I am writing today in support of the City of Winnipeg providing an option to *not* have a Smart Water Meter transmitter placed on my property due to suffering from Electromagnetic Hypersensitivity Disorder (EHS). I am also writing on behalf of family members who also suffer from EHS and wish to express their desire for a clear opt-out policy as well. As a person suffering from EHS, I have had to have my entire home hardwired for Internet and my phone hardwired. I cannot use Blue Tooth devices and I ask my family members to keep any devices they have on Airplane Mode when not using them. Although this helps, I still struggle with the effects of my neighbours' Wifi, and two massive 5G towers and the giant CBC radio tower near my home. Adding emissions from Smart Water Meters multiple times per day will undoubtedly add to my health burden.

Summary:

- *There needs to be a clear and comprehensive opt-out program in place before Smart Meters are purchased so people know ahead of time what to expect*
- *It needs to be without cost*
- *It needs to be available when moving to a new residence*
- *It needs to be available to newly diagnosed individuals* after *the installation of a meter*

City Council entrusts the Public Service to do its due diligence when it gives them a task such as coming up with policies surrounding Smart Meters. The Public Service is, for all intents and purposes, a completely anonymous body of people, at least as far as the residents of Winnipeg are concerned. This group of virtually anonymous people are given immense power to make choices that affect hundreds of thousands of people. With that immense power comes immense responsibility to ensure their decisions do not cause harm.

Councillors know that they themselves are the ones who are public-facing and ultimately will be held accountable in the eyes of the Public when things go wrong. Therefore, Councillors need to do their own due diligence in making sure the Public Service is doing its job properly. After watching the last Standing Committee Meeting on Water, Waste, and the Environment on June 27, 2025, it is evident that the Public Service has *not* done due diligence and below I will highlight my concerns.

Due to the fact that I suffer from EHS, I have had to do my own research to try to regain my health. It is evident that the Public Service has not researched the health effects of their proposed plan. They have not consulted *independent* scientists and doctors who are currently researching and treating the effects of Electromagnetic Frequency/Radiation (EMF/EMR) exposure, such as Canadian researcher Dr. Magda Havas, who has been ringing the alarm bell for years over what she has discovered in her research (see attached documents).

The Public Service clearly has only been parroting talking points from the very industry that serves to make the most money off this plan - the Smart Meter Industry. And they undoubtedly will be using Industry Talking Points in their plan to "educate" the public. The "education" campaign will be Industry Marketing and Propaganda as has been seen in other cities and around the world. Councillors should demand complete transparency as to from whom the Public Service has received their information and what conflicts of interest those entities have. Health

Canada has declared that Smart Meters are safe, despite knowing there have been *no long-term studies* done to inform this declaration. Safety Code 6, which is promoted by Health Canada, has been challenged by doctors across Canada who attest that Health Canada has relied too heavily on *Industry funded studies* and therefore has not provided unbiased evidence (see attached documents).

At the June 27th meeting, Councillors Eadie, Chambers, and Mayes made it clear that there must be an Opt-out option for Winnipeggers. I was shocked at how hard the Public Service representative argued with the Councillors against having any kind of opt-out because it would interfere with their Smart Meter Plan. Somehow in their minds, rather than The Plan being made to serve the people of Winnipeg, the people of Winnipeg are to be made subservient to The Plan. All of us who are sick are seen as "problems" that are interfering with The Plan! Thank God Councillor Eadie stood up for us. Being seen as "inconveniences" to other people is a common situation for people like me who have an invisible disability.

Interestingly, the Public Service is trying to sell the Smart Meter Plan as benefitting Winnipeggers by eliminating the need for people to phone in their readings every month. But I'd like to question who The Plan is really benefitting. If the goal is really to make sure people pay their bill each month without them having to think about it (the "convenience" selling point), then why does the Public Service want the Meters to be sending out multiple transmissions *per day*? Why, according to Mr. Shanks (Director of Water and Waste), is it a "concession" to allow disabled people to "only" have *daily* or weekly or monthly transmissions (June 27th meeting)? Given that there is no long-term research nor research on the *cumulative* effects of adding more EMF producing devices to the environment, and that there *is* evidence in the short term that it can cause some harm, would it not be better for ALL homes to only send out signals once per month rather than having over 200,000 transmissions sent multiple times per day to receiving stations? Why unnecessarily increase the radiation filling our already-saturated environment if the goal *truly* is just to make sure people's monthly readings are done?

If the goal of the Public Service is truly to improve payment, once per month is adequate. If, however, their goal is something else, then this "something else" should be fully disclosed to the public so that we can have true informed consent. Councillors have a duty to the public to investigate this. I have never heard the reasoning for multiple transmissions per day addressed by anyone in the Public Service. The only reason I can see for multiple daily transmissions is data capture. And as I spoke about when I presented at City Hall back in 2024, the selling of data is highly lucrative, bringing in more money than the utility fees themselves. Selling data may be a convenient way for the City to offset the costs of this new Water System, but the public must be informed if this is part of the strategy. If this City is going to be flooded with Electromagnetic radiation from over 200,000 homes *multiple times per day,* on top of emissions from cell towers, wifi, 5G towers, etc., then the public needs to know the whole truth about why this is required. Anything less can be construed as intentional deception. As a taxpayer and a homeowner, I have the right to know exactly why the transmissions are to occur multiple times per day and not monthly. If there is nothing that the Public Service is hiding regarding the implementation of Smart Meters, then why were significant sections of the Winnipeg Diameter Services Report redacted in the document obtained through a FIPPA request? Of special note is

the entire section under the heading "*Options to Reduce Costs in an AMI Deployment*" (p.45-46 of the report). Sections under the heading "*Data Collection Network"* (P.58-60) and information on the internal project support costs (p.129-131) have also been redacted. What is the City trying to hide? (See attached images)

Furthermore, the opt-out as defined in the June 27th meeting would *only* be for medical reasons and would require a doctor's letter or disability paperwork as proof. It is well documented that many who are currently Electrosensitive only became Electrosensitive *after* a new source of exposure was introduced into their environment. What is City Hall going to do for individuals who *become* harmed only *after* these new devices are introduced into their homes or neighbourhoods? Will there be a mechanism for these individuals to have their transmitters removed as well?

Also, most people, including most doctors in Manitoba, are not educated on the signs and symptoms of EMF toxicity. It took me 5 years and dozens of wrong turns, futile testing, ineffective and harmful pills, thousands of dollars and prolonged suffering before I discovered after much research and almost by accident, what was causing my pain and other symptoms. Is City Council going to put warnings on every meter that is installed with a list of symptoms to watch out for so residents who start having symptoms don't suffer for months or years, being given futile tests and treatments? Without this kind of warning you will be causing undue hardship, pain, and possible death to that percentage of people who are prone to acquiring EHS. The Public Service says they need to create an "education campaign" to teach people about the safety of Smart Meters. Will this education include an unbiased representation of both sides of the story or will it only be a one-sided parroting of the talking points of Industry? It is unlikely they will mention that a percentage of the population may come to suffer symptoms of EHS due to their smart meters, because they know if they do, more of the public will resist these meters.

Most doctors aren't aware of the signs and symptoms and general health risks of Electromagnetic radiation. Many doctors won't want to write letters for their patients as they don't know enough about it or don't understand that their patients are in fact suffering from their smart meters. Will City Council make sure Doctors are aware of what to look for? Will City Council be liable for new health issues some people will experience? If not, who will be liable?

