. 1 to CSTS Intervener Evidence Blank
C17-20	Letter dated February 7, 2013 - CEC Submitting IR No. 1 to CSTS Intervener Evidence Sears
C17-21	Letter dated February 7, 2013 - CEC Submitting IR No. 1 to CSTS Intervener Evidence Schoechle
C17-22	Letter dated February 14, 2013 - CEC Submitting Comments on RDCK extension request
C17-23	Submitted at Oral Hearing March 5, 2012 - DOCUMENT HEADED "CEC CROSS EXAMINATION OF FORTISBC INC. -WITNESS AID"
C17-24	Submitted at Oral Hearing March 12, 2012 - STAFF REPORT OF PUBLIC UTILITY COMMISSION OF TEXAS DATED DECEMBER 17, 2012
C17-24-1	Submitted at Oral Hearing March 14, 2012 - PAGE 6 FROM STAFF REPORT OF PUBLIC UTILITY COMMISSION OF TEXAS DATED DECEMBER 17, 2012
C18-1	NELSON-CRESTON GREEN PARTY CONSTITUENCY ASSOCIATION (NCGP) Letters dated August 22, 2012 and September 7, 2012 and Online Registration – Request for Intervener Status by Michael Jessen
C18-2	Letter dated October 26, 2012 – NCGP Submitting Information Request No. 1 to FBC
C18-3	Letter dated October 30, 2012 – NCGP Submitting Comments regarding attending the Procedural Conference and comments regarding the procedural conference, the regulatory timetable, and the Oral Hearing process
C18-4	Submitted at Community Input Session in Trail November 6, 2012 - HARD COPY SUBMISSION OF Michael Jessen

Exhibit No.	Description
C18-5	Letter dated November 16, 2012 – NCGP Submission Regarding Suspension of Proceedings
C18-6	Letter dated November 23, 2012 - NCGP Submitting Information Request No. 2
C18-7	Letter dated December 7, 2012 – NCGP Reply Submission regarding Suspension Request
C18-8	Letter dated December 21, 2012 – NCGP Submitting Comments on Mr. Shadrack's Reconsideration Application
C18-9	Letter dated December 31, 2012 – NCGP Submitting Comments on Objection to Confidential Exhibit B-14-1
C18-10	Letter dated January 17, 2013 - NCGP Submitting Comments regarding Third Round of Information Requests
C18-11	Letter dated February 6, 2013 - NCGP Filing Comments on CSTS video conferencing submission
C18-12	Email dated April 22, 2013 - NCGP supporting CSTS request to reopen evidentiary record to admit IARC report as evidence
C19-1	WEST KOOTENAY CONCERNED CITIZENS (WKCC) Letter dated September 25, 2012 and letters regarding Intervention – Request for Intervener Status by Cliff Paluck and Curtis Bennett
C19-2	Letter dated October 26, 2012– WKCC Submitting Information Request No. 1 dated October 26, 2012
C19-3	Letter dated October 31, 2012– WKCC submission for the Procedural Conference
C19-4	Submitted at Community Input Session in Trail November 6, 2012 - HARD COPY SUBMISSION OF WKCC
C19-5	Letter dated November 13, 2012 – WKCC submission regarding Request for Oral Hearing
C19-6	Letter dated November 23, 2012 – WKCC Submitting Comments regarding the Suspension of Proceedings
C19-7	Letter dated November 23, 2012 – WKCC Submitting Information Request No. 2
C19-7-1	Letter dated November 30, 2012 – WKCC Submitting IR No. 2 Q32 Attachment

Exhibit No.	Description
C19-8	Letter dated January 24, 2013 – WKCC Submitting Evidence
C19-9	Letter dated February 7, 2013 - WKCC Filing Comments on CSTS video conferencing submission
C19-10	Letter dated February 7, 2013 - WKCC Submitting Further Comments on CSTS video conferencing submission
C19-11	Letter dated February 8, 2013 – WKCC Submitting Information Request No. 3
C19-12	Letter dated February 15, 2013 – WKCC Submitting Petition
C19-13	Letter dated February 21, 2013 – WKCC Submitting Responses to FBC IR No. 1
C19-14	Letter dated February 21, 2013 – WKCC Submitting Responses to RDCK IR No. 1
C19-15	Letter dated February 25, 2013 – WKCC Submitting Request to Panel to review IR No. 3 scope
C19-16	Letter dated February 28, 2013 – WKCC Submitting comments regarding Cross Examination of Witnesses and FortisBC responses to IR No. 3 questions
C19-17	Submitted at Oral Hearing March 5, 2012 - WRITTEN OPENING STATEMENT BY MR. BENNETT
C19-18	Submitted at Oral Hearing March 15, 2012 - LETTER DATED MARCH 15, 2013 FROM THERMOGRAFIX CONSULTING CORPORATION WITH REDACTIONS
C19-19	Email dated April 22, 2013 – WKCC supporting CSTS request to reopen evidentiary record to admit IARC report as evidence
C19-20	Letter dated May 2, 2013 – WKCC Submission on CSTS request to reopen evidentiary record to admit IARC report as evidence

