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Question 2.

ANSWER: See above Exhibits 1 & 2

Question 3.

ANSWER: Dr. David Carpenter, Public Health Physician Harvard Medical School, who headed up the New York State Dept. of Public Health for 18 years before becoming Dean of the School of Public Health at the University of Albany, where he currently directs the Institute for Health and the Environment.

Click on link: https://www.youtube.com/watch?v=n7L21XOC2wA

Question 4.

ANSWER: see above

Question 5.

ANSWER: The meter has been known to spontaneously combust i.e. and start catch fire.

Question 6.

ANSWER: Click on links: https://www.youtube.com/watch?v=7MfiNYzdi24&t=1472s

https://www.youtube.com/watch?v=AvjEk_LDwys

https://www.youtube.com/watch?v=Ah3nNo89-NU

Question 7.

ANSWER: March 12, 2015 **Ronald M. Powell, Ph.D.***

*Ronald M. Powell is a retired career U.S. Government scientist. He holds a Ph.D. in Applied Physics from Harvard University. During his Government career, he worked for the Executive Office of the President, the National Science Foundation, and the National Institute of Standards and Technology

Symptoms after Exposure to Smart Meter Radiation

People from coast to coast in the USA, and from one side of the world to the other, are becoming ill after exposure to the radio frequency radiation emitted by Wireless Smart Meters. Attached are the results of two surveys of the symptoms being reported.

The first survey comes from the United States and includes 318 respondents, from 28 states from California to New York, and addresses wireless utility meters that are principally Wireless Smart Meters. Most individuals surveyed developed multiple symptoms. Of the top seven clusters of symptoms in both surveys, six clusters are similar in description and nearly identical in order of occurrence: (1) sleep disruption; (2) headaches; (3) ringing or buzzing in the ears; (4) fatigue; (5) loss of concentration, memory, or learning ability; and (6) disorientation, dizziness, or loss of balance.

The survey does not tell us how likely a given individual is to become symptomatic after exposure to the radiation from Wireless Smart Meters. But the survey does tell us which symptoms a person who does become symptomatic is most likely to experience. The many symptoms found reflect the many body systems that are disrupted by such radiation.

A symptom, of course, is something that can be sensed by an individual, and thus can serve as a warning. Unfortunately, many health effects caused by radio-frequency radiation have no early symptoms and thus give no warning. These health effects become evident only after significant harm has been done. Examples are DNA damage, cancer, and reproduction effects.

OBJECTIVES

- To investigate reported public health and safety complaints about wireless utility meters
- To evaluate the impacts on health and safety due to wireless utility meters.
- To determine whether further study is warranted.

METHODS

Survey was designed by the EMF Safety Network (Network).

- The survey was circulated online through various social media outlets including Network's email list,
- Facebook, and the California EMF Safety Coalition (a discussion group). The survey was also posted on Network's website: www.emfsafetynetwork.org where

visitors were invited to take the survey.

- 443 responses were received from 7/13/2011 through 9/2/2011. (318 of the 443 answered the health questions that formed the basis for the table below on symptoms. RMPowell)
- Network commissioned Survey Design and Analysis (SDA) to provide this report of the survey findings.

RESPONDENT MAKEUP

- 93% are over 40 years old and 43% are over 60 years old
- 73% are women.
- 78% are from California.
- 68% have Pacific Gas and Electric (PG&E) as their utility provider.
- 49% are EMF Sensitive.
- 41% have had a new wireless meter installed in their home; of these . . .
- 56% have had it installed for at least six months
- 89% have electric meters,
- 53% gas meters and 10% water meters
- 35% saw an increase in their utility bill
- 26% have experienced some type of interference
- 8% experienced burned out appliances or damaged electronics including TV, stereo, computer, refrigerator and other.
- 76% indicated they have wireless utility meters installed in their neighborhood, town or city.
- 44% near their home
- 36% in town

TOP HEALTH ISSUES SINCE NEW METERS INSTALLED

- Sleep problems (mentioned by 49%)
- Stress, anxiety and irritability (43%)
- Headaches (40%) (Listed as 41% on symptoms bar graph, rounded up from 40.9%. RMPowell)
- Ringing in the ears (38%)
- Heart problems (26%)

UTILITY and PUBLIC UTILITY COMMISSION INTERACTIONS

(Title inserted by RMPowell.)

- 40% (111 people) of those having wireless meters in their homes or community have complained to their utility provider.
- 96% of these people were either "Unsatisfied" or "Very Unsatisfied" with the handling of their complaint.
- 32% (88 people) complained to the utilities commission.
- 96% of these people were either "Unsatisfied" or "Very Unsatisfied" with the handling of their complaint
- 94% of respondents want to retain or restore their analog meters and 92% of these respondents do not think they should have to pay any additional money.

STATISTICAL TESTING SHOWS THE TOP HEALTH SYMPTOMS ARE POSITIVELY ASSOCIATED WITH

- EMF Sensitivity
- Wireless meters installed in the home

RESULTS:

The most frequently reported symptoms from exposure to smart meters were (1) insomnia, (2) headaches, (3) tinnitus, (4) fatigue, (5) cognitive disturbances, (6) dysesthesias (abnormal sensation), and (7) dizziness. The effects of these symptoms on people's lives were significant.

CONCLUSIONS:

Review of some key studies, both recent and old (1971), reveals that the participants' symptoms were the same as those reported by people exposed to radio frequency fields emitted by devices other than smart meters. Interestingly, the vast majority of Victorian cases did not state that they had been sufferers of electromagnetic hypersensitivity syndrome (EHS) prior to exposure to the wireless meters, which points to the possibility that smart meters may have unique characteristics that lower people's threshold for symptom development.

Question 8.

ANSWER: n/a

Question 9.

ANSWER: n/a

Question 10.

ANSWER: n/a

Question 11.

ANSWER: n/a

Question 12.

ANSWER: Mechanical Engineering Degree Graduated 1964 University Duesseldorf Germany

Question 13.

ANSWER: n/a

Question 14.

ANSWER: n/a

Question 15 a, b, c

ANSWER: Interviewed by Joe Delano KDKA September 2017

click on link: https://www.youtube.com/watch?v=cMnjRHe-9UA

Question 16.

ANSWER: same as above

Question 17.

ANSWER:

Reported Biological Effects from Non-Thermal Radiofrequency Radiation at Low-Intensity Exposure (Cell Tower, Wi-Fi, Wireless Laptop and 'Smart' Meter RF Intensities) Power Density Values in Microwatts/centimeter^2 - uW/cm^2

References and date of discovery

As low as (10^{-13}) or 100 femtowatts/cm^2

Super-low intensity RFR effects at MW resonant frequencies resulted in changes in genes; problems with chromatin conformation (DNA) Belyaev, 1997

5 picowatts/cm^2 (10^{-12})

Changed growth rates in yeast cells - Grundler, 1992

0.1 nanowatt/cm2(10^{-10}) or 100 Super-low picowatts/cm2 intensity RFR effects at MW resonant frequencies resulted in changes in genes; problems with chromatin condensation (DNA) intensities comparable to base stations - Belyaev, 1997

0.00034 uW/cm^2 Chronic exposure to mobile phone pulsed RF significantly reduced sperm count. - Behari, 2006

0.0005 uW/cm^2 RFR decreased cell proliferation at 960 MHz GSM 217 Hz for 30-min exposure Velizarov, 1999

0.0006 - 0.0128 uW/cm^2

Fatigue, depressive tendency, sleeping disorders, concentration difficulties, cardio- vascular problems reported with exposure to GSM 900/1800 MHz cell phone signal at base station level exposures. - Oberfeld, 2004

0.003 - 0.02 uW/cm2

In children and adolescents (8-17 yrs) short-term exposure caused headache, irritation, concentration difficulties in school. - Heinrich, 2010

0.003 to 0.05 uW/cm2

In children and adolescents (8-17 yrs) short-term exposure caused conduct problems in school (behavioral problems) - Thomas, 2010

0.005 uW/cm2

In adults (30-60 yrs) chronic exposure caused sleep disturbances, (but not significantly increased across the entire population) - Mohler, 2010

0.005 - 0.04 uW/cm2

Adults exposed to short-term cell phone radiation reported headaches, concentration difficulties (differences not significant, but elevated) - Thomas, 2008

0.006 - 0.01 uW/cm2

Chronic exposure to base station RF (whole-body) in humans showed increased stress hormones; dopamine levels substantially decreased; higher levels of adrenaline and nor-adrenaline; dose-response seen; produced chronic physiological stress in cells even after 1.5 years. - Buchner, 2012

0.01 - 0.11 uW/cm2 RFR from cell towers caused fatigue, headaches, sleeping problems Navarro, 2003

0.01 - 0.05 uW/cm2

Adults (18-91 yrs) with short-term exposure to GSM cell phone radiation reported headache, neurological problems, sleep and concentration problems. - Hutter, 2006

0.005 - 0.04 uW/cm2

Adults exposed to short-term cell phone radiation reported headaches, concentration difficulties (differences not significant, but elevated) - Thomas, 2008

0.015 - 0.21 uW/cm2

Adults exposed to short-term GSM 900 radiation reported changes in mental state (e.g., calmness) but limitations of study on language descriptors prevented refined word choices (stupefied, zoned-out) - Augner, 2009

0.05 - 0.1 uW/cm2 RFR linked to adverse neurological, cardio symptoms and cancer risk Khurana, 2010

0.05 - 0.1 uW/cm2 RFR related to headache, concentration and sleeping problems, fatigue Kundi, 2009

0.07 - 0.1 uW/cm2

Sperm head abnormalities in mice exposed for 6-months to base station level RF/MW. Sperm head abnormalities occurred in 39% to 46% exposed mice (only 2% in controls) abnormalities was also found to be dose dependent. The implications of the pin-head and banana-shaped sperm head. The occurrence of sperm head observed increase occurrence of sperm head abnormalities on the reproductive health of humans living in close proximity to GSM base stations were discussed." - Otitoloju, 2010

0.38 uW/cm2 RFR affected calcium metabolism in heart cells - Schwartz, 1990

0.8 - 10 uW/cm2 RFR caused emotional behavior changes, free-radical damage by super-weak MWs - Akoev,

2002

0.13 uW/cm2 RFR from 3G cell towers decreased cognition, well-being Zwamborn, 2003

0.16 uW/cm2 Motor function, memory and attention of school children affected (Latvia) Kolodynski, 1996

0.168 - 1.053 uW/cm2

Irreversible infertility in mice after 5 generations of exposure to RFR from an 'antenna park'

Magras & Zenos, 1997

0.2 - 8 uW/cm2 RFR caused a two-fold increase in leukemia in children - Hocking, 1996

0.2 - 8 uW/cm2 RFR decreased survival in children with leukemia - Hocking, 2000

0.21 - 1.28 uW/cm2 Adolescents and adults exposed only 45 min to UMTS cell phone radiation reported increases In headaches. - Riddervold, 2008

0.5 uW/cm2 Significant degeneration of seminiferous epithelium in mice at 2.45 GHz, 30-40 min. Saunders, 1981

0.5 - 1.0 uW/cm2

Wi-FI level laptop exposure for 4-hr resulted in decrease in sperm viability, DNA fragmentation with sperm samples placed in petri dishes under a laptop connected via WI-FI to the internet.

Avendano, 2012

1.0 uW/cm2 RFR induced pathological leakage of the blood-brain barrier. - Persson, 1997

1.0 uW/cm2 RFR caused significant effect on immune function in mice. - Fesenko, 1999

1.0 uW/cm2 RFR affected function of the immune system. - Novoselova, 1999

1.0 – 10 uW/cm2

Short-term (50 min) exposure in electrosensitive patients, caused loss of well-being after GSM and especially UMTS cell phone radiation exposure.- Eltiti, 2007

1.3 - 5.7 uW/cm2 RFR associated with a doubling of leukemia in adults - Dolk, 1997

1.25 uW/cm2 RFR exposure affected kidney development in rats (in-utero exposure) - Pyrpasopoulou, 2004

1.5 uW/cm2 RFR reduced memory function in rats - Nittby, 2007.

2 uW/cm2 RFR induced double-strand DNA damage in rat brain cells - Kesari, 2008

2.5 uW/cm2 RFR affected calcium concentrations in heart muscle cells. - Wolke, 1996

2 - 4 uW/cm2 Altered cell membranes; acetycholine-induced ion channel disruption - D'Inzeo, 1988

4 uW/cm2 RFR caused changes in hippocampus (brain memory and learning)- Tattersall, 2001

4 - 15 uW/cm2 Memory impairment, slowed motor skills and retarded learning in children Chiang, 1989

5 uW/cm2 RFR caused drop in NK lymphocytes (immune function decreased) - Boscolo, 2001

5.25 uW/cm2 20 minutes of RFR at cell tower frequencies induced cell stress response Kwee, 2001

5 - 10 uW/cm2 RFR caused impaired nervous system activity - Dumansky, 1974

6 uW/cm2 RFR induced DNA damage in cells - Phillips, 1998

8.75 uW/cm2 RFR at 900 MHz for 2-12 hours caused DNA breaks in leukemia cells - Marinelli, 2004

10 uW/cm2 Changes in behavior (avoidance) after 0.5 hour exposure to pulsed RFR Navakatikian, 1994

10 - 100 uW/cm2

Increased reported

risk in radar operators of cancer; very short latency period; dose response to exposure level of RFR - Richter, 2000

12.5 uW/cm2 RFR caused calcium efflux in cells - can affect many critical cell functions

Dutta, 1989

13.5 uW/cm2 RFR affected human lymphocytes - induced stress response in cells - Sarimov, 2004

20 uW/cm2 Increase in serum cortisol (a stress hormone) - Mann, 1998

28.2 uW/cm2 RFR increased free radical production in rat cells - Yurekli, 2006

37.5 uW/cm2 Immune system effects - elevation of PFC count (antibody producing cells Veyret, 1991

45 uW/cm2 Pulsed RFR affected serum testosterone levels in mice - Forgacs, 2006

50 uW/cm2 Cell phone RFR caused a pathological leakage of the blood-brain barrier in 1 hour Salford, 2003

50 uW/cm2 An 18% reduction in REM sleep (important to memory and learning functions) - Mann, 1996

60 uW/cm2 RFR caused structural changes in cells of mouse embryos -Somozy, 1991

60 uW/cm2 Pulsed RFR affected immune function in white blood cells - Stankiewicz, 2006

60 uW/cm2 Cortex of the brain was activated by 15 minutes of 902 MHz cell phone

Lebedeva, 2000

65 uW/cm2 RFR affected genes related to cancer - Ivaschuk, 1999

92.5 uW/cm2 RFR caused genetic changes in human white blood cells - Belyaev, 2005

100 uW/cm2 Changes in immune function - Elekes, 1996

100 uW/cm2 A 24.3% drop in testosterone after 6 hours of CW RFR exposure - Navakatikian, 1994

120 uW/cm2 A pathological leakage in the blood-brain barrier with 915 MHz cell RF Salford, 1994

500 uW/cm2 Intestinal epithelial cells exposed to 2.45 GHz pulsed at 16 Hz showed changes in intercellular calcium. Somozy, 1993

500 uW/cm2 A 24.6% drop in testosterone and 23.2% drop in insulin after 12 hrs of pulsed RFR exposure. Navakatikian, 1994

STANDARDS

530 - 600 uW/cm2 Limit for uncontrolled public exposure to 800-900 MHz ANSI/IEEE and FCC

1000 uW/cm2 PCS STANDARD for public exposure (as of September 1,1997) FCC, 1996

5000 uW/cm2 PCS STANDARD for occupational exposure (as of September 1, 1997) FCC, 1996

BACKGROUND LEVELS

0.003 uW/cm2 Background RF levels in US cities and suburbs in the 1990s - Mantiply, 1997

0.05 uW/cm2 Median ambient power density in cities in Sweden (30-2000 MHz) - Hamnierius, 2000

0.1 - 10 uW/cm2 Ambient power density within 100-200' of cell site in US (data from 2000) Sage, 2000

***SAR (Watts/Kilogram)**

0.000064 - 0.000078 W/kg

Well-being and cognitive function affected in humans exposed to GSM-UMTS cell phone frequencies; RF levels similar near cell sites TNO Physics

0.00015 - 0.003 W/Kg

Calcium ion movement in isolated frog heart tissue is increased 18% (P<.01) and by 21% (P<.05) by weak RF field modulated at 16 Hz - Schwartz, 1990

0.000021 - 0.0021 W/Kg

Changes in cell cycle; cell proliferation (960 MHz GSM mobile phone) - Kwee, 1997

0.0003 - 0.06 W/Kg

Neurobehavioral disorders in offspring of pregnant mice exposed in utero to cell phones - dose-response impaired glutamatergic synaptic transmission onto layer V pyramidal neurons of the prefrontal cortex. Hyperactivity and impaired memory function in offspring. Altered brain development. Aldad, 2012

0.0016 - 0.0044 W/Kg

Very low power 700 MHz CW affects excitability of hippocampus tissue, consistent with reported behavioral changes. - Tattersall, 2001

0.0021 W/Kg

Heat cells

shock protein **__HSP 70__ is activated by very low intensity microwave exposure in human epithelial amnion - Kwee, 2001

0.0024 - 0.024 W/Kg

Digital cell phone RFR at very low intensities causes DNA damage in human cells; both DNA damage and impairment of DNA is reported - Phillips, 1998

0.0027 W/Kg

Changes radiation

in active avoidance conditioned behavioral effect is seen after one-half hour of pulsed radiofrequency

Navakatikian, 1994

0.0035 W/Kg

900 MHz cell phone signal induces DNA breaks and early activation of p53 gene; short exposure of 2-12 hours leads cells to acquire greater survival chance - linked to tumor aggressiveness.

Marinelli, 2004

0.0095 W/Kg

MW modulated at 7 Hz produces more errors in short-term memory function on complex tasks (can affect cognitive processes such as attention and memory)

Lass, 2002

0.001 W/Kg

750 MHz continuous wave (CW) RFR exposure caused increase in heat shock protein (stress proteins). Equivalent to what would be induced by 3 degree C. heating of tissue (but no heating occurred) - De Pomerai, 2000

0.001 W/Kg

Statistically significant change in intracellular calcium concentration in heart muscle cells exposed to RFR (900 MHz/50 Hz modulation) - Wolke, 1996

0.0021 W/Kg

A significant change in cell proliferation not attributable to thermal heating. RFR induces non-thermal stress proteins (960 MHz GSM) - Velizarov, 1999

0.004 - 0.008 W/Kg

915 MHz cell phone RFR caused pathological leakage of blood-brain barrier. Worst at lower SAR levels and worse with CW compared to Frequency of pathological changes was 35% in rats exposed to pulsed radiation at 50% to continuous wave RFR. Effects observed at a specific absorption (SA) of > 1.5 joules/Kg in human tissues - Persson, 1997

0.0059 W/Kg

Cell phone RFR induces glioma (brain cancer) cells to significantly increase thymidine uptake, which may be indication of more cell division - Stagg, 1997

0.014 W/Kg

Sperm damage from oxidative stress and lowered melatonin levels resulted from 2-hr per day/45 days exposure to 10 GHz. - Kumar, 2012

0.015 W/Kg Immune system effects - elevation of PFC count (antibody-producing cells) Veyret, 1991

0.02 W/Kg

A single, 2-hr exposure to GSM cell phone radiation results in serious neuron damage (brain cell damage) and death in cortex, hippocampus, and basal ganglia of brain- even 50+ days later blood-brain barrier is still leaking albumin (P<.002) following only one cell phone exposure - Salford, 2003

0.026 W/Kg

Activity of c-jun (oncogene or cancer gene) was altered in cells after 20 minutes exposure to cell phone digital TDMA signal - Ivaschuk, 1997

0.0317 W/Kg Decrease in eating and drinking behavior Ray, 1990

0.037 W/Kg Hyperactivity caused by nitric oxide synthase inhibitor is countered by exposure to ultra-wide band pulses (600/sec) for 30 min - Seaman, 1999

0.037 - 0.040 W/Kg

A 1-hr cell phone exposure causes chromatin condensation; impaired DNA repair mechanisms; last 3 days (longer than stress response) the effect reaches saturation in only one hour of exposure; electro- sensitive (ES) people have different response in formation of DNA repair foci, compared to healthy individuals; effects depend on carrier frequency (915 MHz = 0.037 W/Kg but 1947 MHz = 0.040 W/Kg) - Belyaev, 2008

0.05 W/Kg

Significant increase in firing rate of neurons (350%) with pulsed 900 MHz cell phone radiation exposure (but not with CW) in avian brain cells Beason, 2002

0.09 W/Kg

900 MHz study of mice for 7 days, 12-hr per day (whole-body) resulted in significant effect on mitochondria and genome stability - Aitken, 2005

0.091 W/Kg

Wireless internet 2400 MHz, 24-hrs per day/20 weeks increased DNA damage and reduced DNA repair; levels below 802.11 g Authors say "findings raise questions about safety of radiofrequency exposure from Wi-Fi internet access devices for growing organisms of reproductive age, with a potential effect on fertility and integrity of germ cells" (male germ cells are the reproductive cells=sperm) - Atasoy, 2012

0.11 W/Kg

Increased study

cell death (apoptosis) and DNA fragmentation at 2.45 GHz for 35 days exposure (chronic exposure - Kesari, 2010

0.121 W/Kg

Cardiovascular system shows significant decrease in arterial blood pressure (hypotension) after exposure to ultra-wide band pulses - Lu, 1999

0.13 - 1.4 W/Kg

Lymphoma cancer rate doubled with two 1/2-hr exposures per day of cell phone radiation for 18 months (pulsed 900 MHz cell signal) - Repacholi, 1997

0.14 W/Kg Elevation of immune response to RFR exposure Elekes, 1996

0.141 W/Kg Structural changes in testes - smaller diameter of seminiferous Dasdag, 1999

0.15 - 0.4 W/Kg Statistically significant increase in malignant tumors in rats chronically exposed to RFR - Chou, 1992

0.26 W/Kg Harmful effects to the eye/certain drugs sensitize the eye to RFR - Kues, 1992

0.28 - 1.33 W/Kg

Significant increase in reported headaches with increasing use of hand-held cell phone use (maximum tested was 60 min per day) - Chia, 2000

0.3 - 0.44 W/Kg Cell phone use results in changes in cognitive thinking/mental tasks related to memory retrieval - Krause, 2000

0.3 - 0.44 W/Kg Attention function of brain and brain responses are speeded up - Preece, 1999

0.3 - 0.46 W/Kg

Cell phone RFR doubles pathological leakage of blood-brain barrier permeability at two days (P=.002) and triples permeability at four days (P=.001) at 1800 MHz GSM cell phone radiation - Schirmacher, 2000

0.43 W/Kg

Significant decrease in sperm mobility; drop in sperm concentration; and decrease in seminiferous tubules at 800 MHz, 8-hr/day, 12 weeks, with mobile phone radiation level on STANDBY ONLY (in rabbits) - Salama, 2008

0.5 W/Kg 900 MHz pulsed RF affects firing rate of neurons (Lymnea stagnalis) but continuous wave had no effect - Bolshakov, 1992

0.58 - 0.75 W/Kg Decrease in brain tumors after chronic exposure to RFR at 836 MHz Adey1999

0.6 - 0.9 W/Kg

Mouse embryos develop fragile cranial bones from in utero 900 MHz The authors say "(O)ur results clearly show that even modest exposure (e.g., 6 min daily for 21 days" is sufficient to interfere with the normal mouse developmental process" - Fragopoulou, 2009

0.6 and 1.2 W/Kg Increase in DNA single and double-strand DNA breaks in rat brain cells with exposure to 2450 MHz RFR - Lai & Singh, 1996

0.795 W/Kg

GSM 900 MHz, 217 Hz significantly decreases ovarian development and size of ovaries, due to DNA damage and premature cell death of nurse cells and follicles in ovaries (that nourish egg cells) - Panagopoulous, 2012

0.87 W/kg

Altered human mental performance after exposure to GSM cell phone radiation (900 MHz TDMA digital cell phone signal) - Hamblin, 2004

0.87 W/kg

Change in human brainwaves; decrease in EEG potential and statistically significant change in alpha (8-13 Hz) and beta (13-22 Hz) brainwave activity in humans at 900 MHz; exposures 6/min per day for 21 days (chronic exposure) - D'Costa, 2003

0.9 W/Kg Decreased sperm count and more sperm cell death (apoptosis) after 35 days exposure, 2-hr per day - Kesari, 2012

< 1.0 W/kg

Rats exposed to mobile phone radiation on STANDBY ONLY for 11-hr 45-min plus 15-min TRANSMIT mode; 2 times per day for 21 days showed decreased number of ovarian follicles in pups born to these pregnant rats. The authors conclude "the decreased number of follicles in pups exposed to mobile phone microwaves suggest that intrauterine exposure has toxic effects on ovaries." - Gul, 2009

0.4 - 1.0 W/kg

One 6-hr exposure to 1800 MHz cell phone radiation in human sperm cells caused a significant dose response and reduced sperm motility and viability; reactive oxygen species levels were significantly increased after exposure to 1.0 W/Kg; study confirms detrimental effects of RF/MW to human sperm. The authors conclude "These findings have clear implications for the safety of extensive mobile phone use by males of reproductive age, potentially affecting both their fertility and the health and wellbeing of their offspring." - De Iuliis, 2009

1.0 W/Kg Human semen degraded by exposure to cell phone frequency RF increased free-radical damage. - De Iuliis, 2009

1.0 W/Kg

Motility, sperm count, sperm morphology, and viability reduced in active cell phone users (human males) in dose-dependent manner. - Agarwal, 2008

1.0 W/Kg GSM cell phone use modulates brain wave oscillations and sleep EEG Huber, 2002

1.0 W/Kg Cell phone RFR during waking hours affects brain wave activity. (EEG patterns) during subsequent sleep Achermann, 2000

1.0 W/Kg

Cell use

phone use causes nitric oxide (NO) nasal vasodilation (swelling inside nasal passage) on side of head phone - Paredi, 2001

1.0 W/Kg Increase in headache, fatigue and heating behind ear in cell phone users Sandstrom, 2001

1.0 W/Kg Significant increase in concentration difficulties using 1800 MHz cell phone compared to 900 MHz cell phone - Santini, 2001

1.0 W/Kg Sleep patterns and brain wave activity are changed with 900 MHz cell phone radiation exposure during sleep – Borbely, 1999

1.4 W/Kg

GSM cell phone exposure induced heat shock protein HSP 70 by 360% (stress response) and phosphorylation of ELK-1 by 390% - Weisbrot, 2003

1.46 W/Kg

850 MHz cell phone radiation decreases sperm motility, viability is significantly decreased; increased oxidative damage (free-radicals) significantly decreased; increased oxidative damage (free-radicals)-Agarwal, 2009

1.48 W/Kg

A significant decrease in protein kinase C activity at 112 MHz with 2-hr per day for 35 days; hippocampus is site, consistent with reports that RFR negatively affects learning and memory functions - Paulraj, 2004

1.0 - 2.0 W/Kg Significant elevation in micronuclei in peripheral blood cells at 2450 MHz (8 treatments of 2-hr each) - Trosic, 2002

1.5 W/Kg

GSM cell phone exposure affected gene expression levels in tumor suppressor p53-deficient embryonic stem cells; and significantly increased HSP 70 heat shock protein production - Czyz, 2004

1.8 W/Kg
Whole-body exposure to RF cell phone radiation of 900-1800 MHz 1 cm from head of rats caused high incidence of sperm cell death; deformation of sperm cells; prominent clumping together of sperm cells into "grass bundle shapes" that are unable to separate/swim. Sperm cells unable to swim and fertilize in normal manner. - Yan,

2.0 W/Kg

GSM cell phone exposure of 1-hr activated heat shock protein HSP 27 (stress response) and P38 MAPK (mutagen-activated protein kinase) that authors say facilitates brain cancer and increased blood-brain barrier permeability, allowing toxins to cross BBB into brain - Leszczynski, 2002

2 W/Kg

900 MHz cell phone exposure caused brain cell oxidative damage by increasing levels of NO, MDA, XO and ADA in brain cells; caused statistically significant increase in 'dark neurons' or damaged brain cells in cortex, hippocampus and basal ganglia with a 1-hr exposure for 7 consecutive days - Ilhan, 2004

2.6 W/Kg

900 MHz cell phone exposure for 1-hr significantly altered protein expression levels in 38 proteins following irradiation; activates P38 MAP kinase stress signaling pathway and leads to changes in cell size and shape

(shrinking and rounding up) and to activation of HSP 27, a stress protein (heat shock protein) - Leszczynski, 2004

2.0 - 3.0 W/Kg RFR accelerated development of both skin and breast tumors - Szmigielski, 1982

2 W/Kg Pulse-modulated RFR and MF affect brain physiology (sleep study) - Schmidt, 2012

STANDARDS

0.08 W/Kg IEEE Standard uncontrolled public environment (whole body) IEEE

0.4 W/Kg IEEE Standard controlled occupational environment (whole body) IEEE

1.6 W/Kg FCC (IEEE) SAR limit for 1 gram of tissue in a partial body exposure FCC, 1996

2 W/Kg ICNIRP SAR limit for 10 grams of tissue ICNIRP, 1996

**SAR

Specific Absorption Rate (SAR) is the unit of measurement for the amount of radio frequency energy absorbed by a body when using a wireless device. The SAR Calculator requires you to enter the Electric Field (V/m), Conductivity of the Material (S/m) and Mass Density (kg/m3). It gives the SAR value in W/kg and the power density. The RF exposure limits used are expressed in the terms of SAR, which is a measure of the electric/magnetic field strength and power density for transmitters operating at frequencies from 300 kHz to 100 GHz. The FCC and federal governmental agencies around the world require that any wireless device be evaluated to meet the RF exposure limits set forth in the governmental SAR regulations.