If the Public Service will not do due diligence when making sweeping changes to our basic infrastructure known to be detrimental to the health of at least *some* people, then who is going to do that due diligence? Will City Councillors do it before they vote on this? There are many of us in the community who are more than happy to provide information and research on the known health risks. The research is publicly available. The only thing stopping it from being found is *choosing not to look for it.*

Jennifer MacBeath
Winnipeg Resident
EHS Sufferer

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Radiation from wireless technology affects the blood, the heart, and the autonomic nervous system1)

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Radiation from wireless technology affects the blood, the heart, and the autonomic nervous system[1)]

Abstract: Exposure to electrosmog generated by electric, electronic, and wireless technology is accelerating to the point that a portion of the population is experiencing adverse reactions when they are exposed. The symptoms of electrohypersensitivity (EHS), best described as rapid aging syndrome, experienced by adults and children resemble symptoms experienced by radar operators in the 1940s to the 1960s and are well described in the literature. An increasingly common response includes clumping (rouleau formation) of the red blood cells, heart palpitations, pain or pressure in the chest accompanied by anxiety, and an upregulation of the sympathetic nervous system coincident with a downregulation of the parasympathetic nervous system typical of the "fight-or-flight" response. Provocation studies presented in this article demonstrate that the response to electrosmog is physiologic and not psychosomatic. Those who experience prolonged and severe EHS may develop psychologic problems as a consequence of their inability to work, their limited ability to travel in our highly technologic environment, and the social stigma that their symptoms are imagined rather than real.

Keywords: electrosmog; radio-frequency radiation; rouleau; tachycardia; WiFi; Wolff-Parkinson-White Syndrome.

[1)]Presented at the Corporate Interference with Science and Health: Fracking, Food, and Wireless, Scandinavia House, New York, NY, March 13 and 14, 2013.

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Introduction

Our exposure to devices using electricity and emitting extremely low-frequency and radio-frequency electromagnetic fields has been increasing ever since Edison invented the incandescent light bulb and Tesla and Marconi discovered that radio-frequency (RF) radiation can be transmitted without wires. Radio, television, computers, cell phones, and their accompanying cell phone antennas, cordless phones, wireless routers (WiFi), wireless baby monitors, wireless games, and smart meters are increasing our exposure to RF radiation and especially to microwave radiation (300 MHz–300 GHz).

As an example of the proliferation of this technology, access to WiFi was limited in 2002 but by 2012 access was virtually ubiquitous in the USA (Figure 1). We have city-wide WiFi in some communities, WiFi at work, at home, in school, universities, and hospitals, in restaurants and coffee shops, on public transit, at airports, and on an increasing number of airplanes. As a society, we seem to be insatiable for wireless technology and the connectivity it affords.

Although the downside to this technology, namely, the potentially harmful effects of nonionizing radiation, has received relatively little attention in North America and remains controversial, it is an area that deserves proper research funding based on the sheer number of users and people exposed worldwide to RF electromagnetic fields.

In this article, the relationship between electrosmog exposure and electrohypersensitivity (EHS), with a focus on the cardiovascular system, is presented, based on provocation studies and on reports of ill health among those living near cell phone base stations or exposed to WiFi in schools.

Electrohypersensitivity

Just as some people have multiple chemical sensitivity or react to pollen, mold, and certain types of food, a growing population is becoming "sensitive" to electromagnetic radiation.

Khurana et al. (1) reviewed ten epidemiologic studies, three dealing with cancer and seven with neurobehavioral effects, that examined the putative effects of mobile phone base stations. All of the neurobehavioral studies reported more symptoms with proximity to base stations, and only

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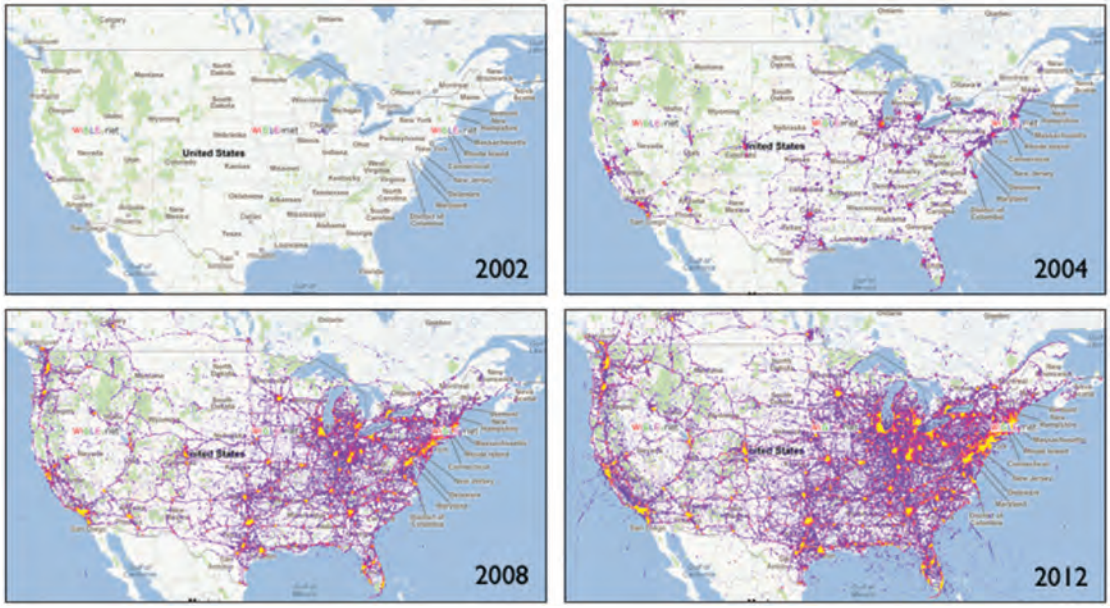

Figure 1 WiFi networks in the USA from 2002 to 2012 (source: wigle.net).

one attributed these health effects to stress rather than RF exposure.

The results from one of these studies are presented in Figure 2 (2). People who lived closest to the antennas experienced the following symptoms more often than those who lived further away: fatigue, sleep disturbance, headaches, feeling of discomfort, difficulty concentrating, depression, memory loss, visual disruptions, irritability, hearing disruptions, skin problems, cardiovascular problems, dizziness, loss of appetite, movement difficulties, and nausea. Many of these symptoms are more common as we age, thus I prefer to call this rapid aging syndrome (RAS). The difference between real aging and RAS experienced by those who are electrically hypersensitive is that when these people go into an electromagnetically clean environment, many of their symptoms diminish

