

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the application and request)
of the DETROIT EDISON COMPANY seeking)
approval and authority to implement its) Case No U-15768
proposed Advanced Metering Infrastructure)
opt out program.)

QUALIFICATIONS & DIRECT TESTIMONY OF DAVID O. CARPENTER, M.D.

1 Q Do you swear that the testimony you are about to give is the truth, the whole
2 truth, and nothing but the truth?

3 A I do.

4 Q Can you please state your name, address and contact information?

5 A. David O. Carpenter, M.D. Institute for Health and the Environment, University at
6 Albany, Rensselaer, NY 12144. Phone: 518-525-2660.

7 email: dcarpenter@albany.edu

8 Q. Who are you testifying for in this proceeding?

9 A. Intervener David Sheldon.

10 Q. Are you currently in private medical practice and, if so, could you state the name
11 of your practice and any areas of specialization within the practice?

12 A. I am a public health physician and as such do not hold a license to practice
13 patient medicine. My area of specialization is environmental health and disease
14 prevention.

15 Q. Are you also associated with the Institute for Health and the Environment at the
16 University at Albany, State University of New York?

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13 patient medicine. My area of specialization is environmental health and disease
14 prevention.

15 Q. Are you also associated with the Institute for Health and the Environment at the
16 University at Albany, State University of New York?

1 A. Yes.

2 Q. Could you tell us briefly what is the scope of research done there and what is
3 your own role at this institute?

4 A. I am the Director of the Institute for Health and the Environment, a Collaborating
5 Centre of the World Health Organization. The Institute promotes interdisciplinary
6 research on issues relation to both health and the environment in both domestic
7 and international settings.

8 Q. Have you devoted a substantial part of your career to studying the effects of low-
9 level non ionizing radiation upon human beings?

10 A. Yes.

11 Q. Do you understand the purpose of this administrative law case and why we have
12 asked you to contribute your testimony?

13 A. Yes, I understand that the purpose is for evidence to be heard anew, on remand
14 from the Michigan Court of Appeals, on whether the Commission should permit
15 Detroit Edison Company to charge back the costs of AMI meters, aka "smart
16 meters", to its customers. I understand the Court of Appeals has directed the
17 Commission to consider the "risks and burdens" of AMI technology, as well as its
18 presumed benefits, before deciding to approve such a source of funding.

19 Q. Do you have an opinion, based on your professional knowledge and experience,
20 as to whether the widespread deployment of radio transmitting smart meters is a
21 safe and prudent course of action, given the present state of knowledge
22 concerning the effects of such radio transmissions upon biological processes?

1 A. I do. My belief is that such widespread deployment cannot be justified at this
2 time based on the peer-reviewed research we have. I would say that universal
3 deployment of such meters throughout our urban areas amount to an experiment
4 on the people living in those areas, an experiment without the consent of the
5 experimental subjects.

6 Q. Can you substantiate that point?

7 A. Yes. Earlier this year I was asked to write my concerns about the health hazards
8 of smart meters. Forty five medical professionals and scientists, who together
9 have authored hundreds of peer-reviewed articles on the effects of
10 electromagnetic radiation, joined together with me in a statement expressing our
11 views on the effects of low level radio frequency and microwave radiation in
12 general and smart meter radiation in particular. That statement is attached to my
13 testimony as Exhibit One.

14 Q. And can you tell us briefly what conclusions were expressed?

15 A. While smart meters are too new for there to be human health studies specifically
16 on exposure from smart meters, there is a strong body of evidence that
17 demonstrates a variety of adverse human health effects, including cancer and
18 effects on brain and behavior, coming from exposure to radiofrequency radiation
19 like that generated by wireless smart meters.

20 Q. To the best of your knowledge, what percentage of the general public could be
21 called "electro-sensitive", i.e. people who experience more or less immediate
22 symptoms when exposed to electromagnetic radiation, such as headaches,
23 mental confusion, rapid heartbeat and so on?

1 A. While the evidence is incomplete for several reasons, most reports indicate that
2 between 5 and 10% of the population show symptoms of electrical
3 hypersensitivity.

4 Q. Is it possible that electro-sensitive people are like the canary in the mine? Or,
5 more precisely, is it possible that the kind of electromagnetic fields that cause
6 electro-sensitive people to experience immediate symptoms of distress, are also
7 the kind of fields that are likely to cause long term illness to a much larger group
8 of individuals who do not experience immediate symptoms?

