

Dear Ms. Martin:

Thank you for inviting me to provide my professional opinions on the SmartMeter safety issue. I will address two questions raised in the attached letter. But first, here is some background information:

1. Currently there are no national or international “**standards**” for safety levels of radiofrequency (a range of 3 kHz to 300 GHz) devices. What FCC is currently using are “guidelines” which have much lower certainty than a “standard”. One can go to many governmental agencies’ websites like NIOSH, EPA, FDA, etc. to verify this. Therefore, for anyone to claim that they meet “FCC” standards gives a false impression of safety certainty compared to “guidelines” which implies that a lot is “unknown”.
2. The current FCC “guideline” was adopted by FCC based on EPA’s recommendation in 1996. EPA made the recommendation “with certain reservation”. There was a letter by Norbert Hankin, Center for Science and Risk Assessment, Radiation Protection Division at EPA describing the current FCC guidelines (The letter can be found through a Google search). According to Hankin’s letter, the FCC current guidelines were solely based on “thermal effect” of radiofrequency, a level at which radiofrequency can cause heat injury. As we know, heat injury is not what the public is concerned about regarding radiofrequency safety. Their concerns are about cancer, miscarriages, birth defects, low semen quality, autoimmune disease, etc. Hankin’s letter, specifically emphasized that the EPA recommended guidelines that FCC is currently using do not apply to non-thermal effects or mechanisms (e.g., cancer, birth defects, miscarriage, autoimmune diseases, etc) which are the focus of the public’s concern. Hankin’s letter states “**Therefore, the generalization by many that the guidelines protect human beings from harm by any or all mechanisms is not justified.**”
3. In addition to being limited to only the thermal effect, the letter also states that the current FCC guidelines recommended by EPA were only based on experiments on animals in laboratories. Establishing firm safety standards usually requires evidence from human studies such as epidemiological studies. The current FCC guidelines were based on animal studies only, not human data, which may explain why they are only considered as guidelines rather than standards. Furthermore, the thermal effect used to establish the FCC guidelines was based on *acute* thermal effect. It did not even deal with chronic long-term intermittent effect. In fact, Hankin’s letter also states “**exposures that comply with the FCC’s guidelines generally have been presented as “safe” by many of the RF system operators and service providers who must comply with them, even though there is uncertainty about possible risk from nonthermal, intermittent exposures that may continues for years**”
4. Electromagnetic fields (EMFs) can come from sources with a spectrum of frequencies. EMFs from electric power sources usually have a frequency less than 1 kHz , while radiofrequency (RF) generated by SmartMeters are reportedly in the range 900 MHz to 2.4 GHz. While overall research on the EMF health effect remains limited, there are more reported studies examining the EMF health effect in power line frequencies (< 1

kHz) including some of my research<sup>1-3</sup> than in RF. It is not clear at this moment whether the findings on the EMF health effect at lower frequencies (i.e., < 1 kHz) can be applied to RF range. If the underlying mechanisms are similar, the findings in lower frequency EMFs can then be applied to RF range for SmartMeter. Many studies of power frequencies reported associations with childhood leukemia, miscarriage, poor semen quality, autoimmune diseases at a level much lower than those generating thermal damage as used by FCC.

5. Many chronic diseases that the public is concerned about (e.g., cancer) have a long latency period and take decades to show symptoms. Most wireless network and devices have only been used widely in the last 10 to 15 years. Therefore, many studies evaluating RF health effect related to cancer risk previously, if they failed to identify an adverse health effect, are not appropriate to be used as evidence to claim the safety of RF exposure since the latency period has not been long enough to show the effect even if an adverse association does indeed exist.
6. While the underlying mechanisms of the potential EMF health effect are not totally understood at present, skeptics have been focused on the EMF thermal effect, especially those who are NOT in the profession of biomedical research, such as physicists. It is now known that EMFs can interfere with the human body through multiple mechanisms. For example, it has been demonstrated that communication between cells depends on EMF signals, likely in a very low level. External EMFs could conceivably interfere with normal cell communication, thus disrupting normal cell differentiation and proliferation. Such disturbance could lead to miscarriage, birth defects, and cancer.

**To address the two questions raised in the letter:**

1. Whether FCC standards for SmartMeter are sufficiently protective of public health taking into account current exposure levels to radiofrequency and electromagnetic fields.

First, FCC currently has only “guidelines”, not standards as explained above. Second, as described in the background information above, the current FCC guidelines only deal with thermal effect which was also based on animal studies only. Meeting the current FCC guidelines, in the best case scenario, only means that one won’t have heat damage from SmartMeter exposure. It says nothing about safety from the risk of many chronic diseases that the public is most concerned about such as cancer, miscarriage, birth defects, semen quality, autoimmune diseases, etc. Therefore, when it comes to non-thermal effects of RF, which is the most relevant effect for public concerns, FCC guidelines are irrelevant and can not be used for any claims of SmartMeter safety unless we are addressing heat damage.

2. Whether additional technology-specific standards are needed for SmartMeter and other devices that are commonly found in and around homes, to ensure adequate protection from adverse health effects.

Safety standards for RF exposure related to non-thermal effects are urgently needed to protect the public from potential adverse health effects from RF exposure that are increasingly prevalent in our daily life due to installation of ever-powerful wireless networks and devices like SmartMeter. Unfortunately scientific research is still lacking in this area and some endpoints like cancer take decades to study. The safety standards are not likely to be available anytime soon. The bottom line is that the safety level for RF exposure related to non-thermal effect is unknown at present and whoever claims that their device is safe regarding non-thermal effect is either ignorant or misleading.

In summary, we do not currently have scientific data to determine where the safe RF exposure level is regarding the non-thermal effect. Therefore, it should be recognized that we are dealing with uncertainty now and most likely for the foreseeable future. The question for governmental agencies, especially those concerned with public health and safety, is that given the uncertainty, should we err on the side of safety and take the precautionary avoidance measures? Unknown does not mean safe. There are two unique features regarding SmartMeter exposure. First, because of mandatory installation, it is a universal exposure. Virtually every household is exposed. Second, it is an involuntary exposure. The public that are exposed to SmartMeters do not have any input in deciding whether they would like to have the SmartMeter installed. The installation is imposed upon the public. Governmental agencies for protecting public health and safety should be much more vigilant towards involuntary environmental exposures because governmental agencies are the only defense against such involuntary exposure. Given the uncertainty of the SmartMeter safety, one rational first step of public policy could be to require household consent before installation of SmartMeters. Finally, because of the nature of universal exposure, many susceptible and vulnerable populations including pregnant women and young children are unknowingly exposed 24 hours a day, 7 days a week. Usually, the threshold of harmful level is much lower for susceptible populations.

### References

1. Li DK, Odouli R, Wi S et al. A population-based prospective cohort study of personal exposure to magnetic fields during pregnancy and the risk of miscarriage. *Epidemiology* 2002;13(1):9-20.
2. Li DK, Yan B, Li Z et al. Exposure to magnetic fields and the risk of poor sperm quality. *Reprod Toxicol* 2010;29(1):86-92.
3. Li DK, Checkoway H, Mueller BA. Electric blanket use during pregnancy in relation to the risk of congenital urinary tract anomalies among women with a history of subfertility. *Epidemiol* 1995;6:485-489.