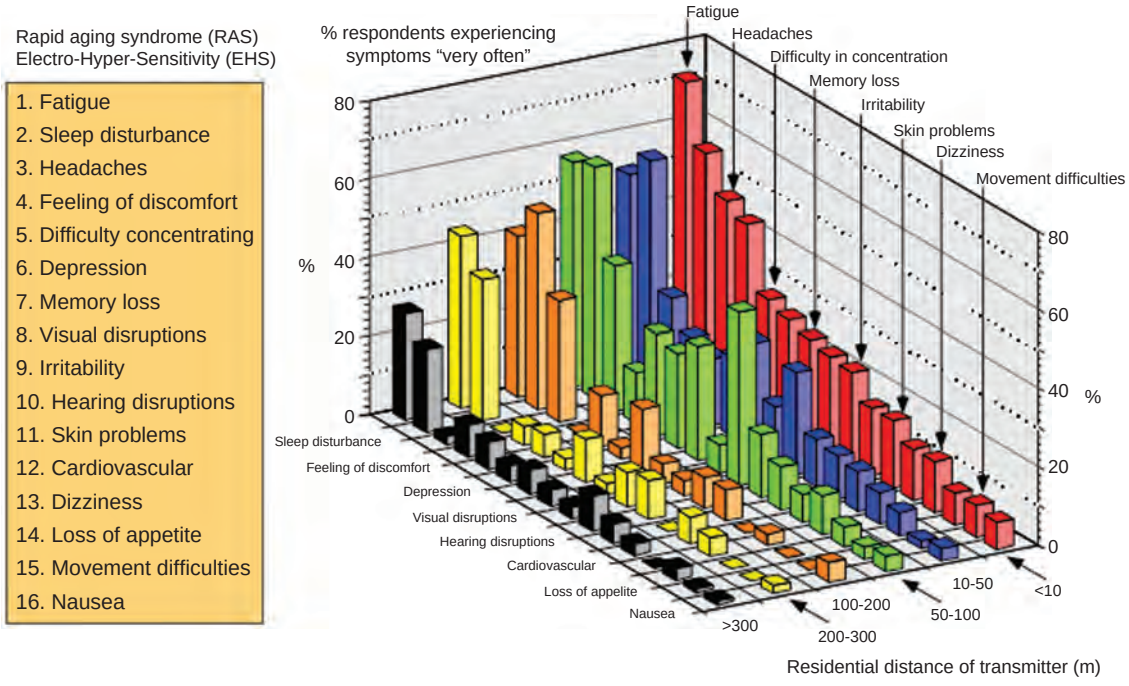

Figure 2 Symptoms experienced by people near cellular phone base stations [based on the work of Santini et al. (2)].

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or disappear. Obviously, this does not happen with real aging.

Because cell towers are proliferating and difficult to avoid in both urban and rural communities and if the results of Santini et al. (2) represent what is happening to those who live near cell towers, then it is quite likely that we are going to experience (or are in the midst of experiencing) an emerging health crisis that is contributing to chronic ill health and is promoting the sale of pain medication, sleep medication, antidepressants and antianxiety medication, pills to moderate energy level and mood, and drugs for those with attention deficit hyperactivity disorder such as Ritalin® (metylfenidat).

In 2006, Hallberg and Oberfeld (3) documented the increasing prevalence of EHS. Figure 3 clearly shows that self-perceived EHS is on the rise. According to the authors, by 2017, 50% of the population is going to be complaining of this illness. Admittedly, this is a rough calculation but it demonstrates that symptoms of EHS are increasing.

It is difficult to estimate the percentage of the population that has EHS. I use a conservative estimate of 3% of the population for those who have severe symptoms, and this is based on the population in Sweden who have registered as being electrohypersensitive (4). Another 35% population may have mild to moderate symptoms of EHS when exposed to electrosmog (5). Based on these percentages, the cumulative number of people who may be adversely affected in Canada, the USA, and Europe is 25 million, for severe sensitivity (EHS), and another 300 million, for mild to moderate sensitivity (electrosensitivity). People in this latter group can function in an electrosmog environment but may develop headaches or have difficulty sleeping and are living a life compromised by increasingly poor health as a consequence of their exposure (Figure 2).

Historically, environmental contaminants have been presented as contentious issues due, in part, to the media's need for "balanced reporting" and, in part, to the economic consequences of altering our behavior as consumers. This was certainly the case with asbestos, dichloro-diphenyl-trichloroethane (DDT), lead, mercury, acid rain, and tobacco smoke and is currently the case with climate change and EHS.

EHS may be viewed as a contentious issue, yet a growing number of international experts, scientists, and medical doctors have been asking governments and international agencies for decades to lower existing guidelines for RF radiation because the current guidelines do not protect public health. Table 1 provides a list of some of these resolutions and appeals.

Some governments have heeded the warnings and have exposure guidelines that are a fraction of those recommended by the World Health Organization (WHO) and accepted by the USA, UK, and Canada.

The WHO held an international workshop on electrosensitivity in Prague in 2004 (6), and they defined EHS as follows:

> "... a phenomenon where individuals experience adverse health effects while using or being in the vicinity of devices emanating electric, magnetic, or electromagnetic fields (EMFs)."

> "Whatever its cause, EHS is a real and sometimes a debilitating problem for the affected persons.... Their exposures are generally several orders of magnitude under the limits in internationally accepted standards."

What role should the WHO and other leading health authorities play in helping these sensitive individual? Some would advocate, at the very least, lower exposure

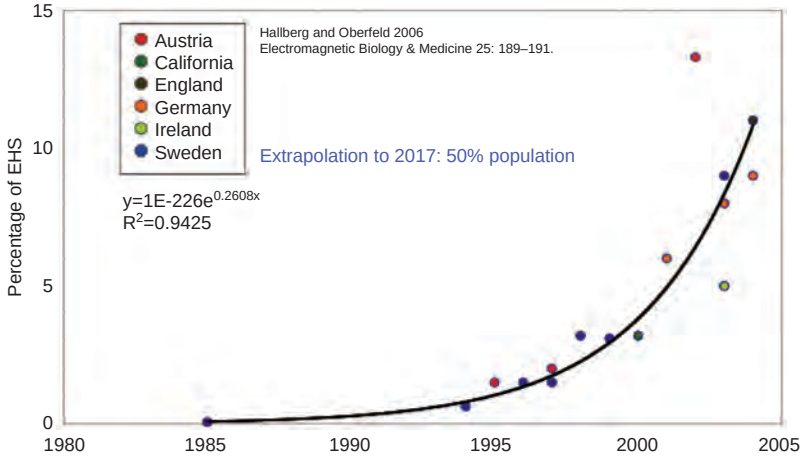

Figure 3 Estimated prevalence of self-proclaimed EHS in various countries [based on the work of Hallberg and Oberfeld (3)].

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Table 1 Appeals and resolutions from international groups of scientists and medical doctors.

Resolution/group	Country	Year	Link
Salzburg Resolution	Austria	2000	http://www.magdahavas.com/international-experts-perspective-on-the-health-effects-of-electromagnetic-fields-emf-and-electromagnetic-radiation-emr/
Catania Resolution	Italy	2002	www.emrpolicy.org/faq/catania.pdf
Freiburger Appeal	Germany	2002	http://www.magdahavas.com/international-experts-perspective-on-the-health-effects-of-electromagnetic-fields-emf-and-electromagnetic-radiation-emr/
World Health Organization	Czech Republic	2004	http://www.who.int/peh-emf/meetings/hypersensitivity_prague2004/en/
Irish Doctors' Environmental Association	Ireland	2005	www.ideaireland.org
Helsinki Appeal	Finland	2005	www.emrpolicy.org/headlines/helsinki_appeal_05.pdf
Benevento Resolution	Italy	2006	http://www.icems.eu/docs/BeneventoResolution_REVISED_march2008.pdf
BioInitiative Report	USA	2007 and 2012	www.bioinitiative.org
Venice Appeal	Italy	2008	http://www.icems.eu/resolution.htm
Porto Alegre	Brazil	2009	http://www.icems.eu/docs/resolutions/Porto_Alegre_Resolution.pdf
Seletun	Norway	2011	http://www.magdahavas.com/international-experts-perspective-on-the-health-effects-of-electromagnetic-fields-emf-and-electromagnetic-radiation-emr/
International Doctors Appeal	Germany	2012	http://www.icems.eu/resolution.htm

limits and possibly places where the radiation is not allowed, similar to smoke-free environments. Instead, the WHO recommended that this illness be referred to as "idiopathic illness", which basically means the cause is unknown. By refusing to acknowledge the cause, the WHO undermines the need for governing agencies to act.

In contrast to the WHO, the Austrian Medical Association (7) came out with guidelines to help doctors diagnose and treat those who experience EHS. In that document, they recognize that there is a rise in stress-related illness and that electrosmog may play a role. They even provide a temporary code (Z58.4, exposure to radiation) under the *International Classification of Diseases, 10th Edition* to be used for EMF syndrome, which is their term for EHS.

