David M. Aaron

December 21, 2012

BY EMAIL

BC Utilities Commission
Sixth Floor, 900 Howe Street, Box 250
Vancouver, BC V6Z 2N3

Attention: Erica Hamilton, Commission Secretary

Dear Sirs / Mesdames:

Re: FortisBC Inc. Application for a Certificate of Public Convenience and Necessity for the Advanced Metering Infrastructure Project ~ Project No.3698682

The CSTS Coalition requests the opportunity to put a third round of information requests to Fortis. Subsequent to filing our second round of information requests, we have retained several consultants who are still in the process of reviewing the voluminous material filed to date in these proceedings. Their review of the record is expected to generate further information requests in relation to their various fields of expertise. We believe these information requests will be of assistance to the Commission in resolving the technical issues before it.

Further, if given the opportunity to submit a third round of information requests, we will ask, *inter alia*:

1. With respect to the enclosed paper by Jeff Gilbert on behalf of Itron, how do the emissions from the meters described by Mr. Gilbert in this paper compare to the emissions from the proposed Fortis AMI meters? Will Fortis please provide the same information about the proposed AMI meters as is provided with respect to the meters described by Mr. Gilbert?

2. Will Fortis provide a map showing where the collectors will be placed in each community?

3. We are told there are some graphs showing frequent transient emission spikes in the publication entitled *Understanding Radio frequency and BC Hydro's Smart Meters*. Please provide us with this publication.

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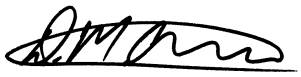
Thank you for considering this request for a third round of information requests.

Please be advised that we intend, within a week, to file an objection to Fortis' confidentiality request contained in Exhibit B-14-1.

Yours truly,



DAVID M. AARON
Encl.

cc: clients
cc: FortisBC Inc.
cc: Interested parties

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Itron, Inc.

Analysis of Biological Hazards from Exposure to Radio Frequency (RF) Radiation

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Overview

This document provides information regarding radio frequency (RF) energy exposure to users of Itron Inc. radio-based meter reading devices (handheld, mobile, and fixed network), as well as transmitters that are associated with electric, gas, and water meters. Each of Itron's products is evaluated for RF safety. RF energy radiated from most Itron products is well below Federal Communication Commission (FCC), Industry Canada (IC), and the Institute of Electrical and Electronic Engineers (IEEE) standards.

Introduction

There is a growing concern worldwide regarding the health effects of exposure to RF energy. The American National Standards Institute (ANSI) updated and published its document *American National Standard Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Field, 300 kHz to 1 GHz* in 1992. The basis for the ANSI standard is the IEEE standard number IEEE C95.1-1991, *IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz*. This standard has since been updated; IEEE C95.1-2005. These are excellent documents for further research on this issue.

The Food and Drug Administration, Center for Devices and Radiological Health, has classified the type of radiation emitted by devices operating in the frequency range of Itron equipment as non-ionizing. This type of radiation is not in the same category as x-rays or nuclear radiation, which may cause genetic damage. Radio emissions at low levels with sporadic duration, such as those produced by Itron equipment, have no known ill effect.

The FCC recently revised a document detailing how to measure or calculate RF levels. The document is titled OET Bulletin 65 Edition 97-01, *Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields*. Calculations provided for Itron devices are based on this document, available from the FCC's web site - http://www.fcc.gov/oet/rfsafety/. Additionally, the FCC released OET Bulletin 65 supplement C Edition 01-01 (OET65C) in June of 2001 which provides further guidance on determining compliance for portable and mobile devices.

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Regulatory Compliance

The FCC has completed a rulemaking entitled *Guidelines for Evaluating the Environmental Effects of Radio Frequency Radiation* (FCC Report and Order, ET Docket 93-62). This document combines standards developed by ANSI and the National Council on Radiation Protection and Measurement (NCRP). The new rules have been incorporated into Title 47 of the Code of Federal Regulations, Parts 1, 2, 15, 24 and 97. These rules dictate the level of compliance necessary in order to meet the new standards. Industry Canada has also published a standard, RSS-102, that addresses RF exposure in Canada. This standard references Safety Code 6 from Health Canada, *Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz*.