9 A. Yes, this is not only possible but likely.

10 Q. So would it be fair to say that from a public health standpoint, protecting the most
11 vulnerable among us might well be viewed not only as an act of compassion
12 toward them but also have the effect of protecting the majority of the population
13 from long term diseases like cancer or neurological diseases like Alzheimer's
14 Disease?

15 A. This is true.

16 Q. Is there data on smart meters going back far enough to trace the long term
17 effects of such meters on people?

18 A. No, but until more data becomes available we have to make inferences based on
19 longer term data that we do have concerning use of cell phones and people living
20 near to radio transmission towers. These studies show that increased
21 radiofrequency exposure increases risk of cancer, and that the most vulnerable
22 parts of the population are children and teenagers.

23 Q. Have you had occasion to testify previously about such effects?

1 A. Yes, in January, 2012, I testified concerning the effects of WiFi radiation on
2 school children in the Oregon Public Schools. My legal testimony in that case is
3 attached here as Exhibit Two.

4 Q. Can you give us a very brief summation in a few sentences as to your
5 conclusions about the Wi-Fi study?

6 A. As with wireless smart meters, WiFi in schools exposes children constantly to
7 radiofrequency radiation. As with smart meters, the specific health effects from
8 exposure to WiFi have not been determined, but WiFi is radiofrequency radiation.
9 Because children are more vulnerable than adults to radiofrequency radiation, as
10 documented by studies from cell phone use and people living near to radio
11 transmission towers, it is unwise to use WiFi in schools when a wired connection
12 to the Internet does not increase exposure.

13 Q. Does an opt-out plan really solve the exposure risk you have been describing
14 here and in your exhibits?

15 A. Not entirely. Not having a smart meter on one's own home will reduce the
16 potentially harmful exposure, but the customer opting out is still going to be
17 exposed to a whole blanket of electromagnetic radiation from the smart meters of
18 immediate neighbors and from all the transmitting and receiving devices and
19 repeaters the utility must install to allow all these meters to report their data, as
20 well as other sources of radiofrequency radiation.

21 Q. If a smarter grid is necessary, what would be the best way to implement the
22 necessary metering technology?


1 A. A properly designed system of wired smart meters using internet cable or fiber
2 optics need not result in any elevated exposure to radio frequencies, but would
3 still provide the utility with information about daily use.

4 Q. Detroit Edison is currently offering an opt-out meter that they call a "digital meter"
5 which is the Itron smart meter with the radios turned off. We understand that it
6 will store detailed usage information that a meter reader can download through a
7 plug-in connection or through an optical port. Do you believe that this meter
8 entirely solves the problem of RF exposure?

9 A. I am not familiar with the details of this meter and so cannot comment on whether
10 or not it would be an entirely safe alternative. But, in principle, it should be
11 possible to devise a safe digital meter that could communicate through a plug-in
12 connection, or through hard-wired means.

13 Q. Is there anything else you would like to add to your testimony today?

14 A. Exposure to radiofrequency radiation has been shown to result in human
15 disease, and we should take every step within reason to avoid increased
16 exposure. All the benefits of a smart grid technology could be obtained with
17 wired smart meters without increasing the risk of exposure and human disease.
18 But at the very least everyone should have the opportunity to opt-out of having
19 wireless smart meters placed on their home.

20
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22 

23
24 David O. Carpenter, M.D

25 Dated: November 13, 2012

26 
DOREEN A. VanVORST

EXHIBIT ONE

**2012 statement of David O. Carpenter, M.D. and
45 other scientists and health professionals
concerning hazards of radiation from 'smart meters'**

**Institute for Health and the Environment
State University of New York at Albany**



We, the undersigned are a group of scientists and health professionals who together have coauthored hundreds of peer-reviewed studies on the health effects of electromagnetic fields (EMFs). We wish to correct some of the gross misinformation found in the letter regarding wireless “smart” meters that was published in the Montreal daily *Le Devoir* on May 24. Submitted by a group Quebec engineers, physicists and chemists, the letter in question reflects an obvious lack of understanding of the science behind the health impacts of the radiofrequency (RF)/microwave EMFs emitted by these meters.

The statement that “Thousands of studies, both epidemiological and experimental in humans, show no increase in cancer cases as a result of exposure to radio waves of low intensity...” is false (1). In fact, only a few such studies, case-control studies of mobile phone use, certainly not thousands, have reported no elevations of cancer, and most were funded by the wireless industry. In addition, these reassuring studies contained significant experimental design flaws, mainly the fact that the populations followed were too small, were followed for a too short a period of time and had used mobile phones for too short a period of time.