A group of psychologists considers EHS to be entirely a psychologic illness rather than a physiologic response to electrosmog (8, 9). A number of the articles reviewed by Rubin et al. are based on flawed assumptions about (1) who is truly experiencing EHS, (2) how people with EHS respond to exposure, (3) what frequencies and intensities they respond to, (3) how quickly they respond and recover following exposure, and (3) how the data should be analyzed. These flawed assumptions lead to flawed conclusions.

For example, not everyone who believes they have EHS actually have EHS. Thus, combing the results for the self-proclaimed "EHS group" is likely to dilute the results, producing no significant effect when analyzed statistically. The question that is being tested by this type of analysis is, "Do those who believe to be electrically sensitive all respond the same way to provocation testing?" and the answer is likely to be "no".

In the study by Rea et al. (10) of 100 people who believed they were electrically hypersensitive, only 16 responded consistently to real exposure and not to sham exposure. Had the results been statistically analyzed for the entire 100 subjects tested, they would have shown no effect of EMF exposure. Objective testing is required, and people should be assessed as individuals rather than members of a group for analysis. An analogous situation is if there were 16 people with diabetes among a group of 100 people who all thought they were diabetic. Statistical analysis of blood sugar measurements before and after consuming a standard meal for the entire group would likely miss the 16 people with diabetes.

The proper way to test for EHS is to monitor and assess individual responses to electrosmog exposure in a double-blind study, as was done by Rea et al. (10).

However, it is clear that those who experience EHS and are no longer able to live a "normal" life and who are not supported by their family, friends, and physicians also experience stress leading to psychologic problems including depression and anxiety disorders. Where I disagree with Rea et al. (10) about EHS is that I believe the physiologic response precedes the psychologic problem.

In this article, examples of the effects of electrosmog on the blood, heart, and autonomic nervous system (ANS) are provided, indicating that EHS is a physiologic response to electromagnetic pollution. The only legitimate use of the term "idiopathic" (i.e., disease or disorder that has no known cause) is in reference to the trigger that initiated the electromagnetic sensitivity. In some cases, with good medical investigation, this also can be surmised.

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Electrosmog affects the blood

Healthy blood consists of erythrocytes (red blood cells), which are round and which float freely in the plasma. A live blood sample, consisting of a drop of blood from a finger prick, can be viewed under the microscope, as shown in Figure 4. Changes in the size, shape, and clumping of these erythrocytes can indicate impaired health.

Figure 4 shows live blood (blood without any chemicals added to it) in an electromagnetically clean environment (A) and the blood from the same person spoke on a cordless phone for 10 min (B) and after using a wired computer for 70 min (C). The erythrocytes are sticking together and resemble a stack of coins. This is known as rouleau formation and indicates unhealthy blood.

Usually rouleau is caused by an increased fibrinogen concentration or other changes in plasma proteins as in multiple myeloma or macroglobulinemia. An alternative explanation is that the rouleau may be due to a reduction in the electrical potential at the cell membrane, which would weaken the repellent forces between cells. A third possibility is that it is a microscopic artifact, which, in this case, is unlikely because the results are repeatable. Research on the mechanisms involved in the rouleau formation is needed.

With rouleau formation, the surface area of the red blood cells is significantly reduced, and the release of nutrients and the removal of waste products are compromised. Symptoms may include headaches, difficulty concentrating, dizziness, nausea, heart and blood pressure problems as well as cold, numbness, or tingling sensation in the extremities (hands and feet).

The good news is that live blood analysis may be a useful diagnostic for EHS. How quickly the blood clumps and how quickly it recovers following exposure may be a good indicator of the degree of sensitivity.

Electrosmog affects the heart and the autonomic nervous system

Some people who are electrically hypersensitive complain of pain or pressure in the chest area, heart palpitations,

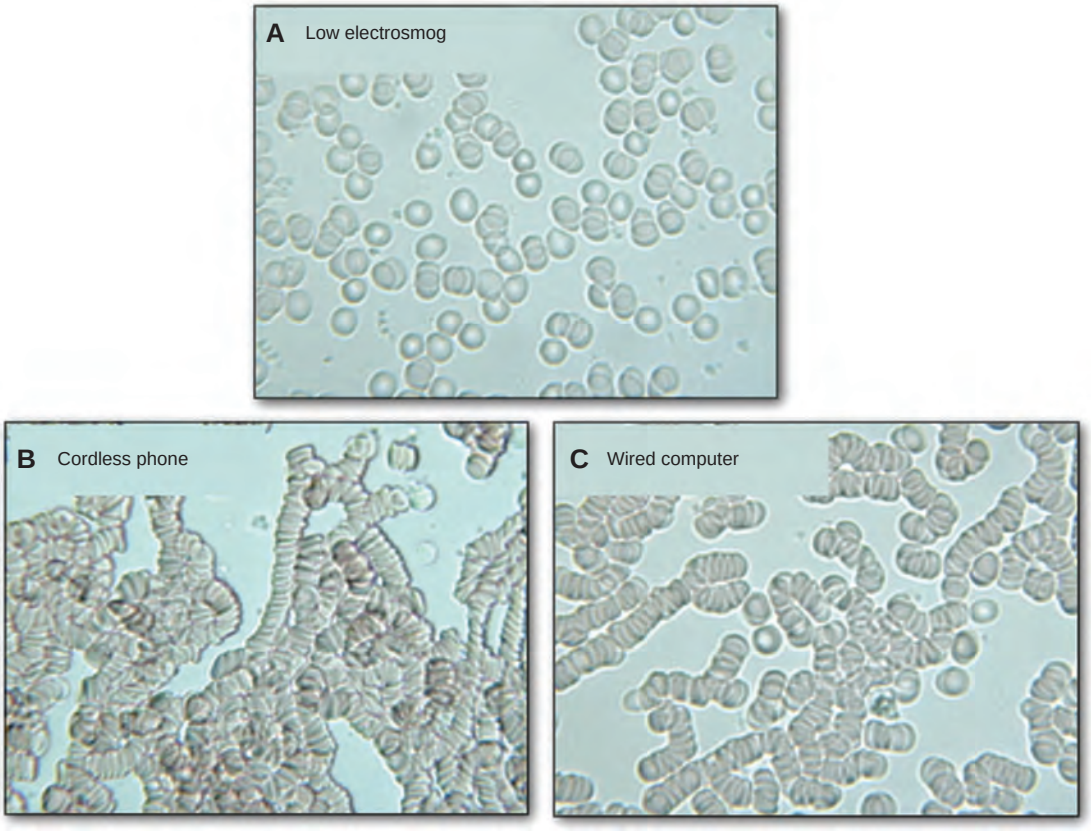

Figure 4 Live blood cells in a low-electrosmog environment (A), after using a cordless phone for 10 min (B), and after using a wired computer for 70 min (C).

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and/or an irregular heartbeat, accompanied by feelings of anxiety that develop rapidly. The symptoms resemble a heart attack and thus contribute to even more anxiety.

To test the effect of electrosmog on the heart, Havas et al. (11) designed a simple experiment where subjects were exposed to electromagnetic radiation generated by the base of a cordless phone. This was a double-blind study with randomized real and sham exposure. A cordless phone base station was selected as the source of exposure because the base emits a constant beacon signal when it is plugged into an electrical outlet. The beacon signal in this case was a pulsed frequency of 2.4 GHz, the same frequency used in WiFi.