The devices Itron manufactures are exempt from routine environmental evaluation due to either their low power or the radio service under which the Itron equipment operates.

Controlled versus Uncontrolled Environments

The revised standards and FCC guidelines define two environments under which exposure to RF energy may occur. Each has a related maximum permissible exposure (MPE) level. These environments are defined in the ANSI document as controlled or uncontrolled. The NCRP names these environments Occupational Exposure or General Public Exposure. The two standards are nearly identical and this report will refer to the ANSI definitions of controlled versus uncontrolled environments.

Controlled environments are locations where there is exposure that may be incurred by persons who are aware of the potential for exposure as a result of employment, by other cognizant persons, or as the incidental result of transient passage through areas where analysis shows the exposure levels may be shown to exceed those of an uncontrolled environment.

Uncontrolled environments are locations where there is the exposure of individuals who have no knowledge or control of their exposure. The exposures may occur in living quarters or workplaces where there are no expectations that exposures may exceed specified levels.

Devices Under Consideration

Currently, Itron markets products for both the US and Canada that operate in three frequency bands. The bands are listed below along with their radio service:

Frequency	Equipment	Radio Service
902-928 MHz	Endpoints, Interrogation Devices, Fixed Network - Unlicensed	FCC Part 15, RSS-210
952-960 MHz	Interrogation Devices, Programming - Licensed	FCC Part101, RSS-119
1427-1432 MHz	Endpoints, Programming, Fixed Network - Licensed	FCC Part 90, RSS-142

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Endpoint products are devices that generally operate at a residence or business location and communicate with the interrogation/reader devices. Itron's line of meter modules falls in this category.
Interrogation & Reader devices gather information from the endpoint devices. Itron produces handheld, vehicle-mounted and pole-mounted devices that encompass this group. Some of these devices transmit a "wake up" signal to interrogate some older endpoints and instruct them to transmit data.

Network Products transmit information from pole-mounted interrogation/reader devices to a network hub so the information can be provided to the final processing location. These devices are either pole-mounted or associated with a commercial or private communications antenna site.

Maximum Permissible Exposure Levels Defined

Each environment has an associated Maximum Permissible Exposure (MPE), based on the frequency band of the transmitting device. The FCC defines the levels by the formulas:

Controlled Environment
Exposure (in mw/cm^2) = Frequency (in MHz)/300

Uncontrolled Environment
Exposure (in mw/cm^2) = Frequency (in MHz)/1500

Using these formulas, the MPE is for each class of Itron device is:

Device Class	Uncontrolled	Controlled
Endpoint (915 MHz)	0.61 mW/cm^2	3.05 mW/cm^2
Interrogation (956 MHz)	0.64 mW/cm^2	3.19 mW/cm^2
Fixed Network (1430 MHz)	0.95 mW/cm^2	4.77 mW/cm^2

RF Emissions Calculations

MPE is calculated using the free-space loss spreading formula generally used to calculate power density (P_D). The P_D is calculated by spreading the radio signal over the area of a sphere, with a radius of D. The standard P_D formula is:

$$P_D = \frac{P \times G}{4 \times \pi \times R^2} \quad \text{or} \quad P_D = \frac{EIRP}{4 \times \pi \times R^2}$$

Where P = Conducted RF Power at the antenna input, in milliwatts.
G = gain of the antenna in numerical form (10^ (dBi / 10)).
R = distance in centimeters (20).
EIRP = effective isotropically radiated power

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Endpoint Devices

Itron's Encoder Receiver Transmitter (ERT) devices encode information from electric, gas and water meters and transmit them to collecting devices. The following P_D is calculated based on the 0.74 mW EIRP of the 41/45-series electric ERT products:

$$P_D = \frac{0.74}{4 \times \pi \times (20^2)} = 0.00015 \text{ mW/cm}^2$$

This calculation is based on 20cm [7.9 inches], which is the absolute minimum separation distance for mobile / portable devices in an uncontrolled environment. The P_D value is negligible compared to the maximum level specified by the FCC (0.61 mW/cm^2) for uncontrolled environments. The P_D for Itron's latest high power endpoint device (100G) is:

$$P_D = \frac{204.17 \times 1.072}{4 \times \pi \times (20^2)} = 0.0435 \text{ mW/cm}^2$$

Once again, the P_D of the 100G is far below the FCC limit.