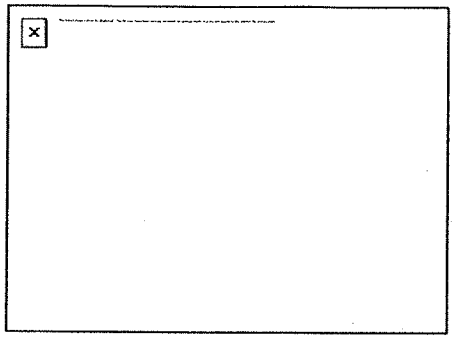
Where,
σ = Conductivity of Material
E = Electric Field(RMS)
m_d = Mass Density

Formula

$$\text{Power Density} = \frac{E^2}{377}$$

Example:
If Electric field(rms)= 4 V/m, conductivity of material =150 S/m, mass density = 1250 kg/m^3
Then, Specific Absorption Rate = 1.92 W/kg and
Power Density = 0.042

**HSP 70



Structure of the ATPase fragment of a 70K heat-shock cognate protein.[1]

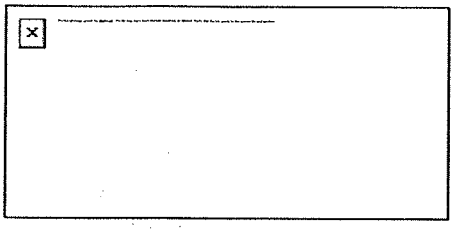
Identifiers	
Symbol	HSP70
Pfam	PF00012
Pfam clan	CL0108
InterPro	IPR013126
PROSITE	PDOC00269
SCOP	3hsc
SUPERFAMILY	3hsc

The 70 kilodalton heat shock proteins (Hsp70s or DnaK) are a family of conserved ubiquitously expressed heat shock proteins. Proteins with similar structure exist in virtually all living organisms. The Hsp70s are an important part of the cell's machinery for protein folding and help to protect cells from stress.

Discovery

Members of the Hsp70 family are very strongly upregulated by heat stress and toxic chemicals, particularly heavy metals such as arsenic, cadmium, copper, mercury, etc. Hsp70 was originally discovered by FM Ritossa in the 1960s when a lab worker accidentally boosted the incubation temperature of Drosophila (fruit flies). When examining the chromosomes, Ritossa found a "puffing pattern" that indicated the elevated gene transcription of an unknown protein. This was later described as the "Heat Shock Response" and the proteins were termed the "Heat Shock Proteins" (Hsps).

Structure



Hsp70 (pdb database 2KHO). Left domain is NBD (Nucleotide Binding domain) which can bind to ATP and ADP. Right lower domain is the groove, Subtrate Binding domain. Right upper domain is the "lid". (α-helices are shown in red. β-strands are shown in green.)

The Hsp70 proteins have three major functional domains:

- N-terminal ATPase **domain** – binds ATP (Adenosine triphosphate) and hydrolyzes it to ADP (Adenosine diphosphate). The NBD consists of two lobes with a deep cleft between them, at the bottom of which nucleotide (ATP and ADP) binds. The exchange of ATP and ADP leads to conformational changes in the other two domains.
- **Substrate binding domain** – is composed of a 15 kDa β sheet subdomain and a 10 kDa helical subdomain. The β sheet subdomain consists of stranded β sheets with upward protruding loops, as a typical β barrel, which enclose the peptide backbone of the substrate. SBD contains a groove with an affinity for neutral, hydrophobic amino acid residues. The groove is long enough to interact with peptides up to seven residues in length.
- C-terminal **domain** – rich in alpha helical structure acts as a 'lid' for the substrate binding domain. The helical subdomain consists of five helices, with two helices packed against two sides of the β sheet subdomain, stabilizing the inner structure. In addition, one of the helix forms a salt bridge and several hydrogen bonds to the outer Loops, thereby closing the substrate-binding pocket like a lid. Three helices in this domain form another hydrophobic core which may be stabilization of the "lid". When an Hsp70 protein is ATP bound, the lid is open and peptides bind and release relatively rapidly. When Hsp70 proteins are ADP bound, the lid is closed, and peptides are tightly bound to the substrate binding domain.

Function and regulation

The Hsp70 system interacts with extended peptide segments of proteins as well as partially folded proteins to prevent aggregation, remodel folding pathways, and regulate activity When not interacting with a substrate peptide, Hsp70 is usually in an ATP bound state. Hsp70 by itself is characterized by a very weak ATPase activity, such that spontaneous hydrolysis will not occur for many minutes. As newly synthesized proteins emerge from the ribosomes, the substrate binding domain of Hsp70 recognizes sequences of hydrophobic amino acid residues, and interacts with them. This spontaneous interaction is reversible, and in the ATP bound state Hsp70 may relatively freely bind and release peptides. However, the presence of a peptide in the binding domain stimulates the ATPase activity of Hsp70, increasing its normally slow rate of ATP hydrolysis. When ATP is hydrolyzed to ADP the binding pocket of Hsp70 closes, tightly binding the now-trapped peptide chain. Further speeding ATP hydrolysis are the so-called J-domain cochaperones: primarily Hsp40 in eukaryotes, and DnaJ in prokaryotes. These cochaperones dramatically increase the ATPase activity of Hsp70 in the presence of interacting peptides.

By binding tightly to partially synthesized peptide sequences (incomplète proteins), Hsp70 prevents them from aggregating and being rendered nonfunctional. Once the entire protein is synthesized, a nucleotide exchange factor (BAG-1 and HspBP1 are among those which have been identified)

stimulates the release of ADP and binding of fresh ATP, opening the binding pocket. The protein is then free to fold on its own, or to be transferred to other chaperones for further processing. HOP (the **H**sp70/Hsp90 **O**rganizing **P**rotein) can bind to both Hsp70 and Hsp90 at the same time, and mediates the transfer of peptides from Hsp70 to Hsp90.[8]

Hsp70 also aids in transmembrane transport of proteins, by stabilizing them in a partially folded state. It is also known to be phosphorylated which regulates several of its functions.

Hsp70 proteins can act to protect cells from thermal or oxidative stress. These stresses normally act to damage proteins, causing partial unfolding and possible aggregation. By temporarily binding to hydrophobic residues exposed by stress, Hsp70 prevents these partially denatured proteins from aggregating, and allows them to refold. Low ATP is characteristic of heat shock and sustained binding is seen as aggregation suppression, while recovery from heat shock involves substrate binding and nucleotide cycling. In a thermophile anaerobe (*Thermotoga maritima*) the Hsp70 demonstrates redox sensitive binding to model peptides, suggesting a second mode of binding regulation based on oxidative stress.

Hsp70 seems to be able to participate in disposal of damaged or defective proteins. Interaction with CHIP(*C*arboxyl-terminus of *H*sp70 *I*nteracting *P*rotein)–an E3 ubiquitin ligase–allows Hsp70 to pass proteins to the cell's ubiquitination and proteolysis pathways.[13]

Finally, in addition to improving overall protein integrity, Hsp70 directly inhibits apoptosis. One hallmark of apoptosis is the release of cytochrome c, which then recruits Apaf-1 and dATP/ATP into an apoptosome complex. This complex then cleaves procaspase-9, activating caspase-9 and eventually inducing apoptosis via caspase-3 activation. Hsp70 inhibits this process by blocking the recruitment of procaspase-9 to the Apaf-1/dATP/cytochrome c apoptosome complex. It does not bind directly to the procaspase-9 binding site, but likely induces a conformational change that renders procaspase-9 binding less favorable. Hsp70 is shown to interact with Endoplasmic reticulum stress sensor protein IRE1alpha thereby protecting the cells from ER stress - induced apoptosis. This interaction prolonged the splicing of XBP-1 mRNA thereby inducing transcriptional upregulation of targets of spliced XBP-1 like EDEM1, ERdj4 and P58IPK rescuing the cells from apoptosis.[15] Other studies suggest that Hsp70 may play an anti-apoptotic role at other steps, but is not involved in Fas-ligand-mediated apoptosis (although Hsp 27 is). Therefore, Hsp70 not only saves important components of the cell (the proteins) but also directly saves the cell as a whole. Considering that stress-response proteins (like Hsp70) evolved before apoptotic machinery, Hsp70's direct role in inhibiting apoptosis provides an interesting evolutionary picture of how more recent (apoptotic) machinery accommodated previous machinery (Hsps), thus aligning the improved integrity of a cell's proteins with the improved chances of that particular cell's survival.

Cancer

Hsp70 is overexpressed in malignant melanoma and under expressed in renal cell cancer.

Expression in skin tissue

Both HSP70 and sp70 genesHSP47 were shown to be expressed in dermis and epidermis following laser irradiation, and the spatial and temporal changes in HSP expression patterns define the laser-induced thermal damage zone and the process of healing in tissues. HSP70 may define biochemically the thermal damage zone in which cells are targeted for destruction, and HSP47 may illustrate the process of recovery from thermally induced damage.

Family members

Prokaryotes express three Hsp70 proteins: DnaK, HscA (Hsc66), and HscC (Hsc62).[20]

Eukaryotic organisms express several slightly different Hsp70 proteins. All share the common domain structure, but each has a unique pattern of expression or subcellular localization. These are, among others:

- Hsc70 (Hsp73/HSPA8) is a constitutively expressed chaperone protein. It typically makes up one to three percent of total cellular protein.
- Hsp70 (encoded by three very closely related paralogs: HSPA1A, HSPA1B, and HSPA1L) is a stress-induced protein. High levels can be produced by cells in response to hyperthermia, oxidative stress, and changes in pH.
- Binding immunoglobulin protein (BiP or Grp78) is a protein localized to the endoplasmic reticulum. It is involved in protein folding there and can be upregulated in response to stress or starvation.
- mtHsp70 or Grp75 is the mitochondrial Hsp70.

The following is a list of human H and their corresponding proteins:

gene	protein	synonyms	subcellular location
HSPA1A	Hsp70	HSP70-1, Hsp72	Nuc/Cyto
HSPA1B	Hsp70	HSP70-2	Nuc/Cyto
HSPA1L	Hsp70		?
HSPA2	Hsp70-2		?
HSPA4	Hsp70-4		?
HSPA4L	Hsp70-4L		?
HSPA5	Hsp70-5	BiP/Grp78	ER
HSPA6	Hsp70-6		?
HSPA7	Hsp70-7		?
HSPA8	Hsp70-8	Hsc70	Nuc/Cyto
HSPA9	Hsp70-9	Grp75/mtHsp70	Mito

HSPA12A	Hsp70-12a		?
HSPA14	Hsp70-14		?

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Question 18.

ANSWER: included in above

Question 19.

ANSWER: a) Elizabeth Pluourde, C.L.S., NCMP, Ph.D. EMF Freedom b) unknown

c) click on link: https://www.youtube.com/watch?v=hXLuZEPbQgw

Question 20.

ANSWER: This is not applicable since I still have an Analog Meter.

Sincerely,

Norbert Sliwinski

Appendix Tab 9

BEFORE THE PENNSYLVANIA PUBLIC UTILITY COMMISSION

NORBERT SLIWINSKI,

Complainant, vs. DUQUESNE LIGHT COMPANY, Respondent.

PUC Docket: C-2016-2559985

SECOND SET OF DISCOVERY REQUESTS TO COMPLAINANT

Respondent Duquesne Light Company ("Duquesne Light") serves its Second Set of Discovery Requests to Complainant pursuant to 52 Pa. Code SS 5.341 and 5.349 In accordance with 52 Pa. Code SS 5.342 and 5.349(d), Complainant Norbert Sliwinski ("Complainant") must respond to each discovery request within 20 days after being served with these discovery requests. Complainant's responses must be verified in accordance with 52 Pa.Code S 1.36. Duquesne Light reserves the right to serve additional discovery requests.

DEFINITIONS

A. The terms "You" and "Your" shall mean Complainant Norbert Sliwinski and any individual acting on his behalf.

B. The term "Formal Complaint" shall mean the Formal Complaint You filed against Duquesne Light with the Pennsylvania Public Utility Commission, Docket No. C-2016-2559985.

C. The term "Document" shall mean any written, typed, printed, graphic, or recorded material that is currently in Your possession, custody, or control or that was formerly in your possession, custody, or control. A Document is in Your "control" if You have ownership, possession, or custody of the Document or if You have the right to secure the Document or a copy from any person or entity that has possession of it. The term "Document" includes, but is not limited to, electronic mail or email, text messages, social media postings, comments, and messages, medical records, articles, studies, word processed documents, digital presentations, facsimiles, instant messages, calendars, diaries, appointment books, agendas, journals, drafts, voicemail messages, post cards, post-it notes, reports, logs, message slips, invoices, checks, paystubs, letters, memoranda, agreements, contracts, tax returns, bank statements, spreadsheets, video recordings, audio recordings, computer programs, printouts, and all other written, graphic, or electronic materials of any nature whatsoever.

INSTRUCTIONS

A. You must provide all information that is available to You. This includes not only Your personal knowledge but also all information that is reasonable available to You.

B. You are requested to produce all responsive Documents that are in Your possession, custody, or control. All Documents must be produced in the same order that they are normally maintained. For each Document, identify which specific discovery request it responds to.

C. If You object to any discovery request, You must explain the reason(s) for Your objection.

D. If You do not have any Documents in Your possession, custody, or control that are responsive to a discovery request, You must say so.

E. In responding to these discovery requests, include all Documents that were obtained by You and anyone acting on Your behalf. If You state that any Document(s) are not within Your possession, custody, or control, describe what effort You made to locate each such Document.

F. If You state that a Document is not under Your control, identify who has control of the Document and state the Document's location.

G. You must produce each Document in its entirety even if only part of the Document is responsive to the document request.

H. These discovery requests are continuing in nature. This means that if You receive or become aware of information that is responsive to any discovery request after You have served Your original answers, You must promptly supplement Your answer and provide that information.

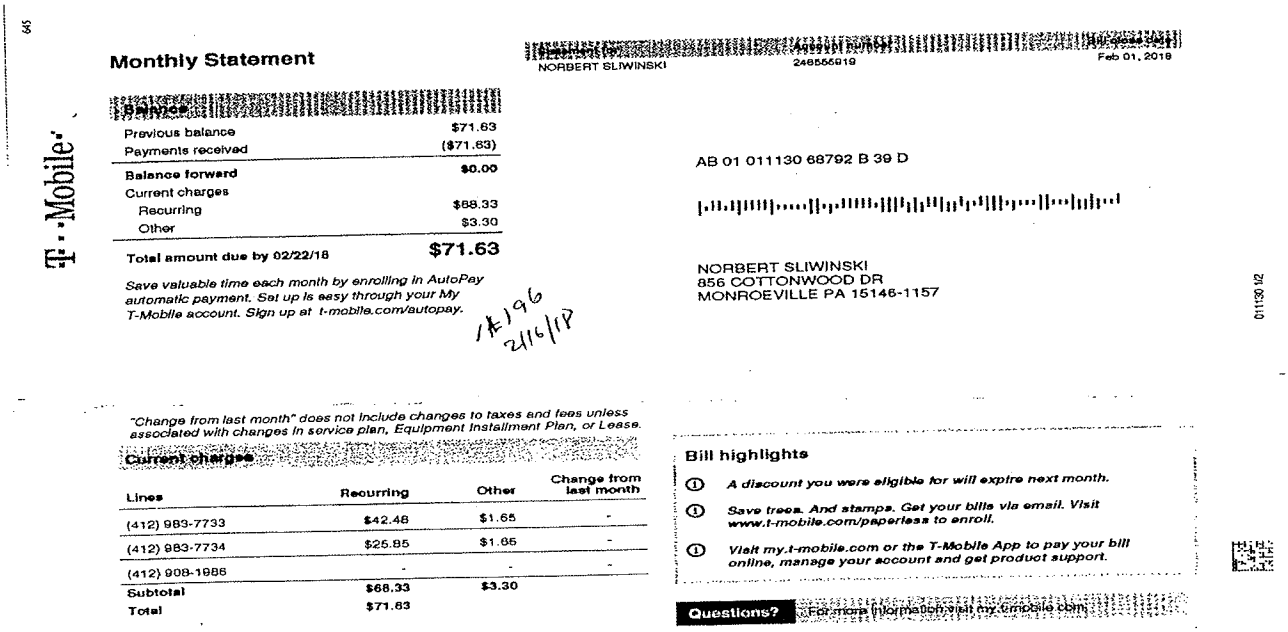
DISCOVERY REQUESTS

1. Identify the type (with make and model) of all devices, appliances, and equipment used in Your home or by You in Your daily life that produce radio frequency or low frequency fields, including, but not limited to, cell phones, microwave ovens, wireless internet, and WI-FI routers.

ANSWER:***One 2009 GE Microwave Model JESCO737DNWW, two Samsung S4 Phone, one WiFi Router Actiontec MI424WR***

2. For each cell phone identified in response to the preceding request, produce the last six months of bills or other usage records for the phone with sufficient detail to show Your actual usage for that period.

ANSWER:



645

T-Mobile

Monthly Statement

NORBERT SLIWINSKI 248555919 Feb 01, 2018

Balance

Previous balance	$71.63
Payments received	($71.63)
Balance forward	**$0.00**
Current charges	
Recurring	$68.33
Other	$3.30
Total amount due by 02/22/18	**$71.63**

Save valuable time each month by enrolling in AutoPay automatic payment. Set up is easy through your My T-Mobile account. Sign up at t-mobile.com/autopay.

1A196 2/16/18

AB 01 011130 68792 B 39 D

NORBERT SLIWINSKI
856 COTTONWOOD DR
MONROEVILLE PA 15146-1157

011130 1/2

"Change from last month" does not include changes to taxes and fees unless associated with changes in service plan, Equipment Installment Plan, or Lease.

Current charges

Lines	Recurring	Other	Change from last month
(412) 983-7733	$42.48	$1.65	-
(412) 983-7734	$25.85	$1.65	-
(412) 908-1986	-	-	-
Subtotal	$68.33	$3.30	
Total	$71.63		

Bill highlights

- *A discount you were eligible for will expire next month.*
- *Save trees. And stamps. Get your bills via email. Visit www.t-mobile.com/paperless to enroll.*
- *Visit my.t-mobile.com or the T-Mobile App to pay your bill online, manage your account and get product support.*

Questions? For more information, visit my.tmobile.com

Monthly Statement

Statement for NORBERT SLIWINSKI | Account number 248555919 | Jan 01, 2018

Balance

Previous balance	$73.87
Payments received	($73.87)
Balance forward	$0.00
Current charges	
Recurring	$68.33
Other	$3.30
Total amount due by 01/22/18	**$71.63**

Save valuable time each month by enrolling in AutoPay automatic payment. Set up is easy through your My T-Mobile account. Sign up at t-mobile.com/autopay.

J# 167 1/19/18

AB 01 014756 42989 B 49 A

NORBERT SLIWINSKI
856 COTTONWOOD DR
MONROEVILLE PA 15146-1157

014756 1/2

"Change from last month" does not include changes to taxes and fees unless associated with changes in service plan, Equipment Installment Plan, or Lease.

Current charges

Lines	Recurring	Other	Change from last month
(412) 983-7733	$42.48	$1.65	$2.19 ↓
(412) 983-7734	$26.85	$1.65	-
(412) 908-1986	-	-	-
Subtotal	$68.33	$3.30	
Total	$71.63		

Bill highlights

- *Save trees. And stamps. Get your bills via email. Visit www.t-mobile.com/paperless to enroll.*
- *Visit my.t-mobile.com or the T-Mobile App to pay your bill online, manage your account and get product support.*

Questions? For more information visit my.t-mobile.com

Monthly Statement

Statement for NORBERT SLIWINSKI | Account number 248555919 | Nov 01, 2017

Balance

Previous balance	$72.18
Payments received	($72.18)
Balance forward	$0.00
Current charges	
Recurring	$68.88
Other	$3.30
Total amount due by 11/22/17	**$72.18**

Save valuable time each month by enrolling in AutoPay automatic payment. Set up is easy through your My T-Mobile account. Sign up at t-mobile.com/autopay.

11/18/17

J# 113

AB 01 014745 94806 B 49 A

NORBERT SLIWINSKI
856 COTTONWOOD DR
MONROEVILLE PA 15146-1157

014745 1/2

"Change from last month" does not include changes to taxes and fees unless associated with changes in service plan, Equipment Installment Plan, or Lease.

Current charges

Lines	Recurring	Other	Change from last month
(412) 983-7733	$42.83	$1.65	-
(412) 983-7734	$26.05	$1.65	-
(412) 908-1986	-	-	-
Subtotal	$68.88	$3.30	
Total	$72.18		

Bill highlights

- *Important notice concerning rate plans with data benefits in Canada and Mexico: Starting 11/12/17 there will be changes to 4G LTE data when traveling in Mexico and Canada. For details, go to t-mo.co/CAMX*
- *Save trees. And stamps. Get your bills via email. Visit www.t-mobile.com/paperless to enroll.*
- *Visit my.t-mobile.com or the T-Mobile App to pay your bill online, manage your account and get product support.*

Questions? For more information visit my.t-mobile.com

Monthly Statement

NORBERT SLIWINSKI | Account number 248555919 | Bill cycle ends Sep 01, 2017

Balances

Previous balance	$72.05
Payments received	($72.05)
Balance forward	**$0.00**
Current charges	
Recurring	$68.75
Other	$3.43
Total amount due by 09/22/17	**$72.18**

Save valuable time each month by enrolling in AutoPay automatic payment. Set up is easy through your My T-Mobile account. Sign up at t-mobile.com/autopay.

V# 2511 9/16/17

AB 01 014594 41723 B 48 A

NORBERT SLIWINSKI
856 COTTONWOOD DR
MONROEVILLE PA 15146-1157

014594 1/2

"Change from last month" does not include changes to taxes and fees unless associated with changes in service plan, Equipment Installment Plan, or Lease.

Current charges

Lines	Recurring	Other	Change from last month
(412) 983-7733	$42.75	$1.78	$0.13 ↑
(412) 983-7734	$25.00	$1.65	-
(412) 908-1986	-	-	-
Subtotal	$68.75	$3.43	
Total	$72.18		

Bill highlights
Follow numbers throughout bill.

1. *You had usage charges.*
2. *Save trees. And stamps. Get your bills via email. Visit www.t-mobile.com/paperless to enroll.*
3. *Visit my.t-mobile.com or the T-Mobile App to pay your bill online, manage your account and get product support.*

Questions?

Monthly Statement

NORBERT SLIWINSKI | Account number 248555919 | Bill cycle ends Feb 01, 2018

Balances

Previous balance	$71.63
Payments received	($71.63)
Balance forward	**$0.00**
Current charges	
Recurring	$68.33
Other	$3.30
Total amount due by 02/22/18	**$71.63**

Save valuable time each month by enrolling in AutoPay automatic payment. Set up is easy through your My T-Mobile account. Sign up at t-mobile.com/autopay.

1# 196 2/16/18

AB 01 011130 68792 B 39 D

NORBERT SLIWINSKI
856 COTTONWOOD DR
MONROEVILLE PA 15146-1157

011130 1/2

"Change from last month" does not include changes to taxes and fees unless associated with changes in service plan, Equipment Installment Plan, or Lease.

Current charges

Lines	Recurring	Other	Change from last month
(412) 983-7733	$42.48	$1.65	-
(412) 983-7734	$25.85	$1.65	-
(412) 908-1986	-	-	-
Subtotal	$68.33	$3.30	
Total	$71.63		

Bill highlights

1. *A discount you were eligible for will expire next month.*
2. *Save trees. And stamps. Get your bills via email. Visit www.t-mobile.com/paperless to enroll.*
3. *Visit my.t-mobile.com or the T-Mobile App to pay your bill online, manage your account and get product support.*

Questions? For more information visit my.t-mobile.com

T · ·Mobile·

Monthly Statement

Billing for: NORBERT SLIWINSKI | Account Number: 248555919 | Bill close date: Oct 01, 2017

Balance

Previous balance	$72.18
Payments received	($72.18)
Balance forward	**$0.00**
Current charges	
Recurring	$68.88
Other	$3.30
Total amount due by 10/22/17	**$72.18**

Save valuable time each month by enrolling in AutoPay automatic payment. Set up is easy through your My T-Mobile account. Sign up at t-mobile.com/autopay.

AB 01 014648 68874 B 49 A

NORBERT SLIWINSKI
858 COTTONWOOD DR
MONROEVILLE PA 15146-1157

014646 1/2

"Change from last month" does not include changes to taxes and fees unless associated with changes in service plan, Equipment Installment Plan, or Lease.

Current charges

Lines	Recurring	Other	Change from last month
(412) 983-7733	$42.83	$1.65	$0.05 ↓
(412) 983-7734	$26.05	$1.65	-
(412) 908-1986	-	-	-
Subtotal	$68.88	$3.30	
Total	$72.18		

Bill highlights

- *Save trees. And stamps. Get your bills via email. Visit www.t-mobile.com/paperless to enroll.*
- *Visit my.t-mobile.com or the T-Mobile App to pay your bill online, manage your account and get product support.*

Questions? For more information visit my.t-mobile.com

J #2534 10/13/17

verizon

NORBERT SLIWINSKI
Primary Phone: 412-372-7338
Account Number: 150-780-078-0001-35
Bill Date: March 9, 2018

Ways to pay
- Via the My Fios app
- Online at verizon.com/PayOnline

Details of Payments

Payments activity since last bill date.

Payments

Previous Balance	136.14	
Payment Received - Thank You	-136.14	3/6
Balance Forward	**$.00**	

Details of Charges

Includes discounts shown on page 2.

Your monthly price after the discounts shown on page 2 were applied.

Fios Internet, TV & Phone Bundle

Your bundle includes Fios Internet 50/50, Fios TV Preferred HD and Fios Digital Voice Unlimited

Bundle Price	**$74.99**	3/10 - 4/9

Equipment and additional services to personalize your Fios service.

Services & Equipment

Services		
DVR Service	12.00	
Equipment		
Rent: 1 TV Equipment Package	5.99	
Rent: Digital Adapter 2 @ 7.99	15.98	
Subtotal	**$33.97**	3/10 - 4/9

Charges that vary monthly based on your account activity.

Your One-Time Activities

Long Distance Calls	.90	See Usage Detail

Includes both Verizon fees and governmental taxes and fees. For details, visit verizon.com/taxesandfees.

Fees & Other Charges

Taxes, Governmental Fees & Surcharges	
PA State and Local Sales Tax	5.13
Telecommunications Relay Service	.08
E911	1.65
Verizon Surcharges & Fees	
Video Franchise Fee	3.62
Federal Universal Service Fee	3.92
PA Gross Receipts Tax Surcharge	1.82
Regulatory Recovery Fee - Federal	.08
PEG Grant Fee	.06
Regional Sports Network Fee	6.39
Fios TV Broadcast Fee	3.49
FDV Administrative Charge	.99
Subtotal	**$27.23**

Total Due **$137.09**

verizon

NORBERT SLIWINSKI
Primary Phone: 412-372-7338
Account Number: 150-780-078-0001-35
Bill Date: April 9, 2018

Ways to pay
- Via the My Fios app
- Online at verizon.com/PayOnline

Details of Payments

Payments activity since last bill date.

Payments

Previous Balance	137.09	
Payment Received - Thank You	-137.09	3/21
Balance Forward	**$.00**	

Details of Charges

Includes discounts shown on page 2.

Fios Internet, TV & Phone Bundle

Your monthly price after the discounts shown on page 2 were applied.

Your bundle includes Fios Internet 50/50, Fios TV Preferred HD and Fios Digital Voice Unlimited

Bundle Price	**$74.99**	4/10 - 5/9

Services & Equipment

Equipment and additional services to personalize your Fios service.

Services		
DVR Service	12.00	
Equipment		
Rent: 1 TV Equipment Package	5.99	
Rent: Digital Adapter 2 @ 7.99	15.98	
Subtotal	**$33.97**	4/10 - 5/9

Your One-Time Activities

Charges that vary monthly based on your account activity.

Long Distance Calls	.20	See Usage Detail

Fees & Other Charges

Includes both Verizon fees and governmental taxes and fees. For details, visit verizon.com/taxesandfees.

Taxes, Governmental Fees & Surcharges	
PA State and Local Sales Tax	5.07
Telecommunications Relay Service	.08
E911	1.65
Verizon Surcharges & Fees	
Video Franchise Fee	3.62
Federal Universal Service Fee	3.70
PA Gross Receipts Tax Surcharge	1.81
Regulatory Recovery Fee - Federal	.08
PEG Grant Fee	.06
Regional Sports Network Fee	6.39
Fios TV Broadcast Fee	3.49
FDV Administrative Charge	.99
Subtotal	**$26.94**

Total Due **$136.10**

verizon

NORBERT SLIWINSKI
Primary Phone: 412-372-7338
Account Number: 150-780-078-0001-35
Bill Date: February 9, 2018

Ways to pay
- Via the My Fios app
- Online at verizon.com/PayOnline

Details of Charges

Includes discounts shown on page 2.

Fios Internet, TV & Phone Bundle

Your monthly price after the discounts shown on page 2 were applied.

Your bundle includes Fios Internet 50/50, Fios TV Preferred HD and Fios Digital Voice Unlimited

Bundle Price	**$74.99**	2/10 - 3/9

Services & Equipment

Equipment and additional services to personalize your Fios service.

