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February 7, 2013

## VIA ELECTRONIC MAIL

British Columbia Utilities Commission  
6<sup>th</sup> Floor, 900 Howe Street  
Vancouver, B.C.  
V6Z 2N3

**Attention: Erica M. 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**

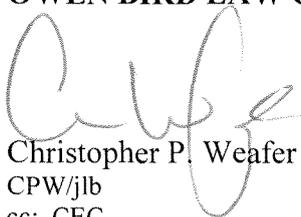
We are counsel for the Commercial Energy Consumers Association of British Columbia (CEC). Attached please find the CEC's Information Requests on the filed evidence of Girish Kumar pertaining to the above-noted matter.

A copy of this letter and attached Information Requests has also been forwarded to FortisBC and registered interveners by e-mail.

If you have any questions regarding the foregoing, please do not hesitate to contact the undersigned.

Yours truly,

**OWEN BIRD LAW CORPORATION**



Christopher P. Weafer  
CPW/jlb

cc: CEC  
cc: FortisBC Inc.  
cc: Registered Intervenors

Commercial Energy Consumers Association of BC

Information Request # 1

For Girish Kumar, B.Sc. PhD (Electrical Engineering)

1. Exhibit C9-8, 3D-CV GIRISH KUMAR

**Research and Development Experience**

Worked in the broad area of microwaves and antennas. More specifically, worked on the followings:

- Broadband Microstrip Antennas (MSA) - Proposed and developed several new broadband MSA configurations, such as, gap coupled and directly coupled rectangular MSA, hybrid coupled circular, semi-circular, and triangular MSA, electromagnetic and aperture coupled multilayer MSA.
- Circularly Polarized MSA - Developed new circularly polarized MSA configurations using modified triangular MSA and off-centered stacked circular MSA.
- Multi-frequency MSA - Worked on several multi-frequency MSA, such as, stub loaded rectangular and circular MSA, hybrid coupled semi-circular and circular MSA.
- Compact Microstrip Antennas - Developed compact MSA configurations using shorted variations of rectangular, circular, and triangular MSA.
- Microstrip Antenna Arrays - Developed phased array MSA for land mobile satellite communication and defence applications.
- HF Broadband antennas - Designed HF broadband antennas using conical monopole, planar disc monopole, and log-periodic antenna arrays.
- Educational Trainer Systems- Designed various antennas, impedance matching networks, and microstrip components for Antenna, Transmission Line, and Microstrip Trainer Systems, respectively.
- Microwave Industrial Applications - worked on several microwave industrial applications, such as, moisture content measurement, microwave heating for food and pharmaceutical applications.

**Research and Deve**

Worked in the br followings:

- Broadband Mi MSA configur: coupled circula multilayer MSA
- Circularly Pola modified triang
- Multi-freque rectangular and
- Compact Micr variations of re
- Microstrip An communication
- HF Broadband disc monopole, and log-periodic antenna arrays.

1.1. Please provide Girish Kumar's credentials establishing expertise in the following areas:

- Educational Trainer Systems- Designed various antennas, impedance matching networks, and microstrip components for Antenna, Transmission Line, and Microstrip Trainer Systems, respectively.

1.1.2. Establishing the biological impact of RF radiation

- Microwave Industrial Applications - worked on several microwave industrial applications, such as, moisture content measurement, microwave heating for food and pharmaceutical applications.

- 1.1.3. Establishing the health impact of RF radiation
- 1.1.4. Evaluating merit of claims that RF radiation is a carcinogen
- 1.1.5. Evaluating epidemiological studies of health issues

2. Exhibit C9-8, 3D-CV GIRISH KUMAR

- Radio Frequency Radiation Study of TV Tower, Worli, I-Ven Realty Limited, Mumbai, 2007.
- Studies of the radiation impact of TV tower on residential building, Shree Ram Urban Infrastructure Limited, Worli, 2008.
- Cell tower radiation report, Telecom Users Group, Delhi, 2010.
- Solutions for Radiation emitted through cell phone towers and other devices, BMS Wellness Pvt. Ltd., 2011-2012.

- 2.1. Please provide copies of applicable reports if the author deals with health effects of RF radiation in these consultancy assignments.
- 2.2. Please provide copies of any other studies Girish Kumar has done with respect to assessing health impacts related to RF Radiation.