Meter Based Devices

Itron has two electric meters with integrated radios, the Centron and the Sentinel. MPE requirements for these meters are the same as for Itron's ERT products.

Centron:

$$P_D = \frac{341.2}{4 \times \pi \times (20^2)} = 0.068 \text{ mW/cm}^2$$

Sentinel:

$$P_D = \frac{251.2 \times 1.62}{4 \times \pi \times (20^2)} = 0.081 \text{ mW/cm}^2$$

The P_D for both the Centron and the Sentinel are both well below FCC limits.

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Handheld Interrogation Devices

These devices are the handheld computers that meter readers use to obtain readings from the Itron ERT products. The handheld units transmit a short radio signal burst that wakes up older ERTs and instructs them to transmit their information. The G5R has an EIRP of 407.4 mW and the FC200 has an EIRP of 370.7 mW. The P_D values calculated are below the level specified by FCC for uncontrolled environments (0.61 mW/cm^2):

G5R: $P_D = \frac{407.4}{4 \times \pi \times (20^2)} = 0.081$ mW/cm^2

FC200: $P_D = \frac{370.7}{4 \times \pi \times (20^2)} = 0.074$ mW/cm^2

Mobile Interrogation Devices

The Data Command Unit (DCU), DataPac, Mobile Collector (MC), and the Mobile Collector Lite (MCL) are interrogation devices that operate from a moving vehicle, normally a van or four-wheel drive vehicle such as a pick-up or SUV. They are also the highest power-transmitting devices Itron produces. These devices operate at similar power levels and transmit characteristics, therefore can be considered together in this analysis.

The DCU has been submitted for several tests regarding RF energy based on requests from Itron clients. The most recent study, performed by Itron staff, was conducted in 1993.

The DCU transmitter connects to an antenna on the roof of the van, and therefore the operator is shielded from RF energy by the structure of the van itself. A van roof made of fiberglass would reduce this protection. The test measurements were conducted at several locations around the van while the DCU transmitted. The results are listed below:

Location	P_D in mW/cm^2
Roof Edge above sliding door, next to luggage rack	0.250
Sliding Door Area, probe at waist level	0.100
Driver Seat	0.075
Exterior Front of the Van	0.050

The readings listed above were measured at a distance of greater than 20cm from the source. Since the operator of the interrogation device cannot be within 20cm of the antenna and still be driving the vehicle, exposure at 20cm is highly unlikely.

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Fixed Network Devices

Cell Control Unit

The cell control unit, or CCU, is a wall, tower, or pole-mounted device that collects information from the ERT-equipped meters or repeaters and sends the information through a network to the utility billing center. The CCU is considered an interrogation device when communicating with ERTs and a network device when communicating to higher level network devices. The CCU can be configured to operate in two different frequency bands, 952 – 960 MHz and 1427 – 1432 MHz.

The P_D limit for the 952 - 960 MHz band is 0.64 mW/cm^2. The P_D limit for the 1427 – 1430 MHz band is 0.95 mW/cm^2

952 – 960 MHZ: $P_D = \frac{1611 \times 1.637}{4 \times \pi \times (20^2)}$ = 0.0.0525 mW/cm^2

1427 – 1432 MHz: $P_D = \frac{2670 \times 1.637}{4 \times \pi \times (20^2)}$ = 0.87 mW/cm^2

Once again, the FCC standards are met. Additionally, the exposure distance for the public, with the exception of radio technicians working on or installing the CCU, would be much greater than 20cm. At 3 meters, the P_D is 0.0023 mW/ cm^2 and 0.004 mW/cm^2, which is considerably below the limits. Most CCUs will be mounted 30 to 50 feet above ground, which further reduces the P_D.

