

# Dr Isaac Jamieson Response to CEC IR 1 – CSTS

Commercial Energy Consumers  
Information Request #1

For Dr. Isaac Jamieson, PhD, DIC, RIBA, ARB, DipAAS, BSc(Hons), MInstP

**Note: As the following had to be prepared on a very short time-scale, not all questions have been answered. Some of those which have been answered are not answered in full because of time restrictions.**

**Disclaimer:** The comments on this report are intended to help advance knowledge in the areas discussed and provide background information based on existing knowledge and related factors that may influence health, wellbeing, productivity and sustainability. They are not intended as a final statement on these topics, and as more information becomes available the opinions given may develop, be adapted or change. Whilst all reasonable precautions have been taken to ensure the validity of the information presented, no warranty is given towards its accuracy. No liability is accepted by the author for damages arising from its use and/or interpretation by others. The mention of specific companies or of particular manufacturers' products does not imply that they are endorsed or recommended or disregarded by the author. The comments given are being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the materials lies with the reader/listener. In no event is the author liable for damages arising from their use. © 2013 Dr Isaac Jamieson

## 1. Exhibit C9-10-1, ISAAC JAMIESON

**"Systematic assessment of the health impact of a rapidly changing environment - particularly in areas of technology, work, energy production and urbanization - is essential." WHO (1986).**

- 1.1. Please confirm that the major authoritative bodies involved in setting standards for RF are continually reviewing and updating their assessment of the RF, health impact and other relevant literature to determine the status of their guidelines and or standards.

Yes.

- 1.2. Please confirm that the evidence of this continual review is a continuing series of reports on the subjects involved and on the setting of their standards.

As above.

- 1.3. Please review the credentials of the individuals involved in writing the chapters of the major authoritative bodies and list for each authoritative body whether or not the authors have suitable credentials to be authoring the reports and sections of reports they are responsible for.

Due to time restrictions, and the amount of work required to obtain the information requested, it is not fully possible to answer this question at this time. Brief examples are given for Russia and Salzburg, Austria (where the most stringent guidelines appear to exist).

### **Russian EMF Guidelines - key contributors**

#### **The Russian Center for Electromagnetic Safety (CEMS)**

Professor Yuri Grigoriev (Dr. Med. Sc.), Chairman of Russian National Committee on Non-ionizing Radiation Protection; Scientific Leader of the Center for Electromagnetic Safety (CEMS); Head of the CEMS Research Department; Chairman of Russian National Committee on Non-ionizing Radiation Protection; Member of the International Advising Committee of the WHO EMF project; IEEE member; and BEMS member.

Dr Oleg A. Grigoriev (Ph.D. of Biological Sciences), Vice-Chairman of the Russian National Committee on Non-Ionizing Radiation Protection. Director of the Center for Electromagnetic Safety.

Anton V. Merkulov (M.S.), Member of Russian National Committee on Non-Ionizing Radiation Protection, Head of Testing Laboratory of Center for Electromagnetic Safety, Master of Engineering.

All contributed key information to the Russian Institute of Hygiene who prepared the SanPiN 2003 document. The above team was also responsible for the preparation of all of the Russian SanPiN EMF RF 1984 document.

**The Russian Institute of Hygiene**

The 2003 Russian SanPiN guidelines covering RF/microwave radiation were prepared at the Russian Institute of Hygiene by Professor Yuri Palzev (Dr.Sci), Dr. Larissa Pochodsey (Dr.Sci.) and Dr Nina Rubtsov (Dr.Sci.).

**All are members of RNCNIRP and have experience in this field for more than 45 years.** In the opinion of Dr Jamieson, those involved in creating the guidelines possesses appropriate credentials and high-level experience.

**Salzburg**

The Salzburg guidelines on RF/microwave radiation were prepared by Dr Gerd Oberfeld MD, who is a Member of the EMF Working Group Austrian Ministry of Health, and has been Public Health Officer at the Public Health Department, Unit for Environmental Health / Medicine Federal State of Salzburg since 1992. He has specialist training and experience in environmental epidemiology and EMF measurements including spectrum analysis. Dr Oberfeld is also the responsible officer for the postgraduate course of Environmental Medicine at the Austrian Medical Association and has been Speaker / Secretary at the Department Environmental Medicine, Austrian Medical Association since 1994. In the opinion of Dr Jamieson, Dr Oberfeld is highly competent and possesses appropriate credentials to author the Salzburg guidelines.

2. Exhibit C9-10-1, ISAAC JAMIESON

**Eger & Jahn's results demonstrate that a significant relationship can exist between individuals' mean exposure levels and reported health symptoms, including sleep problems. Clear trends were shown for decreasing symptom scores in relation to decreasing mean RF/microwave exposure levels.** Such findings would appear to indicate that increasing background RF/microwave radiation, as would occur through the roll out of a RF/microwave AMI structure (and the adoption of smart appliances that communicate wirelessly), may prove detrimental to sleep quality when exposures rise beyond a particular (yet to be determined) threshold.

2.1. Please advise with respect to what the major weakness is of survey types of studies.

Unfortunately there is not enough time available to answer this question thoroughly. A better example may be said to be that undertaken by Oberfeld et al. (2004).

2.2. Is this a yet to be determine threshold an important piece of information for standard setting bodies to have before they set standards.

2.3. Please describe the process involved in developing such studies of potentially appropriate thresholds and how long these processes can take to come to fruition.

2.4. Please advise as to whether or not Isaac Jamieson would recommend that such studies be undertaken.

3. Exhibit C9-10-1, ISAAC JAMIESON

**According to the Canadian Cancer Society (2012), "Cancer is the leading cause of premature death in Canada ... [It was estimated that an] estimated 186,400 new cases of cancer (excluding about 81,300 non-melanoma skin cancers) and 75,700 deaths [would] occur in Canada in 2012. In 2007, cancer surpassed cardiovascular disease (heart and cerebrovascular) as the leading cause of death in Canada."**

- 3.1. Does Isaac Jamieson believe that absolute cancer incident and mortality numbers are the best way to represent cancer outcomes in people's lives for the purposes of discussing appropriate policies for understanding and mitigating outcomes leading to cancer?

No. Absolute cancer incident and mortality numbers were taken as a starting point to raise awareness on the issue.

- 3.2. Does Isaac Jamieson understand the nature of cancer statistics and the role of age adjusted data for more clearly understanding cancer outcomes?

Yes. As noted by Canadian Cancer Statistics 2012 "Cancer risk increases with age, and the number of new cancer diagnoses will continue to increase as the baby boomer population begins to reach age 65. Notable declines in mortality rates for all cancers combined have occurred in both sexes and most age groups."

Under the precautionary principle, factors that increase risk of cancer should be reduced wherever practical. As RF/microwave radiation is a Class 2B carcinogen, exposure to it should be reduced as a matter of best practice.

**Reference**

Canadian Cancer Society (2012), Canadian Cancer Statistics 2012, [https://www.cancer.ca/Canada-wide/About%20cancer/Cancer%20statistics/Stats%20at%20a%20glance.aspx?sc\\_lang=en](https://www.cancer.ca/Canada-wide/About%20cancer/Cancer%20statistics/Stats%20at%20a%20glance.aspx?sc_lang=en)

- 3.3. Please explain why Isaac Jamieson does not present such age adjusted data on cancer as an introduction to the topic instead of absolute numbers.

Time restrictions. Dr Jamieson is seeking to suggest that reducing RF/microwave exposure may help reduce cancer risk and improve cancer outcomes through reducing potential additional exposure to a Class 2B carcinogen.

- 3.4. Does Isaac Jamieson have the age adjusted data for cancer incidence and mortality in Canada?

