

# **Contents of Smart Meter Package**

## **Impact of Smart Meters on Montgomery Village**

### **Concerns about Wireless Smart Meters**

- |                         |   |
|-------------------------|---|
| <i>Attachment No. 1</i> | Statement of the American Academy of Environmental Medicine, cautioning against Smart Meters  |
| <i>Attachment No. 2</i> | Letter from the American Academy of Pediatrics, stressing the vulnerability of children and pregnant women to radiofrequency radiation and advocating action by the U.S. Congress in response |
| <i>Attachment No. 3</i> | Biological Effects from RF Radiation at Low-Intensity Exposure, based on the BioInitiative 2012 Report, and the Implications for Smart Meters and Smart Appliances                            |
| <i>Attachment No. 4</i> | FCC Maximum Permissible Exposure Limits for Electromagnetic Radiation, as Applicable to Smart Meters  |
| <i>Attachment No. 5</i> | Form letter to PEPCO to request removal of a Smart Meter  |
| <i>Attachment No. 6</i> | Sign to post on a Smart Meter when requesting its removal by PEPCO  |
| <i>Attachment No. 7</i> | Brochure of Maryland Smart Meter Awareness  |



## Impact of Wireless Smart Meters on Montgomery Village

### Background

Montgomery Village rightly prides itself on offering a remarkable quality of life for its residents. Sadly, that quality has been substantially degraded in recent months by an increase in microwave radiation. The local electric power company, PEPCO, passed through MV in late 2012 and early 2013, and installed an estimated 12,000 wireless Smart Meters, one on each residence in MV. These Smart Meters are digital watt-hour meters combined with wireless microwave transmitters and receivers. Each Smart Meter transmits pulsed microwave signals with a microwave power output of about 1 watt. So the installed Smart Meters represent about 12,000 watts of microwave transmission capability, embedded intimately in our residential community. The Smart Meters generate and transmit to PEPCO, or its agents, a detailed profile of the electric power consumption of every residence in MV, around the clock, every day of the year, indefinitely. The Smart Meters also communicate with each other, in what is called a mesh network, and forward data along to PEPCO or its agents. Based on a California court document, describing equipment from the same manufacturers used by PEPCO in MV, each Smart Meter transmits an average of 10,000 times per day, and a maximum of 190,000 times per day. For MV's 12,000 Smart Meters, that means an average of 120 million transmissions per day, and a maximum of 2.3 billion transmissions per day.

PEPCO's claimed benefits for Smart Meters can be found at <http://www.pepco.com/energy/blueprint/smetersmd>. PEPCO's main argument for Smart Meters has been that customers can reduce their energy consumption by studying the data that PEPCO collects from their Smart Meters and posts on PEPCO's web site for each customer's account.

### Capabilities

Smart Meters have many capabilities. Smart Meters contain switches that enable PEPCO to turn off the electric power to your home, merely by sending a microwave signal to your Smart Meter. Smart Meters can send microwave signals throughout your home to communicate with emerging Smart Appliances that will have their own microwave transmitters and receivers. Your Smart Meter will identify which Smart Appliances you own, when you use them, and how much power each consumes, around the clock, every day of the year. Smart Meters may even be able to turn these appliances off when so ordered by a wireless signal from PEPCO, but that is less clear at this time. Smart Meters can be reprogrammed remotely by PEPCO to perform additional functions not yet known to the customers, and not subject to their approval.

### Concerns

Wireless Smart Meters give rise to a number of concerns:

## **Health**

Smart Meters are everywhere in MV, and the microwave radiation that each Smart Meter transmits extends far beyond the boundaries of the property on which it is installed. So there is no place in MV where you can go without being exposed to increased microwave radiation generated by Smart Meters. Every room of every home, every crib, every playground, every school, every pool, every walkway, every roadway, every church and synagogue, and every business is subject to an increase in microwave exposure. And this increased exposure is occurring just as the international medical research community is finding that humans are much more sensitive to harm from microwave radiation than earlier understood. That sensitivity extends down to levels easily produced by just one Smart Meter or just one Smart Appliance, for individuals close enough to them, let alone many of them.

Major medical organizations are warning about the adverse impact on human health of the thoughtless expansion of wireless technology. They include the American Academy of Environmental Medicine, composed of medical doctors that address the impact of the environment on health, and the American Academy of Pediatrics, whose 60,000 member doctors care for our children.

Sadly, the FCC's present Maximum Permitted Exposure limits, that govern Smart Meters and other wireless devices, are too high (too permissive) to protect the public. Those FCC limits are based principally on a 1986 analysis, now 27 years old, that predated both most of the microwave devices being regulated, including Smart Meters, and most of the research on the biological effects of microwave radiation. The deficiency of the present limits has been recognized in a bill before the U.S. House of Representatives, H. R. 6358, that would support research toward better founded limits for wireless devices. But the development of more protective limits, if ever undertaken, will take years. In the meantime, the public has been left on its own to endure the consequences. And the pending arrival of Smart Appliances, which will be purchased unwittingly by the public, is going to make the situation much worse.

Smart Meters are too much like a giant uncontrolled medical experiment, in which all of us have been enrolled, without informed consent, or any consent at all.

## **Security**

The power profile, collected by Smart Meters and transmitted throughout the day to the power company or its agents, will be sufficient to determine when you are home, when you are away, when you get up in the morning, and when you go to bed at night, thus decreasing personal security. Also, like all wireless networks, Smart Meters will be susceptible to cyber attack, possibly disrupting the continuity of electrical power to your home and the proper recording of your electricity consumption for billing purposes.

## **Privacy**

In our electrical society, much can be learned about the activities occurring in your home from your electric power profile, since just about every type of electrical device, such as a refrigerator, a television

set, or a computer, has a unique power profile. This identification will become more exacting as the Smart Appliances are put into service. Advertisers may want your profile to determine which appliances you own. Data miners may want your profile for marketing or other purposes. Law enforcement may want your profile for surveillance purposes. And there is currently no law that prevents the sale or transfer of your personal information to anyone.

## **Hidden Costs and Doubtful Benefits**

The State Attorneys General of Illinois, Connecticut, and Michigan have decried the costs of Smart Meters because no commensurate financial benefits to the customers have been convincingly demonstrated.

## **Property Values**

It is early to predict the impact of Smart Meters on an entire community, like MV. But California provides an early indicator. Smart Meters were installed there beginning several years ago, so California is farther along in consideration of the consequences. Since then, 57 counties, cities, and towns in California have opposed mandatory installation of Smart Meters in their jurisdictions. And, a growing number of these jurisdictions, 15 of the 57, have passed ordinances prohibiting Smart Meters altogether. Families looking for a home may prefer to live in a community that has already eliminated Smart Meters, for health or other reasons. This inclination has the potential for depressing property values, and eroding the tax base, in communities that decide to retain Smart Meters. At the same time, this inclination has the potential for increasing property values, and expanding the tax base, in communities that eliminate Smart Meters.

## **What Can Village Residents Do?**

The arrival of Smart Meters has provoked the Maryland public sufficiently that the Maryland Public Service Commission has offered a temporary right for individual homeowners to Opt Out. That is, homeowners may have their Smart Meters removed and replaced with safe, reliable, traditional analog mechanical meters. Unfortunately, most MV residents do not know that they have a Smart Meter, or what risks it entails, or that they have a right to have it removed. So the right to Opt Out will be underutilized by residents, leaving MV exposed to the extra microwave radiation of Smart Meters for the indefinite future. Unfortunately, too, even if all residents willing to study up on Smart meters do Opt Out, there will be so many Smart Meters remaining that microwave radiation levels throughout MV will remain elevated. All of these factors add up to the need for an MV-wide Opt Out. Obtaining that is going to require leadership at both the community level and the MV level.

## **What Can Village Managers Do?**

Study this issue to determine for yourselves the merits of the concerns. If you wish, start with the attached tutorial, Concerns about Smart Meters, written in a neighbor-to-neighbor format. That tutorial is followed by several attachments that expand upon information in the tutorial.

Visit and read the materials on the web site <http://MarylandSmartMeterAwareness.org>. This organization is a non-profit, public-spirited group of Maryland volunteers with more than 500 members. They represent many fields, including doctors, scientists, engineers, computer experts, lawyers, and concerned parents broadly. They are not anti-technology; in fact, many of them have spent their careers developing advanced technology. Rather, they recognize an unwise use of technology when they see it. They are working hard to educate Marylanders about the serious consequences of Smart Meters.

Search the Internet for information about Smart Meters. Recognize that the opposition to Smart Meters is nationwide, with half or more of the states now participating. Appreciate the fact that Maryland has provided an Opt Out. (DC and Pennsylvania have not, but one power company in Virginia has voluntarily offered an Opt Out).

If, after your inquiry, you judge that Smart Meters are not good for you or MV, Opt Out yourselves, both to reduce the risks to your families, and to set a good example for other MV residents. Inform MV residents about Smart Meters through an article in the Village News and, better yet, through an upcoming MV-wide mailing; and urge MV residents to Opt Out.

Write the Maryland Public Service Commission to support its temporary Opt Out privilege and to urge an indefinite extension. Contact the Maryland State Senators and Delegates that represent MV, and the members of the Economic Matters Committee of the House of Delegates, in support of HB1038, which is currently before the Committee. If HB1038 becomes law in the 2014 session, HB1038 will make the right to Opt Out permanent, will prevent any fee from being charged to those opting out, and will protect data collected by Smart Meters from being sold to others.

Then address the big task: pursuing an MV-wide response to Smart Meters, to protect our entire community.

## **Closing**

The regrettable decision to install wireless Smart Meters in our community can be reversed by people of good will and determination. But only if we act together and soon. If we do not, we will have to bear the consequences of our inaction for years to come. That would be a tragic and unnecessary outcome.

## **PEPCO Recently Installed a Wireless Smart Meter on Your Home**

### **The Bad News: You May Not Want One on Your Home**

### **The Good News: You Can Have It Removed by Sending a Letter to PEPCO, as Many Neighbors Have Done**

PEPCO has replaced all traditional analog mechanical power meters with wireless digital Smart Meters on all homes in the PEPCO service area. A similar replacement is underway in many other U.S. states, and in other countries, too. Installation of Smart Meters in Montgomery Village was underway in late 2012 and early 2013.

PEPCO's reasons for installing wireless Smart Meters are described here:

<http://www.pepco.com/energy/blueprint/smetersmd>

Some of the intentions are good. But there are significant concerns, too. The purpose of this document is to describe the concerns so that you can decide for yourself about retaining your Smart Meter. These concerns include health, privacy, security, fire safety, hidden costs and doubtful benefits to the consumer, and the impact on our community as a whole.

These concerns have arisen in many states, and in many countries, too. In Maryland these concerns have been sufficiently great that Maryland permits you to have your wireless Smart Meter removed, through what is called an OPT OUT. Many of your neighbors have already OPTED OUT, and more are in the process of doing so now. You may wish to do so, too. Maryland's OPT OUT permission is currently temporary and the duration is not known. But a new bill, HB1038, is currently before the Maryland House of Delegates to make the OPT OUT permanent and to provide other protections for Marylanders. All of this is discussed here.

### **What is a Wireless Smart Meter?**

Wireless Smart Meters combine a wireless microwave transmitter and a wireless microwave receiver with a digital watt-hour meter. Smart Meters are made by many different manufacturers and thus can have many different appearances, but they all seem to have digital displays. That is, they display individual numerical digits rather than round dials, that look like clock faces, from which the digits are read. The principal type of wireless Smart Meter that PEPCO is installing in our community is the FOCUS AXR-SD made by Landis+Gyr. It is pictured here.<sup>1</sup> However, some homes in our community are receiving the



<sup>1</sup> "Product Specification Sheet - E330 Focus AX + E350 AX-SD Single Phase" found on the web site of the manufacturer, Landis+Gyr: ([http://style.landisgyr.com/apps/products/data/pdf1/FOCUS\\_AX\\_SDSheet.pdf](http://style.landisgyr.com/apps/products/data/pdf1/FOCUS_AX_SDSheet.pdf) ).

I-210+c, made by General Electric. It is pictured next.<sup>2</sup> In our community, this GE meter has a gray plastic cover over the top of the meter, so it looks somewhat different from the picture shown here.

The basic function of any watt-hour meter is to measure the electrical energy that you use so that you can be billed once a month. But the new Smart Meters have many capabilities that go well beyond this simple function, and the implications of those capabilities have not been well explained to the public. Here are the capabilities that I know about, to date:



The Smart Meters report your power usage to PEPCO, not just once a month, which would be sufficient for the type of billing used until now, but rather periodically throughout the day and the night, every day and every night of the year, for the indefinite future. Each Smart Meter does this by sending microwave signals to PEPCO from a transmitter inside the Smart Meter.

The Smart Meters receive commands that PEPCO sends to them. Each Smart Meter is equipped with a microwave receiver for this purpose. The Smart Meters give PEPCO the capability to shut off your electric power, remotely, by sending a microwave signal to your home. The Smart Meters can also be remotely programmed to perform new functions by sending microwave signals to them.

New “Smart Appliances” will become available this year. The Smart Appliances will contain microwave transmitters and receivers of their own. The Smart Meters and the Smart Appliances will be able to communicate with each other by sending microwave signals throughout your home. The Smart Meters will enable PEPCO to identify which Smart Appliances you have in your home, when you put them into service, when and how much you use each of them every day and every night, and when you take them out of service. The Smart Meters may also enable PEPCO to send signals to your Smart Appliances to turn them off, but that is less certain at this time.

Wireless Smart Meters can send microwave signals to other wireless Smart Meters. In fact, they are linked together in a so-called mesh network. One purpose of this mesh network is to assure that data about your power consumption and your Smart Appliances reaches PEPCO even if your signal does not reach PEPCO’s receivers directly. So your Smart Meter will be busy transmitting and receiving data from your neighbors’ Smart Meters. And your neighbors’ Smart Meters will be busy transmitting and receiving data from your Smart Meter. These Smart Meters will also be busy sending signals to each other to keep them “synchronized” with each other in the mesh network.

Some Smart Meters play a special role in the mesh network. They are called Collector Smart Meters. These wireless Collector Smart Meters are especially busy receiving, storing, and transmitting other peoples’ data as well as your own. At this time, I do not know if Collector Smart Meters are employed in PEPCO’s implementation of Smart Meters in Maryland. If Collector Meters are being employed, I have not heard whether PEPCO will notify homeowners that their Smart Meter is a Collector Smart Meter.

In sum, each Smart Meter performs communications services that are analogous to those performed by a cell tower in a cell-phone system: receiving microwave signals, transmitting microwave signals, and relaying data via microwave signals. In this sense, each Smart Meter functions like a mini cell

---

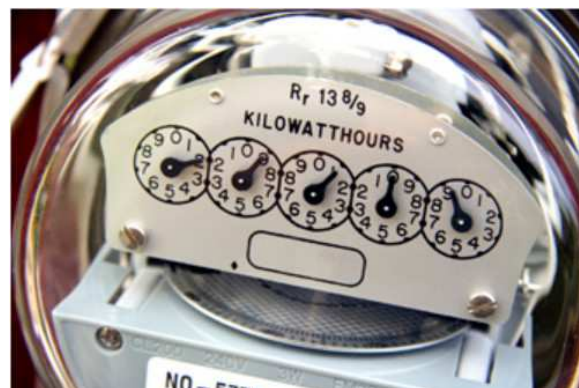
<sup>2</sup> “Residential Electrical Metering, Advanced ANSI metering solutions for the smart grid”, GE Digital Energy, found on this web site: (<http://gedigitalenergy.com/SmartMetering/brochures/I-210PC.htm>).



tower erected on your property. The Smart Meters are very busy. California court documents indicate that the Smart Meters in use there make an average of 10,000 transmissions per day, and a maximum of 190,000 transmissions per day.<sup>3</sup> The manufacturers of those Smart Meters, and the associated wireless networking equipment, also make the equipment that PEPCO is installing in our area.

## How Does a Traditional Analog Mechanical Meter Compare with a Wireless Smart Meter?

A traditional analog mechanical meter, pictured here,<sup>4</sup> serves only one purpose: It records the electrical energy consumed for the purpose of billing the customer once a month. It does not transmit wireless signals to remote locations; it does not receive wireless signals; and it is not subject to interference by wireless signals. It does not communicate with Smart Appliances, and it does not generate data about your use of your appliances. These traditional meters have proven their reliability and accuracy over the years, and they are inexpensive to manufacture. These traditional meters are read periodically by a meter reader on foot.



Some variations of the traditional analog mechanical meter do exist, and I am not certain which of these, if any, are present in our community. Some of these variations contain electronic modules that enable PEPCO to read them remotely from the street by interrogating the modules with a wireless signal. There may be other variations that contain electronic modules that report the meter reading more frequently by wireless means. So there may be some meters in service in our community that are part way between the traditional analog mechanical meter with no wireless capability, and a Smart Meter with extensive wireless capability.

## What are the Concerns about Wireless Smart Meters?

The new capabilities of Smart Meters have given rise to concerns across Maryland and, indeed, in other states, too. In fact, the residents of half or more of the states are currently engaged in battles over the installation of Smart Meters.<sup>5</sup> A wide variety of concerns have been expressed. Here are six of the concerns.

### Concern No 1: HEALTH

The new wireless Smart Meters contain microwave radio transmitters and receivers that transmit and receive bursts of microwave radiation periodically, throughout the day and the night, every day of the year, for the indefinite future. The Smart Meters radiate in every direction, including into, and throughout, your home.

<sup>3</sup> Pacific Gas and Electric Company's Response to Administrative Law Judge's October 18, 2011 Ruling Directing it to File Clarifying Radio Frequency Information. See Response 2 to Judge's Question 2, shown on page 5. PG&E (serving California) employs Smart Meters and internal microwave transmission/reception electronics made by the same manufacturers as those installed in Montgomery Village (Landis+Gyr and General Electric for the meters, and Silver Springs Network for the modules). The exact numbers, before rounding, are an average of 9981 transmissions per day, and a maximum of 190,396 transmissions per day, for each meter. ( <http://www.centerforsafewireless.org/documents/PGERFDataOpt-outResponse2011.pdf> )

<sup>4</sup> ( <http://stopsmartmeters.org/frequently-asked-questions/photos-of-analog-meters> )

<sup>5</sup> ( <http://www.scribd.com/doc/100365955/Actions-Opposing-Smart-Meters-Across-the-United-States> ) and ( <http://takebackyourpower.net/worldwide-directory/usa> )

They do this to assure that the signals reach PEPCO, no matter where PEPCO's receivers are located, and to detect and communicate with any forthcoming Smart Appliances that will be in your home. The result is that Smart Meters expose the residents, and their neighbors, to chronic microwave radiation, which is proving an increasing health concern. The amount of microwave radiation in your home will increase further when the new Smart Appliances arrive, as they, too, begin sending microwave radiation throughout your home. In effect, Maryland residents have been enrolled, in a massive medical experiment, *without informed consent, or any consent at all.*

The full scope of the health hazards of electromagnetic radiation, including microwave radiation, is not yet fully understood and is the subject of intense medical research worldwide. But enough has already been learned to stimulate significant concern. Here are several indicators of the level of that concern:

In May 2011, the World Health Organization classified electromagnetic radiation as a Class 2B carcinogen ("possible carcinogen"), based on the exposure provided by cell phones.<sup>6</sup>

In April 2012, the American Academy of Environmental Medicine (AAEM) issued a cautionary statement about wireless Smart Meters.<sup>7</sup> A copy of that statement is provided as Attachment No. 1. The AAEM is the Nation's leading organization of medical doctors, addressing the impact of the environment on human health. The doctors in the AAEM indicate that they are already seeing patients with adverse health effects from wireless Smart Meters. Unfortunately, most medical doctors, outside of the AAEM, are not trained to recognize the health effects caused by electromagnetic radiation. Further, doctors may not be able to help affected patients until the source of the radiation is removed.