3. Exhibit C9-8, 3D-CV GIRISH KUMAR

- [9] B. Rawat, G.R. Babu and G. Kumar, "A study of biomedical effects using electromagnetic field concept", *Proc. of North Dakota Academy of Science*, vol. 41, p. 22, April 1987.
- [140] G. Kumar and N. Kumar, "Thermal effects of cell phone and cell tower radiation", *Micro-Nano-2011*, JNU, Delhi, March 2011.
- [150] N. Kumar, I. Das and G. Kumar, "Electromagnetic Radiation Hazards and its Biological Effect", *Proc. of National Conf. on Harmful Effects of Mobile Phone Radiations on the Health of Human Beings*, Barwani, India, p. 1, Sep. 2012.
- [151] I. Das, N. Kumar, and G. Kumar, "Review of Electromagnetic Radiation Effect on Plant Growth and Productivity", *Proc. of National Conf. on Harmful Effects of Mobile Phone Radiations on the Health of Human Beings*, Barwani, India, p. 2, Sep. 2012.
- [153] G. Kumar, "Cell Phone/Tower Radiation Hazards and Solutions", *Proc. of Int. Conf. on Engineering, NUiCONE*, Ahmedabad, India, pp. 109-110, Dec. 2012.

- 3.1. Please provide copies of these papers.
- 3.2. Please provide copies of any other papers Girish Kumar has written with respect to assessing health effects of RF radiation.

[150] N. Kumar, I. Das and G. Kumar, "Electromagnetic Radiation Hazards and its Biological Effect", *Proc. of National Conf. on Harmful Effects of Mobile Phone Radiations on the Health of Human Beings*, Barwani, India, p. 1, Sep. 2012.

[153] G. Kumar, "Cell Phone/Tower Radiation Hazards and Solutions", *Proc. of Int. Conf. on Engineering, NUiCONE*, Ahmedabad, India, pp. 109-110, Dec. 2012.

4. Exhibit C9-8, 3D-CV GIRISH KUMAR

Professor Elect. Engg. Dept., I.I.T. Bombay, India Feb. 2001 - present

- 4.1. Would it be fair to say that Girish Kumar has the vast majority of his experience in microwave, radio frequency and antenna electrical engineering and has relatively little experience with health studies ?

5. Exhibit C9-8, 3B- KUMAR REPORT

My comments on the document, "UNDERSTANDING RADIO FREQUENCY AND BC HYDRO'S SMART METERS" are given below:

- 5.1. Please provide a copy of the document referenced, upon which Girish Kumar is commenting.

6. Exhibit C9-8, 3B- KUMAR REPORT

is from 890-960 MHz. Thus, all the health hazards associated with radiation from cell phones and cell towers are applicable to Smart meters.

- 6.1. This opinion makes it sound like there is no difference between cell phones, cell towers and smart meters with respect to assessment of radiation health hazards, does Girish Kumar agree that there are distinct differences with respect to the potential for health hazards between these three sources of RF radiation?
- 6.2. The point made above the selected passage makes it clear that the radio frequency range within which smart meters with wireless communication operate is the same range as that used for cell phones and cell towers. Is Girish Kumar establishing this as a fact?
- 6.3. Cell towers, cell phones and smart meters operate very differently in other respects than their frequency. Does Girish Kumar agree with this statement?
- 6.4. Please provide a full description of the differences in operation between cell towers, cell phones and smart meters with respect to any dimension other than frequency which could have an effect on the degree to which people may be exposed to radio frequency energy, which might be assessed with respect to its potential for causing a hazard to human health?

7. Exhibit C9-8, 3B- KUMAR REPORT

It is mentioned that "There is a great weight of evidence that RF field intensities below Safety Code 6 are not harmful.". This statement is not correct. Canada Health Safety Code 6 mentions safe limit of  $600 \mu\text{W}/\text{cm}^2$  whereas many reports have mentioned several health hazards at much lower level, some of these are given below:

It is mentioned that "There is a great weight of evidence that RF field intensities below Safety Code 6 are not harmful.". This statement is not correct. Canada Health Safety Code 6 mentions safe limit of  $600 \mu\text{W}/\text{cm}^2$  whereas many reports have mentioned several health hazards at much lower level, some of these are given below:

- 7.1. Is Girish Kumar aware of any reports and or studies, which agree with the statement that Safety Code 6 or similar levels of RF radiation are not expected to be harmful to people's health?
- 7.1.1. If so, please list those reports and studies which agree with the statement that RF field intensities below Safety Code 6 are not harmful.