Yes.

**Reference**

Canadian Cancer Society (2012), Canadian Cancer Statistics 2012, [https://www.cancer.ca/Canada-wide/About%20cancer/Cancer%20statistics/Stats%20at%20a%20glance.aspx?sc\\_lang=en](https://www.cancer.ca/Canada-wide/About%20cancer/Cancer%20statistics/Stats%20at%20a%20glance.aspx?sc_lang=en)

- 3.5. Has Isaac Jamieson reviewed the age adjusted cancer statistics for incidence and mortality in the US and or any other jurisdiction?

4. Exhibit C9-10-1, ISAAC JAMIESON

**and individuals as related to cancers. Whilst a number of studies (including the examples given below) indicate a link between inappropriate exposures to some EMF regimes and negative health effects; it is important to recognise that not all studies do so, and that with proper forethought beneficial field regimes can also be created (Jamieson et al. 2010).**

4.1. Please provide a copy of Isacc Jamieson et al, 2010 study referenced above.

The weblink to the paper by Isaac Jamieson et al, 2010 is given in the Appendix A of the original commentary by Dr Jamieson.

5. Exhibit C9-10-1, ISAAC JAMIESON

**An association has also been noted between increased incidences of childhood leukaemia & mortality through RF/microwave exposures at power densities of 8  $\mu\text{W}/\text{cm}^2$  (Hocking et al. 1996); an exposure level lower than that created by some single wireless smart meters, and considerable less than levels being advocated as safe by Health Canada (2009)'s Safety Code 6.**

5.1. Please provide clarification as to whether the 8  $\mu\text{W}/\text{cm}^2$  is based on measured power density at the person's level or whether this is a measured power density at the meter and if so at what distance.

In the research by Hocking et al. (1996), the source of radiation was TV towers (operating at 63-215 MHz) and not smart meters.

#### Reference

Hocking, B., Gordon, I.R., Grain, H.L. & Hatfield, G.E. (1996), Cancer incidence and mortality and proximity to TV towers. Medical Journal of Australia, 165(11-12), pp. 601-605, Published erratum appears in The Medical Journal of Australia, 166(2), pp. 80.

5.2. Please provide a description of how the power density in this case was measured.

In order to determine children's exposures, data on the frequencies and power densities emitted by the TV towers in North Sydney, Australia (for the period of 1956-1990) were obtained from the Commonwealth Department of Communications.

#### Reference

Hocking, B., Gordon, I.R., Grain, H.L. & Hatfield, G.E. (1996), Cancer incidence and mortality and proximity to TV towers. Medical Journal of Australia, 165(11-12), pp. 601-605, Published erratum appears in The Medical Journal of Australia, 166(2), pp. 80.

5.3. Please provide the source of the RF radiation and how it was determined how much exposure the children had in this case.

As detailed above.

6. Exhibit C9-10-1, ISAAC JAMIESON

**"In British Columbia, more than 70,000 people are living with Alzheimer's disease and other dementias. If nothing is done that figure is expected to more than double to 177,000 British Columbians living with the disease," Alzheimer Society British Columbia (2011).**

6.1. Presumably the increases in Alzheimer's disease is in significant part related to the aging of the population, specifically the baby boom generation approaching the age at which vulnerability to this disease is prevalent, is this a fair statement.

6.2. Does Isaac Jamieson have age adjusted numbers for Alzheimer's disease in BC and Canada?

Dr Jamieson has age adjusted numbers for Alzheimer's disease in Canada.

#### Reference

Epidemiology of Dementia in Canada: Information from the Canadian Study of Health and Aging. PPT presentation. <http://www.med.uottawa.ca/sim/data/dementia.ppt>

- 6.3. Please explain why Isaac Jamieson discusses this subject in absolute numbers for the population as opposed to age adjusted numbers.

Time limitations.

7. Exhibit C9-10-1, ISAAC JAMIESON

Kane (2004) proposed that electromagnetic pollution may be a risk factor for ASD. Whilst there are likely to be a number of potential factors that could in part be responsible for any increases that may actually have arisen; his hypothesis is worthy of further study, particularly as anecdotal evidence suggests exposure to lower field regimes may reduce the risk and severity of such conditions and their cost to national economies.

The reasoning behind his hypothesis is "... that human exposures to RF radiation have become pervasive during the past 20 years, whereas such exposures were uncommon prior to that time," and that the increased fetal or neo-natal exposures that could have occurred as a result of such variations may be a driver of increased incidence. Lathe (2009) notes that, in the absence of firm data demonstrating that RF/microwave radiation cannot influence brain tissue, Kane's hypothesis is plausible.

**Research indicating why such a theory should be taken seriously has been conducted for an unpublished pilot study by Dr Dietrich Klinghardt MD, PhD. Measurements of power densities taken in the sleeping areas where women with autistic children slept when they were pregnant [0.011-0.171  $\mu\text{W}/\text{cm}^2$ ] (n = 290) were found to be higher than those measured in the sleeping areas where women with healthy children slept when they were pregnant [0.0005-0.0040  $\mu\text{W}/\text{cm}^2$ ] (n = 12).**

Measurements were also taken by Klinghardt (2008) in the sleeping areas of healthy children [ $\leq 0.0067 \mu\text{W}/\text{cm}^2$ ] (n = 14) and those with autism [0.0087-0.1480  $\mu\text{W}/\text{cm}^2$ ]. The levels of emissions created by smart meters can be above those indicated in Klinghardt's work as being a possible cause for concern.

- 7.1. Do any of these researchers have an explanation as to why RF should affect boys at 4 or 5 to 1 versus girls?
- 7.2. Do any of these researchers have an explanation as to why the rate among boys is increasing but not the rate among girls by nearly as much, if the cause is postulated to be RF why are boys susceptible to RF and not girls?
- 7.3. Please file a copy of Dr. Klinghardt's video covering Smart Meters and Autism, which is available on the internet.

As Dr Jamieson has not referenced that document it is not his responsibility to file a copy of it. He is unaware of which actual document the questioner is referring to.

- 7.4. Please confirm that there is a very significant association of Autism with the age of the mother at the birth of the child and please provide the data supporting this if Isaac Jamieson has such data.
- 7.5. Please confirm that the age at which women have been having children has been increasing steadily for many years and at least as long as the incidence of Autism has been increasing and please provide this data if Isaac Jamieson has the data.
- 7.6. Please provide any studies Isaac Jamieson has conducted on Autism and explain Isaac Jamieson's background and experience in researching and understanding Autism.

Dr Jamieson's research involves gaining understanding of the potential mechanisms that cause various types of ill health, including degenerative disease, and how environmental factors can be adjusted to reduce such risk.

8. Exhibit C9-10-1, ISAAC JAMIESON

It appears prudent to determine if raised EMF exposures do increase autism risk, and if so how new generations of 'bio-friendly' technology may mitigate, or even reverse, such risk.

8.1. Please confirm that this request for research into the causes of Autism is additive to an ongoing active research into causes of Autism and that while some causes are known a great deal is not known about the causes of Autism.

Correct. Since submitting his commentary it has come to Dr Jamieson's attention that Dr Martha Herbert, Assistant Professor of Pediatric Neurology at Harvard Medical School, who is a pediatric neurologist and neuroscientist on the faculty of Harvard Medical School and on the staff at the Massachusetts General Hospital, has conducted and co-authored an extensive review of literature pertinent to a potential link between Autism Spectrum Disorders and RF/microwave radiation with over 550 citations (Herbert & Sage 2012).