In the original study (11), 25 subjects from Colorado were tested, and although most subjects did not react adversely to the radiation from the cordless phone base station (see Figure 5, subject A), a few did react with either tachycardia (rapid heart rate) or arrhythmia (irregular heart rate) (Figure 5, subject B). The reaction was often immediate and coincided with exposure to the radiation. When the radiation ceased, the heart returned to normal.

Two examples of responsive subjects are provided. The heart rate of subject B increased from a resting heart rate of 68 beats per minute (bpm) to a rapid 122 bpm during exposure, decreased to 66 bpm as soon as the radiation was stopped, and increased to 129 bpm when it was resumed. This reaction occurred while the subject was resting in a supine position and was unaware of when he or she was or was not exposed.

During the exposure to radiation from the cordless phone base station, subject C (Figure 6) experienced a slight increase in heart rate (from 65 to 86 bpm), an irregular heartbeat, and changes in the response of the sympathetic and parasympathetic nervous system (SNS and PNS, respectively). This upregulation of the SNS and downregulation of the PNS is an example of the "fight-or-flight" response, indicating physiologic stress. During periods of this type of stress, the body redirects most of the blood and energy from the internal organs to the arms and legs to prepare the organism for fighting or fleeing a stressful situation. Intermittent exposure may not cause a problem but if the exposure is continuous and long-term, the immune system of the body will be compromised and the body will not be able to repair itself, resulting in symptoms that are commonly experienced by those who are electrically hypersensitive. This inability to heal is what then accelerates the symptoms of aging (i.e., RAS).

The level of radiation in this experiment was well below international guidelines. Subjects were exposed to 3 $\mu W/cm^2$, or 0.3% of the guidelines recommended by International Centre for Non-Ionizing Radiation Protection (ICNIRP), the Federal Communication Commission (in US) (FCC), and Health Canada for 2.4-GHz frequencies. According to these organizations, harmful biologic effects do not occur below these thermal guidelines. Both blood and heart results from these provocation experiments indicate otherwise, i.e., that biologic effects that can have serious health implications do occur at levels well below current thermal guidelines.

The cordless phone provocation study has since been repeated for a larger group of subjects and shows similar results (12).

Some suggested that the radiation from the cordless phone was interfering with the technology rather than the heart. If this were the case, then 100% of the subjects would have had similar results because the

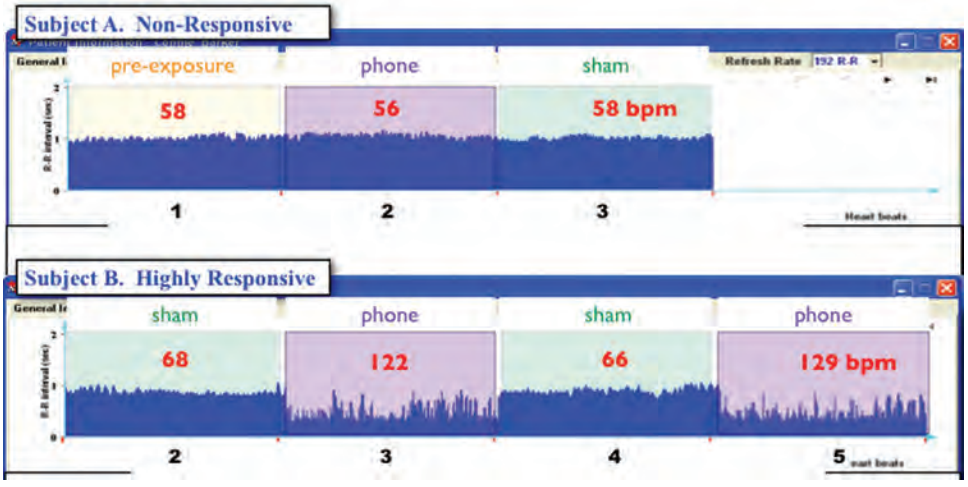

Figure 5 Rhythmograph of HRV during provocation with a digital 2.4-GHz cordless phone and sham exposure. The x-axis unit is time, with each stage lasting approximately 3 min. The y-axis is the R-R interval (in seconds).

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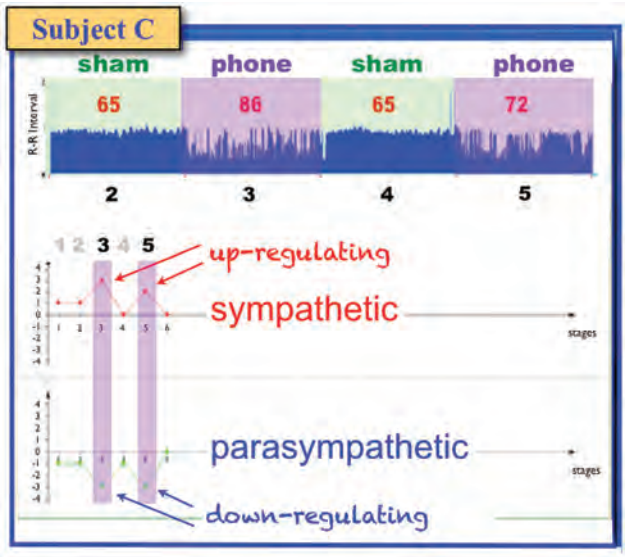

Figure 6 Rhythmograph of HRV and functioning of the SNS and PNS during provocation with digital 2.4-GHz cordless phone and sham exposure.

electromagnetic interference (EMI) would have been consistent rather than highly variable and individualistic. Additional testing of higher levels of radiation at the sensor did not affect the heart rate variability (HRV) of a subject who was nonresponsive to the original levels. Had it been EMI, then higher levels of exposure should have had a greater response, but this was not the case (12).

One subject (52-year-old man) told us that he normally experiences a delayed reaction to electrosmog exposure, and thus we monitored him for 30 min postexposure and observed the delayed response during a period of no exposure. The response included periods of short-term and intermittent irregularity in the R-R interval (HRV) as well as episodic downregulation of both the SNS and the PNS, which were both low to begin with (12). The normally low heart rate, 53–55 bpm, began to increase slightly (61 bpm) 25 min postexposure.

WiFi in schools affects student health

Students in schools with WiFi are complaining of headaches, difficulty concentrating, weakness, and heart palpitations, prompting their parents to take them to their family doctor and to their pediatric cardiologist to determine the nature of their problem.

In one Ontario school district, several students complained of heart problems. A 6-year-old girl had a "musical heart", and she experienced headaches and dizziness only at school. A 12-year-old boy had tachycardia (rapid heart rate). A 12-year-old girl experienced nausea, vomiting, no fever, insomnia, blurred vision, and tachycardia only at school. A 13-year-old boy had a pounding heart, insomnia, and headaches. His family moved to a different school district, and his symptoms disappeared.

In the same area, 4 students had sudden cardiac arrests (SCA) during exercise class within a 2-year period. Two of these students were resuscitated. The annual rate for SCA among young people in Canada is approximately 7 per year; hence, 4 in a small community is unusual.

According to Sinatra (13), a cardiologist, Wolff-Parkinson-White (WPW) syndrome, which is a disorder of the conduction system of the heart, is present in 1 out of 700 students. In a school district with 50,000 students, as many as 70 may have this generally undiagnosed condition. According to Sinatra (13), when students with WPW syndrome are exercising and are exposed to microwave radiation, the combined stress on the heart can lead to supraventricular tachycardia, thus creating the "perfect storm".

Fortunately, due to the Defibrillator Access Act, schools and other public buildings are installing defibrillators. What they should also be doing is trying to determine what is causing SCA and why students are complaining of headaches and heart palpitations at school. A key question that needs to be asked is, "What role does RF radiation from a school's WiFi system and from nearby cell phone base stations play in these symptoms?"