8. Exhibit C9-8, 3B- KUMAR REPORT

•Prof. Girish Kumar, IIT Bombay, India recommends  $100 \mu\text{W}/\text{m}^2 = 0.01 \mu\text{W}/\text{cm}^2$   
Please see my attached presentation especially:

- 8.1. Please provide a description of Girish Kumar's role in setting RF radiation standards in India, if any.
- 8.1.1. If none please clarify to whom he has recommended this standard.
- 8.2. Please provide a list of all RF radiation standard setting authorities to whom Girish Kumar has presented his recommendation and please provide the decisions of those authorities with respect to the standard setting after having received Girish Kumar's recommendation
- 8.3. Please provide a copy of any submission Girish Kumar has made to a standard setting authority with respect to RF radiation standards.
- 8.4. Please provide a description of the use of cell phones, cell towers, wi-fi, cordless radio and any other relevant source of RF radiation within the campus of IIT Bombay and any submissions made by Girish Kumar with respect to changing the standards used by IIT as well as the IIT decision outcomes.
- 8.5. Does Girish Kumar use a cell phone and do members of the faculty in his department use cell phones?

9. Exhibit C9-8, 3B- KUMAR REPORT

On May 31, 2011, International Agency for Research on Cancer (IARC), a part of WHO designates cell phones as "possible human carcinogen" [Class 2B]. They Found evidence of increase in glioma and acoustic neuroma brain cancer for mobile phone users.

- 9.1. Is Girish Kumar aware that the IARC, having classified RF radiation from such sources as cell phones as a Class 2B carcinogen has not yet conducted any study of this issue let alone found evidence of increased glioma and acoustic neuroma brain cancer for mobile phone users?
- 9.2. Could Girish Kumar please provide his understanding of what the criteria are for establishing a Class 2B carcinogen, particularly distinguishing between evidence others have claimed and the results of studies undertaken by IARC to establish evidence?

10. Exhibit C9-8, 3B- KUMAR REPORT

Critical comments by the leading experts on Danish cohort study can be seen at:  
<http://electromagnetichealth.org/electromagnetic-health-blog/critical-comments-danish-study/>

To quote comments by Devra L. Davis, PhD, MPH, Cancer Epidemiologist and President of *Environmental Health Trust*: "Unsurprising, biased and misleading".

10.1. Could Girish Kumar please describe why he selected this critical comment of this particular study for inclusion in his report?

11. Exhibit C9-8, 3B- KUMAR REPORT

BC Hydro's Smart Meter radiation density of  $2 \mu\text{W}/\text{cm}^2$  is well within Canada Health Safety Code 6 but is too high from health point of view as mentioned above.

11.1. Please confirm that in Canada the Safety Code 6 is set by the authorized authorities to govern the potential for health impacts related to RF Radiation and that they and numerous other Canadian Health authorities publicly state that Smart Meters are not a public health problem.

11.2. Please confirm that the RF radiation signal from the Smart Meter referenced comes from a 1 Watt radio transmitter and that this is a relatively low power transmitter

11.3. Please confirm that Girish Kumar understands that, for people, any health issues related to Smart Meters would be a function of physical exposure to the RF radiation signal and not the energy emitted from the transmitter.

11.4. Please confirm that the  $2 \mu\text{W}/\text{cm}^2$  referenced for BC Hydro's Smart Meters, which Girish Kumar is states is too high is the RF radiation measured at 20 cm in front of the meter

11.5. Does Girish Kumar agree that people would not be exposed to RF radiation of this intensity unless they were directly in front of the meter, at the time the meter was sending a signal and 20 cm away from the meter?

11.6. Does Girish Kumar agree that virtually all people, wherever Smart Meters are installed, would not be exposed to the  $2 \mu\text{W}/\text{cm}^2$  RF level from their Smart Meter?