Assistant Professor Herbert has an extensive history of research and clinical practice in neurodevelopmental disorders, particularly autism spectrum disorders, and is Board Certified in Neurology with Special Competency in Child Neurology, with Certification in Neurodevelopmental Disorders. She notes that "thousands of papers that have accumulated over decades that document adverse health and neurological impacts of EMF/RFR which can exert a disorganizing effect on the ability to learn and remember and can also destabilize immune and metabolic functioning. This will make it harder for some children to learn, particularly those who are already having problems in the first place" (Herbert 2013). She urges a need for caution with regard to exposure.

Additionally, the comments by Powerwatch (2013) are worth considering: "The fast rise in diagnosed autistic spectrum disorders over the last 20 years closely matches the rise in children's RF exposure. There are many factors contributing to the rise in autistic spectrum disorders (which certainly includes better diagnosis) but even when the known ones are factored out a fast rise is still seen which is due to "unknown causes". This rise is similar to the increase in children's exposure to DECT cordless phones, WiFi in the home, various PlayStation like games consoles (including Wii), parents' and now their own use of mobile phones." It appears that the proposed introduction of wireless smart meters and related RF/microwave emitting smart technologies would further increase children's exposure to such radiation and their potential risk of succumbing to such conditions.

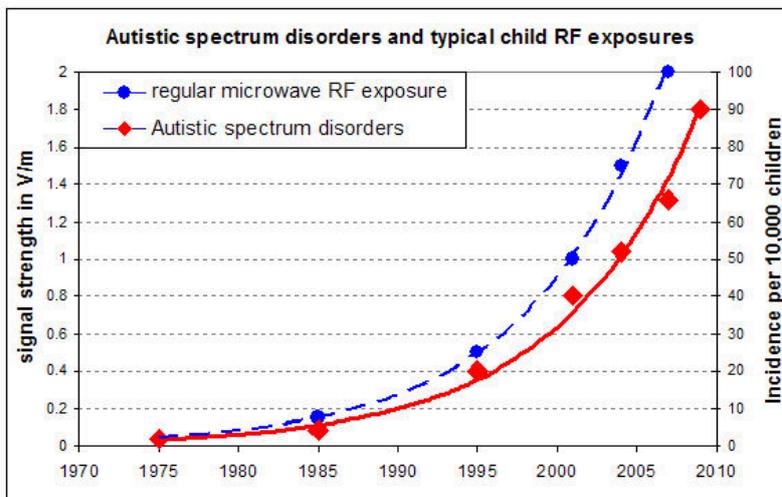


Illustration source: Powerwatch (2013)

## References

Herbert, M. & Sage, C. (2012), Findings in Autism (ASD) Consistent with Electromagnetic Fields (EMF) and Radiofrequency Radiation (RFR). Section 20. BioInitiative 2012, [http://www.bioinitiative.org/report/wp-content/uploads/pdfs/sec20\\_2012\\_Findings\\_in\\_Autism.pdf](http://www.bioinitiative.org/report/wp-content/uploads/pdfs/sec20_2012_Findings_in_Autism.pdf)106pp.

Herbert, M. (2013), Letter to Los Angeles Unified School District, <http://www.powerwatch.org.uk/news/20130208-herbert-letterto-wifi-classroom.pdf>  
Powerwatch (2013), WiFi in schools - a danger for pupils and teachers?, <http://www.powerwatch.org.uk/news/20130214-norwich-wifi.asp>

- 8.2. Please provide Isaac Jamieson's estimate of how long research takes to establish a cause of a disease and confirm that at a minimum this proposed research would take some considerable time.

The length of time it takes to establish cause varies with the disease. Sometimes though causes, or risk factors, are established early on it may take many years before authorities acknowledge this. As an example, it took 25 years for Dr Alice Stewart's finding on the link between X-raying pregnant mothers and childhood cancer to be acted upon (Heffernan 2011).

## Reference

Heffernan, M. (2011), *Wilful Blindness: Why We Ignore the Obvious at Our Peril*. Simon & Schuster, 391pp.

## 9. Exhibit C9-10-1, ISAAC JAMIESON

**Animal research by Odaci et al. (2008) has shown that exposing pregnant rats to 900 MHz microwave radiation (created by a mobile phone in talk mode for 1 hour daily) for the duration of the pregnancy resulted in far fewer nerve cells being present in this part of the brain in offspring ( $p < 0.01$ ). This will have effects on learning and memory - the proposed FortisBC wireless smart meters operate in the 902-928 MHz range.**

- 9.1. Please discuss the challenges involved in moving research from animals like mice to humans.
- 9.2. Please confirm that Isaac Jamieson is not proposing that the frequency range of RF signals is the causative factor for these effects in mice and that the effect has nothing to do with the level of energy.

The frequency range of signals contributes to the type of effect noted, as does their polarity, the frequency of any pulsed signals, shape of the pulse signals, direction the animal is facing, etc. The level of energy too comes into play ... Please refer to the main commentary by Dr Jamieson which discusses such matters in greater detail.

## 10. Exhibit C9-10-1, ISAAC JAMIESON

**A Swiss survey by Rösli et al. (2004), investigating symptoms of ill-health ascribed to EMF exposure, revealed that individuals most often related their symptoms to exposure to RF/microwave radiation from mobile phone base stations (74%), followed by use of mobile phones (36%), cordless phones (29%) and exposure to power lines (27%). The most common mitigative measure taken by the respondents was to avoid exposures.**

10.1. Please confirm that in some survey types of research that there can be a potential for respondents to be subject to bias a number of potential points of view.

Bias has to be taken into account in all survey study types.

10.2. Please discuss the types of bias that can be found in research studies and how researchers go about dealing with these issues.

11. Exhibit C9-10-1, ISAAC JAMIESON

**It appears important to further determine to what extent, if any, the increased exposures to RF/microwave radiation from FortisBC's proposed smart metering system might contribute to a continuing reduction in physical activity levels in British Columbia.**

11.1. Does Isaac Jamieson have any suggestions as to how such a study could be conducted and avoid any number of confounding factors.

Sleep studies, ... movement monitors ...

11.2. How long might such research take to determine whether there is a cause and effect with respect to physical activity and RF and does Isaac Jamieson believe it can be determined definitively?

12. Exhibit C9-10-1, ISAAC JAMIESON

**"Sleep loss and sleep disorders affect an individual's performance, safety, and quality of life. Almost 20 percent of all serious car crash injuries in the general population are associated with driver sleepiness, independent of alcohol effects. Further, sleep loss and sleep disorders have a significant economic impact. The high estimated costs to society of leaving the most prevalent sleep disorders untreated are far more than the costs that would be incurred by delivering adequate treatment (and reducing risk factors – present author's comment). Hundreds of billions of dollars a year are spent on direct medical costs associated with doctor visits, hospital services, prescriptions, and over-the-counter drugs related to sleep problems. Compared to healthy individuals, individuals suffering from sleep loss, sleep disorders, or both are less productive, have an increased health care utilization, and an increased likelihood of accidents," Colten & Altevogt (2006).**

12.1. Please provide car crash and injury data for British Columbia for the last 10 to 20 years and point out where the impact of RF radiation is prevalent given that RF radiation has expanded exponentially in recent years.

The information that is requested would form the basis of a scientific research paper in its own right. Funding would have to be provided for such work.

In his commentary, Dr Jamieson provided examples from peer-reviewed science that indicate that increased levels of exposure to RF/microwave radiation can reduce sleep quality and increase levels of fatigue, which in turn can lead to increased risk of accidents. It appears that the greater the exposure levels encountered the higher the risk.

12.2. Please provide any data with respect to increased health care utilization in BC and increased accident rates in BC to support the proposition that RF has had some impact on these statistics.

Dr Jamieson does not have information on such figures. His commentary provides information on trends that have been observed elsewhere and their likely consequences.

