



# UNDERSTANDING RADIO FREQUENCY AND BC HYDRO'S SMART METERS

Customer and public safety are top priorities for BC Hydro, and will continue to be a focus throughout the Smart Metering Program. BC Hydro recognizes there is discussion about the health effects of low level radio frequency signals. After decades of effort, researchers have not been able to demonstrate that exposure to low level radio frequency signals produces any adverse health or environmental effects.

## BC HYDRO SMART METER SPECIFICATIONS

Smart meters are digital meters that measure the flow of electricity through the grid and intermittently record the amount of power that is used. BC Hydro's new Itron smart meters are part of an integrated system that will help modernize British Columbia's electricity system, improve operational efficiency, reduce wasted electricity, enhance customer service, improve safety and reliability and reduce electricity theft.

Smart meters form a collaborative network where each meter handles its own data, and also serves as relay for other meters should it be required. This is a cost-effective way to ensure a highly reliable communication system. When a connection is disrupted, the relay network automatically reconfigures around the disruption—keeping the network operational. This type of collaborative network significantly reduces the need for high power communications to cover longer distances, and the need for frequent 'status of network' beacon signals—keeping the radio output level lower than using other metering technologies.

Each smart metering system has unique technical attributes, including the duration of the signal, the wattage and the technical configuration of elements. The technical details of BC Hydro's smart metering system include:

SMART METER COMMUNICATION SPECIFICATIONS	
Transmission Duration	On average, a residential meter transmits customer data 4 to 6 times a day—for a total average of one minute per day. In fact, the cumulative exposure to radio frequency from a smart meter—over its entire 20-year life span—is equivalent to the exposure during a single 30 minute cell phone call.
Power Density	Smart meters communicate using very low power signals – less than $2 \mu\text{W}/\text{cm}^2$ when standing adjacent to the meter. The radio frequency energy levels are a small fraction of the exposure limits (approximately 0.5 per cent) specified by regulatory agencies such as Industry Canada and are more stringent than the strictest limit in parts of Europe.  Some of the world's strictest radiofrequency regulations can be found in Europe. Switzerland, for example, has a precautionary limit of $4.5 \mu\text{W}/\text{cm}^2$ for highly sensitive areas such as schools and hospitals. In comparison, BC Hydro's smart meters at the same benchmark distance of 20 centimeters (8 inches)—is less than $2 \mu\text{W}/\text{cm}^2$ .
Proximity	Smart meters are installed outside customer homes and the power density diminishes with distance. At a distance of 3 meters (10 feet), the radio frequency drops to $0.005 \mu\text{W}/\text{cm}^2$ —significantly less than the precautionary levels in parts of Europe. Existing meter boxes, the socket which smart meters will be install onto, acts like a reflective shield that further directs smart meter radio frequency signals away from residents.  In high-density residential complexes that use interior meter banks, the meters communicate with each other using the collaborative network technology. Due to the proximity of meters within the bank, the additive effect peaks at just two times the power density of a single meter and, the cumulative communication time of meters in a meter bank, over a year, would be equivalent to four minutes spent in a wireless internet café.

# SMART METERING PROGRAM

## COLLECTOR SPECIFICATIONS

Fully protected consumption data is routed from meter to meter until it is received by the collector, which then sends data to BC Hydro. The collector sends data back to BC Hydro using a DSL landline, cellular or satellite. A Digital Subscriber Line (DSL) is a family of technologies that provides digital transmission over the wires of a local telephone network.

## COLLECTOR COMMUNICATION SPECIFICATIONS

Transmission Duration	Collectors are inactive for 99 per cent of the time translating into a daily total of less than 13 minutes.
Power Density	Unlike other wireless infrastructure, the collector connects to the meter network using the same power antenna as the meters. In other words, the collector emits the same low level power density as smart meters—less than $2 \mu\text{W}/\text{cm}^2$ . The radio frequency energy levels are a small fraction of the exposure limits (approximately 0.5 per cent) specified by regulatory agencies such as Industry Canada. Even when the collector uses cellular technology to transmit the data back to BC Hydro, the infrequent transmission adds only $0.4 \mu\text{W}/\text{cm}^2$ for a total radio signal level of less than $2.5 \mu\text{W}/\text{cm}^2$ —remaining lower than Europe's precautionary limits.
Proximity	Collectors are mounted on existing utility poles away from residences and are 5.5 to 7.5 meters above ground (18 to 24 feet), where the power density drops to less than $0.005 \mu\text{W}/\text{cm}^2$ .