Services		
DVR Service	12.00	
Equipment		
Rent: 1 TV Equipment Package	5.99	
Rent: Digital Adapter 2 @ 7.99	15.98	
Subtotal	**$33.97**	2/10 - 3/9

Fees & Other Charges

Includes both Verizon fees and governmental taxes and fees. For details, visit verizon.com/taxesandfees.

Taxes, Governmental Fees & Surcharges	
PA State and Local Sales Tax	5.08
Telecommunications Relay Service	.08
E911	1.65
Verizon Surcharges & Fees	
Video Franchise Fee	3.62
Federal Universal Service Fee	3.92
PA Gross Receipts Tax Surcharge	1.82
Regulatory Recovery Fee - Federal	.08
PEG Grant Fee	.06
Regional Sports Network Fee	6.39
Fios TV Broadcast Fee	3.49
FDV Administrative Charge	.99
Subtotal	**$27.18**

Total Due **$136.14**

verizon

NORBERT SLIWINSKI
Primary Phone: 412-372-7338
Account Number: 150-780-078-0001-35
Bill Date: January 9, 2018

Ways to pay
- Via the My Fios app
- Online at verizon.com/PayOnline

Details of Charges

Includes discounts shown on page 2.

Fios Internet, TV & Phone Bundle

Your monthly price after the discounts shown on page 2 were applied.

Your bundle includes Fios Internet 50/50, Fios TV Preferred HD and Fios Digital Voice Unlimited

Bundle Price	**$74.99**	1/10 - 2/9

Services & Equipment

Equipment and additional services to personalize your Fios service.

Services		
DVR Service	12.00	
Equipment		
Rent: 1 TV Equipment Package	5.99	
Rent: Digital Adapter 2 @ 7.99	15.98	
Subtotal	**$33.97**	1/10 - 2/9

Fees & Other Charges

Includes both Verizon fees and governmental taxes and fees. For details, visit verizon.com/taxesandfees.

Taxes, Governmental Fees & Surcharges	
PA State and Local Sales Tax	5.08
Telecommunications Relay Service	.08
E911	1.65
Verizon Surcharges & Fees	
Video Franchise Fee	3.62
Federal Universal Service Fee	3.92
PA Gross Receipts Tax Surcharge	1.82
Regulatory Recovery Fee - Federal	.08
PEG Grant Fee	.06
Regional Sports Network Fee	6.39
Fios TV Broadcast Fee	3.49
FDV Administrative Charge	.99
Subtotal	**$27.18**

Total Due **$136.14**

verizon

NORBERT SLIWINSKI
Primary Phone: 412-372-7338
Account Number: 150-780-078-0001-35
Bill Date: December 9, 2017

Ways to pay
- Via the My Fios app
- Online at verizon.com/PayOnline

Details of Charges

Includes discounts shown on page 2.

Fios Internet, TV & Phone Bundle

Your monthly price after the discounts shown on page 2 were applied.

Your bundle includes Fios Internet 50/50, Fios TV Preferred HD and Fios Digital Voice Unlimited

Bundle Price	**$74.99**	12/10 - 1/9

Services & Equipment

Equipment and additional services to personalize your Fios service.

Services		
DVR Service	12.00	
Equipment		
Rent: 1 TV Equipment Package	5.99	
Rent: Digital Adapter 2 @ 7.99	15.98	
Subtotal	**$33.97**	12/10 - 1/9

Fees & Other Charges

Includes both Verizon fees and governmental taxes and fees. For details, visit verizon.com/taxesandfees.

Taxes, Governmental Fees & Surcharges	
PA State and Local Sales Tax	5.06
Telecommunications Relay Service	.08
E911	1.65
Verizon Surcharges & Fees	
Video Franchise Fee	3.62
Federal Universal Service Fee	3.78
PA Gross Receipts Tax Surcharge	1.82
Regulatory Recovery Fee - Federal	.08
PEG Grant Fee	.06
Regional Sports Network Fee	6.39
Fios TV Broadcast Fee	3.49
FDV Administrative Charge	.99
Subtotal	**$27.02**

Total Due **$135.98**

verizon

NORBERT SLIWINSKI
Primary Phone: 412-372-7338
Account Number: 150-780-078-0001-35
Bill Date: November 9, 2017

Ways to pay
- Via the My Fios app
- Online at verizon.com/PayOnline

Details of Charges

Includes discounts shown on page 2.

Fios Internet, TV & Phone Bundle

Your monthly price after the discounts shown on page 2 were applied.

Your bundle includes Fios Internet 50/50, Fios TV Preferred HD and Fios Digital Voice Unlimited

Bundle Price	**$74.99**	11/10 - 12/9

Services & Equipment

Equipment and additional services to personalize your Fios service.

Services		
DVR Service	12.00	
Equipment		
Rent: 1 TV Equipment Package	5.99	
Rent: Digital Adapter 2 @ 7.99	15.98	
Subtotal	**$33.97**	11/10 - 12/9

Fees & Other Charges

Includes both Verizon fees and governmental taxes and fees. For details, visit verizon.com/taxesandfees.

Taxes, Governmental Fees & Surcharges	
PA State and Local Sales Tax	5.06
Telecommunications Relay Service	.08
E911	1.65
Verizon Surcharges & Fees	
Video Franchise Fee	3.62
Federal Universal Service Fee	3.78
PA Gross Receipts Tax Surcharge	1.82
Regulatory Recovery Fee - Federal	.08
PEG Grant Fee	.06
Regional Sports Network Fee	6.39
Fios TV Broadcast Fee	3.49
FDV Administrative Charge	.99
Subtotal	**$27.02**

Total Due **$135.98**

3. Produce all Documents, including, but not limited to, user manuals and instructional materials, relating to each device identified in response to Request No.1.

ANSWER: ***I do not have manuals for any of the above – items are over 5 years old***

4. Have you ever installed, or participated in the installation of, an Itron SK9AMI7 HW 3.1 OpenWay CENTRON Singlephase Smart Meter at a residential or commercial structure? If so, state:

a. The address of each location where you installed such a meter;
c. The date of each instance when you installed such a meter; and
d. The name, address, and telephone number of any individual who witnessed you install such a meter.
ANSWER: 4 a) b) c) ***n/a***

5. Produce all Documents that relate to Your response to the preceding request.

ANSWER: **n/a**

6. Have you ever witnessed the installation of an Itron SK9AMIT HW 3.1 OpenWay CENTRON Singlephase Smart Meter at a residential or commercial structure? If so, state:

a. The number of times you witnessed an installation of such meter,
b. The address of each location where you witnessed the installation of such a meter; and
c. The date of each instance when you witnessed the installation of such a meter.
ANSWER: a), b) c) **n/a**

7. Produce all Documents that relate to Your response to the preceding request.

ANSWER: ***n/a***

8. Have you ever personally inspected an Itron SKSAMIT HW 3.1 OpenWay CENTRON Singlephase Smart Meter? If so:
a. State each date on which you inspected such a meter;
b. State the address of the location where each such meter was inspected; and
c. Describe in detail how each inspection was performed.
ANSWER: a) b) c) ***never inspected said meter in any state.***

9. Produce all Documents that relate to Your response to the preceding request.

ANSWER: ***n/a***

10. Do You claim that there has been a fire(s) caused by an Itron SKSAMIT HW 3.1 OpenWay CENTRON Singlephase Smart Meter installed by Duquesne Light or its contractors? If so, for each such fire, state:

a. The date of the fire;

b. The address of the location where the fire happened; and

c. All facts that support Your contention or belief that the fire was caused by an Itron SK9AMIT HW 3.1 OpenWay CENTRON Singlephase Smart Meter installed by Duquesne Light or its contractors.

ANSWER: ***No, I did not claim above model meter caught fire, but that a number of SM basically all around the Globe have spontaneously caught on fire.***
Why would I want such a device on my house if there is a possibility they catch fire?

11. Produce all Documents that relate to Your response to the preceding request.

ANSWER: Below some videos of meter fires:
https://www.youtube.com/watch?v=AvjEk_LDwys
https://www.youtube.com/watch?v=szj9pmwawwE&t=3s
https://www.youtube.com/watch?v=PnoMEGYilDc
https://www.youtube.com/watch?v=gOqucXzwKkA fire caused by truck hitting utility pole, which has not even been addressed by the utility companies...

12. Do You claim there has been a privacy, data, or security breach to Duquesne Light's customers caused by an Itron SKSAM|T HW 3.1 OpenWay CENTRON Singlephase Smart Meter? If so, for each such breach, state:

a. The date of each breach;
b. The nature of information breached; and
c. all facts that support Your contention or belief that the breach was caused by an Itron SK9AM|T HW 3.1 OpenWay CENTRON Singlephase Smart Meter.

ANSWER: ***No I did not observe a breach caused by the above meter, but ALL (SM) Smart Meters - due to their design and function - have the ability to both send and receive signals via WiFi. Meters are TRANSPONDERS sending and receiving signals via WiFi from the respective utility companies***

13. Produce all Documents that relate to Your response to the preceding request.

ANSWER: ***Your letter dated states that DLC will harvest the data the meter is collection – unless one notifies the utility by call the published phone number or by email. Why would you have that in your letter if you do not collect the data?***

I might also point out the fact that your form letter dated March 31, 2016 stated: You soon will have access to a secure online portal that provides information and analysis about your electric use. The portal also will provide options to help you manage your electric bill, including displaying your energy use patterns by day of week and time of day, providing a projected monthly bill to-date and sending email or phone alerts to reduce high-bill surprise if your monthly usage passes a certain level. Watch your mail for additional information.

In order to provide you with these services, Duquesne Light will need to share your usage data with our portal provider, Opower, a company we've worked with in the past. Opower will not use your data for any purpose other than what is necessary to provide your online benefits.

The above text is identical for both letter's – one dated May 31, 2016 – the other dated May 3, 2018.
Fact: Opwer has been sold for 523 Million $ to Oracle on May 2, 2016 – 29 days prior to the DLC letter in my case, and nearly 2 years later in letter #2. See Exhibit A & B

Who at DLC does the fact checking? At the time (prior to the acquisition by Oracle) Opower employed over 500 personnel writing software programs how to read the electrical consumption? My present Analog meter has been doing this for over 50 years all on its own.

Yes, any meter can be breached by a hacker, there is no software you can buy to prevent access to the SM. A SM is in essence a computer.

See also: https://www.youtube.com/watch?v=GwlXqE_g40M

14. Outside of the Documents and pleadings already produced in connection with Your Formal Complaint, produce any Document prepared in whole or in part by you that relates to the subject of radio frequency or low frequency radiation.

ANSWER: The US Department of the Navy released a study of over 100 EMF related health effects, ranging from Brain damage to Bone cancer:

https://www.scribd.com/document/44544868/20091016-Naval-Studies

The report below outlines in more detail the effects of RMR

Assessment of Radiofrequency Microwave Radiation Emissions from Smart Meters by Sage Associates Santa Barbara, CA

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SUMMARY OF FINDINGS

This Report has been prepared to document radiofrequency radiation (RF) levels associated with wireless smart meters in various scenarios depicting common ways in which they are installed and operated. The Report includes computer modeling of the range of possible smart meter RF levels that are occurring in the typical installation and operation of a single smart meter, and also multiple meters in California.
It includes analysis of both two-antenna smart meters (the typical installation) and of three-antenna meters (the collector meters that relay RF signals from another 500 to 5000 homes in the area). RF levels from the various scenarios depicting normal installation and operation, and possible FCC violations have been determined based on both time-averaged and peak power limits
(Tables 1 - 14).
Potential violations of current FCC public safety standards for smart meters and/or collector meters in the manner installed and operated in California are predicted in this Report, based on computer modeling (Tables 10 – 17).

Tables 1 – 17 show power density data and possible conditions of violation of the FCC public safety limits, and Tables 18 – 33 show comparisons to health studies reporting adverse health impacts.
FCC compliance violations are likely to occur under normal conditions of installation and operation of smart meters and collector meters in California. Violations of FCC safety limits for uncontrolled public access are identified at distances within 6" of the meter.

Exposure to the face is possible at this distance, in violation of the time-weighted average safety limits (Tables 10-11). FCC violations are predicted to occur at 60% reflection (OET Equation 10 and 100% reflection (OET Equation 6) factors*, both used in FCC OET 65 formulas for such calculations for time-weighted average limits. Peak power limits are not violated at the 6" distance (looking at the meter) but can be at 3" from the meter if it is touched.

This report has also assessed the potential for FCC violations based on two examples of RF exposures in a typical residence. RF levels have been calculated at distances of 11" (to represent a nursery or bedroom with a crib or bed against a wall opposite one or more meters); and at 28" (to represent a kitchen work space with one or more meters installed on the kitchen wall).
FCC compliance violations are identified at 11" in a nursery or bedroom setting using Equation 10* of the FCC OET 65 regulations (Tables 12-13). These violations are predicted to occur where there are multiple smart meters, or one collector meter, or one collector meter mounted together with several smart meters.
FCC compliance violations are not predicted at 28" in the kitchen work space for 60% or for 100% reflection calculations. Violations of FCC public safety limits are predicted for higher reflection factors of 1000% and 2000%, which are not a part of FCC OET 65 formulas, but are included here to allow for situations where site-specific conditions (highly reflective environments, for example, galley-type kitchens with many highly reflective stainless steel or other metallic surfaces) may be warranted. *
*FCC OET 65 Equation 10 assumes 60% reflection and Equation 6 assumes 100% reflection. RF levels are also calculated in this report to account for some situations where interior environments have highly reflective surfaces as might be found in a small kitchen with stainless steel or other metal counters, appliances and furnishings.

This report includes the FCC's reflection factors of 60% and 100%, and also reflection factors of1000% and 2000% that are more in line with those reported in Hondou, 2001; Hondou, 2006 and Vermeeren et al, 2010.
The use of a 1000% reflection factor is still conservative in comparison to Hondou, 2006. A 1000% reflection factor is 12% (or 121 times as high) a factor for power density compared to Hondou et al, 2006 prediction of 1000 times higher power densities due to reflection. A 2000% reflection factor is only 22% (or 441 times) that of Hondou's finding that power density can be as high as 2000 times higher.
In addition to exceeding FCC public safety limits under some conditions of installation and operation,

smart meters can produce excessively elevated RF exposures, depending on where they are installed. With respect to absolute RF exposure levels predicted for occupied space within dwellings, or outside areas like patios, gardens and walk-ways, RF levels are predicted to be substantially elevated within a few feet to within a few tens of feet from the meter(s).

For example, one smart meter at 11" from occupied space produces somewhere between 1.4 and 140 microwatts per centimeter squared (uW/cm2) depending on the duty cycle modeled (Table 12). Since FCC OET 65 specifies that continuous exposure be assumed where the public cannot be excluded (such as is applicable to one's home), this calculation produces an RF level of 140 uW/cm2 at 11" using the FCCs lowest reflection factor of 60%. Using the FCC's reflection factor of 100%, the figures rise to 2.2 uW/cm2 – 218 uW/cm2, where the continuous exposure calculation is 218 uW/cm2 (Table 12). These are very significantly elevated RF exposures in comparison to typical individual exposures in daily life. Multiple smart meters in the nursery/bedroom example at 11" are predicted to generate RF levels from about 5 to 481 uW/cm2 at the lowest (60%) reflection factor; and 7.5 to 751 uW/cm2 using the FCCs 100% reflection factor (Table 13). Such levels are far above typical public exposures.

RF levels at 28" in the kitchen work space are also predicted to be significantly elevated with one or more smart meters (or a collector meter alone or in combination with multiple smart meters). At 28" distance, RF levels are predicted in the kitchen example to be as high as 21 uW/cm2 from a single meter and as high as 54.5 uW/cm2 with multiple smart meters using the lower of the FCCs reflection factor of 60% (Table 14). Using the FCCs higher reflection factor of 100%, the RF levels are predicted to be as high as 33.8 uW/cm2 for a single meter and as high as 85.8 uW/cm2 for multiple smart meters (Table 14). For a single collector meter, the range is 60.9 to 95.2 uW/cm2 (at 60% and 100% reflection factors, respectively) (from Table 15).

Table 16 illustrates predicted violations of peak power limit (4000 uW/cm2) at 3" from the surface of a meter. FCC violations of peak power limit are predicted to occur for a single collector meter at both 60% and 100% reflection factors. This situation might occur if someone touches a smart meter or stands directly in front.

Consumers may also have already increased their exposures to radiofrequency radiation in the home through the voluntary use of wireless devices (cell and cordless phones), PDAs like BlackBerry and iPhones, wireless routers for wireless internet access, wireless home security systems, wireless baby surveillance (baby monitors), and other emerging wireless applications.
Neither the FCC, the CPUC, the utility nor the consumer know what portion of the allowable public safety limit is already being used up or pre-empted by RF from other sources already present in the particular location a smart meter may be installed and operated.

Consumers, for whatever personal reason, choice or necessity who have already eliminated all possible wireless exposures from their property and lives, may now face excessively high RF exposures in their homes from smart meters on a 24-hour basis. This may force limitations on use of their otherwise occupied space, depending on how the meter is located, building materials in the structure, and how it is furnished.

People who are afforded special protection under the federal Americans with Disabilities Act are not sufficiently acknowledged nor protected. People who have medical and/or metal implants or other conditions rendering them vulnerable to health risks at lower levels than FCC RF limits may be particularly at risk (Tables 30-31). This is also likely to hold true for other subgroups, like children and people who are ill or taking medications, or are elderly, for they have different reactions to pulsed RF. Childrens' tissues absorb RF differently and can absorb more RF than adults (Christ et al, 2010; Wiart et al, 2008). The elderly and those on some medications respond more acutely to some RF exposures.

Safety standards for peak exposure limits to radiofrequency have not been developed to take into account the particular sensitivity of the eyes, testes and other ball shaped organs.

There are no peak power limits defined for the eyes and testes, and it is not unreasonable to imagine situations where either of these organs comes into close contact with smart meters and/or collector meters, particularly where they are installed in multiples (on walls of multi-family dwellings that are accessible as common areas).
In summary, no positive assertion
n of safety can be made by the FCC, nor relied upon by the CPUC, with respect to pulsed RF when exposures are chronic and occur in the general population. Indiscriminate exposure to environmentally ubiquitous pulsed RF from the rollout of millions of new RF sources (smart meters) will mean far greater general population exposures, and potential health consequences. Uncertainties about the existing RF environment (how much RF exposure already exists), what kind of interior reflective environments exist (reflection factor), how interior space is utilized near walls), and other characteristics of residents (age, medical condition, medical implants, relative health, reliance on critical care equipment that may be subject to electronic interference, etc) and unrestrained access to areas of property where meter is located all argue for caution.

INTRODUCTION

How Smart Meters Work

This report is limited to a very simple overview of how smart meters work, and the other parts of the communication system that are required for them to transmit information on energy usage within a home or other building. The reader can find more detailed information on smart meter and smart grid technology from numerous sources available on the Internet.

Often called 'advanced metering infrastructure or AMI', smart meters are a part of an overall system that includes a) a mesh network or series of wireless antennas at the neighborhood level to collect and transmit wireless information from all the smart meters in that area back to a utility.

The mesh network (sometimes called a distributed antenna system) requires wireless antennas to be located throughout neighborhoods in close proximity to where smart meters will be placed. Often, a municipality will receive a hundred or more individual applications for new cellular antenna service, which is specifically to serve smart meter technology needs. The communication network needed to serve smart meters is typically separate from existing cellular and data transmission antennas (cell tower antennas). The mesh network (or DAS) antennas are often utility-pole mounted.
This part of the system can spread hundreds of new wireless antennas throughout neighborhoods.

Smart meters are a new type electrical meter that will measure your energy usage, like the old ones do now. But, it will send the information back to the utility by wireless signal (radiofrequency/microwave radiation signal) instead of having a utility meter reader come to the property and manually do the monthly electric service reading. So, smart meters are replacements for the older 'spinning dial' or analog electric meters. Smart meters are not optional, and utilities are installing them even where occupants do not want them.

In order for smart meters to monitor and control energy usage via this wireless communication system, the consumer must be willing to install power transmitters inside the home. This is the third part of the system and involves placing power transmitters (radiofrequency/microwave radiation emitting devices) within the home on each appliance. A power transmitter is required to measure the energy use of

individual appliances (e.g., washing machines, clothes dryers, dishwashers, etc) and it will send information via wireless radiofrequency signal back to the smart meter. Each power transmitter handles a separate appliance. A typical kitchen and laundry may have a dozen power transmitters in total. If power transmitters are not installed by the homeowner, or otherwise mandated on consumers via federal legislation requiring all new appliances to have power transmitters built into them, then there may be little or no energy reporting nor energy savings.

Smart meters could also be installed that would operate by wired, rather than wireless means. Shielded cable, such as is available for cable modem (wired internet connection) could connect smart meters to utilities. However, it is not easy to see the solution to transmit signals from power transmitters (energy use for each appliance) back to the utility.

Collector meters are a special type of smart meter that can serve to collect the radiofrequency/microwave radiation signals from many surrounding buildings and send them back to the utility. Collector meters are intended to collect and re-transmit radiofrequency information for somewhere between 500-5000 homes or buildings. They have three operating antennas compared to two antennas in regular smart meters. Their radiofrequency microwave emissions are higher and they send wireless signal much more frequently. Collector meters can be place on a home or other building like smart meters, and there is presently no way to know which a homeowner or property owner might receive.

Purpose of this Report

This Report has been prepared to document radiofrequency radiation (RF) levels associated with wireless smart meters in various scenarios depicting common ways in which they are installed and operated.
The Report includes computer modeling of the range of possible smart meter RF levels that are occurring in the typical installation and operation of a single smart meter, and also multiple meters in California. It includes analysis of both two-antenna smart meters (the typical installation) and of three-antenna meters (the collector meters that relay RF signals from another 500 to 5000 homes in the area).

RF levels from the various scenarios depicting normal installation and operation, and possible FCC violations have been determined based on both time-averaged and peak power limits (Tables 1 - 14).

Potential violations of current FCC public safety standards for smart meters and/or collector meters in the manner installed and operated in California are illustrated in this Report, based on computer modeling (Tables 10 – 17).

Tables which present data, possible conditions of violation of the FCC public safety limits, and comparisons to health studies reporting adverse health impacts are summarized (Tables 18 – 33).

The next section describes methodology in detail, but generally this Report provides computer modeling results for RF power density levels for these scenarios, analysis of whether and under what conditions FCC public safety limit violations may occur, and comparison of RF levels produced under these scenarios to studies reporting adverse health impacts with chronic exposure to low-intensity radiofrequency radiation at or below levels produced by smart meters and collector meters in the manner installed and operated.

1) Single 'typical' meter - tables showing RF power density at increasing distances in 0.25' (3") intervals outward for single meter (two-antenna meter). Effects of variable duty cycles (from 1% to 90%) and various reflection factors (60%, 100%, 1000% and 2000%) have been calculated.

2) Multiple 'typical' meters - tables showing RF power density at increasing distances as above.

3) Collector meter - tables showing RF power density related to a specialized collector meter which has three internal antennas (one for every 500 or 5000 homes) as above.

4) Collector meter - a single collector meter installed with multiple 'typical' two-antenna meters as above.

5) Tables are given to illustrate the distance to possible FCC violations for time-weighted average and peak power limits (in inches).

6) Tables are given to document RF power density levels at various key distances (11" to a crib in a bedroom; 28" to a kitchen work area; and 6" for a person attempting to read the digital readout of a smart meter, or inadvertently working around a meter.

7) Tables are given to compare RF power density levels with studies reporting adverse health symptoms and effects (and those levels of RF associated with such health effects).

8) Tables are given to compare smart meter and collector meter RF to BioInitiative Report recommended limit (in feet).

Framing Questions

In view of the rapid deployment of smart meters around the country, and the relative lack of public information on their radiofrequency (RF) emission profiles and public exposures, there is a crucial need to provide independent technical information.
There is very little solid information on which decision-makers and the public can make informed decisions about whether they are an acceptable new RF exposure, in combination with pre-existing RF exposures.

On-going Assessment of Radiofrequency Radiation Health Risks

The US NIEHS National Toxicology Program nominated radiofrequency radiation for study as a carcinogen in 1999. Existing safety limits for pulsed RF were termed "not protective of public health" by the Radiofrequency Interagency Working Group (a federal interagency working group including the FDA, FCC, OSHA, the EPA and others). Recently, the NTP issued a statement indicating it will complete its review by 2014 (National Toxicology Program, 2009).
The NTP radiofrequency radiation study results have been delayed for more than a decade since 1999 and very little laboratory or epidemiological work has been completed.

Thus, he explosion of wireless technologies is producing radiofrequency radiation exposures over massive populations before questions are answered by federal studies about the carcinogenicity or toxicity of low-intensity RF such as are produced by smart meters and other SmartGrid applications of wireless. The World Health Organization and the International Agency for Research on Cancer have not completed their studies of RF (the IARC WHO RF Health Monograph is not expected until at least 2011). In the United States, the National Toxicology Program listed RF as a potential carcinogen for study and has not released any study results or findings a decade later.
There are no current, relevant public safety standards for pulsed RF involving chronic exposure of the public, nor of sensitive populations, nor of people with metal and medical implants that can be affected both by localized heating and by electromagnetic interference (EMI) for medical wireless implanted devices.

Considering that millions of smart meters are slated to be installed on virtually every electrified building in America, the scope of the question is large and highly personal. Every family home in the country, and every school classroom – every building with an electric meter – is to have a new wireless meter –

and thus subject to unpredictable levels of RF every day.

1) Have smart meters been tested and shown to comply with FCC public safety limits (limits for uncontrolled public access)?

2) Are these FCC public safety limits sufficiently protective of public health and safety? This question is posed in light of the last thirty years of international scientific investigation and public health assessments documenting the existence of bioeffects and adverse health effects at RF levels far below current FCC standards. The FCC's standards have not been updated since 1992, and did not anticipate nor protect against chronic exposures (as opposed to acute exposures) from low-intensity or non-thermal RF exposures, particularly pulsed RF exposures.

3) What demonstration is there that wireless smart meters will comply with existing FCC limits, as opposed to under strictly controlled conditions within government testing laboratories?

4) Has the FCC been able to certify that compliance is achievable under real-life use conditions including, but not limited to:

- In the case where there are both gas and electric meters on the home located closely together.
- In the case where there is a "bank" of electric and gas meters, on a multi-family residential building such as on a condominium or apartment building wall. There are instances of up to 20 or more meters located in close proximity to occupied living space in the home, in the classroom or other occupied public space.

- In the case where there is a collector meter on a home that serves the home plus another 500 to 5000 other residential units in the area, vastly increasing the frequency of RF bursts.
- In the case where there is one smart meter on the home but it acts as a relay for other local neighborhood meters. What about 'piggybacking' of other neighbors' meters through yours? How can piggybacking be reasonably estimated and added onto the above estimates?
- What about the RF emissions from the power transmitters? Power transmitters installed on appliances (perhaps 10-15 of them per home) and each one is a radiofrequency radiation transmitter.
- How can the FCC certify a system that has an unknown number of such transmitters per home, with no information on where they are placed?
- Where people with medical/metal implants are present?
  (Americans with Disabilities Act protects rights)

5) What assessment has been done to determine what pre-existing conditions of RF exposure are already present. On what basis can compliance for the family inside the residence be assured, when there is no verification of what other RF sources exist on private property?
How is the problem of cumulative RF exposure properly assessed (wireless routers, wireless laptops, cell phones, PDAs, DECT or other active-base cordless phone systems, home security systems, baby monitors, contribution of AM, FM, television, nearby cell towers, etc).

6) What is the cumulative RF emissions worst-case profile? Is this estimate in compliance?

7) What study has been done for people with metal implants* who require protection under Americans with Disabilities Act? What is known about how metal implants can intensity RF, heat tissue and result in adverse effects below RF levels allowed for the general public. What is known about electromagnetic interference (EMI) from spurious RF sources in the environment (RFID scanners, cell towers, security gates, wireless security systems, wireless communication devices and routers, wireless smart meters, etc)

*Note: There are more than 20 million people in the US who need special protection against such

exposures that may endanger them. High peak power bursts of RF may disable electronics in some critical care and medical implants. We already have reports of wireless devices disabling deep brain stimulators in Parkinson's patients and there is published literature on malfunctions with critical care equipment.

PUBLIC SAFETY LIMITS FOR RADIOFREQUENCY RADIATION

The FCC adopted limits for Maximum Permissible Exposure (MPE) are generally based on recommended exposure guidelines published by the National Council on Radiation Protection and Measurements (NCRP) in "Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," (NCRP, 1986).

In the United States, the Federal Communications Commission (FCC) enforces limits for both occupational exposures (in the workplace) and for public exposures. The allowable limits are variable, according to the frequency transmitted. Only public safety limits for uncontrolled public access are assessed in this report.

Maximum permissible exposures (MPE) to radiofrequency electromagnetic fields are usually expressed in terms of the plane wave equivalent power density expressed in units of milliwatts per square centimeter (mW/cm2) or alternatively, absorption of RF energy is a function of frequency (as well as body size and other factors). The limits vary with frequency. Standards are more restrictive for frequencies at and below 300 MHz. Higher intensity RF exposures are allowed for frequencies between 300 MHz and 6000 MHz than for those below 300 MHz.

In the frequency range from 100 MHz to 1500 MHz, exposure limits for field strength and power density are also generally based on the MPE limits found in Section 4.1 of "*IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz*," ANSI/IEEE C95.1-1992 (IEEE, 1992, and approved for use as an American National Standard by the American National Standards Institute (ANSI).