INTERESTED PARTY DOCUMENTS

D-1	POSTNIKOFF, CHRISTINA (CP) Letter Dated August 16, 2012 – Request for Interested Party Status by Christina Postnikoff
D-1-1	Letter Dated October 5, 2012 – CP Submitting Letter of Comment
D-1-2	Letter dated October 30, 2012 - CP Submitting Comment

Exhibit No.	Description
D-1-3	Letter dated November 2, 2012 - CP Submitting Comments
D-1-4	PENDING Submitted at Community Input Session in Trail November 6, 2012 - HARD COPY SUBMISSION OF Christina Postnikoff
D-1-5	Letter dated November 19, 2012 - CP Submitting Letter of Comment
D-1-6	Letter dated November 10, 2012 - CP Submitting Petition Safety Code 6
D-1-7	Letter dated October 26, 2012 - CP Submitting a Request for Information
D-1-8	Letter dated November 23, 2012 - CP Submitting Letter of Comment Regarding Suspension Requests
D-1-9	Letter dated December 4, 2012 - CP Submitting Letter of Comment
D-1-10	Letter dated December 5, 2012 - CP Submitting Letter of Comment
D-1-11	Letter dated December 13, 2012 - CP Submitting Letter of Comment
D-1-12	Letter dated December 27, 2012 - CP Submitting Letter of Comment
D-1-13	Letter dated December 17, 2012 - CP Submitting Letter of Comment Regarding Jerry Flynn's request Exhibit C6-7
D-1-14	Letter dated January 10, 2013 - CP Submitting Letter of Comment
D-1-15	Letter dated January 22, 2013 – CP Submitting Comments Regarding Third Round of Information Requests
D-1-16	Letter dated January 24, 2013 – CP Submitting Letter of Comment
D-1-17	Letter dated February 5, 2013 – CP Submitting Letter of Comment
D-1-18	Letter dated February 27, 2013 – CP Submitting Letter of Comment
D-1-19	Letter dated February 27, 2013 – CP Submitting Letter of Comment Regarding Third Round of Information Requests
D-1-20	Submitted at Oral Hearing March 6, 2012 - CP Submitting Letter of Comment
D-1-21	Submitted at Oral Hearing March 7, 2012 - CP Submitting Letter of Comment

Exhibit No.	Description
D-1-22	Letter received March 8, 2012 - CP Submitting Petition contact details on petition redacted on web submission only
D-1-23	Letter received March 13, 2012 - CP Submitting Letter of Comment
D-1-24	Letter received March 15, 2012 - CP Submitting Letter of Comment
D-1-25	Letter received March 15, 2012 - CP Submitting Letter of Comment
D-2	AULD, HELGA (HA) Letter Dated August 30, 2012 – Request for Interested Party Status by Helga Auld
D-2-1	PENDING Submitted at Community Input Session in Trail November 6, 2012 - - HARD COPY SUBMISSION OF Helga Auld
D-3	COMO, MARIO AND EILEEN (MEC) Letter Dated August 22, 2012 – Request for Interested Party Status by Mario Como and Eileen Como
D3-1	PENDING Submitted at Community Input Session in Trail November 6, 2012 - HARD COPY SUBMISSION OF Eileen and Mario Como
D-4	DOUCET, STEVE (SD) Letter Dated September 7, 2012 – Request for Interested Party Status by Steve Doucet
D-5	LOUISE, LINDA (LL) Letter Dated September 7, 2012 – Request for Interested Party Status by Linda Louise
D-6	MAGNER, GERHARD (GM) Letter Dated September 6, 2012 – Request for Interested Party Status by Gerhard Magner
D-6-1	Letter dated October 26, 2012 - GM Submitting Comment
D-7	NICHOLAS, JUDY (JN) Letter Dated September 5, 2012 – Request for Interested Party Status by Judy Nicholas
D-7-1	Letter Dated February 5, 2013 – JN Submitting Letter of Comment
D-7-2	Letter received March 13, 2012 - JN Submitting Letter of Comment
D-8	PALUCK, CLIFF Letter Dated September 16, 2012 – Request for Interested Party Status by Cliff Paluck
D8-1	PENDING Submitted at Community Input Session in Trail November 6, 2012 - - HARD COPY OF SUBMISSION OF Cliff Paluck

