REQUESTOR NAME: **BC Sustainable Energy Association**
INFORMATION REQUEST ROUND NO: **1**
TO: **FortisBC Inc. (FBC)**
DATE: **October 26, 2012**
PROJECT NO: **3698682**
APPLICATION NAME: **Application for a Certificate of Public Convenience and Necessity (CPCN) for the Advanced Metering Infrastructure (AMI) Project**

Topic: Version of ZigBee

1.1 FortisBC notes that it "*is proposing that the advanced meters include HAN functionality at implementation*"[1]. For the HAN, FortisBC notes that "*initially the meters will use ZigBee Smart Profile v1.1 . . . also support Zigbee Smart Energy v2.0*".

1.1.1 Please explain why the meters need to support two different versions of ZigBee.

1.1.2 Will the two versions be running concurrently in the meter, or will they need to be switched (if so, how will the switch be done)?

1.1.3 Can an In-Home Display using v1.1 communicate to a meter running with v2.0?

1.1.4 Can an In-Home Display using v2.0 communicate to a meter running with v1.1?

1.1.5 It is noted that v2.0 "*. . . is being developed . . .* "[2].

1.1.5.1 When is v2.0 expected to be complete, what hurdles need to be overcome before it is complete and what are the risks?

1.1.5.2 How can v2.0 be delivered if it is not yet complete?

1.1.5.3 What testing has been done for v2.0 or is expected before it is considered complete? Does FortisBC plan any pilot testing?

1.1.6 Whose responsibility is it to work out the technical issues for different versions – FortisBC/Itron or the suppliers of the In-Home Display?

1.1.7 How will different versions of ZigBee affect the end customer?

Topic: BC SMI Regulation

1.2 FortisBC states: "*the Smart Meters and Smart Grid Regulation (2010) details the prescribed requirements of 'Smart Grid' and 'Smart Meter'*". Please confirm that the reference is to the Smart Meters and Smart Grid Regulation, B.C. Reg.

[1] Exhibit B-6, BCUC IR 30.1 Response, Page 47, Line 30
[2] Exhibit B-1, Section 4.1.1, Page 43, Line 14

368/2010, under the Clean Energy Act (located at http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/368_2010).

1.2.1 For convenience, please file a copy of the Smart Meters and Smart Grid Regulation or indicate its location in the filed materials.

1.2.2 Please confirm that the Smart Meters and Smart Grid Regulation applies primarily to BC Hydro. Please identify any aspects of the Regulation that apply directly to FortisBC and the circumstances under which it does.

1.2.3 Please provide FortisBC's interpretation of how the *Clean Energy Act*, Part 5, Section 17 (6)[3] applies to the AMI proposal.

1.2.4 Table 3.2.2.a - Summary of SMI Requirements[4] - of the FortisBC application lists requirements of the Smart Meters and Smart Grid Regulation, with a column indicating requirements that FortisBC's AMI project compiles with in the Regulation. Row 2 of the Table states the requirement that the meter "*transmits and receives information in digital form*" and the tick in the third column indicates that FortisBC complies with this requirement. Please provide a table listing:

a) all the specific types of digital information that need to be transmitted and received between the meter and the LAN in order to meet the SMI Requirements, (e.g. data such kWh and commands such as connect/disconnect),

b) all the specific types of digital information that will be transmitted and received between the meter and the LAN for the "*the AMI solution proposed by Itron*"[5],

c) explanations in each instance where the Itron meter will be transmitting and receiving a type of information not required to be transmitted and received by the Smart Meters and Smart Grid Regulations and each instance (if any) where the Itron meter will *not* be transmitting and receiving a type of information required to by the Smart Meters and Smart Grid Regulation.

1.2.5 Row 8 of Table 3.2.2.a[6] states the requirement that the meter "*can transmit information to and from an IHD*". Please provide a table listing:

a) all the specific types of information that needs to be transmitted to and from an IHD in order to meet the SMI Requirements (e.g. kWh),

b) all specific types of digital information that will be transmitted to and from an IHD for the "*the AMI solution proposed by Itron*"[7],

[3] Exhibit B-1, Section 3.2.2, Page 22, Lines 13-19
[4] Exhibit B-1, Section 3.2.2, Table 3.2.2.a, Page 24
[5] Exhibit B-1, Section 4.2.2, Page 55
[6] Exhibit B-1, Section 3.2.2, Page 24
[7] Exhibit B-1, Section 4.2.2, Page 55

c) explanations in each instance where the Itron meter will be transmitting a type of information not required by the Smart Meters and Smart Grid Regulations and each instance (if any) where the Itron meter will *not* be transmitting a type of information required by the Smart Meters and Smart Grid Regulation.

1.2.6 FortisBC states "*If another HAN technology/protocol becomes dominant in home automation, FortisBC expects the market to respond with protocol-bridging gateway devices capable of interfacing Zigbee to other protocols*"[8].

1.2.6.1 Could all the information beyond that which is described for the SMI Requirements in the previous IR (# 1.2.5, above) be incorporated into a gateway? If not, please explain.

1.2.6.2 Please explain how expanded use of gateways might reduce the complexity in the meters. Please include a discussion of the trade-offs between complexities in the meters versus in the gateway devices and compare upgrading the fleet of smart meters versus gateway products.

1.2.6.3 Please describe the features of what FortisBC anticipates will be the most common In-Home Display device and list all the specific types of digital information that will be transmitted to and from the IHD.

Topic: Canadian Smart Grid Roadmap

1.3 Please file a copy of "*The Canadian Smart Grid Standards Roadmap: A strategic planning document*"[9] ("***Canadian Smart Grid Roadmap***").

1.3.1 Does FortisBC agree that the *Canadian Smart Grid Roadmap,* in providing: "*a roadmap – a strategic plan- to advance the standards environment from today's legacy electricity grid to tomorrow's full deployment, operation and evolution of the Canadian Smart Grid,*" is relevant and helpful to the FortisBC AMI application process? If not, please explain.

1.3.2 Does FortisBC agree that the *Canadian Smart Grid Roadmap* can help the FortisBC AMI application process as it provides "*guidelines for utilities and manufacturers to participate in the emerging Smart Grid marketplace*"? If not, please explain.

1.3.3 The "*Canadian Smart Grid Roadmap*" document notes that the "*Government of Canada's approach toward the future for Smart Grid is focused on three core energy policy objective: . . . . environmental*

[8] Exhibit B-6, BCUC IR #30.2.1, Page 48, Lines 32-33
[9] The Canadian Smart Grid Standards Roadmap: A strategic planning document, October 2012, http://www.scc.ca/sites/default/files/publications/Smart-Grid-Report_FINALOCT2_EN.pdf

performance"[10]. It also notes that "*a Smart Grid will contribute to our goal of improved environmental performance, by reducing greenhouse gas (GHG) emissions*"[11]. Please discuss the ways in which FortisBC is using the Smart Grid to improve environmental performance.

1.3.4 The one specific recommendation within the "*Smart Grid Policy, Legislation and Regulatory*" section of the "*Canadian Smart Grid Roadmap*" document is targeted to the Provincial role. Recommendation R1 states that:

> *"SCC's CNC/IEC should encourage Provincial, Territorialregulators and utilities, when developing business plans for Smart Grid initiatives, to ensure that systems migrate from proprietary technologies to open standards, and from their current architecture to theCanadian Smart Grid Reference Framework described in this report. This step will enable regulators and utilities to compare roadmaps and therefore identify areas of commonality, interoperability, deployment timing and possible technological risk."*[12]

1.3.4.1 Please discuss how FortisBC has implemented its AMI system to use open standards. Please include a discussion about areas of commonality, interoperability, deployment timing and possible technological risk.

1.3.4.2 Please discuss how FortisBC is using the "*Canadian Smart Grid Reference Framework described in this report*" for its AMI system. Please include a discussion about areas of commonality, interoperability, deployment timing and possible technological risk.

1.3.5 Please refer to Figure 5 on page 27 of the "*CanadianSmart Grid Roadmap*" which shows a diagram for a *"Smart Grid Advanced Metering Infrastructure Logical Architecture*"[13] (***Logical AMI Diagram***). Figure 1 below shows the Logical AMI Diagram with a purple oval and a red arrow added for the purpose of the questions that follow.

[10] The Canadian Smart Grid Standards Roadmap: A strategic planning document, October 2012, Section 2.1, Page 4
[11] The Canadian Smart Grid Standards Roadmap: A strategic planning document, October 2012, Section 2.1, Page 4
[12] The Canadian Smart Grid Standards Roadmap: A strategic planning document, October 2012, Section 2.3, Page 7
[13] The Canadian Smart Grid Standards Roadmap: A strategic planning document, October 2012, Section 5.2, Page 27, Figure 5

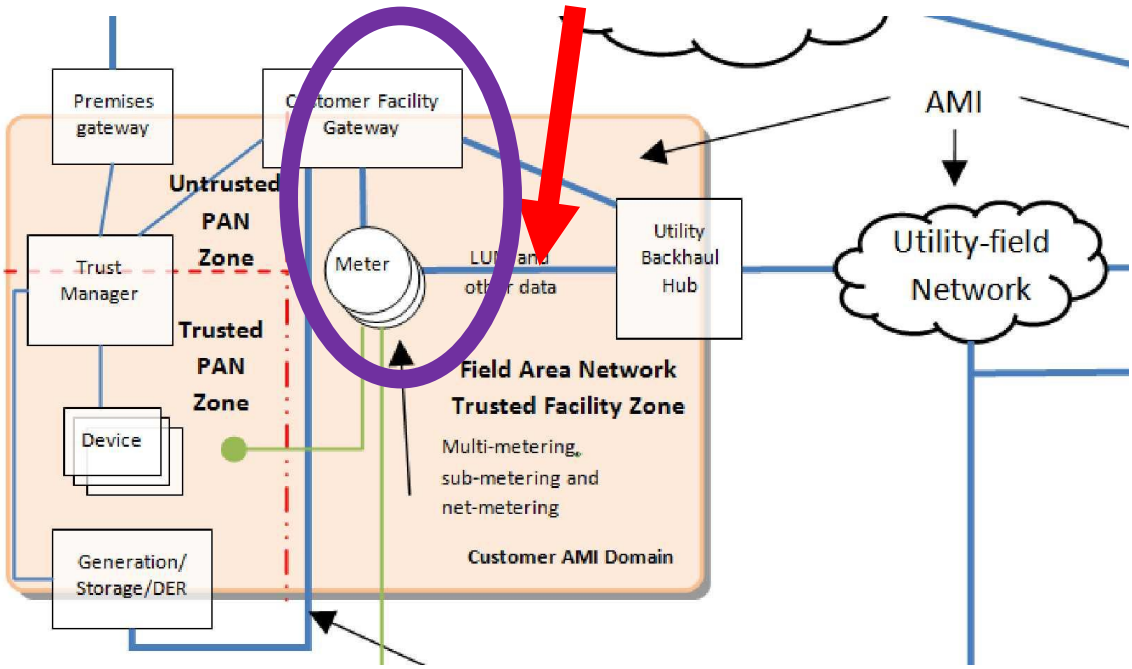

Figure 1: Source: The Canadian Smart Grid Standards Roadmap: A strategic planning document, Standards Council of Canada, October 2012, Section 5.2, Page 27, Figure 5; [with red arrow and purple ovals added for emphasis]

1.3.5.1 Please refer to FortisBC's response to IR 1.2.4 (regarding SMI Requirements concerning "*transmits and receives information in digital form*"[14]), above. Would FortisBC agree that the information listed in IR 1.2.4 is depicted by the red arrow (pointing to "*LUM and other data*") in Figure 1, above? If not, please explain.