## INDEPENDENT ASSESSMENT

The current and previous Chief Medical Health Officers for Vancouver Coastal Health, Dr. Patricia Daly and Dr. John Blatherwick, confirm there is no known health risk and no reason for concern over radio frequency from normal cell phone usage and BC Hydro's smart meters operate at significantly lower power compared to an average cell phone.

In Canada, the standard for acceptable public exposure to radio frequency is governed by Health Canada in Safety Code 6, which has the same specification as the United States Federal Communications Commission (FCC) for the frequency range smart meters operate in.

Dr. John Blatherwick, former Chief Medical Health Officer for Vancouver confirms that the Smart Metering Program is safe. "Some 25,000 scientific pieces have been published on the subject over the past 30 years. Based on a recent in-depth review of the scientific literature, The World Health Organization concluded that there is no evidence to conclude that exposure to low level electromagnetic fields is harmful to human health."

### California Council on Science and Technology (CCST)

On March 31, 2011, the California Council on Science and Technology (CCST) released a study entitled "Health Impacts of Radio Frequency Exposure from Smart Meters" with two main conclusions:

1. The FCC standard provides an accepted factor of safety against known thermally induced health impacts of smart meters and other electronic devices in the same range of radio frequency signals. Exposure levels from smart meters are well below the thresholds for such effects.
2. There is no evidence that additional standards are needed to protect the public from smart meters.

### Electric Power Research Institute (EPRI)

On December 22, 2010, the Electric Power Research Institute (EPRI) released a study entitled "An Investigation of Radio frequency Fields Associated with the Itron Smart Meter" with three main conclusions:

1. Radio frequency output from Itron smart meters transmitting constantly is only 0.8% of FCC limit. Given that smart meter transmits around 1 per cent of the time, the output drops to 0.008 per cent of FCC limit.
2. Interior radio frequency fields are expected to be 10 fold less due to directional properties of the meter.
3. Regardless of how many meters are co-located in an area—the additive effect peaks at just two times the power density of a single meter.

# SMART METERING PROGRAM

## ADDITIONAL RESOURCES

### Electric Power Research Institute

An Investigation of Radiofrequency Fields Associated with the Itron Smart Meter—December 2010  
[http://my.epri.com/portal/server.pt?Abstract\\_id=000000000001021126](http://my.epri.com/portal/server.pt?Abstract_id=000000000001021126)

### California Science Council on Science and Technology

Health Impacts of Radio Frequency from Smart Meters—January, 2011  
<http://www.ccst.us/publications/2011/2011smartA.pdf>

### Edison Electric Institute (EEI), Association of Edison Illuminating Companies (AEIC), Utilities Telecom Council (UTC)

A Discussion of Smart Meters and RF Exposure Issues  
[http://www.aeic.org/meter\\_service/smartmetersandrf031511.pdf](http://www.aeic.org/meter_service/smartmetersandrf031511.pdf)

### University of Ottawa Wireless Communications and Health

Frequently Asked Questions  
<http://www.rfcom.ca/faq/index.shtml>

### International Commission on Non-Ionizing Radiation Protection (ICNIRP)

Exposure to high frequency electromagnetic fields, biological effects and health consequences (100 kHz-300 GHz)—2009  
<http://www.icnirp.de/documents/RFReview.pdf>

### World Health Organization

EMF Worldwide Standards Database  
<http://www.who.int/docstore/peh-emf/EMFStandards/who-0102/Worldmap5.htm>

### Switzerland Federal Office for the Environment

Non-ionizing Radiation Information, Technical Reports, and Ordinance  
<http://www.bafu.admin.ch/elektrosmog/01079/index.html?lang=en>

### Institute of Electrical and Electronics Engineer (IEEE)

IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz (C95.1-2005)  
<http://standards.ieee.org/findstds/standard/C95.1-2005.html>

### Health Canada

Safety Code 6—August 2009  
[http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/radio\\_guide-lignes\\_direct-eng.php](http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/radio_guide-lignes_direct-eng.php)

### Industry Canada

Canadian Table of Frequency Allocations  
[http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/spectrallocation-08.pdf/\\$FILE/spectrallocation-08.pdf](http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/spectrallocation-08.pdf/$FILE/spectrallocation-08.pdf)

### US Federal Communications Commission

Radio Frequency Safety FAQ - August 2010  
<http://www.fcc.gov/oet/rfsafety/ef-faqs.html>