US Federal Communications Commission (FCC) Exposure Standards

Table 1, Appendix A FCC LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

(A) Limits for Occupational/Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm2)	Averaging Time $[E]^2$ $[H]^2$ or S (minutes)
ɜ-3.0	4	1.63	(100)*	6
)-30	42/f	4.89/f	$(900/f_2)$*	6
-300	.4	0.163	1.0	6
0-1500			f/300	6
00-100,000			5	6

B) FCC Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm2)	Averaging Time $[E]^2$ $[H]^2$ or S (minutes)
3-3.0	4	1.63	(100)*	30
0-30	4/f	2.19/f	$(180/f_2)$*	30
0-300	.5	0.073	0.2	30
0-1500		--	f/1500	30
00-100,000		--	1.0	30

f = frequency in MHz

*Plane-wave equivalent power density

NOTE 1: ***Occupational/controlled*** limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2: ***General population/uncontrolled*** exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure. Source: FCC Bulletin OET 65 Guidelines, page 67 . OET, 1997.

In this report, the public safety limit for a smart meter is a combination of the individual antenna frequency limits and how much power output they create. A smart meter contains two antennas. One transmits at 915 MHz and the other at 2405 MHz.

They can transmit at the same time, and so their effective radiated power is summed in the calculations of RF power density. Their combined limit is 655 uW/cm2.

This limit is calculated by formulas from Table 1, Part B and is proportionate to the power output and specific safety limit (in MHz) of each antenna.

For the collector meter, with it's three internal antennas, the combined public safety limit for time-averaged exposure is 571 MHz (a more restrictive level since it includes an additional 824 MHz antenna that has a lower limit than either the 915 MHz or the 2405 MHz antennas).

In a collector meter, only two of the three antennas can transmit simultaneously (the 915 MHz LAN and the GSM 850 MHz (from the FCC Certification Exhibit titled RF Exposure Report for FCC ID: SK9AMI-2A).

The proportionate power output of each antenna plus the safety limit for each antenna frequency combines to give a safety limit for the collector meter of 571 uW/cm2. Where one collector meter is combined with multiple smart meters, the combined limit is weighted upward by the additional smart meters' contribution and is 624 uW/cm2.

Continuous Exposure

FCC Bulletin OET 65 guidelines require the assumption of continuous exposure in calculations. Duty cycles offered by the utilities are a fraction of continuous use, and significantly diminish predictions of RF exposure.
At present, there is no evidence to prove that smart meters are functionally unable to operate at higher duty cycles that some utilities have estimated (estimates vary from 1% to 12.5% duty cycle, and as high as 30%). Confirming this is the Electric Power Research Institute (EPRI) in its "Perspective on Radio-Frequency Exposure Associated with Residential Automatic Meter Reading Technology (EPRI, 2010) According to EPRI:

"The technology not only provides a highly efficient method for obtaining usage data from customers, but it also can provide up-to-the-minute information on consumption patterns since the meter reading devices can be programmed to provide data as often as needed."

The FCC Bulletin OET 65 guidelines specify that continuous exposure (defined by the FCC OET 65 as 100% duty cycle) is required in calculations where it is not possible to control exposures to the general public.

"It is important to note that for general population/uncontrolled exposures it is often not possible to control exposures to the extent that averaging times can be applied. In those situations, it is often necessary to assume continuous exposure." FCC Bulletin OET 65, p, 10

***"Duty factor**. The ratio of pulse duration to the pulse period of a periodic pulse train. Also, may be a measure of the temporal transmission characteristic of an intermittently transmitting RF source such as a paging antenna by dividing average transmission duration by the average period for transmissions. A duty factor of 1.0 corresponds to continuous operation."* (emphasis added) FCC Bulletin OET 65, p, 2

This provision then specifies duty cycles to be increased to 100%.

The FCC Guidelines (OET 65) further address cautions that should be observed for uncontrolled public access to areas that may cause exposure to high levels of RF.

Re-radiation

The foregoing also applies to high RF levels created in whole or in part by re-eradiation. A convenient rule to apply to all situations involving RF radiation is the following:

(1) Do not create high RF levels where people are or could reasonably be expected to be present, and (2) prevent people from entering areas in which high RF levels are necessarily present.

(2) Fencing and warning signs may be sufficient in many cases to protect the general public. Unusual circumstances, the presence of multiple sources of radiation, and operational needs will require more elaborate measures.

(3) Intermittent reductions in power, increased antenna heights, modified antenna radiation patterns, site changes, or some combination of these may be necessary, depending on the particular situation.

FCC OET 65, Appendix B, p. 79

Fencing, distancing, protective RF shielded clothing and signage warning occupants not to use portions of their homes or properties are not feasible nor desirable in public places the general public will spend time (schools, libraries, cafes, medical offices and clinics, etc) These mitigation strategies may be workable for RF workers but are unsuited and intolerable for the public.

Reflections

A major, uncontrolled variable in predicting RF exposures is the degree to which a particular location (kitchen, bedroom, etc) will reflect RF energy created by installation of one or more smart meters, or a collector meter and multiple smart meters. The reflectivity of a surface is a measure of the amount of reflected radiation. It can be defined as the ratio of the intensities of the reflected and incident radiation. The reflectivity depends on the angle of incidence, the polarization of the radiation, and the electromagnetic properties of the materials forming the boundary surface. These properties usually change with the wavelength of the radiation. The reflectivity of polished metal surfaces is usually quite high (such as stainless steel and polished metal surfaces typical in kitchens, for example).

Reflections can significantly increase localized RF levels. High uncertainty exists about how extensive a problem this may create in routine installations of smart meters, where the utility and installers have no idea what kind of reflectivity is present within the interior of buildings.

Reflections in Equation 6 and 10 of the FCC OET Bulletin 65 include rather minimal reflection factors of 100% and 60%, respectively. This report includes higher reflection factors in line with published studies by Hondou et al, 2006, Hondou, 2002 and Vermeeren et al, 2010. Reflection factors are modeled at 1000% and 2000% as well as at 60% and 100%, based on published scientific evidence for highly reflective environments. Hondou (2002) establishes that power density can be higher than conventional formulas predict using standard 60% and 100% reflection factors.

> *"We show that this level can reach the reference level (ICNIRP Guideline) in daily life. This is caused by the fundamental properties of electromagnetic field, namely, reflection and additivity. The level of exposure is found to be much higher than estimated by* conventional *framework of analysis that assumes that the level rapidly decreases with the inverse square distance between the source and the affected person."*

> *"Since the increase of electromagnetic field by reflective boundaries and the additivity of sources has not been recognized yet, further detailed studies on various situations and the development of appropriate regulations are required."*

Hondou et al (2006) establishes that power densities 1000 times to 2000 times higher than the power density predictions from computer modeling (that does not account properly for reflections) can be found in daily living situations. Power density may not fall off with distance as predicted by formulas using limited reflection factors. The RF hot spots created by reflection can significantly increase RF exposures to the public, even above current public safety limits.

> *"We confirm the significance of microwave reflection reported in our previous Letter by experimental and numerical studies. Furthermore, we show that 'hot spots' often emerge in reflective areas, where the local exposure level is much higher than average."*

"Our results indicate the risk of 'passive exposure' to microwaves."

"The experimental values of intensity are consistently higher than predicted values. Intensity does not even decrease with distance from the source."

"We further confirm the existence of microwave 'hotspots', in which he microwaves are 'localized'. The intensity measured at one hot spot 4.6 m from the transmitter is the same as that at 0.1 m from the transmitter in the case without reflection (free boundary condition).
Namely, the intensity at the hot spot is increased by ***approximately 2000 times*** *by reflection."*

"To confirm our experimental findings of the greater-than-predicted intensity due to reflection, as well as the hot spots, we performed two numerical simulations...". " intensity does not monotonically decrease from the transmitter, which is in clear contrast to the case without reflection."

"The intensity at the hot spot (X, Y, Z) = 1.46, -0.78, 105) around 1.8 m from the transmitter in the reflective boundary condition is ***approximately 1000 times higher*** *than that at the same position in the free boundary condition. The result of the simulation is thus consistent with our experiments, although the values differ owing to the different conditions imposed by computational limits."*
"the result of the experiment is also reproduced: a greater than predicted intensity due to reflection, as well as the existence of hot spots."

"In comparison with the control simulation using the free boundary condition, we find that the power density at the hot spot is increased ***by approximately a thousand times*** *by reflection."*

Further, the author comments that:

"we may be passively exposed beyond the levels reported for electro-medical interference and health risks."
"Because the peak exposure level is crucial in considering electro-medical interference, interference (in) airplanes, and biological effects on human beings, we also need to consider the possible peak exposure level, or 'hot spots', for the worst-case estimation."

Reflections and re-radiation from common building material (tile, concrete, stainless steel, glass, ceramics) and highly reflective appliances and furnishings are common in kitchens, for example. Using only low reflectivity FCC equations 6 and 10 may not be informative. Published studies underscore how use of even the highest reflection coefficient in FCC OET Bulletin 65 Equations 6 and 10 likely underestimate the potential for reflection and hot spots in some situations in real-life situations.

This report includes the FCC's reflection factors of 60% and 100%, and also reflection factors of 1000% and 2000% that are more in line with those reported in Hondou, 2001; Hondou, 2006 and Vermeeren et al, 2010. The use of a 1000% reflection factor in this report is still conservative in comparison to Hondou, 2006. A 1000% reflection factor is 12% of Hondou's larger power density prediction (or 121 times, rather than 1000 times)/ The 2000% reflection factor is 22% of Hondou's figure (or 441 times in comparison to 2000 times higher power density in Hondou, 2006).

Peak Power Limits

In addition to time-averaged public safety limits that require RF exposures to be time-averaged over a 30 minute time period, the FCC also addresses peak power exposures. The FCC refers back to the ANSI/IEEE C95.1-1992 standard to define what peak power limits are.

The ANSI/IEEE C95.1-1999 standard defines peak power density as "*the maximum instantaneous power density occurring when power is transmitted.*" (p. 4) Thus, there is a second method to test FCC compliance that is not being assessed in any FCC Grants of Authorization.

> "*Note that although the FCC did not explicitly adopt limits for peak power density, guidance on these types of exposures can be found in Section 4.4 of the ANSI/IEEE C95.1-1992 standard." Page 10, OET 65*

The ANSI/IEEE limit for peak power to which the FCC refers is:

> *"For exposures in uncontrolled environments, the peak value of the mean squared field strengths should not exceed 20 times the square of the allowed spatially averaged values (Table 2) at frequencies below 300 MHz, or the equivalent power density of 4 mW/cm2 for f between 300 MHz and 6 GHz".*

The peak power exposure limit is 4000 uW/cm2 for all smart meter frequencies (all transmitting antennas) for any instantaneous RF exposure of 4 milliwatts/cm2 (4 mW/cm2) or higher which equals 4000 microwatts/cm2 (uW/cm2).
This peak power limit applies to all smart meter frequencies for both the smart meter (two-antenna configuration) and the collector meter (three-antenna configuration). All these antennas are within the 300 MHz to 6 GHz frequency range where the 4000 uW/cm2 peak power limit applies (Table 3, ANSI/IEEE C95.1-1999, page 15).

Smart meters emit frequencies within the 800 MHz to 2400 MHz range.

Exclusions

This peak power limit applies to all parts of the body with the important exception of the eyes and testes.

The ANSI/IEEE C95.1-1999 standard specifically excludes exposure of the eyes and testes from the peak power limit of 4000 uW/cm2*. However, nowhere in the ANSI/IEEE nor the FCC OET 65 documents is there a lower, more protective peak power limit given for the eyes and testes (see also Appendix C).

"The following relaxation of power density limits is allowed for exposure of all parts of the body except the eyes and testes."

"Since most exposures are not to uniform fields, a method has been derived, based on the demonstrated peak to whole-body averaged SAR ratio of 20, for equating nonuniform field exposure and partial body exposure to an equivalent uniform field exposure. This is used in this standard to allow relaxation of power density limits for partial body exposure, except in the case of the eyes and the testes."

"In the case of the eyes and testes, direct relaxation of power density limits is not permitted."(p. 30)

*Note: This leaves unanswered what instantaneous peak power is permissible from smart meters. The level must be below 4000 uW/cm2. This report shows clearly that smart meters can create instantaneous peak power exposures where the face (eyes) and body (testes) are going to be in close proximity to smart meter RF pulses. RF levels at and above 4000 uW/cm2 are likely to occur if a person puts their face close to the smart meter to read data in real time. The digital readout of the smart meter requires close inspection, particularly where there is glare or bright sunlight, or low lighting conditions. Further, some smart meters are installed inside buildings within inches of occupied space, virtually guaranteeing exposures that may violate peak power limits. Violations of peak power limits are likely in these circumstances where there is proximity within about 6" and highly reflective surfaces or metallic objects. The eyes and testes are not adequately protected by the 4000 uW/cm2 peak power limit, and in the cases described above, may be more vulnerable to damage (Appendix C for further discussion).

METHODOLOGY

Radiofrequency fields associated with SMART Meters were calculated following the methodology described here. Prediction methods specified in Federal Communications Commission, Office of Engineering and Technology Bulletin 65 Edition 97-01, August 1997 were used in the calculations.[1]

Section 2 of FCC OET 65 provides methods to determine whether a given facility would be in compliance with guidelines for human exposure to RF radiation. We used equation (3)

$$S = \frac{P \times G \times \partial}{4 \times \pi \times R^2} = \frac{EIRP \times \partial}{4 \times \pi \times R^2} = \frac{1.64 \times ERP \times \partial}{4 \times \pi \times R^2}$$

where:

S = power density (in $\mu W/cm^2$)
P = power input to the antenna (in W)
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
∂ = duty cycle of the transmitter (percentage of time that the transmitter actually transmits over time)
R = distance to the center of radiation of the antenna
EIRP = PG

ERP = 1.64 EIRP

where:

EIRP = is equivalent (or effective) isotropically radiated power referenced to an isotropic radiator

ERP = is equivalent (or effective) radiated power referenced to a half-wave dipole radiator

Analysis input assumptions

1. SMART Meters [SK9AMI-4] have two RF transmitters (antennas) and are the type of smart meters typically installed on most buildings. They contain two antennas that transmit RF signals (916 MHz LAN and 2405 MHz Zigbee). The antennas CAN transmit simultaneously, and thus the maximum RF exposure is determined by the summation of power densities (from the FCC Certification Exhibit titled RF Exposure Report for FCC ID: SK9AMI-4).

   Model SK9AMI-4 transmits on 915 MHz is designated as LAN Antenna Gain for each model.

   a. Transmitter Power Output (TPO) used is as shown on the grant issued by the Telecommunications Certification Body (TCB).

   b. Antenna gain in dBi (decibels compared to an isotropic radiator) used comes from the ACS Certification Exhibit.

   c.

2. Collector Meters [SK9AMI-2A] have three RF transmitters (antennas) and are installed where the utility needs them to relay RF signals from surrounding smart meters in a neighborhood. Collector meters contain a third antenna (GSM 850 MHz, 915 MHz LAN and 2405 MHz Zigbee). Collector meters can be placed on any building where a collector meter is needed to relay signals from the surrounding area. Estimates of the number of collector meters varies between one per 500 to one per 5000 smart meters. Collector meters will thus 'piggyback' the RF signals of hundreds or thousands of smart meters through the one collector meter. In a collector meter, only two of the three antennas can transmit simultaneously (the 915 MHz LAN and the GSM 850 MHz (from the FCC Certification Exhibit titled RF Exposure Report for FCC ID: SK9AMI-2A).

3. The Cell Relay transmitting at 2480 MHz is <u>not</u> on most meters and <u>not</u> considered in this analysis.

   a. Transmitter Power Output (TPO) used is as shown on the grant issued by the Telecommunications Certification Body (TCB).

   b. Antenna gain in dBi (decibels compared to an isotropic radiator) used comes from the ACS Certification Exhibit.

ERP (Effective Radiated Power) used in the computer modeling here is calculated using the TPO and antenna gain established for each model

Red figures used to Calculate ERP		ACS and TCB Certification data sheet							
		SK9AMI-2A				SK9AMI-4			
		ACS			TCB	ACS			TCB
Radio	Frequency	dBm	Watts	dBi	Watts	dBm	Watts	dBi	Watts
GSM	850	31.8	1.5136	-1.0					
LAN	915	21.92	0.1556	3.0		24.27	0.2673	**2.2**	**0.267**
LAN	916								0.257
GSM	1900	28.7	0.7413	1.0					
Register	2405	18.71	0.0743	**1.0**	**0.074**	19.17	0.0826	4.4	
Cell Relay	2480	-14.00	0.00004	4.00					

Assumptions: TPO per TCB , Antenna Gain per ACS Certification

ERP Calculation: **Bold** figures are used for single meter ERP in modeling

Type	TPO	dBi	dB	Mult	ERP	Freq
1900 GSM	0.741	1.0	-1.15	0.77	0.5689	1900
850 GSM	1.514	-1.0	-3.15	0.48	0.7328	850
RFLAN	0.267	2.2	0.05	1.01	**0.2704**	915
ZIG BEE	0.074	1.0	-1.15	0.77	**0.0570**	2405

Model
SK9AMI-4
SK9AMI-2A

Reflection Factor

This equation is modified with the inclusion of a ground reflection factor as recommended by the FCC. The ground reflection factor accounts for possible ground reflections that could enhance the resultant power density. A 60% (0.6) enhancement would result in a 1.6 (1 + 0.6) increase of the field strength or a 2.56 = $(1.6)^2$ increase in the power density. Similar increases for larger enhancements of the field strength are calculated by the square of the original field plus the enhancement percentage. [2.3.4]

Reflection Factors:

60% = $(1 + 0.6)^2$ = 2.56 times
100% = $(1 + 1)^2$ = 4 times
1000% = $(1 + 10)^2$ = 121 times
2000% = $(1 + 20)^2$ = 441 times

Duty Cycle

How frequently SMART Meters can and will emit RF signals from each of the antennas within the meters is uncertain, and subject to wide variations in estimation. For this reason, and because FCC OET 65 mandates a 100% duty cycle (continuous exposure where the public cannot be excluded) the report gives RF predictions for all cases from 1% to 100% duty cycle at 10% intervals. The reader can see the variation in RF emissions predicted at various distances from the meter (or bank of meters) using this report at all duty cycles. Thus, for purposes of this report, duty cycles have been estimated from infrequent to continuous. Duty cycles for SMART Meters were calculated at:

Duty cycle ∂:

1%	50%
5%	60%
10%	70%

20%	80%
30%	90%
40%	100%

Continuous Exposure

FCC Bulletin OET 65 and the ANSI/IEEE C95.1-1992, 1999 requires that continuous exposure be calculated for situations where there is uncontrolled public access. Continuous exposure in this case means reading the tables at 100% duty cycle.

> *"Another feature of the exposure guidelines is that exposures, in terms of power density, E2 or H2, may be averaged over certain periods of time with the average not to exceed the limit for continuous exposure.*[11]
>
> *"As shown in Table 1 of Appendix A, the averaging time for occupational/controlled exposures is 6 minutes, while the averaging time for general population/uncontrolled exposures is 30 minutes. It is important to note that for general population/uncontrolled exposures it is often not possible to control exposures to the extent that averaging times can be applied. In those situations, it is often necessary to assume continuous exposure."* (FCC OET 65, Page 15)

Calculation Distances in Tables (3-inch increments)

Calculations were performed in 3-inch (.25 foot) increments from the antenna center of radiation. Calculations have been taken out to a distance of 96 feet from the antenna center for radiation for each of the conditions above. The antenna used for the various links in a SMART Meter is assumed to be at the center of the SMART Meter from front to back – approximately 3 inches from the outer surface of the meter.

Calculations have also been made for a typical nursery and kitchen. In the nursery it has been assumed that the baby in his or her crib that is located next to the wall where the electric SMART Meters are mounted. The closest part of the baby's body can be as close as 11 inches* from the meter antenna. In the kitchen it has been assumed that a person is standing at the counter along the wall where the electric SMART Meters are mounted. In that case the closest part of the adult's body can be located as close to the meter antenna as 28 inches.

The exposure limits are variable according to the frequency (in megahertz). Table 1, Appendix A show exposure limits for occupational (Part A) and uncontrolled public (Part B) access to radiofrequency radiation such as is emitted from AM, FM, television and wireless sources.

* Flush-mounted main electric panels that house smart meters are commonly installed; placing smart meters 5" 6" closer to occupied space than box-mounted main electric panels that sit outward on exterior building walls. Assumptions on spacing are made for flush-mounted panels.

Conditions Influencing Radiofrequency Radiation Level Safety

The location of the meter in relation to occupied space, or outside areas of private property such as driveways, walk-ways, gardens, patios, outdoor play areas for children, pet shelters and runs, and many typical configurations can place people in very close proximity to smart meter wireless

emissions. In many instances, smart meters may be within inches or a few feet of occupied space or space that is used by occupants for daily activities.

Factors that influence how high RF exposures may be include but are not limited to where the meter is installed in relation to occupied space, how often the meters are emitting RF pulses (duty cycle), and what reflective surfaces may be present that can greatly intensify RF levels or create 'RF hot spots' within rooms, and so on. In addition, there may be multiple wireless meters installed on some multi-family residential buildings, so that a single unit could have 20 or more electric meters in close proximity to each other, and to occupants inside that unit. Finally, some meters will have higher RF emissions, because – as collector units – their purpose is to collect and resend the RF signals from many other meters to the utility. A collector meter is estimated to be required for every 500 to 5000 buildings. Each collector meter contains three, rather than two transmitting antennas. This means higher RF levels will occur on and inside buildings with a collector meter, and significantly more frequent RF transmissions can be expected. At present, there is no way to predict whose property will be used for installation of collector meters.

People who are visually reading the wireless meters 'by sight' or are visually inspecting and/or reading the digital information on the faceplate may have their eyes and faces only inches from the antennas.

Current standards for peak power limit do not have limits to protect the eyes and testes from instantaneous peak power from smart meter exposures, yet relevant documents identify how much more vulnerable these organs are, and the need for such safety limits to protect the eyes and testes.

No Baseline RF Assessment

Smart meter and collector meter installation are taking place in an information vacuum. FCC compliance testing takes place in an environment free of other sources of RF, quite unlike typical urban and some rural environments. There is no assessment of baseline RF conditions already present (from AM, FM, television and wireless communication facilities (cell towers), emergency and dispatch wireless, ham radio and other involuntary RF sources. Countless properties already have elevated RF exposures from sources outside their own control.

Consumers may also have already increased their exposures to radiofrequency radiation in the home through the voluntary use of wireless devices (cell and cordless phones), PDAs like BlackBerry and iPhones, wireless routers for wireless internet access, wireless home security systems, wireless baby surveillance (baby monitors), and other emerging wireless applications.

Neither the FCC, the CPUC, the utility nor the consumer know what portion of the allowable public safety limit is already being used up or pre-empted by RF from other sources already present in the particular location a smart meter may be installed and operated.

Consumers, for whatever personal reason, choice or necessity who have already eliminated all possible wireless exposures from their property and lives, may now face excessively high RF exposures in their homes from smart meters. This may force limitations on use of their otherwise occupied space, depending on how the meter is located, building materials in the structure, and how it is furnished.

RESULTS, FINDINGS AND CONCLUSIONS

The installation of wireless 'smart meters' in California can produce significantly high levels of

radiofrequency radiation (RF) depending on many factors (location of meter(s) in relation to occupied or usable space, duty cycle or frequency of RF transmissions, reflection and re-radiation of RF, multiple meters at one location, collector meters, etc).

Power transmitters that will relay information from appliances inside buildings with wireless smart meters produce high, localized RF pulses. Any appliance that contains a power transmitter (for example, dishwashers, washers, dryers, ranges and ovens, convection ovens, microwave ovens, flash water heaters, refrigerators, etc) will create another 'layer of RF signals' that may cumulatively increase RF exposures from the smart meter(s).

It should be emphasized that no single assertion of compliance can adequately cover the vast number of site-specific conditions in which smart meters are installed. These site-specific conditions determine public exposures and thus whether they meet FCC compliance criteria.

Tables in this report show either distance to an FCC safety limit (in inches) or they show the predicted (calculated) RF level at various distances in microwatts per centimeter squared (uW/cm2).

Both depictions are useful to document and understand RF levels produced by smart meters (or multiple smart meters) and by collector meters (or collections of one collector and multiple smart meters).

Large differences in the results of computer modeling occur in this report by bracketing the uncertainties (running a sufficient number of computer scenarios) to account for variability introduced by possible duty cycles and possible reflection factors.

FCC equations from FCC OET 65 provide for calculations that incorporate 60% or 100% reflection factors. Studies cited in this report document higher possible reflections (in highly reflective environments) and support the inclusion of higher reflection factors of 1000% and 2000% based on Vermeeren et al, 2010, Hondou et al, 2006 and Hondou, 2002. Tables in the report provide the range of results predicted by computer modeling for duty cycles from 1% to 100%, and reflection factors of 60%, 100%, 1000%, and 2000% for comparison purposes. FCC violations of time-weighted average calculations and peak power limit calculations come directly from FCC OET 65 and from ANSI/IEEE c95.1-1992, 1999. Duty cycle (or how frequently the meters will produce RF transmissions leading to elevated RF exposures) is uncertain, so the full range of possible duty cycles are included, based on best available information at this date.

- Tables 1-2 show radiofrequency radiation (RF) levels at 6" (to represent a possible face exposure). These are data tables.
- Tables 3-4 show RF levels at 11" (to represent a possible nursery/bedroom exposure). These are data tables.
- Tables 5-6 show RF levels at 28" to represent a possible kitchen work space exposure. These are data tables.
- Tables 7-9 show the distance to the FCC violation level for time-weighted average limits and for peak power limits (in inches). These are data tables.
- Tables 10-15 show where FCC violations may occur at the face, in the nursery or in the kitchen scenarios. These are colored tables highlighting where FCC violations may occur under all scenarios.
- Tables 16-29 show comparisons of smart meter RF levels with studies that report adverse health impacts from low-intensity, chronic exposure to similar RF exposures. These are colored tables highlighting where smart meter RF levels exceed levels

associated with adverse health impacts in published scientific studies.
- Tables 30-31 show RF levels in comparison to Medtronics advisory limit for MRI exposures to radiofrequency radiation at 0.1 W/Kg or about 250 uW/cm2. These are colored tables highlighting where smart meter RF levels may exceed those recommended for RF exposure.
- Tables 32-33 show RF levels from smart meters in comparison to the BioInitiative Report recommendation of 0.1 uW/cm2 for chronic exposure to pulsed radiofrequency radiation.

Findings

RF levels from the various scenarios depicting normal installation and operation, and possible FCC violations have been determined based on both time-averaged and peak power limits (Tables 1 - 14).

Potential violations of current FCC public safety standards for smart meters and/or collector meters in the manner installed and operated in California are illustrated in this Report, based on computer modeling (Tables 10 – 17).

Tables that present data, possible conditions of violation of the FCC public safety limits, and comparisons to health studies reporting adverse health impacts are summarized (Tables 18 – 33).

Where do predicted FCC violations occur for the 655 uW/cm2 time-averaged public safety limit at the face at 6" distance from the meter?

Table 10 shows that for one smart meter, no violations are predicted to occur at 60% or 100% reflection factor at any duty cycle, but violations are predicted to occur with nearly all scenarios using either 1000% or 2000% reflection factors.

Table 10 also shows that for multiple smart meters, FCC violations are predicted to occur at 60% reflection factor @ 50% to 100% duty cycles; and also at 100% reflection factor @ 30% to 100% duty cycle. All scenarios using either 1000% or 2000% reflection factors indicate FCC violations can occur (or conservatively at 12% to 22% of those in Hondou et al, 2006).

Table 11 shows that for one collector meter, one violation occurs at 60% @ 100% duty cycle; and at 100% reflection factor for duty cycles between 60% and 100%. Violations are predicted to occur at all scenarios using either 1000% or 2000% reflection factors.

Table 11 also shows that for one collector meter plus multiple smart meters, FCC violations can occur at 60%reflection factor @ 40% to 100% duty cycles; and also at 100% reflection factor @ 30% to 100% duty cycle. All scenarios using either 1000% or 2000% reflection factors indicate FCC violations can occur.

Where do predicted FCC violations occur for the 655 uW/cm2 time-averaged public safety limit in the nursery crib at 11" distance?

Table 12 shows that for one smart meter, no violations are predicted to occur at 60% or 100% reflection factor at any duty cycle, but violations would be predicted with nearly all scenarios using either 1000% or 2000% reflection factors.

Table 12 also shows that for multiple smart meters, no FCC violations are predicted to occur at 60% reflection factor at any duty cycle; and also at 100% reflection factor @ 90% and 100% duty cycle. All scenarios using either 1000% or 2000% reflection factors indicate FCC violations can occur.

Table 13 shows that for one collector meter, one violation occurs at 100% reflection @100% duty cycle. No violations at 60% reflection are predicted. Violations are predicted to occur at all scenarios using 1000% reflection except @ 1% duty cycle. All 2000% reflection scenarios indicate FCC violations can occur.

Table 13 shows that for one collector meter plus multiple smart meters, FCC violations are not predicted to occur at 60% reflection factor. At 100% reflection factor, violations are predicted at 60% to100% duty cycles. FCC violations are predicted for all1000% and 2000% reflection factors with the exception of 1000% reflection at 1% duty cycle.

Where do predicted FCC violations occur for the 655 uW/cm2 time-averaged public safety limit in the kitchen work space at 28" distance?