1.3.5.2 It is noted that the "*Canadian Smart Grid Roadmap*" recommends communication of Legal Units of Measure (LUM)[15]. Does the proposed FortisBC AMI system communicate LUM at the location shown by the red arrow in Figure 1, above?

1.3.5.3 Does the proposed FortisBC AMI system meet all sections of Recommendation M2[16]? If not, please explain.

1.3.6 Considering that the "*Logical AMI Diagram*" shows a logical architecture, would FortisBC agree that the Itron meter with the ZigBee technology are generally described by the "*Customer Facility Gateway*" and Meter

[14] Exhibit B-1, Section 3.2.2, Table 3.2.2.a, Page 24 - which refers to Section 2(b) of the Smart Meter and Smart Grid Regulation (2010)
[15] The Canadian Smart Grid Standards Roadmap: A strategic planning document, October 2012, Section 5.3, Recommendation M2, Page 29
[16] The Canadian Smart Grid Standards Roadmap: A strategic planning document, October 2012, Section 5.3, Recommendation M2, Page 29

together depicted by the purple circle in Figure 1 above? If not, please discuss.

1.3.7 The "*CanadianSmart Grid Roadmap*" provides "*a list of key standards referenced in electricity metering requirements*"[17].

1.3.7.1 Please provide a table listing the standards from Table 9[18]of the "*CanadianSmart Grid Roadmap*" and indicate ones the FortisBC AMI system will follow or not follow. Please give an explanation where a standard is not followed.

1.3.7.2 Do the FortisBC AMI smart meters meet the ANSI C12.19 standard[19] as reference in the "*Canadian Smart Grid Roadmap*" for storing of energy information to be transmitted to the Head End System?

Topic: SMI Network Requirements for Electric Vehicles

1.4 The Summary of SMI Requirements states that the Smart Grid should: "*Establish a telecommunications network with sufficient speed and bandwidth to facilitate the use of electric vehicles.*"[20]

1.4.1 Please describe the specific types of network characteristics (speed, bandwidth, end-to-end latency, reliability, etc.) which FortisBC believes appropriate to describe the telecommunications network performance to facilitate the use of electric vehicles. Please include the limiting values of those characteristics that FortisBC believes to be "sufficient", and describe how the FortisBC system will meet those values through the range of WAN configurations.

1.4.2 Please discuss in general terms what measures FortisBC taking to ensure the telecommunications network can handle the electric vehicles.

1.4.3 Please discuss what FortisBC is doing to align with the Province of BC program to set up a province-wide network of charging stations[21]. Please describe how FortisBC interprets and has accommodated in its AMI system the following requirements of Community EV chargers:

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[17] The Canadian Smart Grid Standards Roadmap: A strategic planning document, October 2012, Section 5.2, Page 26, section 5.1
[18] The Canadian Smart Grid Standards Roadmap: A strategic planning document, October 2012, Section 5.3, Table 9, Page 31
[19] The Canadian Smart Grid Standards Roadmap: A strategic planning document, October 2012, Section 5.3, Table 9, Page 31
[20] Exhibit B-1, Section 3.2.2, Table 3.2.2.a, Page 24
[21] Community Charging Infrastructure, Fraser Basin Council; http://www.fraserbasin.bc.ca/programs/community_charging_infrastructure.html

"- communications capability for data access and charging station management, and

- *Ability to measure and record energy usage and time of use statistics*"[22]

1.4.3.1 Please discuss how FortisBC intends to address Recommendation M5[23] of the "*Canadian Smart Grid Roadmap*" dealing with electric vehicles.

Topic: Itron Specifications

1.5 Please supply a specification for the Itron meter that will be used for the FortisAMI system.

1.5.1 Please confirm if the Itron meter meets the SMI Requirements.

Topic: Connected Products

1.6 In a June 2012 release, Itron announces that "*It also extends to integrated products and communications modules, incorporating ZigBee into third party products.*"[24]

1.6.1 Please describe how FortisBC will ensure a competitive market for products which connect to the Itron meters.

1.6.2 Please confirm that any certified ZigBee product (of the appropriate version) can connect to the Itron meter, and will be given authorization to do so in an unbiased manner.

1.6.3 Please describe the process by which manufacturers will be able to develop and introduce products to connect to the Itron meter.

Topic: SMI Network Requirements for Distributed Generation

1.7 The SMI Requirements note that the Smart Grid should: "*Establish a telecommunications network with sufficient speed and bandwidth to facilitate distributed generation.*"[25]

Please describe the specific types of network characteristics (speed, bandwidth, end-to-end latency, reliability, etc.) which FortisBC believes

[22] Community Charging Infrastructure Fund, September 21, 2012; http://www.livesmartbc.ca/incentives/transportation/Level2-EVSE-List-of-Qualified-Products.pdf
[23] The Canadian Smart Grid Standards Roadmap: A strategic planning document, October 2012, Section 5.3, Recommendation M5, Page 30-31
[24] Itron Expands Portfolio of ZigBee Smart Energy-Certified Products, June 7, 2012; https://www.itron.com/newsAndEvents/Pages/Itron-Expands-Portfolio-of-ZigBee-Smart-Energy-Certified-Products.aspx
[25] Exhibit B-1, Section 3.2.2, Table 3.2.2.a, Page 24

appropriate to describe the telecommunications network performance to facilitate distributed generation. Please include the limiting values of those characteristics that FortisBC believes to be "sufficient", and describe how the FortisBC system will meet those values through the range of WAN configurations.

Topic: FortisBC RFP

1.8 "*FortisBC used a competitive RFP process for the two primary components of the AMI system: one for the MDMS software solution, and a second one for the AMI hardware infrastructure*."[26]

1.8.1 Please provide a copy of the RFP for the AMI hardware infrastructure.

1.8.2 Regarding the LAN side, FortisBC states: "*The RFP did not specify the type of meter-to-collector communications technology (RF, PLC, BPL or other) to be used for the AMI system . . .* "[27]

Regarding the IHD side, FortisBC states: "*One of the requirements of the procurement process was that vendors be able to meet emerging industry standards for IHDs using the Zigbee communications protocol. Initially the meters will use Zigbee Smart Profile v1.1, which is supported by a wide variety of commercially available IHDs.*

The selected meters also support Zigbee Smart Energy v2.0, which is being developed by the ZigBee Alliance specifically to provide additional functionality related to the delivery and use of energy and water."[28]

1.8.2.1 Please explain why the meter-to-collector communications was not specified, yet the meter-to-IHD communications was specifically required to be ZigBee.

1.8.2.2 Please provide a copy of the portion(s) of the RFP that relates to ZigBee.

1.8.2.3 Please provide a copy of the portion(s) of BC Hydro's RFP for smart meters that relates to ZigBee or other communications protocols between the meter and the IHD and explain the differences. Alternatively, please explain FortisBC's understanding of BC Hydro's RFP in this regard.

[26] Exhibit B-1, Section 4.2.1, Page 53, Lines 2-4
[27] Exhibit B-1, Section 4.2.2, Page 55, Lines 7-8
[28] Exhibit B-1, Section 4.1.1, Page 43, Lines 10-16

Topic: BC Hydro In-Home Feedback RFEI

1.9 Please file a copy of the BC Hydro document "Request for Expression of Interest, In-Home Feedback Devices (RFEI #1089) Issue Date December 2, 2011" available on the Internet at *https://docs.zigbee.org/zigbee-docs/dcn/11/docs-11-5774-00-0mwg-bc-hydro-rfi.pdf*, plusany updates.

1.9.1 Will FortisBC be releasing a requirements document for the HAN devices and gateways themselves (similar to BC Hydro's document)? If so, please include the wording or describe. If not, why not?

1.9.2 Noting that the document concerns the devices that communicate to the Smart Meters, but not the Smart Meter itself, please confirmthat the HAN devices for BC Hydro must meet SEP 1.1 (see Section 1.2, Section 1.5 (REQ 1), and Section 1.6.1 (REQ 6)), but these devices are not required to meet SEP 2.0.

a) Please explain the expected operation should a SEP 2.0 HAN device attempt communication with the Smart Meter.

b) Will FortisBC be placing the same requirements on its HAN devices as BC Hydro? If not, please explain any differences.

1.9.3 Please confirm that Gateway products for BC Hydro must be upgradeable to SEP 2.0 (see Section 1.6.4, (REQ 37)), and elaborate on how this is accomplished.

a) Will FortisBC be placing the same requirements on its Gateway devices as BC Hydro? If not, please explain any differences.

Topic: Smart Energy Profile

1.10 Please confirm that "*Zigbee Smart Profile v1.1*"[29] should be written "*ZigBee Smart Energy Profile V1.1*"; and "*Smart Energy v2.0*"[30] should be written "*Smart Energy Profile V2.0*"? If not, please explain and provide references.

1.10.1 Please file a copy of "*ZigBee Smart Energy Features*"[31].

1.10.2 Please confirm that the "*ZigBee Smart Energy Features*" accurately describes the features provided in ZigBee Smart Energy V1.1 and are the same features provided by the Itron solution. If not, please note changes.

1.10.3 Did the RFP specify specifically that "*Zigbee Smart Energy Profile V1.1*" was required in the meters or was the statement regarding ZigBee more generic?

[29] Exhibit B-1, Section 4.1.1, Page 43, Line 12
[30] Exhibit B-1, Section 4.1.1, Page 43, Line 14
[31] ZigBee Smart Energy Features, https://docs.zigbee.org/zigbee-docs/dcn/08-0013.pdf

1.10.4 FortisBC notes that Smart Energy Profile v2.0 was developed by the ZigBee Alliance[32]. Please clarify the role of WiFi and HomePlug for the development of Smart Energy ProfileV2.0.

1.10.4.1 Please compare the ZigBee Alliance[33] to the North American Energy Standards Board (NAESB)[34] and the Institute of Electrical and Electronics Engineers (IEEE)[35] which are referenced in numerous places throughout the "*CanadianSmart Grid Roadmap*". Please include comparisons of whether they are considered standards making bodies, how standards are developed, membership requirements, use of open standards, etc.

1.10.5 FortisBC states that ZigBee is "*based on an IEEE 802 standard*"[36].

a) Please confirm that ZigBee is based upon IEEE 802.15.4 and explain the relationship between the two.

b) Please describe the relationship of IEEE 802.15.4 to SEP 2.0 and the relationship of ZigBee to SEP 2.0.

Topic: WIBEEM

1.11 The "*Canadian Smart Grid Roadmap"* discusses the work of ISO/IEC JTC 1/ SC 25 which the Roadmap says "*has a new focus on home and building energy management, and a connection to the Smart Grid*"[37]. Please file a copy of the Working Group 1's smart grid report: "*Smart Grid Standards for Residential Customers*"[38] found at http://hes-standards.org/doc/SC25_WG1_N1516.pdf.