In December 2012, the American Academy of Pediatrics (AAP) wrote to the U.S. House of Representatives to emphasize the vulnerability of children and pregnant women to radiofrequency (RF) radiation, including cell phone radiation. The AAP urged support of a new bill, H.R. 6358, that would support the development of new standards for maximum radiation exposure that would be more protective than the current standards. The AAP is "a non-profit professional organization of 60,000 primary care pediatricians, pediatric medical subspecialists, and pediatric surgical specialists dedicated to the health, safety and well-being of infants, children, adolescents, and young adults...." The letter from the AAP to the U.S. House of Representatives is provided as Attachment No. 2.

Also, in December 2012, an international group of 29 M.D.s, Ph.D.s, and other professionals in health care, from ten countries, issued a 1479-page report entitled "BioInitiative 2012 - A Rationale for Biologically-based Exposure Standards for Low-Intensity Electromagnetic Radiation".<sup>8</sup> As the basis for this report, the authors considered the "content and implications of about 1800 new studies" since the last BioInitiative Report was published in 2007.<sup>9</sup> A co-editor selected 67 studies for special attention in the summary. Those studies found biological effects from radiofrequency/microwave radiation at low intensities, of the type emitted by cell towers, Wi-Fi, wireless laptops, and Smart Meters. Those biological effects fell into eight major categories, including: brain cancer and blood-brain barrier

---

<sup>6</sup> You may read the press release of the International Agency for Research on Cancer, of the World Health Organization, on the Internet: ( [http://www.iarc.fr/en/media-centre/pr/2011/pdfs/pr208\\_E.pdf](http://www.iarc.fr/en/media-centre/pr/2011/pdfs/pr208_E.pdf) ).

<sup>7</sup> ( <http://aaemonline.org/pressadvisoryemf.pdf> )

<sup>8</sup> BioInitiative Working Group, Cindy Sage and David O. Carpenter, Editors, BioInitiative Report: A Rationale for Biologically-based Public Exposure Standards for Electromagnetic Radiation at [www.bioinitiative.org](http://www.bioinitiative.org), December 31, 2012. ( <http://www.bioinitiative.org> )

<sup>9</sup> BioInitiative 2012 Report cited in footnote 8 on page 4, Section 1, Summary for the Public and Conclusions, 2012 Supplement: Summary for the Public – Ms. Sage, page 3.

breakdown; other forms of cancer; cardiovascular effects; oxidative and DNA damage; sleep disruption and memory/learning/behavior effects; stress proteins and disrupted immune function; and reproduction/fertility effects. All effects occurred at levels below, or far below, the FCC Maximum Permitted Exposure limits currently governing Smart Meters and many other microwave devices, indicating that such high limits provide no protection against these biological effects. And most of the biological effects occurred at levels of radiation easily produced by the presence of just one Smart Meter on or near a home, let alone a whole community of them. The full report can be read on line or downloaded without charge.<sup>10</sup> A discussion of the implications of the 67 studies for Smart Meters and Smart Appliances is provided as Attachment No. 3.

In February 2013, the citizens of Maine presented, to the Maine Public Utilities Commission, both expert and lay testimony about adverse health effects from the microwave radiation from Smart Meters. They explained: “Expert testimony is that of scientists engaged in research on the biological effects of low-level RF or those engaged in public health or policy in this arena. Lay witness testimony is typically from those sensitive to electricity and/or electromagnetic fields, a condition that is often referred to as electromagnetic hypersensitivity (EHS) or electrically sensitive (ES).” You can read that testimony on the web site of the Maine Coalition to STOP “Smart” Meters.<sup>11</sup>

You might ask: If Smart Meters are harmful to human health, why hasn’t the U.S. Government protected us from them? The answer, at least in part, is that the current Maximum Permitted Exposure (MPE) limits from the Federal Communications Commission, that govern the electromagnetic radiation from Smart Meters and other wireless devices, are based primarily on a 1986 analysis that has not been significantly updated since then. That was 27 years ago, before most of the microwave devices in our environment, including Smart Meters, were created, and before nearly all of the currently available medical research findings on adverse biological effects became available. If you would like to know more about the FCC MPE limits, see Attachment No 4. As an indication of the inadequacy of the FCC MPE limits, there is a bill currently before the U.S. House of Representatives, H.R. 6358. This bill would support research toward new exposure limits to protect the public better from harmful levels of electromagnetic radiation. But that process will take years. In the meantime, the public is on its own. You can read a summary of the bill on the web site of Maryland Smart Meter Awareness.<sup>12</sup> This is the bill mentioned above that is supported by the American Academy of Pediatrics.

PEPCO could have eliminated the health concern by using a hardwired technology, instead of a wireless technology, for returning the data from Smart Meters to PEPCO. New digital watt-hour meters that employ only hardwired technologies are already commercially available. Examples of hardwired technologies are hardwired telephone lines, hardwired Internet connections, and hardwired cable television lines. A prime example of such an alternative is the new FIOS optical-fiber system recently installed by Verizon in our community. It is very safe. Further, Smart Meters are not mobile devices; so they do not require a wireless approach to achieve mobility.

There may be other wireless microwave devices in your home, such as cell phones, cordless phones, local area computer networks (including Wi-Fi), and microwave ovens. Yes, they, too emit microwave radiation. But there is a difference. These devices are *under your control*. You can control whether you use them or not, how frequently, and for how long. And you are free to change your mind about such use in the future, as

---

<sup>10</sup> BioInitiative 2012 Report cited in footnote 8 on page 4.

<sup>11</sup>

( <http://www.mainecoalitiontostopsmartmeters.org/2013/02/introduction-to-our-puc-filings-of-expert-and-lay-witness-testimony> )

<sup>12</sup> ( <http://marylandsmartmeterawareness.org/smart-meter-news/ask-your-congressional-rep-to-co-sponsor-h-r-6358> )

more is learned about the health effects of microwave radiation. But once a wireless Smart Meter has been installed on your home, you have forfeited your control over the microwave exposure provided by that Smart Meter.

It is informative to compare the microwave power output levels of Smart Meters to the microwave power output levels of other microwave devices that may be in your home.

<u>Device</u>	<u>Microwave Power Output</u>				
Smart Meter <sup>13</sup>	1.115	watts	which is	1115	milliwatts
Typical leakage from a microwave oven <sup>14</sup>	1	watt	which is	1000	milliwatts
Typical cell phone <sup>14,15</sup>	0.5	watt	which is	500	milliwatts
Wireless LAN (802.11a) <sup>14</sup>	0.251	watt	which is	251	milliwatts
Wireless LAN (802.11n) <sup>14</sup>	0.250	watt	which is	250	milliwatts
Cordless phone <sup>16</sup>	0.230	watt	which is	230	milliwatts
Wireless LAN (802.11 b,g) <sup>14</sup>	0.100	watt	which is	100	milliwatts
Typical laptop wireless LAN (Wi-Fi) <sup>14</sup>	0.032	watt	which is	32	milliwatts

So the Smart Meter's microwave power output is comparable to the microwave power output of the most powerful source of microwave radiation in your home: the typical leakage from a microwave oven. Further, each Smart Meter has twice the microwave power output of the typical cell phone, four to eleven times the microwave power output of a wireless local area network (LAN), five times the power output of a cordless telephone, and thirty-five times the microwave power output of the LAN in the typical laptop. Factors other than power output are very important to the actual exposure received, such as carrier continuity (continuous versus pulsed, and duty cycle), modulation method (the technique used to place information on the carrier), the distance from the source, and the presence of intervening structures that may absorb or reflect the radiated signals, among others. These other factors can be highly variable.

If you think of microwave safety as staying within a "microwave exposure budget" for your home, then the following question becomes important: Do you value the service that a wireless Smart Meter offers you so highly that it merits being the largest part of your microwave exposure budget?

You may hear proponents of Smart Meters say: "Since there are other sources of microwave radiation in your environment, what does one more source matter?" The response of the opponents of Smart Meters is

<sup>13</sup> The FOCUS AXR-SD and the I-210+c both have FCC-ID OWS-NIC514, which indicates that they send and receive information in two microwave frequency ranges: (1) 902.3 to 926.9 MHz, and (2) 2405.8 to 2480.9 MHz. MHz means millions of hertz. 1 hertz is one cycle per second. The microwave output power in the first frequency range is 0.968 watts. The microwave output power in the second frequency range is 0.147 watt. The sum of these two is 1.115 watts. Landis+Gyr and PEPCO declined to answer a question as to whether the two frequency ranges are used simultaneously. I assume here that they are and have summed their outputs as a result. If they are not used simultaneously, then the microwave output power would be 0.968 watts. (<http://stopsmartmeters.org/wp-content/uploads/2012/01/OWS-NIC514-FCC-specifications.pdf>).

<sup>14</sup> Wikipedia provides data on power levels on the Internet: (<http://en.wikipedia.org/wiki/DBm>). 1 watt is equivalent to 1000 milliwatts.

<sup>15</sup> The World Health Organization indicates that mobile phones have a peak power level between 0.1 and 2 watts. "Electromagnetic fields and public health: mobile phones", FactSheet N 193, June 2011 (<http://www.who.int/mediacentre/factsheets/fs193/en/>).

<sup>16</sup> Panasonic specifies the power output of its DECT 6.0 cordless telephone Model KXTG1061 as 115 milliwatts for the handset and another 115 milliwatts for the base station for a total capacity of 230 milliwatts. (<http://service.us.panasonic.com/OPERMANPDF/KXTG1061-MUL.PDF>). Other cordless models may use higher power levels. Additional references are being sought for clarification.

this: “The fact that there are other sources of microwave radiation in your environment is exactly why you don’t want any more, as that only exacerbates the health risks.”

If you would like to learn more about the possible adverse health effects of electromagnetic fields, including microwaves from Smart Meters, view the 45-minute on-line video made by Dietrich Klinghardt, M.D., Ph.D., as posted on the web site of Joseph Mercola, D.O. Dr. Klinghardt is one of the world’s leading experts on the impact of the environment on human health. In particular, he has done extensive work with autistic children. That video appears part way down the following web page, under the heading “Smart Meters and Electromagnetic Radiation - the Health Crisis of Our Time”:

<http://articles.mercola.com/sites/articles/archive/2012/12/05/smart-utility-meters.aspx>

## **Concern No. 2: SECURITY**

Smart Meters decrease both your personal security and the cyber security of your supply of electrical power.

**Personal Security:** The Smart Meter broadcasts, to anyone who can receive and decode the signal, a power profile that will be sufficient to determine when you are home, when you are on vacation, when you go to bed at night, and when you rise in the morning, thus raising personal security concerns.

**Cyber Security:** Because the wireless Smart Meters are, indeed, wireless, they are potentially vulnerable to “hacking” by those who wish to do mischief, or worse. In fact, a wireless Smart Meter network, similar to that in our community, has already been hacked in order to demonstrate its vulnerability.<sup>17</sup> The risk from such hacking is of special concern because a wireless Smart Meter can shut off your electric power, may be able to shut off individual Smart Appliances in your home, and, of course, does determine your reported electricity consumption for billing purposes. By comparison, the traditional analog mechanical power meters, that have served us well for years, are inherently resistance to such hacking, have no shut-off capability, and cannot be tampered with remotely.

If you would like to know more about the impact of Smart Meters on the security of the electrical power grid, view the on-line video of James Woolsey, former Director of the CIA, posted on the same web site above, just above the heading “Getting Smarter about the Smart Grid”. He calls the supposed “smart grid” (of which Smart Meters are a part) the “stupid grid” because of its vulnerability to cyber attack.

<http://articles.mercola.com/sites/articles/archive/2012/12/05/smart-utility-meters.aspx>

## **Concern No. 3: PRIVACY**

The Smart Meters feed data to the electric power company everyday about your usage of electric power and about your ownership and use of Smart Appliances. These data, which are sometimes called your “electric power profile”, may be collected and processed by third-party companies on behalf of the electric power companies. There is no legal protection in place to prevent uses of that information which you may not like, including the sale of that information to other parties. And there are an endless number of possible “customers” for that information. For example, sellers of Smart Appliances may want your data to determine which Smart Appliances you own, and whether they should target you with advertising for new

---

<sup>17</sup> The hacking report appears at the following URL on the web site of StopSmartMeters.org:  
( <http://stopsmartmeters.org/2013/01/19/full-speed-toward-an-iceberg-silver-spring-hacked> ).



Smart Appliances. Data mining companies may want your data for targeted advertising and a host of other applications. And law enforcement authorities and security agencies may want your data for surveillance purposes.

Given that the electronic modules in Smart Meters can be reprogrammed remotely, it is impossible to know, at this time, what additional uses will be found for Smart Meters in the future – uses that can be implemented without your knowledge or your approval.

Thus, once a Smart Meter has been mounted on your home and begins sending microwave signals into your home, and receiving microwave signals from inside your home, it will be difficult to determine what tasks this new type of surveillance device is actually performing.

If you would like to know more about the privacy issue with Smart Meters, consider the following on-line video made by Jerry Day. I do not know much about him, but his message seems correct.<sup>18</sup>

[http://www.youtube.com/watch?v=8JNFr\\_j6kdl&list=UUklG6ilxW\\_PeYeDspKSRGZQ](http://www.youtube.com/watch?v=8JNFr_j6kdl&list=UUklG6ilxW_PeYeDspKSRGZQ)

#### **Concern No. 4: FIRE SAFETY**

Smart Meters have been implicated in hundreds of house fires, for reasons that are not yet publicly understood. The Maryland Public Service Commission was sufficiently concerned about the fire hazard that it held a special hearing on this topic in August 2012. I have not yet heard a report of its findings.

Our local fire department, on Montgomery Village Avenue, indicated in early January 2013, that, as of that time, it had not yet seen a Smart Meter fire in Montgomery Village. But the fire department advised that if an electrical fire of this type should occur, the fire department cannot fight that fire until the electrical power is first turned off by PEPCO. So, if a Smart Meter fire does start, homeowners and their neighbors, after assuring their own personal safety, should call BOTH the fire department and PEPCO, and then await PEPCO's arrival.

If you would like to know more about the fire-safety issue, enter "Smart Meter Fires" into your Internet search engine. You will find many responses, some of which contain videos, like the one below, of Smart Meter fires:

<http://www.youtube.com/watch?v=Ah3nNo89-NU>

#### **Concern No. 5: HIDDEN COSTS AND DOUBTFUL BENEFITS FOR THE CONSUMER**

PEPCO is not overtly charging for Smart Meters, in the form of an explicit charge on your electric-power bill. But, clearly there will be a cost for the enormous number of Smart Meters involved, for their installation, for the creation of the extensive wireless microwave mesh network that supports these meters, for the maintenance of all of this microwave equipment, and for the processing of the volumes of data collected by the Smart Meters. I don't have documented figures on the costs, but I have seen an estimate of \$1 billion for Maryland alone. The U.S. Government is providing part of the funding through the stimulus bill of 2009. You can guess who is going to repay that cost, and the rest of the costs, in the form of taxes and rate increases for electricity. In fact, PEPCO has already filed, with the Maryland Public Service Commission, for a rate increase totaling \$60.8 million, on November 30, 2012. For the typical residential customer, PEPCO indicates that this increase will be \$7.13 per month per 1000 kWh of electrical energy consumed, which amounts to an

---

<sup>18</sup> Jerry Day's web sites: ( <http://www.jerryday.com> ) and ( <http://www.freedomtaker.com> ).

increase of 4.98 percent.<sup>19</sup> Of course, we have to expect some increases in the cost of electricity over time. But, in this case, we can wonder if the costs associated with Smart Meters are a major factor in this increase.

Further, the financial benefits of Smart Meters to customers are in doubt. Several State Attorneys General have objected:

A study by the Attorney General of Connecticut found that the claimed financial benefits of Smart Meters do NOT justify the costs.<sup>20</sup>

An assessment by the Attorney General of Illinois found that Smart Meters were more about profits for the utilities than about savings for their customers.<sup>21</sup>

The Attorney General of Michigan cited the lack of evidence that Smart Meters “will actually produce a net economic benefit to customers.”<sup>22</sup>

Further, many Maryland customers are concerned that PEPCO is spending an enormous amount of money on Smart Meters that would be better spent addressing the real problem of concern to PEPCO’s customers: the reliability of the PEPCO power system. Improved reliability might be better achieved by other changes, such as burying power lines that are vulnerable to damaging storms, and improving the control and monitoring systems at key junctions on the electric power grid. It is doubtful that collecting detailed data on power usage in every individual home, every day of the year, through wireless Smart Meters, is as important to improving reliability.

## **Concern No. 6: PROPERTY VALUES**

It is early to predict the impact of Smart Meters on entire communities, like Montgomery Village, but perhaps not entirely too early. We have only to look at communities in which Smart Meters were installed much earlier than they were here. California provides a striking example. Smart Meters were installed in parts of that state beginning several years ago. Since then, 57 counties, cities, and towns in California have opposed mandatory installation of Smart Meters in their jurisdictions. And 15 of the 57 have prohibited them altogether.<sup>23</sup> So once residents and governments have had a chance to consider the implications of Smart Meters for their communities, they have often turned against them. This kind of concern is reflected nationwide by the emergence of many groups opposed to Smart Meters in many states.<sup>24</sup>

---

<sup>19</sup> To find the details on PEPCO’s requested rate increase, enter “9311” (without the quotes) into the box “Case Search” on this PSC web page: ( <http://webapp.psc.state.md.us/Intranet/home.cfm> ). Select the first item on the resulting list by clicking on “See more.” Then see pages 3 and 5 in Volume I of II, in the file VollofII.pdf. See also page 10 in Volume II of II, in the file VollofII.pdf. Both volumes are about 400 pages long, so downloading them will take time. The rate increase described here applies to what PEPCO calls “a typical residential Standard Offer Service (SOS) customer”.

<sup>20</sup> The statement by the Connecticut Attorney General, George Jepsen, can be found on the Internet in this document: ( [http://www.ct.gov/ag/lib/ag/press\\_releases/2011/020811clpmeters.pdf](http://www.ct.gov/ag/lib/ag/press_releases/2011/020811clpmeters.pdf) ).

<sup>21</sup> The statement by the Illinois Attorney General, Lisa Madigan, can be found on the Internet here: ( <http://www.lisamadigan.org/Newsroom/lisainthenews/item/2011-06-lisa-madigan-opinion-editorial-comed-experiment-too> ).

<sup>22</sup> The statement by the Michigan Attorney General, Bill Shuette, can be found on the Internet here: ( [http://www.annarbor.com/DTE-SMART-METERS\\_ATTORNEY-GENERAL-OPINION.pdf](http://www.annarbor.com/DTE-SMART-METERS_ATTORNEY-GENERAL-OPINION.pdf) ).

<sup>23</sup> See article “CA Local Governments on Board”. ( <http://stopsmartmeters.org/how-you-can-stop-smart-meters/sample-letter-to-local-government/ca-local-governments-on-board> )

<sup>24</sup> ( <http://www.scribd.com/doc/100365955/Actions-Opposing-Smart-Meters-Across-the-United-States> ) and ( <http://takebackyourpower.net/worldwide-directory/usa> )

So it does not require too much insight to realize that more individuals and families, looking for a home, might prefer to live in a community that has already eliminated Smart Meters. This inclination may ultimately depress property values, and the associated tax base, in communities that decide to tolerate Smart Meters. This inclination may also boost property values, and the associated tax base, in communities that eliminate Smart Meters. Looking at this issue another way, I have yet to hear of a single person who finds the presence of Smart Meters a positive factor in determining where to live.

### **For Further Information about the Concerns**

If you would like to know more about the concerns related to Smart Meters, visit the web site below, or the many other web sites on the Internet. The web site below is that of **Maryland Smart Meter Awareness**. There you will find extensive information about Smart Meters. The brochure of this organization is included in this package as Attachment No. 7.

<http://marylandsmartmeterawareness.org>

This organization is a non-profit, public-spirited group of Maryland volunteers with more than 500 members. They represent many fields, including doctors, scientists, engineers, computer experts, lawyers, and concerned parents broadly. They are not anti-technology; in fact, many of them have spent their careers developing advanced technology. Rather, they recognize an unwise use of technology when they see it. They are working hard to educate Marylanders about the serious consequences of Smart Meters.