Table 14 shows that for one smart meter, no violations are predicted to occur at 60% or 100% reflection factor at any duty cycle. Violations would be predicted with scenarios of 1000% reflection @ 70% to 100% duty cycles and at 2000% reflection factor @ 20% to 100% duty cycles.

Table 14 also shows that for multiple smart meters, no FCC violations are predicted to occur at 60% or at the 100% reflection factors at any duty cycle. Violations are predicted at 1000% reflection factor @ 70% to 100% duty cycles and at 2000% reflection factor @20% to 100% duty cycles.

Table 15 shows that for one collector meter, one violation occurs at 100% reflection @100% duty cycle. No violations at 60% reflection are predicted. Violations are predicted to occur at all scenarios using 1000% reflection except @ 1% duty cycle. All 2000% reflection scenarios indicate FCC violations can occur.

Table 15 shows that for one collector meter plus multiple smart meters, FCC violations are not predicted to occur at 60% or at 100% reflection factors at any duty cycle. At 1000% reflection factor, violations are predicted at 30% to 100% duty cycles. FCC violations are also predicted at 2000% reflection factor @10 to 100% duty cycles.

Where can peak power limits be violated? The peak power limit of 4000 uW/cm2 instantaneous public safety limit at 3" distance? This limit may be exceeded wherever smart meters and collector meters (face plate or any portion within 3" of the internal antennas can be accessed directly by the public.

Table 16 shows that for one smart meter, no violations are predicted to occur at 60% or 100% reflection factor at any duty cycle. Peak power limit violations would be predicted with scenarios of 1000% reflection @ 10% to 100% duty cycles and at 2000% reflection factor @ 10% to 100% duty cycles.

Table 16 also shows that for multiple smart meters, peak power limit violations are predicted to occur at 60% reflection @ 60% to 100% duty cycle and for 100% reflection @ 40% to 100% duty cycles. Violations are predicted at 1000% reflection factor @ 10% to 100% duty cycles and at 2000% reflection factor @1% to 100% duty cycles.

Table 17 shows that for one collector meter, peak power limit violations are predicted to occur at 60% reflection @80% to 100% duty cycles and at 100% reflection @ 50% to 100% duty cycles. Violations of peak power limit are predicted to occur at all scenarios using 1000% reflection except @ 1%; and for 2000% reflection violations of peak power limit are predicted at all duty cycles.

Table 17 shows that for one collector meter plus multiple smart meters, peak power limit violations are predicted to occur at 60% @ 40% to 100% and 100% reflection @ 30% to 100% duty cycles. At 1000% and 2000% reflection factors, peak power limit violations are predicted at all duty cycles.

Where are RF levels associated with inhibition of DNA repair in human stem cells at 92.5 uW/cm2 exceeded the in the nursery crib at 11" distance?

Table 18 shows that for one smart meter, RF exposures associated with inhibition of DNA repair in human stem cells are predicted to occur at 60% reflection factor@ 70% to 100% duty cycles, and at 100% reflection factor @ 50% to 100% duty cycles. All scenarios using either 1000% or 2000% reflection factors exceed these RF exposures except 1000% at 1% duty cycle.

Table 18 also shows that for multiple smart meters, RF exposures associated with inhibition of DNA repair in human stem cells are predicted to occur at 60% reflection factor@ 20% to 100% duty cycles, and at 100% reflection factor @ 20% to 100% duty cycles. All scenarios using either 1000% or 2000% reflection factors exceed these RF exposure levels except 1000% at 1% duty cycle.

Table 19 shows that for one collector meter, RF exposures associated with inhibition of DNA repair in human stem cells are predicted to occur at 60% reflection factor@ 30% to 100% duty cycles, and at 100% reflection factor @ 20% to 100% duty cycles. All scenarios using either 1000% or 2000% reflection factors exceed these RF exposure levels.

Table 19 shows that for one collector meter plus multiple smart meters, RF exposures associated with inhibition of DNA repair in human stem cells are predicted to occur at 60% reflection factor@ 20% to 100% duty cycles, and at 100% reflection factor @ 10% to 100% duty cycles. All scenarios using either 1000% or 2000% reflection factors exceed these RF exposure levels.

Where are RF levels associated with pathological leakage of the blood-brain barrier at 0.4 – 8 uW/cm2 exceeded the in the nursery crib at 11" distance?

Table 20 shows that for one smart meter, RF exposures associated with pathological leakage of the blood-brain barrier at 8 uW/cm2 are predicted to occur at 60% reflection factor@ 10% to 100% duty cycles, and at 100% reflection factor @ 5% to 100% duty cycles. RF levels at 0.4 uW/cm2 (the lower end of the range) are exceeded at all duty cycles and at all reflection factors in the nursery in the crib.

Table 20 also shows that for multiple smart meters, RF exposures associated with pathological

leakage of the blood-brain barrier at 8 uW/cm2 are predicted to occur at 60% reflection factor@ 5% to 100% duty cycles, and at 100% reflection factor @ 5% to 100% duty cycles. RF levels at 0.4 uW/cm2 (the lower end of the range) are exceeded at all duty cycles and at all reflection factors in the nursery in the crib.

Table 21 shows that for one collector meter, RF exposures associated with pathological leakage of the blood-brain barrier at 8 uW/cm2 are predicted to occur at 60% reflection factor@ 5% to 100% duty cycles, and at 100% reflection factor @ 5% to 100% duty cycles. RF levels at 0.4 uW/cm2 (the lower end of the range) are exceeded at all duty cycles and at all reflection factors in the nursery in the crib.

Table 21 shows that for one collector meter plus multiple smart meters, .RF exposures associated with pathological leakage of the blood-brain barrier at 8 uW/cm2 are predicted to occur at 60% reflection factor@ 5% to 100% duty cycles, and at 100% reflection factor @ 1% to 100% duty cycles. RF levels at 0.4 uW/cm2 (the lower end of the range) are exceeded at all duty cycles and at all reflection factors in the nursery in the crib.

Where are RF levels associated with adverse neurological symptoms, cardiac problems and increased cancer risk exceeded in the nursery crib at 11" distance?

Table 22 shows that for one smart meter, RF exposures associated with adverse neurological symptoms above 0.1 uW/cm2 are exceeded at all duty cycles and at all reflection factors in the nursery in the crib.

Table 22 shows that for multiple smart meters, RF exposures associated with adverse neurological symptoms above 0.1 uW/cm2 are exceeded at all duty cycles and at all reflection factors in the nursery in the crib.

Table 23 shows that for one collector meter, RF exposures associated with adverse neurological symptoms above 0.1 uW/cm2 are exceeded at all duty cycles and at all reflection factors in the nursery in the crib.

Table 23 shows that for one collector meter plus multiple smart meterss, RF exposures associated with adverse neurological symptoms above 0.1 uW/cm2 are exceeded at all duty cycles and at all reflection factors in the nursery in the crib.

Where are RF levels associated with inhibition of DNA repair in human stem cells at 92.5 uW/cm2 exceeded the in the kitchen work space at 28" distance?

Table 24 shows that for one smart meter, RF levels do not exceed those associated with inhibition of DNA repair at 60% or 100% reflection factor at any duty cycle. RF levels are exceeded at 1000% @ 10% to 100% duty cycles; and at 2000% reflection factor @ 5% to 100% duty cycles.

Table 24 also shows that for multiple smart meters, RF levels do not exceed those associated

with inhibition of DNA repair at 60% or 100% reflection factor at any duty cycle. RF levels are exceeded at 1000% @ 5% to 100% duty cycles; and at 2000% reflection factor @ 1% to 100% duty cycles.

Table 25 shows that for one collector meter, RF levels do not exceed those associated with inhibition of DNA repair at 60% at any duty cycle; at 100% reflection factor they are exceeded at 70% to 100% duty cycles.. RF levels are exceeded at 1000% @ 5% to 100% duty cycles; and at 2000% reflection factor @ 1% to 100% duty cycles.

Table 25 shows that for one collector meter plus multiple smart meters, RF levels exceed those associated with inhibition of DNA repair at 60% reflection@100% duty cycle; at 100% reflection factor they are exceeded at 70% to 100% duty cycles.. RF levels are exceeded at 1000% @ 5% to 100% duty cycles; and at 2000% reflection factor @ 1% to 100% duty cycles.

Where are RF levels associated with pathological leakage of the blood-brain barrier and neuron death at 0.4 – 8 uW/cm2 risk in the kitchen work space at 28" distance?

Table 26 shows that for one smart meter, RF exposures associated with pathological leakage of the blood-brain barrier at 8 uW/cm2 are predicted to occur at 60% reflection factor@ 40% to 100% duty cycles, and at 100% reflection factor @ 30% to 100% duty cycles, and at all 1000% and 2000% reflections. RF levels at 0.4 uW/cm2 (the lower end of the range) are exceeded at all duty cycles and at all reflection factors in the kitchen work space except at 1% duty cycle for 60% and 100% reflections.

Table 26 also shows that for multiple smart meters, RF exposures associated with pathological leakage of the blood-brain barrier at 8 uW/cm2 are predicted to occur at 60% reflection factor@ 30% to 100% duty cycles, and at 100% reflection factor @ 20% to 100% duty cycles, and at all 1000% and 2000% reflections. RF levels at 0.4 uW/cm2 (the lower end of the range) are exceeded at all duty cycles and at all reflection factors in the kitchen.

Table 27 shows that for one collector meter, RF exposures associated with pathological leakage of the blood-brain barrier at 8 uW/cm2 are predicted to occur at 60% reflection factor@ 20% to 100% duty cycles, and at 100% reflection factor @ 10% to 100% duty cycles. RF levels at 0.4 uW/cm2 (the lower end of the range) are exceeded at all duty cycles and at all reflection factors in the kitchen work space.

Table 27 shows that for one collector meter plus multiple smart meters, .RF exposures associated with pathological leakage of the blood-brain barrier at 8 uW/cm2 are predicted to occur at 60% reflection factor@ 20% to 100% duty cycles, and at 100% reflection factor @ 20% to 100% duty cycles. RF levels at 0.4 uW/cm2 (the lower end of the range) are exceeded at all duty cycles and at all reflection factors in the kitchen work space.

Where are RF levels associated with adverse neurological symptoms, cardiac problems and increased cancer risk in the kitchen work space at 28" distance?

Table 28 shows that for one smart meter, RF exposures associated with adverse neurological symptoms above 0.1 uW/cm2 are exceeded at all duty cycles and at all reflection factors in the kitchen work space.

Table 28 shows that for multiple smart meters, RF exposures associated with adverse neurological symptoms above 0.1 uW/cm2 are exceeded at all duty cycles and at all reflection factors in the kitchen work space.

Table 29 shows that for one collector meter, RF exposures associated with adverse neurological symptoms above 0.1 uW/cm2 are exceeded at all duty cycles and at all reflection factors in the kitchen work space.

Table 29 shows that for one collector meter plus multiple smart meterss, RF exposures associated with adverse neurological symptoms above 0.1 uW/cm2 are exceeded at all duty cycles and at all reflection factors in the kitchen work space.

Where do RF levels exceed the Medtronics Safety Advisory?

Table 30: At no duty cycles for either 60% or 100% reflection factors; between 10% and 100% duty factors for 1000% and between 5% and 100% duty factors for 2000% reflection (for one smart meter).

Table 30: At 60% reflection @ 60% to 100% duty cycle; and at 100% reflection @ 40% to 100% duty cycle; at 1000% reflection @ 5% to 100% duty cycle and for all duty cycles at 2000% reflection (for multiple smart meters).

Table 31: At 60% reflection @ 70% to 100% duty cycle; at 100% reflection at 50% to 100% duty cycles; at 1000% reflection @ 5% to 100% and at all duty cycles for 2000% reflection (for one collector meter).

Table 31: At 60% reflection @ 40% to 100% duty cycle; at 100% reflection at 30% to 100% duty cycles; and at all duty cycles for both 1000% reflection and for 2000% reflection (for one collector meter plus three smart meters).

Where are RF levels associated with smart meters in all their configurations (one meter, multiple smart meters, one collector meter, one collector plus multiple smart meters) above those recommended in the BioInitiative Report (2007)?

Tables 32 and 33 depict the distance from the center of radiation for the smart meter(s) and collector meter scenarios in feet. The distances (in feet) at which RF levels exceed the BioInitiative Report recommended limit of 0.1 uW/cm2 is as small as 3.4' (one smart meter at 60% reflection and 1% duty cycle). At 60% reflection and 100% duty cycle, the distance to the BioInitiative recommended limit increases to 34 feet for one smart meter.

When multiples of smart meters are considered, the shortest distance to where the BioInitiative

Report recommended limit is exceeded is 9.7 feet (for 60% reflection @ 1% duty cycle). It increases to 97' @100% duty cycle for multiple smart meters.

For a single collector meter, the shortest distance to a BioInitiative Report exceedence is 5.9 feet (60% reflection @ 1% duty cycle). At 60% reflection and 100% duty cycle, it increases to 59 feet.

For a collector and multiple smart meters, the shortest distance is 10.9 feet at 60% reflection @ 1% duty cycle, and increases to108 feet at 100% duty cycle.

Conclusions

FCC compliance violations are likely to occur under widespread conditions of installation and operation of smart meters and collector meters. Violations of FCC safety limits for uncontrolled public access are identified at distances within 6" of the meter. Exposure to the face is possible at this distance, in violation of the time-weighted average safety limits (Tables 10-11). FCC violations are predicted to occur at 60% reflection and 100% reflection factors*, both used in FCC OET 65 formulas for such calculations for time-weighted average limits. Peak power limits are not violated at the 6" distance (looking at the meter) but can be at 3" from the meter, if it is touched.

This report has also assessed the potential for FCC violations based on two examples of RF exposures in a typical residence. RF levels have been calculated at distances of 11" (to represent a nursery or bedroom with a crib or bed against a wall opposite one or more meters); and at 28" (to represent a kitchen work space with one or more meters installed on the kitchen wall).

FCC compliance violations are identified at 11" in a nursery or bedroom setting using Equation 10* of the FCC OET 65 regulations (Tables 12-13). These violations are predicted to occur where there are multiple smart meters, or one collector meter, or one collector meter mounted together with several smart meters.

FCC compliance violations are not predicted at 28" in the kitchen work space for 60% or for 100% reflection calculations. Violations of FCC public safety limits are predicted for higher reflection factors of 1000% and 2000%, which are not a part of FCC OET 65 formulas, but are included here to allow for situations where site-specific conditions (highly reflective environments, for example, galley-type kitchens with many highly reflective stainless steel or other metallic surfaces) may be warranted (see Methodology Section).

In addition to exceeding FCC public safety limits under some conditions of installation and operation, smart meters can produce excessively elevated RF exposures, depending on where they are installed. With respect to absolute RF exposure levels predicted for occupied space within dwellings, or outside areas like patios, gardens and walk-ways, RF levels are predicted to be substantially elevated within a few feet to within a few tens of feet from the meter(s).

For example, one smart meter at 11" from occupied space produces somewhere between 1.4 and 140 microwatts per centimeter squared (uW/cm2) depending on the duty cycle modeled (Table 12). Since FCC OET 65 specifies that continuous exposure be assumed where the public cannot be excluded (such as is applicable to one's home), this calculation produces an RF level of 140 uW/cm2 at 11" using the FCCs lowest reflection factor of 60%.

Using the FCC's reflection factor of 100%, the figures rise to 2.2 uW/cm2 – 218 uW/cm2, where the continuous exposure calculation is 218 uW/cm2 (Table 12). These are very significantly elevated RF exposures in comparison to typical individual exposures in daily life.

Multiple smart meters in the nursery/bedroom example at 11" are predicted to generate RF levels from about 5 to 481 uW/cm2 at the lowest (60%) reflection factor; and 7.5 to 751 uW/cm2 using the FCCs 100% reflection factor (Table 13). Such levels are far above typical public exposures.

RF levels at 28" in the kitchen work space are also predicted to be significantly elevated with one or more smart meters (or a collector meter alone or in combination with multiple smart meters). At 28" distance, RF levels are predicted in the kitchen example to be as high as 21 uW/cm2 from a single meter and as high as 54.5 uW/cm2 with multiple smart meters using the lower of the FCCs reflection factor of 60% (Table 14).

Using the FCCs higher reflection factor of 100%, the RF levels are predicted to be as high as 33.8 uW/cm2 for a single meter and as high as 85.8 uW/cm2 for multiple smart meters (Table 14). For a single collector meter, the range is 60.9 to 95.2 uW/cm2 (at 60% and 100% reflection factors, respectively) (from Table 15).

Table 16 illustrates predicted violations of peak power limit (4000 uW/cm2) at 3" from the surface of a meter. FCC violations of peak power limit are predicted to occur for a single collector meter at both 60% and 100% reflection factors. This situation might occur if someone touches a smart meter or stands directly in front.

Uncertainty About Actual RF Levels

Consumers may also have already increased their exposures to radiofrequency radiation in the home through the voluntary use of wireless devices (cell and cordless phones), PDAs like BlackBerry and iPhones, wireless routers for wireless internet access, wireless home security systems, wireless baby surveillance (baby monitors), and other emerging wireless applications.

Neither the FCC, the CPUC, the utility nor the consumer know what portion of the allowable public safety limit is already being used up or pre-empted by RF from other sources already present in the particular location a smart meter may be installed and operated.

Consumers, for whatever personal reason, choice or necessity who have already eliminated all possible wireless exposures from their property and lives, may now face excessively high RF exposures in their homes from smart meters. This may force limitations on use of their otherwise occupied space, depending on how the meter is located, building materials in the structure, and how it is furnished.

People who are afforded special protection under the federal Americans with Disabilities Act are not sufficiently acknowledged nor protected. People who have medical and/or metal implants or other conditions rendering them vulnerable to health risks at lower levels than FCC RF limits may be particularly at risk (Tables 30-31).

This is also likely to hold true for other subgroups, like children and people who are ill or taking medications, or are elderly, for they have different reactions to pulsed RF. Childrens' tissues absorb RF differently and can absorb more RF than adults (Christ et al, 2010; Wiart et al, 2008). The elderly and those on some medications respond more acutely to some RF exposures.

Eyes and Testes - Safety standards for peak exposure limits to radiofrequency have not been developed to take into account the particular sensitivity of the eyes, testes and other ball shaped organs.

There are no peak power limits defined for the eyes and testes, and it is not unreasonable to imagine situations where either of these organs comes into close contact with smart meters and/or collector meters, particularly where they are installed in multiples (on walls of multi-family dwellings that are accessible as common areas).

What can be determined from the relevant standards (FCC and ANSI/IEEE and certain IEEE committee documents is that the eye and testes are potentially much more vulnerable to damage, but that there is no scientific basis on which to develop a new, more protective safety limit. What is certain is that the peak power limit of 4000 uW/cm2 exceeds what is safe (Appendix C).

In summary, no positive assertion of safety can be made by the FCC, nor relied upon by the CPUC, with respect to pulsed RF when exposures are chronic and occur in the general population. Indiscriminate exposure to environmentally ubiquitous pulsed RF from the rollout of millions of new RF sources (smart meters) will mean far greater general population exposures, and potential health consequences.

Uncertainties about the existing RF environment (how much RF exposure already exists), what kind of interior reflective environments exist (reflection factor), how interior space is utilized near walls), and other characteristics of residents (age, medical condition, medical implants, relative health, reliance on critical care equipment that may be subject to electronic interference, etc) and unrestrained access to areas of property where meter is located all argue for caution.

Electronic Interference

Consumers may experience electronic interference (electromagnetic interference or EMI) from smart meter wireless signals. The FCC also is charged with investigating consumer complaints about electronic interference.

> *"The FCC requires that unlicensed low-power RF devices must not create interference and users of such equipment must resolve any interference problems or cease operation. According to the FCC (47CFR Part 15): "The operator of a radio frequency device shall be required to cease operating the device upon notification by a Commission representative that the device is causing harmful interference. Operation shall not resume until the condition causing the harmful interference has been corrected."*
>
> (EPRI, 2010)

Medical and other critical care equipment in the home environment may not work or work properly due to electronic interference from smart meters.

Security systems, surveillance monitors and wireless intercoms may be rendered inoperable or unreliable. Some cordless telephones do not work reliably or have substantial interference from smart meter RF emissions.

Electronic equipment and electrical appliances may be damaged or have to be replaced with other, newer equipment in order not to be subject to electromagnetic interference from smart meter RF bursts.

Americans With Disabilities Act

People who have medical implants, particularly metal implants, may be more sensitive to spurious RF exposures for two reasons. Electromagnetic interference (EMI) with critical care medical equipment and medical implants is a potentially serious threat. Patients with deep-brain stimulators (Parkinson's disease patients) have reported adverse health effects due to RF from various environmental sources like security gates and RFID scanners. Patients with deep brain stimulators have reported the devices to be reprogramming or electrodes shut-down as a result of encounters with wireless RFID scanners. One manufacturer, Medtronics, has issued a warning for DBS implant patients to limit RF exposure to less than 0.1 W/Kg SAR (or sixteen times lower than for the general public) for MRI exposures.

The IEEE SC4 committee (2001) considered changes to existing ANSI/IEEE standards adopted in 1992 (C95.1-1992). They discussed vulnerable organs (eyes, testes) and metallic implants that can intensify localized RF exposures within the body and its tissues.

> *"Question 20: Are there specific tissues or points within the body that have particularly high susceptibilities to local heating due to thermal properties in the immediate vicinity of the tissue?"*

Committee minutes include the following discussion on metallic implants.

> *"Metallic implants are an interesting example of this question. There can be very localized high field concentrations around the tips of long metal structures, in the gaps of wire loops. Of course, these metal devices don't create energy, but can only redistribute it, so the effect is limited to some extent. Also the high thermal conductivity and specific heat capacity make them good thermal sinks for any localized heat sources generated around them."*

Since deep brain stimulators in Parkinson's patients involve metal implants that are essentially long metal structures with tips that interface with brain tissue and nerves within the brain and body, exposing such patients with implants to high levels of pulsed RF that can produce localized, high RF within the body is certainly inadvisable. It is clear the IEEE SC4 committee recognized the potential risk by to calling such implanted metallic devices good 'thermal sinks' for localized heating dissipation.

The FCC's Grants of Authorization and other certification procedures do not ensure adequate safety to safeguard people under Department of Justice protection under the Americans with Disabilities Act.

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Appendix A Tables A1- A 48

RADIOFREQUENCY RADIATION VERSUS DISTANCE

One Smart Meter

Table A1	60% Reflection	(1%-100% duty cycles in each table)
Table A2	100% Reflection	(1%-100% duty cycles in each table)
Table A3	1000% Reflection*	(1%-100% duty cycles in each table)
Table A4	2000% Reflection*	(1%-100% duty cycles in each table)

Multiple Smart Meters (Four)**

Table A5	60% Reflection	(1%-100% duty cycles in each table)
Table A6	100% Reflection	(1%-100% duty cycles in each table)
Table A7	1000% Reflection	(1%-100% duty cycles in each table)
Table A8	2000% Reflection	(1%-100% duty cycles in each table)

One Collector Meter

Table AA9	60% Reflection	(1%-100% duty cycles in each table)
Table A10	100% Reflection	(1%-100% duty cycles in each table)
Table A11	1000% Reflection	(1%-100% duty cycles in each table)
Table A12	2000% Reflection	(1%-100% duty cycles in each table)

One Collector Meter + 3 SM**

Table A13	60% Reflection	(1%-100% duty cycles in each table)
Table A14	100% Reflection	(1%-100% duty cycles in each table)
Table A15	1000% Reflection	(1%-100% duty cycles in each table)
Table A16	2000% Reflection	(1%-100% duty cycles in each table)

TABLES OF CRITICAL DISTANCES IN NURSERY (CRIB AT 11") AND KITCHEN SINK (AT 28") FROM SMART METER A17-A48)

Table A17	Nursery Set –
Table A18	One Smart Meter – Critical Distance 11" to baby in crib
Table A19	60%, 100%, 1000%, 2000% duty cycle
Table A20	1% thru 90% duty cycle
Table A21	Nursery Set –
Table A22	Eight Smart Meters – Critical Distance 11" to baby in crib
Table A23	60%, 100%, 1000%, 2000% reflection
Table A24	1% thru 100% duty cycle
Table A25	Nursery Set –
Table A26	One Collector– Critical Distance 11" to baby in crib
Table A27	60%, 100%, 1000%, 2000% reflection
Table A28	1% thru 100% duty cycle
Table A29	Nursery Set –
Table A30	One Collector Meter + 7 SM– Critical Distance 11" to baby crib
Table A31	60%, 100%, 1000%, 2000% reflection
Table A32	1% thru 100% duty cycle
Table A33	Kitchen Set –
Table A34	One Smart Meter – Critical Distance 28" to kitchen sink person
Table A35	60%, 100%, 1000%, 2000% reflection
Table A36	1% thru 100% duty cycle
Table A37	Kitchen Set -
Table A38	Eight Smart Meters – Critical Distance 28" to kitchen sink person
Table A39	60%, 100%, 1000%, 2000% reflection
Table A40	1% thru 100% duty cycle
Table A41	Kitchen Set –
Table A42	One Collector – Critical Distance 28" to kitchen sink person
Table A43	60%, 100%, 1000%, 2000% reflection
Table A44	1% thru 100% duty cycle
Table A45	Kitchen Set –
Table A46	One Collector + 7 SM – Critical Distance 28" to kitchen
Table A47	60%, 100%, 1000%, 2000% reflection
Table A48	1% thru 100% duty cycle

Appendix B Tables 1 – 33 of Report

Data Tables, FCC Violation Tables, Health Comparisions

Appendix C

Other Sources of Information on sensitivity of the eyes and tests

In the most recent proposed revisions of RF safety standards, the IEEE SC4 committee (2001) deliberated at length over the problem of peak power limits and non-uniform RF exposure with respect to the eye and tests. The quotes below come from committee drafts submitted in response to questions from the committee moderator.

ANSI/IEEE standards adopted in 1992 (C95.1-1992) and 1999 revisions
June 2001 SC-4 Committee Minutes

These committee discussions are informative on the issue of particular organ sensitivity to RF, and unanswered questions and differences of opinion on the subject among members. They discussed vulnerable organs (eyes, tests) and metallic implants that can intensify localized RF exposures within the body and its tissues (see also discussion on metallic implants).

Question: Are there specific tissues or points within the body that have particularly high susceptibilities to local heating due to thermal properties in the immediate vicinity of the tissue?

Committee minutes include the following discussion on the particular sensitivities of 'ball shaped' organs including the eyes and tests.

"*Eye balls are commonly regarded as the critical organ*"

"*In the range of a few GHz* (gigahertz)*, resonances may occur in ball shaped eyes and testes. They are also electrically and thermally partly insulated from other tissues. Additionally, these organs or some of their parts (lens) are thermally a little bit more vulnerable than other tissues.*"

"*modeling has noted that rapid changes in dielectrics such as cerebral spinal fluid in the ventricles of the brain and surrounding brain tissue lead to high calculated SARs. Secondly, exposure of the eye to microwave radiation can lead to increased temperature that is sufficient to damage tissues. The temperature rise will, of course, depend on the intensity of the irradiation,*

how well the energy is coupled into tissues, and how well the deposited energy is removed by normal mechanisms such as conduction and blood flow. Microwaves at the lower frequencies will be deposited deeper in the eye, while at higher frequencies they will be absorbed near the front surface of the eye. The eye does not efficiently remove heat deposited internally by microwave exposure. The main avenue of heat removal is conduction and blood flow through the retina and choroid. The lens has been thought to be the most vulnerable tissue since it has no blood flow. Other than conduction through the sclera and convection from the surface of the cornea, heat removal is poor compared to other body tissues. Because the lens is avasular it has been thought to be particularly sensitive to thermal effects of microwave exposure. These facts have led many investigators to postulate that the poor heat dissipation from within the eye of humans and other animals may lead to heat buildup and subsequent thermal damage."

"Eyes do not have good blood circulation and testes have lower than body temperature."

"These organs are not well-perfused, hence have been singled out for the exclusion."

"Are the above numbers valid for all parts of the body in all exposure conditions over the time averaging period of the exposure? They (the basic limits) were derived in the manner you describe in body resonance conditions i.e. coherent exposure over the whole-body length of a human. Could the limit values of SAR be increased for partial body exposure?
Yes, but we do not have the data to make this decision. In the near field of a source, clearly the limit value will depend on frequency (depth of penetration), organ blood supply and tolerance of that organism to sustain a certain rate of temperature increase during the time averaging period and the environmental conditions. If you have to deal with possible pathologies of organs then matters become even more complicated, because you are dealing not only with heat physiology, but also with general pathology, whose books are much thicker than those on physiology.

15. Did you ever perform any job responsibilities or engage in a course of study specifically relating to radio frequency or low frequency radiation? If so, describe each job responsibility and/or course of study in detail.

ANSWER: ***No***

16. Produce all Documents that relate to Your response to the preceding request.

ANSWER: **n/a**

17. Are you a certified electrician? If so, state the date of certification.

ANSWER: ***No, but I know enough of electromechanical design of the SM that I can say with certainty that they ALL send and receive instructions via the airwaves (at will, or when quarried by outside sources) to "share" the stored or acquired data which is unprotected and can be accessed at will by outside sources and or intruders. They also have a switch power supply (converting A/C voltage to DC voltage) Switching power supplies produce high voltage transient currents which enter a consumers residence via***

the electrical wires and cause more health problems that the EMF radiation of the typical SM. Furthermore, it has been shown that SM do not have an "overload protection –(fuse)" which can lead to catastrophic destruction of the SM in case of a voltage/amperage surge.