1.11.1 The SC 25 / WG 1 *Smart Grid Standards for Residential Customers* mentions a "*low power radio that uses energy for a mesh network efficiently*", called WiBEEM[39]. Please confirm that WiBEEM is an International Standard being developed based on IEEE 802.15.4. Discuss whether it could be a firmware/software upgrade to ZigBee radios in the Smart Meters.

[32] Exhibit B-1, Section 4.1.1, Page 43, Lines 14-15
[33] Exhibit B-1, Section 4.1.1, Page 43, Lines 16-17
[34] "*CanadianSmart Grid Roadmap*", Section 3, Page 9
[35] "*CanadianSmart Grid Roadmap*", Section 2.2, Page 5
[36] Exhibit B-1, Section 4.1.1, Page 43, Footnote 8
[37] The Canadian Smart Grid Standards Roadmap: A strategic planning document, October 2012, Section 5.3, Recommendation M6, Page 31
[38] Smart Grid Standards for Residential Customers, ISO/IEC JTC 1/ SC 25/WG 1
[39] Smart Grid Standards for Residential Customers, ISO/IEC JTC 1/ SC 25/WG 1, Page 8,

Topic: Consortium for SEP 2

1.12 Please refer to the series of documents by the Consortium for SEP 2 Interoperability (CSEP) athttp://www.csep.org.

The CSEP home page states:

"*The Smart Energy Profile 2 is the forthcoming standard for applications that enable home energy management via wired and wireless devices that support Internet Protocol.*"[40]

1.12.1 Please confirm that the "*Zigbee Smart Energy v2.0*" that FortisBC refers to is the same as the "*Smart Energy Profile 2*" that is referred to by CSEP. If not, please explain. If yes, please answer the following questions:

1.12.1.1 Is Itron a member of CSEP? If not, why not, and are there plans to become a member and at what level?

1.12.1.2 Is FortisBC a member of CSEP? If not, why not, and are there plans to become a member and at what level?

1.12.2 Is FortisBC, Itron, or both, familiar with the work of CSEP?

1.12.3 Do FortisBC, Itron or both have any disagreements with the CSEP approach? If so, please explain.

1.12.4 The press release of CSEP[41] states: "*The Consortium will create and maintain a comprehensive test and certification test suite to validate interoperability for a variety of wired or wireless devices. Products to be certified as a result of the Consortium's work are expected to include thermostats, appliances, electric meters, gateways, electric vehicles, and countless other devices in the Smart Grid.*"

Will the Itron solution meet the CSEP "*comprehensive test and certification test suite*"?

1.12.5 What testing for interoperability between the Itron meter and other products will be done?

1.12.6 The CSEP Organizational Resolutions[42] state: "*RESOLVED, that with respect to the qualifications of membership as a Sponsor set forth in*

[40] Consortium for SEP 2 Interoperability home page, http://www.csep.org
[41] CSEP press release, Oct 25, 2011; http://www.csep.org/media/uploads/documents/consortium_for_sep_2_interoperability_launches_pr_111025.pdf
[42] http://www.csep.org/media/uploads/documents/csep_org_resolutions_120524.pdf

Section 4.1(a)(1) of the bylaws, the board of directors shall use the following elements in determining whether an industry trade association is focused on supporting an international standard MAC/PHY [lower layers of Media Access Control/Physical Layers (e.g. radio or powerline)]:

(1) The industry trade association focuses on supporting an open MAC/PHY that is developed and maintained through a collaborative and consensus driven process, one that facilitates interoperability and data exchange among different products or services and is intended for widespread adoption;

(2) The IPR [Intellectual Property Rights] essential to implement the MAC/PHY can be licensed by all applicants on a worldwide, non-discriminatory basis, either for free and under other reasonable terms and conditions, or on reasonable terms and conditions (which may include monetary compensation);

(3) The MAC/PHY is not dominated by a single interest group;

(4) Development and maintenance of the MAC/PHY is driven by the market and is open to all interested parties;

(5) The quality of the MAC/PHY is sufficient to permit the development of a variety of competing implementations of interoperable products;

(6) The MAC/PHY is easily available to the general public at a reasonable price, i.e., RAND;

(7) The MAC/PHY is transparent, meaning that there are no masked or hidden features or normative references that do not conform to these open standards principles; and

(8) The MAC/PHY is intended to be supported over a long period of time."

Does the solution provided by Itron meet these considerations? If not, please explain.

Topic: Smart Grid Interoperability Panel SEP Document

1.13 In the Foreword of the "*CanadianSmart Grid Roadmap*", John Walter, CEO of the Standards Council of Canada and Serge P. Dupont, Deputy Minister of Natural Resources Canada, states:

"*By identifying a path forward on the priority standards for Canada, this work supports that of the United States National Institute of Standards and Technology to develop a broad range of standards for the smart grid.*"[43]

[43] The Canadian Smart Grid Standards Roadmap: A strategic planning document, October 2012, Foreword

The Smart Grid Interoperability Panel[44] (SGIP) of the National Institute of Standards and Technology (NIST) developed 20 Priority Action Plans (PAP) which "*categorized priority actions to define the challenges to and objectives for developing interoperability for the Smart Grid*"[45].

Priority Action Plan #18 is the "*Smart Energy (SEP) Profile 1.X to 2.0 Transition*". It is a detailed 92-page document[46] (***SGIP SEP document***) to "*specifically address SEP 1.x to SEP 2.0 migration and coexistence*"[47].

FortisBC states: "*Initially the meters will use Zigbee Smart Profile v1.1.*"[48]. and that "*the selected meters also support Zigbee Smart Energy v2.0.*"[49].

The "*SGIP SEP document*" states: "*As a result of significant architectural changes and feature upgrades, SEP 2.0 is not backwards compatible with SEP 1.x neither at the network and application layers nor in the security architecture.*"[50]

1.13.1 Please confirm that FortisBC/Itron intends to implement both SEP 1.1 and SEP 2.0 in the same meters.

1.13.2 Does FortisBC agree with the "*SGIP SEP document*" that "*SEP 2.0 is not backwards compatible with SEP 1.x*"? Please respond regarding (a) the network and application layers and (b) the security architecture. If not, please explain.

1.13.3 Please discuss the consequences of implementing both SEP 1.1 and SEP 2.0 in the same meters.

1.13.4 Will the AMI solution proposed by FortisBC meet the requirements described in the "*SGIP SEP document*"? If not, please explain.

1.13.5 Regarding the SEP V1.x and SEP V2.0 issues, the "*SGIP SEP document*" states:

> "*Stranded devices and a negative experience by the Customer will translate directly into costs and lost opportunities for all parties involved in the migration. Costs due to adverse migration events identified in the use cases included replacing failed devices, additional*

[44] Web site of SGIP; http://www.nist.gov/smartgrid/priority-actions.cfm
[45] SGIP, Priority Actions; http://www.nist.gov/smartgrid/priority-actions.cfm
[46] PAP 18: SEP 1.x to SEP 2.0 Transition and Coexistence Guidelines and Best Practices, Page 6, Line 136, SGIP; http://collaborate.nist.gov/twiki-sggrid/pub/SmartGrid/SEPTransitionAndCoexistenceWP/PAP_18_SEP_Migration_Guidelines_and_Best_Practices_ver_1_03.docx
[47] SGIP SEP document, Page 6, Line 136
[48] Exhibit B-1, Section 4.1.1, Page 43
[49] Exhibit B-1, Section 4.1.1, Page 43
[50] SGIP SEP document, Page 6, Lines 116-118

call center technical support, truck rolls for on-site technical support, the processing of regulatory complaints, lost sales opportunities, addressing adverse publicity, and the cost of the Customer's time to determine what went wrong with the migration and how to repair it. Cost is also a factor when Utilities and regulators are determining time durations for support of various best practice migration recommendations."[51]

In addition, the "*SGIP SEP document*" states that: "*there is a risk of stranding some of those existing investments*"[52].

1.13.5.1 Please discuss what FortisBC will be doing to:
a) reduce the potential for migration costs,
b) reduce lost opportunities,
c) minimize the potential for negative customer experiences, and
d) minimize the risk of stranding investments.

1.13.5.2 Is the migration from SEP V1.x and SEP 2.0 included within FortisBC's budget for the AMI program? If there are problems with the migration from SEP V1.x and SEP 2.0 will the costs be borne by FortisBC, Itron or customers who use or want to use IHD?

1.13.5.3 Does FortisBC agree that many of the issues and complexities in the "*SGIP SEP document*" do not apply for systems that involve only one version of SEP? If not, please explain.

1.13.5.4 Please discuss the advantages/disadvantages and consequences if the FortisBC AMI project only used SEP 1.x.

<u>Topic: HAN Projects in North America</u>

1.14 FortisBC proposes that advanced meters for its program will include HAN functionality at implementation[53]. FortisBC discusses AMI projects throughout Canada[54].

1.14.1 Please provide estimates for the total number of in-home display units deployed and provisioned/activated throughout Canada.

1.14.2 Please provide estimates for the number of in-home display units with ZigBee Smart Energy Profile V1.x deployed and provisioned/activated throughout Canada.

[51] SGIP SEP document, Page 17, Lines 578-585
[52] SGIP SEP document, Page 18, Lines 589-590
[53] Exhibit B-6, BCUC IR 30.1 Response, Page 47; Exhibit B-1, Page 1, Line 25; Exhibit B-1, Section 4.1.1, Page 44, Lines 1-9.
[54] Exhibit B-1, Section 8.1.1, Page 125, Line 10 to Page 126, Line 22

1.14.3 Please provide estimates for the total number of in-home display units deployed and provisioned/activated throughout the United States.

1.14.4 Please provide estimates for the number of in-home display units with ZigBee Smart Energy Profile V1.x deployed and provisioned/activated throughout the United States.

1.14.5 What area has the highest penetration of In-Home Displays in North America? Please describe the type and number of HANs installed, the number of HANs provisioned/activated, and the number of Smart Meters.

1.14.6 Please provide any studies that provide projections for the number and type of in-home displays throughout North America.

Topic: Adoption Rate for In-Home Displays

1.15 FortisBC cited a recent In-Home Display pilot program and survey by the US Department of Energy and CenterPoint Energy in Texas[55].

From the July 2012 compliance reports from CenterPoint and other Texas smart meter implementations, it is noted that the following number of HANs have been provisioned:

Utility	HANs	Total Meters	Percentage
CenterPoint Energy Houston Electric[56]	9,562	2,283,012	0.4%
AEP[57]	76	593,784	0.01%
TNMP[58]	0	52,451	0%

1.15.1 Please confirm the numbers in the table, and adjust as necessary.

1.15.2 FortisBC estimates an adoption rate of 30% for In-Home Displays[59], and that penetration between 2015 and 2020[60]. Please provide the estimated adoption rate on a year by year basis.

1.15.3 Please discuss how FortisBC developed its forecast IHD adoption rate and compare the rates to other jurisdictions.