You may also wish to monitor the web site of the Maryland Public Service Commission (PSC) for emerging information. The Maryland PSC regulates the electric power utilities for the Maryland State Government. All postings can be found here:

[http://webapp.psc.state.md.us/Intranet/Casenum/CaseAction\\_new.cfm?RequestTimeout=500?](http://webapp.psc.state.md.us/Intranet/Casenum/CaseAction_new.cfm?RequestTimeout=500?)

You may have to wait a minute or two for this web site to come up. Then, to see all actions of relevance to PEPCO customers, enter 9207 in the box entitled "Case Search". When Case Number 9207 comes up, you may wish to see Item 203. Click there on "See more." to read the temporary Order 84926 that PSC issued to permit Maryland residents to OPT OUT of the installation of Smart Meters and thus to stay with the traditional analog mechanical meters.

If you search the Internet for information on Smart Meters more generally, you will find that there are many organizations, around the nation and in other countries, too, that have been formed to resist Smart Meters, and why those organizations are concerned. A good set of keywords on which to search is "Smart Meter Opposition".

### **How Can You OPT OUT of Having a Wireless Smart Meter?**

So many Maryland residents have objected to the installation of the new wireless Smart Meters that the Maryland Public Service Commission (PSC) has responded. In May 2012, the PSC issued Order 84926, giving Maryland customers the right to OPT OUT of the installation of Smart Meters while the PSC reviews the situation. This right extends both to customers who do not yet have a Smart Meter and to those who already have a Smart Meter and would like it replaced. At the moment, this order is temporary, so those wishing to take advantage of it will want to do so promptly. The PSC cannot tell us, at this time, whether, or when, this



order will be revoked or extended. If this order is revoked, Smart Meters could be reimposed on those who have OPTED OUT, whether before or after the installation of a Smart Meter.

Many of your neighbors have already OPTED OUT, to protect themselves and their neighbors. Some of your neighbors OPTED OUT before the Smart Meters were installed and thus avoided the installation of Smart Meters altogether. Other neighbors are OPTING OUT now, after the installation of the Smart Meters. To date, the requests from our neighbors, to OPT OUT after installation, have been honored by PEPCO without incident. The Smart meters have been removed by PEPCO in 4 to 21 days after the requests were received. You may OPT OUT, too, if you wish to do so.

**If you decide to OPT OUT, you must notify PEPCO in writing.**

PEPCO Smart Grid Deferral  
Mail Stop EP7642  
701 9th Street NW  
Washington, DC 20068

You may write your own letter, following the guidance on the web site [MarylandSmartMeterAwareness.org](http://MarylandSmartMeterAwareness.org). Or you may use a form letter, designed according to the guidance from [MarylandSmartMeterAwareness.org](http://MarylandSmartMeterAwareness.org) and from the Maryland Public Service Commission. A copy of that form letter is provided as Attachment No. 5. Note that the inclusion of your PEPCO Account Number, from your latest PEPCO bill, is vital. To date, PEPCO has responded to most OPT OUT letters from your neighbors with return letters of its own, documenting that their request to OPT OUT has been received. Keep that return letter on hand, as proof that you have notified PEPCO. When you send your letter to PEPCO, post a sign on your Smart Meter that will remain there until PEPCO's contractor comes to make the replacement. A copy of the sign, prepared for double-sided printing, is desired, is provided as Attachment No. 6.

When you send your letter to PEPCO to OPT OUT, you may wish to keep a copy, and to send your letter by "Certified U.S. Mail, with a Return Receipt Requested". Then, if PEPCO fails to send you a return letter documenting your request to OPT OUT, you can use a copy of the letter you sent to PEPCO, plus the Return Receipt, as evidence that you have properly notified PEPCO that you have OPTED OUT.

If you already have an installed Smart Meter, the Maryland PSC tells me that there are two different actions that PEPCO can take to comply with your request to OPT OUT:

- (1) Remove the wireless Smart Meter and replace it with a traditional analog mechanical meter.
- OR (2) Remove the wireless Smart Meter and replace it with another Smart Meter that has its transmitter turned off.

However, we have observed a third response by PEPCO, that was not explicitly described to me by the PSC, but that likely complies with the PSC's order:

- (3) Remove the wireless Smart Meter and replace it with a digital meter that has no wireless transmission capability.

The first meter of this type that we have seen in our community is the Alpha Plus, A1T+ variation, made by Elster, shown here.<sup>25</sup> This A1T+ variation does support “time-of-use” metering capabilities; that is, it can be set to charge different rates for electricity used at different times of day. However, this meter does not have “load profile recording” capabilities so it probably cannot conduct surveillance. This meter offers several communications options. But all of them, as far as I can tell, are *wired* methods, such as a modem for telephone dial in. So this meter, like (1) above, appears to eliminate any possibility of microwave radiation exposure.



In my view, the relative desirability of the three options above is this:

Option (1) above is the most desirable approach and, thus, it is the best one to specify in the OPT OUT letter to PEPCO, if only because a visual inspection of your meter will be sufficient to determine if PEPCO has complied. Also, specifying a “Traditional Analog Mechanical Meter with no wireless transmission capability” will help assure that you are not given a traditional meter that has been modified by the *addition* of wireless transmission capability, as some have been.

Option (3) is a close second, because it fully protects the residents from microwave radiation exposure, and, presumably, from surveillance.

Option (2) is a distant third because a Smart Meter with its transmitter turned off may look no different from a Smart Meter with its transmitter turned on, so you may not know if the transmitter is truly off, and permanently so. Also, it is unclear to me at this time whether PEPCO can turn the transmitter on and off, remotely, just by sending a microwave signal to the receiver in the Smart Meter. Even if the transmitter is permanently off, you may still face some of the other concerns about Smart Meters, as described above. For example, if the receiver is still operational, then PEPCO may still have the capability to turn your power off remotely, and it may still be possible for your Smart Meter to be hacked.

## What Should You Do on the Day PEPCO’s Contractor Comes to Replace Your Smart Meter?

The attached form letter asks PEPCO to contact you to set a date and a time for the replacement of your Smart Meter. The principal purpose of this request is to give you, or a family member, the option to be present when your Smart Meter is replaced, which is highly recommended.

If you can be present, you can talk with the PEPCO contractor before the replacement begins, to be certain that the replacement meter will be a “Traditional Analog Mechanical Meter with no wireless transmission capability” as specified in your letter to PEPCO and as stated on the sign you have posted on your Smart Meter. The sign will be especially important if you are not able to be home at the time of the replacement.

<sup>25</sup> The Alpha Plus family of meters is described here: ( <http://www.elstermetering.com/en/915.html> ). The variations available for this meter, like the A1T+, are described here: ( [http://www.tikaenergy.com/Elster\\_info/Elster\\_ALPHA\\_Plus\\_Meter\\_Variations\\_and\\_Specifications\\_E.pdf](http://www.tikaenergy.com/Elster_info/Elster_ALPHA_Plus_Meter_Variations_and_Specifications_E.pdf) ).

Finally, before the PEPCO contractor makes the replacement, turn off all appliances in your home, and, if you are able to do so, all circuit breakers in your electrical load (service) panel, where the electrical power enters your home. This will assure that no electrical current is flowing through the power meters during the replacement. This procedure eliminates any possibility of an electrical flash over that could damage the electrical contacts on the power meter, or the electrical contacts on the power box in which your meter is installed. This procedure is also safer for the PEPCO contractor. Unfortunately, the PEPCO contractors have been installing the Smart Meters “hot”, that is, without turning off the power drawn by the home first. After the PEPCO contractor tells you that he or she has completed the exchange of your Smart Meter for a “Traditional Analog Mechanical Meter without wireless transmission capability”, you can turn your circuit breakers back on.

## **What Can You Do if PEPCO Fails to Respond Promptly to Your OPT OUT Request?**

To date, PEPCO has complied promptly with our neighbors’ written requests for removal of their Smart Meters. However, if PEPCO should fail to respond promptly to your written request for removal, notify the Maryland PSC by letter, so that the PSC can enforce your request. Here is the address for this purpose:

Odogwn Obi Linton, Director  
Office of External Relations  
Public Service Commission of Maryland  
William Donald Schaeffer Tower  
6 St. Paul St., 16th Floor  
Baltimore, MD 21202-6806

## **Is There a Possible Downside To Opting Out?**

Yes, in this sense: PEPCO wants to charge a fee to Maryland residents who OPT OUT, perhaps even a monthly fee, even though the Maryland PSC currently permits OPTING OUT. PEPCO’s OPT-OUT customers view such a fee dimly. To them, this is a fee for the privilege of not being irradiated by PEPCO’s Smart Meters. Fortunately, at this time, there is no fee for OPTING OUT. Also a bill, HB1038, has been introduced in the Maryland House of Delegates, by Delegate Glen Glass, with nineteen co-sponsors. If this bill becomes law, it will prevent any fee from being charged for OPTING OUT, ever. You may read that bill here:

<http://legiscan.com/gaits/search?state=MD&bill=HB1038>

This bill has many provisions, including the following. These provisions are important both for customers who OPT OUT and for customers who don’t OPT OUT:

- (1) makes your right to OPT OUT permanent, but does not require anyone to OPT OUT
- (2) prevents the electric power utilities from charging their customers any fee for OPTING OUT
- (3) bars the electric utilities from selling your personal data, collected by your Smart Meter, to others.

## What Can You Do to Make the Current Temporary OPT OUT Permanent, and With No Fee?

There are two parts of the Maryland State Government that have the power to make the current temporary OPT OUT permanent: (1) the Maryland Public Service Commission, and (2) the Maryland General Assembly (which is the state's legislature). The first can act sooner than the second, but the second rules in the end.

Here is what you can do to help, if you would like to keep the right to OPT OUT:

- (1) Send an e-mail message to the members of the Economic Matters Committee of the Maryland House of Delegates, urging their support for HB1038. As noted above, this bill will make the right to OPT OUT permanent. But this bill must be approved by this committee in order to be sent on to the full House of Delegates for a vote. You can find an Internet form for sending such a message here:

<http://actionmail.ksconline.net/md-house-econ-committee.html>

The Economic Matters Committee held a meeting to hear testimony from the public, the electric power companies, and the Maryland Public Service Commission about HB1038 on Thursday, March 14, 2013. Marylanders from across the State completely filled the hearing room, and testified in row after row. Both verbal and written testimony from medical doctors and scientists was included. All those testifying received a good hearing in proceedings that lasted for two hours. After the hearing, the Committee decided to study HB1038 further over the summer.

You may view this hearing in its entirety on the Internet on the web site below. The part of the hearing addressing HB1038 begins at time 00:05:11 and ends at time 02:07:00. When you first click on the web site below, a message will alert you that you need to download the Microsoft Silverlight viewer to see the video, and will give you a button to click on to install it. Thereafter, the video will play.

<http://mgahouse.maryland.gov/house/play/1caf8e854c2f430ca06e88e79fbf8ffa/?catalog/03e481c7-8a42-4438-a7da-93ff74bdaa4c&playfrom=311873>

- (2) If you have already OPTED OUT, send a letter to the Maryland Public Service Commission (PSC), indicating that you have OPTED OUT of the PEPCO Smart Meter installation, and why. The Maryland PSC has the authority to extend the OPT OUT privilege, but needs to know the level of interest of Marylanders. Let the PSC know that you would like to see its TEMPORARY OPT OUT order made permanent, and with no OPT-OUT fee. Otherwise, the PSC may later terminate its temporary order and force you to accept a wireless Smart Meter. Here is the address for such a letter:

Public Service Commission (re: Smart Meter Opt Out)  
Attn: David J. Collins, Executive Secretary  
William Donald Schaefer Tower  
6 St. Paul Street, 16th Floor  
Baltimore, MD 21202-6806

- (3) Send an e-mail message to Maryland State Delegate Glen Glass, in support of the bill HB1038. He is the author of HB1038, which, as noted above, now has nineteen co-sponsors. Delegate Glass represents State District 34a, which includes Cecil County and Harford County.

State Delegate Glen Glass:                      glen.glass@house.state.md.us

- (4) Send an e-mail message to your Maryland State Senator and to your three Maryland State Delegates, with your views. Encourage these representatives to support the new Maryland House of Delegates bill, HB1038.

Here are the e-mail addresses applicable to Montgomery Village residents in Maryland State District 14 (North Village, East Village, and Eastgate communities):

State Senator Karen Montgomery:	karen.montgomery@senate.state.md.us
State Delegate Anne Kaiser:	anne.kaiser@house.state.md.us
State Delegate Eric Luedtke:	eric.luedtke@house.state.md.us
State Delegate Craig Zucker:	craig.zucker@house.state.md.us

Here are the e-mail addresses applicable to Montgomery Village residents in Maryland State District 39 (all other communities in Montgomery Village):

State Senator Nancy J. King:	nancy.king@senate.state.md.us
State Delegate Charles Barkley:	charles.barkley@house.state.md.us
State Delegate Kirill Reznik:	kirill.reznik@house.state.md.us
State Delegate A. Shane Robinson:	shane.robinson@house.state.md.us

- (5) Send an e-mail message to our representative in the U.S. House of Representatives, John Delaney, seeking his support for House bill H.R. 6358. You can reach him through his contact form on his web site:

<https://delaney.house.gov/contact/email-me>

This bill will support research toward new exposure limits to protect the public better from harmful levels of electromagnetic radiation, including the microwave radiation from Smart Meters. You can read a summary of the bill on the site of Maryland Smart Meter Awareness:

<http://marylandsmartmeterawareness.org/smart-meter-news/ask-your-congressional-rep-to-co-sponsor-h-r-6358>

You can read the entire bill on the web site of the U.S. Congress:

[http://thomas.loc.gov/home/gpoxmlc112/h6358\\_ih.xml](http://thomas.loc.gov/home/gpoxmlc112/h6358_ih.xml)

If you scan through the bill, you will find a list of specific health problems, arising from exposure to electromagnetic radiation, that need further research.

## (6) Support Maryland Smart Meter Awareness (MSMA)

MSMA is non-profit advocacy group, composed of public-spirited Maryland volunteers from many fields. These individuals are working hard to raise awareness about wireless Smart Meters and to assure that your right to OPT OUT is preserved in the future. MSMA is interacting with Maryland State officials, including the Maryland General Assembly and the Maryland Public Service Commission. You may wish to log in, periodically, to the organization's web site to see what is happening. And you may wish to join the organization and to contribute to its support, as I, too, have done. The brochure of Maryland Smart Meter Awareness is provided as Attachment No. 7.

<http://marylandsmartmeterawareness.org>

## Closing

Since the public has not been well informed about the implications of wireless Smart Meters and about the right to OPT OUT, we must rely on each other to spread the word, so that those who wish to OPT OUT may do so. Feel free to speak with your neighbors, family members, and friends about this topic. We are all in this together, for at least two reasons:

- (1) We all experience microwave radiation, not only from our own Smart Meter, but also from the Smart Meters of our neighbors, especially our nearest neighbors because they are closest. So Smart Meters are truly a community issue, not just an individual issue.
- (2) We need our neighbors' help to write to the Maryland House of Delegates and to the Maryland Public Service Commission in support of a permanent right to OPT OUT, as described above. We have a chance to make our democracy work for us, but only if we participate.

In the meantime, we Marylanders can be grateful that we have a right to OPT OUT, even if it is currently temporary. That right makes OPTING OUT routine for us. Unfortunately, some states offer no OPT-OUT rights to their residents. Our friends in DC and Pennsylvania envy us, because they have no right to OPT OUT; and they are struggling hard to get that right. Our friends in Virginia have no state-wide OPT-OUT rights. But those residents who are customers of Dominion Virginia Power have just received a limited form of an OPT OUT that addresses several of the major concerns about Smart Meters.<sup>26</sup>

## Attachments

Several attachments, referred to in the text above, follow.

---

<sup>26</sup> Dominion Virginia Power announced, on April 22, 2013, that its customers may elect a Smart Meter with "both the two way communications and data storage features disabled; the only recording features retained are the minimum needed for monthly billing." ( <https://www.dom.com/about/conservation/pdf/meter-option-requirements.pdf> ) Dominion Virginia Power, at 1-866-566-6436, indicated the following (paraphrased): When this option is elected by a customer, Dominion Virginia Power will replace the wireless Smart Meter with a different Smart Meter with the named features disabled. Restoration of the disabled features would require replacement with a different meter. This offer from Dominion Virginia Power is voluntary and was not mandated by the Virginia General Assembly or by the Virginia State Corporation Commission which regulates the electric power companies.



# American Academy of Environmental Medicine

6505 E Central • Ste 296 • Wichita, KS 67206

Tel: (316) 684-5500 • Fax: (316) 684-5709

[www.aaemonline.org](http://www.aaemonline.org)

## Executive Committee

### President

A.L. Barrier, M.D., FAAO-HNS  
One Hospital Drive  
Columbia, MO 65212

### President-Elect

Amy Dean, D.O.  
1955 Pauline Blvd Ste 100D  
Ann Arbor, MI 48103

### Secretary

Charles L. Crist, M.D.  
3009 Falling Leaf Ctr, Ste 1  
Columbia, MO 65201

### Treasurer

James W. Willoughby, II, D.O.  
24 Main St.  
Liberty, MO 64068

### Immediate Past President

Robin Bernhoft, M.D., FAAEM

### Advisor

Gary R. Oberg, M.D., FAAEM

### Board of Directors

Craig Bass, M.D.  
Amy Dean, D.O.  
Stephen Genuis, M.D., FAAEM  
Martha Grout, M.D., MD(H)  
Janette Hope, M.D.  
W. Alan Ingram, M.D.  
Derek Lang, D.O.  
Glenn A. Toth, M.D.  
Ty Vincent, M.D.

### Continuing Medical Education

Chairman  
James W. Willoughby, II, D.O.  
24 Main St.  
Liberty, MO 64068

### Executive Director

De Rodgers Fox

### Press Advisory

April 12, 2012

### Contact Information:

Dr. Amy L. Dean, D.O.

President-Elect

American Academy of Environmental Medicine

(734)213-4901

[environmentalmed@yahoo.com](mailto:environmentalmed@yahoo.com)

@dramydean

## The American Academy of Environmental Medicine Calls for Immediate Caution regarding Smart Meter Installation

Wichita, KS- The American Academy of Environmental Medicine today released its position paper on electromagnetic field (EMF) and radiofrequency (RF) health effects calling for immediate caution regarding smart meter installations. Citing several peer-reviewed scientific studies, the AAEM concludes that “significant harmful biological effects occur from non-thermal RF exposure” showing causality. The AAEM also expresses concern regarding significant, but poorly understood quantum field effects of EMF and RF fields on human health.

“More independent research is needed to assess the safety of ‘Smart Meter’ technology,” said Dr. Amy Dean, board certified internist and President-Elect of the AAEM. “Patients are reporting to physicians the development of symptoms and adverse health effects after ‘Smart Meters’ are installed on their homes. Immediate action is necessary to protect the public’s health.”

Dr. William J. Rea, past president of AAEM says, “Technological advances must be assessed for harmful effects in order to protect society from the ravages of end-stage disease like cancer, heart disease, brain dysfunction, respiratory distress, and fibromyalgia. EMF and wireless technology are the latest innovations to challenge the physician whose goal is to help patients and prevent disease.” Rea, a thoracic and cardiovascular surgeon and environmental physician adds, “A more thorough review of technological options to achieve society’s worthwhile communications objectives must be conducted to protect human health.”