Non industry-funded studies have clearly demonstrated a significant increase in cancer cases among individuals who have suffered from prolonged exposure to low-level microwaves, transmitted notably by radio antennas. The effects were best documented in meta-analyses that have been published and that include grouped results from several different studies: these analyses consistently showed an increased risk of brain cancer among regular users of a cell phone who have been exposed to microwaves for at least ten years.

Brain Cancer Rates

Furthermore, the argument that brain cancer rates do not indicate an overall increase in incidence is not evidence that cell phones are safe: the latency for brain cancer in adults after environmental exposure can be long, up to 20-30 years. Most North Americans haven’t used cell phones extensively for that long. The evidence of the link between long-term cell phone use and brain cancer comes primarily from Northern Europe, where cell phones have been commonly used since the 1990s.

Children are especially at risk. In May 2012, the U.K.’s Office of National Statistics reported a 50 percent increase in incidence of frontal and temporal lobe tumors in children between 1999 and 2009. This statistic is especially disturbing since in May 2011, after reviewing the published scientific literature regarding cancers affecting cell phone users, the International Agency for Research on Cancer (IARC) classified radiofrequency radiation as a 2B, possible human carcinogen. Despite the absence of scientific consensus, the evidence is sufficiently compelling for any cautious parent to want to reduce their loved one’s exposure to RF/microwave emissions as much as possible, as recommended by various countries such as Austria, Belgium, Germany, Russia and the United Kingdom.

Electrosensitivity

Public fears about wireless smart meters are well-founded. They are backed by various medical authorities such as those of the Santa Cruz County (California) Public Health Department. These authorities are worried about the growing number of citizens who say they have developed electrohypersensitivity (EHS), especially since for many of them, the symptoms developed after the installation of such meters (it takes some time for most people to link the two events).

Since the turn of the millennium, people are increasingly affected by ambient microwaves due to the growing popularity of wireless devices such as cell phones and Wi-Fi Internet. Therefore, the mass deployment of smart grids could expose large chunks of the general population to alarming risk scenarios without their consent. According to seven surveys done in six European countries between 2002 and 2004, about 10% of Europeans have become electrosensitive, and experts fear that percentage could reach 50% by 2017. The most famous person to publicly reveal her electrosensitivity is Gro Harlem Brundtland, formerly Prime Minister of Norway and retired Director of the World Health Organization (WHO).

While there is no consensus on the origins and mechanisms of EHS, many physicians and other specialists around the world have become aware that EHS symptoms (neurological, dermatological, acoustical, etc.) seem to be triggered by exposure to EMF levels well below current international exposure limits, which are established solely on short-term thermal effects (2). Organizations such as the Austrian Medical Association and the American Academy of Environmental Medicine have recognized that the ideal way to treat of EHS is to reduce EMF exposure.

Therefore, caution is warranted because the growing variety of RF/microwave emissions produced by many wireless devices such as smart meters have never been tested for their potential biological effects.

Well-known bioeffects

While the specific pathways to cancer are not fully understood, it is scientifically unacceptable to deny the weight of the evidence regarding the increase in cancer cases in humans that are exposed to high levels of RF/microwave radiation.

The statement that “there is no established mechanism by which a radio wave could induce an adverse effect on human tissue other than by heating” is incorrect, and reflects a lack of awareness and understanding of the scientific literature on the subject. In fact, more than a thousand studies done on low intensity, high frequency, non-ionizing radiation, going back at least fifty years, show that some biological mechanisms of effect do not involve heat. This radiation sends signals to living tissue that stimulate biochemical changes, which can generate various symptoms and may lead to diseases such as cancer.

Even though RF/microwaves don't have the energy to directly break chemical bonds, unlike ionizing radiation such as X-rays, there is scientific evidence that this energy can cause DNA damage indirectly leading to cancer by a combination of biological effects. Recent publications have documented the generation of free radicals, increased permeability of the blood brain barrier allowing potentially toxic chemicals to enter the brain, induction of genes, as well as altered electrical and metabolic activity in human brains upon application of cell phone RF/microwaves similar to those produced by smart meters.

These effects are cumulative and depend on many factors including RF/microwave levels, frequency, waveform, exposure time, bioavailability between individuals and combination with other toxic agents.