[55] Exhibit B-1, Section 4.1.1, Page 44, Line 10 to Page 45, Line 2
[56] CenterPoint Energy Monthly Report to AMIT, July 31, 2012; http://www.puc.texas.gov/industry/projects/electric/34610/AMITMtg071912/CNP_Monthly_Compliance_Report.pdf
[57] TDU Montly Report to AMIT, July 31, 2012; http://www.puc.texas.gov/industry/projects/electric/34610/AMITMtg071912/AEP_Monthly_Compliance_Report.pdf
[58] TNMP Monthly Report to AMIT, July 31, 2012; http://www.puc.texas.gov/industry/projects/electric/34610/AMITMtg071912/TNMP_Monthly_Compliance_Report.pdf
[59] Exhibit B-6, BCUC IR #8.2 Response, Page 20, Lines 5-10
[60] Exhibit B-6, BCUC IR #30.3 Response, Page 49, Lines 11-18

1.15.4 Please discuss what measures FortisBC plans to take in order to reach its estimated adoption rate for In-Home Displays.

1.15.5 What version of ZigBee was used for the Texas projects?

1.15.6 Please refer to the presentation titled "Smart Meter Texas, Proposed Scope for Summer Release"[61]. Please file a copy of Slide 22, showing an example of how a customer adds a thermostat to his or her own HAN device through Smart Meter Texas website.

1.15.6.1 Please confirm that Slide 22 shows the customer adding a HAN device (the example show is "Den – thermostat") via the utility's website.

1.15.6.2 As far as FortisBC knows, is this the current method by which customers add HAN devices in the Texas projects? If not, please explain.

1.15.6.3 Does this mean, for the Texas projects, that the customer's own HAN is managed by the utility, with all the information of each device stored at the utility? Please discuss, including why this is necessary and the privacy considerations.

1.15.6.4 Is FortisBC planning to incorporate the same HAN process as is used in the Texas example? If so, what measures is FortisBC planning to incorporate to address privacy considerations. If not, please describe how the FortisBC HAN process will be different.

1.15.6.5 Please comment on the proposition that if the customer had a gateway device, then only that device would need to be registered and the customer's other HAN products would be up to the customer to configure the customer's own HAN network and would not be registered at the utility? Please explain for both Texas and FortisBC.

1.15.6.6 Is the Smart Meter the coordinator of the network for customer's HAN network? Please explain for both Texas and FortisBC, including the role and functions of the coordinator. Please discuss any limitations this might entail, including how many devices the coordinator can connect.

1.15.6.7 If a customer wishes to create his/her own HAN network with its own coordinator, (and not have the Smart Meter as coordinator but as an end device), is this possible? Please explain for both Texas and FortisBC.

[61] Smart Meter Texas, Proposed Scope for Summer Release, Slide 22, http://www.puc.state.tx.us/industry/projects/electric/34610/AMITMtg052510/SMT-Summer-Functionality.ppt

1.15.6.8 Please describe the type of messages that will be sent to the homes from FortisBC – are individual appliances given commands (e.g. adjust thermostat setpoints) or are more general commands given such as to reduce overall load?

1.15.6.9 Please confirm that commands that can be sent by FortisBC to the customer's IHD will require prior approval by the Commission such as by an approved rate structures.

Topic: Hardware Requirements for SEP 2.0

1.16 From a design point of view, it is noted that "*the code for a SEP1.x stack, . . . requires roughly 160 Kbytes of flash . . . plus 10-12 Kbytes worth of RAM.*"[62]

For "*running SEP2.0 . . . it may require as much as 256 Kbytes of flash and 24-32 Kbytes of RAM*."[63]

1.16.1 Are these estimates accurate regarding Itron's solution?

1.16.2 Since the Itron solution has both V1.1 and V2.0 SEP, will it require the combined capacity of both the V1.1 and V2.0 devices?

1.16.3 Commentator Lee Goldberg states that "*. . . there is no firm consensus on what it will take. . . "*[64] for what is needed for devices to implement SEP 2.0. Does FortisBC agree? Please explain.

1.16.4 Please discuss the level of confidence that FortisBC has that the Itron solution has adequately accommodated the needs for SEP 2.0.

1.16.5 It seems that the ZigBee is acting as the center control manager for all the HAN products, as shown in Figure 4[65]. Please discuss for the FortisBC implementation.

[62] ZigBee's Smart Energy 2.0 Profile Brings New Capabilities and Design Challenges, 3/7/2012, Lee Goldberg, Electronic Products; http://www.digikey.ca/ca/en/techzone/energy-harvesting/resources/articles/zigbees-smart-energy-20-profile.html
[63] ZigBee's Smart Energy 2.0 Profile Brings New Capabilities and Design Challenges, 3/7/2012, Lee Goldberg, Electronic Products; http://www.digikey.ca/ca/en/techzone/energy-harvesting/resources/articles/zigbees-smart-energy-20-profile.html
[64] ZigBee's Smart Energy 2.0 Profile Brings New Capabilities and Design Challenges, 3/7/2012, Lee Goldberg, Electronic Products; http://www.digikey.ca/ca/en/techzone/energy-harvesting/resources/articles/zigbees-smart-energy-20-profile.html
[65] ZigBee's Smart Energy 2.0 Profile Brings New Capabilities and Design Challenges, 3/7/2012, Lee Goldberg, Electronic Products; http://www.digikey.ca/ca/en/techzone/energy-harvesting/resources/articles/zigbees-smart-energy-20-profile.html

Topic: In-Home Displays

1.17 FortisBC includes a picture of a sample In-Home Display in its application[66]. Looking at the picture of the display, it is evident that the display shows present power ("right now"), energy profile in the past hours, and projected electricity bill.

1.17.1 In the view of FortisBC, does this one screen meet the data information requirements for the Table 3.2.2a SMI Requirements? If not, please explain what other information needs to be displayed in order to meet the requirements.

1.17.2 How is the Projected Electrical Bill calculated?

1.18 FortisBC notes that the In-home display will be "*purchased by customer with PowerSense incentive*"[67].

1.18.1 What procedure will be necessary for a customer to connect their IHD to his or her IHD to the meter? How long will it take, how complex is the procedure and what support will be provided to the customer?

1.18.2 Will there be any restrictions on which customers can connect?

1.18.3 Please estimate the time frame at which customers will be able to connect IHDs to the meter and discuss the factors which determine whether or not a customer can connect IHDs to the meter.

1.19 The Advanced Metering Infrastructure (AMI) Future Program Study done by Navigant Consulting for FortisBC includes a description and picture of a Blue Line In-Home Display unit used for Hydro One[68].

1.19.1 Navigant implies that The Energy Detective (TED) can track energy without a smart meter – can the Blue Line Innovations also track energy without a smart meter? Please explain the operation of these products.

1.19.2 Can the Itron meters track energy and output to an In-Home Display as fast as products such as the TED and Blue Line Innovations? Please explain any performance that Itron meters (communicating with appropriate In-Home Display units) may lack including the speed of energy updates (e.g. how many seconds between energy updates) compared to these types of products.

[66] Exhibit B-1, Section 4.1.1, Figure 4.1.1.a, Page
[67] Exhibit B-6, BCUC IR #8.2 Response, Page 20, Line 9-10
[68] Exhibit B-1, Appendix C-1, Page 15 of 65 to Page 16 of 65

Topic: Measurement Canada Certified Meters

1.20 FortisBC states that in reference to a list of HAN alternatives, including LonWorks that: "*None of the alternative protocols listed this question are available in Measurement Canada-certified meters.*"[69]

1.20.1 Please discuss any significant differences in Smart Meters approved for the United States and for Canada. How long does it typically take for a meter certified in the US to be certified by Measurement Canada?

1.20.2 Please list the number and suppliers of Measurement Canada certified meters with ZigBee versions 1.0.

1.20.3 Please list the number and suppliers of Measurement Canada certified meters with ZigBee versions 1.1.

1.20.4 Please list the number and suppliers of Measurement Canada certified meters with ZigBee versions 2.0.

Topic: Collaboration Between FortisBC and BC Hydro

1.21 FortisBC discusses its collaboration with BC Hydro in various places in the application. In Section 8.2, FortisBC states:

"*As part of the Company's AMI Project, FortisBC, FortisBC Energy (FEI) and BC Hydro initiated a process to review the opportunities and benefits of collaboration and coordination on Smart Meter (AMI) projects.*"[70]

1.21.1 Noting that this FortisBC AMI application followed BC Hydro's SMI Project, please discuss any improvements or changes that FortisBC made to its AMI project as a result of BC Hydro's experience with SMI.

1.21.2 FortisBC states that "*BC Hydro, FEI and FortisBC will continue to work together to ensure that in-home display devices will work for any of the three utilities.*"[71] Does this mean that all three utilities will have meters that will use ZigBee Smart Energy Profile V1.1 and Smart Energy Profile V2.0? If not, please explain.

1.21.3 Please describe the differences between the BC Hydro and FortisBC smart meters.

Topic: Delay for SEP 2.0 Completion

1.22 Commentator Jeff St. John states that: "*big utilities like California's Pacific Gas & Electric insist they want to wait until SEP2.0 is commercially available*

[69] Exhibit B-6, BCUC IR #30.2, Page 48, Lines 10-22
[70] Exhibit B-1, Section 8.2, Page 127, Line 1 to Page 129 Line 3
[71] Exhibit B-1, Section 8.2.3, Page 128, Lines 8-10

before they go full-bore into connecting smart meters to home area networks."[72]

1.22.1 In FortisBC's view is Mr. St. John's statement accurate?

1.22.2 Please discuss the advantages, disadvantages and consequences if the FortisBC AMI project was delayed until SEP2.0 was commercially available.

1.22.3 Please discuss the advantages, disadvantages and consequences if the FortisBC AMI project was redesigned to support only SEP2.0 and not SEP 1.1.

1.22.4 Please discuss the advantages, disadvantages and consequences if the FortisBC AMI project was redesigned to utilize other HAN solutions.

1.22.5 Mr. John states that "*some in the smart grid industry are worried that today's SEP1.x systems will have trouble upgrading to SE 2.0 when it rolls out over the next couple of years.*"[73] Does FortisBC share that view? Please explain what FortisBC is doing to overcome the potential concerns in the industry.

Topic: Pilot Testing

1.23 Does FortisBC plan pilot testing, such as BC Hydro's Conservation Research Initiative (CRI) pilots[74], for any part of the FortisBC AMI system? Please describe in detail.

Topic: ZigBee Performance and Sealing of Meters

1.24 FortisBC states that the meters have "*the addition of the ZigBee and LAN communications radios sealed inside the meter.*"[75]

1.24.1 Please describe the upgrade process across the FortisBC AMI system if a new version of ZigBee requires the ZigBee radio hardware to be upgraded.

1.24.2 Please describe the minimum and maximum distances for the ZigBee signals under a range of conditions, including walls and floors.

1.24.3 How do ZigBee signals perform in apartment or similar situations where there may be longer distances from the meter to the In-Home Display and

[72] "*Smart Grid Standards: SEP 1.0 vs 2.0 vs. the Proprietary Old School*", Jeff St. John, Aug 27, 2012; http://www.greentechmedia.com/articles/read/smart-grid-standards-sep-1.0-vs.-2.0-vs.-the-proprietary-old-school
[73] "*Smart Grid Standards: SEP 1.0 vs 2.0 vs. the Proprietary Old School*", Jeff St. John, Aug 27, 2012; http://www.greentechmedia.com/articles/read/smart-grid-standards-sep-1.0-vs.-2.0-vs.-the-proprietary-old-school
[74] Exhibit B-1, BC Hydro Smart Meter Business Case, Appendix C-4, Page 25 and 26
[75] Exhibit B-1, Section 4.1.2, Page 46, Lines 10-11

where there may be several walls or floors? Also, please describe how ZigBee performs in rural situations where the meter may be a significant distance from the premises or where there may be obstructions such as trees and hills?