The AAEM calls for:

- Immediate caution regarding “Smart Meter” installation due to potentially harmful RF exposure
- Accommodation for health considerations regarding EMF and RF exposure, including exposure to wireless “Smart Meter” technology
- Independent studies to further understand health effects from EMF and RF exposure

- Use of safer technology, including for “Smart Meters”, such as hard-wiring, fiber optics or other non-harmful methods of data transmission
- Independent studies to further understand the health effects from EMF and RF exposures
- Recognition that electromagnetic hypersensitivity is a growing problem worldwide
- Consideration and independent research regarding the quantum effects of EMF and RF on human health
- Understanding and control of this electrical environmental bombardment for the protection of society

The AAEM’s position paper on electromagnetic and radiofrequency fields can be found at:

[http://aaemonline.org/emf\\_rf\\_position.html](http://aaemonline.org/emf_rf_position.html)

AAEM is an international association of physicians and other professionals dedicated to addressing the clinical aspects of environmental health. More information is available at [www.aaemonline.org](http://www.aaemonline.org).

-----

**About AAEM:** The American Academy of Environmental Medicine was founded in 1965, and is an international association of physicians and other professionals interested in the clinical aspects of humans and their environment. The Academy is interested in expanding the knowledge of interactions between human individuals and their environment, as these may be demonstrated to be reflected in their total health. The AAEM provides research and education in the recognition, treatment and prevention of illnesses induced by exposures to biological and chemical agents encountered in air, food and water.

###





## **American Academy of Environmental Medicine**

### **Electromagnetic and Radiofrequency Fields Effect on Human Health**

For over 50 years, the American Academy of Environmental Medicine (AAEM) has been studying and treating the effects of the environment on human health. In the last 20 years, our physicians began seeing patients who reported that electric power lines, televisions and other electrical devices caused a wide variety of symptoms. By the mid 1990's, it became clear that patients were adversely affected by electromagnetic fields and becoming more electrically sensitive. In the last five years with the advent of wireless devices, there has been a massive increase in radiofrequency (RF) exposure from wireless devices as well as reports of hypersensitivity and diseases related to electromagnetic field and RF exposure. Multiple studies correlate RF exposure with diseases such as cancer, neurological disease, reproductive disorders, immune dysfunction, and electromagnetic hypersensitivity.

The electromagnetic wave spectrum is divided into ionizing radiation such as ultraviolet and X-rays and non-ionizing radiation such as ultrasound and radiofrequency (RF), which includes WiFi, cell phones, and Smart Meter wireless communication. It has long been recognized that ionizing radiation can have a negative impact on health. However, the effects of non-ionizing radiation on human health recently have been seen. Discussions and research of non-ionizing radiation effects centers around thermal and non-thermal effects. According to the FCC and other regulatory agencies, only thermal effects are relevant regarding health implications and consequently, exposure limits are based on thermal effects only.<sup>1</sup>

While it was practical to regulate thermal bioeffects, it was also stated that non-thermal effects are not well understood and no conclusive scientific evidence points to non-thermal based negative health effects.<sup>1</sup> Further arguments are made with respect to RF exposure from WiFi, cell towers and smart meters that due to distance, exposure to these wavelengths are negligible.<sup>2</sup> However, many *in vitro*, *in vivo* and epidemiological studies demonstrate that significant harmful biological effects occur from non-thermal RF exposure and satisfy Hill's criteria of causality.<sup>3</sup> Genetic damage, reproductive defects, cancer, neurological degeneration and nervous system dysfunction, immune system

dysfunction, cognitive effects, protein and peptide damage, kidney damage, and developmental effects have all been reported in the peer-reviewed scientific literature.

Genotoxic effects from RF exposure, including studies of non-thermal levels of exposure, consistently and specifically show chromosomal instability, altered gene expression, gene mutations, DNA fragmentation and DNA structural breaks.<sup>4-11</sup> A statistically significant dose response effect was demonstrated by Maschevich *et al.*, who reported a linear increase in aneuploidy as a function of the Specific Absorption Rate (SAR) of RF exposure.<sup>11</sup> Genotoxic effects are documented to occur in neurons, blood lymphocytes, sperm, red blood cells, epithelial cells, hematopoietic tissue, lung cells and bone marrow. Adverse developmental effects due to non-thermal RF exposure have been shown with decreased litter size in mice from RF exposure well below safety standards.<sup>12</sup> The World Health Organization has classified RF emissions as a group 2 B carcinogen.<sup>13</sup> Cellular telephone use in rural areas was also shown to be associated with an increased risk for malignant brain tumors.<sup>14</sup>

The fact that RF exposure causes neurological damage has been documented repeatedly. Increased blood-brain barrier permeability and oxidative damage, which are associated with brain cancer and neurodegenerative diseases, have been found.<sup>4,7,15-17</sup> Nittby *et al.* demonstrated a statistically significant dose-response effect between non-thermal RF exposure and occurrence of albumin leak across the blood-brain barrier.<sup>15</sup> Changes associated with degenerative neurological diseases such as Alzheimer's, Parkinson's and Amyotrophic Lateral Sclerosis (ALS) have been reported.<sup>4,10</sup> Other neurological and cognitive disorders such as headaches, dizziness, tremors, decreased memory and attention, autonomic nervous system dysfunction, decreased reaction times, sleep disturbances and visual disruption have been reported to be statistically significant in multiple epidemiological studies with RF exposure occurring non-locally.<sup>18-21</sup>

Nephrotoxic effects from RF exposure also have been reported. A dose response effect was observed by Ingole and Ghosh in which RF exposure resulted in mild to extensive degenerative changes in chick embryo kidneys based on duration of RF exposure.<sup>24</sup> RF emissions have also been shown to cause isomeric changes in amino acids that can result in nephrotoxicity as well as hepatotoxicity.<sup>25</sup>

Electromagnetic field (EMF) hypersensitivity has been documented in controlled and double blind studies with exposure to various EMF frequencies. Rea *et al.* demonstrated that under double blind placebo controlled conditions, 100% of subjects showed reproducible reactions to that frequency

to which they were most sensitive.<sup>22</sup> Pulsed electromagnetic frequencies were shown to consistently provoke neurological symptoms in a blinded subject while exposure to continuous frequencies did not.<sup>23</sup>

Although these studies clearly show causality and disprove the claim that health effects from RF exposure are uncertain, there is another mechanism that proves electromagnetic frequencies, including radiofrequencies, can negatively impact human health. Government agencies and industry set safety standards based on the narrow scope of Newtonian or “classical” physics reasoning that the effects of atoms and molecules are confined in space and time. This model supports the theory that a mechanical force acts on a physical object and thus, long-range exposure to EMF and RF cannot have an impact on health if no significant heating occurs. However, this is an incomplete model. A quantum physics model is necessary to fully understand and appreciate how and why EMF and RF fields are harmful to humans.<sup>26,27</sup> In quantum physics and quantum field theory, matter can behave as a particle or as a wave with wave-like properties. Matter and electromagnetic fields encompass quantum fields that fluctuate in space and time. These interactions can have long-range effects which cannot be shielded, are non-linear and by their quantum nature have uncertainty. Living systems, including the human body, interact with the magnetic vector potential component of an electromagnetic field such as the field near a toroidal coil.<sup>26,28,29</sup> The magnetic vector potential is the coupling pathway between biological systems and electromagnetic fields.<sup>26,27</sup> Once a patient’s specific threshold of intensity has been exceeded, it is the frequency which triggers the patient’s reactions.

Long range EMF or RF forces can act over large distances setting a biological system oscillating in phase with the frequency of the electromagnetic field so it adapts with consequences to other body systems. This also may produce an electromagnetic frequency imprint into the living system that can be long lasting.<sup>26,27,30</sup> Research using objective instrumentation has shown that even passive resonant circuits can imprint a frequency into water and biological systems.<sup>31</sup> These quantum electrodynamic effects do exist and may explain the adverse health effects seen with EMF and RF exposure. These EMF and RF quantum field effects have not been adequately studied and are not fully understood regarding human health.

Because of the well documented studies showing adverse effects on health and the not fully understood quantum field effect, AAEM calls for exercising precaution with regard to EMF, RF and general frequency exposure. In an era when all society relies on the benefits of electronics, we must find ideas and technologies that do not disturb bodily function. It is clear that the human body uses electricity from the chemical bond to the nerve impulse and obviously this orderly sequence can be

disturbed by an individual-specific electromagnetic frequency environment. Neighbors and whole communities are already exercising precaution, demanding abstention from wireless in their homes and businesses.

Furthermore, the AAEM asks for:

- An immediate caution on Smart Meter installation due to potentially harmful RF exposure.
- Accommodation for health considerations regarding EMF and RF exposure, including exposure to wireless Smart Meter technology.
- Independent studies to further understand the health effects from EMF and RF exposure.
- Recognition that electromagnetic hypersensitivity is a growing problem worldwide.
- Understanding and control of this electrical environmental bombardment for the protection of society.
- Consideration and independent research regarding the quantum effects of EMF and RF on human health.
- Use of safer technology, including for Smart Meters, such as hard-wiring, fiber optics or other non-harmful methods of data transmission.

Submitted by: Amy L. Dean, DO, William J. Rea, MD, Cyril W. Smith, PhD, Alvis L. Barrier, MD

## **Bibliography: Electromagnetic and Radiofrequency Fields Effect on Human Health**

1. California Council on Science and Technology. (Internet). (2011). Health Impacts of Radiofrequency Exposure from Smart Meters. Available from:  
<http://www.ccst.us/publications/2011/2011smartA.pdf>
2. Electric Power Research Institute. (Internet). (2011). Radio-Frequency Exposure Levels from Smart Meters: A Case Study of One Model. Available from:  
[https://www.nvenergy.com/NVEnergize/documents/EPRI\\_1022270\\_caseStudy.pdf](https://www.nvenergy.com/NVEnergize/documents/EPRI_1022270_caseStudy.pdf)
3. Hill, AB. The Environment and Disease: Association or Causation? Proceedings of the Royal Society of Medicine. 1965; 58: 295-300.
4. Xu S, Zhou Z, Zhang L, et al. Exposure to 1800 MHz radiofrequency radiation induces oxidative damage to mitochondrial DNA in primary cultured neurons. Brain Research. 2010; 1311: 189-196.
5. Phillips JL, Singh NP, Lai H. Electromagnetic fields and DNA damage. Pathophysiology. 2009; 16: 79-88.
6. Ruediger HW. Genotoxic effects of radiofrequency electromagnetic fields. Pathophysiology. 2009; 16(2): 89-102.
7. Zhao T, Zou S, Knapp P. Exposure to cell phone radiation up-regulates apoptosis genes in primary cultures of neurons and astrocytes. Neurosci Lett. 2007; 412(1): 34-38.
8. Lee S, Johnson D, Dunbar K. 2.45 GHz radiofrequency fields alter gene expression on cultured human cells. FEBS Letters. 2005; 579: 4829-4836.
9. Demsia G, Vlastos D, Matthopoulos DP. Effect of 910-MHz electromagnetic field on rat bone marrow. The Scientific World Journal. 2004; 4(S2): 48-54.
10. Lai H, Singh NP. Magnetic-field-induced DNA strand breaks in brain cells of the rat. Environmental Health Perspectives. 2004; 112(6): 687-694. Available from:  
<http://ehp03.niehs.nih.gov/article/info:doi/10.1289/ehp.6355>
11. Mashevich M, Foldman D, Kesar, et al. Exposure of human peripheral blood lymphocytes to electromagnetic fields associated with cellular phones leads to chromosomal instability. Bioelectromagnetics. 2003; 24: 82-90.
12. Magras IN, Xenos TD. RF radiation-induced changes in the prenatal development of mice. Bioelectromagnetics. 1997; 18:455-461.
13. Ban R, Grosse Y, Lauby-Secretan B, et al. Carcinogenicity of radiofrequency electromagnetic fields. The Lancet Oncology. 2011; 12(7): 624-626. Available from:

[http://www.thelancet.com/journals/lanonc/article/PIIS1470-2045\(11\)70147-4/fulltext?\\_eventId=login](http://www.thelancet.com/journals/lanonc/article/PIIS1470-2045(11)70147-4/fulltext?_eventId=login)

14. Hardell L, Carlberg M, Hansson Mild K. Use of cellular telephones and brain tumour risk in urban and rural areas. *Occup. Environ. Med.* 2005; 62: 390-394.
15. Nittby H, Brun A, Eberhardt J, et al. Increased blood-brain barrier permeability in mammalian brain 7 days after exposure to the radiation from a GSM-900 mobile phone. *Pathophysiology.* 2009; 16: 103-112.
16. Awad SM, Hassan NS. Health Risks of electromagnetic radiation from mobile phone on brain of rats. *J. Appl. Sci. Res.* 2008; 4(12): 1994-2000.
17. Leszczynski D, Joenvaara S. Non-thermal activation of the hsp27/p38MAPK stress pathway by mobile phone radiation in human endothelial cells: Molecular mechanism for cancer - and blood-brain barrier – related effects. *Differentiation.* 2002; 70: 120-129.
18. Santini R, Santini P, Danze JM, et al. Study of the health of people living in the vicinity of mobile phone base stations: 1. Influences of distance and sex. *Pathol Biol.* 2002; 50: 369-373.
19. Abdel-Rassoul G, Abou El-Fateh O, Abou Salem M, et al. Neurobehavioral effects among inhabitants around mobile phone base stations. *Neurotox.* 2007; 28(2): 434-440.
20. Hutter HP, Moshammer H, Wallner P, Kundi M. Subjective symptoms, sleeping problems, and cognitive performance in subjects living near mobile phone base stations. *Occup. Environ. Med.* 2006; 63: 307-313.
21. Kolodynski AA, Kolodynska VV. Motor and psychological functions of school children living in the area of the Skrunda Radio Location Station in Latvia. *Sci. Total Environ.* 1996; 180: 87-93.
22. Rea WJ, Pan Y, Fenyves EJ, et al. Electromagnetic field sensitivity. *Journal of Bioelectricity.* 1991; 10(1 & 2): 243-256.
23. McCarty DE, Carrubba S, Chesson AL, et al. Electromagnetic hypersensitivity: Evidence for a novel neurological syndrome. *Int. J. Neurosci.* 2011; 121(12): 670-676.
24. Ingole IV, Ghosh SK. Cell phone radiation and developing tissues in chick embryo – a light microscopic study of kidneys. *J. Anat. Soc. India.* 2006; 55(2): 19-23.
25. Lubec G, Wolf C, Bartosch B. Amino acid isomerisation and microwave exposure. *Lancet.* 1989; 334: 1392-1393.
26. Smith CW. Quanta and coherence effects in water and living systems. *Journal of Alternative and Complimentary Medicine.* 2004; 10(1): 69-78.

27. Smith CW (2008) Fröhlich's Interpretation of Biology through Theoretical Physics. In: Hyland GJ and Rowlands P (Eds.) Herbert Fröhlich FRS: A physicist ahead of his time. Liverpool: University of Liverpool, 2<sup>nd</sup> edition, pp 107-154.
28. Del Giudice E, Doglia S, Milani M, et al. Magnetic flux quantization and Josephson behavior in living systems. *Physica Scripta*. 1989; 40: 786-791.
29. Tonomura A, Osakabe N, Matsuda T, et al. Evidence for Aharonov-Bohm effect with magnetic field completely shielded from electron wave. *Phys. Rev. Lett.* 1986; 56(8):792-75.
30. Del Giudice E, De Ninno A, Fleischmann, et al. Coherent quantum electrodynamics in living matter. *Electromagn. Biol. Med.* 2005; 24: 199-210.
31. Cardella C, de Magistris L, Florio E, Smith C. Permanent changes in the physic-chemical properties of water following exposure to resonant circuits. *Journal of Scientific Exploration*. 2001; 15(4): 501-518.





**AAP Headquarters**

141 Northwest Point Blvd  
Elk Grove Village, IL 60007-1019  
Phone: 847/434-4000  
Fax: 847/434-8000  
E-mail: kidsdocs@aap.org  
www.aap.org

**Reply to****Department of Federal Affairs**

Homer Building, Suite 400 N  
601 13th St NW  
Washington, DC 20005  
Phone: 202/347-8600  
Fax: 202/393-6137  
E-mail: kids1st@aap.org

**Executive Committee****President**

Thomas K. McInerney, MD, FAAP

**President-Elect**

James M. Perrin, MD, FAAP

**Immediate Past President**

Robert W. Block, MD, FAAP

**Executive Director/CEO**

Errol R. Alden, MD, FAAP

**Board of Directors****District I**

Carole E. Allen, MD, FAAP  
Arlington, MA

**District II**

Danielle Laraque, MD, FAAP  
Brooklyn, NY

**District III**

David I. Bromberg, MD, FAAP  
Frederick, MD

**District IV**

Francis E. Rushton, Jr, MD, FAAP  
Beaufort, SC

**District V**

Marilyn J. Bull, MD, FAAP  
Indianapolis, IN

**District VI**

Pamela K. Shaw, MD, FAAP  
Kansas City, KS

**District VII**

Kenneth E. Matthews, MD, FAAP  
College Station, TX

**District VIII**

Kyle Yasuda, MD, FAAP  
Seattle, WA

**District IX**

Stuart A. Cohen, MD, MPH, FAAP  
San Diego, CA

**District X**

Sara H. Goza, MD, FAAP  
Fayetteville, GA

December 12, 2012

The Honorable Dennis Kucinich  
2445 Rayburn House Office Building  
Washington, DC 20515

Dear Representative Kucinich:

On behalf of the American Academy of Pediatrics (AAP), a non-profit professional organization of 60,000 primary care pediatricians, pediatric medical subspecialists, and pediatric surgical specialists dedicated to the health, safety and well-being of infants, children, adolescents, and young adults, I would like to share our support of H.R. 6358, the *Cell Phone Right to Know Act*.

The AAP strongly supports H.R. 6358's emphasis on examining the effects of radiofrequency (RF) energy on vulnerable populations, including children and pregnant women. In addition, we are pleased that the bill would require the consideration of those effects when developing maximum exposure standards. Children are disproportionately affected by environmental exposures, including cell phone radiation. The differences in bone density and the amount of fluid in a child's brain compared to an adult's brain could allow children to absorb greater quantities of RF energy deeper into their brains than adults. It is essential that any new standards for cell phones or other wireless devices be based on protecting the youngest and most vulnerable populations to ensure they are safeguarded throughout their lifetimes.

In addition, the AAP supports the product labeling requirements in H.R. 6358. These standards will ensure consumers can make informed choices in selecting mobile phone purchases. They will also enable parents to better understand the potential dangers of RF energy exposure and protect their children.

On July 24, the U.S. Government Accountability Office (GAO) published a report on federal cell phone radiation exposure limits and testing requirements. The GAO noted that the Federal Communications Commission's (FCC) most recent data indicates that the number of estimated mobile phone subscribers has grown from approximately 3.5 million in 1989 to approximately 289 million at the end of 2009. Cell phone use behaviors have also changed during that time. The quantity and duration of cell phone calls has increased, as has the amount of time people use mobile phones, while cell phone and wireless technology has undergone substantial changes. Many more people, especially adolescents and young adults, now use cell phones as their only phone line, and they begin using wireless phones at much younger ages.

Despite these dramatic changes in mobile phone technology and behavior, the FCC has not revisited the standard for cell phone radiation exposure since 1996. The current FCC standard for maximum radiation exposure levels is based on the heat emitted by mobile phones. These guidelines specify exposure limits for hand-held wireless devices in terms of the Specific Absorption Rate (SAR), which measures the rate the body absorbs radiofrequency (RF). The current allowable SAR limit is 1.6 watts per kilogram (W/kg), as averaged over one gram of tissue. Although wireless devices sold in the United States must ensure that they do not exceed the maximum allowable SAR limit when operating at the device's highest possible power level, concerns have been raised that long-term RF energy exposure at this level affects the brain and other tissues and may be connected to types of brain cancer, including glioma and meningioma.

In May 2011, the International Agency for Research on Cancer (IARC), the United Nations' World Health Organization's (WHO) agency promoting international cancer research collaboration, classified RF energy as "possibly carcinogenic to humans." In addition, the National Cancer Institute has stated that although studies have not definitively linked RF energy exposure from cell phones to cancer, more research is required to address rapidly changing cell phone technology and use patterns.

This and other research identified by the GAO demonstrates the need for further research on this issue, and makes clear that exposure standards should be reexamined.