Exhibit No.	Description
D-9	RAYMOND, MARGARET (MR) Letter Dated August 23, 2012 – Request for Interested Party Status by Margaret Raymond
D-10	SIMONET, SARAH (SS) Letter Dated August 24, 2012 – Request for Interested Party Status by Sarah Simonet
D-11	THE VALLEY VOICE (VV) Letter Dated September 12, 2012 – Request for Interested Party Status by Jan McMurray
D-12	PONGRATZ-DOYLE, JEANETTE Letter Dated September 17, 2012 – Request for Interested Party Status by Jeanette Pongratz-Doyle
D-13	TOWN OF OLIVER (TO) – Web Registration Dated February 18, 2013 – Request for Interested Party Status by Cathy Cowen

LETTERS OF COMMENT

E-1	Stein, C – Letter of Comment received August 1, 2012
E-2	Sadler, S and Hetman, T – Letter of Comment dated August 14, 2012
E-3	Moffet, J – Letter of Comment dated October 24, 2012
E-4	Louise, L - Submitted at Community Input Session in Trail November 6, 2012 - HARD COPY SUBMISSION OF LINDA LOUISE
E-5	Helfer , M - Submitted at Community Input Session in Trail November 6, 2012 - HARD COPY SUBMISSION OF MARY-LIN HELFER WITH ATTACHED PETITIONS contact details on petition redacted on web submission only
E-6	Boutet, S - Submitted at Community Input Session in Trail November 6, 2012 - HARD COPY SUBMISSION OF SAMANTHA BOUTET
E-7	Russell, K - Submitted at Community Input Session in Trail November 6, 2012 - HARD COPY SUBMISSION OF KIM RUSSELL
E-8	Fields, D - Submitted at Community Input Session in Trail November 6, 2012 - HARD COPY SUBMISSION OF DAPHNE FIELDS
E-9	Gallatin, A - Submitted at Community Input Session in Trail November 6, 2012 - HARD COPY SUBMISSION OF ANNETTE GALLATIN

Exhibit No.	Description
E-10	Bowles, P - Submitted at Community Input Session in Trail November 6, 2012- HARD COPY SUBMISSION OF PAUL BOWLES
E-11	Gay, M - Submitted at Community Input Session in Trail November 6, 2012- HARD COPY SUBMISSION OF MARY GAY
E-12	Catalano, R - Submitted at Community Input Session in Trail November 6, 2012- HARD COPY SUBMISSION OF ROGER CATALANO
E-13	Westbury, G - Submitted at Community Input Session in Trail November 6, 2012- HARD COPY SUBMISSION OF GARY WESTBURY
E-14	Baker, L and Conner, R - Submitted at Community Input Session in Trail November 6, 2012- HARD COPY SUBMISSION OF RALPH CONNER AND LILLIAN BAKER
E-15	Marshall, F - Submitted at Community Input Session in Trail November 6, 2012- HARD COPY SUBMISSION OF FRED N.J. MARSHALL
E-16	Tyl, Ivo - Submitted at Community Input Session in Osoyoos November 7, 2012- HARD COPY SUBMISSION OF IVO TYL
E-17	Voakes, R-M - Submitted at Community Input Session in Osoyoos November 7, 2012 - HARD COPY SUBMISSION OF ROSE-MARIE VOAKES
E-18	Town of Osoyoos - Submitted at Community Input Session in Osoyoos November 7, 2012- HARD COPY SUBMISSION OF MICHAEL RYAN, TOWN OF OSOYOOS
E-19	MCQuarrie, V - Submitted at Community Input Session in Osoyoos November 7, 2012- HARD COPY SUBMISSION OF VIRGINIA MCQUARRIE, WITH ATTACHED PETITIONS contact details on petition redacted on web submission only
E-20	Turek, V - Submitted at Community Input Session in Osoyoos November 7, 2012- HARD COPY SUBMISSION OF VERA TUREK
E-21	McCavour, P - Submitted at Community Input Session in Osoyoos November 7, 2012- HARD COPY SUBMISSION OF PAUL McCAVOUR
E-22	Winfrey, F - Submitted at Community Input Session in Osoyoos November 7, 2012- HARD COPY SUBMISSION OF FLORENCE WINFREY
E-23	Nicholas, J - Submitted at Community Input Session in Osoyoos November 7, 2012- HARD COPY SUBMISSION OF JUDY NICHOLAS