Clear evidence that these microwaves are indeed bioactive has been shown by the fact that low-intensity EMFs have proven clinically useful in some circumstances. Pulsed EMFs have long been used to successfully treat bone fractures that are resistant to other forms of therapy. More recently, frequency-specific, amplitude-modulated EMFs have been found useful to treat advanced carcinoma and chronic pain.

High frequency EMFs such as the microwaves used in cell phones, smart meters, Wi-Fi and cordless “DECT” phones, appear to be the most damaging when used commonly. Most of their biological effects, including symptoms of electrohypersensitivity, can be seen in the damage done to cellular membranes by the loss of structurally-important calcium ions. Prolonged exposure to these high frequencies may eventually lead to cellular malfunction and death.

Furthermore, malfunction of the parathyroid gland, located in the neck just inches from where one holds a cell phone, may actually cause electrohypersensitivity in some people by reducing the background level of calcium ions in the blood. RF/microwave radiation is also known to decrease the production of melatonin, which protects against cancer, and to promote the growth of existing cancer cells.

Early warning scientists attacked

In recommending that the Precautionary Principle be applied in EMF matters, the European Environment Agency’s Director Jacqueline McGlade wrote in 2009: “We have noted from previous health hazard histories such as that of lead in petrol, and methyl mercury, that ‘early warning’ scientists frequently suffer from discrimination, from loss of research funds, and from unduly personal attacks on their scientific integrity. It would be surprising if this is not already a feature of the present EMF controversy...” Such unfortunate consequences have indeed occurred.

The statement in the *Le Devoir* letter, “if we consider that a debate should take place, it should focus exclusively on the effects of cell phones on health”, is basically an acknowledgement that there is at least some reason to be concerned about cell phones. However, while the immediate exposure from a cell phone is of much greater intensity than the exposure from smart meters, cell phone use is temporary.

Smart meters

Wireless smart meters typically produce atypical, relatively potent and very short pulsed RF/microwaves whose biological effects have never been fully tested. They emit these millisecond-long RF bursts on average 9,600 times a day with a maximum of 190,000 daily transmissions and a peak level emission two and a half times higher than the stated safety signal, as the California utility Pacific Gas & Electric recognized before that State’s Public Utilities Commission. Thus people in proximity to a smart meter are at risk of significantly greater aggregate exposure than with a cell phone, not to mention the cumulative levels of RF/microwaves that people living near several meters are exposed to.

People are exposed to cell phone microwaves primarily in the head and neck, and only when they use their device. With smart meters, the entire body is exposed to the microwaves, which increases the risk of overexposure to many organs.

In addition to these erratic bursts of modulated microwaves coming from smart meters that are transferring usage data to electric, gas and water utilities, wireless and wired smart (powerline communication) meters are also a major source of “dirty electricity” (electrical interference of high frequency voltage transients typically of kilohertz frequencies). Indeed, some scientists, such as American epidemiologist Sam Milham, believe that many of the health complaints about smart meters may also be caused by dirty electricity generated by the « switching » power supply activating all smart meters. Since the installation of filters to reduce dirty electricity circulating on house wiring has been found to relieve symptoms of EHS in some people, this method should be considered among the priorities aimed at reducing potential adverse impacts. Indeed, the Salzburg State (Austria) Public Health Department confirms its concern about the potential public health risk when in coming years almost every electric wire and device will emit such transient electric fields in the kilohertz-range due to wired smart meters.

Rather be safe than sorry

The apparent adverse health effects noted with smart meter exposure are likely to be further exacerbated if smart appliances that use wireless communications become the norm and further increase unwarranted exposure.

To date, there have been few independent studies of the health effects of such sources of more continuous but lower intensity microwaves. However, we know after decades of studies of hazardous chemical substances, that chronic exposure to low concentrations of microwaves can cause equal or even greater harm than an acute exposure to high concentrations of the same microwaves.

This is why so many scientists and medical experts urgently recommend that measures following the Precautionary Principle be applied immediately — such as using wired meters — to reduce biologically inappropriate microwave exposure. We are not advocating the abolishment of RF technologies, only the use of common sense and the development and implementation of best practices in using these technologies in order to reduce exposure and risk of health hazards.