The GAO concluded that the current exposure limits may not reflect the latest research on RF energy, and that current mobile phone testing requirements may not identify maximum RF energy exposure. The GAO proposed that the FCC formally reassess its limit and testing requirements to determine whether they are effective. The AAP commends the activities proposed under H.R. 6358, as they would address this research gap and improve consumer knowledge and safety. Establishing an expanded federal research program as the basis for exposure standards will ensure that consumer protections incorporate the latest research. Currently, the National Institute of Health (NIH), the only federal agency the GAO identified as directly funding research on this topic, provided approximately \$35 million from 2001 to 2011. Given this previous funding level, the AAP supports the \$50 million per fiscal year for seven years that H.R. 6358 would authorize.

The AAP appreciates your recognition of the need for new research and standards for mobile phone radiation, and is pleased to support H.R. 6358. For further assistance, please do not hesitate to contact Sonya Clay, Assistant Director, Department of Federal Affairs, at 202-347-8600 or [sclay@aap.org](mailto:sclay@aap.org).

Sincerely,

A handwritten signature in dark ink, reading "Thomas K. McInerney". The signature is fluid and cursive, with the first name "Thomas" and last name "McInerney" clearly legible.

Thomas K. McInerney, MD, FAAP  
President

# **Biological Effects from RF Radiation at Low-Intensity Exposure, based on the BioInitiative 2012 Report, and the Implications for Smart Meters and Smart Appliances**

## **Introduction and Conclusions**

The Biological Effects Chart, at the end of this document, has been produced using data from a massive new review of the medical research literature on the biological effects of electromagnetic fields. That review is called the BioInitiative 2012 Report.<sup>2</sup> The purpose of the Biological Effects Chart is to show the radiofrequency (RF) exposure levels at which biological effects were found in 67 studies from the RF Color Charts of the BioInitiative 2012 Report, and then to compare those exposure levels to the following:

- (1) current FCC Maximum Permitted Exposure (MPE) limits that govern Smart Meters and Smart Appliances in the United States
- (2) new biologically based RF exposure limits proposed in the BioInitiative 2012 Report
- (3) calculated RF exposure levels produced by a single Smart Meter at various distances
- (4) calculated RF exposure levels produced by a single Smart Appliance at various distances

This comparison is based on RF exposure levels expressed as the RF power density (RF power per unit area). This comparison does not address other potentially important factors such as carrier continuity (continuous versus pulsed radiation) and modulation technique (the method used to impress information on the carrier), among others. The purpose is to identify what biological effects arise from exposure to RF power density levels like those produced by Smart Meters and Smart Appliances.

This comparison indicates the following:

- (1) The current FCC Maximum Permitted Exposure (MPE) limits are so high that they provide no protection for the public from the biological effects found in any of the 67 studies.
- (2) New biologically based RF exposure limits proposed in the BioInitiative 2012 Report are 1 million times lower than current FCC limits and would protect against the biological effects found in nearly all of the 67 studies.
- (3) A single Smart Meter on a home can produce RF exposure levels that caused the biological effects found in either most or many of the 67 studies, depending on the distance from the Smart Meter.
- (4) A single Smart Appliance in the home can produce RF exposure levels that caused the biological effects found in nearly half or fewer of the 67 studies, depending on the distance from the Smart Appliance. Multiple Smart Appliances in a home multiply the total exposure.

---

<sup>1</sup> The author holds a Ph.D. in Applied Physics from Harvard University, 1975.

<sup>2</sup> BioInitiative Working Group, Cindy Sage and David O. Carpenter, Editors, BioInitiative Report: A Rationale for Biologically-based Public Exposure Standards for Electromagnetic Radiation, December 31, 2012 ( <http://www.bioinitiative.org> ).

(5) A single Smart Meter on a nearest neighbor's home can produce RF exposure levels that caused the biological effects found in many of the 67 studies. A given home may have one to eight nearest neighbors, each with a Smart Meter, multiplying the total exposure in the given home.

Other observations:

(1) Most biological effects of RF exposure cannot be sensed by human beings. Examples are the onset of cancer, DNA damage, and fertility effects. One category of effects that can often be sensed includes neurological effects on sleep, memory, learning, and behavior.

(2) Unborn and very young children may be more affected by RF exposure than adults.

This document provides background information, an explanation of each feature of the Biological Effects Chart, and a detailed discussion of each of the conclusions and observations summarized above. That discussion begins on page 11.

Figure 1, on page 9 in this document, and the Biological Effects Chart, at the end of this document, are in color, and are most easily understood when viewed in color. But they can also be understood in black and white. To make that possible, key lines in Figure 1 and in the Biological Effects Chart are identified not only by color but also by line thickness and line style (solid versus dashed).

## Terminology for Parts of the Electromagnetic Spectrum

Electromagnetic fields occur over a wide range of frequencies, referred to as the electromagnetic spectrum.<sup>3</sup> But the terms used for parts of that spectrum are not consistently named or defined. The BioInitiative 2012 Report uses the following definitions for two key parts of the electromagnetic spectrum:

extra low frequency (ELF): electromagnetic fields with frequencies from 1 to 300 Hz<sup>4</sup>

radiofrequency (RF): electromagnetic fields with frequencies from 100 kHz to 300 GHz<sup>5</sup>

Within the *radiofrequencies* lie the *microwave* frequencies. Microwaves, too, are variously defined. Here are two common definitions:

microwaves: electromagnetic fields with frequencies from 300 MHz to 300 GHz<sup>6</sup>

microwaves: electromagnetic fields with frequencies from 1 GHz to 100 GHz<sup>7</sup>

This document focuses on the biological effects of the frequencies at which the following devices operate. Those frequencies are shown in round numbers.

---

<sup>3</sup> Explanation of units of measure for frequency: 1 hertz is 1 cycle per second. 1 kilohertz is equivalent to 1000 hertz. 1 megahertz is equivalent to 1000 kilohertz and to 1,000,000 hertz. 1 gigahertz is equivalent to 1000 megahertz and to 1,000,000 kilohertz and to 1,000,000,000 hertz. These units are abbreviated as follows: hertz (Hz), kilohertz (kHz), megahertz (MHz), and gigahertz (GHz).

<sup>4</sup> BioInitiative 2012 Report cited in footnote 2 on page 1, Section 26, Glossary of Terms and Abbreviations, page 3. The Report notes that the term Extremely Low Frequency is used in Europe and the term Extra Low Frequency is used in the United States. Wikipedia uses the term Extremely Low Frequency to refer to 3 to 300 hertz ([http://en.wikipedia.org/wiki/Extremely\\_low\\_frequency](http://en.wikipedia.org/wiki/Extremely_low_frequency)).

<sup>5</sup> BioInitiative 2012 Report cited in footnote 2 on page 1, Section 26, Glossary of Terms and Abbreviations, page 5.

<sup>6</sup> (<http://en.wikipedia.org/wiki/Microwaves>)

<sup>7</sup> (<http://en.wikipedia.org/wiki/Microwaves>)

cell towers <sup>8</sup>	300, 400, 700, 800, 900, 950, 1800, 1900, 2100 MHz
Wi-Fi (most common type of WLAN) <sup>9</sup>	2400, 2500 MHz (predominant) 2600, 3600, 5000 MHz (emerging)
wireless laptops <sup>10</sup>	2400 MHz (predominant) 5000 MHz (emerging)
Smart Meters <sup>11</sup>	900, 2400 MHz (Smart Meters and Collector Smart Meters) 850 MHz (Collector Smart Meters only)
Smart Appliances <sup>12</sup>	2400 MHz

Note that that all of these devices operate at frequencies between 300 MHz and 5000 MHz. The frequencies at which Smart Meters and Smart Appliances operate are right in the middle of this range. According to one or more of the definitions given above, all of these frequencies may be referred to as either *radiofrequencies (RF)* or *microwaves*. Since the BioInitiative 2012 Report refers to these frequencies as *radiofrequencies (RF)*, that term will be used here. But the term *microwaves* could have been used just as well.

## The BioInitiative 2012 Report

The BioInitiative 2012 Report was developed by an international group of 29 individuals with expertise on the biological effects of electromagnetic fields, or on the related public-health issues.<sup>13</sup> As a group, these experts hold 20 PhD degrees, one DrSc degree, 9 MD degrees, one DVM degree, and four degrees of MSc, MA, MPH, or MSPAS. These experts come from ten countries, each with the following number of participants:

USA	10	India	2
Sweden	6	Italy	2
Austria	2	Denmark	1
Canada	2	Russia	1
Greece	2	Slovak Republic	1

The goal of the BioInitiative Report is to present “a solid scientific and public health policy assessment that is evidence-based.” The report was prepared “independent of governments, existing bodies and industry professional societies that have clung to old standards.”<sup>14</sup>

<sup>8</sup> ( [http://en.wikipedia.org/wiki/Cellular\\_network](http://en.wikipedia.org/wiki/Cellular_network) ), ( [http://en.wikipedia.org/wiki/GSM\\_frequency\\_bands](http://en.wikipedia.org/wiki/GSM_frequency_bands) ), and ( [http://en.wikipedia.org/wiki/UMTS\\_frequency\\_bands](http://en.wikipedia.org/wiki/UMTS_frequency_bands) )

<sup>9</sup> ( <http://en.wikipedia.org/wiki/Wi-Fi> ) and ( [http://en.wikipedia.org/wiki/List\\_of\\_WLAN\\_channels](http://en.wikipedia.org/wiki/List_of_WLAN_channels) )

<sup>10</sup> ( [http://en.wikipedia.org/wiki/Wireless\\_LAN](http://en.wikipedia.org/wiki/Wireless_LAN) )

<sup>11</sup> Both the Landis-Gyr FOCUS AXR-SD and the General Electric I-210+c Smart Meters, being installed in Maryland, have FCC ID OWS-NIC514. They send and receive information in two microwave frequency ranges: (1) 902.3 to 926.9 MHz, and (2) 2405.8 to 2480.9 MHz ( <http://stopsmartmeters.org/wp-content/uploads/2012/01/OWS-NIC514-FCC-specifications.pdf> ). Collector Smart Meters have a third transmission frequency of 850 MHz ( [http://sagereports.com/smart-meter-rf/?page\\_id=210](http://sagereports.com/smart-meter-rf/?page_id=210) ). They receive and retransmit the signals from Smart Meters to assure that those signals reach the antennas of the electric power company. It is not clear to me at this time whether Collector Smart Meters are employed in all installations of Smart Meters.

<sup>12</sup> The most likely transmitter/receiver in the Smart Appliances is the so-called ZigBee device. ZigBee devices operate at 865 MHz (in Europe) and 915 MHz (in the USA and Australia) as well as 2.4 GHz (worldwide) ( <https://en.wikipedia.org/wiki/ZigBee> ). But the Smart Meters first observed in installations in Maryland seem to require that the ZigBee devices operate at 2.4 GHz.

<sup>13</sup> BioInitiative 2012 Report cited in footnote 2 on page 1, cover page of the full report, as a single PDF file.

<sup>14</sup> BioInitiative 2012 Report cited in footnote 2 on page 1, Section i, Preface 2012, page 2.

## The Scope of the BioInitiative 2012 Report

The 1479-page BioInitiative 2012 Report considers the “content and implications of about 1800 new studies” since the last BioInitiative Report was published in 2007.<sup>15</sup> The 2012 Report contains 16 chapters that address key categories of biological effects. The 2012 Report also contains several chapters that address key public policy issues, such as the nature and shortcomings of the current exposure standards, and the bases for sufficient argument for changing those standards. Emphasized is the importance of weighing the magnitude of potential harm against the evidence of potential harm, to determine when protective action should be triggered.<sup>16</sup> Since Smart Meters are being mandated for entire populations in the United States, the magnitude of potential harm is considerable, so prudence dictates serious consideration of the increasing evidence of harm.

## The Data Source for the Biological Effects Chart

The data for the appended Biological Effects Chart were drawn from the so-called RF Color Charts in the BioInitiative 2012 Report.<sup>17</sup> The RF Color Charts contain two charts:

The first chart describes 67 studies of the biological effects of radiofrequency (RF) radiation.<sup>18</sup> Each study represents one or more biological effects found at a one value of the RF power density (RF power per unit area) or within a range of such values. These data are especially useful when considering whole-body exposure, which is the type of exposure that human beings receive from Smart Meters at a distance of 1 meter or more.<sup>19</sup> These data form the basis for the appended Biological Effects Chart.

The second chart describes 68 studies of the biological effects of radiofrequency (RF) radiation.<sup>20</sup> In this chart, each study represents one or more biological effects found at one Specific Absorption Rate, or SAR value, or within a range of such values. A SAR value is the RF power absorbed per unit mass of the biological entity being irradiated. These data are especially useful when less than the entire body is irradiated, and at very close distances, such as when a cell phone irradiates the head.

---

<sup>15</sup> BioInitiative 2012 Report cited in footnote 2 on page 1, Section 1, Summary for the Public and Conclusions, 2012 Supplement: Summary for the Public – Ms. Sage, page 3.

<sup>16</sup> BioInitiative 2012 Report, cited in footnote 2 on page 1, Table 1-1, Section 23: The Precautionary Principle, 2012 Supplement: The Precautionary Principle – Mr. Gee, page 2.

<sup>17</sup> BioInitiative 2012 Report, cited in footnote 2 on page 1, Section 1, Summary for the Public and Conclusions, Table 1-2 Reported Biological Effects from Radiofrequency Radiation at Low-Intensity Exposure 2012, no page numbers.

<sup>18</sup> Each study in the first chart derives from one publication. But three publications contributed two studies, and one publication contributed three studies. As a result, the 67 studies derive from 62 publications. So the terms *studies* and *publications* have slightly different meanings as used here.

<sup>19</sup> More specifically, the power density values used in the first table are valid in the “far field” (also called the “radiative field”) of the Smart Meter. For the type of antenna in a Smart Meter or a Collector Smart Meter, the far field should begin about two wavelengths from the meter ( [http://en.wikipedia.org/wiki/Far\\_field](http://en.wikipedia.org/wiki/Far_field) ). A Collector Smart Meter transmits on three frequencies (850, 900, and 2400 MHz). The longest wavelength transmitted by a Collector Smart Meter is determined by the lowest frequency which it transmits, which is 850 MHz. That wavelength is 0.35 meters (about 1 foot). A Smart Meter transmits on two frequencies (900 MHz and 2400 MHz), so the lowest frequency transmitted by a Smart Meter is 900 MHz, and the longest wavelength it transmits is 0.33 meters (again about 1 foot). Smart Appliances are expected to transmit at 2400 GHz, with has a wavelength of 0.13 meters (about 5 inches). So for all three devices, the far field begins about 0.7 meters (about 2 feet), or less, from them. This document addresses distances from 1 meter (about 3 feet) up, so all such distances are in the far field for all three devices.

<sup>20</sup> Each study in the second chart derives from one publication. But two publications contributed two studies each. As a result the 68 studies derive from 66 publications. So the terms *studies* and *publications* have slightly different meanings as used here.

This is not the usual case for RF exposure from Smart Meters, so these data were not used for the appended Biological Effects Chart.

## **Criteria for Selection of the Studies in the RF Color Charts**

The criteria used in the BioInitiative 2012 Report to select the studies for the RF Color Charts, and thus for the appended Biological Effects Chart, were the following:<sup>21</sup>

- (1) A selection of good examples only. Not intended to be comprehensive.
- (2) Peer-reviewed and published studies only.
- (3) Good exposure data (numeric).
- (4) Author(s) have clear methods and conclusions.
- (5) Cover wide range of topics, such as genotoxicity, neurological, immune, cancers, behavior, attention, memory, sleep, etc.
- (6) Cover wide range of exposure levels, with an emphasis on the lowest levels and the more recent studies.

Every study in the first chart of the RF Color Charts, and thus every study in the appended Biological Effects Chart based on that first chart, except one (Dumansky, 1974), was published after 1986. 1986 is the year of publication of the document on which the current FCC Maximum Permitted Exposure (MPE) limits are principally based.<sup>22</sup> That was 27 years ago, which is one factor in explaining why the current FCC MPE limits are out of date. The references for the studies in the RF Color Charts, and thus for the biological effects data in the appended Biological Effects Chart, are included in the reference list that immediately follows the RF Color Charts in the PDF file of the full BioInitiative 2012 Report.<sup>23</sup>

## **Explanation of the Appended Biological Effects Chart**

### **The Horizontal Axis of the Biological Effects Chart**

The studies are presented in order of increasing RF power density along the horizontal axis of the Biological Effects Chart. That order facilitates comparing effects observed at similar RF power densities. Each position along the horizontal axis of the Biological Effects Chart represents one study whose principal author and date of publication are written under that axis. The studies could just as well have been ordered alphabetically by the authors' last names, or numerically by the publication dates.

### **The Vertical Axis of the Biological Effects Chart**

The vertical axis represents the RF power densities at which each study was conducted. These power densities cover a wide range of values, so a logarithmic vertical axis was employed. This approach permitted displaying 11 orders of magnitude on the Biological Effects Chart.<sup>24</sup> The units of measure

---

<sup>21</sup> The criteria were provided by Cindy Sage, co-editor of BioInitiative 2012, in a private communication, April 23, 2013.

<sup>22</sup> The current FCC exposure limits are based principally on a 1986 publication of the National Council on Radiation Protection and Measurements (NCRP). That publication is "Report No. 086 - Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields". The NCRP was chartered by the U.S. Congress in 1964, but is not a Government agency and is not subject to oversight by the Congress.

<sup>23</sup> BioInitiative 2012 Report cited in footnote 2 on page 1, Reported Biological Effects from Radiofrequency Radiation (RFR) at Low-Intensity Exposure Levels, sequential pages 112-121 in the 1479-page PDF version of the full Report.

<sup>24</sup> Each order of magnitude is a factor of 10.

selected for the vertical axis are milliwatts per square meter ( $\text{mW}/\text{m}^2$ ).<sup>25</sup> These units work well for the wide range of power densities required for the vertical axis, making the length of the smallest number, 0.000001, not too much longer than the length of the largest number, 10000.

The selected units for the vertical axis also work well for relating the RF power density shown to the total RF power that an adult human would receive. The surface area of an adult human is about 2 square meters ( $\text{m}^2$ ).<sup>26</sup> So the surface area that an adult human presents to an RF wave arriving from the front, or from the back, is about 1 square meter ( $\text{m}^2$ ). So when an adult human faces an oncoming wave of radiation with a power density of, say, 10 milliwatts per square meter ( $\text{mW}/\text{m}^2$ ), that human will receive a total of 10 milliwatts (mW) of radiation over the entire body. That is, the number describing the power density will be the same as the number describing the total power received, even though the units of measure are different in the two cases. So, when examining the vertical axis of the attached Biological Effects Chart, each number on that axis may be taken to mean *both* the power density (in  $\text{mW}/\text{m}^2$ ) of the oncoming wave of RF radiation *and* the total RF power (in mW) received by an adult human when standing with the front, or the back, facing the direction from which the radiation is coming.

## The Round Red Dots on the Biological Effects Chart

Each round red dot • on the attached Biological Effects Chart indicates the RF power density at which the study named on the horizontal axis, directly below the dot, was conducted. Some studies were conducted over a range of power densities. In such cases, the average value of the high and low ends of the range determines the location of the dot on the vertical axis. The range of power densities applicable is shown as a black vertical line through the dot. The top of the vertical line marks the high end of the range, and the bottom of the vertical line marks the low end of the range. On those vertical lines, the dots appear higher than the middle. That effect results from the logarithmic vertical axis, even though the dots are located at the true average value of the high and low ends of the range.

## The Alphabetic Codes above the Dots on the Biological Effects Chart

A one- or two-letter code appears just above each of the dots on the Biological Effects Chart. Each code, such as “CB”, identifies the category into which the biological effects found by a given study fall. Those one- and two-letter codes are translated in the table on the Biological Effects Chart, first into the one or two words represented by the letters of the codes, and then into a fuller description of the category, as reported in the RF Color Charts of the BioInitiative 2012 Report. For example, the code “CB” stands for the words “Cancer, Brain” and represents a category that contains “Brain tumors and blood-brain barrier”.<sup>27</sup> Similarly, the code “CO” stands for the words “Cancer, Other” and represents a category that contains “Cancer (other than brain), cell proliferation”.