Exhibit No.	Description
E-24	Sutherland, A - Submitted at Community Input Session in Osoyoos November 7, 2012- HARD COPY SUBMISSION OF AGNES SUTHERLAND
E-25	PENDING Zita, S - Submitted at Community Input Session in Osoyoos November 7, 2012- HARD COPY SUBMISSION OF SUSAN ZITA
E-26	King, Skip Submitted at Community Input Session in Osoyoos November 7, 2012- HARD COPY SUBMISSION OF SKIP KING
E-27	Delagran, G - Submitted at Community Input Session in Osoyoos November 7, 2012- HARD COPY SUBMISSION OF GEORGINA DELAGRAN
E-28	Enns, M - Submitted at Community Input Session in Kelowna November 8, 2012 - HARD COPY SUBMISSION OF MS. MARTY ENNS
E-29	Kergan, C - Submitted at Community Input Session in Kelowna November 8, 2012- HARD COPY SUBMISSION OF CAROL KERGAN
E-30	Bleiler, G - Submitted at Community Input Session in Kelowna November 8, 2012- HARD COPY SUBMISSION OF GERALD BLEILER
E-31	Allan, B - Submitted at Community Input Session in Kelowna November 8, 2012- HARD COPY SUBMISSION OF BEVERLY ALLEN
E-31-2	Submitted at Oral Hearing March 11, 2012 – Letter of Comment and Petitions contact details on petition redacted on web submission only
E-31-3	Submitted at Oral Hearing March 15, 2012 – LETTER DATED MARCH 14, 2013 FROM B. ALLEN
E-31-4	Letter received March 6, 2013 – B.Allen Submitting Comments
E-32	Popp, S - Submitted at Community Input Session in Kelowna November 8, 2012- COPY OF PHOTOGRAPHS OF METERS WITH ATTACHED SKETCH from STEFAN POPP
E-33	Miles, R - Submitted at Community Input Session in Kelowna November 8, 2012- HARD COPY SUBMISSION OF ROBERT MILES
E-34	Pitman, E - Submitted at Community Input Session in Kelowna November 8, 2012- HARD COPY SUBMISSION OF EDITH PITMAN

Exhibit No.	Description
E-35	Roth, D - Submitted at Community Input Session in Kelowna November 8, 2012- HARD COPY SUBMISSION OF DONNA ROTH
E-36	Kapchinsky, R - Submitted at Community Input Session in Kelowna November 8, 2012- HARD COPY SUBMISSION OF RORY KAPCHINSKY
E-37	Moore, J – Letter of Comment dated August 15, 2012
E-38	Dueck, D and T– Letter of Comment dated August 30, 2012
E-39	Schoof, R and H – Letter of Comment dated August 31, 2012
E-40	Loftus, B – Letter of Comment dated September 1, 2012
E-41	Ness, P – Letter of Comment dated September 1, 2012
E-42	Young, L – Letter of Comment dated November 16, 2012
E-43	Beck, R – Letter of Comment dated September 3, 2012
E-44	Dansereau, A – Letter of Comment dated September 4, 2012
E-45	Bibby, N – Letter of Comment dated September 6, 2012
E-46	Jones, P and C – Letter of Comment dated September 5, 2012
E-47	Snider, L – Letter of Comment dated September 5, 2012
E-48	Charman, M – Letter of Comment dated September 7, 2012
E-49	Poulin, M and Trotter, P – Letter of Comment dated September 7, 2012
E-50	McNeil, T and G – Letter of Comment dated September 11, 2012
E-51	Nickisch, L – Letter of Comment dated September 11, 2012
E-52	Roberts, S – Letter of Comment dated October 25, 2012
E-53	Iannella, E – Letter of Comment dated October 30, 2012
E-54	Residents of Oliver – Letter of Comment dated October 31, 2012
E-55	Iannella, T – Letter of Comment dated October 30, 2012
E-56	Ostrikoff, S – Letter of Comment dated November 5, 2012