13. Exhibit C9-10-1, ISAAC JAMIESON

Paolo Vecchia, Chairman for ICNIRP, commented in 2008 that **"the ICNIRP guidelines [which are similar to Safety Code 6 guidelines – present author's comment] are neither mandatory prescriptions for safety, the "last word" on the issue nor are they defensive walls for Industry or others."** (Vecchia 2008).

13.1. Please confirm that standards and guidelines are constantly under review and potential changes in the recommendations and standards may occur at the conclusion of any of the review steps.

Yes.

13.2. What does Isaac Jamieson anticipate utility regulators should do with respect to this changing landscape of standard setting?

Adopt the precautionary principle where they consider appropriate.

13.3. Does Isaac Jamieson expect regulators to conduct scientific meta-analysis and determine standards themselves?

As noted by Dr Jamieson in his initial commentary, as health risks may exist with regard to new technologies, health impact assessments should be carried out as a matter of best practice. Ideally this should be done at the earliest possible opportunity, particularly if reasons for potential cause for concern are already indicated.

Dr Jamieson has provided BCUC with examples of research indicating that the RF/microwave emissions from smart meters may negatively impact the health and wellbeing of BC citizens. If BCUC considers that evidence he and others have presented is strong enough to warrant caution, it may wish to adopt the Precautionary Principle, and the ALARA principle, without need for additional research to determine whether it is prudent to mandatorily increase BC citizens' exposure to a Class 2B carcinogen 24/7.

**It is up to the regulators to determine how they wish to proceed.** If BCUC does not consider the evidence presented strong enough for it to make a decision; it appears that there are still grounds for it to wish health impact assessments to be undertaken. As noted by the World Health Organization, "Systematic assessment of the health impact of a rapidly changing environment - particularly in areas of technology, work, energy production and urbanization - is essential." WHO (1986).

13.4. Does Isaac Jamieson expect that the regulatory process is suitable for scientific standard setting?

Dr Jamieson considers that the regulatory process is suitable for determining whether the metering infrastructure proposed by FortisBC is fit for purpose. Further investigation is necessary.

14. Exhibit C9-10-1, ISAAC JAMIESON

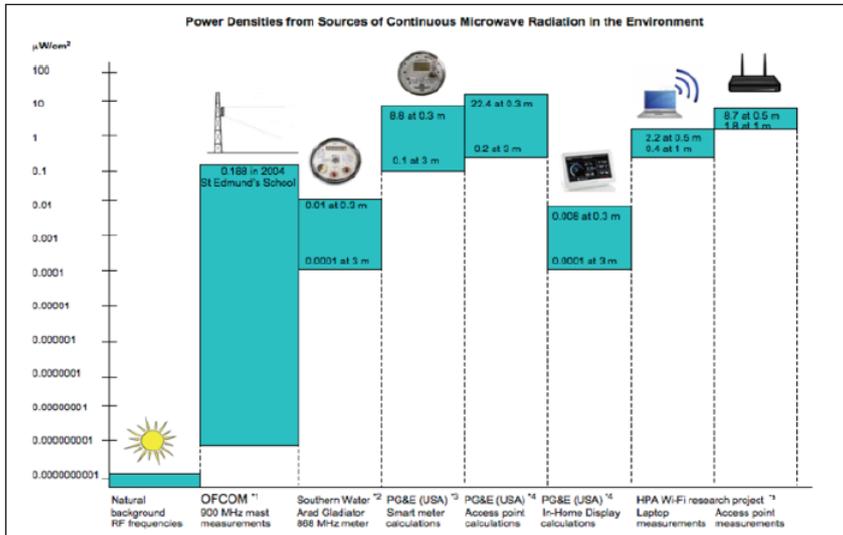


Figure 1.3 Microwave emissions from different sources (Image source: BEMRI.org, 2012).

14.1. Please confirm that this chart is deficient in representing the equipment in question because it does not represent some key criteria which are important to assessing RF radiation power intensities.

The questioner has unfortunately omitted to state which criteria are considered key in their review. Were these key criteria given in the bar graph provided by Exponent? Please note: Dr Jamieson did not prepare the above graph.

14.2. Please identify the missing criteria and provide improved information with respect to each.

As the criteria that the questioner considers missing are not actually listed, this request appears rather vague.

The graph would have benefited from having stating whether maximum / peak level or average power density values were shown for the values given. It appears that the values for the OFCOM, PG&E and (probably) Southern Water references are averaged. A complaint might also be placed that the power density assessment should be integrated over time (CENELEC and ICNIRP use 6 minutes). Since so many devices pulse on and off depending on their set-up, their average power densities are much lower than their maximum power densities. As an example, UK smart meters may now be restricted to one data-burst per hour, and at even at one 3 second burst per 5 minutes the average power will be 0.01 of the burst power.

In North America, where MESH connected meters talk together frequently, their average power is much lower than the maximum communication bursts power. Pulses/peak data-bursts are more bio-active than CW radiation.

Other refinements to the graph could include summing signals, including (important) bandwidth issues. There can be considerable confusion about "max level" and "peak level". To provide some more background information; 'peak level' is the highest level that the signal creates. Usually this is given in dBuV/m, which can (if required) be converted to an 'equivalent power density' as if it were a CW signal. 'Maximum level' depends on the type of RF/microwave detector used. This can be measured in a number of ways including: 'peak', 'signal', 'quasi-peak', 'rms', 'average' (over a preset number of RF cycles or spectrum analyser sweeps).

Normally the majority of measurements use the maximum rms value that is usually considerably lower than the peak instantaneous value. Dr Jamieson has no data to indicate whether or not the

examples shown in the above graph present rms values. As previously stated, Dr Jamieson did not create the above graph.

15. Exhibit C9-10-1, ISAAC JAMIESON

A number of effects have been scientifically established, and their implications for human health have led to a number of scientists, and foreign health agencies, advocating the need for the adoption of more onerous standards (Grigoriev 2010, Chiang 2009, WHO 2009, Pilette 2008, USG 2008, McKeown 2007, Oberfeld 2003, Polish Minister of the Environment 2003, SanPiN 2003, Vecchia 2003, WHO 2002a, SAEFL 2000, Sage 2000, Ministry of Health of the Ukraine 1996).

15.1. Please identify the author of the Sage 2000 study and provide a copy.

The author of the Sage (2000) copy is Cindy Sage of Sage Associates. For copyright reasons Dr Jamieson is unable to provide a copy of that report.

**Reference**

Sage Associates (2000), An overview of radiofrequency/microwave radiation studies relevant to wireless communications and data. International Conference on Cell Tower Siting, Salzburg, Austria, Land Salzburg-Landessanitatsdirektion - Umweltmedizin, Federal State of Salzburg Public Health Department Environmental Health Unit, 7-8 June 2000.

15.2. Please identify the scientific credentials of the author and the foreign health agency the individual is associated with.

The author of that report is Cindy Sage, co-editor of the BioInitiative Report and the BioInitiative Report 2012. She has a B.A. in Biology, an M.A. in Geology and has been involved in environmental planning and EMF impact assessment and research for over 30 years. She is not associated with a foreign health agency.

15.3. Please identify the adoption of onerous standards in the health agency in question.

As the questioner may already be aware, and as Dr Jamieson discovered when he recently contacted Dr.György Thuróczy PhD., Head of Department of Non-Ionising Radiation at the National Research Institute for Radiobiology and Radiohygiene, Hungary; the Hungarian National Standards 0 Hz to 300 GHz frequency radiation were changed to the 1999/519/EU Recommendation (corresponding to ICNIRP 1998) in 2004 (!).