1. Scientific papers on EMF health effects

2. Explanation and studies on electrosensitivity

3. Governments and organizations that ban or warn against wireless technology

- David O. Carpenter, MD, Director, Institute for Health & the Environment, University at Albany, USA
- Jennifer Armstrong, MD, Past President, Canadian Society of Environmental Medicine, Founder, Ottawa Environmental Health Clinic, Ontario, Canada
- Pierre L. Auger, M. D., FRCPC, Occupational medicine, Multiclinique des accidentés 1464, Montreal, Quebec, Canada
- Fiorella Belpoggi, Director Cesare Maltoni Cancer Research Center, Ramazzini Institute, Bologna, Italy
- Martin Blank, PhD, former President, Bioelectromagnetics Society, Special Lecturer, Department of Physiology and Cellular Biophysics, Columbia University Medical Center, New York, USA

- Barry Breger, MD, Centre d'intégration somatosopique (orthomolecular medicine), Montreal, Quebec
- John Cline, MD, Professor, Institute for Functional Medicine, Federal Way, WA, USA, Medical Director, Cline Medical Centre, Nanaimo, BC, Canada
- Alvaro Augusto de Salles, PhD, Professor of Electrical Engineering, Federal University of Rio Grande do Sul, Porto Alegre, Brazil
- Christos Georgiou, Prof. Biochemistry, Biology Department, University of Patras, Greece
- Andrew Goldsworthy, PhD, Honorary lecturer in Biology, Imperial College, London, UK
- Claudio Gómez-Perretta, MD, PhD, Director, Centro de Investigación, Hospital Universitario LA Fe, Valencia, Spain
- Livio Giuliani, PhD, Senior Researcher, National Insurance Institute (INAIL), Chief of Radiation and Ultrasounds Research Unit, Rome, Italy
- Yury Grigoriev, PhD, Chair Russian National Committee on Non-Ionizing Radiation Protection, Moscow, Russia
- Settimio Grimaldi, PhD, Director, Institute of Translational Pharmacology (Neurobiology and molecular medicine), National Research Council, Rome, Italy
- Magda Havas, PhD, Centre for Health Studies, Trent University, Canada
- Lennart Hardell, MD, Professor of Oncology, University Hospital, Örebro, Sweden
- Denis L. Henshaw, PhD, Professor of Physics, Head of The Human Radiation Effects Group, University of Bristol, UK
- Ronald B. Herberman, MD, Chairman of Board, Environmental Health Trust, and Founding Director emeritus, University of Pittsburgh Cancer Institute, USA
- Donald Hillman, PhD, Dairy Science, Professor Emeritus, Department of Animal Science, Michigan State University, USA
- Isaac Jamieson, PhD, Environmental Science (electromagnetic phenomena in the built environment), independent architect, scientist and environmental consultant, Hertfordshire, UK
- Olle Johansson, PhD, Professor of Neuroscience (Experimental Dermatology Unit), Karolinska Institute, Stockholm, Sweden
- Yury Kronn, PhD, Soviet authority on physics of nonlinear vibrations and high frequency electromagnetic vibrations, founder of Energy Tools International, Oregon, USA
- Henry Lai, PhD, Professor of Bioengineering, University of Washington School of Medicine, Seattle, WA, USA
- Abraham R. Liboff, PhD, Professor Emeritus, Department of Physics, Oakland University, Rochester, Michigan, USA
- Don Maisch, PhD, Researcher on radiation exposure standards for telecommunications frequency, EMFacts Consultancy, Tasmania, Australia
- Erica Mallery-Blythe, MD, Emergency Medicine Physician, England
- Andrew A. Marino, MD, PhD, JD, Professor of Neurology, LSU Health Sciences Center, Shreveport, LA, USA
- Karl Maret, MD, M.Eng., President, Dove Health Alliance, Aptos, CA, USA
- Andrew Michrowski, PhD, Director, Planetary Association for Clean Energy, Ottawa, Canada
- Sam Milham, MD, former chief epidemiologist, Washington State Department of Health, USA
- Joel M. Moskowitz, PhD, Director, Center for Family and Community Health, School of Public Health, University of California, Berkeley
- Gerd Oberfeld, MD, Public Health Department, Salzburg State Government, Austria
- Mike O'Carroll, PhD, Professor Emeritus (Applied Mathematics), University of Sunderland, UK
- Jerry L. Phillips, PhD, Director, Center for Excellence in Science, Department of Chemistry and Biochemistry, University of Colorado, USA