1.24.3.1 Are repeaters anticipated, and if so do they need to be powered?

1.24.3.2 Does FortisBC guarantee a HAN signal all the way to inside the premises? If so, how is this determined or specified? What happens for sporadic errors? If not, who is responsible to get the signal from the meter to the premises and who pays if extra costs are incurred?

1.24.3.3 Are other communication methods than ZigBee anticipated for the Meter to In-Home Displays for difficult situations? If so, please explain. Is powerline communications being considered?

Topic: WAN

1.25 FortisBC states that for its WAN[76] it will use an "*optimal combination*"[77] of WAN technologies.

1.25.1 FortisBC estimates 136 collector locations to be used. What level of confidence does FortisBC have on this number? What are the factors which might change this number?

1.25.2 If more collector locations or routers are required, or more expensive WAN techniques are needed, please describe how the extra costs will be handled. Does the budget include a contingency for such an eventuality?

1.25.3 Please describe the over system performance in terms of characteristics such as speed, bandwidth, end-to-end latency, and reliability and how the use of different WAN technologies can affect that performance. Please also describe peak situations such as outages.

Topic: IPv6 Stack

1.26 FortisBC states that for the LAN, *"the network will use an IPv6 stack."*[78] It is noted that FortisBC discussed IPV6 only within the section on Local Area Network. Please discuss the plans of FortisBC for IPV6 throughout all areas of the proposed AMI system.

[76] Exhibit B-1, Section 4.1.3, Page 46, Line 21 to Page 49, Line 10
[77] Exhibit B-1, Section 4.1.3, Page 46, Line 27
[78] Exhibit B-1, Section 4.1.2, Page 45, Line 30

Topic: PLC Alternative

1.27 FortisBC considered a number of project alternatives[79] to the FortisBC proposed system including status quo, AMR and Power Line Carrier (PLC). An Itron system PLC system was used for comparative purposes[80]. A range of BCUC IRs regarding the PLC system, including detailed pricing[81] were answered by FortisBC[82].

1.27.1.1 Please confirm that all comparison features and pricing for the PLC systems were based on one PLC system, the Itron system. If not, please explain.

1.27.1.2 Please describe the PLC technology used for the Itron system, including its advantages and disadvantages. Please provide references for installations throughout North America.

1.27.1.3 Would FortisBC agree that there is a wide variety of PLC systems in use, with a range of features and pricing; and that the Itron system is only one of those PLC systems. Please describe and compare other types of PLC systems.

Topic: Hybrid Systems

1.28 FortisBC states "*On a net present value basis, FortisBC determined the cost of implementing a 100 percent PLC AMI solution in the FortisBC service territory would not be cost competitive relative to the proposed AMI project. Given the cost comparison, the 100 percent PLC option was eliminated from further consideration.*"[83]

In answer to a BCUC IR about hybrid systems, FortisBC states: "*FortisBC assumed vendors would propose hybrid alternatives in optimizing their responses to the RFP.*"[84]

1.28.1 Please comment on the viability of a hybrid system.

1.28.2 Please provide references to hybrid systems in North America.

1.28.3 As a reason for eliminating the PLC option, FortisBC states that "*it is not consistent with the metering system and services deployed to 1.8 million BC Hydro electricity customers*"[85].

1.28.3.1 Please explain in detail what FortisBC means by "*consistent*".

[79] Exhibit B-1, Section 7.0, Page 105, Line 1 to Page 123 Line 6
[80] Exhibit B-1, Section 7.3, Page 111, Line 22 to Page 115 Line 7
[81] Exhibit B-6, BCUC IR #48, #96 and others
[82] Exhibit B-6
[83] Exhibit B-1, Section 7.3, Page 114, Line 13 to Page 115, Line 2
[84] Exhibit B-6, BCUC IR #106.1, Page 246, Lines 1-18
[85] Exhibit B-1, Section 7.3, Page 115, Lines 4-5

1.28.3.2 Does FortisBC believe it is restricted in its metering system and services because of the selection by BC Hydro?

1.28.3.3 Does FortisBC believe that it cannot choose a PLC system because BC Hydro chose an RF system?

Topic: Support for Gas and Water Meters

1.29 In this present AMI application, FortisBC notes that:

> "*Further, the AMI system proposed is capable of supporting gas and water meters within the Company's service area, which may create revenue opportunities for the utility and its customers in the future as explained in section 8.3"* [86]

1.29.1 Please describe at a high level what plans FortisBC has to integrated gas and water meter reading with the AMI system, any discussions Fortis has had with gas and water utilities in this regard and relevant time-lines.

1.29.2 Within the referenced section 8.3[87] of Exhibit B-1, it was not clear how the benefits would transfer to the customers. Please clarify and expand on how the proposed FortisBC implementation for the present AMI application will be "*to the benefit the utility customers within the FortisBC franchise and the broader public interest across the Province.*"[88]

30.0 Topic: Theft reduction
Reference: Exhibit B-1, section 5.3 Financial benefits; Exhibit B-6, Table BCUC IR1 Q15.1 – Ranking of Customer Benefits, pdf p.30 of 519

Table BCUC IR1 Q15.1 – Ranking of Customer Benefits has a note stating "NPV of avoided capital costs, not NPV of revenue requirement."

30.1 Please explain what "NPV of avoided capital costs, not NPV of revenue requirement" means in this context.

31.0 Topic: Theft Reduction

Reference: Exhibit B-1, section 5.3.2, page 88: "Based on the data supplied by the feeder meters, AMI connected transformer meters can be strategically deployed downstream to effectively balance the energy inventory in targeted areas of the feeder."

31.1 Please provide a diagram showing feeder, transformer, portable wireless meters and in-home meters, showing how they would be deployed in a typical situation.

[86] Exhibit B-1, Section 4.1, Page 42, Lines 2-5
[87] Exhibit B-1, Section 8.3, Page 130, Lines 4-25
[88] Order G-168-08, Section 4.5, page 15, last paragraph.

31.2 Are the feeder meters and AMI-connected transformer meters typically permanently installed?

31.3 Is the detection of theft the only purpose of energy balancing in this context?

32.0 Topic: Theft Reduction

Reference: Exhibit B-6, response to BCUC IR 87.2, lines 24-25: "Easton reports that 13 percent of operators detected by the police in BC faced criminal charges compared to 60 percent in the rest of the country."

32.1 Please discuss the implications to the NPV of the AMI program if the rate of charges brought against detected operators in BC were to approach the 60% average of the rest of the country within, say, ten years.

33.0 Topic: Theft detection

Reference: Exhibit B-1, section 5.3.2, page 83, lines 19-20: "… the current deterrence benefit will drop from 75 percent in 2012 to 70 percent by 2017."; Tables 5.3.2.b and 5.3.2.c; page 84, line 6; page 89, line 11.

33.1 Please describe how Fortis determined the numeric values for the deterrence benefits.

33.2 How does Fortis evaluate the probabilities for the values it uses for deterrence benefits?

34.0 Topic: Theft detection

Reference: Exhibit B-1, section 5.3.2, pages 84 and 86, Tables 5.3.2.b and 5.3.2.c

34.1 For clarity, does "deterrence" in this context mean that the parties in question have chosen to pay for the electricity they consume, rather than stealing it, i.e. as opposed to being deterred from illegally growing marijuana?

34.2 Please confirm that "Total sites" means the total of sites in the Fortis service area that are estimated to have grow-ops.

34.3 Please confirm that "Total paying sites" means the number of grow-op sites in the Fortis service area that are estimated, based on the estimated "deterrence" ratio, to pay for their electricity, rather than stealing it.

34.4 Please confirm that "Total theft sites" means the number of grow-op sites in the Fortis service area that are estimated, based on the estimated "deterrence" ration, to steal all (or most of) the electricity they use.

34.5 Please provide the calculation used to derive the "NPV of Net Benefit" figure at the bottom of each table.

34.6 Please provide the calculation for "Recovered revenue from theft identification."

35.0 Topic: Theft detection: alternative energy sources

Reference: Exhibit B-1, section 5.3.2, page 83, lines 30-32; "It is expected that with an AMI-enabled theft detection program, marijuana grow operators may choose to switch to alternate energy sources rather than pay for electricity."; and Exhibit B-6, response to BCUC IR 87.2.5; Exhibit B-1, section 3.2.5, page 38, Reduced GHG Emissions.

35.1 Please confirm that the "alternative energy sources" Fortis expects grow operators to switch to are fossil fuel powered generators. If not, please explain and discuss.

35.2 For each year of the AMI program life, please provide Fortis's estimate of the quantity of greenhouse gas emissions that would result from the use of alternative energy sources.

35.3 Has Fortis factored greenhouse gas emissions from alternative energy sources used by grow operators into its estimate of the greenhouse gas emissions effects of the AMI program?

36.0 Topic: Meter technology upgrades
Reference: Exhibit B-6, BCUC IR 1.2

"...Itron CENTRON OpenWay meters are designed to have a service life of 20 years."

36.1 Does FBC agree that smart meter software expectations and opportunities will evolve significantly over the 20-year design service life of the proposed meters?

36.2 Is the software in the proposed Itron CENTRON OpenWay meters capable of being updated remotely, i.e., without opening the meters?

37.0 Topic: Tracking original meter manufacturing dates
Reference: Exhibit B-6, BCUC IR 6.2; BCUC IR 6.3

FBC does not track original meter manufacturing dates for its meter population therefore the average age of the approximately 80,000 mechanical meters [IR 6.2] and 35,000 digital meters [IR 6.3] is not available.

37.1 Does FBC intend to track original meter manufacturing dates and internal hardware and software versions for the proposed smart meters?

37.2 If not, will FBC be able to implement batch software updates?

38.0 Topic: Net metering
Reference: Exhibit B-1, Table 4.2.a - Business Use Cases for Advanced Metering System, C2 Customer billed on net metering tariff; Exhibit B-6, BCUC IR 18.3

BCUC IR 18.3 "Do the residential advanced meters proposed by FortisBC have the ability to meter both import and export power? If yes, what is the incremental cost of including this functionality within each meter? If no, please explain why not.
Response:
Yes, all Itron OpenWay meters are equipped with net metering capabilities at no additional cost."

38.1 With the AMI in place, will net metering customers be able to see both production (as well as consumption) of electricity and the corresponding credit (as well as charge) on the Customer Information Portal? On an In-Home Device?

39.0 Topic: Future benefits
Reference: Exhibit B-1, section 6.0 Future Benefits; Table 5.3.2b Probable AMI Forecast

Table 5.3.2b Probable AMI Forecast shows a "Marginal Revenue Margin" of $65.35/MWh for 2012, and escalating annually to 2016. Section 6 Future Benefits discusses several types of future benefits enabled by the AMI Project, including Distribution Loss Reduction, Power Grid Voltage Optimization, Outage Management, Customer Pre-Pay Tariff, Future Conservation Rate Structures. These are "subject to potential additional capital expenditure." [p.97]

39.1 Is FortisBC's substantial positive Marginal Revenue Margin an impediment to future implementation of future benefits of the AMI Project discussed in section 6?