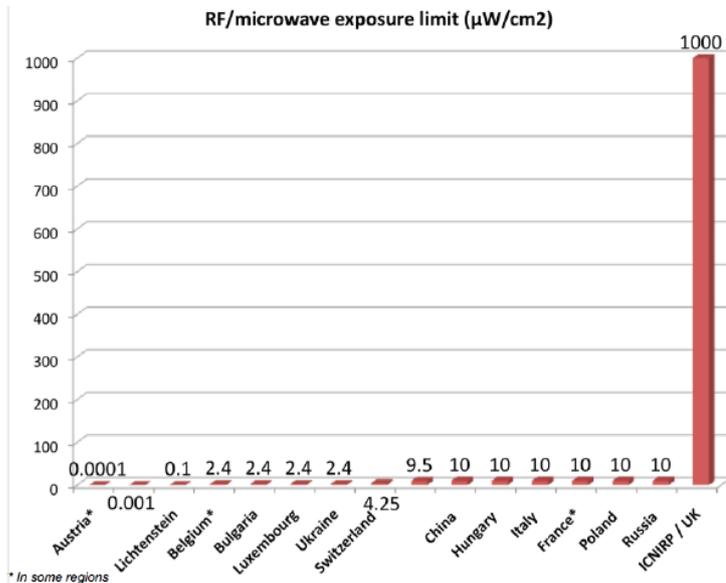
As can be seen by the date of the original reference, the earlier standards were still in place when Sage (2000) originally mentioned them. This provides an indication of how standards can change. A more recent example of this, in the opposite direction, is India's decision to reduce its permitted RF/microwave exposure levels to 10% of that presently allowed by ICNIRP (Government of India 2013).

**References**

Government of India (2013), Ensuring Safety from Radiations: Mobile Towers and Handsets. Department of Telecom, Govt. of India. 1pp., [www.dot.gov.in/2013/Eng\\_final.pdf%20dated%2015-01-2013.pdf](http://www.dot.gov.in/2013/Eng_final.pdf%20dated%2015-01-2013.pdf)

15.4. Please provide Isaac Jamieson's opinion with respect to the scientist credentials of the author of the Sage 2000 study.

16. Exhibit C9-10-1, ISAAC JAMIESON



\* In some regions  
**Figure 1.4 Comparison between exposure levels permitted in other countries & ICNIRP levels used in UK (Jamieson 2012b).**

16.1. Please provide the source for the determination that the ICNIRP guidelines are for 1000 µW/cm<sup>2</sup> and the source for the UK guidelines or standards showing them at the same level.

The source for the value shown for ICNIRP is from the Netherland's National Institute for Public Health and the Environment (2011). In the UK in 2004, the Board of NRPB recommended the adoption of the ICNIRP Guidelines (McKinlay et al. 2004) - in 2005 the National Radiological Protection Board (NRPB) was became the Radiation Protection Division of the UK's Health Protection Agency (HPA).

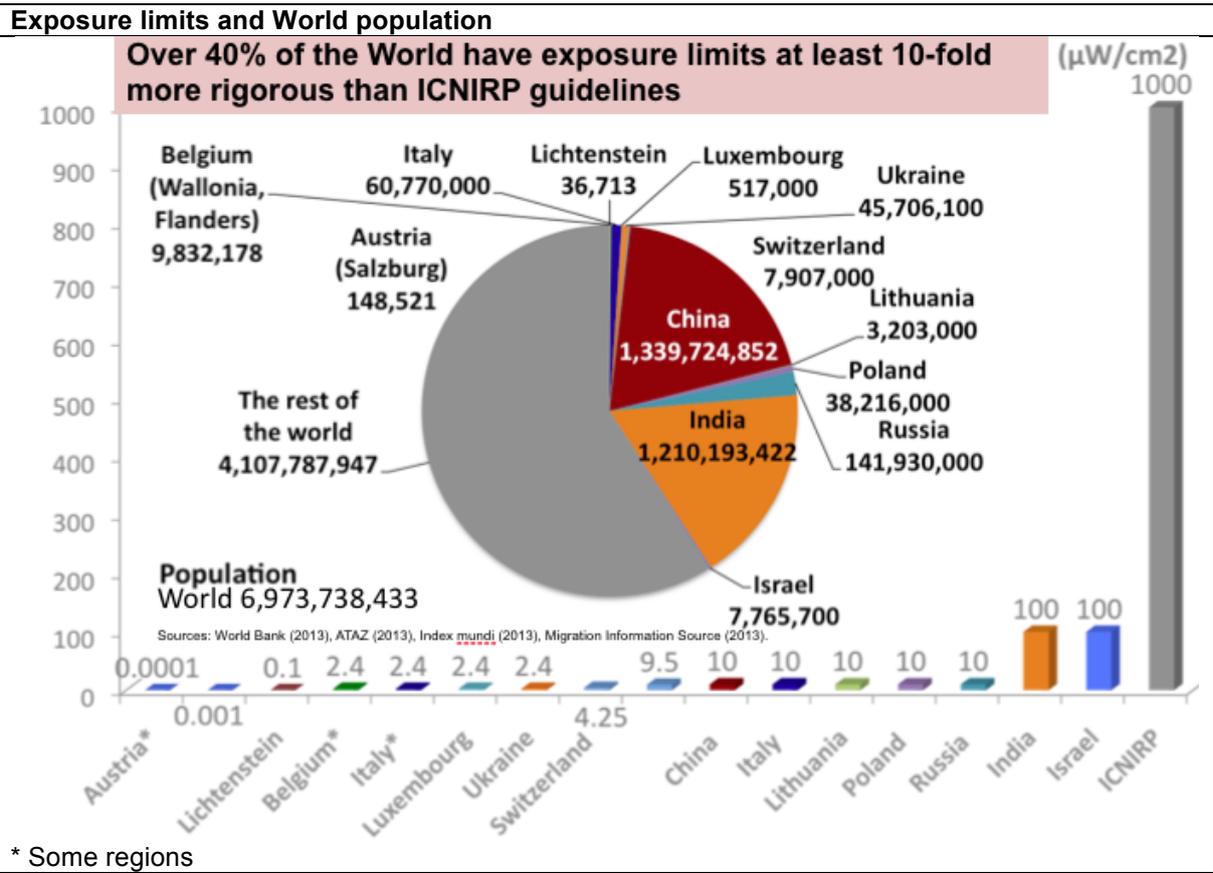
**References**

McKinlay, A.F., Allen, S.G., Cox, R., Dimbylow, P.J., Mann, S.M., Muirhead, C.R., Saunders, R.D., Sienkiewicz, Z.J., Stather, J.W. & Wainwright, P.R. (2004), Documents of the NRPB, 15(2), [http://www.hpa.org.uk/web/HPAweb&HPAwebStandard/HPAweb\\_C/1254510609795](http://www.hpa.org.uk/web/HPAweb&HPAwebStandard/HPAweb_C/1254510609795)

National Institute for Public Health and the Environment (2011), Comparison of international policies on electromagnetic fields (power frequency and radio frequency fields). National Institute for Public Health and the Environment, The Netherlands, 13 pp.

16.2. Please explain why the countries selected are shown the way they are and whether or not there are other counties in the world with different standards than those shown.

The countries documented in that graph are shown in level of ascending exposure limits. They are selected to show that some countries have guidelines considerably lower than ICNIRP. The list given is not exhaustive. There are a number of countries for which data is presently missing. At present the countries of over 40% of the World's population have exposure levels at least 10-fold lower than ICNIRP.