See: https://www.youtube.com/watch?v=gOqucXzwKkA&t=37s

26. Identify all medical conditions that make you vulnerable to, or that would be aggravated by, proximity to an Itron SK9AM|T HW 3.1 OpenWay CENTRON Singlephase Smart Meter.

ANSWER: ***Heart conditions where prevalent in my family. My mother died of heart failure at age 71. My dad had a "weak" heart. In my case the condition is hereditary and gene related, prolonged exposure to EMF by a SM would be serious and could lead to premature death. I also am suffering from Hemochromatosis. Blood samples are taken every 4 weeks to check the amount of iron. I am on blood thinner medication daily. I am being Phlebotomized every time the HCT is below 45 which is about 8 times a year.***

28. Produce all Documents, including but not limited to hospital and/or medical records and studies, demonstrating the relationship between the medical condition(s) identified in Your email dated April 26, 2018 containing your discovery responses and your proximity to an Itron SK9AM|T HW 3.1 OpenWay CENTRON Singlephase Smart Meter.

ANSWER: ***see pages 51-59 and Exhibits C & D***

UPMC LIFE CHANGING MEDICINE

UPMC East Non-Invasive Imaging 2775 Mosside Blvd
Monroeville, PA 15146
Phone: 412-357-3549 Fax:

TRANSTHORACIC ECHOCARDIOGRAM

SLIWINSKI, NORBERT **Exam Date: 02/12/2018 08:25** **Echo #: CV1025542**

MRN: 784760199 **EMPI:** 2500739 **Birth Date:** 11/14/1941
Gender: M **Address:** 856 COTTONWOOD DR, , MONROEVILLE, PA, 15146
Ordered By: SHARMA, PARMINDER **Sonographer:** DICOCCO, ANDREW
Interpreted By: Lindsay Mehring, D.O. **Signed Date/Time:** 2/13/2018 1:30:00 PM
Room/Location: OP/- **Tape:** DIGITAL
Height: 180 cm **Weight:** 71 kg **BSA:** 1.9 m2 **Resting Blood Pressure:** 162/92 mmHg

Diagnosis/Indications

Chest Pain, Other (R07.9)
Dyspnea on exertion (R06.09)

Echocardiographic Measurements

Diastolic Diameter:	4.6 cm (3.5 - 5.5 cm)	**Aortic Root:**	3.2 cm (2.0 - 3.7 cm)
Systolic Diameter:	3.2 cm (2.5 - 4.0 cm)	**Left Atrium:**	cm (1.9 - 3.8 cm)
Septal Thickness:	1.4 cm (0.7 - 1.2 cm)		
Posterior Wall Thickness:	0.9 cm (0.7 - 1.1 cm)	**EF %:**	55-60 (55-75%)

Two Dimensional Echocardiography

Left ventricular size is normal. Left ventricular septal thickness is increased consistent with asymmetric hypertrophy. Segmental left ventricular function is normal. Overall left ventricular function is normal. The estimated left ventricular ejection fraction is 55-60 %. Right ventricular size is normal. Right ventricular wall thickness is normal. Right ventricular function is normal. The right ventricular TAPSE is 3.1 cm (normal > 1.6 cm). The left atrial volume index is 43 ml/m2 (normal 40; Revised J Am Soc Echo 1/15). The left atrium is moderately enlarged. The right atrial size is normal. The pulmonary artery size is normal. The aortic root size is normal. The aortic valve is normal. The mitral valve is normal. The tricuspid valve is normal. The pulmonic valve is normal. No pericardial effusion is seen. The inferior vena cave is dilated.

Spectral Doppler

There is trace aortic regurgitation. There is trace mitral regurgitation. There is mild tricuspid regurgitation. There is trace pulmonic regurgitation. The mitral inflow E velocity is 81 cm/sec. The mitral inflow A velocity is 66 cm/sec. The mitral annular E velocity is 7 cm/sec. The mitral inflow E/A ratio is 1.2. The mitral inflow E to annular E ratio is 12 (> 15 may be consistent with increased left ventricular filling pressure). The peak tricuspid regurgitant velocity is 2.7 m/sec and with an assumed right atrial pressure of 8 mmHg, the estimated pulmonary artery systolic pressure is 37 mmHg. There is a pseudonormal pattern consistent with diastolic dysfunction grade 2.

Color Flow Doppler

There is trace aortic regurgitation. There is trace mitral regurgitation. There is mild tricuspid regurgitation. There is trace pulmonic regurgitation.

Final Impressions

1. Normal left ventricle size. Septal thickness is increased consistent with asymmetric hypertrophy. The left ventricle has normal systolic function. The estimated left ventricular ejection fraction is 55-60%.
2. Normal right ventricle size. The right ventricle has normal function.
3. Mild tricuspid regurgitation.

UPMC LIFE CHANGING MEDICINE

UPMC East Non-Invasive Imaging 2775 Mosside Blvd
Monroeville, PA 15146
Phone: 412-357-3549 Fax:

TRANSTHORACIC ECHOCARDIOGRAM

SLIWINSKI, NORBERT Exam Date: 02/12/2018 08:25 Echo #: CV1025542

4 The left atrium is moderately enlarged.
5 Borderline pulmonary hypertension; the estimated pulmonary artery systolic pressure is 37 mmHg.
6 Dilated inferior vena cava, consistent with increased right atrial pressure.
7 There is a pseudonormal pattern consistent with diastolic dysfunction grade 2.
8 As compared to 7/23/12: Diastolic dysfunction is now present.

This is an electronically authenticated signature, which is an attestation that I have personally interpreted this/these examination(s) and agree with the findings as noted above.

Lindsay Mehring, D.O. Signed: 2/13/2018 1:30:00 PM

Report generated on 2/13/2018 1:30:08 PM

Page 2 of 2

Asymmetric Septal Hypertrophy see Exhibit C
Polycythemia vera see Exhibit D

UPMC - PRESBYTERIAN
PA

*** RADIOLOGY REPORT ***

Patient Name: SLIWINSKI, NORBERT A DOB: 11/14/1941

MRN: 784760199 Gender: M Location: MIC (PUHSHY)

Patient Phone Number: 412-372-7338

Exam Desc: XRAY HIPS, 2 VIEWS BILATERAL, WITH PELV WHEN PERFORMED

Collection Date: 07/17/2017 14:04
Dictated on : 07/17/2017 14:23

Attending MD: BERNARD J BERNACKI

Requesting MD: BERNARD J BERNACKI

Accession #: 85003555 Visit Number: 0094907797198

Attending Interpreter: CAMILO G BORRERO
Assisting Interpreter:

*** FINAL REPORT ***

Reason for the Exam:
m54.5;
History:
Pain.
Findings:
AP radiograph of pelvis and 2 radiographs of each hip obtained. No fracture, malalignment or avascular necrosis. Minimal bilateral trochanteric enthesopathy. Bulky adductor enthesophytes noted along the inferomedial border of each obturator ring.
Moderate to advanced L3-L4 through L5-S1 disc space narrowing noted. 3 radiographs of lumbar spine obtained and shows advanced disc space narrowing at L1-L2, L2-L3 and L4-L5. Moderate narrowing at L3-L4 and L4-L5. Nonbridging anterior annular osteophytes noted. Moderate diffuse facet arthropathy.
No fracture or subluxation appreciated.
Impression:
1. Moderate to advanced lumbar spondylosis but no fracture or subluxation.
2. Unremarkable radiographs of each hip.
3. Adductor bony enthesophytes.
RELEVANT CLINICAL INFORMATION: m54.5;
Dictated by: CAMILO G BORRERO
Signed by: CAMILO G BORRERO
Signed on: 07/17/2017 at 2:23 PM

UPMC - PRESBYTERIAN
PA

*** RADIOLOGY REPORT ***

Patient Name: SLIWINSKI, NORBERT A DOB: 11/14/1941

MRN: 784760199 Gender: M Location: MIC (PUHSHY)

Patient Phone Number: 412-372-7338

Exam Desc: MR SPINE LUMBAR WITHOUT CONTRAST

Collection Date: 11/07/2017 13:30
Dictated on : 11/07/2017 16:25

Attending MD: DANIEL M BURSICK

Requesting MD: DANIEL M BURSICK

Accession #: 86115623 Visit Number: 0094907797300

Attending Interpreter: RAKHEE KISAN SANSGIRI
Assisting Interpreter:

*** FINAL REPORT ***

Reason for the Exam:
Abnormal xray, spine, DJD Low back pain, >6 wks / red flag(s) / radiculopathy
Presurgical evaluation, lumbar spine; Other intervertebral disc degeneration, lumbosacral region
CLINICAL HISTORY: Back pain
TECHNIQUE: Pulse sequences: Sagittal T1, sagittal T2, sagittal STIR, axial T1, axial T2. Examination was performed without contrast.
COMPARISON: Whole body nuclear medicine bone scan 11/07/2017
FINDINGS:
Lumbar spinal lordosis is maintained. There is 6 mm grade 1 retrolisthesis of L2 over L3. Vertebral body heights remain within normal limits. A Schmorl's node is noted along the inferior endplate of L3 vertebra. Reactive endplate marrow changes are noted at L2-L3 level. Diffuse decreased marrow signal on the T1 sequence can be seen in high-level athletes, smokers or in chronic hypoxia/anemia. The paraspinal soft tissues and included abdominal viscera show no acute abnormalities. The conus terminates at the L2 level. The distal spinal cord, conus and cauda equina are normal. No epidural collection or intraspinal mass lesion is noted.
At L1-L2, diffuse disc bulge is noted. Mild facetal hypertrophy is present. Spinal canal and neural foramina remain patent.
At L2-L3, diffuse disc bulge results in mild subarticular recess stenosis. Mild to moderate facetal hypertrophy results in mild spinal canal stenosis. Neural foramina remain patent.
At L3-L4, diffuse disc bulge is present. Moderate facetal hypertrophy results in mild spinal canal stenosis. Moderate bilateral neural foraminal stenosis is present.
At L4-L5, diffuse disc bulge results in left subarticular recess stenosis. Moderate facetal hypertrophy is present. Spinal canal is patent. Mild bilateral neural foraminal stenosis is shown.
At L5-S1, diffuse disc bulge does not contact the descending nerve roots. Spinal canal and neural foramina remain patent.
IMPRESSION:

<<< PAGE 1 >>>

Page 1 of 2

UPMC - PRESBYTERIAN
PA

*** RADIOLOGY REPORT ***

Patient Name: SLIWINSKI, NORBERT A DOB: 11/14/1941

MRN: 784760199 Gender: M Location: MIC (PUHSHY)

Patient Phone Number: 412-372-7338

Exam Desc: MR SPINE LUMBAR WITHOUT CONTRAST

Collection Date: 11/07/2017 13:30
Dictated on : 11/07/2017 16:25

Attending MD: DANIEL M BURSICK

Requesting MD: DANIEL M BURSICK

Accession #: 86115623 Visit Number: 0094907797300

Attending Interpreter: RAKHEE KISAN SANSGIRI
Assisting Interpreter:

Degenerative changes notable for shallow posterior disc protrusions at multiple levels as detailed above.
RELEVANT CLINICAL INFORMATION: Abnormal xray, spine, DJD Low back pain, >6 wks / red flag(s) / radiculopathy Presurgical evaluation, lumbar spine; Other intervertebral disc degeneration, lumbosacral region
Dictated by: RAKHEE KISAN SANSGIRI
Signed by: RAKHEE KISAN SANSGIRI
Signed on: 11/07/2017 at 4:25 PM

PATIENT NAME: SLIWINSKI, NORBERT A
PATIENT ID#: 204424831
SSN: 204424831
DATE OF BIRTH: 11/14/1941
DATE OF VISIT: 08/23/2006

OFFICE NOTE

DIAGNOSIS/ES:

1. Pulmonary embolism.
2. Prothrombin gene abnormality.

The patient is a 64-year-old white male who was involved with a motorcycle accident. He had to bring the motorcycle down and stopped it in the grass, and he had trauma to his knee. Apparently there was some cartilage and a meniscus tear at the time. He did well and then a short time later developed idiopathic pulmonary emboli presenting with hemoptysis. He did not have a lot of shortness of breath. A Doppler study of his legs was negative. There were no signs of occult malignancy. His CAT scan of the abdomen was negative.

His hypercoag profile, the factor V Leiden was normal. The prothrombin gene assay was heterozygous, which is positive. His MTHFR was normal. The antithrombin III level was low, most likely related to the thrombosis. His protein C level was normal as was protein S. The lupus anticoagulant profile was not drawn.

He is planning to go to Russia. He is a project manager and is working as an engineer. He will be there through most of the year. He will be back in October briefly and then he will be off to Russia.

CURRENT MEDICATIONS: He is on Coumadin 7.5 alternating with 5 mg a day.

PHYSICAL EXAMINATION: An alert pleasant male in no apparent distress. His weight is 185 pounds. Blood pressure is 110/70. He is afebrile. HEENT shows no lymphadenopathy in his neck. His chest is clear. Cardiac exam is benign. Abdomen is soft. Extremities are normal.

ASSESSMENT: Pulmonary emboli following trauma to his right knee in a patient of whose prothrombin gene heterozygote abnormal.

I feel he should maintain his Coumadin INR between 2 and 3 for the rest of his life. I told him the alternative recommendation would be Coumadin for 6 months and then he would have approximately a 25% chance of developing a recurrent blood clot in the near future. If he is going to continue to travel and change his diet, it may be safer to stop the Coumadin at 6 months and just prophylax him with heparin or Lovenox shots at periods of high risk such as airplane travel or if he is hospitalized for surgery of his knee, etc.

I have recommended he defer his surgery of his knee for 6 weeks for now, whereas,

his thrombotic risk would be lower.

Typically, if the INR becomes less than 2 we would phone in orders for a heparin of Lovenox shots. That will be difficult for us when he is in Russia.

I believe there will be INR testing in Russia, and he should to get checked twice a week and e-mail Dr. Bernacki with the results. His diet will be completely different, and I expect a complete different dose of Coumadin to be required.

I did caution him that if he has diarrhea, begins an antibiotic, or changes his diet that the Coumadin level will change.

For completeness, I am going to check his lupus anticoagulant profile, and I will repeat his antithrombin III level.

If his lupus anticoagulant profile is abnormal, that would be an additive risk factor in addition to the prothrombin gene assay, of which I would encourage lifelong use of Coumadin. He is going to come back and see me when he returns in October.

Dennis Meisner, MD

cc: Bernard Joseph Bernacki, DO
521 Greenfield Avenue
Pittsburgh, PA 15207

d:08-23-2006 t:08-23-2006
djn:829487
t:12 mt:9999
Scribes Online

NOTE TYPE: OFFICE NOTE

PATIENT NAME: SLIWINSKI, NORBERT

ARIA ID: A2500739

DATE OF BIRTH: Nov 14, 1941

DATE OF VISIT: Mar 26, 2018

FOLLOW UP OFFICE NOTE

DIAGNOSIS:
Primary D45 - Polycythemia vera, Diagnosed Dec 29, 2015 (Active)

PRINCIPAL DIAGNOSIS:
1. Polycythemia vera, JAK-2 mutation positive.
2. History of hypercoagulable state, positive for prothrombin gene variant, diagnosed in August 2006 when he was diagnosed with PE. He suffered right lower extremity DVT in June 2015.

HISTORY OF PRESENT ILLNESS/INTERM HISTORY:
1. Phlebotomy as needed for a goal hematocrit less than 45. He will not need phlebotomized today.
2. Xarelto 20 mg daily.

INTERVAL HISTORY: Mr. Sliwinski returns to clinic for further management of the above. He has done well since his last visit. Denies any fevers or chills. Denies any nausea or vomiting. Denies any bright red blood per rectum or any melena. He denies any shortness of breath, cough or hemoptysis. He denies any headaches or vision changes. He denies any new bone pain. He denies any easy bleeding or bruising.

REVIEW OF SYSTEMS:
The pertinent ROS are incorporated in the HPI. Beyond those, the remaining 10 organ system ROS are either normal/negative

PHYSICAL EXAMINATION:

Performed on Mar 26, 2018 08:17							
Height	68.7 in	Weight	170.2 lbs	BSA (derived)	1.92 sq.m	BMI	25.35
Temperature	97.2 F	Pulse	55 /min	Respiration	16 /min	BP	122/71
Pulse Oximetry (O2 Sat)	98 %	Fatigue	0	Pain Assessment	0		

Performance Status: 0 - Fully active, able to carry on all predisease activities without restrictions. (ECOG)

Constitutional	Alert, cooperative, oriented. Mood and affect appropriate.
Head	Normocephalic; no scars.
Eyes	Conjunctivae and sclerae are clear and without icterus. Pupils are reactive and equal.
ENMT	No oral exudates, ulcers, masses, thrush or mucositis. Oropharynx clear.
Hematologic/Lymphatic	No petechiae or purpura. No tender or palpable lymph nodes.
Respiratory	Lungs are clear to auscultation without rhonchi or wheezing.

Electronically Signed by: Daniel Petro, M.D. on 4/7/2018 11:54:34

Cardiovascular	Regular rate and rhythm of heart without murmurs, gallops or rubs.
Abdomen	Non-tender, non-distended. Good bowel sounds.
Extremities	No edema.
Integumentary	No rashes, scars, or lesions suggestive of malignancy.
Neurologic	No sensory or motor deficits, normal cerebellar function, normal gait.

LABORATORY/RADIOLOGY DATA:

Test performed on Mar 26, 2018 07:57

CO2	23.0 mmol/L	Ferritin	4 ng/mL
Iron	27 ug/dL	LDH (Total)	161 IU/L
Magnesium	2.0 mg/dL	Phosphorus	2.7 mg/dL
Sodium - Whole Blood	139 mEq/L	BUN	16 mg/dL
Iron Binding Capacity (TIBC)	507 ug/dL	Potassium - Whole Blood	3.8 mEq/L
Calcium	9.5 mg/dL	Chloride - Whole Blood	110 mEq/L
Transferrin Saturation	5 %	Alkaline Phosphatase	38 IU/L
Creatinine	1.0 mg/dL	AST (SGOT)	19 IU/L
Cr Clearance (Est)	68.6200 mL/min	ALT (SGPT)	15 IU/L
Glucose - Whole Blood	155 mg/dL	Calcium, Ionized (mmol/L)	1.16 mmol/L
Protein, Total	6.6 g/dL	Albumin	3.8 g/dL
eGFR	73 mL/min/1.73**2	Bilirubin, Total	0.4 mg/dL
eGFR African-American	84 mL/min/1.73m**2	WBC	6.5 X10E+09/L
RBC	5.76 X10E+12/L	HGB	13.8 g/dL
HCT	43.2 %	MCV	75.0 fL
MCH	23.9 pg	MCHC	31.9 g/dL
RDW	18.2 %	Platelet Count	345 X10E+09/L
MPV	8.3 fL	Neutrophils (Abs)	4.6 X10E+09/L
Lymphocytes (Abs)	1.2 X10E+09/L	Monocytes (Abs)	0.4 X10E+09/L
Eosinophils (Abs)	0.3 X10E+09/L	Basophils (Abs)	0.0 X10E+09/L
Neutrophil %	70.5 %	Lymphocyte %	18.1 %
Monocyte %	6.3 %	Eosinophil %	4.4 %
Basophil %	0.7 %	Diff Type	Auto diff performed

Test performed on Mar 07, 2018 09:57

Neutrophils (c/mcl)	6300 CELLS/MCL	Lymphocytes (c/mcl)	1600 CELLS/MCL
Monocytes (c/mcl)	600 CELLS/MCL	Eosinophils (c/mcl)	100 CELLS/MCL
Basophils (c/mcl)	0 CELLS/MCL	Neutrophils, Total %	72 %

ASSESSMENT AND PLAN:

1. Primary polycythemia vera, JAK2 mutation positive. Mr. Sliwinski is doing well. Hematocrit today is 43.2. He will not need phlebotomy. We will continue to follow CBC monthly and phlebotomize as needed to keep hematocrit less than 45.
2. Iron deficiency secondary to phlebotomy. Follow iron studies. Discussed high iron foods/diet.
3. History of hypercoagulable state. He will continue on Xarelto 20 mg daily.

He will return to our clinic in 4 months; sooner if needed.

He knows to call or return at any time with questions or problems.

Electronically Signed by: Daniel Petro, M.D. on 4/7/2018 11:54:34

List of 142 Reviews on Non-thermal Effects of Microwave/Intermediate Frequency EMFs

Martin L. Pall *

Among the scientific reviews documenting these various non-thermal health effects are 142 that follow. Each of these reviews cites at least a dozen primary literature citations showing non-thermal effects, with many citing 100 or more going up to the 3rd reference which cites over 1000 such citations. It can be seen from this that the primary literature citations supporting the existence of various non-thermal health effects cited in these reviews go into several thousands. This list is not and is not intended to be a list of all important such reviews. However, it gives some measure of the size of the literature that contradicts the industry contention that there are no non-thermal effects of microwave frequency EMFs.

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* Personal Profile

Martin L. Pall Professor Emeritus of Biochemistry and Basic Medical Sciences Washington State University

I have received seven international honors for my research on environmental medicine over the

past decade, with five of those after I "retired" from the University.

I just received an 8th this morning for a paper I published on how electromagnetic fields impact the cells of our bodies, published in the prestigious medical journal, Journal of Cellular and Molecular Medicine (JCMM), see attached. The 8th such honor is that this JCMM EMF paper was chosen to be placed on the Global Medical Discovery web site as one of the top medical papers of 2013. I have also recently submitted a paper also on the effects of microwave frequency EMFs in producing a whole series of important changes in the body, changes that have been reported in many different studies and now have known mechanisms that explain how they come about.

This second paper also discusses the issue of current health standards that are, as you know, based on the assumption that all we have to worry about is heating, however those standards are contradicted by over 20,000 papers in the scientific literature. I have already given 4 professional talks on biological effects of EMFs and will be giving five more in Europe in a few weeks. What has been shown in both of these papers, which are based in turn on many hundreds of other studies, is that EMFs act by activating what are known as voltage-gated calcium channels (VGCCs), opening up those channels and allowing calcium to flow into the cells, such that most of the consequences of such opening involve the effects of excessive intracellular calcium including downstream effects. The evidence for a VGCC role is that in two dozen studies, one could block all measured effects of EMFs by using calcium channel blockers, drugs that block these voltage-gated calcium channels. The downstream effects of excessive intracellular calcium include elevated nitric oxide (NO), NO signaling, peroxynitrite derived from NO and consequent oxidative stress. Heating which as you know is the basis of both the U.S. and International safety standards, has nothing to do with the biological effects, and therefore the safety standards are based on a false assumption. What I considered in addition, in these two papers, with most of the consideration being in the second one, is whether and how the various biological effects that have been widely reported and documented, may be produced as a consequence of VGCC activation.

There were 10 biological responses EACH OF WHICH HAVE BEEN WIDELY REPORTED and each of which can be understood as being generated by downstream consequences of VGCC activation and elevated intracellular calcium. Those 10 are: Oxidative stress, therapeutic effects, single strand breaks in cellular DNA (as detected by alkaline comet assays), double strand breaks in cellular DNA (as detected by formation of micronuclei), cancer (which can be generated by the same well-documented mechanism that produces inflammatory carcinogenesis), male and female infertility (in which DNA double strand breaks have roles and possibly also calcium-triggered apoptosis), breakdown of the blood-brain barrier (produced by oxidative activation of matrix metalloproteinases and consequent degradation of tight junctions), and loss of melatonin leading to consequent sleep dysfunction. Each these has been widely reported, each of them is serious and each of them can be understood as being generated by the VGCC mechanism. Contrast this with the advocates of heating as the sole or at least the main EMF effect and who cannot understand how any of these are generated. They use circular logic, this cannot be generated by heating therefore these hundreds of reports cannot be true, therefore this strengthens the case for heating. Let me comment on the issue of inconsistency of the data. I examined the data on the studies of single stranded breaks in cellular DNA in the first paper. And yes, although the majority of studies showed substantial elevation of such breaks, there was a minority that did not. These different studies used different types of cells grown under different conditions or used different cells in the body and they often used different EMF fields. Two studies looked a several types of cells

and showed that some cell types produced such single stranded breaks in the DNA and others did not. One study compared different EMF fields and showed that they differed from one another. THAT IS EXACTLY WHAT YOU WOULDEXPECT! Some cells have no VGCCs and will not respond, and some with only low levels may not respond either. The claim that these are inconsistent is simply based on a false expectation. I have not examined the other claims of inconsistency but am skeptical about them, as you should be. Even if there is genuine inconsistency, this does not allow one to throw out many thousands of studies showing real biological effects at EMF field levels that are well within "safety standards" and should not, therefore, occur at all. Let me say just a few words about Wi-Fi. Barrie Trower whom I met about 3 months ago when he and I gave a talk in Portland, says that from his extensive experience as a military intelligence expert in the UK, that the wavelength used for Wi-Fi is particularly active biologically and is therefore especially problematic. The data showing this has been classified in the UK, the U.S. and other countries so we have no way of ascertaining how convincing it may be. He has been given permission to talk about this, but only at a superficial level. His number one concern is female fertility, because females develop all the eggs they will ever have before puberty, while they are in school. I have discussed the issue of Wi-Fi safety in schools in my second attached paper and ask you to give it careful thought - the health and safety of many thousands of students and teachers is in your hands. Sloppy reasoning is unacceptable.

32. Describe in detail how proximity to an Itron SKSAM|T HW 3.1 OpenWay CENTRON Singlephase Smart Meter would adversely affect the medical condition(s) identified in Your email dated April 26, 2018 containing your discovery responses.

ANSWER: ***There are numerous reports and studies warning that the installation of a SM should not be anywhere near your house. Publications, papers and convincing testemonies from people all over the globe are sufficient for me NOT to have ANY kind of SM installed next to my bed. (My head is less than 40inch from my analog meter !)SM produce Cirty Electricity – which is even more harmful than EMF.*** See
https://www.youtube.com/watch?v=yHrLBb3iqr4
https://www.youtube.com/watch?v=ErBISqF6Afs

The American Academy of Environmental Medicine (AAEM) *called for a moratorium* on smart meters (2012) and continues to veto them today. See it here:
https://smartmeterharm.files.wordpress.com/2012/12/1-analysis-exhibits-12-12.pdf

Based on their literature reviews and clinical experience, they advised no smart meters should be located in or next to the homes of those with cardiac or neurological conditions, including Parkinson's or dementia; or electro sensitivity; or cancer.

Their board wrote to California's Public Utilities Commission: *"guidelines for RF exposure used to justify installation of 'smart meters' are based only on thermal effects and are obsolete"* - guidelines now under heavy fire from the 224-scientist appeal to the UN see below

Smart meters and cell damage from pulsed EM radiation - our health at risk?

Lynne Wycherley 11th April 2017

'Smart meters' looked like a great idea, writes Lynne Wycherley, giving us more control over our energy use. The downside? They emit as many as 14,000 short bursts of intense microwave radiation a day, disrupting cellular electrochemistry and causing health symptoms from migraine to tinnitus, insomnia, dizziness, anxiety, chest pain, palpitations and memory loss. Now a growing number of 'electro-sensitives' have had enough!

Smart meters' should be abolished because they use short high-intensity pulses of microwave radiation. We know from the nanosecond studies these can be very damaging with calcium channel activation continuing long after the pulse has ceased.

As early as 2012, environmental health Professor David Carpenter, founder of Albany School of Public Health, and author of 370 peer-reviewed publications, issued a public letter on the plausible toxic risks of intensive, pulsed-microwave smart metering. His letter *Smart-meters: Correcting the Gross Misinformation* was rapidly signed by 50 international health experts. Click here: http://www.stopsmartmetersbc.com/letters/smart-meters-correcting-the-gross-misinformation-david-carpenter-full/

"We, the undersigned ... have co-authored hundreds of peer-reviewed studies on the health effects of electromagnetic fields (EMFs) ... Mass deployment of smart grids could expose large chunks of the general population to alarming risk scenarios ..."

"More than a thousand studies done on low intensity, high frequency, non-ionizing radiation going back at least fifty years, show ... biochemical changes which ... may lead to diseases."

Noting, among other risks, the free-radical / cellular / genetic harm recorded in many recent papers on wireless exposure - and the relative potency of smart-meters' pulses - he adds: *"Prolonged exposure ... may eventually lead to cellular malfunction ... With both cell towers and smart meters, the entire body is immersed by microwaves."*

Though his letter needs updating (see Belpomme, for example, below) he and his signatories are correct in signaling that all of us in the Green movement - activists, politicians, energy suppliers, families - have been given a sanitized *version* of long-term EMF health risks, including from high-density smart metering. At worst, equivalent to Big Tobacco's *"smoke it baby! there are no risks!"*

The International Appeal to the United Nations

Though there is no world consensus on the degree of risk arising from pulsed-microwave pollution (RF-EMFs), it is salutary that most independent EMF scientists are voicing caution. And their numbers are rising rapidly.

In an unprecedented step, 190 precautionary scientists launched an appeal to the United Nations (2015, ongoing) to seek progressive, healthy alternatives to high-SARS phones / tablets and the piercing pulsed microwaves from smart meters, plus similar rollouts.