40.0 Topic: Weather information on IHD
Reference: Exhibit B-6, BCUC IR 8.1.2

"The Itron Customer Care applications, that form part of the AMI project, trend temperature delivered from a variety of weather feeds against meter data. FortisBC intends to subscribe to live hourly weather feeds at several locations throughout its service territory at a cost of less than $3,000 annually in order to provide this information to customers."

40.1 Will customers who access electricity consumption information through an In Home Display (IHD), as distinct from the Customer Internet Portal (CIP), be able to see consumption data displayed with the weather data, as on the CIP?

41.0 Topic: Smart Grid
Reference: Exhibit B-6, Table BCUC IR1 Q12.3 – Smart Grid Vision.

41.1 Please add a column to Table BCUC IR1 Q12.3 indicating what if any changes would be required to implement each component, such as

hardware in meter, firmware update in meter, communications infrastructure upgrade, MDMS system upgrade, or other.

42.0 Topic: Conservation benefits
Reference: Exhibit B-1, section 3.2.5 Non-financial customer service and operational benefits; Exhibit B-6, Table BCUC IR Q16.1 Residential CIP Savings.

"...By its design, the RIB rate only results in bill reductions for customers that are able to reduce their overall consumption. The availability of information to customers regarding their level of consumption in relation to the RIB threshold in any particular billing period will be enhanced by AMI." [p.31]

Table BCUC IR Q16.1 shows corrected customer information portal savings, by year, and the dollar value of each.

42.1 Are the figures in Table BCUC IR Q16.1 based on the Forecast Adoption Rate for CIP shown in BCUC IR 8.2? Please describe the source and assumptions behind the data.

42.2 Please provide a table similar to Table BCUC IR Q16.1 showing electricity and cost savings attributable to In-Home Displays.

43.0 Topic: Conservation Benefits

Reference: Exhibit B-1, section 3.2.1, page 19, lines 20-21: "This information will help customers make decisions regarding their energy consumption relative to their personal needs."

43.1 What energy conservation savings does Fortis believe are achievable through the provision of in-home energy consumption information? Would the savings be predominantly behavioural? Please discuss.

43.2 Has Fortis researched the experience of other jurisdictions in this regard? What did it find?

43.3 Does Fortis plan any programs to engage its customers in energy conservation supported by the use of in-home energy consumption information?

44.0 Topic: Conservation Benefits

Reference: Exhibit B-1, section 6.5.

44.1 Please confirm that Fortis does not rely on the cost savings from any conservation measures in its business case for the AMI program.

44.2 Does Fortis believe that time-of-use rates, critical peak pricing and pre-payment are the only energy conservation measures that would be supported or enabled by the AMI program? Please discuss.

44.3 Please discuss the proposition that time-of-use pricing and critical peak pricing mainly shift load, rather than reducing it. Please confirm that the savings shown in Table 6.5.a are intended to represent genuine savings of energy, i.e. as opposed to shifted loads. Please discuss how these estimates were derived.

44.4 Please discuss the commitment for "submission of a regulatory application in 2016 or later." Would Fortis be willing to commit to an earlier time-line? Why or why not?

44.5 How does the 2016 date relate to Fortis's long-term energy planning work and its regulatory filings of long-term resource plans, DSM expenditure schedules and other filings?

44.6 How does the AMI program relate to Fortis's existing energy conservation and efficiency programs and plans?

44.7 Would the AMI program help or enable the integration of energy efficiency and conservation programs between Fortis's gas and electricity services? Please discuss.

45.0 Topic: In-Home Display and Customer Information Portal
Reference: Exhibit B-6, BCUC IR 8.2

"FortisBC has rated customer demand for IHD and portal features on a scale of 1 to 10 based on the forecast adoption rates.

IHD/Portal Feature	Forecast Adoption Rate	Demand (1-low, 10-high)
Pre-pay	3-8%	1
In-home display (purchased by customer with PowerSense incentive)	30%	3
Use of customer portal to monitor consumption	15%	2

45.1 What is the source of the data in BCUC IR 8.2? Please provide a copy of the applicable report.

45.2 How does the data in this table compare to the results found by other utilities?

45.3 What is the definition of "Forecast Adoption Rate"?

45.4 In BCUC IR 30.3, FortisBC says "30 percent penetration of IHDs is expected to occur between 2015 and 2020 (assuming BCUC approval of the AMI Project is received by July 20, 2013)." Does that apply to the data in the table in BCUC IR 8.2?

45.5 Is the figure of 15% for Forecast Adoption Rate for Use of CIP to monitor consumption also based on the same time period of 2015 to 2020?

46.0 Topic: In-Home Display and Customer Information Portal
Reference: Exhibit B-1, section 4.1.1 Home-Area Network

46.1 Please provide a table comparing the features available on the In-Home Display and Customer Internet Portal, such as the lag time, the granularity of consumption information (how frequently it is updated), ambient temperature, etc.

46.2 To clarify, if the smart meter provides hourly data to the head end confirm that the maximum granularity that the CIS can provide is hourly data. If not, please explain.

46.3 Can the smart meter provide sub-hourly data to an IHD even though it is providing hourly data to the head end? What granularity?

47.0 Topic: In-Home Display
Reference: Exhibit B-6, BCUC IR 28

"Preliminary research indicated a price range of $80-$150 per In-Home Display (IHD) device. The approved 2012-13 DSM Plan includes a nominal $50 incentive or up to half the cost, of eligible IHDs. The net Customer Portion of Cost would be $40-$100 of the price range indicated above."

"The IHD devices will be piloted in 2014, with availability to customers expected in 2015."

47.1 Are the In-Home Display units (suitable for the smart meters FortisBC proposes to install) currently available? If so, please provide product information. If not, when will they be available?

47.2 Are the IHD devices that will be piloted in 2014 unique to FBC's AMI system?

47.3 Will In Home Display units be certified, and if so by what body?

48.0 Topic: GHG emission reductions
Reference: Exhibit B-1, p.2; p.20; p.38

"The BC Government is committed to reducing GHG emissions by one-third, as compared to 2007 levels, by 2020. The proposed AMI Project supports the GGRTA through the reductions in the manual meter reading function (and associated vehicle usage). This reduction is expected to contribute to a decrease in GHG emissions (currently estimated at 191 tonnes per year) associated with the existing manual meter reading function." [p.20]

48.1 Is the GHG emissions reduction estimate based on GHGenius? If not, please provide an estimate using GHGenius v.4.0.

48.2 Please provide an estimate of the cumulative GHG emissions reductions over the project lifetime.

48.3 Please confirm that induced GHG emissions is factored into the calculation of GHG emissions reductions, such as increased fossil fuel energy use by marijuana grow-ops that are induced by theft detection to move away from electricity use.

49.0 Topic: Safety and meter installation
Reference: Exhibit B-6, BCUC IR 27.1.1

"Itron OpenWay meters are capable of reporting temperature conditions from the meter over the network. Itron is currently making necessary enhancements to the HES to receive temperature data from the meter. If overheating is detected, the system will be able to remotely disconnect the meter and service. FortisBC expects this functionality to be enabled (at no additional cost) prior to meter deployment."

49.1 If 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?

50.0 Topic: Privacy
Reference: Exhibit B-1, section 8.4.4 Privacy; Exhibit B-9 Supplemental Privacy Information; Exhibit B-9 Attachment 1, Investigation Report F11-03, British Columbia Hydro And Power Authority. Information and Privacy Commissioner, December 19, 2011

The B.C. Information and Privacy Commissioner issued Investigative Report F11-03 concerning BC Hydro's Smart Meter and Infrastructure Initiative (SMI) under the *Freedom of Information and Protection of Privacy Act* ("FIPPA").

"...However, the Commissioner found that BC Hydro is not complying with the requirement to notify customers of the purposes for collecting the personal information in relation to the SMI project, the legal authority for the collection, and providing the contact information for a person within BC Hydro who can answer questions regarding the collection." (at para. 7). The report made a series of recommendations to address these concerns, but overall, did not object to the implementation of smart meters. For reference, a copy of the report prepared by the Office of the Information and Privacy Commissioner is provided as Attachment 1 to this letter."

50.1 Does FortisBC assert that its implementation of its proposed AMI program will meet all of the privacy recommendations that the Information and Privacy Commissioner made to BC Hydro regarding BC Hydro's SMI program?

50.2 Please provide a table showing the Information and Privacy Commissioner's 14 recommendations to BC Hydro regarding privacy aspects of BC Hydro's SMI program and the corresponding measures FortisBC is or will take regarding its AMI program.

50.3 Please discuss any privacy concerns and requirements to inform customers regarding the use of customer information to detect electricity theft.

51.0 Topic: Privacy
Reference: Exhibit B-9

The Ontario Information and Privacy Commissioner published "Privacy by Design:Achieving the Gold Standardin Data Protection for the Smart Grid, June 2010,"("Privacy by Design"), available at http://www.ipc.on.ca/images/Resources/achieve-goldstnd.pdf. The document is apparently the joint product of the Information and Privacy Commissioner of Ontario, Hydro One Inc. and Toronto Hydro. The executive summary states:

> *"Privacy by Design* (the Gold Standard for data protection), is *the* standard to be adopted for Smart Grid implementation for data protection."

51.1 Is FortisBC familiar with *Privacy by Design*? Please file a copy.

51.2 *Privacy by Design* sets out seven "best practices." Please provide a table listing these best practices and indicate whether and how FortisBC's AMI program will meet each one.

52.0 Topic: Privacy
Reference: Exhibit B-9, Attachment 2, FortisBC Privacy Policy, pdf p.41 of 46

"FortisBC has a privacy policy in place and an updated privacy policy coming into effect on November 1, 2012 that protects personal information in accordance with PIPA." [p.2, underline added]

"This Privacy Policy was last updated in July of 2012."

52.1 Please explain why FortisBC's Privacy Policy was last updated July 2012 but is not in effect until November 1, 2012.

53.0 Topic: Information security
Reference: Exhibit B-1, section 8.4.3 Security

"FortisBC's objective is to follow the security specifications set out in the AMI-SECAMI System Security Requirements, provided as Appendix F-1." [p.135, footnote omitted]

53.1 How does the information security design for the FortisBC AMI program compare with the information security design for BC Hydro's SMI program? Are there any significant differences? If so, please explain.

54.0 Topic: Health
Reference: Exhibit B-1, Appendix C-5, Status of Research on Radiofrequency Exposure and Health in Relation to Advanced Metering Infrastructure ("RF Health Report"), pdf p.521

54.1 Who are the individual authors of the RF Health report, and what are their qualifications?

54.2 Has Exponent, Inc. provided reports on radiofrequency exposure and health in relation to advanced metering infrastructure for clients other than FBC? If so, please provide the number of such reports by year.

54.3 Please provide a copy of any other report by Exponent on RF exposure and health in relation to the Itron AMI7 meter.