Exhibit No.	Description
E-57	Mufford – Letter of Comment dated November 8, 2012
E-58	Dahl, E – Letter of Comment dated November 12, 2012
E-59	Hook, A – Letter of Comment dated November 19, 2012
E-60	Duerichen, D – Letter of Comment dated November 22, 2012
E-61	Protheroe, T – Letter of Comment dated November 24, 2012
E-62	Morrish, H – Letter of Comment dated November 29, 2012
E-63	Mann, D – Letter of Comment dated December 1, 2012
E-64	Sharp, C – Letter of Comment dated November 9, 2012
E-65	Janko, D – Letter of Comment dated September 29, 2012
E-66	Form Letters of Comment (73 names)
E-67	McSwan, K – Letter of Comment dated October 3, 2012
E-68	Doucet, Sandra – Letter of Comment dated October 2, 2012
E-69	Currie-Johnson, P – Letter of Comment dated November 8, 2012
E-70	Verona, J and Jaynson, T – Letter of Comment dated November 9, 2012
E-71	Pallett, A – Letter of Comment dated November 9, 2012
E-72	Di Luorio, K – Letter of Comment dated November 18, 2012
E-73	Jensen, E and R – Letter of Comment dated December 5, 2012
E-74	Morrish, H – Letter of Comment dated December 10, 2012
E-75	Chapman, L – Letter of Comment dated December 3, 2012
E-76	Form Letters of Comment (29 names)
E-77	Form Letters of Comment (35 names)
E-78	Lepp, Frances E., Letter of Comment and Petitions November to December 2012 contact details on petition redacted on web submission only
E-79	Benoit, L and Chabot, A – Form Letter and Comment dated November 6, 2012

Exhibit No.	Description
E-80	Prince, A – Form Letter and Comment dated December 1, 2012
E-81	Munns, P – Form Letter and Comment dated dated November 28, 2012
E-82	Williams, D - Comment and Form Letter dated November 5, 2012
E-83	Form Letters of Comment (8 names)
E-84	Nicholas, J - Petitions October 2012 to January 2013 contact details on petition redacted on web submission only
E-85	Roth, D – Letter of Comment December 10, 2012
E-86	East, B – Letter of Comment November 12, 2012
E-87	MacLeod, R – Letter of Comment August 31, 2012
E-88	Council for the Village of Montrose – Letter of Comment August 23, 2012
E-89	Krohman, M and Kratky, L – Letter of Comment August 22, 2012
E-90	Clapp, P – Letter of Comment November 25, 2012
E-91	Regional District of Kootenay Boundary Board of Directors – Letter of Comment December 5, 2012
E-92	Janzen, A – Letter of Comment January 9, 2013
E-93	Janzen, M and P – Letter of Comment January 8, 2013
E-94	Johnson, E – Letter of Comment received November 27, 2012
E-95	Kaslo and Area Chamber of Commerce – Letter of Comment received December 5, 2012
E-96	Council of the Village of Kaslo– Letter of Comment received December 6, 2012
E-97	O'Reilly, D – Letter of Comment January 10, 2013
E-98	Rooney, S – Letter of Comment December 16, 2012
E-99	Turner, J - Letter of Comment, Photographs from meeting, newspaper article and meeting notice, petition and form letters received January 23, 2013 contact details on petition redacted on web submission only

Exhibit No.	Description
E-100	Karow, Hans - Letter of Comment and Petitions received January 28, 2013 contact details on petition redacted on web submission only
E-101	Beaulac, C and E – Letter of Comment January 23, 2013
E-102	DeNarda, L – Letter of Comment January 12, 2013
E-103	El Campanario B and B – Letter of Comment January 12, 2013
E-104	Gates, R – Letter of Comment September 7, 2012
E-105	Hatings, P – Letter of Comment January 14, 2013
E-106	McKay, D – Letter of Comment September 8, 2012
E-107	McKay, J and A – Letter of Comment received January 18, 2013
E-108	Rioux, T – Letter of Comment September 1, 2012
E-109	Robertson_J – Letter of Comment August 16, 2012
E-110	Sinclair, C – Letter of Comment January 14, 2013
E-111	Bach, H and C – Letter of Comment January 14, 2013
E-112	Copeland, B and R – Letter of Comment January 14, 2013
E-113	Eikanger, D and F – Letter of Comment January 10, 2013
E-114	Fields, D - Petitions received January 28, 2013 contact details on petition redacted on web submission only
E-115	Roberts, S – Letter of Comment January 20, 2013
E-116	Form Letters of Comment (26 names) January 2013
E-117	Abott, R – Letter of Comment February 1, 2013
E-118	Taylor, F – Letter of Comment February 1, 2013
E-119	Zita, S – Letter of Comment September 7, 2012
E-120	Oliver Senior Center Society – Letter of Comment September 18, 2012
E-121	Howse, C – Letter of Comment July 29, 2012