## The Thick Horizontal Blue Line at the Top of the Biological Effects Chart

The thick horizontal blue line, which appears at the top of the Biological Effects Chart, represents the Maximum Permitted Exposure (MPE) limits of the Federal Communications Commission (FCC). These are the limits applicable to the general population for uncontrolled exposure for the frequencies that Smart

---

<sup>25</sup> 1 milliwatt (mW) is one-thousandth of a watt (W).

<sup>26</sup> The surface area of a man is about 1.9 square meters ( $\text{m}^2$ ); and the surface area of a woman is about 1.6 square meters ( $\text{m}^2$ ), both according to Wikipedia ( [http://en.wikipedia.org/wiki/Body\\_surface\\_area](http://en.wikipedia.org/wiki/Body_surface_area) ).

<sup>27</sup> The reference to blood-brain barrier refers to the weakening of the barrier that the body erects between the blood and the brain to prevent harmful entities circulating in the blood from entering the brain.



Meters, Collector Smart Meters, and Smart Appliances use: 2400 MHz, 900 MHz, and 850 MHz. The top edge of the blue line is the limit applicable to 2400 MHz. The bottom edge of the blue line is the limit applicable to 850 MHz. The limit applicable to 900 MHz falls in between.

<b>Frequency (MHz)</b>	<b>FCC Maximum Permitted Exposure (MPE) Limits<sup>28</sup> (mW/m<sup>2</sup>)</b>	
2400	10,000	(Smart Meters, Collector Smart Meters, and Smart Appliances)
900	6000	(Smart Meters and Collector Smart Meters)
850	5700	(Collector Smart Meters)

However, those FCC limits apply to the time-average RF power density over a period of 30 minutes. So, pulsed signals, like those issued by Smart Meters and Smart Appliances, are permitted to assume even higher peak values, as long as the time-average over a period of 30 minutes is below the FCC limits shown.

## The Thick Horizontal Yellow Line on the Biological Effects Chart

The thick horizontal yellow line, which appears about one-third from the bottom of the Biological Effects Chart, shows the new RF exposure limits proposed in the BioInitiative 2012 Report for chronic exposure to pulsed radiation. Pulsed radiation is the type of radiation that Smart Meters and Smart Appliances emit. The top of this line is located at 0.006 milliwatts per square meter (mW/m<sup>2</sup>). The bottom of this line is located at 0.003 milliwatts per square meter (mW/m<sup>2</sup>).<sup>29</sup>

### **New Biologically Based RF Exposure Limits Proposed in the BioInitiative 2012 Report<sup>30</sup>** (as expressed, equivalently, in various units of measure)

0.3 to 0.6	nanowatts per square centimeter (nW/cm <sup>2</sup> )	(units used in BioInitiative 2012)
0.003 to 0.006	milliwatts per square meter (mW/m <sup>2</sup> )	(units used in appended Chart)
3 to 6	microwatts per square meter (μW/m <sup>2</sup> )	

The data from the 67 studies in the Biological Effects Chart indicate why this level might have been judged appropriate by the authors of the BioInitiative 2012 Report: This level would protect against the biological effects found by all but five of the 67 studies. The BioInitiative 2012 Report indicates that these proposed new limits “may need to change in the future, as new and better studies are completed.”<sup>31</sup> Note that this level, which can also be expressed as 3 to 6 microwatts per square meter (μW/m<sup>2</sup>), is in agreement with the level of 5 microwatts per square meter (μW/m<sup>2</sup>) proposed by Dietrich Klinghardt, M.D., Ph.D., in his detailed video treatment of the health hazards of Smart Meters.<sup>32</sup>

<sup>28</sup> Questions and Answers about Biological Effects and Potential Hazards of Radiofrequency Electromagnetic Fields, OET (Office of Engineering and Technology) Bulletin 56, Fourth Edition, Federal Communications Commission, August 1999. See Table 1(B), Limits for General Population/Uncontrolled Exposure, page 15.

( [http://www.fcc.gov/Bureaus/Engineering\\_Technology/Documents/bulletins/oet56/oet56e4.pdf](http://www.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet56/oet56e4.pdf) )

<sup>29</sup> BioInitiative 2012 Report cited in footnote 2 on page 1, Section 1, Summary for the Public and Conclusions, 2012 Supplement: Summary for the Public – Ms. Sage, pages 25-26.

<sup>30</sup> 1 milliwatt (mW) is one thousandth of a watt (W). 1 microwatt (μW) is one millionth of a watt (W). 1 nanowatt (nW) is one billionth of a watt (W). 1 centimeter (cm) is one hundredth of a meter (m). So, 1 square centimeter (cm<sup>2</sup>) is one ten thousandth of 1 square meter (m<sup>2</sup>).

<sup>31</sup> See footnote 29 above.

<sup>32</sup> Dr. Klinghardt’s video, and further information about him, can be found on the following web sites:

( <http://marylandsmartmeterawareness.org/smart-meter-news/dr-dietrich-klinghardt-smart-meters-emr-the-health-crisis-of-our-time> ) and ( <http://www.klinghardtacademy.com/BioData/Dr-Dietrich-Klinghardt.html> ).

## The Thin Horizontal Green Lines on the Biological Effects Chart

The four thin horizontal green lines show the power density of the RF radiation emitted by a Smart Meter at four different distances. To determine these levels, I assumed that the Smart Meter is the type being installed in Maryland, as described in footnote 11 on page 3:

$P$  = RF power output = 1 watt

$g$  = antenna gain = 4 dBi = 2.5 (a pure number, a ratio)<sup>33</sup>

This Smart Meter has an RF power output,  $P$ , of approximately 1 watt. The antenna used in the Smart Meter is a variation of a vertical dipole antenna which provides a gain,  $g$ , of 4 dBi, or 2.5, in the horizontal direction. I have not accounted for absorption by obstructions, such as walls and other objects, which can lower RF power density levels. Nor have I accounted for reflections from walls or other objects, which can raise or lower RF power density levels. So the actual power densities would likely fall somewhere between the two extremes that could apply if these other factors had been considered. The RF power density,  $P_D$ , in watts per square meter ( $W/m^2$ ) can be calculated from this equation:

$$P_D = g \left[ \frac{P}{4\pi r^2} \right]$$

In the above equation,  $r$  is the distance, in meters, from the Smart Meter, in the horizontal direction. This equation can be understood this way: The radiation from the Smart Meter travels outward from the meter and is initially regarded as spreading uniformly over the surface of a sphere (centered on the Smart Meter) which has a radius,  $r$ , and thus a surface area of  $4\pi r^2$ . So the part of the equation in square brackets [ ] indicates the power density that would be produced, at a distance,  $r$ , if the radiation from the Smart Meter spread uniformly over the surface of that sphere. The antenna used in the Smart Meter increases the power density in the horizontal direction, at the expense of a decrease in the power density in the vertical direction, because all receivers of interest are in the horizontal direction. Those receivers include the antennas of the electric power company and the antennas of other Smart Meters in the area with which a given Smart Meter communicates. The antenna gain,  $g$ , accounts for this characteristic of the antenna and causes  $P_D$  to represent the power density in the horizontal direction.

The RF power density,  $P_D$ , computed from the above equation is plotted in Figure 1 on page 9 as a function of the distance from the Smart Meter. The power density is expressed in units of milliwatts per square meter ( $mW/m^2$ ) to match the units in the Biological Effects Chart under discussion. A logarithmic vertical axis is used for the power density, again to match the logarithmic vertical axis of the Biological Effects Chart. The vertical axis appears on both sides of Figure 1 to facilitate easier reading.

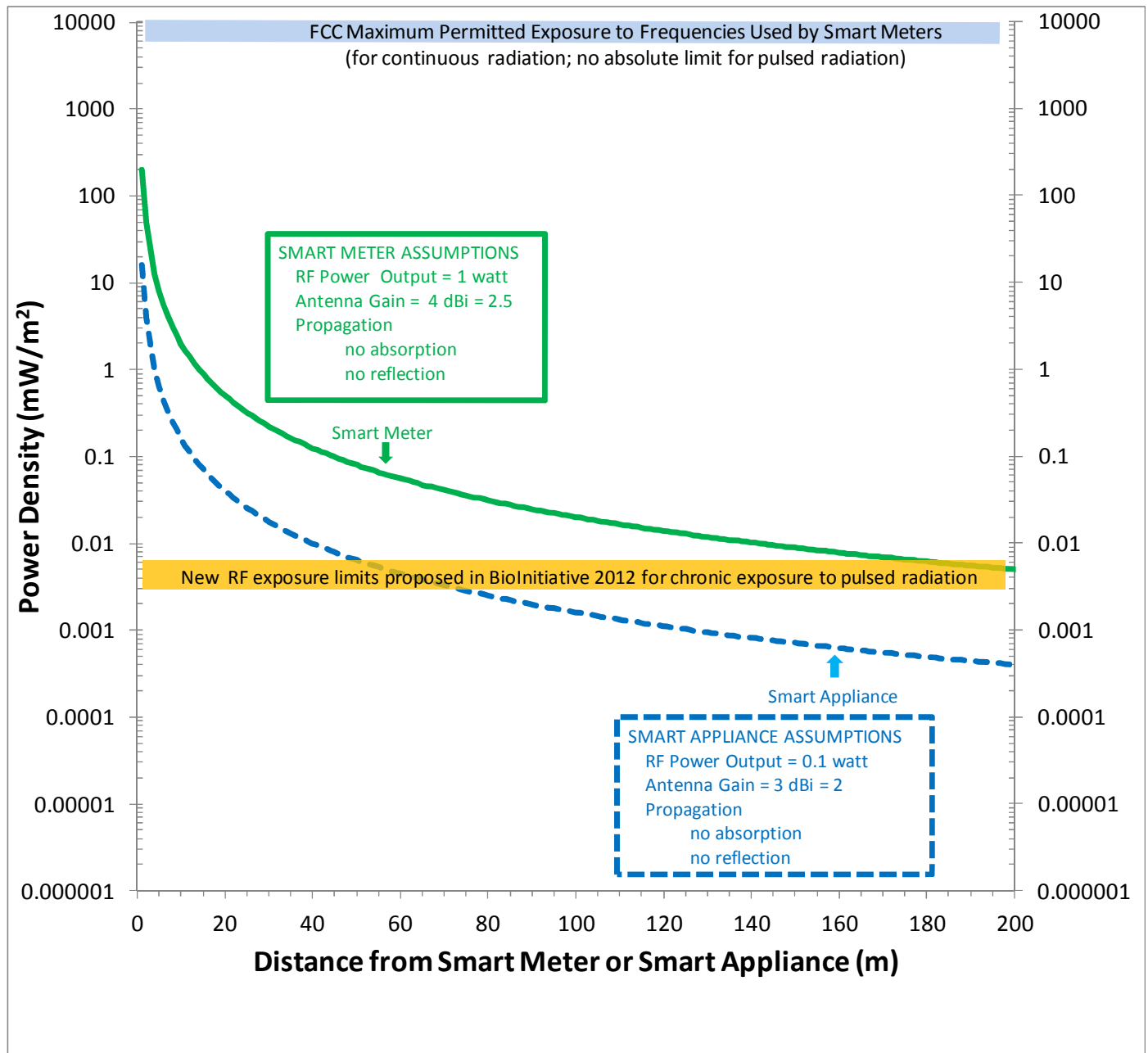
The power density is strongest near the Smart Meter and falls off quickly with increasing distance, but persists at lower levels to great distances. The power density of the Smart Meter drops to the maximum

---

<sup>33</sup> The antenna gain,  $g$ , is usually specified in dBi, which means the gain, in decibels, relative to an ideal isotropic antenna, which is an idealized antenna that radiates equally in all directions. The gain of the antenna in a Smart Meter (with FCC ID OWS-NIC514) is 4 dBi and translates to a factor of 2.5. That is, the power density in the horizontal direction is 2.5 times greater than it would be if the antenna radiated equally in all directions. In the case of Smart Meters, the power density in the vertical direction is reduced in favor of increased power density in the horizontal direction where all intended receivers are located. To access the reference, start at ( <http://transition.fcc.gov/oet/ea/fccid> ). In the box Grantee Code, enter OWS. In the box Product Code, enter –NIC514 (including the hyphen), press Search, click on the first entry Detail, and click on Test Report. This should take you to this location ( <https://apps.fcc.gov/eas/GetApplicationAttachment.html?id=1174749> ) which you cannot address directly. Then see page 3 of 66 of the document found.

exposure level proposed in the BioInitiative 2012 Report at a distance of about 180 meters. On the appended Biological Effects Chart, the four thin horizontal green lines show the power densities, taken from Figure 1, for distances of 1 meter (3 feet), 5 meters (16 feet), 20 meters (66 feet), and 100 meters (328 feet).

**Figure 1: Smart Meter and Smart Appliance RF Power Densities versus Distance**



## The Thin Dashed Horizontal Blue Lines on the Biological Effects Chart

Smart Meters are designed to communicate wirelessly with new Smart Appliances that are now becoming available. The Smart Appliances contain RF transmitters and receivers of their own. Through the Smart Meters, the Smart Appliances can report, to the electric power company, data sufficient to identify the specific appliances and to indicate when they were installed or removed, and how much power they are

consuming throughout the day and the night, every day of the year. Less certain is whether the electric power company will be able to turn off the Smart Appliances by sending a wireless signal to them through the Smart Meter. (For example, the electric power company might want to turn off appliances that draw a lot of electricity at certain times of day, and in certain seasons, when the load on the electric power system is high. An example would be turning off the air-conditioner at midday in midsummer.)

Such Smart Appliances will increase the RF radiation inside each home. Verifiable data on the actual RF power output of the transmitters that will be used in the Smart Appliances is hard to find at present; but a likely value is 0.1 watt, since that is a common value used for other short-range wireless devices.<sup>34</sup> The antenna gain is assumed to be 3 dBi or 2.<sup>35</sup> The frequency of operation is assumed to be 2.4 GHz to communicate with the Smart Meters.<sup>36</sup>

The RF power density for Smart Appliances is calculated with the same equation used for Smart Meters above but with the different values for  $P$  and  $g$  just cited:

$$P = \text{RF power output} = 0.1 \text{ watt}$$
$$g = \text{antenna gain} = 3 \text{ dBi} = 2 \text{ (a pure number, a ratio)}$$

The result for a single Smart Appliance is shown by the dashed blue line in Figure 1 on page 9. Once again, I have not accounted for absorption and reflection during propagation. Absorption can lower the power density. Reflection can lower or raise the power density. So the power densities shown in Figure 1 would likely fall somewhere between the two extremes that could apply if these other factors had been considered. The patterns of absorption and reflection inside homes vary greatly, so many different situations are possible.

The power density from a single Smart Appliance does not fall to the new maximum exposure level proposed in the BioInitiative 2012 Report until a distance of 50 meters (164 feet) from the Smart Appliance has been reached. So there will be no location within the typical home that will be that far from a Smart Appliance. Of course, over time, many such Smart Appliances may be purchased for a home, multiplying the total exposure produced.

In the appended Biological Effects Chart, the thin dashed blue lines show the RF power density, taken from Figure 1, for a single Smart Appliance at three distances: 1 meter (3 feet), 3 meters (10 feet), and 10 meters (33 feet) from the Smart Appliance. 10 meters is about as far from a Smart Appliance as a person can get inside the typical home with a single centrally located Smart Appliance.

---

<sup>34</sup> The most likely transmitter/receiver in the Smart Appliances is the so-called ZigBee device. These devices have RF outputs ranging from 0.001 watt to 0.1 watt, which is equivalent to a range of 1 milliwatt (mW) to 100 milliwatts (mW).

( <https://en.wikipedia.org/wiki/ZigBee> )

<sup>35</sup> The assumed gain,  $g$ , in this case, is 3 dBi, which is based on the performance of an ordinary vertical dipole antenna. That is, the power density in the horizontal direction is 2 times greater than it would be if the antenna radiated equally in all directions.

<sup>36</sup> ZigBee devices operate at 865 (in Europe) and 915 MHz (in the USA and Australia), as well as 2.4 GHz (worldwide); but the design of the Smart Meters installed in Maryland seems to require that the ZigBee devices operate at 2.4 GHz.

( <https://en.wikipedia.org/wiki/ZigBee> )

## Conclusions and Observations

### Current FCC Maximum Permitted Exposure (MPE) Limits Are Too High to Protect the Public

Because the FCC Maximum Permitted Exposure (MPE) limits are at power densities higher than the power densities addressed in all of the 67 studies, those limits provide no protection against the biological effects found in any of the 67 studies, no matter what the source of the RF radiation.

Further, the FCC Maximum Permitted Exposure limits apply to each source of radiation, individually, not to the combined exposure from all sources. But a person will generally be exposed to radiation from a combination of sources. So the FCC Maximum Permitted Exposure limits not only are too high to protect a person from a single source of radiation, but also do not consider the actual exposure received by a person from multiple sources of radiation.

### New Biologically Based RF Exposure Limits, Proposed in the BioInitiative 2012 Report, are 1 Million Times Lower than the FCC Limits, to Protect the Public

The new RF exposure limits proposed in the BioInitiative 2012 Report are about 1 million times lower (stricter) than the current FCC Maximum Permitted Exposure Limits in the frequency ranges at which Smart Meters, Collector Smart Meters, and Smart Appliances operate.

#### Comparison of RF Exposure Limits

BioInitiative 2012 Report (RF)	FCC MPE (850 to 2400 MHz)	Ratio (FCC/BioInitiative 2012)
.003 to .006 mW/m <sup>2</sup>	5700 to 10,000 mW/m <sup>2</sup>	950,000 to 3,000,000

As shown in the appended Biological Effects Chart, the new RF exposure limits in the BioInitiative 2012 Report are low enough to protect against the biological effects found in nearly all of the 67 studies covered by that Chart.

### A Single Smart Meter Can Produce RF Power Density Levels Shown to Cause Biological Effects

The Biological Effects Chart enables a comparison between the RF power densities produced by a Smart Meter, at various distances from that Smart Meter, and the RF power densities that triggered biological effects in the 67 studies.

The power density at 1 meter (3 feet) from a Smart Meter is higher than the power density that triggered biological effects in 50 of the 67 studies.

The power density at 5 meters (16 feet) from a Smart Meter is higher than the power density that triggered biological effects in 26 of the 67 studies.

The power density at 20 meters (66 feet) from a Smart Meter is higher than the power density that triggered biological effects in 14 of the 67 studies.

This distance of 20 meters is likely as far from a Smart Meter as a person can get and still be inside the typical home. So living and sleeping on the side of a home that is farthest from the Smart Meter is helpful but still may not reduce the received power densities to biological insignificance. Further, one or more of the neighbors' Smart Meters may be closer and may thus be the stronger source.

The power density at 100 meters (328 feet) from a Smart Meter is higher than the power density that triggered biological effects in 6 of the 67 studies.

So, even at the distance of a football field from the Smart Meter, the power density received may still be biologically significant.

As shown in Figure 1, the RF power density from a Smart Meter does not drop down to the level of the proposed new RF exposure limits until distances of 180 to 200 meters from the Smart Meter are reached. In most residential communities, whether composed of single-family homes, townhomes, or apartments, it will not be possible to get sufficiently far away from *all* of the Smart Meters present in that community.

## **A Single Smart Appliance inside a Home Can Produce RF Power Density Levels Shown to Cause Biological Effects**

Unfortunately, the problem of excess exposure to RF radiation will get worse as Smart Appliances are adopted. They contain their own internal RF transmitters and receivers. Those Smart Appliances are designed to communicate with Smart Meters and to report through the Smart Meters to the electric power company. The data the Smart Appliances report will be sufficient for the electric power company to identify which appliances you own, when you use them, and how much power they consume, throughout the day and the night. The electric power company may even be able to turn the Smart Appliances off by sending a wireless signal to the Smart Meter that is then transferred to the Smart Appliances, but that is less certain at this time.