55.0 Topic: Health
Reference: Exhibit B-1, Appendix C-5, Status of Research on Radiofrequency Exposure and Health in Relation to Advanced Metering Infrastructure, (Sub-)Appendix A, Technical Memorandum, Advanced Metering Infrastructure Exposure Assessment, p.A-2 (pdf p.564 of 747)

"In the 900 MHz band, the signal power from the Itron AMI7 meter (FCC ID SK9AMI7) is 689 milliwatts (mW) for an antenna gain of 1.66. Under typical use, the duty cycle is between 0.02% and 0.58% with a mean of 0.06%. The maximum duty cycle under all circumstances is 5%.20" [underline added]

55.1 Please confirm that the Itron AMI7 meter (FCC ID SK9AMI7) is the model of advanced meter in FBC's AMI Project. If not, please explain.

55.2 Please confirm that the characteristics of the Itron AMI7 meter described in the passage quoted above accurately describe the characteristics of the advanced meters in the configuration and usage that FBC proposes in the AMI Project.

55.3 Please describe the term "duty cycle" in this context.

55.4 What does a duty cycle "between 0.02% and 0.58% with a mean of 0.06%" and a maximum of "5%" mean in terms of seconds or minutes per hour or per day?

55.4.1 Does this duty cycle include all data from the meter, including data for supporting the mesh network and other network traffic?

55.5 Please explain why the duty cycle is given as a range. Does the duty cycle range apply to each specific installed meter, or to the fleet of meters? Will some installed meters be at the low end of the range while others are at the high end of the range? What factors determine the length of the duty cycle for a particular meter; for the fleet of meters?

55.6 In what circumstances does the maximum duty cycle of 5% occur? Would this occur with a specific installed meter, or with the fleet of meters? How frequently does the maximum duty cycle of 5% occur?

55.7 Please define the mean duty cycle. Is it a weighted average? Does the mean duty cycle of 0.06% include the expected occurrences of the maximum duty cycle?

55.8 Please provide a copy of "Analysis of Radio Frequency Exposure Associated with Itron OpenWay® Communications Equipment" by Itron, Inc. and "Wireless Transmissions: An Examination of OpenWay Smart

Meter Transmissions in a 24-Hour Duty Cycle" by Itron. Inc., cited in footnote 20.

56.0 Topic: Health
Reference: Exhibit B-1, Appendix C-5, Status of Research on Radiofrequency Exposure and Health in Relation to Advanced Metering Infrastructure, (Sub-)Appendix A, Technical Memorandum, Advanced Metering Infrastructure Exposure Assessment, p.A-1, p.A-2

"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."[p.A-1]

Table 1. RF Exposure at 902 MHz to 928 MHz

Condition	Exposure at 0.5 meters (mW/cm^2)
Mean duty cycle 0.08%	0.000056
Maximum typical duty cycle 0.58%	0.00054
Maximum supported duty cycle 5%	0.0047
Exposure Limit 902 MHz [21]	0.6

[p.A-2]

56.1 Please show the calculation of the Exposure Limit for the RF-LAN, with references from Health Canada Safety Code 6 (2009).

57.0 Topic: Health
Reference: Exhibit B-1, Appendix C-5, Status of Research on Radiofrequency Exposure and Health in Relation to Advanced Metering Infrastructure, (Sub-)Appendix A, Technical Memorandum, Advanced Metering Infrastructure Exposure Assessment, p.A-1

"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."

57.1 Does the ZigBee radio operate (in terms of emitting RF) even if the customer does not choose to install an In-Home Device?

57.2 If so, is there some way that the customer, or FBC at the customer's request, can turn off the ZigBee radio in a specific installed meter?

58.0 Topic: Health
Reference: Exhibit B-1, Appendix C-5, Status of Research on Radiofrequency Exposure and Health in Relation to Advanced Metering Infrastructure, (Sub-)Appendix A, Technical Memorandum, Advanced Metering Infrastructure Exposure Assessment, p.A-3

Table 2. RF Exposure at 2,400MHz

Condition	Exposure at 0.5 meters (mW/cm^2)
Duty cycle 1%	0.00013
Exposure Limit at 2400 MHz	1

58.1 Please show the calculation of the Exposure Limit for the ZigBee radio, with references from Health Canada Safety Code 6 (2009).

58.2 What does a duty cycle of 1% for the ZigBee radio mean in terms of seconds or minutes per hour or per day?

58.3 What is the output level of the ZigBee and does it adjust according to the strength required?

59.0 Topic: Health
Reference: Exhibit B-1, Appendix C-5, Status of Research on Radiofrequency Exposure and Health in Relation to Advanced Metering Infrastructure, (Sub-)Appendix A, Technical Memorandum, Advanced Metering Infrastructure Exposure Assessment, p.A-2

"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."

59.1 The RF exposure estimates in Appendix C-5, Appendix A for RF-LAN and ZigBee are formula-based. Please provide information that confirms or modifies these estimates on an empirical basis (i.e., on-site measurements).

59.2 If a customer was particularly interested in reducing the RF signal within the premises, would placing a dense barrier of some type on the inside wall opposite the meter further reduce the RF signal?

60.0 Topic: Health
Reference: Exhibit B-1, Appendix C-5, Status of Research on Radiofrequency Exposure and Health in Relation to Advanced Metering Infrastructure, (Sub-)Appendix A, Technical Memorandum, Advanced Metering Infrastructure Exposure Assessment

60.1 Appendix A provides RF exposure data for the Itron advanced meters that FBC proposes in this application. How does the RF exposure from these Itron meters compare to the RF exposure from the types of meters in the

RFP proposals that were not accepted by FBC? Please provide a table comparing the WAN and LAN RF exposure of the various types of meters in the proposals that FBC considered.

60.2 Is there any significant difference between the RF exposure of the Itron AMI7 meter and any of the other types of meters considered by FBC?

61.0 Topic: Health
Reference: Exhibit B-1, Appendix C-5, Status of Research on Radiofrequency Exposure and Health in Relation to Advanced Metering Infrastructure, (Sub-)Appendix A, Technical Memorandum, Advanced Metering Infrastructure Exposure Assessment, Figure 1, RF Exposure, p.A-4.

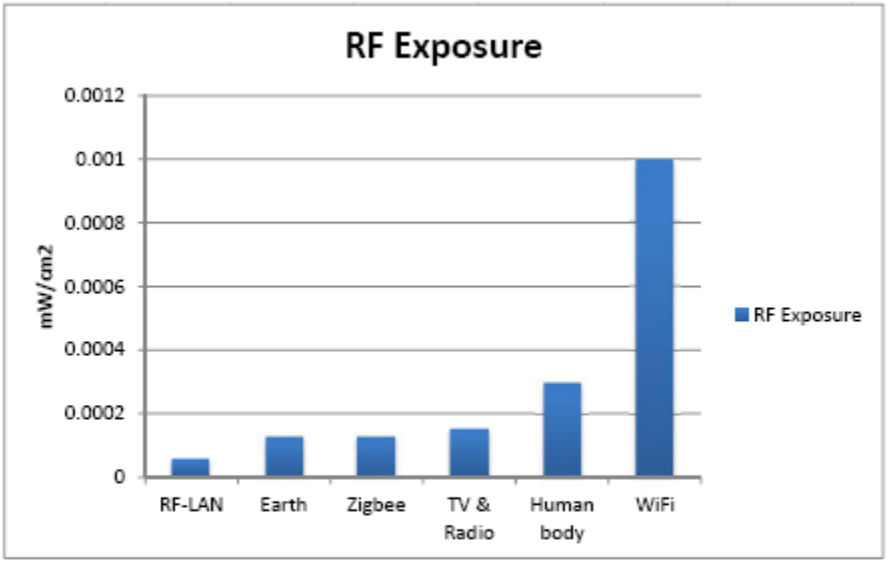

Figure 1. Comparison of RF exposure from RF-Lan and Zigbee signals to RF exposure from other sources under typical use. RF-LAN and Zigbee exposure is for an outside exposure at a distance of 0.5 meters. Exposure at larger distances or inside the residence is much smaller.

"The exposure limit increases with frequency and is equal to 0.62 mW/cm^2 at 928 MHz." [Footnote 21, p.A-2]

61.1 Confirm that the fact that "the [Health Canada] exposure limit increases with frequency" means that RF exposure in mW/cm^2 is less of a potential health consequence at *higher* RF frequencies and more of a potential health consequence at *lower* frequencies.

61.2 Confirm that Figure 1 shows various sources of RF Exposure that are at different frequencies and therefore the potential health consequences of the various sources do not necessarily correspond to the indicated RF Exposure.

61.3 Please provide a table and graph showing the various sources of RF Exposure as a ratio of the corresponding exposure limit, and include cell phone exposure referred to on p.A-5.

61.4 What do the authors intend to convey by showing RF Exposure from "Earth" and "Human Body" at levels equal to or higher than RF Exposure from RF-Lan and ZigBee? Is the implication that RF Exposure from RF-Lan and ZigBee are at levels lower than natural background levels?

61.5 Please discuss how the RF exposure of RF-Lan in the 902-928 MHz range and ZigBee in the 2400-2482 MHz range compare with exposure at similar distances to the electric and magnetic fieldsof electric current at 60 Hz at the customer meter.

62.0 Topic: Health
Reference: Exhibit B-1, Appendix C-5, Status of Research on Radiofrequency Exposure and Health in Relation to Advanced Metering Infrastructure, 6. Conclusion, p.30 [pdf p.555 of 747]

"The advanced meters utilized by FortisBC will operate in compliance with the regulations of Health Canada. Exposure to RF energy will be far below the exposure limits recommended by Health Canada, and those of ICNIRP and other scientific and regulatory agencies. In this report, recent scientific research regarding cancer and symptoms has been summarized to determine whether it might suggest adverse effects at levels below exposure limits recommended by these organizations. The reviews and the recently published research with improved exposure information do not provide a reliable scientific basis to conclude that the operation of the advanced meters will cause or contribute to adverse health effects or physical symptoms in the population."

62.1 The RF Health Report's conclusions are stated with reference to the Itron AMI7 meters proposed by FBC. Would the conclusions of the authors of the RF Health Report quoted above be any different in reference to any of the other types of advanced meters considered by FBC?

63.0 Topic: Health
Reference: Exhibit B-1, Appendix B-6, Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3 kHz to 300 GHz (Health Canada Safety Code 6 (2009)), p.11

"The scientific literature with respect to possible biological effects of RF energy has been monitored by Health Canada scientists on an ongoing basis since the last version of Safety Code 6 was published in 1999. During this time, a significant number of new studies have evaluated the potential for acute and chronic RF energy exposures to elicit possible effects on a wide range of biological endpoints including: human cancers (epidemiology); rodent lifetime mortality; tumor initiation, promotion and co-promotion; mutagenicity and DNA damage; EEG activity; memory, behaviour and cognitive functions; gene and protein expression; cardiovascular function; immune response; reproductive outcomes; and <u>perceived electromagnetic hypersensitivity</u> (EHS) among others. Numerous authoritative reviews have summarized this literature(13–30)."[p.11 of 30]

63.1 Does Health Canada deny the existence or validity of perceived electromagnetic hypersensitivity?

64.0 Topic: Health
Reference: Exhibit B-1, Appendix B-6, Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3 kHz to 300 GHz (Health Canada Safety Code 6 (2009)), p.11

"Despite the advent of thousands of additional research studies on RF energy and health, the predominant adverse health effects associated with RF energy exposures in the frequency range from 3 kHz to 300 GHz still relate to the occurrence of tissue heating and excitable tissue stimulation from short-term (acute) exposures. 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."