11.7. Does Girish Kumar agree that the intensity of the RF radiation from the Smart Meter attenuates with distance away from the radio signal source in the Smart Meter and that this attenuation reduces exponentially with the square of the distance away?

11.8. Does Girish Kumar agree that the relevant exposure of people to RF radiation will be the exposure at a greater distance than 20 cm and that the average distance people will be away from a Smart Meter RF signal is likely to 10 feet?

11.8.1. If not please provide Girish Kumar's understanding of the relevance of distance and the likely average distance 99.9% of the population would experience from their Smart Meters

Critical comments by the leading experts on Danish cohort study can be seen at:  
<http://electromagnetichealth.org/electromagnetic-health-blog/critical-comments-danish-study/>

BC Hydro's Smart Meter radiation density of  $2 \mu\text{W}/\text{cm}^2$  is well within Canada Health Safety Code 6 but is too high from health point of view as mentioned above.

- 11.9. Does Girish Kumar agree that the relevant exposure of people to RF radiation is also a function of duration of exposure to the RF radio signal and that the duty cycle of a Smart Meter is relevant to determining the level of exposure?
- 11.10. Does Girish Kumar agree that the Smart Meters in question have a duty cycle of less than 1 minute per day or about .07% duty or 99.93% idle and if not please provide Girish Kumar's understanding of the duty cycle of the Smart Meters?
- 11.11. Does Girish Kumar agree that the meter boxes and the backing plates the Smart Meters plug into provide a degree of shielding from the RF radiation signal and that the RF exposure behind a Smart Meter is significantly less than in front of the Smart Meter and that Smart Meters are generally installed on the external wall of a home facing away from the residential space?
- 11.12. Does Girish Kumar have any evidence as to the degree to which the RF radiation signal from a Smart Meter is reduced behind the backing plate of the Smart Meter versus being in front?
- 11.13. Does Girish Kumar agree that there is also a degree of shielding provided by the building materials through which the RF signals must travel before they would reach people?
- 11.14. Does Girish Kumar agree that the RF radiation signals from the collector tower to which the Smart Meters would send their signal are also low power, likely more than 20 feet away from people and are inactive 99% of the time?
- 11.15. Does Girish Kumar agree that the sum total of the actual exposure people would receive from a Smart Meter and the related collector towers would be very much smaller than the 2  $\mu\text{W}/\text{cm}^2$  RF radiation signal continuously on at 20 cm in front of the meter?
- 11.16. Would Girish Kumar agree that the relevant exposure of people to RF radiation from Smart Meters would be determined by the following calculation?  
 Life Time Exposure =  $\sum_t (P_t * D_t * T_t * A_t)$  where  
 t is the time duration of exposure in days for a life time  
 $P_t$  is the power of the transmission signal in  $\mu\text{W}/\text{cm}^2$   
 $D_t$  is the Distance factor =  $(1/d^2)$  and d is average distance away from transmitter in meters  
 $T_t$  is the time duration of the RF transmission signals = duty cycle active percentage  
 $A_t$  is the attenuation factor due to shielding incorporating and reflection factors = % attenuated

If Girish Kumar does not agree with this could he please provide his own methodology for the Smart Meters in question?

- 11.17. Does Girish Kumar agree that his methodology for assessing cell tower exposure related to the power of the exposure is the following;  
 Power density  $P_d$  at a distance R is given by

$$P_d = \left( \frac{P_t \times G_t}{4\pi R^2} \right)$$

Watt/m<sup>2</sup>

$$P_d = \left( \frac{P_t \times G_t}{4\pi R^2} \right)$$

Watt/m<sup>2</sup>

t a distance R is given by

$P_t$  = Transmitter power in Watts

$G_t$  = Gain of transmitting antenna

$R$  = Distance from the antenna in meters

- 11.18. Please explain the significance of the gain of the transmitting antenna and its applicability or inapplicability to the question of assessing the Smart Meters?
- 11.19. Please explain the significance of the  $4\pi$  in the formula above and discuss its applicability or inapplicability to the question of assessing the Smart Meters?
- 11.20. Does Girish Kumar agree that the relevant exposure for people to the cell tower RF radiation would also be a function time duration of exposure and attenuation of the signal through any medium between the signal and the people, if any?