17. Exhibit C9-10-1, ISAAC JAMIESON

Many radiofrequency and microwave frequency signals can be excluded from the environments that individuals occupy through shielding, the types of building materials used, and the choice of using non RF/microwave emitting technologies. Biological effects have been observed with both natural and manmade fields.

17.1. Please explain the technical and scientific basis of the shielding of environments from RF radiation.

**Background information**

In addition to their visible architectural structure, individual buildings possess their own invisible and often unique 'electromagnetic architecture' signatures, which influence the degrees of RF/microwave propagation that can take place. These can be influenced and altered by a variety of factors including: types of walling; glazing; partitioning; flooring; roofing; and furnishings used.

When wishing to undertake RF/microwave shielding, it should also be taken into consideration that bandwidth usage may change at a later date, so additional frequencies may have to be blocked.

**Signal propagation in buildings**

**Ceilings:** Plasterboard or timber ceilings allow RF/microwave signal penetration to far higher degree than concrete ceilings.

**Walling:** The types of walling used influences the degree of signal propagation that occurs. Generally timber walling (and plasterboard stud walling) allow signals through most effectively. Poor signal transmission is found with reinforced concrete, concrete block and brick walls. When wishing

to introduce shielding care has to be taken not to increase the likelihood of other problems such as mold growth due to reduced breathability of the building structure if metal sheeting is used.

**Doors:** Often doors are highly transparent to RF/microwave radiation unless special precautions are taken with shielding.

**Windows:** Without testing, it can be difficult to determine the effectiveness of signal transmission through existing glazing unless its exact specification is known - this is much easier to determine with new build. The degree of RF/microwave transmission through glazing can vary tremendously depending on the type of glazing used and any coatings it has. Metal-coated glazing, such as low e-glass, which is used to help keep buildings cool in summer and warm in winter, dramatically reduces RF/microwave signal strength. This type of glazing provides good security for WLAN, but poor transmission for the frequency ranges being proposed in the current application by FortisBC.

Any RF/microwave shielding effects created by glazing will be reduced when windows are opened for ventilation unless metal mesh is used as well to screen the opened areas. Keeping windows shut on hot days is likely to increase energy usage as additional artificial ventilation and cooling may be required. The type of window frames used, and their structure, can also influence the effectiveness of RF/microwave shielding.

**Metal clad insulation:** This is used much more nowadays in general building construction in an aim to increase energy efficiency (and can also be used as a shielding material). Metal clad insulation can create considerable problems with signal transmission and reception, even in 'standard' buildings where shielding is unintended. It can lead to the creation of 'hot spots' where high field levels exist and 'black spots' where signals cannot be received. Such materials greatly complicate effective wireless transmission both indoors and out. This problem is avoided with wired systems.

**Flooring:** Timber flooring allows RF/microwave signals through to a far higher degree than concrete flooring, reinforced concrete flooring or concrete and metal deck floor construction. With concrete flooring the signal virtually disappears. With reinforced concrete, the spacing of the metal bars will determine in part the frequencies that can get through.

**Wireless smart meters – transmission effectiveness and locations:** 900MHz is far more effective at propagation through building materials than the higher 1800MHz and 2.4GHz. Transmission will also be affected by the types of building construction that are encountered and whether signals have to pass through one or several rooms.

**Smart meters and neighbouring buildings:** The impact of neighbouring buildings on the reflection of signals is often dependant on how they are constructed and can be quite significant difficulties.

**Technical issues:** It is recognised by wireless industry experts that 'black spots' areas where no signals can be received can often be found even within unshielded buildings. This problem could be solved by using wired technology.

Every dwelling has different signal propagation conditions. Reduced signal coverage occurs as frequencies increase. There are already reports of poor signal penetration of 2.4GHz ZigBee transmissions indoors, partially as a result of meter placement, with huge variations in field levels being encountered over relatively small areas due to reflection. It has also been reported that the use of WiFi applications in that frequency range can introduce interference on ZigBee networks, even in situations where ZigBee is switching channels to improve coverage. It is recognised by experts that co/cross channel interference in the 2.4 GHz range will get worse.

The issue of poor propagation of 2.4 GHz signals within buildings which may compromise such technology's effective use, has yet to be fully addressed.

## **Shielding methods**

**Metal shielding:** This can be effective in preventing the ingress or egress of RF/microwave emissions if a full Faraday cage structure is created in which no signal can get in or out. When there are even small openings in the structure RF/microwaves may enter or exit and cause problems. As discussed above, metal coatings can also be used on glass for shielding purposes.

**Frequency Selective Surfaces (FSS):** These can be installed in areas of buildings to allow in specific frequencies, such as those used by the emergency services, whilst excluding the ingress of other frequencies. These can be either active or passive, i.e. fixed or changeable with regard to the frequencies they allow through or block. Sometimes FSS are used by companies who wish wireless accessibility only in highly localised areas of buildings.

There are a variety of element patterns that can be introduced into FSS to block some frequencies but include others. These include: caltrops; circular patch; cross dipole; dipole; Jerusalem cross; ring; square loop; square mesh; and tripole. Additionally, it is feasible to introduce slots into conductive sheeting to make it completely transparent to predetermined RF/microwave frequencies. It is also possible to block signals by retuning the surface with a frequency of around 100kHz to make signals, such as those passing through the surface undecipherable. The cost of introducing FSS into buildings is significant, particularly as a retrofit measure.

**Smart walls:** These can have their electromagnetic characteristics reconfigured at choice to allow or block different frequency ranges. This type of walling includes 'intelligent wall units', metal walling with antennae in them controlled by PC to allow the ingress of particular frequencies within particular rooms when required. Such walling would generally block the signals from wireless smart meters unless they were received from the antennae placed in the walls.

**Smart appliances and shielding:** In situations, where shielding is undertaken, an additional challenge will be created by the presence of RF/microwave emitting smart appliances indoors, with the radiation they create being confined and reflected backward into the building increasing individuals' exposure levels from such sources. When wireless smart appliances find they are unable to connect wirelessly with smart meters, they will continue to send out their "calling cards" seeking to connect, thereby further increasing radiation levels indoors. There should be an option to disable the wireless function of such devices.

### **Biological effects of Shielding**

Peer-reviewed scientific research indicates that Faraday cage conditions can help protect against detrimental biological effects created by exposure manmade to RF/microwave radiation at levels that can be encountered outdoors. It also indicates that the best situation appears to be where low field regimes exist, the need for shielding is avoided and individuals can be properly exposed to more natural electromagnetic field regimes.

As noted by Jamieson et al. (2010), citing research on mice by Mose et al. (1973) and Fischer (1973), exposure to Faraday cage conditions has been also been indicated as compromising immune system functioning; with exposure to constant vertical DC field protocols mimicking natural field conditions (that can be masked by manmade radiation or Faraday cage conditions) being shown to enhance biological performance.

In that work, the plaque count method devised by Jerne & Norlin (1963) was used to determine the degree of immunity exhibited by animals exposed to different field regimes, with higher plaque counts indicating more efficient immune system response. It was revealed that a vertical DC electric field of only 40 V/m could significantly increase immune system response over true Faraday cage conditions, with further improved immune system responses being noted at the further increased field strengths shown. Natural fair-weather DC fields of 80-150 V/m are regularly encountered outdoors in Nature and are often blocked from ingress indoors (Table 17.1.1).

**Table 17.1.1: Plaque Counts after 15-day exposure to various field levels** (Mose et al. 1973, Fischer 1973).

Number of investigations per exposure	Vertical DC electric field strength (V/m)	Plaque counts (indicating degree of immunity)		
		Constant DC field	Control chamber (normal conditions)	Faraday cage conditions
10	40 V/m	210.2 ± 24.1	232.3 ± 13.2	111.6 ± 11.0
10	200 V/m	608.0 ± 55.1	384.0 ± 31.7	199.2 ± 16.5
15	1,000 V/m	572.4 ± 112.8	161.6 ± 31.5	76.0 ± 34.0

Source: Möse et al. (1973), Fischer (1973).