The effects of microwave radiation on the heart have been known for decades (14). In a 1969 symposium on the biological effects and health implications of microwave radiation, the authors clearly state that, "In the interest of occupational hygiene…researchers have recommended that cardiovascular abnormalities be used as screening criteria to exclude people from occupations involving radio-frequency exposures". Perhaps students need to be screened at school to ensure that they do not have an underlying heart condition that may be exacerbated with WiFi microwave exposure.

According to Drezner et al. (15), out-of-hospital SCA among young people is on the rise in the USA, although doctors do not know the reason. The increasing exposure to electrosmog may be to blame for at least part of this increase. More research is urgently needed in this area.

Children are much more sensitive to environmental toxins than are adults, and as such, there should be stricter guidelines for exposure. To date, at least nine countries have issued warnings that children should limit their use of cell phones. These countries include the UK (2000), Germany

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(2007), France (2008), Russia (2008), India (2008), Belgium (2008), Finland (2009), the USA (2009), and Canada (2012). The same warning should be issued for children exposed to wireless games and WiFi routers, depending on the amount of time students are exposed to these emitters.

WiFi routers emit a beacon signal that is continuous as long as the device is activated. In other words, you do not have to be connected to the Internet to be exposed to the radiation generated by the wireless router. When information is either uploaded or download, the radiation levels increase both at the router and at the computer. The same is true for cordless phones and wireless baby monitors. Voice-activated baby monitors and cordless phones that radiate only when in use are available in Europe but are not currently available in North America.

Historic research on microwave illness resembles current research on electrohypersensitivity

The information provided in this article is not new. Reviews as far back as 1969 summarized the effects of microwave radiation and identified many of the same symptoms. Dodge (16) reviewed the Soviet and Eastern European literature and reported that microwave radiation affects the central nervous system, ANS (as shown here), neurohumoral systems, endocrine glands and functions, eye and ocular function, blood and hematopoietic system (as shown here), and miscellaneous organs.

Dodge (16) identified general subjective complaints resulting from exposure to electromagnetic radiation (Table 2) that are similar to the symptoms experienced by those who live near cell phone base stations (Figure 2). The major difference is that Dodge was reviewing symptoms for men who were occupationally exposed, whereas Santini et al. (2) was documenting symptoms for those who lived near cell phone antennas and were exposed to radiation in their own homes and as such were unable to avoid exposure.

Glaser (17) reviewed the literature on the biologic effects of microwave radiation and provided more than 2000 references in 1972. Although many of these studies were conducted at levels above existing guidelines, we are getting similar results at levels of microwave radiation that are well below these guidelines.

Most revealing are the "psychophysiologic disorders" based on human behavioral studies. These disorders include the following and are similar to those reported by Santini et al. (2): neurasthenia (general "bad" feeling), depression, impotence, anxiety, lack of concentration, hypochondria, dizziness, hallucinations, sleepiness, insomnia, increased irritability, decreased appetite, loss of memory, scalp sensations, increased fatigability, chest pain, and tremor of the hands.

Both Glaser and Dodge worked for the US Navy and had access to information that was later declassified. In one limited-edition (only 15 copies were produced) document, Pollack and Healer (18) recommended that the power density guideline in the USA be reduced from 10,000 $\mu W/cm^2$ to the same level used in the Soviet Union (10 $\mu W/cm^2$), but little attention was paid to this recommendation.

Table 2 Subjective symptoms associated with RF and microwave radiation.

General subjective complaints resulting from exposure to electromagnetic radiation (16)	Symptoms experienced "very often" by those who live within 300 m of a cell phone base station (2)
Similar symptoms	
Pain in head and eyes	Headaches and visual disruptions
Weakness, weariness, and dizziness	Dizziness and fatigue
Depression, antisocial tendencies, and general irritability	Depression and irritability
Impairment of memory and general mental function	Memory loss
Adenoma and inability to make decisions	Difficulty concentrating
Chest pain and heart palpitation	Cardiovascular
Dyspepsia, epigastric pain, and loss of appetite	Loss of appetite
Sensitivity of mechanical stimulation and dermagraphism	Skin problems
Different symptoms	
Lacrimation	Irritability
Hypochondria, sense of fear, and general tension	Nausea
Inhibition of sex life (male)	Movement difficulties
Scalp sensations and hair loss	Hearing disruption
Trembling of eyelids, tongue, and fingers	Sleep disturbance
Asthma	Feeling of discomfort
Brittle fingernails	

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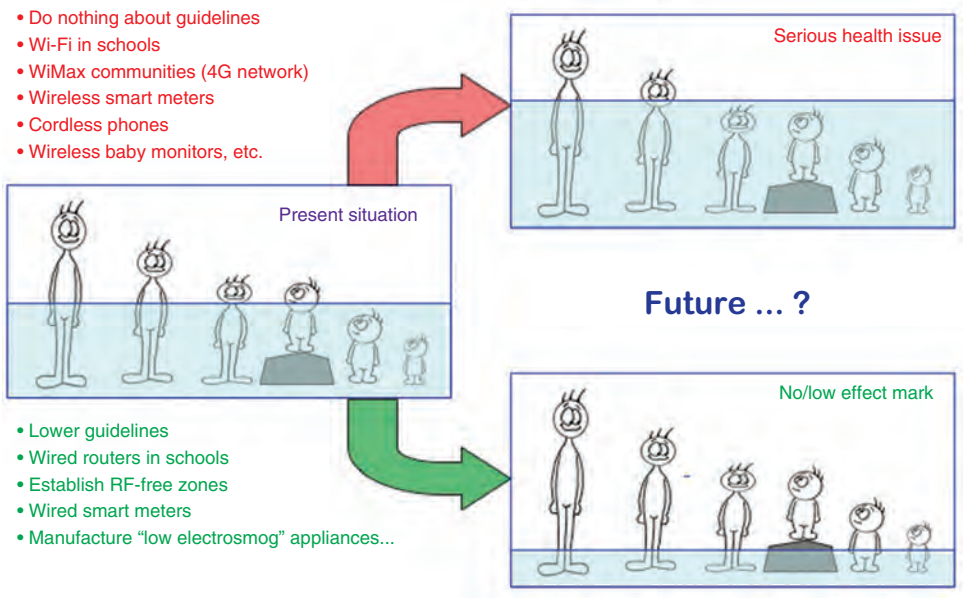

Figure 7 Two future health scenarios based on the steps we take or fail to take to reduce electrosmog exposure.

Years later, the power density guideline in the USA was reduced from 10,000 to 1000 μW/cm^2, although this was still based on thermal effects.

Where do we go from here?

If we do nothing about guidelines and allow WiFi to be installed in schools, if we allow WiMax to come into neighborhoods as part of the 4G network, if we allow wireless smart meters to be installed on homes, and if we fail to regulate the technology in a way that minimizes microwave exposure, then many more people are likely to become ill and some will die (Figure 7).

If we choose to minimize exposure by establishing biologically based guidelines rather than the current thermal guidelines, by encouraging wired Internet access in schools, universities, hospitals, workplaces, and homes, by installing wired smart meters, and by establishing RF-free zones for those who are highly sensitive, then we can reverse much of the damage that has been inflicted (Figure 7).

The choice is ours, and the real question is, "Do we have the foresight and courage to make the right decision or will we require a health tsunami before we act?"

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Date: October 12, 2010

To: California Council on Science and Technology (CCST)

Re: Request for input regarding Smart Meters

Laura Lee Martin invited me to be part of the Technical Response Team for CCST and to provide information about the safety of Smart Meters and other wireless devices, which I am providing below.