## 12. Exhibit C9-8, 3B- KUMAR REPORT

It is not mentioned that at what distance measurements have been taken from various sources. Power density at a point varies as  $1/(\text{square of distance between source and measuring point})$ , so knowing the distance is important. Smart meters are installed in the vicinity of the houses or sometimes inside the houses, apartment buildings, offices, etc. so distance is very small. Precaution must be taken that smart meters are not installed at places, where people are working or living in the near vicinity for longer time.

- 12.1. Please confirm that the relevant exposure of people to RF radiation is not a question of the installation of the Smart Meters but a function of their wireless transmission operation and the attenuation factors which may apply to the signal to which people may be exposed.
- 12.2. Please confirm that inside a Faraday cage people would be exposed to no RF radiation signal and please explain what a Faraday cage is.
- 12.3. Please confirm that people are exposed to RF radiation signals from other sources including those which they may have in their possession or installed in their homes, work or other environments as well as sources external to their homes, work and other environments.
- 12.4. Does Girish Kumar agree that when assessing exposure to RF radiation that the sum total of all exposures would be relevant to the assessment and that the relative contribution of each source would be relevant in setting out protection or mitigation policies should one believe that this would be necessary?
- 12.5. Has Girish Kumar assessed the relevant contributions of RF radiation from all sources and the proportion which a Smart Meter RF signal might represent and if so could he please provide his assessment?

## 13. Exhibit C9-8, 3C – GK Cell Tower Radiation

It is not mentioned that at what distance measurements have been taken from various sources. Power density at a point varies as  $1/(\text{square of distance between source and measuring point})$ , so knowing the distance is important. Smart meters are installed in the vicinity of the houses or sometimes inside the houses, apartment buildings, offices, etc. so distance is very small. Precaution must be taken that smart meters are not installed at places, where people are working or living in the near vicinity for longer time.

## Mobile Towers – 5 lakh

13.1. Please confirm that 5 lakh is equivalent in the Arabic number system to 500,000.

14. Exhibit C9-8, 3C – GK Cell Tower Radiation

- Use the BlackBerry device in areas where there is a strong wireless signal. The indicator that provides information about the strength of the wireless signal is located in the upper-right corner of the Home screen and displays five ascending bars. Three or more bars indicate a strong signal. A reduced signal display, which might occur in areas such as an underground parking structure or if you are traveling by train or car, might indicate increased power output from your BlackBerry device as it attempts to connect to a weak signal.

14.1. Please confirm that cell phones do not emit a constant level of power but that the power varies with the cell tower density and accessibility to the cell phone, with power decreasing with increased density and accessibility of the cell towers.

14.2. Please confirm that cell phone power for transmission of radio frequency signals has in general decreased as the cell phone technology has advanced and please provide any historical information Girish Kumar has with respect to the decline in power required for a cell phone to operate.

15. Exhibit C9-8, 3C – GK Cell Tower Radiation

### Re-evaluation - Risk underestimated by at least 25%

- For every 100 hours of use -26% ↑ risk of meningioma
- Initial 24% risk of glioma ↑ to 55% over 10 years- regular users are taken as people who use it for **2hrs/month.**
- **Doubled - quadrupled brain tumor risk for heavy users (1/2 hour/day) over 8 to 10 years.**
- **Children, young adults– excluded. New study - Mobi-kids**

15.1. Please provide a copy of the reevaluation study which makes these claims.

15.2. Please confirm that subsequent studies by MP Little (M P Little, senior scientist<sup>1</sup>, P Rajaraman, investigator<sup>1</sup>, R E Curtis, research statistician<sup>1</sup>, S S Devesa, contractor<sup>2</sup>, P D Inskip, senior investigator<sup>1</sup>, D P Check, programmer<sup>2</sup>, M S Linet, senior investigator<sup>1</sup>) have confirmed that the predicted risk in

the Interphone study let alone an increased risk are not present in the US epidemiological

**(1/2 hour/day) over 8 to 10 years.**

➤ **Children, young adults– excluded. New study - I**

evidence they have reviewed and that they have provided caveats with respect to latency which may be beyond the bound of knowing.