Repeaters

Repeaters are necessary when the RF path between the endpoint and the CCU is blocked by buildings, trees, or other obstructions. Repeaters transmit in the 902 – 928 MHz band. The FCC limit is 0.61 mW/cm^2. The repeater's P_D is below the limit.

$P_D = \frac{605.34 \times 3.27}{4 \times \pi \times (20^2)}$ = 0.394 mW/cm^2

Network Control Node

The network control node (NCN) is a device that collects meter readings from the fixed network CCU devices and forwards them to the next level of the network. The NCN is made up of a controlling computer, radio transceiver device and an external antenna. The antenna is normally mounted on a commercial radio site, with the antenna elevated above areas accessible by the general public. Unlike other Itron devices, the radiated radio signal from the NCN depends on the installation and can vary greatly. The length of cable, the type of cable and type of connectors all affect the final effective radiated power. Therefore, the figures used to calculate RF levels from the NCN should be considered typical, but by no means absolute.

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The effective isotropically radiated power of the antenna is calculated using the following assumptions: transmitter output power is 31 dBm, antenna gain is 10 dB and line losses total -2.5 dB. EIRP based on these values is 38.5 dBm, or 7079.5 milliwatts. The P_D at 20cm for this product is:

$$P_D = \frac{7079.5}{4 \times \pi \times (20^2)} = 1.41 \text{ mW/cm}^2$$

While this levels exceeds the ANSI recommendations, it should be noted that the transmit antenna is normally mounted outside the range of the general public. The minimum safe distance while the device is transmitting can be calculated as follows:

$$P_D = \frac{EIRP}{4 \times \pi \times D^2} \qquad D = \frac{EIRP}{4 \times \pi \times (956 or 1430 \div 1500)}$$

For the NCN, the minimum safe distance calculates to 29.73cm (11.7 inches) and 24.31cm (9.57 inches). Exposure to the public at a distance greater than these distances meets the FCC standards.

Summary

Itron is concerned with the potential hazards of RF energy exposure and seeks to minimize this exposure whenever possible. This report has shown that in most instances, Itron products are well below standards for RF energy exposure to humans.

Radio transmissions, from radio, TV, cellular and other communications systems, are present daily, whether or not used. Comparably, RF energy from Itron products lasts only a fraction of a second. Meter readers operating handheld units are not at risk, as these devices meet the standard. Technical personnel who service the CCU and DCU must take care when operating the device, but even this exposure cannot be considered constant.

The reader is directed to the references listed in the beginning of this paper. For additional information, contact Jeff Gilbert at the address listed below.

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Annex A

Product RF Exposure Information

MPE for a sampling of Itron products:

Device	Frequency Band	FCC MPE Limit (mW/cm^2@ 20cm)	Device MPE (mW/cm^2@ 20cm)	Margin (mW/cm^2@ 20cm)
41/45	902 - 928 MHz	0.61	0.00015	0.6099
100G	902 - 928 MHz	0.61	0.0425	0.568
60W	902 - 928 MHz	0.61	0.00316	0.607
200W	1427 - 1432 MHz	0.95	0.2	0.750
200WP	1427 - 1432 MHz	0.95	0.105	0.845
8-CH Repeater	902 - 928 MHz	0.61	0.394	0.216
FC200R	952 - 960 MHz	0.64	0.11	0.530
G5R	952 - 960 MHz	0.64	0.11	0.530
Mobile Collector*	952 - 960 MHz	0.64*	2.45*	-1.81*
CCU4x	952 - 960 MHz	0.64	0.525	0.115
CCU5x	1427 - 1432 MHz	0.95	0.87	0.080
Centron	902 - 928 MHz	0.61	0.068	0.542
Sentinel	902 - 928 MHz	0.61	0.081	0.529

*The operator cannot be within 20cm (7.9 inches) of the device when driving a vehicle. MPE limit is met at 40cm (15.8 inches). 40cm minimum separation distance is called out in the user/operational manual of the device.