1. Conflict of Interest:

I did not receive the *Conflict of Interest* form but would like to declare that I have no conflict of interest related to Smart Meters.

2. Biographical Summary:

Dr. Magda Havas is Associate Professor of Environmental and Resource Studies at Trent University (Canada) where she teaches and does research on the biological effects of electromagnetic radiation including radio frequency and microwave radiation, poor power quality, ground current, and low frequency electromagnetic fields. She has served as an expert witness in both Canada and the United States regarding health effects associated with electromagnetic exposure. She is currently science advisor on EMF-related issues to several non-profit organizations in Canada, U.S., U.K., and the Netherlands. Dr. Havas is currently reviewing documents given to her by a retired scientist, who worked for the U.S. military and the U.S. government on the biological effects of microwave radiation. These documents include declassified military reports, internal government reports, and translation from the European literature dating back to the 1930s.

3. Written Submission on Smart Meters.

Provide information about smart meters and address the following points:

- *Whether FCC standards for Smart Meters are sufficiently protective of public health taking into account current exposure levels to radiofrequency and electromagnetic fields.*

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

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

In my opinion, the FCC standard for Smart Meters is not sufficient to protect public health.

This is based on the following facts:

4.1 Thermal vs. Non-thermal Debate. The thermal vs. non-thermal debate is largely a red herring that has been perpetuated for decades and has influenced the type of research done in the United States. The FCC standard is based on a **thermal** effect. It was originally based on the amount of radiation that would heat an adult male in the US military exposed to radar. While the heating effect is not disputed, biological effects, some of which have adverse health consequences, occur well below the thermal guideline (Inglis 1970). As a consequence various countries in the world are opting for a "**biologically**" based guideline rather than a "**thermal**" guideline, which takes into account not only adult males in peak physical conditions but children, pregnant women, the elderly, and those who have developed electrohypersensitivity (EHS). I will return to the concept of EHS later.

4.2 Guidelines in Russia, Switzerland, Poland, and China are well below the FCC standard (i.e. 10 vs. 1000 microW/cm^2 or 1% of FCC guidelines). Some military and government insiders tried to get U.S. guidelines reduced decades ago but were not successful (Pollack and Healer 1967, Dodge 1969). Steneck et al. (1980) provides an excellent account of how the U.S. standards were established for radio frequency radiation.

4.3 Our exposure to radio frequency radiation (RFR) is increasing exponentially as we design more equipment that relies on higher frequencies in the electromagnetic spectrum. Prior to World War II, this type of radiation was negligible. Today we have radar (military, marine, aviation, and weather), we have cell phone antennas, radio and TV broadcast antennas, and a growing number of WiFi hotspots, citywide WiFi and Wi-Max antennas. Inside buildings we have cordless phones, many of which emit microwave radiation even when they are not being used; wireless alarm systems; wireless baby monitors, wireless computers, iPads, and Smart Phones that can connect to wireless internet or WiFi. More children are playing wireless video games than

ever before and radio frequency identification devices (RFID) are placed into merchandise to provide information to the manufacturer about consumer habits. The "smart meter" is just another source of exposure that will be placed on every home and in every apartment. Smart meters are being used to monitor use of electricity, gas and water. As part of this system, appliances are being designed to communicate directly with smart meters, all in a wireless mode, which will ultimately increase levels of radiation in the home.

4.4 I work with people who have become **electrically hypersensitive** (EHS) and I have received emails and phone calls from those who have had smart meters placed on their homes. They complain of ill health and many are unable to use the room closest to the smart meter. These individuals have no place to "hide" from the growing levels of electrosmog especially in densely populated urban centers. Sickness contributes to time off work and away from school, growing medical costs and a general poorer quality of life. Children are particularly vulnerable as are pregnant women and those with compromised immune systems. The presence of metal implants in the body (such as metal pins in bones) may concentrate the absorption of radiation at the location of implantation, inducing thermal effects from lower power densities than would ordinarily cause such harm (Massey 1979). Some implants, such as pace makers and deep brain stimulators for Parkinson's disease, may malfunction and this can be fatal. In Switzerland about 5% of the population has EHS. If the same fraction of the population has EHS in the US that would come to a staggering 15 million people!

The symptoms following exposure to radio frequency radiation were labeled radiowave sickness and were first reported for those occupationally exposed in the former Soviet Union. These same symptoms are now referred to as electrohypersensitivity (EHS) and are experienced by a growing fraction of the population. They include . . .

"*. . . headache, eyestrain and tearing, fatigue and weakness, vertigo, sleeplessness at night and drowsiness during the day, moodiness, irritability, hypochondria, paranoia, either nervous tension or mental depression and memory impairment. After longer periods of exposure, additional complaints may include sluggishness, inability to make decisions, loss of hair, pain in muscles and in the heart region, breathlessness, sexual problems and even a decrease in lactation in nursing mothers. Clinically observed effects in persons voicing these complaints include trembling of the eyelids, fingers and tongue, increased perspiration of the extremities, [and] rashes . . .*" (Massey, 1979).

4.5 In addition to sensitive people, Switzerland also identifies ***Places of Sensitive Use*** (German acronym is OMEN). These places include: living rooms; classrooms and kindergartens; hospitals and nursing homes; permanent jobs (where people spend more than 2.5 days per week); and playgrounds. For these OMEN sites, the Swiss government recommends that greater precaution be taken for long-term exposure to weak radiation. In these places, radiation from wireless microwave base stations (such

as cordless phones or WLAN/WiFi) may exceed radiation from nearby cell phone base stations and hence these devices must generate emissions as low as possible. For more information visit http://www.bag.admin.ch/themen/strahlung/00053/index.html?lang=en .

5. **Whether additional technology specific standards are needed for Smart Meters and other devices that are commonly found in and around homes, to ensure adequate protection from adverse health effects.**

Technology specific standards are definitely needed for Smart meters as well as cordless phones, DECT baby monitors, wireless routers, and all of the other devices that emit radio frequency radiation.

Massey, in a report published by Duke Law Journal in 1979, identifies nine variables that need to be considered when determining the impact of microwave radiation. These are "power density, intensity and relative phase of all field components, specific frequency ranges, waveform characteristics, exposure regimes, specific occupations, level of control over exposed populations, individual differences (age, sex, health, specific predisposing factors) and presence of other environmental stressors." The current FCC guidelines do NOT take these into consideration.

We have evidence that pulsed microwave frequencies, that are generated by WiFi and cordless phones are more harmful than continuous wave and yet this is not considered in the FCC guidelines (Reno 1975).

The key microwave emitting devices in the home/office/school environment are:

Cordless phones (some are labeled DECT and others pulsed digital 2.4 GHz). These radiate all the time even when no one is using them. They should be replaced by wired phones or cordless phones currently available in Europe, which are "on-demand" phones that radiate only when the handset is not in the cradle of the base station. These phones are so dangerous that I recently submitted a Petition to the Auditor General of Canada to have DECT phones banned (Havas 2008).

The DECT baby monitor also radiates all the time, as does the receiver that is often carried on the Mother's waist. Here we need a voice-activated baby monitor that is used in Europe.

Wireless Internet (WiFi or WLan) is not as common in Europe as they are in North America. There they prefer using wired service in the form of fiber optic and Ethernet connections. Germany hotels ask that you bring an Ethernet cables with you, as they don't provide WiFi. The Swiss government is providing free fiber optics to schools provided they don't install wireless routers.