15.3. Please confirm that the MobiKids study is being undertaken by Dr. Elizabeth Cardis of the Centre for Research in Environmental Epidemiology (CREAL) and that Dr. Elizabeth Cardis was a principal in the Interphone Study.

15.4. Please indicate whether the Interphone Study has adopted the corrections proposed in the re-evaluation and if so what if any comments they have provided and provide any reference material to support.

16. Exhibit C9-8, 3C – GK Cell Tower Radiation

International Agency for Research on Cancer (IARC), a part of WHO designates cell phones as "possible human carcinogen" [Class 2B]



Found evidence of increase in glioma and acoustic neuroma brain cancer for mobile phone

16.1. Please confirm that the neither World Health Organization (WHO) nor the International Agency for Research on Cancer (IARC) designated cell phones as a possible carcinogen but classified radiofrequency electromagnetic fields as a possible carcinogen Class 2B.

16.2. Please provide a copy of the full WHO press release 208.

16.3. Please confirm that the following is a partial excerpt of the results of their examination of the issue and the conclusions, which are conditional that there could be some risk.

**Results**

The evidence was reviewed critically, and overall evaluated as being *limited*<sup>2</sup> among users of wireless telephones for glioma and acoustic neuroma, and *inadequate*<sup>3</sup> to draw conclusions for other types of cancers. The evidence from the occupational and environmental exposures mentioned above was similarly judged inadequate. The Working Group did not quantitate the risk; however, one study of past cell phone use (up to the year 2004) showed a 40% increased risk for gliomas in the highest category of heavy users (reported average, 30 minutes per day over a 10-year period).

**Conclusions**

Dr. Jonathan Samet (University of Southern California, USA), overall Chairman of the Working Group, indicated that "the evidence, while still accumulating, is strong enough to support a conclusion and the 2B classification. The conclusion means that there could be some risk, and therefore we need to keep a close watch for a link between cell phones and cancer risk."

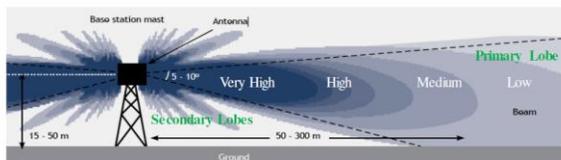
International Agency for Research on Cancer (IARC), a part of WHO designates cell phones as "possible human carcinogen" [Class 2B]



World Health Organization

Found evidence of increase in glioma and acoustic neuroma brain cancer for mobile phone

17. Exhibit C9-8, 3C – GK Cell Tower Radiation



Propagation of "main beam" from antenna mounted on a tower or roof top

People living within 50 to 300 meter radius are in the high radiation zone (dark blue) and are more prone to ill-effects of electromagnetic radiation

Power varies by  $1/R^2$ , where R = Distance from tower

17.1. Please provide a calculation of the radiation exposure in  $\mu\text{W}/\text{cm}^2$  for each 10 feet from 50 feet to 500 ft at the central point of the emission using the emissions for the Usha Kiran case example or confirm that the later provided calculations would apply to the Usha Kiran building case.

17.2. The graphic shows that at 300 m the impact of the beam is low, please provide Girish Kumar's view as to whether or not the risk at 300 m or 500 m would be minimal compared to the Usha Kiran building example.

17.3. For the Usha Kiran building example please provide the distance from the cell tower emission point to the closest apartments in the building.

17.4. Please confirm that these calculations apply for 100% continuous operation day and night and or provide an estimate of the operating profile.

17.5. Please compare the calculations at 500 meters of  $318 \mu\text{W}/\text{m}^2$  for a single operator and  $4770 \mu\text{W}/\text{m}^2$  with the emissions likely to impact a person in a home coming from a Smart Meter with a  $2 \mu\text{W}/\text{cm}^2$  signal to a person on average 10 feet from the Smart Meter, when the Smart Meter radio signal is not emitting 99.93% of the time and where the Smart Meter signal is shielded by the backing plate.

17.6. Please provide Girish Kumar assessment of the relative risk of the Smart Meter and the Cell Tower example at Usha Kiran.

17.7. Please provide a description of the building shielding proposals Girish Kumar has developed and proposed and provide any papers written on the shielding of buildings and how this is accomplished.