Evidence indirectly supporting the possible health benefits that may occur through the adoption of more natural electromagnetic field protocols is given by Hahn (1956), who noted dramatic recoveries in sick animals (cows, goat, pigs and a chicken with avian influenza) after exposure to DC vertical electric fields. Additionally, over an 8-year test period, none of those individuals exposed to such fields (whilst managing the exposed animals on a regular basis) succumbed to colds, influenzas or any another type of infectious disease. Hahn (1956) also documented reduced incidents of infection and improved recovery rates in hospital areas where DC vertical fields were created indoors.

#### **Shielding of Natural Radiowaves**

Radiowaves are also created in Nature. Research indicates that atmospheric electricity (*also known as sferics*), the electromagnetic impulse and carrier-frequencies created by Nature during weather-conditions, may also significantly influence biological functioning, and that screening or masking naturally occurring electromagnetic weather patterns may be detrimental to health.

As an example, with regard to oxygen-uptake, Lotmar et al. (1969, 1968) directly demonstrated the relationship between the specific electromagnetic frequencies and waveforms created by natural atmospheric phenomena present during different weather conditions and tissue-respiration. The results of their tests on mouse liver tissue respiration using (simplified) simulated fair weather fields and poor-weather fields (which represented the field conditions present during very heavy thunderstorms) are shown (Table 17.1.2) and indicate that some carrier and impulse-frequencies can substantially influence biological oxygen-uptake. Similar tests have not yet been undertaken assessing the possible effects of 900MHz, 1800MHz or 2.4GHz on oxygen-uptake in comparison with simulated fair weather fields.

In Lotmar et al. (1969, 1968)'s work, a 42±2.8% reduction in *in-vitro* respiration was demonstrated during the electromagnetically-simulated cyclonic (poor) weather programs compared to the simulated fair weather situation ( $p < 0.001$ ). The field intensities used were typical of those that can be found under such conditions in real-life.

**Table 17.1.2: Simulated weather conditions & oxygen-uptake of isolated mouse liver tissue**

Type of Impulse Program	Carrier-Frequency	Impulse-Frequency	Field Intensity	Mean O <sub>2</sub> consumption of liver tissue
Simulated cyclonic weather programs	10 – 100 kHz	30 – 100 Hz	>100 mV/m	42% reduction ± 2.8%
Fair weather narrow-band	10kHz	3 – 10 Hz	10 mV/m	No effect shown

A Faraday cage was used to shield natural atmospheric impulse frequencies and Helmholtz coils used to simulate the Earth's magnetic field.

Source: Lotmar et al. (1969, 1968).

Similar findings on oxygen-consumption were made by Damasche & Becker (1964), with regard to the effects of differences in the pulse-repetition rates of VLF atmospheric on the oxygen-consumption rates of *Zootermopsis nevadensis Hagen* (termites) – *VLF frequencies cover the range*

3kHz to 30kHz. A significant correlation was again shown, with O<sub>2</sub> utilization being markedly improved during incidents of minima in VLF atmospherics and markedly worse during incidents of maxima. Comparable effects were demonstrated using simulated fields in laboratory conditions, though specific effects for individual impulse frequencies could not be determined.

Unlike exposures to man-made RF/microwave radiation, cyclonic weather fields - such as those shown above which are indicated as reducing oxygen uptake - are normally only experienced for short periods of time. The field levels at which effects have been recorded are far less than those deemed safe in Health Canada's Safety Code 6 (2009).

In the Landau Lecture that Nobel Prize Winner Otto Warburg gave in 1966 on 'The Prime Cause and Prevention of Cancer, he noted that "sub-optimal oxygenation of cells and tissues is a prime factor in cancer and degenerative diseases". He also demonstrated that reduced levels of useable oxygen place stress on the body and decrease brain efficiency (Warburg 1966).

Exposure to vertical DC electric fields and fair-weather RF frequencies, which can be beneficial to health and wellbeing, can be inadvertently prevented through typical shielding regimes and the presence of manmade RF/microwave radiation that can counteract their effects.

**Shielding:** Shielding buildings against RF/microwave radiation ingress or egress is often difficult and costly. Whilst potentially helping to reduce individuals' exposure to RF/microwave radiation indoors, it fails to take address the issue of individuals wishing to be protected from increased levels RF/microwave radiation when outside their homes and within their neighbourhoods, or even wishing to naturally ventilate their homes as an energy saving measure.

**Recommendations:** In this instance, the simplest, and most cost effective, solution appears to be to reduce the likelihood of shielding being required by having a wired metering infrastructure instead of a wireless one (and encourage people to use wired devices where practical). Reducing/avoiding creating extra exposures reduces the potential size of the problem. Where practical unnecessary creation of, and exposure to, RF/microwave radiation (a Class 2B Carcinogen (WHO/IARC 2011)) should be avoided.

These recommendations are suggested on the scientific basis that RF/microwave can often be biologically active in a non-beneficial way (refer also to the peer-reviewed science mentioned in Dr Jamieson's original commentary). Connectivity can be achieved without the use of RF/microwave wireless technology. It is proposed by Dr Jamieson that as a matter of best practice it may be prudent to retain analog meters, until their replacements are proven to be safe and financially viable.

## References

- Damaschke, K. & Becker, G. (1964), Korrelation der Atmungsintensität von Termiten zu Änderungen der Impulsfrequenz der Atmospherics. Z. Naturforschung, Vol. 19, No. 2, pp. 157-160.
- Fischer, G. (1973), Die bioklimatologische Bedeutung des elektrostatischen Gleichfeldes. Zbl. Bakt. Hyg., 1. Abt., Orig., Reihe B, 157, pp. 115-130.
- Hahn, F. (1956), Luftelektrizität gegen Bakterien für gesundes Raumklima und Wohlbefinden [Air electricity against bacteria for healthy room climate and well-being]. Albrecht Philler Verlag, Minden.
- Jerne, N.K & Nordin, A.A. (1963), Plaque formation in agar by single antibody-producing cells. Science, 26, pp. 405.
- Lotmar, R., Ranscht-Froemsdorff, W.R. & Weise, H. (1969), Dämpfung der Gewebeatmung (QO<sub>2</sub>) von Mäuseleber durch künstliche Impulsstrahlung. International Journal of Biometeorology, 13(3 & 4), pp 231-238.
- Lotmar, R. & Ranscht-Froemsdorff, W.R. (1968), Intensität der Gewebeatmung und Wetterfaktoren. (Korrelation d. QO<sub>2</sub> von Kaninchenhaut und Atmospherics). Z. angew. Bäder- und Klimaheilkunde.
- Möse, J.R., Fischer, G. & Strampfer, G. (1973), Immunbiologische Reaktion im elektrostatischen Gleichfeld und Faraday-Käfig. Z. Immunitätsforsch Exp Klin Immunol 145, pp. 404-412.
- Warburg, O. (1966), The Prime Cause and Prevention of Cancer, 1966, Lindau Lecture, Wurzburg, Germany.

18. Exhibit C9-10-1, ISAAC JAMIESON

Fibre optics networks present a more secure, cost-effective, alternative to wireless smart meters. They are also more biologically friendly and 'future proofed' than wireless options and BPL. "...when you add a demand for reliability and resiliency (as well as a technology that doesn't conduct electricity) to the trends already highlighted, fiber offers a exemplary conduit for the intelligence, two-way communications, and control and monitoring capabilities smart grid applications demand." (Hardy 2010).