6. An additional point I would like to make relates to **dirty electricity**. Wires can act like antennas and the radiation produced by radio frequency generating devices can flow along and reradiate from wires both inside and outside the home. This contributes to

dirty electricity and localized radiation exposure. Dirty electricity has been associated with cancers (Milham and Morgan 2008); health and behavior problems in schools (Havas and Olstad 2008); and both diabetes and multiple sclerosis (Havas 2006). From a human health perspective and to protect sensitive electronic equipment it is important to maintain good power quality and to prevent radiation from smart meters flowing along wires.

I have great concern regarding the current levels of microwave radiation in North America. Instead of promoting wireless technology, we should be promoting wired technology and reserving wireless for situations where wired in not possible (while one is travelling for example). Shortly after X-rays were discovered, they were used in shoe stores to determine shoe-size for young children. Fortunately, we recognized that X-rays were harmful and we restricted their use to essential medical diagnoses. We need to recognize that microwaves are also harmful and we cannot use this technology in a frivolous manner. With more frequencies being used, with the levels of radiation increasing, and with so little research on the long-term, low-level effects of this technology we are creating a potential time bomb. If smart meters are placed on every home, they will contribute significantly to our exposure and this is both unwise and unsafe.

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Respectfully Submitted,
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October 12, 2010.

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2 August 2016

Edward S. Finley, Jr., Chair
North Carolina Utilities Commission
4325 Mail Service Center
Raleigh, NC 27699-4300

Subject: Docket Number E-7 Sub 1115 - Smart Meter Opt-Out Fees

Dear Chairman Finley:

We, the undersigned, are a group of scientists and health professionals who together have coauthored many peer-reviewed studies on the health effects of radiofrequency radiation (RFR). We are aware that the North Carolina Utilities Commission (NCUC) is considering a proposed smart meter opt-out fee from Duke Energy, which was submitted on July 29, 2016. Smart meters, along with other wireless devices, have created significant public health problems caused by the RFR they produce, and awareness and reported problems continue to grow. With Duke Energy being America's largest utility provider and, consequently, having the largest potential smart meter implementation reach, it is imperative that the NCUC be fully aware of the harm that RFR can cause and allow utility customers to opt out of smart meter installation with no penalty.

The majority of the scientific literature related to RFR stems from cell phone studies. There is strong evidence that people who use a cell phone held directly to their ear for more than ten years are at significantly increased risk of developing gliomas of the brain and acoustic neuromas of the auditory nerve. There is also evidence that the risk of developing these cancers is greater in younger than older people. The May 2016 report from the US National Toxicology Program showing that rats exposed to cell phone radiation for nine hours per day over their life-span develop gliomas of the brain and Schwannoma of the heart (the same kind of cancer as acoustic neuroma) adds proof to the conclusions from the human health studies that radiofrequency radiation increases risk of cancer.

Smart meters and cell phones occupy similar frequency bands of the electromagnetic spectrum, meaning that cell phone research can apply to smart meter RFR. Smart meter RFR consists of frequent, very intense but very brief pulses throughout the day. Because smart meter exposure over a 24 hour period can be very prolonged (pulses can average 9,600 times a day), and because there is building evidence that the sharp, high intensity pulses are particularly harmful, the cell phone study findings are applicable when discussing adverse health impacts from smart meters.

While the strongest evidence for hazards coming from RFR is for cancer, there is a growing body of evidence that some people develop a condition called electrohypersensitivity (EHS). These individuals respond to being in the presence of RFR with a variety of symptoms, including headache, fatigue, memory loss, ringing in the ears, "brain fog" and burning, tingling and itchy skin. Some reports indicate that up to three percent of the population may develop these symptoms, and that exposure to smart meters is a trigger for development of EHS.

In short:

- Smart meters operate with much more frequent pulses than do cell phones, increasing the potential for adverse health impacts.
- Smart meter pulses can average 9,600 times a day, and up to 190,000 signals a day. Cell phones only pulse when they are on.
- Cell phone RFR is concentrated, affecting the head or the area where the phone stored, whereas smart meter RFR affects the entire body.

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- An individual can choose whether or not to use a cell phone and for what period of time. When smart meters are placed on a home the occupants have no option but to be continuously exposed to RFR.

We are aware that the North Carolina Department of Health and Human Services (DHHS) drafted an August 2015 report, "Health Impacts of Advanced Metering Systems (Smart Meters)," and we strongly disagree with the DHHS's Executive Summary conclusion that "There is insufficient evidence to link RF exposures to adverse health outcomes." The research findings by independent scientists point to a clearer relationship between RFR and health effects than industry-funded studies.

We read with great concern Laura Combs' and Andrew McAfee's May 5, 2016, review of public records related to the August 24, 2015, DHHS smart meter health impact report. As researchers highly involved in educating others about the many serious adverse health impacts of RFR, we strenuously object to the poor source material chosen by DHHS staff. With a leading DHHS staff member admitting that he is not qualified to review the literature, and the fact that he relied on industry representatives for assistance, the DHHS conclusion is not surprising. Further, the unscientific, medically unsupported characterization by another DHHS staff member that people who experience electromagnetic hypersensitivity are mentally ill (this staff member also stated that he is advocating for Duke Energy in relation to smart meter opt-out) reveals a public health agency that is not only incapable of producing an adequate report, but one that is not working to ensure fair treatment of and protection of the public.

The adverse health impacts of low intensity RFR are real, significant and for some people debilitating. We want to stress three fundamentals as your agency proceeds to consider a smart meter opt-out:

- The Federal Communication Commission's safety standards do not apply to low intensity RFR.
- There is no safe level of exposure established for RFR.
- People around the world are suffering from low intensity RFR exposure, being at increased risk of developing both cancer and EHS.

Citizens rely on their government agencies for protection from harm. Accordingly, we urge the NCUC to reject any fees or tariffs associated with smart meter opt-out and allow citizens to opt out without penalty.

Thank you for your attention and consideration. What you do in this instance affects the lives of many in North Carolina and beyond.

Yours sincerely,



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Dr. Sam Milham, MD, MPH
Former chief epidemiologist, Washington State Department of Health

Declaration: Doctors Call for Protection from Radiofrequency Radiation Exposure

Physicians Call for Health Canada to Provide:

i) Wireless safety standards that are more protective of the health of Canadians; and

ii) Guidelines and resources to assist Canadian physicians in assessing and managing health problems related to microwave radiation.

There is considerable evidence and research from various scientific experts that exposure to microwave radiation from wireless devices; Wi-Fi, smart meters and cell towers can have an adverse impact on human physiological function.[1] [2] Many recent and emerging studies from university departments and scientific sources throughout the world support the assertion that energy from wireless devices may be causatively linked to various health problems including reproductive compromise, developmental impacts, hormonal dysregulation and cancer. In fact, in 2011 the World Health Organization listed microwave radiation as a Class 2B possible carcinogen[3] and subsequent research strengthened the evidence that a stronger designation may be justified.[4] [5] [6]

Out of sincere concern for the health of Canadians at all stages of life – from the developing fetus through childhood and into adulthood – we respectfully request that:

i) Health Canada develop and support strategies to raise awareness about microwave radiation impacts and to minimize prolonged exposure to microwave radiation in schools and other places where children are regularly exposed.

ii) As Health Canada has acknowledged that a full literature review was not part of its latest update of Safety Code 6 (the safety guideline for wireless exposure pertaining to thermal effects on the tissue of adult males) we request a comprehensive literature review for all age ranges with less reliance on industry-funded studies.

iii) Health Canada provide guidelines and resources to assist Canadian physicians in becoming apprised of microwave exposure and related health problems and clinical presentations that may be associated with over-exposure or sensitivity (similar to the 2012, "**Guideline of the Austrian Medical Association for the diagnosis and treatment of EMF related health problems and illnesses**.") (Note; this guideline is under review with an update expected.)

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