17.8. Please provide any study documentation with respect to the cancer cases in the Usha Kiran building example particularly to the extent there was work done to determine the effects of

People living within 50 to 300 meter radius are the high radiation zone (dark blue) and are more prone to ill-effects of electromagnetic radiation

Power varies by  $1/R^2$ , where R = Distance from

possible confounding factors or were the cancer cases identified essentially anecdotal and not studied in detail.

18. Exhibit C9-8, 3C – GK Cell Tower Radiation

Ultimately, everything is related to Energy

$$\text{Energy} = (\text{Power} \times \text{Time})$$

If we want to be safe for:

- 100 years, power density must be <100  $\mu\text{W}/\text{m}^2$
- 10 years, power density must be <1000  $\mu\text{W}/\text{m}^2$
- 1 year, power density must be <10,000  $\mu\text{W}/\text{m}^2$

Above values are for continuous exposure. If we are exposed for only a few hours per day, then we can afford to be exposed to higher radiation density.

Ultim

ated to Energy

$$\text{Energy} = (\text{Power} \times \text{Time})$$

18.1. Please confirm that if the exposure from a Smart Meter is only for .07% of a day then this would add a factor of at least 1000 versus continuous exposure.

If we want to be safe for:

18.2. Please confirm that Girsh Kumar believes that a power density of .01  $\mu\text{W}/\text{cm}^2$  would be safe for continuous exposure for 100 years.

■ 100 years, power density must be <100  $\mu\text{W}/\text{m}^2$

■ 10 years, power density must be <1000  $\mu\text{W}/\text{m}^2$

■ 1 year, power density must be <10,000  $\mu\text{W}/\text{m}^2$

18.3. Please discuss the multiple sources of RF exposure and how Girsh Kumar would proceed to prioritize reduction of exposure for instance (1) by reducing the most significant exposures first (2) confining each category the safe limit (3) benefit weighting of exposures to limit least valuable exposure (4) other alternatives as he would propose.

19. Exhibit C9-8, 3C – GK Cell Tower Radiation

Step 1

- Convince operators to reduce transmitted power from 20W/carrier to max. 1 -2 W in dense urban area.

HOW TO IMPLEMENT ?

Remove the power amplifier or reduce gain of amplifier.

Convince operators to reduce transmitted power from 20W/carrier to max. 1 -2 W in dense urban area

19.1. Please compare the power from the carriers to North American standards for carriers

19.2. Please confirm that North American carriers operate at powers in the range proposed.

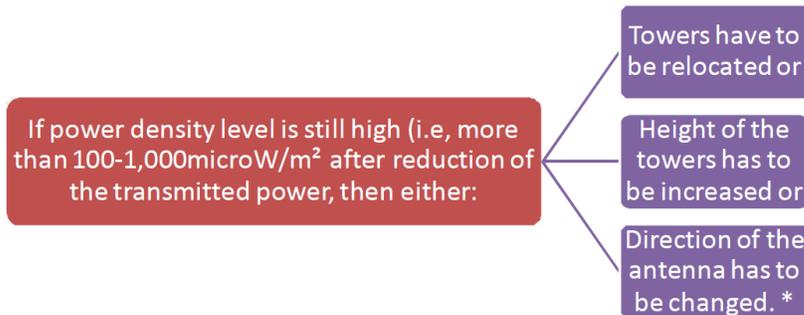
Step 1

HOW TO IMPLEMENT ?

Remove the power amplifier or reduce gain

- 19.3. Please describe how to remove power amplification and reduce the gain of the antenna (or amplifier if this is correct).
- 19.4. Please discuss why telecom carriers in India have lower towers and use more power in their communication signals than is done in North America.
- 19.5. Please discuss the ability of the telecom industry in India to make the additional investments to increase the number of communication towers, increase the height of the towers and change the direction of the antennas.

20. Exhibit C9-8, 3C – GK Cell Tower Radiation



- 20.1. Please discuss Girish Kumar’s preferred height for towers, preferred kinds of locations for towers and how the direction of the antenna might change.
- 20.2. Please quantify in  $\mu\text{W}/\text{cm}^2$  the preferred cell tower radio frequency emission after these proposed changes would be made in terms of the distance from the tower similar to the quantification of the existing situation provided in earlier slides.