- John Podd, PhD, Professor of Psychology (experimental neuropsychology), Massey University, New-Zeland
- William J. Rea, MD, thoracic and cardiovascular surgeon, founder of the Environmental Health Center, Dallas, Tx, USA
- Elihu D. Richter, MD, Professor, Hebrew University-Hadassah School of Public Health and Community Medicine, Jerusalem, Israel
- Leif G. Salford, MD, Senior Professor of Neurosurgery, Lund University, Sweden
- Nesrin Seyhan, MD, Founder and Chair of Biophysics, Medical Faculty of Gazi University, Turkey
- Cyril W. Smith, PhD, lead author of “Electromagnetic Man”, retired from Electronic and Electrical Engineering, University of Salford, UK
- Morando Soffritti, MD, □ Scientific Director of the European Foundation for Oncology and Environmental Sciences “B. Ramazzini” in Bologna, Italy
- Antoinette “Toni” Stein, PhD, Collaborative on Health and the Environment (CHE-EMF Working Group), Co-Coordinator, Berkeley, CA, USA
- Stanislaw Szmigielski, MD, PhD Professor of Pathophysiology, Consulting Expert, former director of Microwave Safety, Military Institute of Hygiene and Epidemiology, Warsaw, Poland
- Bradford S. Weeks, MD, Director, The Weeks Clinic, Clinton, WA, USA
- Stelios A. Zinelis, MD, Vice-President, Hellenic Cancer Society, Cefallonia, Greece

EXHIBIT TWO

Testimony of Dr. David O. Carpenter
Concerning health effects of WiFi System
In Portland, Oregon Public Schools

Testimony given under oath
December 20th, 2011
In United States District Court
District of Oregon
Portland Division

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United States District Court

District of Oregon

Portland Division

AHM, by and through
her Guardian *ad litem* and father,
David Mark Morrison, and
David Mark Morrison, individually,

v.

Portland Public Schools,

Defendant.

Civil Action No. 3:11-cv-00739-MO

**Amended Declaration of
Dr. David O. Carpenter, M.D.**

I, Dr. David O. Carpenter, M.D., under penalty of perjury pursuant to 28 U.S.C. § 1746,
hereby make the following declaration in support of an injunction against Portland Public Schools'
use of WI-FI:

1. I am a public health physician, educated at Harvard Medical School. My current title is Director of the Institute for Health and the Environment at the University at Albany and Professor of Environmental Health Sciences within the School of Public Health. Formerly, I was the Dean of the School of Public Health at the University of Albany and the Director of the Wadsworth Center for Laboratories and Research of the New York State Department of Health.

2. I served as the Executive Secretary to the New York State Powerlines Project in the 1980s, a program of research that showed children living in homes with elevated magnetic fields coming from powerlines suffered from an elevated risk of developing leukemia. After this I became the spokesperson on electromagnetic field (EMF) issues for the state during the time of my employment in the Department of Health. I have published several reviews on the subject and have edited two books.

3. I am a Co-Editor and a Contributing Author of the *BioInitiative: A Rationale for a Biologically-based Public Exposure Standard for Electromagnetic Fields (ELF and RF)*, www.bioinitiative.org. It documents bioeffects, adverse health effects and public health conclusions about impacts of electromagnetic radiation (electromagnetic fields including extremely-low frequency ELF-EMF and radiofrequency /microwave or RF-EMF fields). The public health chapter from this report was subsequently published in a peer-reviewed journal.

4. Additionally, I am a Co-Author of *Setting Prudent Public Health Policy for Electromagnetic Field Exposures*, *Reviews on Environmental Health*, Volume 23, No 2, 2008, attached as Addendum A-2.

5. In addition, in 2009, I was invited to present to the President's Cancer Panel on the subject of powerline and radiofrequency fields and cancer, and have testified on this issue before the United States House of Representatives.

6. In sum, I am a public health physician, professor and former public health school Dean with expertise in electrophysiology, low-frequency electromagnetic fields bioeffects, and

radiofrequency (RF) and microwave (MW) radiation bioeffects.

7. WI-FI deploys pulse-modulated (“PM”) microwave (“MW”) radiation (within the larger RF radiation spectrum) with a carrier frequency that is similar to that used by a microwave oven: about 2.45 GHz. This is the “Agent”. The 2.45 GHz frequency was chosen for the oven because of its wavelength and harmonic resonance with the water molecule, to ensure the most efficient absorption by living tissues and effective heating by way of the agitation of water at the molecular level. The pulse-modulation of a wave with lower frequencies in addition to the high-frequency carrier signal, increases the exposure complexity and in turn the bioeffects in an exposed population.