"Now is the time to ask serious questions about this emerging environmental health crisis", their video warns, before offering some strong medicine:

"We have created something that is harming us and it is getting out of control! ... Wireless utility meters, and cell towers, are blanketing our neighborhoods with radiation... BIOLOGICAL facts are being ignored ... International standard setting bodies are not acting to protect the public's health." [Emphasis as per the published transcript]

In its call for cleaner, safer, ways forward, the International EMF Scientist Appeal is undeniably 'Green'. Yet how many of us are fully aware of its call? Today, it carries 224 signatories from 41 nations; all have peer-reviewed research in the field, and none - to their credit - have been cowed or co-opted by the multi-billion-dollar Big Telecoms industry: a colossus whose turnover has begun to rival that of fossil fuels.

Standard-setting bodies with documented conflicts of interests, meanwhile, continue to stifle reform - not least in the UK: see the shocking exposé of AGNIR, for example, by UK neuroscientist Dr Sarah Starkey. Plus French documentary *Microwaves, Science & Lies*, and the recent letter of no confidence in the EMF wing of the World Health Organisation.

People testifying to harm

Within months of PG&E's (Pacific Gas & Electric) Californian smart-meter rollout, over 2,000 health complaints were filed. Harsh headaches, dizziness, tachycardia, insomnia, tinnitus; in desperation, some householders fled their homes, while others slept in their cars.

Let's not forget that PG&E is the energy giant first exposed by Erin Brockovich for dumping hexavalent chromium.

As wave after wave of people have attested to similar problems from US and Canadian rollouts - many testifying to no prior inkling of smart-meter problems (as here /here) - court cases have arisen. Biophysics professor Andrew Marino, an authority on physiological reactions to 'weak' EMFs, gave lengthy evidence in defense of impacted residents.

Eviscerating outdated exposure standards, he concluded *"coercing the complainants to endure... such exposure ... amount[s] to involuntary human experimentation."* In addition health risks from *"the type of electromagnetic energy emitted from smart meters ... are heightened in the very young, the very old, and in those with pre-existing diseases and disorders."*

Case histories, echoing others around the world, include, for example, 84-year old Dr Georgetta Livingstone (Michigan). When her meter was fitted, she was hit by unexpected sharp pains in her body, headaches, violent head-to-toe rashes, insomnia, intense itching, depression and anxiety. With no remission, it seems, until her meter was finally removed. (Notice Professor O Johansson: skin reactions to EMFs). Such testimonies, however contested, may offer us helpful clues.

IT professionals are among those testifying to impacts. Silicon Valley consultant Jeromy Johnson *(see his TED talk)* and his wife, a GP, were axed by headaches, insomnia, and palpitations.

In *Smart meters, the opposite of green,* hosted by Green editor Rob Sidon, Johnson notes that if we connect everything wirelessly to smart meters we risk *"filling our homes, our children, and ourselves"* with RF microwaves emerging as subtly bioactive. (See, e.g., harm to insects from all 'weak' sources tested: Margaritis et al 2013). *"How can a technology be considered sustainable if its byproduct harms not only humans but plants, insects and animals?"*

Problems have also emerged in Australia, and beyond. In her peer-reviewed paper, Dr Federica Lamech, GP (Victoria), shares 92 in-depth patient case histories. Smart meters, it seems, were 'the last straw' in wireless exposure, tipping them into full-blown electrosensitivity - a syndrome now hallmarked, it seems, by toxic and inflammatory biomarkers, and impaired brain blood-flow (Belpomme 2015-2016: nearly 700 lab-verified cases, Paris).

Lamech herself was stricken *"with palpitations, chest pain, insomnia, dizziness, inability to concentrate, memory loss and fainting spells. I [later] found out it was [when] the smart meters were remotely turned on."*

Professor Dariusz Leszczynski, biochemist, notes it is normal to have a bell-curve of responses to environmental toxins, and pulsed RF, his field, is no exception. If so, how can we, as Greens, find ways to support the human rights of adults / children at the 'unlucky' end of the spectrum?

Dr Isaac Jamieson, who advises the EU on bio-sustainability, analyzed (1, 2,) how Big Energy smart-metering can infringe the Universal Declaration of Human Rights, especially birthright to health.

Eyes on stalks: the corporate hijack of smart-metering

According to multi-award-winning health documentary *Take Back Your Power,* Big Energy may have hidden drivers for smart-metering. Filmed in Canada and the USA, this deeply humanitarian film, best seen in full [here], reveals how Green aims can sadly become co-opted and perverted. In a race *"to monetize the data"*, a focus on the bottom line is sweeping injured families aside.

Director Josh del Sol told me, based on his long research, *"with more than 5,000 technology patents muffled by the USPTA ... new, decentralized, clean energy technologies are in fact being artificially-blocked from market proliferation."* TNCs *"are hijacking the good intentions of environmentalists everywhere ... with a profit potential (for them) in the trillions."*

Notice, for example, this big-client marketing by Onzo (2017): *"We take data from smart meters... and build a highly personalized profile for each and every utility customer. We then tag this profile with key behavioural, attitudinal and lifestyle characteristics ... We even tag appliances that we see being used in the home. .. giving [you] the ability to monetise [your] customer data by providing a direct link to appropriate third party organisations."*

Hidden risks to our cells

Dr Dietrich Klinghardt and team (New Jersey) found striking increases in toxic, inflammatory markers in patients' blood samples - and their asymptomatic spouses - after smart-meter installation. Naturally, this needs wider testing, controlling for any confounding factors, but might there be wider risks, however subtle, at a cellular level?

Professor Martin Pall, a biochemist with 8 international awards, clearly thinks so. In 2013, he won a Global Medical Discovery listing for his landmark paper on a master mechanism of harm from wireless pulsed microwaves: watch his gripping, short talk. Supported by many peer-reviewed papers, it helps to explain the damage (nitrosative / oxidative) to organs and DNA seen in many new studies on WiFi and similar sources.

It's striking that Pall singles out smart metering. *"'Smart meters' should be abolished because they use short high-intensity pulses of microwave radiation. We know from the nanosecond studies these can be very damaging and act via VGCC [calcium channel] activation [his research] with activation continuing long after the pulse has ceased ... It has been known for over 30 years that short microwave pulses can cause massive cellular damage."* See also his review of pulsed-microwave neurological risks, including from wireless smart meters (2015).

Disturbing toxic 'window effects' have been found at low wireless intensities: co-tumour promotion, for example, from levels comparable to tablets' (Professor Lerchl 2015). While peer-reviewed findings at far lower levels - a clue to life's sensitivity - raise growing questions about microwave-dense 'smart homes' and corporate IoT.

A 2011 study, 'Electromagnetic hypersensitivity: evidence for a novel neurological syndrome' described by DE McCarty et al in the *International Journal of Neurosciences* concluded that *"EMF hypersensitivity can occur as a bona fide environmentally inducible neurological syndrome."*

The single subject was a self-diagnosed EMF sensitive exposed to a 60Hz field of 300V/m in a *"double-blinded EMF provocation procedure specifically designed to minimize unintentional sensory cues"* who *"developed temporal pain, headache, muscle twitching, and skipped heartbeats within 100 s after initiation of EMF exposure ($p < .05$)."*

The authors continue: *"The symptoms were caused primarily by field transitions (off-on, on-off) rather than the presence of the field, as assessed by comparing the frequency and severity of the effects of pulsed and continuous fields in relation to sham exposure. The subject had no conscious perception of the field as judged by her inability to report its presence more often than in the sham control.*

"The subject demonstrated statistically reliable somatic reactions in response to exposure to subliminal EMFs under conditions that reasonably excluded a causative role for psychological processes."

Downplayed pollution; ripples in the UK

When governments or smart-meter manufacturers cite 'compliance', they are referring to widely challenged 'safety standards' based on high microwave levels that cook tissue; all risks from lower exposures - growing annually in peer-reviewed literature - are air-brushed away.

Output is often time-averaged, disguising the microwave pulse-intensity, allowing some misleading comparisons with cell-phones: see industry whistle-blower Diana Ostermann and Dr Karl Maret. Sporadic uploads to masts (WAN) can be cited without mentioning the all-hour house-piercing 'spikes' [here] - every two seconds, in the case of tested British Gas meters.

Dr Andrew Tresidder, GP, perceives medical risks (ditto Dr Liz Evans GP): *"some have 14,000 very high intensity spikes per day. Biologically, 14,000 screams are not silence!"* Data obtained by a Californian court revealed, for example, 9,600 spikes per day, rising up to 190,000.

Dr Andrew Goldsworthy, a senior EMF biologist, advised Parliament that permanent exposure *"without the fully informed consent of the people affected is in contravention of the Nuremberg code".* Contrast this to Big Energy's all-soothing, all-cosy smart meter adverts, and questions of ethics hit home.

As Greens, we may have missed these aspects. Governments, in Rachel Carson's words, have fed us *"little tranquillizer pills of half truth".* Can we catch up with the rapidly growing precautionary science? In all conscience, how many households may be struggling with hidden impacts?

With no clue that the meters (though not a full-blown mesh network, UK) may be a plausible risk factor, particularly if by children's bedrooms or banked in flats? *(See **Notes** for emerging case histories).*

Kilohertz voltage-spikes from smart meter's switched-mode power (lay measurements here) can add to EMFs in homes, and raise other potential health questions (see Dr David Carpenter), even - unfortunately - in wired smart-meters.

Under revised EU energy rules, meanwhile, some countries have waived smart-metering as cost-ineffective. Overseas, fires have prompted some large recalls.

A potential creeping stress on trees?

In last year's peer-reviewed research paper revealing phone-mast microwave damage to trees - even, in cases, at two miles - the authors noted *"this constitutes a danger to trees worldwide".* Might wireless smart grids exacerbate this? Notice Professor C Georgiou's work on EMF free-radical risks to plants, and Haggerty 2010 on aspen seedlings sickened by background RF.

Civilian researchers in Monterey (California) recorded unusual bark splits in oaks and pines following the microwave 'smart' grid and WiFi grid switch-on: could this be a theme for eco-research? According (again) to Dr Andrew Goldsworthy, Imperial College, in *Why Our Urban Trees Are Dying*, our rocketing RF pollution could be a factor in tree disease:

"Trees are now dying mysteriously from a variety of diseases in urban areas all over Europe and are also showing abnormal photoperiodic responses. In addition, many have cancer-like growths under the bark (phloem nodules) and the bark may also split so that the underlying tissues become infected. All of these can be explained as being a result of ... radio-frequency radiation."

Wings for a wiser world

As Greens, we have not always penetrated the emerging risks of dense, pulsed-microwave smart-metering and grids. Nor have we questioned, as fully as we might, other electrosmog raisers, such as LTE, IoT and corporate-proposed 5G. [NEW: see the Environmental Health Trust on 5G and the skin-burning properties of weak millimetre waves.]

Nor have we challenged the deep, pervasive big-industry influences on EMF research, regulation, and 'spin', as exposed in a remarkable new book (just published), *Corporate Ties That Bind: An Examination of Corporate Manipulation and Vested Interests in Public Health.*

But as we catch up with the latest cautioning science, we can begin to expose these dark trends, and the risks and pollution levels they feed. While laying bare the outworn paradigm (denial of all non-heating effects) to which TNCs and governments so scandalously cling.

And on balance, we could begin to initiate healing changes. For though it is challenging to discover that pulsed RF is emerging, by degrees, as subtly bioactive, our Green ethics, our courage, surely enables us to adapt.

Potential solutions, for social and technical visionaries, are legion. From the new, responsive data-over-grid technology, for example, that can manage energy without microwave smart

meters. To cleaning up kilohertz EMFs (dirty electricity, also from solar inverters) including, perhaps, the subtly neuro-active frequencies.

To the deep carbon savings of simple energy bill comparison with neighbours, a growing trend. To lending families plug-in energy monitors, perhaps, an alternative to permanent pollution. To conserving wired resources while cleaner technologies evolve. To the inspiring possibilities of data-rich infrared and VLC (LiFi / visual light communication) - now found to have useful reflectivity - combined with fibre-optics ... And so on.

Globally, the more we can integrate EMF precautionary science into our daily lives, low carbon strategies, and environmental health awareness, then the more bio-sensitive, and inspiringly fit for the future, we become. So hatching an overdue paradigm - Wings for a wiser world.

Notes

Professor Belpomme Scans revealed damaged blood-flow in limbic area of brain (a seat of Alzheimer's); Belpomme flagged potential dementia risks. Follow-up brain scans, where taken, found improvements from sustained wireless reduction - not easy, in today's environments.

Emerging testimonies (UK)

ES-UK health charity Confidential help-line is hearing from people testifying to problems

Other testimonies Although circumstantial, these examples give a flavor of the type of testimonies emerging around the world:

Anna, a freelance journalist/film-maker, told me she moved from London into a small block of flats, Bedford, in March 2012. A fit runner and gym-user on a super-healthy diet, she was bewildered by the onset of inexplicable illnesses that would persist until her departure 4 years later.

She was afflicted by a set of symptoms she had never experienced before: violent headaches, deep 'brain fog', exhaustion, neurological symptoms - *"my nerves felt wired"* - chest-tightness, buzzing tinnitus, repeated nausea / dizziness, leg jitters, a racing / irregular heartbeat, and poor sleep. All with no known allergen, or other salient stress.

Working from home, she struggled to continue. Eventually, weakened, she caught a serious neurological viral infection and later meningitis (also neurological: *see Pall 2015, above*). But to her surprise, on moving to a new flat with analogue meters, almost all of the four years' symptoms vanished and did not return. What had been different about her previous flat?

One day, speaking to Southern Electricity, she discovered her previous electricity meter had been a smart meter, along with the others in the block. In her 4 years, she had not realised that the meter near to her bed, plus the 11 others crammed in the building (3 nearby) were wireless smart meters.

In her view, it all began to make sense: the *"suicidal headaches"*, fatigue, illnesses, and astonishing improvement on moving house to a smart-meter free area.

Cathy, a normally fit horse rider, also shared her experience with me. When her neighbours adopted a smart-meter (on a thin partition wall, 3/1/2017) she was hit with inexplicable harsh headaches, tachycardia, weakness, tinnitus, disorientation, blurred vision, 'brain fog', insomnia, irritability, fatigue, labile temperature, and high blood pressure - all new.

She had hoped it was a passing coincidence, but experienced no relief for weeks until 7 days lodging with a friend (no smart meter); her symptoms vanished, her sleep was restored. She returned home feeling optimistic but was felled by the same symptoms. Her neighbor eventually asked for the meter's output to be deactivated; the suppliers said they would do so remotely.

When the harsh discomfort continued, a technician discovered only the in-house display was dormant: the meter was still emitting non-stop microwave pulses. The neighbor was reluctant to help further. She continues to struggle.

IT professional Steve Weller's public testimonial (Australia) submitted to regulators, is worth reading. A calm, alert, resumé of problems that began with close exposure to a WiFi router, he describes being woken nightly, as if *"someone had* [pushed] *a long sharp needle into my head"*, only to discover his neighbor had fitted two smart meters behind his bed.

Forced to retreat from rising work pollution to salvage his health, he does not know how he will support his family. His exposé of industry-favored 'tests' that discredit people experiencing problems (page 8) is illuminating and echoes many points by cautioning scientists. (Also notice physics professor James McCaughan, who was impacted by wireless devices, and has to work in a Faraday Cage).

Compliance. Public Health England's exposure assessments of smart meters are based on the unreformed 'safety standards', already described, based only on thermal injury. It cites AGNIR and ICNIRP, both under fire for conflicts of interest, nepotism, and stifling reform.

For contrast see, e.g., physicist Dr Ron Powell's cautious assessment: he notes that even ZigBee exceeds levels at which bio-effects have been recorded. Since the US National Toxicology Programme's cancer findings in RF-exposed mice *(see Paul Mobbs)* - scientists' calls for pulsed RF to be upgraded to a class 1 or 2A carcinogen have increased. After classifying pulsed microwaves as a 2B carcinogen in 2011, IARC clarified that this applied to all wireless sources.

Images in case helpful:

Smart meter health refugees: Vic & Rosemary Trudeau (Melbourne) testified to nausea, chest pain and insomnia after smart-meter installation **c. Herald Sun**

A tree in Berkeley by a newly installed bank of PG&E smart meters (top) and 20 days later (below) despite 'ample rain' c. Berkeley residents.

The AAEM continues: *"Wireless RF radiation ... effects accumulate over time which is an important consideration given the chronic nature of exposure to 'smart meters'. The current medical literature raises credible questions about genetic and cellular effects, hormonal effects ... blood / brain barrier damage, and increased risks of certain types of cancers from RF and ELF levels similar to those emitted by 'smart meters'. Children are placed at particular risk."*

Footage has been published of smart meter transmissions disrupting the human heartbeat. Blind electrocardiogram field tests (16 May 2017), verified by Dr Gilberto Leon MD, an American GP, reveal smart meter heartbeat disruption in an apparently healthy adult male.

Repeated disruption was found at 1m from a smart meter in blind tests on a healthy adult male. Dr Leon warned this effect "*silently makes our hearts work too hard*", a chronic stress. He had to halt a later blind test (1.5m) on a woman due to the meter's apparent, rapid impact. If such risks are confirmed by double-blind studies (if funded), or found at greater distances, should smart-meters be re-sited or withdrawn?

Electro-siege ... RF-sensitive medical implants

Pacemakers, insulin pumps, deep-brain stimulators, cochlear implants, internal defibrillators (ICDs), spinal stimulators and other RF-sensitive implants are in growing use worldwide. Many of us have loved ones with such implants and may face personal use in later life.

Geophysics professor Gary Olhoeft has a Parkinson's deep-brain-stimulator that can be affected unpredictably around wireless technologies, even shutting off. He has given talks on the EMF cacophony we are creating - and its breathtaking short-sightedness.

During one such talk, everyone present indicated that their own medical implants had been disturbed by EMFs in the environment. On the lack of research into such interactions, he says *"you have to ask: why is so little known about something that has the potential to injure or kill so many ... ?"*

Internationally, there has been no post-rollout monitoring of possible smart-meter / medical implant interactions, despite the meters' 24:7 piercing microwave pulses, mixed modalities, and situations - such tiny shop units (UK) - which create sustained close exposure. Despite the new EU law on occupational EMFs.

Louis Donovan (California) testifies to four hospitalizations from pacemaker shut-downs, plus EMI that continually overrode his pacemaker, that coincided with smart-metering and ceased only on meter removal many months later. Baffled surgeons found no fault with his mint-condition device. Jerry Kozak (Canada) had chronic palpitations that overrode his pacemaker, relieved only by blocking his smart-meter. Though circumstantial, such testimonies suggest a need for vigilance.

In 2015, engineer Jeff Silverberg at the Center for Devices and Radiological Health (USA) reported that *"EMC information in regulation is often incomplete and has errors."* Noting that, numerically, medical implant interference problems may far exceed those reported to his unit, he flagged growing risks from the *"proliferation of RF wireless technology".*

Under stress? The 'white tree' of our nervous systems

Published non-ionizing risks to our nervous systems, long noted by military sources, continue to grow. Harvard neurology professor Martha Herbert co-authored a paper with 560 references on a plausible link between EMFs and autism (*Pathophysiology* 2013). *"The nervous system is an electrical organ"*, observes former bioengineering professor Henry Lai, who surveys neuroactive findings to 2007 and 2007 to 2014, cautioning that few address our long-term exposure.

As noted, biochemist Professor Martin Pall demonstrates that ion-channels (VCCGs) in our cells can be over-stimulated by pulsed RF (and by strong AC electric fields) with oxidative/ genotoxic *"downstream effects"* (see Part 1). *"It is time for a paradigm shift ... current safety standards are based on quicksand."* He highlighted smart-meter pulse intensity. In his new paper 2016, he notes *"VGCCs occur in very high densities throughout the nervous system."*

Reviewing research that, in his analysis, meets *"five criteria for causality"*, he observes that neural symptoms reported in smart meter and cell-tower epidemiology are consistent with substantial Soviet research, including Lerner 1980: *"1300 [pulsed] microwave workers ... with relatively low exposure levels had an approximate doubling of neurological complaints ... over controls."*

Could we revisit the Precautionary Principle? Gareth Shane, Maryland, testifies to sudden deterioration in his multiple sclerosis when a smart-meter was installed on his home without his knowledge, with rapid reversal after its removal, a testimony backed by his doctor. The global absence of health screening to test whether such experiences exceed coincidence is troubling.

Needles in the night: smart meters by bedrooms

Addressing a smart grid conference, Dr Karl Maret, a US physician and engineer, advised *"don't have your kids or elderly or sick people sleep on the other side of a wall where the smart meter is"* He points out whole-body exposure is involuntary, at times considerable (his measurements: 1, 2,) with pulse intensity disguised by time-averaged data. Preliminary microscopy (Springob 2013; video) suggested near-field risks to blood cells; however, this needs scaled-up replication.

Though models vary, the reality may be less cosy than adverts suggest. In Britain, modest cellular uploads (WAN) coexist, as elsewhere, with house-piercing pulses (HAN). Measurements by Dr Liz Evans GP and others unveil the high-intensity microwave spikes firing off every 2 seconds (video).

When the UK government dismissed *wired* smart-meter options - used extensively in mainland Europe - Dr Evans set up a pressure group, 'Stop Smart Meters UK'. *"Ours is very much an environmental message"*, explains co-founder Mike Mitcham, an IT consultant. They hope that by airing unresolved health, privacy and security issues, plus malfunctions and the eye-watering expense, bio-friendly Green alternatives will emerge.

But while wireless smart-meter modalities and outputs vary, close *overnight* exposure looks increasingly unwise. [See this typical US testimony at 22:10]. Pulsed RF has been shown repeatedly to raise oxidative stress, even at relatively low levels [re: Zigbee]: a chronic disease risk factor.

Insomnia is a keynote in US court cases on smart meters, plus emerging epidemiology from other countries (see Notes). Norwegian paediatrician Dr Toril Jelter has compiled childhood insomnia cases resolved by removing wireless transmitters - including smart meters.

Dr Lamech 2014 *(see Part 1)* found insomnia topped her peer-reviewed, smart meter case histories: patients ended up *"relocating their bedrooms, moving to another residence ... or moving out of the state"* while headaches / dizziness etc. linked to exposure at work, it seems, forced some to lose their jobs.

Collating 210 health testimonies in Maine, USA, biochemist Dr Richard Conrad commented *"what struck me most was the common time-line: normal people, strange new symptoms, who only later discovered that a smart meter had been installed ... Upon inquiry, they found out it had been installed at the time or just before their symptoms initiated."* (2013)

Animal studies, whatever our misgivings about them, are less vulnerable to attribution errors, or failures to connect real-life exposure with possible effects. While results have varied, in some studies low level pulsed RF was found to alter small mammals' sleep cycles or to interfere with GABA (e.g. 3, 4,) the calming neurotransmitter. (Or melatonin 5,).

Short term human trails on pulsed RF and sleep, often on fit young men, have had mild, mixed results. Poor sleepers (and 'electrosensitives' 6, 7,) may be at raised risk (8, 9,). RF susceptibility was first observed in 1932 .

Swept off-stage - cancer data and environmental pulsed RF

In 2013 a group of six medical doctors from Oregon sent evidence to the Federal Communications Commission suggesting community health risks from smart meter rollouts. Led by Dr Paul Dart, their referenced 18-month review of 289 bio-medical studies brings to light some valuable cautioning evidence on chronic pulsed RF exposure, air-brushed from public reviews.

Referencing the late Professor Neil Cherry, this includes a helpful, visual summary of longitudinal cancer studies for radar workers, radio hams, and residents exposed to cell towers (phone masts). Such as Dode 2011, a high-quality paper in *Science of the Total Environment,* which found a spatial / dose relationship and short latency. (See also Yakymenko 2011 review).

What might be the chronic effects, perhaps, of additional, all-hour exposures? [Re: Professor Karl Hecht's suppressed work]. Such as penetrating smart meter pulses - often over 40,000 per day (British Gas) - on top of other EMFs? Notice, for example, animal studies of near-field WiFi toxicity [10, 11, 12, 13] and brain protein mayhem from in-situ cordless phone transmitters (DECT). Plus risks to melatonin from certain magnetic fields [+ here].

The doctors noted smart metering is *"a community issue not just an individual issue"* because of interpenetrating exposures. With additive smog from RF 'smart' appliances. They called for protection of *"vulnerable groups in the population including children"*, anticipating the International EMF scientist Appeal (see Part 1). And advised local suppliers to *"adopt a policy of minimising its RF footprint in the community"*: a timely concept.

Fiber optics: the elegance of light

Could we adapt existing smart meters, perhaps, to function without house-piercing microwaves?

So-called 'opt-out' meters in Michigan still emitted all-hour microwave pulses (HAN) - only the uploads to the power company had been disabled (WAN) - helping to explain, perhaps, why unaware symptomatic residents testified to little relief (see also Milham below).

Wired smart meter rollouts have mostly used RF overlying electric wiring ('powerline carrier' or 'broadband over powerline'), common in Europe and Scandinavia. However, this often generates

strong EMI (electromagnetic interference), raising medical implant issues, and is contraindicated for electro sensitives, many of whom have testified to chronic problems (e.g. 14, 15,).

Before the UK rollout, engineer Alasdair Phillips (known to Greens for his work with Greenham Common protesters and Dr Chris Busby) flagged options for wired rollouts in preference to *"yet another microwave source inside our homes."* And noted big wireless lobbyists in the wings.

"Wireless transmissions ... should be able to be disabled and wired smart interfaces be built in as standard", observes Dr Isaac Jamieson, bio sustainability consultant, in his paper Smart Meters, Smarter Practices, best read in full [here / here].

Discussing Chatanooga's highly successful fibre-optic smart grid, he explains fiber optics are more *"future proof"* than wireless. High in data-capacity, they reduce EMF stresses on people (pp77-123) and habitats (pp137-142). And slash the hacking perils that led Britain's GCHQ to wave a red flag and former CIA chief James Woolsey to censure wireless smartgrids. A new poll reports 51% of UK firms fear linked cybersecurity risks.

New start-ups by UK farmers, in which communities lay down their own fibre-optics, show initial costs can be kept low. The fibres can last 50 years, a contrast to the rapid obsolescence of some wireless approaches. FirstEnergy's chief of information predicted wireless meter turnovers of *"5 to 7 years"* while analyst Nick Hunn warns UK smart meters will soon become *"stranded assets"*.

Dr Sam Milham testifies to smart meter risks

Life's sensitivity to EMFs continues to surprise. In January, *New Scientist* reported how delicate bioelectricity directs growth, from cell structure upwards. In February, *Science Daily* aired how DNA relays faint electrical signals. Professor Martin Blank has unveiled DNA's frequency-sensitive structure, and Professor Frank Barnes radical-pair spin effects. In all, it would be astonishing if our rising, penetrating EMFs - pulsed-microwave, kilohertz, AC and magnetic - were not placing stresses on our biology.

Professor Magda Havas posits risks to diabetics from DE (dirty electricity), the higher frequency transients/ harmonics from switched-mode power that overlay wiring and its EM fields. *"By closely following plasma glucose levels in four Type 1 and Type 2 diabetics, we find that they responded directly to the amount of DE in their environment. In an electromagnetically clean environment, Type 1 diabetics require less insulin and Type 2 diabetics have lower levels of plasma glucose."*

Epidemiologist Dr Sam Milham has published pioneering papers on the possible impacts of DE on human biology. Though more data and high-quality follow-ups are certainly needed, his thoughtful investigations and case studies raise valid questions about possible disease risks from exposure.

In April, Milham filed a testimony in an Arizona court case contesting smart meters. *"Because it is at the front end of a building's wiring, the dirty electricity from the smart meter's SMPS [switched-mode power] has a gateway into that building's wiring ... The house wiring acts as an antenna [radiating] 6 to 8 feet from the house wiring or extension cords"*

He suggests that the many, published neurotoxic effects in DE frequency ranges found on house wiring *might* be a putative stressor. Engineer Lloyd Morgan has also tested DE and child asthma.

If DE is indeed subtly bioactive, and oscilloscopes confirm rises, then (as with smart meter microwave pulses) the inverse square law is of limited help in cramped conditions. Novel filtering may be a way forward.

'Vive la Résistance?' Civil unrest in France

In France, smart meter health and privacy issues have hit home. Many householders have testified to harm from "Linky" powerline-carrier meters (examples) and 16 mayors and 300 councils - their numbers rising - have taken a stand. Their letter to President Hollande 2017 called for recognition of problems, an end to customer intimidation, and restitution of basic human rights.

Marc Khanne is the award-winning director of *Desperately Seeking White Zone*, the beautifully filmed documentary about people exiled by electrosensitivity *(see Part 1 latest evidence: Belpomme)* including former telecoms / IT workers.

He told me of a gentle husband and wife living in Ariège who were unconcerned about smart meters. On installation, they suffered sleep starvation, headaches, nausea, memory failure and other harsh problems. An electrician eventually uncovered excessive DE from their smart-meter installation. The couple testify to being left in reduced health, with impaired physical tolerance to EMFs.

The Precautionary Principle - curbing involuntary exposure

Though smart meter EMF output varies, why ramp up household EMFs at all, given the mounting precautionary science (16, 17, 18) when cleaner ways forward are perceptible? A fully Green solution would address carbon and EMF medical risks jointly. As in the BauBio eco-movement.

Micheal Bevington's scholarly *Electromagnetic Sensitivity* carries nearly 2,000 citations revealing 'non-thermal' EMFs are bioactive. Should we assent to a dying paradigm - denial of all such effects to permit a corporate free-for-all - when we could be aiding wise reform? (And exposing regulator scandals, here). See the new Green-led French law on EMF 'sobriety'.