When these Smart Appliances are installed in a home, they will significantly increase the radiation levels in that home for several reasons:

They will begin transmitting, and from distances very close to the residents.

The number of Smart Appliances in the home may increase with time as the residents gradually replace their old appliances with new Smart Appliances, increasing the total radiation level.

The Smart Meters will transmit more frequently, in order to communicate with the Smart Appliances.

Even a single Smart Appliance can produce RF power densities of concern. An inspection of the appended Biological Effects Chart indicates the following:

The power density at 1 meter (3 feet) from a Smart Appliance is higher than the power density that triggered biological effects in 32 of the 67 studies.

The power density at 3 meters (10 feet) from a Smart Appliance is higher than the power density

that triggered biological effects in 21 of the 67 studies.

The power density at 10 meters (33 feet) from a Smart Appliance is higher than the power density that triggered biological effects in 10 of the 67 studies.

These observations do not bode well for having 5, 10, or 15 Smart Appliances in a home. The RF radiation from even a few Smart Appliances, because they will be so close to the residents, may rival that of a home's more distant Smart Meter. And the RF radiation from a large number of Smart Appliances may exceed that of a home's Smart Meter.

## **A Single Smart Meter on a Neighbor's Home Can Produce RF Power Density Levels Shown to Cause Biological Effects**

For some locations in a given home, the distance to a neighbor's Smart Meter may be less than the distance to the resident's own Smart Meter. Thus, a neighbor's Smart Meter may be the principal source of radiation for some locations in the given home. The Biological Effects Chart shows that a single Smart Meter can produce RF power densities found to cause biological effects even at distances greater than 20 meters, and certainly up to 100 meters. And the number of neighbors within that range can be large. A given single-family home in a residential community may have one to eight nearest neighbors, and even more next nearest neighbors, all within 100 meters (328 feet) of a given home, and each with a Smart Meter.

The problem of exposure from the neighbors' Smart Meters becomes more serious as the distances between adjacent homes, and thus the distances between adjacent Smart Meters, get smaller. So, generally speaking, residents of townhouses will receive more radiation from their neighbors' Smart Meters than residents of single-family homes. And residents of apartments will receive even more radiation from their neighbors' Smart Meters, depending on the location of the Smart Meters in the apartment buildings.

So Smart Meters are a community concern, not just an individual concern. To resolve the problems of RF exposure for a given home, it will be necessary to address all of the Smart Meters near that home. Smart Appliances, too, contribute to this concern. While, individually, they have a lower RF power output than a Smart Meter, the Smart Appliances of neighbors can also increase the RF exposure in the given home.

Fortunately, some states have offered an individual OPT OUT from the installation of a Smart Meter.<sup>37</sup> While such an OPT OUT is very helpful, and is definitely the **vital first step**, the data on biological effects discussed here suggest the limitations of such an OPT OUT in resolving the problem of excess radiation from Smart Meters. There is no substitute for a roll back of all Smart Meters at the community level, or higher.

## **Most Biological Effects of RF Radiation Cannot be Sensed by Human Beings**

Most biological effects of RF radiation cannot be sensed by human beings. This fact is evident from an inspection of the categories of biological effects from the RF Color Charts in the BioInitiative 2012 Report, as shown below. For example, humans cannot sense the onset of cancer, DNA damage, or fertility effects.

---

<sup>37</sup> Maryland, through the Maryland Public Service Commission, currently offers a temporary OPT OUT, with the future of that OPT OUT yet to be decided. And the Maryland House of Delegates is currently considering legislation (HB1038) that would make the OPT OUT permanent and would provide other protections for Maryland homeowners.

## Categories of Biological Effects in the RF Color Charts of the BioInitiative 2012 Report

Code	Code Translation	Biological Effects Category
CB	Cancer, Brain	Brain tumors and blood-brain barrier
CO	Cancer, Other	Cancer (other than brain), cell proliferation
H	Heart	Cardiac, heart muscle, blood-pressure, vascular effects
MC	Metabolism, Calcium	Disrupted calcium metabolism
OD	Oxidation, DNA	Oxidative damage/ROS/DNA damage/DNA repair failure
R	Reproduction	Reproduction/fertility effects
S	Sleep	Sleep, neuron firing rate, EEG, memory, learning, behavior
SI	Stress, Immune	Stress proteins, HSP, <sup>38</sup> disrupted immune function

The principal category of biological effects that humans *can* often sense is the S (or Sleep) category. This category includes neurological effects on sleep, memory, learning, and behavior, among others. Unfortunately, not sensing these particular effects does not guarantee that other biological effects are not occurring.

## RF Radiation May Affect Unborn and Very Young Children More Severely than Adults

The BioInitiative 2012 Report presents evidence that unborn and very young children may be more greatly affected by RF radiation than adults because unborn and very young children are in “critical phases of growth and development”.<sup>39</sup>

Concern for unborn and very young children is shared by the American Academy of Pediatrics (AAP) which wrote to the U.S. Congress in support of a bill before the U.S. House of Representatives (H.R. 6358).<sup>40</sup> This bill would fund development of better founded RF exposure limits to protect against cell phones and other wireless sources of RF radiation. The AAP made the following statement:

*The AAP strongly supports H.R. 6358’s emphasis on examining the effects of radiofrequency (RF) energy on vulnerable populations, including children and pregnant women. In addition, we are pleased that the bill would require the consideration of those effects when developing maximum exposure standards. Children are disproportionately affected by environmental exposures, including cell phone radiation. The differences in bone density and the amount of fluid in a child’s brain compared to an adult’s brain could allow children to absorb greater quantities of RF energy deeper into their brains than adults. It is essential that any new standards for cell phones or other wireless devices be based on protecting the youngest and most vulnerable populations to ensure they are safeguarded through their lifetimes.*<sup>41</sup>

<sup>38</sup> HSP stands for Heat Shock Proteins. BioInitiative 2012 Report, cited in footnote 2 on page 1, Section 1, Summary for the Public and Conclusions, Table 1-2 Reported Biological Effects from Radiofrequency Radiation at Low-Intensity Exposure 2012, no page numbers.

<sup>39</sup> BioInitiative 2012 Report cited in footnote 2 on page 1, Section 1: Summary for the Public and Conclusions, 2012 Supplement: Summary for the Public – Ms. Sage, pages 8-10.

<sup>40</sup> Summary of H.R. 6358 can be found here:

( <http://marylandsmartmeterawareness.org/smart-meter-news/ask-your-congressional-rep-to-co-sponsor-h-r-6358> ). Full copy of H.R. 6358 can be found here: ( [http://thomas.loc.gov/home/gpoxmlc112/h6358\\_ih.xml](http://thomas.loc.gov/home/gpoxmlc112/h6358_ih.xml) ).

<sup>41</sup> ( [http://ehtrust.org/wp-content/uploads/2012/12/aap\\_support\\_letter\\_cell\\_phone\\_right\\_to\\_know\\_act.pdf](http://ehtrust.org/wp-content/uploads/2012/12/aap_support_letter_cell_phone_right_to_know_act.pdf) )



Smart Meters and Smart Appliances operate in the same frequency ranges as cell phones. Further, Smart Meters have twice the RF power output of the typical cell phone, as shown in the table below, and will be transmitting day and night. Emerging Smart Appliances will likely have about one-fifth the RF power output of the typical cell phone. But a given home may have several Smart Appliances; and they, too, will be transmitting day and night.

Device	RF Power Output				
Smart Meter <sup>42</sup>	1.115	watts	which is	1115	milliwatts
Typical leakage from a microwave oven <sup>43</sup>	1	watt	which is	1000	milliwatts
Typical cell phone <sup>43</sup>	0.5	watt	which is	500	milliwatts
Wireless LAN (802.11a) <sup>43</sup>	0.251	watt	which is	251	milliwatts
Wireless LAN (802.11n) <sup>43</sup>	0.250	watt	which is	250	milliwatts
Cordless phone <sup>44</sup>	0.230	watt	which is	230	milliwatts
Smart Appliance <sup>45</sup>	0.100	watt	which is	100	milliwatts
Wireless LAN (802.11 b, g) <sup>43</sup>	0.100	watt	which is	100	milliwatts
Typical laptop wireless LAN (Wi-Fi) <sup>43</sup>	0.032	watt	which is	32	milliwatts

## A Final Note

The Smart Meter is the first source of RF exposure that is mandated for installation in every home in an entire region without the informed consent, or any consent, of the residents, and that is not under the control of the residents.

For other sources of RF exposure in the home, the residents have a choice to use them, or not to use them, and how often, and how long. Some of those other sources are included in the table above.

The Smart Appliances, while not mandated, will be the second source of RF exposure in a home that is not under the control of the residents -- if manufacturers of the Smart Appliances provide no way of turning off the RF transmitters in those appliances.

The only solution for the individual homeowner, at present, is the removal of the Smart Meter and the avoidance of the Smart Appliances. This is a vital first step; but it is only a partial solution for a given home, because the radiation from the neighbors' Smart Meters and Smart Appliances will cross property boundaries. Collaboration with the neighbors on reducing exposure levels is needed; and a solution at the community level, or higher, will be even more effective.

---

<sup>42</sup> The Landis+Gyr FOCUS AXR-SD and the General Electric I-210+c, being installed in Maryland, have FCC-ID OWS-NIC514 which indicates that they send and receive information in two microwave frequency ranges: (1) 902.3 to 926.9 MHz, and (2) 2405.8 to 2480.9 MHz. The RF power output in the first frequency range is 0.968 watts. The RF power output in the second frequency range is 0.147 watt. These values sum to the 1.115 watts shown here, to provide an indication of the total RF power output capability of a Smart Meter. I have used an approximate value of 1 watt for the RF power output of a Smart Meter throughout this document ( <http://stopsmartmeters.org/wp-content/uploads/2012/01/OWS-NIC514-FCC-specifications.pdf> ).

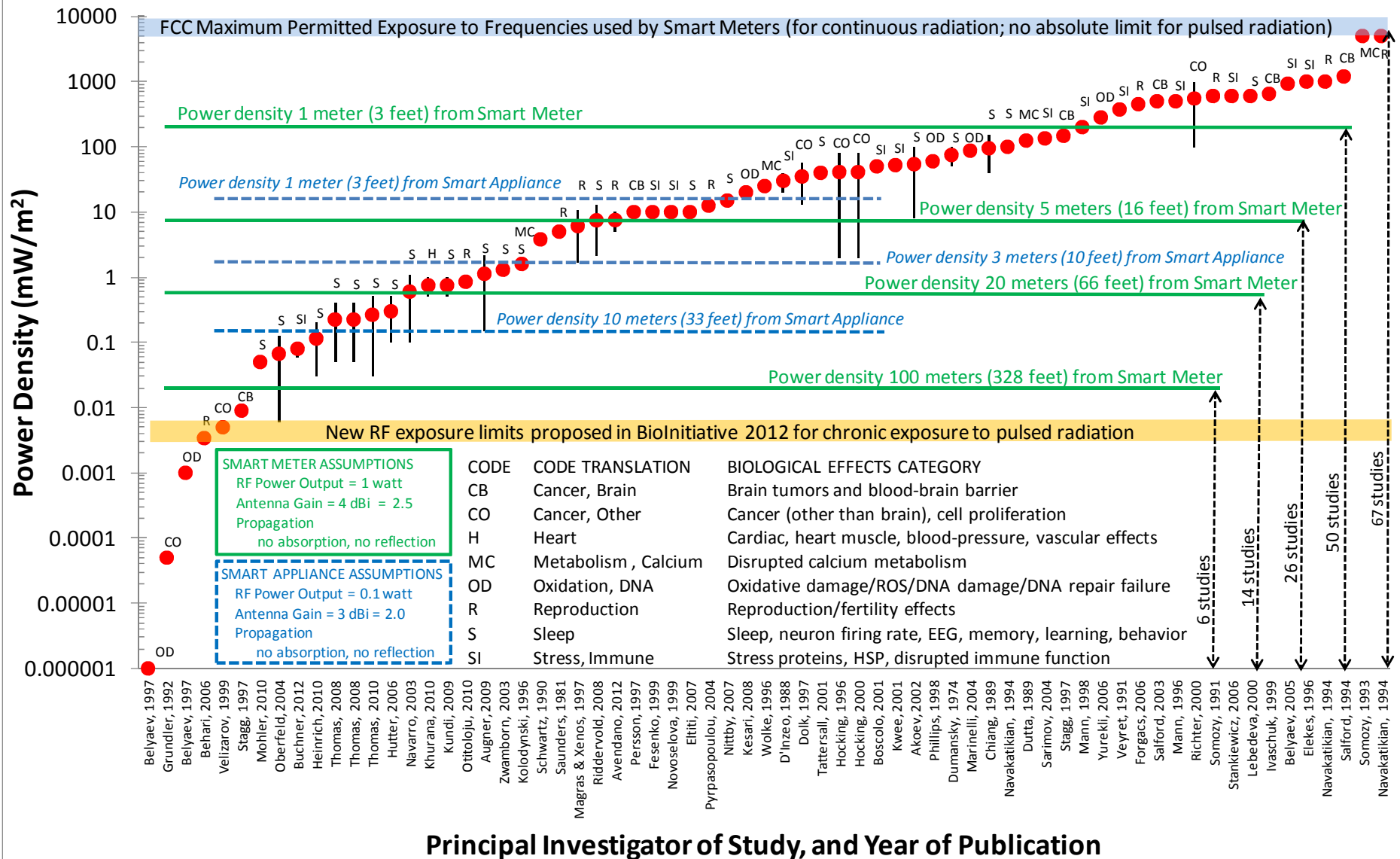
<sup>43</sup> The RF power output levels come from this web site: ( <http://en.wikipedia.org/wiki/DBm> ). 1 watt equals 1000 milliwatts.

<sup>44</sup> Panasonic specifies the power output of its DECT 6.0 cordless telephone Model KXTG1061 as 115 milliwatts for the handset and another 115 milliwatts for the base station, for a total capability of 230 milliwatts.

<sup>45</sup> For a reference, see footnote 34 on page 10.

# Reported Biological Effects from RF Radiation at Low-Intensity Exposure in Each of the 67 Studies Referenced in the "BioInitiative 2012" Report (Cell Tower, Wi-Fi, Wireless Laptop, and Smart Meter Power Densities)

Reference for data dots (red), data range indicators (vertical black lines through red dots), biological effects categories for the red dots, and new proposed limits (yellow line): BioInitiative Working Group, Cindy Sage and David O. Carpenter, Editors. BioInitiative Report: A Rationale for Biologically-based Public Exposure Standards for Electromagnetic Radiation at [www.bioinitiative.org](http://www.bioinitiative.org), December 31, 2012. For references for other information on this chart, including the FCC Maximum Permitted Exposure limits, and the power densities of Smart Meters and Smart Appliances, see accompanying paper.



## FCC Maximum Permissible Exposure Limits for Electromagnetic Radiation, as Applicable to Smart Meters

This document expresses my best understanding, as of the above date, of the FCC Maximum Permissible Exposure (MPE) limits, as applicable to Smart Meters. This understanding has been reached by reading the FCC document in the first footnote below, and by asking the FCC any questions that remained.

### History

The FCC's most recent explanation of its current exposure limits was published in 1999 with the title "Questions and Answers about Biological Effects and Potential Hazards of Radiofrequency Electromagnetic Fields".<sup>1</sup> The current FCC exposure limits are based principally on a 1986 publication of the National Council on Radiation Protection and Measurements (NCRP). That publication is "Report No. 086 - Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields".<sup>2</sup> The NCRP was chartered by the U.S. Congress in 1964, but is not a Government agency and is not subject to oversight by the Congress.<sup>3</sup>

The current FCC exposure limits agree, in part, with those developed jointly in 1992 by the American National Standards Institute (ANSI) and the Institute of Electrical and Electronics Engineers (IEEE). The exceptions are "limits on exposure to power density above 1500 MHz, and limits for exposure to lower frequency magnetic fields."<sup>4</sup> I will not address the ANSI and IEEE limits further here because the FCC limits are the ones applicable to Smart Meters.

The fact that the current exposure limits are based on the NCRP limits published in 1986, now 27 years ago,

---

<sup>1</sup> "Questions and Answers about Biological Effects and Potential Hazards of Radiofrequency Electromagnetic Fields", OET (Office of Engineering and Technology) Bulletin 56, Fourth Edition, Federal Communications Commission, August 1999.

( [http://www.fcc.gov/Bureaus/Engineering\\_Technology/Documents/bulletins/oet56/oet56e4.pdf](http://www.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet56/oet56e4.pdf) )

<sup>2</sup> This document is sold by the NCRP for \$56 in downloadable PDF form.

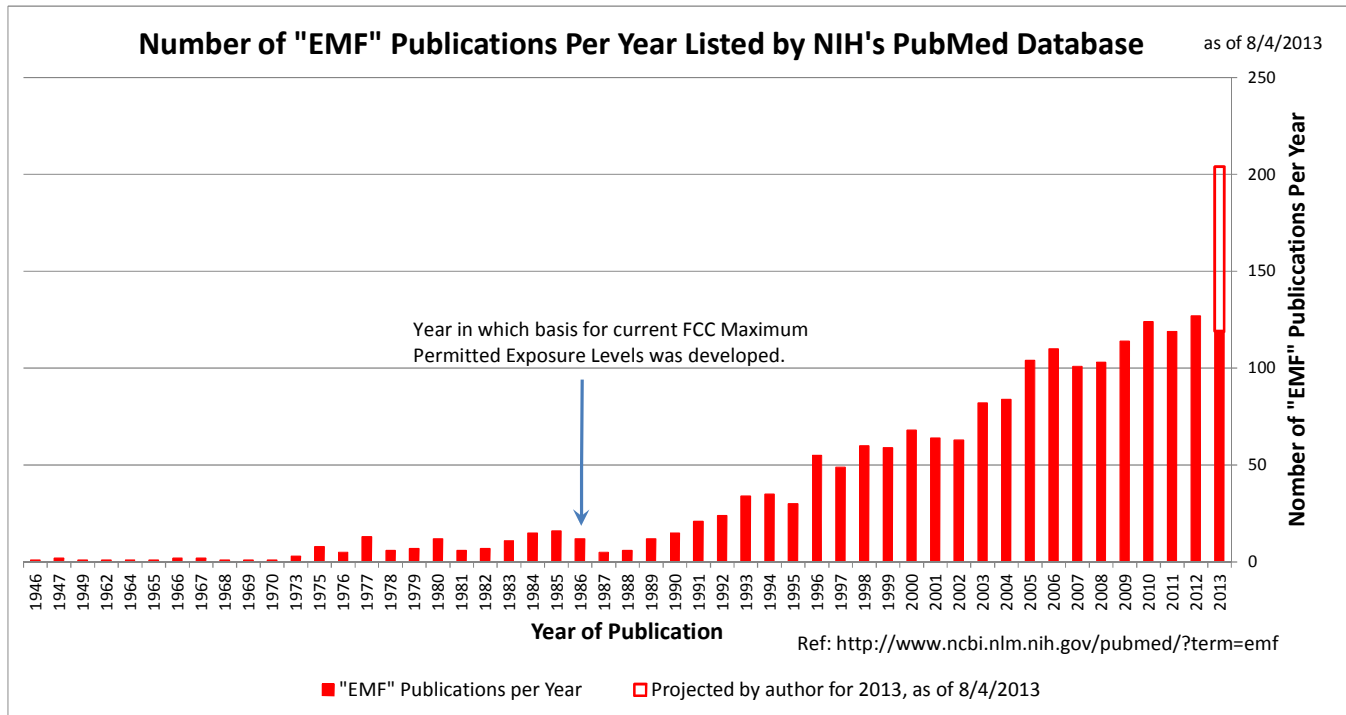
( <http://www.ncrppublications.org/Reports/086> ).