8. In the context of school development, WI-FI exposes building occupants including children and adults constantly from both computers and infrastructure antennas. Duration may be an even more potent contributing factor to RF/MW radiation bioeffects than exposure levels. Chronic, such as all-day, school exposure, is more likely than short and intermittent exposure, such as cell phone use, to produce harmful health effects, and is likely to do so at lower exposure levels.

9. Persons stationed close to school computers with WI-FI and especially those very near to any WI-FI infrastructure will receive considerably higher exposure than do others.

10. It is generally accepted within the relevant scientific community and has been established beyond any reasonable doubt that adverse human health effects occur at far lower levels of RF/MW radiation exposure than those that cause noticeable heating, particularly where the wavelength approaches body-part size and thus maximizes absorption, where the wavelength has resonance with the water molecule, where there is more complex, modulated wave, where there is chronic exposure duration, and where exposed persons lack the capacity voluntarily to remove themselves from radiation sources.

11. Some effects are shown to occur at several hundred thousand times below the FCC public exposure guidelines, which are set based on the fallacious assumption that there are no adverse health effects at exposures that do not cause easily measureable heating. FCC guidelines

also only apply to 30-minute public exposures; therefore do not even infer safety at durations >30 minutes, such as in a school setting.

12. Exposure to high-frequency RF and MW radiation and also the extreme low frequency (ELF) EM fields that accompany WI-FI exposure have been linked to a variety of adverse health outcomes. Some of the many adverse effects reported to be associated with and/or caused by ELF fields and/or RF/MW radiation include neurologic, endocrine, immune, cardiac, reproductive and other effects, including cancers.

13. Studies of isolated cells have shown that RF/MW exposures may cause changes in cell membrane function, cell communication, metabolism, activation of proto-oncogenes, and can trigger the production of stress proteins at exposure levels below FCC guidelines and also at and less than school WI-FI exposure levels and parameters. Resulting effects in cellular studies include without limitation DNA breaks and chromosome aberrations, cell death including death of brain neurons, increased free radical production, activation of the endogenous opioid system, cell stress and premature aging.

14. Human studies of comparable RF/MW radiation parameters show changes in brain function including memory loss, retarded learning, performance impairment in children, headaches and neurodegenerative conditions, melatonin suppression and sleep disorders, fatigue, hormonal imbalances, immune dysregulation such as allergic and inflammatory responses, cardiac and blood pressure problems, genotoxic effects like miscarriage, cancers such as childhood leukemia, childhood and adult brain tumors, and more.

15. There is consistent evidence for increased incidence of effects in individuals who live near to high-power short-wave, AM, FM and TV transmission towers. This is particularly relevant because, like WI-FI, radio-TV transmission towers give continuous, whole-body radiation, not just radiation to the head, constantly.

16. Since WI-FI transmitters, both infrastructural and on computers, are indoors, where children and teachers may be very close by, and since WI-FI, at 2.45 GHz, deploys a

wavelength, at ~12.2 cm or ~ 4.8 inches, more absorbable by children's and adults' bodies and brains than radio-TV wavelengths, the harmfulness of WI-FI radiation likely exceeds that of radio-TV towers.

17. Like second-hand smoke, EMF and RF/MW radiation involve complex mixtures, where different frequencies, intensities, durations of exposure(s), modulation, waveform and other factors are known to produce variable effects, often more harmful with greater complexity. Decades of scientific study have produced substantial evidence that EMF and RF/MW radiation may be considered neurotoxic, carcinogenic and genotoxic. Sources of fields and radiation, but are not limited to: power lines, navigational radar, cell phones, cordless phones [or Digitally Encoded Cordless Transmission Devices (D.E.C.T.) phones], cell towers, 'smart' meters and their grids or infrastructure, "smart" boards, meters and grids, WiMax and wireless internet (WI-FI).

18. The RF/MW radiation and low-frequency EMF science that currently exists includes tens of thousands of studies dating back to the 1920s. On the basis of this vast body of literature, many public health experts believe, myself included, that it is likely society will face epidemics of neurotoxic effects and degeneration, cancers and genotoxicity in the future, resulting from the extreme and mostly involuntary exposure to RF/MW radiation and EMFs. WI-FI radiation in schools exceeds natural background levels of microwave radiation by trillions of times. Thus, it is important that all of us restrict our use of cell phones, and be as free as possible from exposure to unnatural, background sources of MW radiation, particularly WI-FI.