Voluntary EM exposure is still rising, with all the nitrosative, genotoxic, and other peer-reviewed risks (such as to the blood-brain barrier) this can bring. But as awareness of precautionary science grows, despite 'product defence' strategies, calls for cleaner buildings may rise: a new 'organic'.

But if EMFs escalate from old-style smart metering plus hyper-profit corporate 5G / IoT - casting caution to the wind - then ramped up *involuntary* exposure could harm birthright to health. A theme explored internationally by Dr Isaac Jamieson (pp 41-76). Even noting Article 2 'right to life' (UK) reflecting the rising data on foetal / infertility risks (pp 107-110).

So might smart meters have been oversold? Some studies suggest linked 'in home displays' soon lose their novelty. (Ovo found that 61% had been switched off!) And that when compliance while under study is removed, energy savings can shrivel, a poor trade-off for permanent electrosmog.

Meanwhile, 'nudge' techniques and education - such as energy costs of standby - may yield change more cost-effectively, as noted by energy professor Stephen Thomas, Greenwich. Grid issues aside, plug-in energy monitors cost only £15!

Are there safer routes to grid reform?

Distinguished communications engineer Dr Timothy Schoeshle, Colorado University, has served on many international, technical, standard-setting bodies for data technologies. Co-pioneer of many techologies, such as barcodes, home networks and Voice over Internet Protocol, plus founder of PhD programmes, he has had key standard-setting roles in home automation and grid topology.

His penetrating white paper *Getting Smarter About the Smart-grid* (Nov 2012) opens up technical possibilities for smart-grids with fewer attendant health / habitat / security risks than the wireless grids being widely pursued. Above all, he repeatedly exposes what he sees as *"hype"* surrounding smart-meters.

Their mountains of in-home personal data, he maintains, are ultimately *"not necessary to the basic purpose of the smart-grid: supply/demand balancing, demand response (DR), dynamic pricing, renewable integration, or local generation and storage - as promoters of the meters and uninformed parties routinely claim."*

He clarifies repeatedly how smart-metering has been conflated with grid modernization, confusion infecting governments and *"non-engineers"*, including academics, to the visible neglect of distributive, cost-effective, less toxic alternatives. So breeding *"third party jackals"* to profit from the meters' endless, granular data: a corporate gangway into homes worldwide.

How does he view smart-meter rollouts and IoT today, I wondered, and claims made for them? Does he perceive any new ways forward? André Fauteux, editor of La Maison du 21e siècle (journal for healthy sustainable buildings), relayed my enquiry to him at his Colorado home, adding further questions.

Asked about smart meter energy-efficiency claims, Dr Schoechle opined *"No ... It's a big myth. Smart meters are not useful for much but they allow utilities to cut costs ... They don't help manage energy problems. The flow of information is in the wrong direction ... the house needs to know the condition of supply and demand on the grid to use it wisely."*

Could fibre-optic grids be the future? *"Yes. I'm writing a paper called 'Reinventing wires: the future of landlines and networks' on the economic and social benefits of high-speed fiber public networks. We don't need all these 5G networks, they are much more expensive than fiber. And that's why utilities and the telecom industry want to build them: to make a profit.*

"They have to do this every 10 to 20 years, reinvent new generations of technology to be successful, otherwise they go out of business. It's planned obsolescence ... I recommend deploying local fiber-optic networks everywhere ... The original idea of the smart grid was to use information to better control the generation, transmission and distribution of power. This is still a good idea and fiber is best."

And what of IoT? *"The IoT is all about selling more chips and software to make everything dependent on network services, but we don't need to do that. We can benefit from home automation if it's used to manage energy within a home or building or local neighborhood grid, called 'micro-grids' ...*

"I'm working on standardization of communication technologies for residential gateways dedicated to assuring premises security and safety (fire, physical, health) and they will benefit

privacy too. Home automation [has] new opportunities to reduce wireless, which suffers from severe security, safety and privacy flaws."

Skylights - promising ways forward

As Greens, always alert for opportunities to clean up rather than pollute, can we support any other low-EMF solutions? An eco start-up called 'Transverter', for example, tackles energy quality and efficiency all in one.

In his paper '*The extreme effects of computer and CFL power supplies on the grid*', founder Heart Akerman analyses how lack of power correction in countless commercial devices wastes energy and can produce needlessly turbid electromagnetic fields - the opposite of electromagnetic hygiene.

Passionate about energy efficiency, plus health, he and his team have pioneered technologies that restore pure sine waves. Alongside low power, bio-friendly DC lighting.

The University of Edinburgh is looking at affordable photo-receptors and LEDs that could create IoT systems from data-rich light (LiFi) rather than bioactive pulsed RF. Pending LiFi optical safety testing, such strides, I perceive, could be adapted for localised, low-EMF systems.

Dr Timothy Schoeshle has further transformative suggestions. The new high-capacity Power-over-Ethernet (POE) could support, for example, secure home automation / broadband, DC distribution

(AC is more bioactive) and could *"power just about anything"*. Whilst fibre microgrids could bring energy management/storage close to grassroot, renewable sources while reducing toxic EMFs, security risks, and long-distance inefficiencies. As well as excessive Big Data - superbly reframed by Vandana Shiva (addressing *Resurgence & Ecologist,* Oxford 2016) as *"data obesity"*!

The hidden carbon costs of storing endless, granular, smart meter data, meanwhile, may have barely begun. A Gartner report showed the annual electricity bill for running a 750 square metre data centre, cooling included, can exceed $1.5 million. Whilst *The Independent* reported that world data-storage centres (for all-source data) accounted for 3% of global energy consumption in 2015.

In summary, we do not have to choose between cutting carbon and curbing bioactive EMFs. With vision and enterprise, they can go hand in hand. Producing a potential quantum leap in eco-thinking, with exciting possibilities.

Any 'third industrial revolution', a term coined by Professor Jeremy Rifkin, will be biosustainable only if we bring the growing wealth of precautionary EMF science, military included, into our awareness and energy use. An inconvenient - and inspiring - truth.

Notes

Cardiac tests: Galvanic skin-shock reactions were also discovered (*personal communication*). Pulsed RF heartbeat disruption has also been found in fetuses stressed by cell-phones and in some patients blindly exposed to cordless-phone transmitters.

Medical implants: See also Katie Singer's *Electronic Silent Spring*, highly recommended, in which Professor Olhoeft is a guest voice and advisor. Research on EMI from RFID readers (e.g. van der Togt 2008/Siedman 2009), meanwhile, may have subtle implications for the RFID explosion from IoT. A paper for the EU also exposed EMF risks to patients with metal implants (2015).

Neurotoxicity: Findings continue to grow, e.g. Othman 2017, rodents prenatally exposed to near-field WiFi 2h/day had "*impaired ... neurodevelopment*" (re: high SARS WiFi tablets). On near-field smart meter "bursts", perhaps notice Zhang 2008 [gene expression] found more neural effects from intermittent pulse-modulated microwaves than unbroken and Diem 2005 more DNA breaks (3G).

Professor Martha Herbert, reflecting on her work: *"The more sensitive our scientific measurement instruments become, the more we learn that every cell in our body uses electromagnetic signalling"*

Output: Pulse intensity V/m (plus frequency/duty cycle) may be more significant, biologically, than other smart meter metrics, re: Prof Pall. Dr Mallery-Blythe notes low-intensity "window effects" also need to be considered, plus non-linear biological responses/ concurrent RF exposures.

Dr Liz Evans GP testified to MPs, opposing smart meters. In subsequent written evidence she states *"I am a qualified doctor and the mother of four young children and there is no way that I will ever agree to have a wireless Smart Meter ... There is no mention in any of the literature from the DECC of the proven safe distance from one or more wireless 'Smart' Meters for humans and animals, or the duration of safe long-term exposure in hours per day. There is also no mention of proven safe exposure levels for pregnant women and children or the impact of multiple Smart Meters on RF safety levels in apartments/ terraced housing etc."*

Privacy violations: A global human rights concern. The close up, granular data can reveal a child home alone, for example, and other sensitive information (e.g. Samsung's 'smart' TV fine print warned conversations could reach 3rd parties) while feeding highly intrusive marketing.

Sleep impairment: e.g. In desperation, Liz Barris (USA) slept in her car for 7 months until her smart meter was removed, a pattern across other states. The Trudeaus (Melbourne) did so for a year; Leo Weiser (Canada) for three. Dr Rubik, MD, had patients living in tents. An Okehampton family, UK (personal communication) report chronic insomnia etc., children included, since installation.

And so on ... Discomfort may play a role: Dr Diane Culik MD, Oakland, linked her nightly arrhythmia to her nearby meter. Sleep assays, sensitive to individual variability, await independent funding.

Dr Paul Dart & colleagues One took the trouble to visit the Parisian researchers who are revolutionising our understanding of electro sensitivity. (More proactive than government health officials, it seems!) Notice their section on metering options pp69-74. Current 'smart' appliances transmit continual WiFi-like pulses with no "off" option, raising passive exposure.

Why opt-outs are inadequate: If you are boxed in by neighbors' meters, in poor health, and cannot afford to move, opt-outs offer little EMF protection or health choice. As Greens committed

to social justice, how can we protect the disadvantaged? Can we call for equitable, electro-clean alternatives? ***See end*** for a relevant case history.

Fibre-optic grids: Low-EMF benefits could be undermined if councils permit intensive use of add-on FTTC (fibre to the cell) including controversial, high-density microwave/ MMwave 5G rollouts

Protecting habitats Frank Clegg, former CEO of Microsoft Canada, perceives that *"blanket radiation"* from wireless-mesh smart grids adds a further RF stress to habitats. See, eg., pollinators nesting above ground/ sparrow loss. Citizen reports may offer possible clues. Beekeeper Dr Marianna Hartsong (USA), for example, testifies to dramatic bee hostility coinciding with local switch on; within 8 days, with no known chemical involvement, two thirds of her bees were dead. If a degree of bee / nesting disturbance is a recurring feature, over time, could we be overlooking hotspots or subtle eco-effects? Notice this paper on polarization.

'Dirty Electricity': Milham 2008 *"A cohort cancer incidence analysis of the teacher population showed a positive trend (P = 7.1 x 10 (-10)) of increasing cancer risk with increasing cumulative exposure to high frequency voltage transients on the classroom's electrical wiring."*

Diabetes: Among similar cases, a diabetic boy's 2-year stable blood-sugar (6.8) rose to 9.5 while a smart-meter was active near his bed, resolving only after removal (Michigan). If common, such clues may prove helpful *if* replicable after excluding confounding factors / stressors.

DE from Solar Power Inverters is an area where we could make rapid progress - if we disseminate information. In tests (e.g. as here, by safe technology advocate Jeromy Johnson) solar inverters tend to generate high, systemic, DE. And await filtering technologies to restore EM hygiene.

French Testimonies For example: 1) Hélene Stephane is trying to raise awareness of the plight of her aging parents, struck down with worsening symptoms since installation, and forced to sleep in the woods. 2) Thérèse, Brittany, testifies [video in French] that she and her husband fell ill on installation with no knowledge that smart meters could have any electromagnetic issues. Her sleep starvation, headaches, tachycardia, chest constriction, skin rashes etc. are relieved only by keeping their electricity switched off. But despite certified support from three doctors, their supplier refuses to remove their Linky smart meter.

Precautionary Principle: EMF biologist Dr Andrew Goldsworthy (ret.), Imperial College UK:

"DECC is not giving the public the necessary information to enable it to decide on the safety of [pulsed RF] smart meters, particularly their likely effects on cancer and other health concerns. Either it does not know about them or it has been badly misinformed."

Professor Olle Johansson, Karolinksa Institute, addressing Krakow: *"If we make environments safer for those with EMF exposure symptoms, everyone's disease-risk profile may benefit."*

Regulator Scandals e.g. AGNIR / Public Health England burying RF risks: *"Public health ... cannot be protected when evidence of harm, no matter how inconvenient, is covered up."* (Dr Starkey 2016.)

Smart meters oversold? See also K T Weaver's thoughtful research, here / here, at 'smart grid awareness' org, which may help to balance over-optimism. Depending on load balance, savings may be meagre without time of use tariffs, vetoed as hazardous by the UK's chief fire officers.

Grid modernization After a 6 month engineering review, Northeast Utilities USA concluded mass smart-metering diverted funds from overdue grid modernizations that could improve energy efficiency. Have any suppliers buried engineering reservations, perhaps, to cash in on subsidies?

'Reinventing wires' is being published by the National Institute for Science, Law & Public Policy.

An English case history: *(see Part 1 for others)* Sam, Gloucestershire, kindly shared her experience. It seems her health suffered from high EMF exposure during sustained work in an electronic financial-futures exchange. She also lived by a TETRA mast *(see The Ecologist 2004)*. She had never heard of 'electro sensitivity' but her disabling symptoms from EMFs, carefully screened for other causes, were eventually verified by medical specialists. She had to give up work.

As a single mother with two schoolchildren on a very low income, she has few housing options. Struggling to maintain her health in lodgings near augmented phone masts (pulsed microwaves), she applied to a housing association for less polluted accommodation. The association offered her a place in a small, new, three-unit terrace and agreed to waive all smart meters. But on arrival (2017) she was stricken with aggressive symptoms, amongst the worst she had experienced. It transpired the private contractors had fitted 9 wireless smart meters (gas, electricity, water). After 2 weeks she could barely speak, walk, think, or see properly; her nervous system felt on fire; her sleep was ash. One of her daughters had persistent headaches, anomia, and confusion, all new.

Camping with her children on a friend's floor, Sam regained her speech and motor functions after four days. But she knew that if she relinquished her home within a year, she would lose all right to reapply for housing. (Outside Sweden, relevant human rights are gravely lacking).

With difficulty, she negotiated removal of her smart-meters. Her neighbors' meters remain; the 135 meters on the rest of new estate afford no escape. She continues to suffer, struggling to function in her electro-polluted home; she is worried about her children's health.

33. To the extent not previously requested, produce all Documents, including but not limited to hospital and/or medical records and studies, demonstrating the relationship between any medical condition that you may suffer from and your proximity to an Itron SKSAM|T HW 3.1 OpenWay CENTRON Singlephase Smart Meter.

ANSWER:

34. Describe in detail how proximity to an Itron SK9AM|T HW 3.1 OpenWay CENTRON Singlephase Smart Meter could lead to an increase in "heart problems, blood clots, hyper-sensitivity to sound, spinal stenosis, and other age-related aches and pains" as alleged in Your Response to Respondent's First Set of Discovery Requests Directed to Complainant.

ANSWER: See

35. To the extent not previously requested, produce all Documents, including but not limited to hospital and/or medical records and studies, demonstrating the relationship between your alleged medical conditions as described in your email dated April 26, 2018 containing your discovery responses and your proximity to an Itron SKSAM|T HW 3.1 OpenWay CENTRON Singlephase Smart Meter.

ANSWER: **According to all available studies SM radiation destroyed blood cells and brains.**

https://www.youtube.com/watch?v=atrmN6V0P3g
https://www.youtube.com/watch?v=ZCuyriGTTS8

36. To the extent not previously requested, produce all Documents, including but not limited to hospital and/or medical records and studies, that relate to Your claim that Duquesne Light's installation of an Itron SK9AM|T HW 3.1 OpenWay CENTRON Singlephase Smart Meter at the Property will negatively affect your health or condition(s), as alleged throughout Your Formal Complaint.

ANSWER: ***This has been answered i.e. documented elsewhere in this document***

37. Describe in detail what "heart problems" from which you are suffering. In doing so, state:
a, The date on which the "heart problems" began;
b. Whether you have been medically diagnosed with any heart condition and the date of the same,
c. The date on which you began treatment for the condition; and
d. Your last date of treatment.
ANSWER: ***See answer and support documents question 26.***

38. Describe in detail the "age-related aches and pains" from which you are suffering.

a. The date on which the "age-related aches and pains" began;
b. Whether you have been medically diagnosed with any age-related condition and the date of the same,
c. The date on which you began treatment for the condition; and
d. Your last date of treatment.

ANSWER: ***See answer and support documents question 26.***

Exhibit A

Oracle acquires Opower in $532 million deal

Mike Snider, USA TODAY Published 9:01 a.m. ET May 2, 2016 | **Updated 9:06 a.m. ET May 2, 2016**

(Photo: Justin Sullivan, Getty Images)

CONNECTTWEETLINKEDINCOMMENTEMAILMORE

Software giant Oracle has acquired cloud-based energy software company Opower in a $532 million cash deal.

The Redwood Shores, Calif. maker of cloud and software management systems will pay $10.30 per share of Opower, which supplies utilities with cloud-based energy efficiency services and other software. The price represents a 30% premium over Opower's closing share price Friday of $7.90. The companies expect the deal to close by the end of 2016.

Opower (OPWR) shares were up more than 29% in premarket trading. Oracle (ORCL) shares closed Friday down 1.17% to $39.86.

Based in Arlington, Va., Opower provides its cloud services to more than 100 utilities globally. When integrated with Oracle's current utilities operation suite and cloud services for electric, gas and water providers, the companies will become the largest provider to the $2.3 trillion utilities industry, Oracle says. "Utilities want modern technology solutions that work together to meet their evolving customer, operational and compliance needs," said Rodger Smith, senior vice president and general manager for Oracle Utilities' global business unit in a statement announcing the transaction. "Together, Oracle Utilities and Opower will be the largest provider of mission-critical cloud services to utilities."

Opower CEO and C-founder Dan Yates said in a statement, "The combination will provide the industry with the most modern, complete cloud applications for the entire utility value chain, from meter to grid to end-customers."

This makes the second recent acquisition for Oracle. Last week, it acquired construction contract and payment management cloud service company Textura for $663 million.

Oracle's stock is down 10% from a year ago, but up 9% so far this year.

Exhibit B

Duquesne Light
Our Energy...Your Power®

May 31, 2016

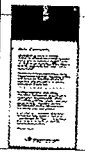
74923-1 0003609 ********SCH 5-DIGIT 15140 0010
Norbert Sliwinski
856 Cottonwood Dr
Monroeville, PA 15146-1157

Dear Norbert Sliwinski,

During the next several weeks, Duquesne Light will exchange your existing electric meter with a new, digital model. This exchange is part of an overall upgrade of the company's metering infrastructure required by Pennsylvania Act 129.

The new digital meter will operate as your existing meter does today, and you will not notice any difference in how it measures your electric use. In the future, as the advanced metering infrastructure is activated in your neighborhood, Duquesne Light will offer a variety of programs and services that can help you save energy, in addition to benefiting the environment.

What We Will Do

Before the Exchange	Day of the Exchange		After the Exchange
			
We will call to remind you of the upcoming work using the following phone number: (412) 372-7338	A Duquesne Light authorized installer, with a valid ID, will arrive at your residence to complete the exchange between 7 a.m. - 5 p.m. You do not need to be home for the exchange.	Once the meter exchange is complete, the installer will verify that your new meter is working properly.  The installer will leave behind a door hanger, indicating the type of work that was performed.	You may be asked to participate in a telephone survey regarding your meter exchange experience. Quality checks will be conducted on a small percentage of completed meter exchanges. You do not need to be home for this activity. On a future bill, you will temporarily see multiple readings and ID numbers for your meter when it is exchanged and activated on our network.

Steps You Should Take

1. **If the phone number above is incorrect, or one is not listed,** please contact us via email at MeterExchangeInquiry@duqlight.com or by phone at 1-888-928-8539 (press "1" and follow the prompts) to update your contact information.
2. **Make sure we can access the meter** by removing any barriers, such as locked gates, pets or material blocking the meter.
3. **If your meter is located inside your residence,** please call 1-888-895-1044 to set up an appointment for the installer to gain access to your home to complete the meter exchange.
4. **Notify others in your household** about the upcoming exchange.

In some limited cases, the meter replacement will result in a brief interruption (approximately 10 minutes) of your electric service. After the exchange is complete, your service will return to normal. We apologize for any inconvenience this outage may cause.

Please note: Even if your electric service is not interrupted, we recommend that you check and, if necessary, reset clocks, surge protectors, Ground Fault Interrupter (GFI) outlets – the type of outlet commonly used near water sources such as kitchens and bathrooms – and other electronic devices.

Thank you for your patience during the meter exchange. Over time, the new advanced metering infrastructure and the future services it enables will help you better manage your energy use.

Online Portal: Putting More Energy Use Info in Your Hands

You soon will have access to a secure online portal that provides near real-time information and analysis about your electric use. The portal also will provide options to help you manage your electric bill, including displaying your energy-use patterns by day of week and time of day, providing a projected monthly bill to-date and sending email or phone alerts to reduce high-bill surprise if your monthly usage passes a certain level. Watch your mail for additional information.

In order to provide you with these services, Duquesne Light will need to share your usage data with our portal provider, Opower, a company we've worked with in the past. Opower will not use your data for any purpose other than what is necessary to provide your online benefits.

You will be automatically enrolled in the online portal program and your customer usage data will be provided to Opower unless you notify us within 30 days. If you do not want us to make your usage data available to Opower, please contact Duquesne Light Customer Service within 30 days by email at customercare@duqlight.com or by calling 1-888-928-8539 (press "1" and follow the prompts). Customers that unenroll from the program will not have access to the Online Portal.

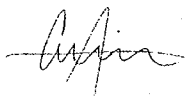
Future Benefits

Longer-term, thanks to technology enabled by the new advanced metering infrastructure, we also plan to offer additional programs and services, such as:

- An optional Time-of-Use program that may provide benefits to customers who can shift portions of their power use to non-peak hours.
- Outage alerts and restoration estimates that will help our customers plan during storm-related service interruptions.

If you have any questions about this letter or any of the services and programs offered, contact us via email at customercare@duqlight.com or by phone at 1-888-928-8539 (press "1" and follow the prompts.) You also can check the Meter Exchange Program section of DuquesneLight.com for more information.

Sincerely,



Campbell Hawkins
Vice President of Customer Care

(July 2016)

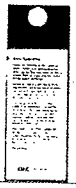
DUQUESNE LIGHT CO.

May 3, 2018

As you may recall, Duquesne Light is exchanging its existing electric meters with new, advanced digital models to provide new options to help customers manage their electricity usage. The exchange is part of an overall upgrade to the company's metering infrastructure required by the Public Utility Commission (PUC) under Pennsylvania Act 129 of 2008. It will enable Duquesne Light to offer a variety of programs and services that can help you save energy, in addition to benefiting the environment.

You are receiving this letter because Duquesne Light will soon be replacing your electric meter. While the company previously delayed your meter exchange, nearly half a million meters have been replaced and the company is nearing completion of the program.

As a result, per Pennsylvania law, the existing Duquesne Light meter at your residence will be replaced with an advanced digital meter. Duquesne Light will attempt to contact you before the meter exchange takes place.

Before the Exchange	Day of the Exchange		After the Exchange
			
We will call to remind you of the upcoming work using the following phone number: [redacted]	A Duquesne Light authorized installer, with a valid ID, will arrive to complete the exchange between 7 a.m. - 5 p.m. You do not need to be present for the exchange.	Once the meter exchange is complete, the installer will verify that your new meter is working properly.  The installer will leave behind a door hanger, indicating the type of work that was performed.	You may be asked to participate in a telephone survey regarding your meter exchange experience. Quality checks will be conducted on a small percentage of completed meter exchanges. You do not need to be present for this activity. On a future bill, you will temporarily see multiple readings and ID numbers for your meter when it is exchanged and activated on our network.

In addition, there are circumstances that may require the exchange of the meter prior to this scheduled installation. These include, but are not limited to: the failure of the current meter, if the meter at your address is randomly

Este es un mensaje importante. Si usted no lo entiende, favor de llama a 412-393-7100.

selected for PUC-required accuracy testing, or when the current automated meter reading system for meters is taken offline later this year. Duquesne Light will attempt to contact you in such circumstances before this exchange takes place.

Steps You Should Take

1. **If the phone number above is incorrect, or one is not listed,** please contact us via email at MeterExchangeInquiry@duqlight.com or by phone at 1-888-928-8539 (press "5" and follow the prompts) to update your contact information.
2. **Make sure we can access the meter** by removing any barriers, such as locked gates, pets or material blocking the meter.
3. **If your meter is located inside your residence/business,** please call 1-888- 928-8539 (press "5" and follow the prompts) to set up an appointment for the installer to gain access to your home to complete the exchange.
4. **Notify others in your residence/business** about the upcoming exchange.

In some limited cases, the meter replacement will result in a brief interruption (approximately 10 minutes) of your electric service. After the exchange is complete, your service will return to normal. We apologize for any inconvenience this outage may cause.

Please note: Even if your electric service is not interrupted, we recommend that you check and, if necessary, reset clocks, surge protectors, Ground Fault Interrupter (GFI) outlets – the type of outlet commonly used near water sources such as kitchens and bathrooms – and other electronic devices.

Online Portal: Putting More Energy Use Information in Your Hands

You soon will have access to a secure online portal that provides information and analysis about your electric use. The portal also will provide options to help you manage your electric bill, including displaying your energy-use patterns by day of week and time of day, providing a projected monthly bill to-date and sending email or phone alerts to reduce high-bill surprise if your monthly usage passes a certain level. Watch your mail for additional information.

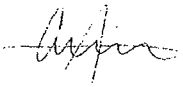
In order to provide you with these services, Duquesne Light will need to share your usage data with our portal provider, Opower, a company we've worked with in the past. Opower will not use your data for any purpose other than what is necessary to provide your online benefits.

You will be automatically enrolled in the online portal program and your customer usage data will be provided to Opower. If you do not want us to make your usage data available to Opower, please contact us by email at MeterExchangeInquiry@duqlight.com or by calling 1-888-928-8539 (press "5" and follow the prompts). Customers who choose not to enroll in the program will not have access to the online portal.

More Information at DuquesneLight.com

For more information on other customer benefits available through the new metering infrastructure, visit the Meter Exchange section of our website, DuquesneLight.com. If you have any questions about this letter, or any of the services and programs offered, contact us via email at DLCCustomerService@duqlight.com or by phone at 1-888-928-8539 (press "5" and follow the prompts).

Sincerely,



Campbell Hawkins
Vice President of Customer Service

Este es un mensaje importante. Si usted no lo entiende, favor de llama a 412-393-7100.

Exhibit C

Asymmetric Septal Hypertrophy

Also called hypertrophic cardiomyopathy, asymmetric septal hypertrophy is a condition that occurs when heart muscles cells enlarge, causing the walls of the lower heart chambers (typically the left ventricle) to become thick and stiff. This makes it difficult for the heart to relax and for a sufficient amount of blood to fill the heart chambers. While the heart squeezes normally, the limited filling prevents the heart from pumping enough blood, especially during physical activity. Children with asymmetric septal hypertrophy are not allowed to play competitive sports because of the possibility of a sudden collapse or increased heart failure.

Exhibit D

Polycythemia vera

Polycythemia vera is a slow-growing blood cancer in which your bone marrow makes too many red blood cells. These excess cells thicken your blood, slowing its flow. They also cause complications, such as blood clots, which can lead to a heart attack or stroke.

Polycythemia vera isn't common. It usually develops slowly, and you might have it for years without knowing. Often the condition is found during a blood test done for another reason.

Without treatment, polycythemia vera can be life-threatening. But proper medical care can help ease signs, symptoms and complications of this disease. Over time, in some cases there's a risk of progressing to more-serious blood cancers, such as myelofibrosis or acute leukemia.

Symptoms

Itchiness, especially following a warm bath or shower

- Headache
- Dizziness
- Bleeding or bruising, usually minor
- Weakness
- Fatigue
- Blurred vision
- Excessive sweating
- Painful swelling of one joint, often the big toe
- Shortness of breath
- Numbness, tingling, burning or weakness in your hands, feet, arms or legs
- A feeling of fullness or bloating in your left upper abdomen due to an enlarged spleen

- Fevers
- Unexplained weight loss

Causes

Polycythemia vera is one of a group of blood cancers known as myeloproliferative neoplasms. It occurs when a mutation in a gene causes a problem with blood cell production. Normally, your body regulates the number of each of the three types of blood cells you have — red blood cells, white blood cells and platelets. But in polycythemia vera, your bone marrow makes too many of some blood cells.

The mutation that causes polycythemia vera is thought to affect a protein switch that tells the cells to grow. Specifically, it's a mutation in the protein Janus kinase 2 (JAK2). Most people with polycythemia vera have this mutation. The cause of the mutation isn't known, but it's generally not inherited.

Risk factors

Polycythemia vera can occur at any age, but it's more common in adults older than 60.

Complications

Possible complications of polycythemia vera include:

- **Blood clots.** Increased blood thickness and decreased blood flow, as well as abnormalities in your platelets, increase your risk of blood clots. Blood clots can cause a stroke, a heart attack or a blockage of an artery in your lungs (pulmonary embolism) or in a vein deep within a muscle (deep vein thrombosis).
- **Enlarged spleen (splenomegaly).** Your spleen helps your body fight infection and filter unwanted material, such as old or damaged blood cells. The increased number of blood cells caused by polycythemia vera makes your spleen work harder than normal, which causes it to enlarge.
- **Problems due to high levels of red blood cells.** Too many red blood cells can lead to a number of other complications, including open sores on the inside lining of your stomach, upper small intestine or esophagus (peptic ulcers) and inflammation in your joints (gout).
- **Other blood disorders.** In rare cases, polycythemia vera can lead to other blood diseases, including a progressive disorder in which bone marrow is replaced with scar tissue (myelofibrosis), a condition in which stem cells don't mature or function properly (myelodysplastic syndrome), or cancer of the blood and bone marrow (acute leukemia).

Truth stands, even if there be no public support.
It is self-sustained.
-Mahatma Gandhi