Exhibit No.	Description
E-122	Gravelle, S – Letter of Comment August 17, 2012
E-123	Fields, D. – Petition
E-124	Nutter, H. and J. – Letter of Comment February 8, 2013
E-125	Tresek, J. – Letter of Comment November 9, 2012
E-126	Willness, D. – Letter of Comment February 5, 2013
E-127	Hampson, P. & L. – Letter of Comment dated February 15, 2013
E-128	Hopkins, D. & J. – Letter of Comment dated February 15, 2013
E-129	Hollihn, M. – Letter of Comment dated February 17, 2013
E-130	Lawrence, L. & C. – Letter of Comment dated February 25, 2013
E-131	Slosmanis, B. – Letter of Comment dated February 17, 2013
E-132	Jeffs, R., Long, A., Hammond H and S., Elder, B and R.G. – Form Letters of Comment received February 18, 2013
E-133	Reibin, K., – Letter of Comment dated February 21, 2013
E-134	Kaszuba, S and E., - Form Letter of Comment dated February 17, 2013
E-135	Stoushnow, V., – Form Letter of Comment dated February 17, 2013
E-136	Mackay, J., – Form Letter of Comment dated February 25, 2013
E-137	Schantz, U., – Form Letter of Comment and Petition dated February 22, 2013
E-138	Fields, D Petitions received February 27, 2013 contact details on petition redacted on web submission only
E-139	Form Letters of Comment (10 names) received January 28, 2013
E-140	Form Letters of Comment (70 names) received February 25, 2013
E-141	Rooney, S - Petitions and Letter dated February 22, 2013 contact details on petition redacted on web submission only
E-142	Lang, A - Petitions and Letter dated February 21, 2013 contact details on petition redacted on web submission only

Exhibit No.	Description
E-143	Form Letters of Comment (5 names) received February 25, 2013
E-144	Johansson, O - Letter of Comment dated March 3, 2013
E-145	Adams, G and G - Letter of Comment dated March 4, 2013
E-146	Anderson, L - Form Letter of Comment dated March 1, 2013
E-147	Conway, G - Letter of Comment dated March 8, 2013
E-148	Curran, L - Letter of Comment dated March 4, 2013
E-149	Currie, G – Form Letter of Comment dated March 4, 2013
E-150	Davidson, C - Letter of Comment dated March 4, 2013
E-151	Davis, K – Form Letter of Comment dated March 2, 2013
E-152	Idle, M - Letter of Comment dated March 6, 2013
E-153	Jonkheid, J and JJ Steenberg- Letter of Comment dated February 28, 2013
E-154	Kenny, R - Letter of Comment dated March 4, 2013
E-155	Klassen, K - Form Letter of Comment dated March 3, 2013
E-156	Lang, A - Letter of Comment dated March 7, 2013
E-157	Martin, M - Form Letter of Comment dated March 2, 2013
E-158	Nellestijn, G and A - Form Letter of Comment dated February 28, 2013
E-159	Ray, T - Form Letter of Comment dated February 28, 2013
E-160	Regional District Okanagan Similkameen Letter of Comment dated February 25, 2013
E-161	Richer, F - Letter of Comment dated March 2, 2013
E-162	Slocan Park Care Society - Letter of Comment dated March 6, 2013
	Exhibit numbers E-163 through E-165 were not issued
E-166	Catalano, R - Petitions received March 4, 2013 contact details on petition redacted on web submission only

Exhibit No.	Description
E-167	Sagewood Mobile Home Park – Petitions and Letter received March 5, 2013 contact details on petition redacted on web submission only
E-168	Petitions received February 28, 2013 - contact details on petition redacted on web submission only
E-169	Lerch, Bob - Letter of Comment dated February 22, 2013
E-169-1	Lerch, Bob - Letter of Comment dated February 27, 2013
E-170	White, C - Form - Letter of Comment dated March 6, 2013
E-171	Vanzhov, F - Letter of Comment dated February 28, 2013
E-172	Tatum, P- Letter of Comment dated February 28, 2013
E-173	Taylor, R - Letter of Comment dated March 4, 2013
E-174	Health Action Network Society - Letter of Comment dated March 14, 2013