64.1 Can it be said that Health Canada Safety Code 6 is intended to protect only against thermal consequences of RF exposure? Or is Health Canada Safety Code 6 intended to protect against any levels of RF exposure?

65.0 Topic: Health
Reference: Exhibit B-1, Appendix B-6, Health Canada Safety Code 6 (2009)

"Proposed effects from RF energy exposures in the frequency range between 100 kHz and 300 GHz, at levels below the threshold to produce thermal effects, have been reviewed. At present, these effects have not been scientifically established, nor are their implications for human health sufficiently well understood. Additionally, a lack of evidence of causality, biological plausibility and reproducibility greatly weaken the support for the hypothesis for such effects. Thus, these proposed outcomes do not provide a credible foundation for making science-based recommendations for limiting human exposures to low-intensity RF energy." [p.11 of 30]

65.1 Does this mean that Health Canada considers human exposure to RF energy at levels below those specified in Safety Code 6 to be acceptable?

66.0 Topic: Health
Reference: Exhibit B-1, Appendix B-6, Health Canada Safety Code 6 (2009)

"For <u>frequencies from 100 kHz to 300 GHz</u>, 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 ~1.0 ^{o}C, at a whole-body average SAR of ~4 W/kg(7–9). 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. A safety margin of 50 has been incorporated for exposures in uncontrolled environments to protect the general public, resulting in a whole-body average SAR limit of 0.08 W/kg. [p.11 of 30, underline added]

"**controlled environment** – A condition or area where exposure is incurred by persons who are aware of the potential for RF exposure and are cognizant of the

intensity of the RF fields in their environment, where exposures are incurred by persons who are aware of the potential health risks associated with RF exposure and whom [sic] can control their risk using mitigation strategies." [p.24 of 30]

66.1 Please confirm that the proposed Itron AMI7 RF-LAN radio in the 900 MHz band and ZigBee radio in the 2400 MHz band are within the "frequencies from 100 kHz to 300 GHz" range discussed in the Safety Code 6 passage above.

66.2 Please confirm that an advanced meter installed in a customer's premises would be in an "uncontrolled environment" as the term is used in Safety Code 6.

67.0 Topic: Health
Reference: Exhibit B-1, Appendix B-6, Health Canada Safety Code 6 (2009), Table 6. Exposure Limits for Uncontrolled Environments

67.1 Please confirm that Table 6 row 5 (300 – 1500 MHz) is applicable to the Itron AMI7 RF-LAN and row 6 (1500 – 15000 MHz) is applicable to the ZigBee radio.

68.0 Topic: Opt-out provisions
Reference: general

68.1 Has FortisBC considered 'opt-out' provisions for customers who are opposed to having an advanced meter at their premises? If so, what options has FortisBC considered and what were the results? If not, why not?

68.2 If 'opt-out' provisions were to be made available for customers who are opposed to having an advanced meter at their premises, who should pay for any incremental cost – the customer or ratepayers as a whole?

69.0 Topic: Indirect customers
Reference: Exhibit B-6, BCUC IR 6.6; BCUC IR 115.3; Exhibit B-1, Section 8.3, Additional Utilities and Cost Sharing of AMI; Exhibit B-1, Section 9.4 Other BC Utilities

"FortisBC has received correspondence from a representative of BCMEU who has indicated that a majority of the BCMEU members are not interested in the implementation of AMI in their respective service territories. FortisBC notes that Nelson, Grand Forks, and Penticton have already implemented or are in the process of implementing AMR solutions. The City of Kelowna has indicated that if they believe there is merit to move towards an AMI system through some type of partnership/procurement advantage for the City supported by a positive business case, then Kelowna would most likely pursue the installation of AMI for its customers. FortisBC and the City of Kelowna have deferred further discussion of a possible AMI solution for Kelowna pending the outcome of the regulatory process for FortisBC's application." [Exhibit B-1, p.130]

"The 162,000 customer count referenced on page 15 of the Application refers to the total direct and indirect customer count served by FortisBC. For clarity, direct customers (approximately 115,000) are those customers served directly (metered and billed) by FortisBC within its service territory. The remaining approximately 47,000 indirect customers are those customers of the five municipalities (Kelowna, Summerland, Penticton, Grand Forks, Nelson) to which FortisBC provides wholesale service. FortisBC's proposed AMI Project will only impact the metering technology for the Company's direct customers." [BCUC IR 6.6]

69.1 What are the implications for the theft detection function of the AMI system of the fact that 47,000 indirect customers will not get smart meters in the defined proposal?

69.2 FBC notes that BC Hydro's implementation of smart meters within the BC Hydro service territory will tend to motivate operators of grow-ops to relocate to the FBC service territory. Will the combination of BC Hydro's SMI program and FBC's AMI program tend to motivate grow-ops operators to relocate to the five municipalities to which FBC provides wholesale service?

69.3 What is FBC's understanding of how BC Hydro is dealing with the question of whether municipal utilities to which BC Hydro provides wholesale service will implement smart meters within their service areas.

69.3.1 Please describe the content of any discussions FBC has had with BC Hydro on this topic.

69.3.2 Please describe the content of any discussions FBC has had with the B.C. government on this topic.

70.0 Topic: Remote connection, disconnection
Reference: Exhibit D-1

Interested party Christina Postnikoff quotes an organization as stating that:

> "'AMI by itself will not allow for remote disconnections or connections. To do this, FortisBC would have to purchase and install "collars"'..."

70.1 Is it correct that "AMI by itself will not allow for remote disconnections or connections" and that to do this FBC "would have to purchase and install 'collars'"? Please explain.

70.2 Please discuss how the disconnection and reconnection procedures for FortisBC might change with the ability to remote disconnect and reconnect.

70.3 How long does it take to send a remote signal end-to-end (minimum and maximum)?

71.0 Topic: Outage notification
Reference: Exhibit B-6, BCUC IR 17.1

"At this time, FortisBC has not included in the project cost the design to include an email notification system that will advise a customer of an outage for a specific meter. This is a customer benefit that will be considered for implementation in the future. FortisBC intends to allow customers to select the method (if any) by which they wish to be notified of a power outage, including automated e-mail and Short Message Service (text message) notifications. The immediate benefit of Automated Outage Notification is intended to inform FortisBC of the duration of outages, the number and location of outages. This will also aid in identifying specific meters that are still out before a crew leaves an area."

71.1 Will any software or hardware upgrades to the proposed smart meter units be required in order to implement automated customer outage notification to customers?

72.0 Topic: Hourly interval data
Reference: Exhibit B-6 BCUC IR 18.1; BCUC IR 121.1; BCUC IR 35.1

"FortisBC does consider it a requirement of TOU and CPP rates that the AMI meter has hourly interval data availability at minimum." [BCUC IR 18.1]

'"One of the largest drivers of data volumes for a utility is the meter reads from all of the smart meters in its territory. Prior to the implementation of a smart meter, utilities would conduct one meter read a month per meter. With the new smart meters that capture usage data in 15-minute intervals, utilities will collect more than 3,000 meter readings a month for each meter. This translates to terabytes (TB) of data being collected and stored at the customer level. We can expect 300 TB per year of meter data by 2012, according to the FPL Group..." [BCUC IR 121.0, lines 17 – 20]

"FortisBC has provided for the storage, retrieval and archiving of customer metering data for seven years using the most cost effective storage available while preserving reliability and security. Please also refer to the response to BCUC IR1 Q35.1." [BCUC IR 121.1]

"The MDMS is designed to store data from 150,000 AMI metering endpoints. Three years of data will be available for immediate retrieval and four additional years will be archived. For the solution, FortisBC has estimated and accounted for 1.5TB per year of storage." [BCUC IR 35.1]

72.1 Is the <u>hourly</u> interval data built into the proposed smart meter model? Could the data interval be changed (e.g., made more frequent than hourly) in the future? If so, could this be done by an electronic software update or would it require physical changes to the meters?

72.2 How did FBC determine that <u>hourly</u> interval data, as opposed to, say, half-hourly interval data, is a requirement for TOU and CPP rates?

72.3 Is 15-minute interval data standard, or common, for smart meter systems in North America?

72.4 To clarify, can FBC confirm that Table 1 and the quoted text in the preamble to BCUC IR 121.1 is from http://www.elp.com/index/display/article-display/6753277598/articles/utility-automation-engineering-td/volume-16/issue-9/features/addressing-the-big-data-concern-in-the-utilities-sector.html ?

73.0 Topic: Choice of Itron package
Reference: Exhibit B-1, p.125; Exhibit B-6

73.1 Are the Itron Openway meters that FortisBC proposes exactly the same as the Itron Openway meters being installed by BC Hydro? Are the Itron Openway meters that FortisBC proposes in use elsewhere at the present time? Where?

73.2 Is the combination of the Itron Openway meters and the Itron WAN system that FortisBC proposes in use elsewhere at the present time? If so, where?

73.3 Did FortisBC's RFP require that the proposed technology have been in commercial service for some period of time? Please provide details.

73.4 Does FortisBC have evaluation reports on implementation of (a) the Itron Openway meters or (b) the Itron Openway meters and head-end systems? If so, please provide copies, confidentially if necessary.

73.5 What economic life estimate is used for Itron meters used by other utilities?

74.0 Topic: Wireless v. Wired
Reference: Exhibit B-6, BCUC IR 38.2

"Although FortisBC cannot say with certainty that the requirements did not eliminate non-RF communication technologies from being proposed, the Company is confident that the requirements in the RFP were reasonable, prudent and did not needlessly restrict vendor proposals. For example, FortisBC required that proposals should support hourly consumption reads to ensure that time-based rates could be supported. Although older PLC technologies might be challenged to meet this requirement, FortisBC understands that wired technologies exist that are perfectly capable of meeting the requirement."

74.1 Would any of the wired technologies that are capable of meeting the hourly consumption reads requirement be capable of meeting the other requirements of the Request for Proposals?

74.2 When FBC designed and issued the RFP did FBC anticipate that all the proposals would be for wireless systems?

"FortisBC did not specify any particular type of communications technology based on the experience of other Fortis Inc. companies (or any other utilities), including FortisAlberta (which uses PLC) and FortisOntario (which uses RF). This decision was made for two main reasons:

1. AMI communications technologies are continuously evolving, so it was prudent to test the market with business requirements, not technology requirements; and
2. FortisBC AMI requirements are unique to its operating environment."

74.3 When was FortisAlberta's PLC-based metering system selected and implemented? Was the PLC-based system selected from an RFP? If not, what factors caused FortisAlberta to chose PLC system over a wireless metering system? If there was an RFP, did it specify a non-wireless system? Were any wireless systems proposed?

74.4 Please answer the same questions regarding FortisOntario's Radio Frequency-based metering system.

74.5 What did Util-Assist tell FBC about the relative merits, costs and benefits of wired versus wireless metering systems?

74.6 Is FBC aware of any electricity utilities in North America that are currently implementing wired metering systems?

74.7 What is it about FortisBC's operating environment and associated AMI requirements that differs from utilities such as FortisAlberta that have chosen wired metering systems?