19. In public health science, it is generally accepted fact that vulnerable subgroups exist within any human population. This is also recognized specifically for RF/MW radiation and fields. These groups include children, pregnant women, the elderly and those with preexisting illnesses and/or impairments. Children are more vulnerable to RF/MW radiation because of the susceptibility of their developing nervous systems. RF/MW penetration is greater relative to head size in children, who have a greater absorption of RF/MW energy in the tissues of the head at WI-FI frequencies.

Such greater absorption results because children's skulls are thinner, their brains smaller, and their brain tissue is more conductive than those of adults, and since it has a higher water content and ion concentrations. The Presidential Cancer Panel found that children 'are at special risk due to their smaller body mass and rapid physical development, both of which magnify their vulnerability to known carcinogens, including radiation.'

http://deainfo.nci.nih.gov/advisory/pcp/annualReports/pcp08-09rpt/PCP_Report_08-09_508.pdf

20. FCC public RF/MW radiation exposure guidelines are based on the height, weight and stature of a 6-foot tall man, not children or adults of smaller stature. The guidelines do not take into account the unique susceptibility of growing children to exposures. Since children are growing, their rate of cellular activity and division is more rapid, and they are at more risk for DNA damage and subsequent cancers. Growth and development of the central nervous system is still occurring well into the teenage years, such that the neurological impairments predictable by the extant science may have great impact upon development, cognition, learning, and behavior. Prenatal exposure has been identified as a risk factor for childhood leukemia, and is associated with miscarriage. Children are largely unable to remove themselves from exposures to harmful substances in their environments. Their exposure is involuntary.

21. When WI-FI is in operation in a school, children and their parents have no choice but to allow the school to expose them to trillions of times higher microwave radiation than exists naturally on Earth at the same frequencies. Children and other building users are exposed to as much as 30-40 hours per week of constant, digitally encoded WI-FI signals from each wireless device and infrastructural antenna in a school building. Based upon a review of the Mount Tabor WI-FI Floor Plan, a given child is subject to direct signals from multiple WI-FI transmitters, including rooms full of students and teachers transmitting numerous laptop and other wireless signals. There is a major legal difference between an exposure that an individual chooses to accept and one that is forced upon a person, especially a dependent, who can do nothing about it.

22. WI-FI in the Portland Schools deploys similar PM MW radiation, at 2.45 and 5 GHz, to that of cell and cordless phones and their infrastructure. There is clear and strong evidence that intensive use of cell phones increases incidence of brain cancer, tumors of the auditory nerve, and cancer of the parotid gland, the salivary gland in the cheek by the ear. Cell and cordless phone radiation closely resembles that of WI-FI radiation exposure, except that WI-FI is more hazardous by way of frequency, duration, and the involuntary nature of exposure. While a cell or cordless phone is used only intermittently and primarily voluntarily, a WI-FI radiation microenvironment is constant in duration, with unavoidable radiation exposure even when nearby students are not actively using it. Because WI-FI radiation is essentially the same as, but more hazardous than, that for cell and cordless phones, there is every reason to understand that the health effects will be the same or worse, varying in relation to the total dose of radiation, and intensified by the constancy of duration. There is evidence from Scandinavian studies of cell phone usage that children who use cell phones are about five times more likely to develop brain cancer than if their usage starts as an adult. Thus, it is especially necessary to protect children from pulse-modulated MW radiation such as both cell phones and WI-FI deploy.

23. Based on a high degree of scientific certainty, Portland Public Schools' use of WI-FI is causing and will continue to cause AHM, other students, and school staff and faculty adverse health effects, and should be discontinued immediately. Educating by way of the Internet via cabled systems only decreases MW radiation exposure and is of minimal expense.

24. Having reviewed hundreds, possibly thousands, of studies in RF/MW radiation and ELF fields, published from decades ago to the present, I would provide you the following primary evidence, without limitation. Due to the active suppression of the RF/MW literature, some researchers in public health science are less aware of these studies. However, the forefront experts specializing in these areas, RF/MW radiation and ELF fields, recognize the certainties in this large body of scientific literature, which establishes without limitation that PM MW radiation with chronic duration is quite harmful to humans, particularly children, as well as to animals and plants.