**Fibre optics appears a smarter more 'environmentally friendly' alternative to adopt for general rollouts to gain public acceptance and attract investment.**

- 18.1. Is this solution one that requires integration with home service offerings to make it economic and in what way does Isaac Jamieson believe that the BC Utility Commission can require utilities to go into businesses they are not in and or to partner with businesses they are not planning to partner with?

It is Dr Jamieson's intent, in the initial commentary he provided, and in this current set of responses, to offer advice to FortisBC and BCUC that may help them avoid potential problems and optimise the design, operation and financial viability of metering systems in British Columbia.

The adoption of fibre optic systems would help reduce some, though not all, of the potential problems that are being encountered and/or may arise with smart meters. Integration of a fibre optic system with home service offerings, as undertaken in smart metering roll-outs elsewhere, would appear to increase the financial viability of such an option and potentially open up a new revenue stream to FortisBC and its shareholders.

Dr Jamieson does not believe that BCUC can require utilities to go into businesses they are not in, or to partner with businesses they are not planning to partner with. His intent is to provide suggestions that may benefit BCUC, FortisBC and the citizens of British Columbia.

Incidentally, with regard to financial viability, it was reported by Merrion (2011) that in a 3-month pilot test of around 8,000 randomly selected dwellings where smart meters were installed, less than 9% used their newly installed smart meters to save money by turning off appliances adjusting thermostats afternoons or on hot days, even though ComEd imposed higher rates, or offered rebates during peak-demand hours, to encourage consumer reduction.

"It's devastating to their plan," says Susan Satter, senior assistant Illinois attorney general for public utilities. The report shows "zero statistically different result in usage, compared to business as usual." (Merrion 2011).

**Reference**

Merrion, P. (2011), Pilot test of ComEd's smart grid shows few consumers power down to save money. <http://www.chicagobusiness.com/article/20110528/ISSUE01/305289982/pilot-test-of-comeds-smart-grid-shows-few-consumers-power-down-to-save-money>

19. Please describe the state of Wi-Fi services at Imperial College London and whether or not they are expanding or being eliminated.

- 19.1. Please provide copies of any presentations Isaac Jamieson has made to the University regarding RF radiation on the campus.

- 19.2. Please indicate whether or not the offices in Isaac Jamieson department have any wireless equipment installed in them.

The above question is irrelevant. The following may be of interest to the questioner: "**WiFi Use: Before smart meters, about 40% of respondents were using wifi without symptoms. 11% were using wifi but with symptoms from it, and 17% were not using wifi because it had caused symptoms in the past. Following smart meter exposure, those able to use wifi without symptoms dropped**

**(from 40%) to 18% (less than one-half of before) while those continuing to use wifi but with symptoms from it nearly tripled (from 11%) to 28%. The number of respondents who could not use wifi at all because of symptoms more than doubled (from 17%) to 41%**" (Conrad & Friedman 2013).

Also of potential interest to the questioner is the following: **"Computer Use: Before smart meters, nearly 79% of respondents were using computers without symptoms while about 20% were using computers despite having symptoms from computer use. Following smart meter exposure, those able to operate a computer without symptoms dropped (from 79%) to 39% (about one-half of before), while those showing symptoms from computer use nearly tripled (from 20%) to 57%**" (Conrad & Friedman 2013).

#### Reference

Conrad, R. & Friedman, E. (2013), EXHIBIT D – Smart Meter Health Effects Survey and Report, <http://www.mainecoalitiontostopsmartmeters.org/wp-content/uploads/2013/01/Exhibit-10-Smart-Meter-Health-Effects-Report-Survey2.pdf> [This a revised version of the version filed with Maine PUC and may include more recent analyses or additions, edits for clarity or, periodically, additional data if those authors reopen the survey. Current version date: 2/6/13].

19.3. Please indicate whether or not Isaac Jamieson has a cell phone and whether or not his colleagues in the department have cell phones.

The above question is irrelevant. The following may be of interest to the questioner: **"Cell Phone Use: Before smart meters 50% of respondents were using cell phones without symptoms, while 18% used cell phones but with symptoms. 14% of respondents did not use cell phones because of symptoms. Following smart meters, those able to use cell phones without symptoms dropped (from 50%) to 24% (about one-half of before), and those with symptoms from cell phone use more than doubled (from 18%) to 39%. After smart meters, those who did not use cell phones at all because of symptoms nearly doubled (from 14%) to 26%**" (Conrad & Friedman 2013).

#### Reference

Conrad, R. & Friedman, E. (2013), EXHIBIT D – Smart Meter Health Effects Survey and Report, <http://www.mainecoalitiontostopsmartmeters.org/wp-content/uploads/2013/01/Exhibit-10-Smart-Meter-Health-Effects-Report-Survey2.pdf> [This a revised version of the version filed with Maine PUC and may include more recent analyses or additions, edits for clarity or, periodically, additional data if those authors reopen the survey. Current version date: 2/6/13].

19.4. Please indicate whether or not Isaac Jamieson has knowledge of any RF studies regarding the campus at Imperial College London and please provide copies of any such studies if they exist.

The above question is irrelevant.

19.5. Please provide a description of an activity Isaac Jamieson has participated in with respect to RF policy at the University level.

A detailed investigation of the possible effects of different types of RF/microwave exposure was undertaken as part of Dr Jamieson's PhD research. Additionally, whilst at Imperial College London, research proposals were written related to RF/microwave emissions and how potential detrimental effects might be mitigated and biologically beneficial electromagnetic environments created.

Dr Jamieson organised the one-day international conference "Electromagnetic Phenomena and Health – A Continuing Controversy?" through the Electrostatics Group of the Institute of Physics whilst at Imperial College London. The speakers at that event were: Dr Mike Repacholi (Former Director of EMF Program, World Health Organization University of Rome); Dr Paolo Vecchia (Chairman of ICNIRP); Professor Yury Grigoriev (Chairman of Russian National Committee on Non-ionizing Radiation Protection); Dr David O. Carpenter (Director of the Institute for Health & Environment at the University at Albany); Associate Professor Olle Johansson (Associate Professor

of The Experimental Dermatology Unit, Karolinska Institute Stockholm); Professor Henry C. Lai (Department of Bioengineering, University of Washington); Dr John Swanson (UK National Grid); Professor Mike O'Carroll (Professor Emeritus and formerly Pro Vice-Chancellor, University of Sunderland); and Dr Jamieson himself.

An extract from the Foreword to the Conference Proceedings of that event, for which he was co-editor, is given below:

“A variety of natural electromagnetic phenomena – from electrostatic and magnetostatic fields to radiowaves, microwaves, infrared, visible light, ultraviolet, X-rays and gamma radiation – may influence human health and wellbeing (by their presence, intensity or absence) in a number of diverse ways. ...

Since the deployment, use and types of technology and materials that can alter the electromagnetic nature of environments to which individuals are exposed are growing at an ever increasing rate; it is necessary to consider and rigorously assess the possible biological effects (both beneficial and detrimental) that they may cause, or be instrumental in causing, so that appropriate safety and best practice measures can be introduced/adhered to if and where appropriate ...” (Jamieson & Holdstock 2010).

Dr Jamieson has been involved with matters related to RF/microwave policy at European level as an Expert Group Member of the European Commission's DC SANCO Group of Stakeholders on EMF since 2011.

#### **Reference**

Jamieson, I.A. & Holdstock, P. (2010), Electromagnetic Phenomena and Health – A Continuing Controversy?, IOP Conference Series: Earth and Environmental Science, 10(1).  
<http://iopscience.iop.org/1755-1315/10/1/011001?fromSearchPage=true>