<sup>3</sup> The National Council on Radiation Protection and Measurements has this history: (1) in 1929, formed as the U.S. Advisory Committee on X-Ray and Radium Protection; (2) in 1946, renamed as the National Committee on Radiation Protection and Measurements; (3) in 1964, chartered by the U.S. Congress and renamed as the National Council on Radiation Protection and Measurements.

( [https://en.wikipedia.org/wiki/National\\_Council\\_on\\_Radiation\\_Protection\\_and\\_Measurements](https://en.wikipedia.org/wiki/National_Council_on_Radiation_Protection_and_Measurements) )

<sup>4</sup> In the document in my footnote 1 above, footnote 9 on page 12 explains: 'The FCC adopted limits for field strength and power density that are based on Sections 17.4.1 and 17.4.2, and the time-averaging provisions of Sections 17.4.1.1 and 17.4.3, of "Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," NCRP Report No. 86, for frequencies between 300 kHz and 100 GHz (Reference 34). With the exception of limits on exposure to power density above 1500 MHz, and limits for exposure to lower frequency magnetic fields, these MPE limits are also based on the guidelines developed by the IEEE and adopted by ANSI. See Section 4.1 of ANSI/IEEE C95.1-1992, "Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz".' Further, again in the document in my footnote 1 above, footnote 4 on page 10 describes ANSI and IEEE as follows: "ANSI is a non-profit, privately funded, membership organization that coordinates development of voluntary national standards. The IEEE is a non-profit technical and professional engineering society."

means that those limits: (1) predated the emergence of the vast majority of devices currently emitting microwave radiation into our environment, including Smart Meters and other digital microwave devices; and (2) cannot be current with results of medical research on the bioeffects of electromagnetic radiation, including microwaves. The growth in the medical research literature since 1986 has been substantial and is illustrated by the following figure. That figure shows the number of publications addressing “EMF” (electromagnetic fields), as indexed in PubMed. PubMed is the on-line database of the medical research literature maintained by the National Institutes of Health. PubMed is the most comprehensive index to the medical research literature in the world.



On March 29, 2013, the FCC issued, for comment, proposed new exposure limits. While there are many changes, the key numbers that are currently applicable to Smart Meters, as described in the next section, appear to be unchanged.<sup>5</sup>

## Current FCC Maximum Permissible Exposure Limits

Within the FCC's 1999 publication, "Questions and Answers...", the exposure limits of relevance to Smart meters are contained in Table 1(B), entitled "Limits for General Population/Uncontrolled Exposure", on page 15. Since Smart Meters operate in two principal frequency bands, one at about 900 MHz, and one at about 2400 MHz (which is equivalent to 2.4 GHz),<sup>6</sup> just two lines from Table 1(B) apply to these frequency

<sup>5</sup> Reassessment of Federal Communications Commission Radiofrequency Exposure Limits and Policies (ET Docket No. 13-84), and Proposed Changes in the Commission's Rules Regarding Human Exposure to Radiofrequency Electromagnetic Fields (ET Docket No. 03-137), released March 29, 2013. See Table 1 on pages 98, 110, and 122 of the PDF version. ( <http://www.fcc.gov/document/fcc-review-rf-exposure-policies> )

<sup>6</sup> The FOCUS AXR-SD and the I-210+c both have FCC-ID OWS-NIC514, which indicates that they send and receive information in two microwave frequency ranges: (1) 902.3 to 926.9 MHz, and (2) 2405.8 to 2480.9 MHz. MHz means millions of hertz. 1 hertz is one cycle per second. The microwave output power in the first frequency range is 0.968 watts. The microwave output power in the second frequency range is 0.147 watt. The sum of these two is 1.115 watts. Landis+Gyr and PEPCO declined to answer a question as to whether the two frequency ranges are used simultaneously. I assume that they are and have summed their outputs as a result

bands, as shown below.

### Extracted from FCC Table 1 (B) Limits for General Population/Uncontrolled Exposure

<i>line</i>	Frequency Range	Power Density	Averaging Time
	MHz	mW/cm <sup>2</sup>	minutes
(a)	300-1500	f/1500	30
(b)	1500-100,000	1.0	30
f is the frequency in MHz			

Line (a) above applies to the 900 MHz frequency band used by Smart Meters. That line indicates that the permitted power density increases as the frequency increases. At 900 MHz, the maximum permitted power density is (900/1500) mW/cm<sup>2</sup>, which is 0.6 mW/cm<sup>2</sup>. Line (b) applies to the 2400 GHz frequency band of Smart Meters, and the maximum permitted power density is 1 mW/cm<sup>2</sup>, independent of frequency. With this understanding, Table 1(B) can be applied to Smart Meters, as shown below. I have added columns that translate mW/cm<sup>2</sup> into mW/m<sup>2</sup> and into W/m<sup>2</sup> for comparison with data from other sources.<sup>7</sup>

### Limits for General Population/Uncontrolled Exposure for Smart Meters

Frequency	Power Density			Averaging Time
MHz	mW/cm <sup>2</sup>	mW/m <sup>2</sup>	W/m <sup>2</sup>	minutes
900	0.6	6,000	6	30
2400	1.0	10,000	10	30

### Interpretation of the Tables

Here is how to interpret the table. For easy reference, call the power-density levels in the table the **absolute levels**, consistent with the terminology that the FCC uses.

- (1) A continuous exposure of an individual is considered compliant with the FCC limits if that exposure remains at or below the specified absolute level for that frequency, even if that exposure continues indefinitely.
- (2) A discontinuous exposure, such as that produced by a digital signal, is considered compliant with the FCC limits, if the average exposure over a period of 30 minutes is at or below the specified absolute level for that frequency. That is, if the exposure rises above the absolute level for that frequency, even for a moment, then the average level, over a 30 minute period, must be at or below the absolute level. Stated another way, periods of exposure at higher than the absolute level must

---

( <http://stopsmartmeters.org/wp-content/uploads/2012/01/OWS-NIC514-FCC-specifications.pdf> ).

<sup>7</sup> 1 meter (m) equals 100 centimeters (cm). So 1 square meter (m<sup>2</sup>) equals 10,000 square centimeters (cm<sup>2</sup>). 1 watt (W) equals 1000 milliwatts (mW).

be accompanied, in any given 30 minute interval, by periods of exposure far enough below the absolute level that the average over 30 minutes does not exceed the absolute level.

Because of (2) above, the level of exposure permitted for short intervals of time may greatly exceed the absolute level. Consider an exposure that is ON for less than 30 minutes and the is OFF for the rest of the 30 minutes. Here are some specific patterns that would be permitted, no matter how many times the 30 minute pattern is repeated.

### Examples of FCC Permitted Exposure Levels at 900 MHz

ON Time	OFF Time	ON Time Fractions	Permitted Power Density During ON Time		
minutes:seconds	minutes:seconds		mW/cm <sup>2</sup>	mW/m <sup>2</sup>	W/m <sup>2</sup>
30:00	00:00	1	0.6	6,000	6
01:00	29:00	1/30	18	180,000	180
00:20	29:40	1/90	54	540,000	540
00:01	29:59	1/1800	1080	10,800,000	10,800

### Examples of FCC Permitted Exposure Levels at 2400 MHz

ON Time	OFF Time	ON Time Fractions	Permitted Power Density During ON Time		
minutes:seconds	minutes:seconds		mW/cm <sup>2</sup>	mW/m <sup>2</sup>	W/m <sup>2</sup>
30:00	00:00	1	1	10,000	10
01:00	29:00	1/30	30	300,000	300
00:20	29:40	1/90	90	900,000	900
00:01	29:59	1/1800	1800	18,000,000	18,000

### Discussion of Examples of Permitted Exposure Levels

The surface area of a human being is about 2 m<sup>2</sup>.<sup>8</sup> So the surface area presented to a microwave wave coming from the front or the back is about 1 m<sup>2</sup>. Consider the W/m<sup>2</sup> column in the above table. An oncoming microwave wave will transfer to a human being the number of watts shown in the W/m<sup>2</sup> column. Consider the three examples at 2400 GHz that are contained in the preceding table:

- (1) A microwave wave with a power density of 300 W/m<sup>2</sup> will transfer 300 watts of power to a human being. That is the amount of power required to run 3 light bulbs of 100 watts each. Such

<sup>8</sup> The surface of a man is about 1.9 m<sup>2</sup>. The surface of a woman is about 1.6 m<sup>2</sup>. Both according to Wikipedia ( [http://en.wikipedia.org/wiki/Body\\_surface\\_area](http://en.wikipedia.org/wiki/Body_surface_area) )

exposure would be compliant with the FCC exposure limits, if continued for 1 minute or less.

- (2) A microwave wave with a power density of  $900 \text{ W/m}^2$  will transfer 900 watts of power to a human being. This is somewhat more than the amount of microwave power, 700 watts, generated by the typical consumer microwave oven.<sup>9</sup> So exposure of a human being to a microwave wave with somewhat greater power than a microwave oven would be compliant with the FCC exposure limits, if continued for 20 seconds or less.
- (3) A microwave wave with a power density of  $18,000 \text{ W/m}^2$  will transfer 18,000 watts of power to a human being. This is between one-third and one-half of the maximum power that the typical home can draw (48,000 watts) without tripping its master circuit breaker (200 amperes AC at 240 volts AC). Such exposure would be compliant with the FCC exposure limits, if continued for 1 second or less.

For each of the three examples given above, the level of exposure cited, with the associated duration, could be repeated once each 30 minutes, indefinitely, and still be in compliance with the FCC exposure limits.

Finally, exposure of a human being at even higher power levels than discussed here is permitted by the FCC exposure limits, if the duration of that exposure is sufficiently short.

These examples indicate that the current FCC exposure limits permit exposure levels to microwave radiation that challenge common sense. While I have not yet read the 1986 NCRP publication on which the current FCC exposure limits are based, I do wonder what sort of scientific basis I will find there that could justify such extraordinary power levels, even in 1986.

## Peak versus Average Exposure Levels

Given the above discussion, the concerns raised by the FCC exposure limits arise not only from high permitted absolute levels, but also from the concept of time averaging, which does, indeed, seem based on thermal thinking only. When the level of microwave radiation exposure is averaged over time, the implicit assumption being made is that the body reacts the same way to:

- (1) a burst of microwave radiation of high intensity but short duration
- (2) a hypothetical continuous level of radiation at a lower level but with the same average value over the same period of time

So a real burst-exposure event is translated into a hypothetical continuous exposure event, and the effect of that hypothetical exposure event is taken to represent the effect of the real event. Yet, everyday life suggests that the body may not react the same way to these two different circumstances. Ask a boxer if the following two events are of equal concern: (1) a series of “average” punches over the length of a fight, or (2) a single punch, somewhere during the fight, with the energy of the sum of all the “average” punches.

## Thermal versus Non-Thermal Effects on Humans

The FCC developed two sets of exposure limits, one for Occupational/Controlled Exposure and one for the General Population/Uncontrolled Exposure. Only the latter have been discussed here because only they

---

<sup>9</sup> The typical consumer microwave oven consumes 1100 watts of electrical power and produces 700 watts of microwave power. ( [http://en.wikipedia.org/wiki/Microwave\\_oven](http://en.wikipedia.org/wiki/Microwave_oven) )



apply to Smart Meters installed on residences. My understanding is that the Occupational set were based principally on thermal (heating) effects on the human body; but the existence of possible non-thermal effects was recognized back then, according to the FCC. So when the limits for the General Population were developed, a factor of five reduction in permitted levels, relative to the Occupational set, was implemented for the General Population set, for two reasons, again according to the FCC: (1) to allow for non-thermal effects, and (2) to provide a safety margin because exposure levels in the General Population would not generally be known as well as the levels in an occupational setting.

So the FCC exposure limits made some recognition of the existence of non-thermal effects. But I must wonder if the knowledge of non-thermal effects, back in 1986, was adequate to support that factor of five.

## **Applying the FCC Exposure Limits**

Additional information on applying the FCC exposure limits is contained in "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields", OET Bulletin 65, Edition 97-01, published in August 1997.<sup>10</sup>

## **Legal Presentation of the FCC Exposure Limits**

The current FCC exposure limits are presented, in legal form, in the Code of Federal Regulations in 47 CFR 1.1307<sup>11</sup> and 47 CFR 1.1310.<sup>12</sup> The latter publication is the one that contains Table 1 which also appears in the FCC's 1999 publication "Questions and Answers..." , OET Bulletin 56, introduced above.

---

<sup>10</sup> ( [http://www.fcc.gov/Bureaus/Engineering\\_Technology/Documents/bulletins/oet65/oet65.pdf](http://www.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet65/oet65.pdf) )

<sup>11</sup> 47 CFR 1.1307  
( <http://www.ecfr.gov/cgi-bin/retrieveECFR?gp=12&SID=049f730b665fd682e5a64add8d6b80b4&ty=HTML&h=L&r=SECTION&n=47y1.0.1.1.2.9.192.7> )

<sup>12</sup> 47 CFR 1.1310  
( <http://www.ecfr.gov/cgi-bin/retrieveECFR?gp=12&SID=049f730b665fd682e5a64add8d6b80b4&ty=HTML&h=L&r=SECTION&n=47y1.0.1.1.2.9.192.10> )



---

Date

TO:

PEPCO Smart Grid Deferral

Mail Stop EP7642

701 9th Street NW

Washington, DC 20068

NOTICE OF DEFERRAL OF INSTALLATION OF SMART METERS PER PSC'S  
ORDER NO. 84926 DATED MAY 24, 2012

I am hereby notifying PEPCO and its agents that you are not to install a Smart Meter anywhere on my property pursuant to Order No. 84926 issued by the Maryland Public Service Commission on May 24, 2012.

Because you have already installed a Smart Meter on my property, please remove that Smart Meter and replace it with a –

**TRADITIONAL ANALOG MECHANICAL METER  
WITH NO WIRELESS COMMUNICATIONS CAPABILITY**

Kindly send me a letter, acknowledging this letter, and then contact me, **in advance of coming**, to set the date and the time that you will appear to make the requested replacement.

Thank you.

Regards,

---

Signature

---

Name (printed)

---

Street Address

---

City, State, and Zip Code

---

PEPCO Account Number

---

Telephone Number



# NOTICE TO PEPCO AND ITS AGENTS

*PURSUANT TO ORDER  
#84926 OF THE MARYLAND  
PUBLIC SAFETY COMMISSION,  
REPLACE THIS SMART METER*

*WITH A*

**TRADITIONAL ANALOG  
MECHANICAL METER  
WITH NO WIRELESS  
TRANSMISSION CAPABILITY**

# NOTICE TO PEPCO AND ITS AGENTS

*PURSUANT TO ORDER  
#84926 OF THE MARYLAND  
PUBLIC SAFETY COMMISSION,  
REPLACE THIS SMART METER*

*WITH A*

**TRADITIONAL ANALOG  
MECHANICAL METER  
WITH NO WIRELESS  
TRANSMISSION CAPABILITY**

## OPT OUT NOW

You will receive a Smart Meter unless you opt out now. See insert or our website for where to send.

***Our Public Service Commission has now ruled that customers may opt out of smart meter installations. Currently there is no opt out fee. Protect yourself, your loved ones, and your home today!***

## WHAT YOU CAN DO

**1. Write to your state representatives and tell them to support HB 1038: Smart Meter No Cost Opt Out.** We should not have to pay extra to protect ourselves from the demonstrated risks associated with wireless Smart Meters.

**2. Tell your utility company and the Public Service Commission you want to OPT OUT of your Smart Meter installation** now and protect your home or business.

**3. Strengthen our voice by joining MSMA - it's free and you will receive monthly e-mail updates.**

**4. Inform others.** This debacle has already cost tax payers billions. Can you imagine having to pay even more to protect your family from these meters, or worse yet, become one of the many people who have experienced negative effects from Smart Meters?

There are safer solutions to meet our energy needs than to increase our radiation exposure, compromise security, and commit customers to years of untold rate increases to support this technology.

Did you know that despite mounting evidence and court actions related to the adverse cost, safety, and health effects of Smart Meters, your utility is moving forward with forced Smart Meter installations?

---

*We're all for progress and conservation, but not at the cost of our health and privacy.*

---



### ***What is Maryland Smart Meter Awareness (MSMA)?***

MSMA is a grass roots, all volunteer group serving Maryland. We are a nonpolitical, highly diverse group of concerned citizens who have come together at a critical time to inform our neighbors and protect our consumer rights to safety, privacy, and choice. Our volunteers are average citizens who want utilities to act responsibly by deploying safe and tested solutions.

**MarylandSmartMeterAwareness.org**

## WHAT IS A SMART METER?

## DO I HAVE A CHOICE?



*Utility companies are replacing our current analog meters with untested Smart Meters*

*Are you aware of the risks associated with these new meters and that you have a right to opt out of your installation?*

## ***What is a Smart Meter?***

Smart Meters are new generation utility meters that monitor and automatically transmit your energy usage via wireless signals on the microwave spectrum. Smart Meters require an unprecedented wireless mesh network infrastructure, both indoors and outdoors. This mesh network blankets entire communities with non-ionizing radiation, about which non-industry funded scientists issue dire warnings. On the surface, Smart Meters seem like progress, but they are the Trojan Horse of our time.

## ***What's the big deal?***

Unlike safe analog meters, Smart Meters allow utilities, third parties, and government access to precise information about your private life, emit RF microwave radiation linked with health and environmental problems, increase utility bills, and can catch on fire or damage appliances. Folks in 32 states and all over the world are rejecting Smart Meters and demanding a halt and a recall. Nevertheless, utilities are spreading misleading information and continuing to force Smart Meters on the public. We have a right to say NO!

## ***Contrary to what utilities tell us,***

- **Smart Meters do not save money or energy**
- **Smart Meters have never been safety tested for health effects**
- **Non-industry funded scientists issue dire warnings about non-ionizing radiation**
- **Smart Meters violate our privacy & compromise security**

# **SMART METER FACTS**

- Three attorneys general have filed objections stating that they are too expensive and consumers will never see any real savings.
- Ratepayers are reporting bill increases.
- Smart meters provide the utilities with a tool to control our energy use during peak times, saving themselves money, not the ratepayers.
- Through incentive programs (rebates), time of use pricing (higher rates during peak times), and remote power rationing, utilities can increase their profits while passing on the enormous costs of this expensive roll out onto ratepayers.
- Businesses and households who cannot lower usage during peak times - i.e. retirees, disabled Americans, individuals using medical equipment, telecommuters, home businesses, and stay at home moms - can expect to pay even more for electricity.
- Smart Meters are not ANSI or UL certified.
- Smart Meters have been associated with over 900 fires.
- Shortly following Smart Meter installation, customers have reported incidents of wiring and appliance damages.
- Smart Meters pulse RF radiation anywhere between 14,000 to 190,000 times each day according to utility documents.
- Is this radiation harmful? Independent studies - not industry funded - say YES. See the report of 1800+ studies at [www.BiolInitiative.org](http://www.BiolInitiative.org)
- Upon installation of Smart Meters, people report headaches, ringing ears, dizziness, breathing problems, insomnia, nausea, cognitive problems, memory loss, muscle spasms, and heart problems.
- The American Academy of Environmental Medicine (AAEM) recommends a moratorium on Smart Meters based on double-blinded, placebo controlled research of RF radiation, particularly if a household member already suffers from any of 40 conditions listed, particularly those with chronic illness.
- In addition, many prestigious medical institutions, scientists, and experts all over the globe have released similar warnings of negative health effects. Children, pregnant women, seniors, people with immune deficiencies, medical conditions, and implants are especially at risk.
- Smart Meters have been shown to interfere with vital medical equipment such as pacemakers.
- Smart Meters transmit personal information about our daily activities and are, in effect, a new form of surveillance. Anyone with access (authorized or not) can tell whether you are home or not; what appliances you are using; whether or not your home alarm system is on or what medical equipment you are using.
- There is no law protecting disclosure or sale of our sensitive information which is stored for years. This information is extremely valuable to third parties such as insurance companies, marketers, law enforcement, and criminals.

**MarylandSmartMeterAwareness.org**